

CITY OF VAUGHAN

EXTRACT FROM COUNCIL MEETING MINUTES OF MAY 14, 2013

Item 22, Report No. 19, of the Committee of the Whole, which was adopted without amendment by the Council of the City of Vaughan on May 14, 2013.

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**MEASURING SUSTAINABILITY PERFORMANCE OF
NEW DEVELOPMENT IN BRAMPTON, RICHMOND HILL AND VAUGHAN
DRAFT COMPREHENSIVE REPORT
FILE 22.24.1**

The Committee of the Whole recommends approval of the recommendation contained in the following report of the Commissioner of Planning, dated April 30, 2013:

Recommendation

The Commissioner of Planning, in consultation with the Commissioner of Engineering and Public Works and the Commissioner of Strategic and Corporate Services, recommends that staff **be directed** to prepare a report to Council on recommendations for a phased approach to implement sustainability guidelines and metrics in the development review process.

Contribution to Sustainability

The project, Measuring Sustainability Performance of New Development in Brampton, Richmond Hill and Vaughan, implements priorities previously set by Council in *Green Directions Vaughan*, the City's Community Sustainability and Environmental Master Plan. Specifically, Objective 2.3 speaks to creating a city with sustainable built form. Action Item 2.3.1 refers to developing criteria to measure the sustainability performance of development, specifically to develop "sustainable development evaluation criteria" with a focus on ecological and social aspects of sustainability. Integrating sustainability guidelines and metrics in the development review process for each development application is an important tool to achieve sustainable communities.

Economic Impact

The City has partnered with the City of Brampton and the Town of Richmond Hill in undertaking this study. The total cost to the City of Vaughan (approved in the 2011 Budget) for the study under the funding arrangement with the municipal partners is \$22,500 (net) of the total project cost of \$180,000. A grant agreement was signed by the City of Brampton with the Federation of Canadian Municipalities (FCM) in January 2011 to reimburse the municipal partners up to \$85,000 from the Green Municipal Fund.

It should be noted that the financial consideration for this initiative has not been fully determined. A report will be provided at a later date outlining implementation actions, recommendations and resource requirements for consideration. The timing of this report is planned to coincide with Council Budget discussions later this year. However, at this stage it is anticipated there may be potential resourcing challenges associated with the following:

- Administering and monitoring the process;
- Resourcing incentives to encourage sustainable development;
- City service level implications and resourcing requirements;
- Generally communicating the transition.

Communications Plan

The communications plan for the project, Measuring Sustainability Performance of New Development, includes consultation as part of the development of the sustainability guidelines and metrics as well as outreach for the purposes of knowledge transfer. Consultation has included two workshops held in Vaughan for staff of the three partner municipalities. Two forums have been held for the development community, one in Brampton and one in Vaughan.

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Outreach as part of the knowledge transfer process will continue into the future once the project has been approved by the respective Councils. The partners will seek to present the results of the project at various venues, such as the annual symposium of the Ontario Professional Planners Institute, the annual conference of the Canadian Institute of Planners, the annual conference of the Federation of Canadian Municipalities, the Municipal Leaders Forum (an initiative of the Greater Toronto Chapter of the Canada Green Building Council), and where other opportunities arise.

The consulting team's Draft Comprehensive Report will be made available on the Policy Planning Projects and Studies web site under the project title, Measuring Sustainability Performance of New Development in Brampton, Richmond Hill and Vaughan (https://www.vaughan.ca/projects/policy_planning_projects/Pages/default.aspx).

Purpose

The project, Measuring Sustainability Performance of New Development, was the subject of a staff report and presentation to the Priorities and Key Initiatives Committee of Council on March 18, 2013. The presentation by representatives of the consulting team (Dan Lemming), York Region Public Health (Dr. Kurji) and Peel Public Health (Gayle Bursey) emphasized the broader linkages between public health and sustainable communities. The incorporation of sustainability guidelines and metrics into the development review process, to improve the sustainability performance of communities, is an important means of delivering the City's sustainability agenda and is aligned with objectives of other government agencies.

Having established the broader context and importance of the project in a previous report to Council, the purpose of this report is to present the draft Sustainability Metrics and accompanying consultants' report for public comment. This report demonstrates the range of policy support in *Green Directions Vaughan*, the VOP 2010, and other City master plans and studies for implementing the sustainability metrics in the development review process.

Following the public comment period, a Final Comprehensive Report will be brought to Council, which will focus on recommendations for a phased implementation approach of the sustainability guidelines and sustainability metrics in the development review process. A range of implementation issues identified in this report will be more fully considered in the future report to Council. Issues identified in the meeting of the Priorities and Key Initiatives Committee of Council on March 18, 2013 will also be addressed in the future staff report, such as:

- City capacity and resources to evaluate the required data;
- Integration of City resources so as not to operate in "silos";
- Consideration of product marketability in the implementation approach, such as in regard to neighbourhood retail options; and
- The need to clearly communicate the approach to the public and other stakeholders.

Background - Analysis and Options

History of the Project

Previous reports were brought to the Environment Committee of Council in 2009 and 2010 to update Council on the process to establish the project to identify a green development checklist. It evolved into collaboration with municipal partners, the City of Brampton and Town of Richmond Hill, and environmental partners (TRCA and Clean Air Partnership). A Memorandum of Understanding was signed by the municipal collaborators in January 2011 following confirmation of matching funds of \$85,000 from the Green Municipal Fund of the Federation of Canadian Municipalities.

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Phase 1 of the project was led by the City of Brampton and began in 2011 with a focus on developing the sustainability guidelines. Phase 2 is being led by the City of Vaughan and has a focus on identifying and testing sustainability metrics within the framework of the guidelines developed in Phase 1. A report and presentation to the Priorities and Key Initiatives Committee of Council was provided on March 18, 2013 with a focus on illustrating the links between public health and sustainable communities. Following the public comment period on the Draft Comprehensive Report attached to this report, a Final Comprehensive Report will be brought to Council, which will focus on implementing the findings of the project.

Economic Benefits

A wide range of studies document the economic benefits of green building and sustainable communities that accrue within a 5 to 20 year time period. The main economic benefits often cited include:

- Energy and water use reductions resulting in costs savings to building owners, often with a payback within 5 years;
- Energy and water use reductions providing a cost savings to governments by deferring or eliminating the need for infrastructure upgrades and expansions;
- Increased property values resulting from lower vacancy rates as consumers seek the benefits of multi-year cost savings;
- Improved employee attendance and productivity for commercial developments, as a result of better indoor temperatures, ventilation and attention to natural light;
- Creating opportunities to expand the green economy with respect to products and services; and
- As noted in the discussion at the meeting of the Priorities and Key Initiatives Committee of Council on March 18, 2013, addressing trends in chronic diseases for even a small percentage of the population will have a dramatic savings in health care costs.

Provincial Policy

There is an underlying policy framework that supports the development and application of sustainability metrics. Bill 51, the Planning and Conservation Land Statute Amendment Act, added the following as a matter of provincial interest in Section 2 of the Planning Act: “the promotion of development that is designed to be sustainable, to support public transit and to be oriented to pedestrians”.

Section 41 of the Planning Act was amended by Bill 51 to provide new powers related to obtaining sustainable design features for buildings through site plan control. In particular, paragraph 2 of subsection 41 (4) of the Act was amended by adding the following to the list of plans and drawings which the municipality may approve as a condition of development:

- “(d) matters relating to exterior design, including without limitation the character, scale, appearance and design features of buildings, and their sustainable design, but only to the extent that it is a matter of exterior design, if an official plan and a by-law passed under subsection (2) that both contain provisions relating to such matters are in effect in the municipality;
- (e) the sustainable design elements on any adjoining highway under a municipality's jurisdiction, including without limitation trees, shrubs, hedges, plantings or other ground cover, permeable paving materials, street furniture, curb ramps, waste and recycling containers and bicycle parking facilities, if an official plan and a by-law passed under subsection (2) are in effect in the municipality; and
- (f) facilities designed to have regard for accessibility for persons with disabilities.”

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York Region Official Plan

The York Regional Official Plan (ROP 2010), approved by the Minister of Municipal Affairs and Housing on September 7, 2010, is the upper tier planning document that provides the framework for achieving the Region’s vision to 2031. The ROP 2010 was subject to over 50 appeals and is now in the hands of the Ontario Municipal Board. The Regional Official Plan has received partial approval and the majority of the document is now in effect. Those portions of the Plan still under appeal, largely policies related to employment and retail uses, will be addressed through an OMB hearing which will take place this year. There are a number of new sustainability policies within the York ROP 2010 that staff will need to take into account as part of City studies and review of development applications.

Relevant VOP 2010 Policies

Section 9.1.3 of the VOP 2010 directs the City to establish “Green Development Standards” relating to a range of sustainability items. Until such time as Green Development Standards are adopted by Council, applications are required to submit a “Sustainable Development Report” with reference to the policies of the York Region Official Plan regarding sustainable buildings.

Site Plan Control is noted in Section 10.1.2 (Implementation Tools) of the VOP 2010. The amendments of Bill 51 to paragraph 2 of subsection 41 (4) of the Planning Act regarding sustainable design are included in Policy 10.1.2.20.

Section 10.1.3 regarding a complete application submission provides that a Sustainable Development Report may be required in support of a complete application submission.

Policies Supporting Sustainability Metrics

A precedent is referenced for over 80% of the metrics, identifying a recognized standard, municipal guideline or provincial policy that has helped inform the mandatory, recommended minimum and aspirational targets. In many cases, the identified precedent refers to Leadership in Energy and Environmental Design (LEED) rating systems and the Toronto Green Standard (TGS), which have been successfully implemented and are the result of comprehensive research and extensive consultation. The table below provides the local municipal and regional policy support for each of the sustainability metrics. The ROP 2010 policies below are not subject to region-wide appeals, but a few policies are not in force and effect in site-specific parts of the City.

Sustainability Indicator and/or Metric	York Region Official Plan Policy	VOP 2010 Policy
Persons and jobs per hectare	5.2.14 and 5.2.15 5.6.3 (New Community Areas)	9.2.2.14.b.i (New Community Areas)
Location Efficiency	7.2.25 a. and d. 5.6.12.d (New Community Areas)	4.2.2.14 and 4.2.2.14 (Transit-Oriented Development) 9.2.2.14.b.xii.D (New Community Areas)
Proximity to Principal and Basic Amenities	5.2.8	4.2.3.1 a. to f.
Urban Tree Diversity	2.2.50	3.3.3.5
Site Accessibility	5.2.7 and 5.2.8.f	2.1.3.2.p and 7.5.1.4
Housing Unit Mix	3.5.4	2.1.3.2.j 7.5.1.1 and 7.5.1.3
Green Buildings	5.2.24	
Community Form	4.4.1 5.6.5 (New Community Areas)	9.2.2.14.b.iii to viii. (New Community Areas)

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Landscape and Street Tree Planting and/or Preservation	2.2.50, 5.2.8, 5.2.33, 5.4.6.i 5.6.7 and 5.6.16 (New Community Areas)	9.1.1.2.c and 10.1.1.7.o
Proximity to Natural Green Space	5.6.15 (New Community Areas)	7.3.1.2.c 9.2.2.14.b.ix (New Community Areas)
Bicycle Parking	7.2.10 to 7.2.14 and 5.2.10.f	4.2.3.8 to 4.2.3.10 and 4.2.3
Off-street parking	3.1.3, 3.2.3 and 5.2.10	4.3.2.2 to 4.3.2.9
Surface Parking	3.1.3, 3.2.3 and 5.2.10	4.3.2.2 to 4.3.2.9
Carpooling and Efficient Vehicle Parking	5.2.10.f	4.3.2.2.d and 4.3.2.7 3.7.1.3 and 3.7.1.4
Traffic Calming		4.3.1.1 to 4.3.1.4
School Proximity to Transit Routes and Bikeways	5.6.12.e (New Community Areas)	4.2.1.26 and 4.2.3.10
Proximity to Schools	5.6.12.e (New Community Areas)	4.2.3.1.b, 4.2.3.4, and 4.3.3.4
Cultural Heritage Conservation	3.4.1 to 3.4.14	Section 6
Ratio of Residents:Jobs per Hectare	5.1.2 (Table 1) 5.2.5	
Block Perimeter/Length	4.2.3.3 5.6.12.a	2.2.5.6.d (Primary Centres) 2.2.5.7.f (Local Centres) 4.2.3.3
Intersection Density	5.4.20 (Regional Centres) 5.6.12.a	4.2.3.3
Site Permeability/Connectivity	5.2.10.d 5.4.20 (Regional Centres)	4.2.3.1 to 4.2.3.4
Distance to Public Transit	5.3.4 7.2.25	4.2.2.14
Proximity to Trail and Bike Paths	5.2.4 7.2.1 to 7.2.15	4.2.3.1 to 4.2.3.6
Promote Walkable Streets	5.2.3	4.2.3.4
Parks	5.3.7, 5.3.8 5.4.6.j (Regional Centres and Corridors) 5.5.3.f (Local Centres and Corridors) 5.6.14 and 5.6.15 (New Community Areas)	7.3.1.2 to 7.3.1.4 7.3.2.1 to 7.3.2.7
Stormwater Quantity/Quality	2.3.37 and 2.3.38 5.2.11 5.6.11 (New Community Areas)	3.6.2.2 3.6.6.3, 3.6.6.4 and 3.6.6.8
Rainwater Re-use	5.2.11 5.2.32	9.1.3.1.d
Stormwater Architecture/Features	2.1.12	3.6.6.5 and 3.6.6.6
Dedicate Land for Food Production	3.1.8 6.3.16	7.4.1.1 to 7.4.1.5
Natural Heritage System Enhancements	2.1.3 and 2.1.4 (Greenlands System)	3.2.3.1, 3.2.3.13 to 3.2.3.15
Restore and Enhance Soils	2.2.53	3.3.7.2 and 3.6.7.2
Topography and Landform Conservation	2.2.53	3.3.7.1 to 3.3.7.4

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Canopy Cover	5.2.34	9.1.1.2, 9.1.1.10 10.1.1.7.o
Solar Readiness	5.2.26	8.5.1.1, 8.5.1.7, 9.1.3.1.b
Passive Solar Alignment	5.2.13, 5.2.26 5.6.9 (New Community Areas)	4.2.1.26 (Local Streets) 8.5.1.1, 9.1.3.1.b 9.2.2.14.b.ix (New Community Areas)
Building Energy Efficiency	5.2.20 and 5.2.21 7.5.11	8.5.1.2 9.1.3.2
District Energy Viability Study	5.2.13, 5.6.10 7.5.13	5.2.1.5 8.5.1.2, 8.5.1.6
Potable Water	5.2.22 and 5.2.23 5.6.11 (New Community Areas) 7.1.19 and 7.1.21	9.1.3.2.c 9.2.2.14.b.xi.B (New Community Areas)
Reduce Light Pollution	3.1.10	10.1.2.25
Materials and Solid Waste Management	5.2.30	8.6.1.6 and 8.6.1.7
Bird Friendly Design		
Reduce Heat Island Effect	5.2.34 to 5.2.36	9.2.2.14.b.xv (New Community Areas) 10.1.1.14

Relevant Official Plan Amendments

The Planning Department presented a Report to Committee of the Whole, which was ratified by Council on December 14, 2009, to implement a complete application process according to the Planning and Conservation Land Statue Amendment Act (Bill 51). An Urban Design Brief or Guidelines was identified as material that may be required to be submitted in support of a complete application. The guidelines and submission requirements will be finalized following either the testing of sustainability performance measures and/or approval of the new City-wide Official Plan, VOP 2010, which includes the latest version of the City's requirements for a complete application.

Relevant City of Vaughan Master Plans and/or Studies

The sustainability metrics will be integrated into the development review process and be aligned with existing City-initiated studies and/or Master Plans. Such studies are briefly described below.

Green Directions Vaughan (GDV) - (2009)

Green Directions Vaughan, the City's Community Sustainability and Environmental Master Plan, is a long term plan designed to guide the community toward a more sustainable future by addressing environmental, cultural, social and economic issues. In November 2012, Council approved the tracking of 24 indicators in order to monitor the implementation of *GDV*. Many of these indicators closely align with the sustainability indicators and/or metrics being proposed for the development review process, but the *GDV* indicators are evaluated and presented at a City-wide scale. The 24 *GDV* indicators will be critical in assessing the longer-term trends of green development measures integrated into development applications.

Active Together Master Plan (2008)

The "Active Together" Master Plan is an integrated long-term strategy that guides planning for parks, recreation, culture and library facilities and services until the City's

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ultimate build-out. A comprehensive needs assessment was prepared, including the creation of measurable standards for facilities and services that are unique to Vaughan. An implementation strategy was developed that establishes priorities, timing, and financial implications for the future provision of parks and facilities. The 2008 plan is currently under review.

Pedestrian and Bicycle Master Plan Study (2007)

The Vaughan Pedestrian and Bicycle Master Plan (the VPBP) is a 20 year plan that has been designed with guidelines and recommendations that will assist City staff in the development and implementation of new programs and facilities that can make Vaughan a pedestrian and cycling-friendly City. The VPBP consists of a number of key components that include:

- a recommended network of on and off-road cycling facilities and multi-use trails as well as recommendations on how to improve the pedestrian environment and support public transit use;
- a recommended set of pedestrian and cycling route and facility planning & design guidelines;
- policy & program suggestions; and
- an implementation strategy.

Heritage Conservation District Plans

The *Ontario Heritage Act* enables municipal councils to designate a Heritage Conservation District (HCD) “through adoption of a district plan with policies and guidelines for conservation, protection and enhancement of the area’s special character”. All four historic villages within the City of Vaughan (Kleinburg-Nashville, Maple, Thornhill and Woodbridge) are identified as Heritage Conservation Districts and are recognized in the VOP 2010 as Local Centres. The HCDs allow the City of Vaughan to recognize, that in addition to a collection of historic buildings, it is the cumulative character of the buildings, streetscape, landscape, and other cultural and urban features that define the character of place and achieve a sense of identity.

Urban Forest Management Strategy (2012)

In 2009, the City of Vaughan approved *Planting Our Future: A 5-Year Plan to Expand the Urban Forest*, a document that describes the benefits of a healthy urban forest. According to the recently completed Urban Forest Study, a joint project with York Region, Markham, Richmond Hill and the Toronto and Region Conservation Authority (TRCA), forest cover in Vaughan stands at 17%, whereas the ideal range is between 20-25% for a municipality. Among the 22 recommendations in the Urban Forest Study, the following are of particular relevance to the design and implementation of sustainability metrics in the development review process:

- Continue to establish a diverse tree population (recommendation #5);
- Continue to develop municipal guidelines and regulations for sustainable streetscape and subdivision design that ensure adequate soil quality and quantity for tree establishment (recommendation #9);
- Develop Tree Protection Guidelines for tree protection zones and other measures to be undertaken for all publically and privately owned trees (recommendation #13);
- Explore the development of targets for ecosystem services; integrate such targets into the Natural Heritage Strategy (recommendation #18); and

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- Utilize the criteria and performance indicators developed by Kenney *et al.* (2011) to inform the creation of a strategic urban forest management plan and to assess the progress made towards urban forest sustainability (recommendation #22).

Waste Collection By-Law (217-2010) Waste Collection Design Standards Policy (2007)

The Waste Collection Design Standards Policy document sets out the City's requirements (design standards) for the collection of waste for various categories of development and land uses. All applicants submitting development and redevelopment applications must provide a "Waste Collection Design Standards" submission as identified in Part 4 (Collection Requirements) of this document with their site plan / development application.

Storm Drainage/Stormwater Management Master Plan

The Storm Drainage/Storm Water Management Master Plan is being undertaken concurrent with the Master Plan for water and wastewater infrastructure. Specific considerations of the Storm Drainage/Storm Water Management Master Plan include, but are not limited to:

- A broad level analysis of emerging groundwater management issues;
- Review and recommendations to incorporate low impact development guidelines into the storm drainage and stormwater management criteria;
- Development of stormwater servicing options for growth scenarios;
- Consideration of alternative servicing solutions to address integrated objectives and environmental targets to accommodate future growth; and
- Financial planning analysis to identify funding options regarding stormwater rates and other funding structures.

City Transportation Master Plan (New Path)

Vaughan Council approved the City's new Transportation Master Plan (TMP) in October 2011. The main components of the TMP focus on a mix of transportation solutions including a transit-first approach and a reduction in vehicle use through improved active transportation, strategic road improvements, parking management, additional mobility choices for new development and redevelopment, and enhanced infrastructure in the Vaughan Metropolitan Centre.

Engineering Design Criteria and Standard Drawings (Revision December 2012)

The Engineering Design Criteria are intended: (a) as a guideline to provide a sound, sustainable engineering basis for municipal servicing and subdivision design; (b) to establish a uniform set of minimum standards to support an appropriate standard of living; and (c) to improve processing of subdivision plans and agreements in the City of Vaughan.

City-Wide Parking Standards Review and Zoning By-Law

A Parking Standards Review study was undertaken as per Council direction of June 11, 2007. The study concluded that the "Parking Requirements" of By-law 1-88 demonstrated an auto-oriented approach which ensured that each destination can accommodate peak parking demand on site. The study assesses the overall approach to parking standards throughout the City under the mandate that parking policies and standards should be responsible, implementable, and promote more sustainable forms of development.

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The City is taking a phased approach to the implementation of the recommendations resulting from the City-Wide Parking Standards Review. Phase 1 of the implementation approach includes a revised parking by-law specific to the Vaughan Metropolitan Centre (VMC) intended to address revised parking standards, definitions for uses permitted in the VMC, bicycle parking/storage, and the introduction of parking management strategies. The draft by-law was the subject of a Committee of the Whole Public Hearing on February 26, 2013.

A staff recommendation adopted by Council was to establish a Working Group consisting of Enforcement Services, Building Standards, Fire & Safety, Engineering, Planning, Finance, Legal Services Departments, and any other Departments necessary to address the issues of on-street parking, priced parking and the management and enforcement of public parking, including consideration of the development of a Parking Strategy and Parking Management Business Plan or Parking Authority.

Section 37 – Implementation Guidelines and Negotiating Protocol

Section 37 of the Planning Act authorizes municipalities to enter an agreement in which a developer provides community benefits in exchange for greater height and density than would otherwise be permitted on a given site. The VOP 2010 and the VMC Secondary Plan have provisions for the use of s. 37. The Policy Planning department is currently developing a protocol to facilitate s. 37 agreements between the City and private development interests.

Vaughan Accessibility Plan (2011)

Accessibility planning initiatives have increased in Vaughan with the need to develop standards to meet the Accessibility for Ontarians with Disabilities Act, 2005 (AODA). An accessibility standard for the built environment (buildings and outdoor spaces) is in development and not yet law.

The Vaughan Accessibility Plan 2011 highlights the following:

- corporate achievements in the area of accessibility; and
- strategies, phased in over the next few years, which City of Vaughan departments will undertake to ensure that inclusion for all residents and staff can be realized.

The Study – Phase 1

Phase 1 of the project was led by the City of Brampton and The Planning Partnership, with the goal to develop Sustainable Community Development Guidelines (SCDGs). The Phase 1 SCDGs will be a new chapter in the City of Brampton's municipal-wide urban design guidelines, the Development Design Guidelines, and will assist the City in the review of development applications and technical reports and documentation. The SCDGs will serve to help describe the qualitative sustainability aspects proposed developments should aim to achieve, including highlighting examples of how they could be achieved. The Phase 1 report will be brought to the City of Brampton Planning, Design and Development Committee in the near future.

The focus of the guidelines is on qualitative urban design and community development principles. The guidelines apply to a range of development scales, which include Secondary Plans, Block Plans, and Draft Plans of Subdivision, and Site Plans. These guidelines helped to inform the metric and target priorities for Phase 2 of the project. The SCDGs can be adapted by the City of Vaughan as a component of the future City-wide urban design study scheduled to be undertaken in 2014 upon approval of the 2014 capital budget. In the meantime, City staff will seek opportunities to implement the SCDGs on a trial basis as part of the development review process.

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The Study – Phase 2

Phase 2 is led by the City of Vaughan and the consulting team of Halsall Associates working collaboratively with The Planning Partnership. Building on the principles and guidelines developed under Phase 1, and using the four sustainability themes established in the Phase 1 document, quantitative sustainability metrics were developed for the municipal partners. The draft sustainability metrics (see Appendix A of Attachment 1) were developed to help inform and measure the sustainability performance of new developments within the three municipalities.

The Phase 2 deliverables to be provided by the consulting team include:

- A main report describing the research, evaluation and consultation process;
- Appendix A in the form of a matrix of sustainability metrics pertinent to (a) Block Plan and Draft Plan scales, and (b) Site Plan and Building scales.
- Appendix B, which provides a rationale for each of the sustainability metrics and the main sources of information for interpretation of the metrics and targets;
- A sample information package was developed for use in the municipal staff workshops when testing and evaluating the proposed sustainability metrics;
- A tracking log (Appendix C) of the comments and changes to the metrics during the development and evaluation tasks of the Study; and
- A glossary of terms (Appendix D).

In addition, City of Vaughan staff led the research and writing of a report, the Energy Use Forecasting Report, to test scenarios of energy use and greenhouse gas emissions to 2031 in each of the partner municipalities. The Energy Use Forecasting Report provides information to:

- Inform the sustainability metrics with respect to energy efficiency targets;
- Identify recommendations for energy savings beyond the use of the sustainability metrics in the development review process for new development and re-development; and
- Set the ground work for a municipal-wide Community Energy Plan to meet ROP 2010 policy 5.2.13.

The sustainability metrics are detailed in Appendix A as a matrix or checklist with the following structure:

- Core themes (Built Environment, Mobility, Natural Environment & Open Space, and Infrastructure & Buildings);
- Indicators;
- Performance metrics;
- Mandatory, recommended minimum and aspirational targets;
- Precedents; and
- Point allocation.

The metrics can be applied at scales of development ranging from Secondary Plan/Block Plan, Draft Plan of Subdivision, Site Plan and at the building scale.

Attachment 1, the Draft Comprehensive Report provided by the consulting team, is a detailed description of the research, consultation process, testing, and eventual selection of indicators and metrics. Key issues can be highlighted here:

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- As illustrated in the table above that cross-references the metrics with York Region and VOP 2010 policies, the metrics are not new to the development approvals process, but offers a standardized approach to measure the sustainability performance of proposed developments;
- Recommended minimum and aspirational targets are above thresholds that are required according to pertinent legislation and/or policy;
- An application does not have to achieve a minimum score for each metric, but an overall score or rating will be evaluated as part of the development approvals process;
- There is general industry acceptance of municipalities using a green development evaluation system, but some form of recognition or more staff attention to work through innovative solutions for high-performing sustainability projects was noted as an incentive;
- The summary of sustainability performance will be provided in the staff report for a development application; and
- The sustainability metrics are aligned with performance indicators identified for Green Directions Vaughan.

Next Steps

Final Comprehensive Report

Following the public comment period, the consulting team and municipal partners will prepare a Final Comprehensive Report to bring to Committee of the Whole in the future. The Final Comprehensive Report will also integrate peer review comments from the Clean Air Partnership (CAP) and the Toronto and Region Conservation Authority (TRCA). As with all other Study documents (Phase 1 consultants' report, workshop materials and presentations, Interim Report, and Draft Comprehensive Report), the Vaughan On-Line project site, Measuring Sustainability Performance, will be used to circulate the Final Comprehensive Report for City staff review.

Implementation Issues

The Final Comprehensive Report will assess implementation issues and provide recommendations to integrate the sustainability metrics into policy planning, new infrastructure and development review processes. Consultation with stakeholders including external agencies (TRCA and York Region) will be required. While the implementation policies are in place in the VOP 2010 (see the subsection above titled, Relevant VOP 2010 Policies), several issues that require further discussion include, but are not limited to:

- Education and outreach;
- Potential changes to existing by-laws and/or Letter of Credit provisions;
- Reviewing the City of Vaughan Design Review Panel Protocol to ensure minimum staffing impact;
- Opportunities to use Local Improvement Charges or Community Improvement Plan provisions to encourage enhanced sustainability performance of new developments;
- Alternative approaches to financing implementation;
- Impacts on existing City staff resources;
- Impacts on City service levels respecting maintenance and replacement of capital infrastructure life cycle costs;
- Explore incentive options and any budgetary implications;
- Procedures for staff and training;

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- Tools for staff to verify that sustainability targets will be achieved;
- Identify on a periodic basis the trends and progress that sustainability performance of new development has on influencing metrics associated with broader sustainability performance within the City;
- Alignment with the Vaughan Vision 2020 Strategic Initiatives with particular attention to Strategic Initiative #2, “Further evolve performance indicators”; and
- Data sharing agreements with the Region of York.

In the same way that the municipal workshops brought staff together from various departments to test the sustainability metrics, Policy Planning staff with Engineering and Corporate Services will engage in focus sessions with staff in a range of departments to address implementation issues around key process themes, such as:

- A phased approach to implementation starting with a testing stage for staff and applicants to become familiar with the sustainability metrics and the necessary information requirements of submittal materials. This may include only initial implementation at the early stages of the development application review process (e.g. pre-application consultation only);
- A period of time to test and determine thresholds that are sensible for certain types of applications and locations in Vaughan;
- Circulation process (Pre-Application Consultation, deeming an application complete, Development Review Panel Protocol, etc);
- Submittal materials and need for Terms of Reference for key submittal documents;
- Any amendments to VOP 2010 and/or by-laws;
- Financing options (Local Improvement Charges, Community Improvement Plans, Gas Tax, etc). This will include a discussion on the potential impact of incentives if offered as part of the program;
- Education, including staff training and external stakeholder communication;
- Inspections and staff time to review/monitor applications;
- City service levels and infrastructure maintenance costs; and
- Data needs (e.g. GIS) and tracking of sustainability performance for each application.

Relationship to Vaughan Vision 2020/Strategic Plan

This report is consistent with the priorities previously set by Council and the necessary resources have been allocated and approved for the project.

Regional Implications

The project, Measuring Sustainability Performance of New Development, intended to implement Action Item 2.3.1 of Green Directions Vaughan, is consistent with numerous action items in the Region of York Sustainability Strategy 2007, particularly Section 2 regarding healthy communities and Section 4 regarding a sustainable natural environment. Support from York Region in coordinating information requirements and through new and updated data sharing agreements, training and support will assist staff to implement the findings of the study. The project is consistent with Section 5.2 (Sustainable Cities, Sustainable Communities) of the York Region Official Plan.

Conclusion

The intended result of the project is a user-friendly checklist of environmental performance standards, to integrate into the development review and relevant policy plans and infrastructure processes that are accepted by industry and consistent among the partner municipalities. The

CITY OF VAUGHAN

EXTRACT FROM COUNCIL MEETING MINUTES OF MAY 14, 2013

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consulting team of Halsall Associates and The Planning Partnership has delivered the Draft Comprehensive Report according to the RFP requirements. The focus in the Draft Comprehensive Report is to make available to the public the draft sustainability metrics and approach to evaluating the sustainability performance of development proposals. An approximately one month comment period is recommended, such that comments received by May 30th, 2013 will be considered. Following the incorporation of stakeholder comments, a Final Comprehensive Report will be brought to Council in the future.

Applying sustainability metrics to the development review process for relevant types of development applications will be necessary if the City is to achieve multiple sustainability objectives identified in Green Directions Vaughan, the York Region and City of Vaughan Official Plans and policy documents adopted by the City and other levels of government and agencies. Applying these metrics may require additional staff resources to: (1) assess new information that will be required for development applications, or; (2) integrate the new information into both City and Region GIS data bases. Assistance and support from staff in the offices of Information & Technology Management and Innovation & Continuous Improvement, along with support from building industry stakeholders, may be required to integrate the information into City processes and the City's Corporate GIS system.

Therefore, it is recommended that the report be received and that the Draft Comprehensive Report be made available for review and comment by the public and stakeholders. Comments should be submitted by May 30th, 2013.

Attachments

1. Measuring Sustainability Performance of New Development in Brampton, Richmond Hill and Vaughan – Draft Comprehensive Report prepared by Halsall Associates and The Planning Partnership.
2. Draft Energy Use and Greenhouse Gas Emissions Forecasting Report (February 2013), prepared by the City of Vaughan.

Report prepared by:

Tony Iacobelli, Senior Environmental Planner, ext. 8630
Roy McQuillin, Manager, Policy Planning, ext. 8211
Rob Bayley, Manager of Urban Design, Development Planning, ext. 8254

(A copy of the attachments referred to in the foregoing have been forwarded to each Member of Council and a copy thereof is also on file in the office of the City Clerk.)

COMMITTEE OF THE WHOLE - APRIL 30, 2013

MEASURING SUSTAINABILITY PERFORMANCE OF NEW DEVELOPMENT IN BRAMPTON, RICHMOND HILL AND VAUGHAN DRAFT COMPREHENSIVE REPORT FILE 22.24.1

Recommendation

The Commissioner of Planning, in consultation with the Commissioner of Engineering and Public Works and the Commissioner of Strategic and Corporate Services, recommends that staff **be directed** to prepare a report to Council on recommendations for a phased approach to implement sustainability guidelines and metrics in the development review process.

Contribution to Sustainability

The project, Measuring Sustainability Performance of New Development in Brampton, Richmond Hill and Vaughan, implements priorities previously set by Council in *Green Directions Vaughan*, the City's Community Sustainability and Environmental Master Plan. Specifically, Objective 2.3 speaks to creating a city with sustainable built form. Action Item 2.3.1 refers to developing criteria to measure the sustainability performance of development, specifically to develop "sustainable development evaluation criteria" with a focus on ecological and social aspects of sustainability. Integrating sustainability guidelines and metrics in the development review process for each development application is an important tool to achieve sustainable communities.

Economic Impact

The City has partnered with the City of Brampton and the Town of Richmond Hill in undertaking this study. The total cost to the City of Vaughan (approved in the 2011 Budget) for the study under the funding arrangement with the municipal partners is \$22,500 (net) of the total project cost of \$180,000. A grant agreement was signed by the City of Brampton with the Federation of Canadian Municipalities (FCM) in January 2011 to reimburse the municipal partners up to \$85,000 from the Green Municipal Fund.

It should be noted that the financial consideration for this initiative has not been fully determined. A report will be provided at a later date outlining implementation actions, recommendations and resource requirements for consideration. The timing of this report is planned to coincide with Council Budget discussions later this year. However, at this stage it is anticipated there may be potential resourcing challenges associated with the following:

- Administering and monitoring the process;
- Resourcing incentives to encourage sustainable development;
- City service level implications and resourcing requirements;
- Generally communicating the transition.

Communications Plan

The communications plan for the project, Measuring Sustainability Performance of New Development, includes consultation as part of the development of the sustainability guidelines and metrics as well as outreach for the purposes of knowledge transfer. Consultation has included two workshops held in Vaughan for staff of the three partner municipalities. Two forums have been held for the development community, one in Brampton and one in Vaughan.

Outreach as part of the knowledge transfer process will continue into the future once the project has been approved by the respective Councils. The partners will seek to present the results of the project at various venues, such as the annual symposium of the Ontario Professional

Planners Institute, the annual conference of the Canadian Institute of Planners, the annual conference of the Federation of Canadian Municipalities, the Municipal Leaders Forum (an initiative of the Greater Toronto Chapter of the Canada Green Building Council), and where other opportunities arise.

The consulting team's Draft Comprehensive Report will be made available on the Policy Planning Projects and Studies web site under the project title, Measuring Sustainability Performance of New Development in Brampton, Richmond Hill and Vaughan (https://www.vaughan.ca/projects/policy_planning_projects/Pages/default.aspx).

Purpose

The project, Measuring Sustainability Performance of New Development, was the subject of a staff report and presentation to the Priorities and Key Initiatives Committee of Council on March 18, 2013. The presentation by representatives of the consulting team (Dan Lemming), York Region Public Health (Dr. Kurji) and Peel Public Health (Gayle Bursey) emphasized the broader linkages between public health and sustainable communities. The incorporation of sustainability guidelines and metrics into the development review process, to improve the sustainability performance of communities, is an important means of delivering the City's sustainability agenda and is aligned with objectives of other government agencies.

Having established the broader context and importance of the project in a previous report to Council, the purpose of this report is to present the draft Sustainability Metrics and accompanying consultants' report for public comment. This report demonstrates the range of policy support in *Green Directions Vaughan*, the VOP 2010, and other City master plans and studies for implementing the sustainability metrics in the development review process.

Following the public comment period, a Final Comprehensive Report will be brought to Council, which will focus on recommendations for a phased implementation approach of the sustainability guidelines and sustainability metrics in the development review process. A range of implementation issues identified in this report will be more fully considered in the future report to Council. Issues identified in the meeting of the Priorities and Key Initiatives Committee of Council on March 18, 2013 will also be addressed in the future staff report, such as:

- City capacity and resources to evaluate the required data;
- Integration of City resources so as not to operate in "silos";
- Consideration of product marketability in the implementation approach, such as in regard to neighbourhood retail options; and
- The need to clearly communicate the approach to the public and other stakeholders.

Background - Analysis and Options

History of the Project

Previous reports were brought to the Environment Committee of Council in 2009 and 2010 to update Council on the process to establish the project to identify a green development checklist. It evolved into collaboration with municipal partners, the City of Brampton and Town of Richmond Hill, and environmental partners (TRCA and Clean Air Partnership). A Memorandum of Understanding was signed by the municipal collaborators in January 2011 following confirmation of matching funds of \$85,000 from the Green Municipal Fund of the Federation of Canadian Municipalities.

Phase 1 of the project was led by the City of Brampton and began in 2011 with a focus on developing the sustainability guidelines. Phase 2 is being led by the City of Vaughan and has a focus on identifying and testing sustainability metrics within the framework of the guidelines developed in Phase 1. A report and presentation to the Priorities and Key Initiatives Committee

of Council was provided on March 18, 2013 with a focus on illustrating the links between public health and sustainable communities. Following the public comment period on the Draft Comprehensive Report attached to this report, a Final Comprehensive Report will be brought to Council, which will focus on implementing the findings of the project.

Economic Benefits

A wide range of studies document the economic benefits of green building and sustainable communities that accrue within a 5 to 20 year time period. The main economic benefits often cited include:

- Energy and water use reductions resulting in costs savings to building owners, often with a payback within 5 years;
- Energy and water use reductions providing a cost savings to governments by deferring or eliminating the need for infrastructure upgrades and expansions;
- Increased property values resulting from lower vacancy rates as consumers seek the benefits of multi-year cost savings;
- Improved employee attendance and productivity for commercial developments, as a result of better indoor temperatures, ventilation and attention to natural light;
- Creating opportunities to expand the green economy with respect to products and services; and
- As noted in the discussion at the meeting of the Priorities and Key Initiatives Committee of Council on March 18, 2013, addressing trends in chronic diseases for even a small percentage of the population will have a dramatic savings in health care costs.

Provincial Policy

There is an underlying policy framework that supports the development and application of sustainability metrics. Bill 51, the Planning and Conservation Land Statue Amendment Act, added the following as a matter of provincial interest in Section 2 of the Planning Act: “the promotion of development that is designed to be sustainable, to support public transit and to be oriented to pedestrians”.

Section 41 of the Planning Act was amended by Bill 51 to provide new powers related to obtaining sustainable design features for buildings through site plan control. In particular, paragraph 2 of subsection 41 (4) of the Act was amended by adding the following to the list of plans and drawings which the municipality may approve as a condition of development:

- “(d) matters relating to exterior design, including without limitation the character, scale, appearance and design features of buildings, and their sustainable design, but only to the extent that it is a matter of exterior design, if an official plan and a by-law passed under subsection (2) that both contain provisions relating to such matters are in effect in the municipality;
- (e) the sustainable design elements on any adjoining highway under a municipality's jurisdiction, including without limitation trees, shrubs, hedges, plantings or other ground cover, permeable paving materials, street furniture, curb ramps, waste and recycling containers and bicycle parking facilities, if an official plan and a by-law passed under subsection (2) are in effect in the municipality; and
- (f) facilities designed to have regard for accessibility for persons with disabilities.”

York Region Official Plan

The York Regional Official Plan (ROP 2010), approved by the Minister of Municipal Affairs and Housing on September 7, 2010, is the upper tier planning document that provides the framework for achieving the Region's vision to 2031. The ROP 2010 was subject to over 50 appeals and is

now in the hands of the Ontario Municipal Board. The Regional Official Plan has received partial approval and the majority of the document is now in effect. Those portions of the Plan still under appeal, largely policies related to employment and retail uses, will be addressed through an OMB hearing which will take place this year. There are a number of new sustainability policies within the York ROP 2010 that staff will need to take into account as part of City studies and review of development applications.

Relevant VOP 2010 Policies

Section 9.1.3 of the VOP 2010 directs the City to establish “Green Development Standards” relating to a range of sustainability items. Until such time as Green Development Standards are adopted by Council, applications are required to submit a “Sustainable Development Report” with reference to the policies of the York Region Official Plan regarding sustainable buildings.

Site Plan Control is noted in Section 10.1.2 (Implementation Tools) of the VOP 2010. The amendments of Bill 51 to paragraph 2 of subsection 41 (4) of the Planning Act regarding sustainable design are included in Policy 10.1.2.20.

Section 10.1.3 regarding a complete application submission provides that a Sustainable Development Report may be required in support of a complete application submission.

Policies Supporting Sustainability Metrics

A precedent is referenced for over 80% of the metrics, identifying a recognized standard, municipal guideline or provincial policy that has helped inform the mandatory, recommended minimum and aspirational targets. In many cases, the identified precedent refers to Leadership in Energy and Environmental Design (LEED) rating systems and the Toronto Green Standard (TGS), which have been successfully implemented and are the result of comprehensive research and extensive consultation. The table below provides the local municipal and regional policy support for each of the sustainability metrics. The ROP 2010 policies below are not subject to region-wide appeals, but a few policies are not in force and effect in site-specific parts of the City.

Sustainability Indicator and/or Metric	York Region Official Plan Policy	VOP 2010 Policy
Persons and jobs per hectare	5.2.14 and 5.2.15 5.6.3 (New Community Areas)	9.2.2.14.b.i (New Community Areas)
Location Efficiency	7.2.25 a. and d. 5.6.12.d (New Community Areas)	4.2.2.14 and 4.2.2.14 (Transit-Oriented Development) 9.2.2.14.b.xii.D (New Community Areas)
Proximity to Principal and Basic Amenities	5.2.8	4.2.3.1 a. to f.
Urban Tree Diversity	2.2.50	3.3.3.5
Site Accessibility	5.2.7 and 5.2.8.f	2.1.3.2.p and 7.5.1.4
Housing Unit Mix	3.5.4	2.1.3.2.j 7.5.1.1 and 7.5.1.3
Green Buildings	5.2.24	
Community Form	4.4.1 5.6.5 (New Community Areas)	9.2.2.14.b.iii to viii. (New Community Areas)
Landscape and Street Tree Planting and/or Preservation	2.2.50, 5.2.8, 5.2.33, 5.4.6.i 5.6.7 and 5.6.16 (New Community Areas)	9.1.1.2.c and 10.1.1.7.o
Proximity to Natural Green Space	5.6.15 (New Community Areas)	7.3.1.2.c 9.2.2.14.b.ix (New Community

Sustainability Indicator and/or Metric	York Region Official Plan Policy	VOP 2010 Policy
		Areas)
Bicycle Parking	7.2.10 to 7.2.14 and 5.2.10.f	4.2.3.8 to 4.2.3.10 and 4.2.3
Off-street parking	3.1.3, 3.2.3 and 5.2.10	4.3.2.2 to 4.3.2.9
Surface Parking	3.1.3, 3.2.3 and 5.2.10	4.3.2.2 to 4.3.2.9
Carpooling and Efficient Vehicle Parking	5.2.10.f	4.3.2.2.d and 4.3.2.7 3.7.1.3 and 3.7.1.4
Traffic Calming		4.3.1.1 to 4.3.1.4
School Proximity to Transit Routes and Bikeways	5.6.12.e (New Community Areas)	4.2.1.26 and 4.2.3.10
Proximity to Schools	5.6.12.e (New Community Areas)	4.2.3.1.b, 4.2.3.4, and 4.3.3.4
Cultural Heritage Conservation	3.4.1 to 3.4.14	Section 6
Ratio of Residents:Jobs per Hectare	5.1.2 (Table 1) 5.2.5	
Block Perimeter/Length	4.2.3.3 5.6.12.a	2.2.5.6.d (Primary Centres) 2.2.5.7.f (Local Centres) 4.2.3.3
Intersection Density	5.4.20 (Regional Centres) 5.6.12.a	4.2.3.3
Site Permeability/Connectivity	5.2.10.d 5.4.20 (Regional Centres)	4.2.3.1 to 4.2.3.4
Distance to Public Transit	5.3.4 7.2.25	4.2.2.14
Proximity to Trail and Bike Paths	5.2.4 7.2.1 to 7.2.15	4.2.3.1 to 4.2.3.6
Promote Walkable Streets	5.2.3	4.2.3.4
Parks	5.3.7, 5.3.8 5.4.6.j (Regional Centres and Corridors) 5.5.3.f (Local Centres and Corridors) 5.6.14 and 5.6.15 (New Community Areas)	7.3.1.2 to 7.3.1.4 7.3.2.1 to 7.3.2.7
Stormwater Quantity/Quality	2.3.37 and 2.3.38 5.2.11 5.6.11 (New Community Areas)	3.6.2.2 3.6.6.3, 3.6.6.4 and 3.6.6.8
Rainwater Re-use	5.2.11 5.2.32	9.1.3.1.d
Stormwater Architecture/Features	2.1.12	3.6.6.5 and 3.6.6.6
Dedicate Land for Food Production	3.1.8 6.3.16	7.4.1.1 to 7.4.1.5
Natural Heritage System Enhancements	2.1.3 and 2.1.4 (Greenlands System)	3.2.3.1, 3.2.3.13 to 3.2.3.15
Restore and Enhance Soils	2.2.53	3.3.7.2 and 3.6.7.2
Topography and Landform Conservation	2.2.53	3.3.7.1 to 3.3.7.4
Canopy Cover	5.2.34	9.1.1.2, 9.1.1.10 10.1.1.7.o
Solar Readiness	5.2.26	8.5.1.1, 8.5.1.7, 9.1.3.1.b

Sustainability Indicator and/or Metric	York Region Official Plan Policy	VOP 2010 Policy
Passive Solar Alignment	5.2.13, 5.2.26 5.6.9 (New Community Areas)	4.2.1.26 (Local Streets) 8.5.1.1, 9.1.3.1.b 9.2.2.14.b.ix (New Community Areas)
Building Energy Efficiency	5.2.20 and 5.2.21 7.5.11	8.5.1.2 9.1.3.2
District Energy Viability Study	5.2.13, 5.6.10 7.5.13	5.2.1.5 8.5.1.2, 8.5.1.6
Potable Water	5.2.22 and 5.2.23 5.6.11 (New Community Areas) 7.1.19 and 7.1.21	9.1.3.2.c 9.2.2.14.b.xi.B (New Community Areas)
Reduce Light Pollution	3.1.10	10.1.2.25
Materials and Solid Waste Management	5.2.30	8.6.1.6 and 8.6.1.7
Bird Friendly Design		
Reduce Heat Island Effect	5.2.34 to 5.2.36	9.2.2.14.b.xv (New Community Areas) 10.1.1.14

Relevant Official Plan Amendments

The Planning Department presented a Report to Committee of the Whole, which was ratified by Council on December 14, 2009, to implement a complete application process according to the Planning and Conservation Land Statute Amendment Act (Bill 51). An Urban Design Brief or Guidelines was identified as material that may be required to be submitted in support of a complete application. The guidelines and submission requirements will be finalized following either the testing of sustainability performance measures and/or approval of the new City-wide Official Plan, VOP 2010, which includes the latest version of the City's requirements for a complete application.

Relevant City of Vaughan Master Plans and/or Studies

The sustainability metrics will be integrated into the development review process and be aligned with existing City-initiated studies and/or Master Plans. Such studies are briefly described below.

Green Directions Vaughan (GDV) - (2009)

Green Directions Vaughan, the City's Community Sustainability and Environmental Master Plan, is a long term plan designed to guide the community toward a more sustainable future by addressing environmental, cultural, social and economic issues. In November 2012, Council approved the tracking of 24 indicators in order to monitor the implementation of *GDV*. Many of these indicators closely align with the sustainability indicators and/or metrics being proposed for the development review process, but the *GDV* indicators are evaluated and presented at a City-wide scale. The 24 *GDV* indicators will be critical in assessing the longer-term trends of green development measures integrated into development applications.

Active Together Master Plan (2008)

The "Active Together" Master Plan is an integrated long-term strategy that guides planning for parks, recreation, culture and library facilities and services until the City's ultimate build-out. A comprehensive needs assessment was prepared, including the creation of measurable standards for facilities and services that are unique to Vaughan.

An implementation strategy was developed that establishes priorities, timing, and financial implications for the future provision of parks and facilities. The 2008 plan is currently under review.

Pedestrian and Bicycle Master Plan Study (2007)

The Vaughan Pedestrian and Bicycle Master Plan (the VPBP) is a 20 year plan that has been designed with guidelines and recommendations that will assist City staff in the development and implementation of new programs and facilities that can make Vaughan a pedestrian and cycling-friendly City. The VPBP consists of a number of key components that include:

- a recommended network of on and off-road cycling facilities and multi-use trails as well as recommendations on how to improve the pedestrian environment and support public transit use;
- a recommended set of pedestrian and cycling route and facility planning & design guidelines;
- policy & program suggestions; and
- an implementation strategy.

Heritage Conservation District Plans

The *Ontario Heritage Act* enables municipal councils to designate a Heritage Conservation District (HCD) “through adoption of a district plan with policies and guidelines for conservation, protection and enhancement of the area’s special character”. All four historic villages within the City of Vaughan (Kleinburg-Nashville, Maple, Thornhill and Woodbridge) are identified as Heritage Conservation Districts and are recognized in the VOP 2010 as Local Centres. The HCDs allow the City of Vaughan to recognize, that in addition to a collection of historic buildings, it is the cumulative character of the buildings, streetscape, landscape, and other cultural and urban features that define the character of place and achieve a sense of identity.

Urban Forest Management Strategy (2012)

In 2009, the City of Vaughan approved *Planting Our Future: A 5-Year Plan to Expand the Urban Forest*, a document that describes the benefits of a healthy urban forest. According to the recently completed *Urban Forest Study*, a joint project with York Region, Markham, Richmond Hill and the Toronto and Region Conservation Authority (TRCA), forest cover in Vaughan stands at 17%, whereas the ideal range is between 20-25% for a municipality. Among the 22 recommendations in the *Urban Forest Study*, the following are of particular relevance to the design and implementation of sustainability metrics in the development review process:

- Continue to establish a diverse tree population (recommendation #5);
- Continue to develop municipal guidelines and regulations for sustainable streetscape and subdivision design that ensure adequate soil quality and quantity for tree establishment (recommendation #9);
- Develop Tree Protection Guidelines for tree protection zones and other measures to be undertaken for all publically and privately owned trees (recommendation #13);
- Explore the development of targets for ecosystem services; integrate such targets into the Natural Heritage Strategy (recommendation #18); and
- Utilize the criteria and performance indicators developed by Kenney *et al.* (2011) to inform the creation of a strategic urban forest management plan and to assess the progress made towards urban forest sustainability (recommendation #22).

Waste Collection By-Law (217-2010) Waste Collection Design Standards Policy (2007)

The Waste Collection Design Standards Policy document sets out the City's requirements (design standards) for the collection of waste for various categories of development and land uses. All applicants submitting development and redevelopment applications must provide a "Waste Collection Design Standards" submission as identified in Part 4 (Collection Requirements) of this document with their site plan / development application.

Storm Drainage/Stormwater Management Master Plan

The Storm Drainage/Storm Water Management Master Plan is being undertaken concurrent with the Master Plan for water and wastewater infrastructure. Specific considerations of the Storm Drainage/Storm Water Management Master Plan include, but are not limited to:

- A broad level analysis of emerging groundwater management issues;
- Review and recommendations to incorporate low impact development guidelines into the storm drainage and stormwater management criteria;
- Development of stormwater servicing options for growth scenarios;
- Consideration of alternative servicing solutions to address integrated objectives and environmental targets to accommodate future growth; and
- Financial planning analysis to identify funding options regarding stormwater rates and other funding structures.

City Transportation Master Plan (New Path)

Vaughan Council approved the City's new Transportation Master Plan (TMP) in October 2011. The main components of the TMP focus on a mix of transportation solutions including a transit-first approach and a reduction in vehicle use through improved active transportation, strategic road improvements, parking management, additional mobility choices for new development and redevelopment, and enhanced infrastructure in the Vaughan Metropolitan Centre.

Engineering Design Criteria and Standard Drawings (Revision December 2012)

The Engineering Design Criteria are intended: (a) as a guideline to provide a sound, sustainable engineering basis for municipal servicing and subdivision design; (b) to establish a uniform set of minimum standards to support an appropriate standard of living; and (c) to improve processing of subdivision plans and agreements in the City of Vaughan.

City-Wide Parking Standards Review and Zoning By-Law

A Parking Standards Review study was undertaken as per Council direction of June 11, 2007. The study concluded that the "Parking Requirements" of By-law 1-88 demonstrated an auto-oriented approach which ensured that each destination can accommodate peak parking demand on site. The study assesses the overall approach to parking standards throughout the City under the mandate that parking policies and standards should be responsible, implementable, and promote more sustainable forms of development.

The City is taking a phased approach to the implementation of the recommendations resulting from the City-Wide Parking Standards Review. Phase 1 of the implementation approach includes a revised parking by-law specific to the Vaughan Metropolitan Centre (VMC) intended to address revised parking standards, definitions for uses permitted in the VMC, bicycle parking/storage, and the introduction of parking management strategies.

The draft by-law was the subject of a Committee of the Whole Public Hearing on February 26, 2013.

A staff recommendation adopted by Council was to establish a Working Group consisting of Enforcement Services, Building Standards, Fire & Safety, Engineering, Planning, Finance, Legal Services Departments, and any other Departments necessary to address the issues of on-street parking, priced parking and the management and enforcement of public parking, including consideration of the development of a Parking Strategy and Parking Management Business Plan or Parking Authority.

Section 37 – Implementation Guidelines and Negotiating Protocol

Section 37 of the Planning Act authorizes municipalities to enter an agreement in which a developer provides community benefits in exchange for greater height and density than would otherwise be permitted on a given site. The VOP 2010 and the VMC Secondary Plan have provisions for the use of s. 37. The Policy Planning department is currently developing a protocol to facilitate s. 37 agreements between the City and private development interests.

Vaughan Accessibility Plan (2011)

Accessibility planning initiatives have increased in Vaughan with the need to develop standards to meet the Accessibility for Ontarians with Disabilities Act, 2005 (AODA). An accessibility standard for the built environment (buildings and outdoor spaces) is in development and not yet law.

The Vaughan Accessibility Plan 2011 highlights the following:

- corporate achievements in the area of accessibility; and
- strategies, phased in over the next few years, which City of Vaughan departments will undertake to ensure that inclusion for all residents and staff can be realized.

The Study – Phase 1

Phase 1 of the project was led by the City of Brampton and The Planning Partnership, with the goal to develop Sustainable Community Development Guidelines (SCDGs). The Phase 1 SCDGs will be a new chapter in the City of Brampton's municipal-wide urban design guidelines, the Development Design Guidelines, and will assist the City in the review of development applications and technical reports and documentation. The SCDGs will serve to help describe the qualitative sustainability aspects proposed developments should aim to achieve, including highlighting examples of how they could be achieved. The Phase 1 report will be brought to the City of Brampton Planning, Design and Development Committee in the near future.

The focus of the guidelines is on qualitative urban design and community development principles. The guidelines apply to a range of development scales, which include Secondary Plans, Block Plans, and Draft Plans of Subdivision, and Site Plans. These guidelines helped to inform the metric and target priorities for Phase 2 of the project. The SCDGs can be adapted by the City of Vaughan as a component of the future City-wide urban design study scheduled to be undertaken in 2014 upon approval of the 2014 capital budget. In the meantime, City staff will seek opportunities to implement the SCDGs on a trial basis as part of the development review process.

The Study – Phase 2

Phase 2 is led by the City of Vaughan and the consulting team of Halsall Associates working collaboratively with The Planning Partnership. Building on the principles and guidelines developed under Phase 1, and using the four sustainability themes established in the Phase 1 document,

quantitative sustainability metrics were developed for the municipal partners. The draft sustainability metrics (see Appendix A of Attachment 1) were developed to help inform and measure the sustainability performance of new developments within the three municipalities.

The Phase 2 deliverables to be provided by the consulting team include:

- A main report describing the research, evaluation and consultation process;
- Appendix A in the form of a matrix of sustainability metrics pertinent to (a) Block Plan and Draft Plan scales, and (b) Site Plan and Building scales.
- Appendix B, which provides a rationale for each of the sustainability metrics and the main sources of information for interpretation of the metrics and targets;
- A sample information package was developed for use in the municipal staff workshops when testing and evaluating the proposed sustainability metrics;
- A tracking log (Appendix C) of the comments and changes to the metrics during the development and evaluation tasks of the Study; and
- A glossary of terms (Appendix D).

In addition, City of Vaughan staff led the research and writing of a report, the Energy Use Forecasting Report, to test scenarios of energy use and greenhouse gas emissions to 2031 in each of the partner municipalities. The Energy Use Forecasting Report provides information to:

- Inform the sustainability metrics with respect to energy efficiency targets;
- Identify recommendations for energy savings beyond the use of the sustainability metrics in the development review process for new development and re-development; and
- Set the ground work for a municipal-wide Community Energy Plan to meet ROP 2010 policy 5.2.13.

The sustainability metrics are detailed in Appendix A as a matrix or checklist with the following structure:

- Core themes (Built Environment, Mobility, Natural Environment & Open Space, and Infrastructure & Buildings);
- Indicators;
- Performance metrics;
- Mandatory, recommended minimum and aspirational targets;
- Precedents; and
- Point allocation.

The metrics can be applied at scales of development ranging from Secondary Plan/Block Plan, Draft Plan of Subdivision, Site Plan and at the building scale.

Attachment 1, the Draft Comprehensive Report provided by the consulting team, is a detailed description of the research, consultation process, testing, and eventual selection of indicators and metrics. Key issues can be highlighted here:

- As illustrated in the table above that cross-references the metrics with York Region and VOP 2010 policies, the metrics are not new to the development approvals process, but offers a standardized approach to measure the sustainability performance of proposed developments;
- Recommended minimum and aspirational targets are above thresholds that are required according to pertinent legislation and/or policy;

- An application does not have to achieve a minimum score for each metric, but an overall score or rating will be evaluated as part of the development approvals process;
- There is general industry acceptance of municipalities using a green development evaluation system, but some form of recognition or more staff attention to work through innovative solutions for high-performing sustainability projects was noted as an incentive;
- The summary of sustainability performance will be provided in the staff report for a development application; and
- The sustainability metrics are aligned with performance indicators identified for Green Directions Vaughan.

Next Steps

Final Comprehensive Report

Following the public comment period, the consulting team and municipal partners will prepare a Final Comprehensive Report to bring to Committee of the Whole in the future. The Final Comprehensive Report will also integrate peer review comments from the Clean Air Partnership (CAP) and the Toronto and Region Conservation Authority (TRCA). As with all other Study documents (Phase 1 consultants' report, workshop materials and presentations, Interim Report, and Draft Comprehensive Report), the Vaughan On-Line project site, Measuring Sustainability Performance, will be used to circulate the Final Comprehensive Report for City staff review.

Implementation Issues

The Final Comprehensive Report will assess implementation issues and provide recommendations to integrate the sustainability metrics into policy planning, new infrastructure and development review processes. Consultation with stakeholders including external agencies (TRCA and York Region) will be required. While the implementation policies are in place in the VOP 2010 (see the subsection above titled, Relevant VOP 2010 Policies), several issues that require further discussion include, but are not limited to:

- Education and outreach;
- Potential changes to existing by-laws and/or Letter of Credit provisions;
- Reviewing the City of Vaughan Design Review Panel Protocol to ensure minimum staffing impact;
- Opportunities to use Local Improvement Charges or Community Improvement Plan provisions to encourage enhanced sustainability performance of new developments;
- Alternative approaches to financing implementation;
- Impacts on existing City staff resources;
- Impacts on City service levels respecting maintenance and replacement of capital infrastructure life cycle costs;
- Explore incentive options and any budgetary implications;
- Procedures for staff and training;
- Tools for staff to verify that sustainability targets will be achieved;
- Identify on a periodic basis the trends and progress that sustainability performance of new development has on influencing metrics associated with broader sustainability performance within the City;
- Alignment with the Vaughan Vision 2020 Strategic Initiatives with particular attention to Strategic Initiative #2, "Further evolve performance indicators"; and
- Data sharing agreements with the Region of York.

In the same way that the municipal workshops brought staff together from various departments to test the sustainability metrics, Policy Planning staff with Engineering and Corporate Services will engage in focus sessions with staff in a range of departments to address implementation issues around key process themes, such as:

- A phased approach to implementation starting with a testing stage for staff and applicants to become familiar with the sustainability metrics and the necessary information requirements of submittal materials. This may include only initial implementation at the early stages of the development application review process (e.g. pre-application consultation only);
- A period of time to test and determine thresholds that are sensible for certain types of applications and locations in Vaughan;
- Circulation process (Pre-Application Consultation, deeming an application complete, Development Review Panel Protocol, etc);
- Submittal materials and need for Terms of Reference for key submittal documents;
- Any amendments to VOP 2010 and/or by-laws;
- Financing options (Local Improvement Charges, Community Improvement Plans, Gas Tax, etc). This will include a discussion on the potential impact of incentives if offered as part of the program;
- Education, including staff training and external stakeholder communication;
- Inspections and staff time to review/monitor applications;
- City service levels and infrastructure maintenance costs; and
- Data needs (e.g. GIS) and tracking of sustainability performance for each application.

Relationship to Vaughan Vision 2020/Strategic Plan

This report is consistent with the priorities previously set by Council and the necessary resources have been allocated and approved for the project.

Regional Implications

The project, Measuring Sustainability Performance of New Development, intended to implement Action Item 2.3.1 of Green Directions Vaughan, is consistent with numerous action items in the Region of York Sustainability Strategy 2007, particularly Section 2 regarding healthy communities and Section 4 regarding a sustainable natural environment. Support from York Region in coordinating information requirements and through new and updated data sharing agreements, training and support will assist staff to implement the findings of the study. The project is consistent with Section 5.2 (Sustainable Cities, Sustainable Communities) of the York Region Official Plan.

Conclusion

The intended result of the project is a user-friendly checklist of environmental performance standards, to integrate into the development review and relevant policy plans and infrastructure processes, that are accepted by industry and consistent among the partner municipalities. The consulting team of Halsall Associates and The Planning Partnership has delivered the Draft Comprehensive Report according to the RFP requirements. The focus in the Draft Comprehensive Report is to make available to the public the draft sustainability metrics and approach to evaluating the sustainability performance of development proposals. An approximately one month comment period is recommended, such that comments received by May 30th, 2013 will be considered. Following the incorporation of stakeholder comments, a Final Comprehensive Report will be brought to Council in the future.

Applying sustainability metrics to the development review process for relevant types of development applications will be necessary if the City is to achieve multiple sustainability objectives identified in Green Directions Vaughan, the York Region and City of Vaughan Official Plans and policy documents adopted by the City and other levels of government and agencies. Applying these metrics may require additional staff resources to: (1) assess new information that will be required for development applications, or; (2) integrate the new information into both City and Region GIS data bases. Assistance and support from staff in the offices of Information & Technology Management and Innovation & Continuous Improvement, along with support from building industry stakeholders, may be required to integrate the information into City processes and the City's Corporate GIS system.

Therefore, it is recommended that the report be received and that the Draft Comprehensive Report be made available for review and comment by the public and stakeholders. Comments should be submitted by May 30th, 2013.

Attachments

1. Measuring Sustainability Performance of New Development in Brampton, Richmond Hill and Vaughan – Draft Comprehensive Report prepared by Halsall Associates and The Planning Partnership.
2. Draft Energy Use and Greenhouse Gas Emissions Forecasting Report (February 2013), prepared by the City of Vaughan.

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/lm

Measuring the Sustainability
Performance of New Development
COMPREHENSIVE REPORT
-DRAFT-

PREPARED FOR THE CITIES OF BRAMPTON AND VAUGHAN
AND TOWN OF RICHMOND HILL

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EXECUTIVE SUMMARY

The project, Measuring Sustainability Performance of New Development in Brampton, Richmond Hill and Vaughan, is a collaboration of municipal partners (City of Brampton, Town of Richmond Hill, and City of Vaughan) and environmental partners (TRCA and Clean Air Partnership). A Memorandum of Understanding was signed by the municipal partners in January 2011 following confirmation of matching funds of \$85,000 from the Green Municipal Fund of the Federation of Canadian Municipalities.

The intended result of the project is a user-friendly checklist of sustainability performance standards, to integrate into the development review process, that are consistent among the partner municipalities. The consulting team of Halsall Associates and The Planning Partnership has delivered the Draft Comprehensive Report according to the RFP requirements. The focus in the Draft Comprehensive Report is to make available to the public the draft sustainability metrics and approach to evaluating the sustainability performance of development proposals. Following the incorporation of stakeholder comments, a Final Comprehensive Report will be brought to Council in the future.

A comprehensive Executive Summary will be provided in the Final Comprehensive Report of the project.

1.0 VISION AND SUSTAINABILITY GOALS

Developing policy and measuring progress towards sustainability has become increasingly important in managing growth and improving health and wellbeing within cities. Concerns over public health, climate change, energy, and resource use have brought sustainability to the forefront for those planning, building and managing communities in Ontario. Provincial legislation, plans and policies now speak to this sustainability priority as evident in the Provincial Policy Statement (PPS 2005) and the *Planning Act* (Bill 51), and the *Places to Grow Act*, 2006. A number of municipalities in the GTA, including Toronto, East Gwillimbury and Pickering, have developed Sustainability Guidelines, Standards or Metrics as one set of planning tools to achieve healthy, complete, sustainable communities.

Responding to this growing priority for sustainable development, the Cities of Brampton and Vaughan and the Town of Richmond Hill (the municipal partners) have joined together to produce a consolidated set of sustainability guidelines, including metrics and targets as key planning tools to guide the sustainability performance of new development applications including Secondary Plans, Block Plans, Subdivisions and Site Plans. The Sustainability Guidelines and tools also aim to:

- Level the playing field across the three municipalities and provide consistency, simplifying the process for developers;
- Provide a tool to quantify and rank the intended performance of proposed projects/plans; and
- Improve the submission and review process for the municipal partners and developers.

The guidelines act to complement and support other provincial/municipal requirements, such as the Ontario Building Code, urban design and healthy community guidelines, master environmental servicing plans, environmental impact studies, natural heritage evaluations, and growth management plans. Policy direction for this project is supported in various documents approved or adopted by the three partner municipalities as described below.

1.1 City of Brampton

Brampton is planned as a dynamic, urban, sustainable municipality, where growth is managed that protects the environment, enhances its heritage as a Flower City, contributes to the economy and enhances the quality of life. The City of Brampton has an inventory of over 175 environmental sustainability plans, programs, projects and initiatives. Below is a brief outline of three of the most relevant programs, the Official Plan, Environmental Master Plan and Development Design Guidelines.

Brampton's Official Plan 2006 "Our Brampton ... Our Future" (OP 2006) provides the overarching policy support for implementing triple-bottom line sustainability in all aspects of City functions. The OP's Sustainable City Concept is further supported by policies provided in Transportation, Natural Heritage and Environmental Management, Recreational Open Space and Urban Design.

Brampton Grow Green will be the City's first Environmental Master Plan and will provide a sustainable environmental framework for the City as both a land use approval authority and a corporation. The EMP is intended to:

- bring cohesion to current environmental initiatives, policies and programs across City departments and services;
- identify new best practices to guide the City's operational, planning and regulatory functions;
- develop community and stakeholder awareness, collaboration and partnerships for environmental sustainability; and
- act in combination with the OP 2006, the Strategic Plan and the Growth Management Program as the City's Integrated Community Sustainability Plan.

City Council approved the *Development Design Guidelines* (DDGs) in 2003 with a focus on new development. The City is now preparing the newest chapter of the DDGs, the *Sustainable Community Development Guidelines* (SCDGs) which is Phase I of the larger collaborative project between Brampton, Vaughan and Richmond Hill. The SCDGs provides the framework to guide the development of specific metrics and targets (i.e. to be determined in Phase II) by providing a comprehensive list of potential sustainability measures, practices and policy strategies. Both phases are intended to guide the planning and design aspects of sustainable communities at a range of scales from Secondary Plan Areas, Block Plan Areas, and Draft Plan of Subdivision and Site Plans.

In support of the SCDGs, other City programs and initiatives include:

- Brampton's Growth Management Program – manages growth through the delivery of services and structures;
- Parks, Culture and Recreation Master Plan – provides a framework to direct the development and delivery of recreation facilities to promote active lifestyles;
- PathWays Master Plan – provides a long term plan to provide infrastructure for alternative and active modes of transportation across the City;
- Transportation and Transit Sustainable Master Plan – provides a framework for the delivery of an integrated multi-modal transportation network.

1.2 City of Vaughan

Building on the Strategic Plan, *Vaughan Vision 2020*, and *Green Directions*, the Vaughan Official Plan (VOP 2010) is the largest single policy document emerging from *Vaughan Tomorrow*. VOP 2010, adopted by Council in September 2010, will help secure the City's green policy transformation.

Green Directions Vaughan is the City's Community Sustainability and Environmental Master Plan (CSEMP). The plan establishes the principles of sustainability to be used in the development of other plans and master plans to achieve a healthy natural environment, vibrant communities and a strong economy. *Green Directions Vaughan* includes a series of recommended actions that span the entire sphere of municipal responsibility, including operational and regulatory functions. A specific action item directs the City to develop sustainability guidelines for use in the development review process.

The City-wide Urban Design Guidelines and Standard, scheduled to be undertaken in 2014 upon approval of the 2014 capital budget, is a complementary document to the City of Vaughan's new Official Plan (VOP) that is critical in implementing the "Plan for Transformation" into an attractive, livable and healthy community with a distinct identity. Whether the Sustainability Metrics document is integrated into the City-wide Urban Design Guidelines and Standard or acts as a companion checklist will be decided by City staff.

1.3 Town of Richmond Hill

The Richmond Hill Official Plan, partially approved by Order of the OMB on April 5, 2012, represents a fundamental shift in the Town's approach to land use planning. The Official Plan establishes a vision for "building a new kind of urban" community through a focus on environment-first/sustainability, city-building, and place-making. In doing so, the Plan aims to harness the process of urbanization as a positive force on the landscape, establishing policies that aim to improve and enhance the environment over the long term. Policies in the Official Plan direct the Town to prepare Town-wide urban design guidelines and sustainable design criteria to ensure the placemaking and sustainable design policies are addressed through individual development applications.

The Draft Town-wide Urban Design Guidelines will follow the Sustainability Metrics prepared as part of Phase II of this project. These documents will be used together as two new tools to foster a *new kind of urban* community as part of the development application review process.

2.0 INTRODUCTION

2.1 Purpose of Guidelines

The Sustainability Guidelines will provide tools to help municipal staff and developers inform, guide, and quantify the sustainability performance of new development. By adopting the proposed sustainability metrics as a lens through which to evaluate future development, communities will become more liveable. Residents will be healthier, more physically active, and more resource conscious.

Sustainability metrics and targets have been defined to help guide and quantify the sustainability performance for various scales of land use planning (i.e. site plans, subdivision/neighbourhood plans, secondary/block plans).

2.2 Process and Consultation

This project is a collaboration between the three partner municipalities and is being undertaken in two phases (summarized below). A continued third phase is likely to follow, with the focus on project implementation.

Phase I: Sustainable Community Development Guidelines (SCDGs) for the City of Brampton.

Phase I was led by The Planning Partnership and included the preparation of qualitative urban design principles for the City of Brampton. A high-level summary of the SCDGs are included in Section 4.0. This document was shared with Vaughan and Richmond Hill as part of the FCM partnership. Vaughan and Richmond Hill are using the document to inform their own municipal-wide Urban Design Guideline projects. The four sustainability themes used in the Phase 1 document, namely: 1. Built Environment; 2. Natural Heritage/Open Space; 3. Mobility; and 4. Infrastructure; were used to organize the Sustainability Metrics prepared in Phase II of the project.

Phase II: Sustainability Performance Metrics for the Cities of Brampton and Vaughan and Town of Richmond Hill.

Phase II was led by Halsall Associates, working collaboratively with The Planning Partnership. Building on the principles and guidelines developed under Phase I, and using the four sustainability themes established in the Phase I document, quantitative sustainability metrics were developed for the municipal partners. The draft sustainability metrics (see Appendix A) were developed to help inform and measure the sustainability performance of new developments within the three municipalities.

Phase II of the project followed the process below to ensure the draft sustainability metrics are realistic from a technical perspective and implementable as part of the planning application review process:

1. Develop draft sustainability metrics and review with the Municipal Partners Technical Advisory Team (TAT);
2. Identify development sites within the partner municipalities upon which to test the practicality and implementability of the draft sustainability metrics;
3. Chair a collaborative workshop with municipal staff and key stakeholders (Workshop 1) to evaluate the draft metrics and apply them to the selected test sites (see section 3.4.1 for Workshop 1 feedback);
4. Chair a collaborative forum with the development industry to inform the industry about the project and gather input on implementation of draft sustainability metrics (see section 3.6 for the Developer Forum feedback);
5. Chair a collaborative workshop with municipal staff and key stakeholders (Workshop 2) to refine certain sustainability metrics and discuss implementation, including a proposed dynamic tool to guide users through the applicable sustainability metrics (see section 3.4.2 for Municipal Workshop 2 feedback);
6. Consolidate feedback and revise draft sustainability metrics;
7. Individual municipal workshop (Workshop 3) to test the draft sustainability metrics;
8. Peer review by TRCA and Clean Air Partnership on draft sustainability metrics;
9. Finalize Draft Sustainability Metrics for Public Comment; and
10. Develop and deliver an Implementation tool (the dynamic sustainability tool).

NOTE: Deliverables 7 through 10 are still under development.

Phase III: Implementation of the Sustainability Guidelines

Phase III is beyond the scope of this project but will likely include further collaboration among the partners. Municipal specific fine tuning of the Guidelines and implementation strategies will respond to local conditions. The main components of this phase will likely include:

- Amendment considerations to existing documents (OP, Site Plan, Secondary Plans, etc...);
- Revisions and/or development of municipal Standards;
- Submission requirements;
- Education and communication;
- Internal testing of implementation tool;
- Pilot projects; and
- Staff resourcing.

2.3 Document Organization

The *Sustainable Community Design Guidelines*' proposed sustainability metrics have been incorporated into both a static and dynamic tools. The static tool acts as a checklist for municipal staff and developers to help inform the sustainability performance of the proposed development. The checklist is structured with the headings listed below:

- Categories;
- Indicators;
- Performance metrics;
- Mandatory, minimum and aspirational targets;
- Precedents; and
- Point allocation.

A further description and definition of the categories, indicators, metrics and targets are provided in Sections 3.2 and 5.0. The sustainability metrics, precedents and point allocations are included in Appendix A, with further rationale behind each of the metrics presented in Appendix B.

The, excel-based Dynamic Tool provides an efficient and effective means for applicants and municipal staff to quantify the sustainability performance of proposed plans. For each of the sustainability metrics, strategic questions are posed within the tool and points are awarded depending on user inputs. To cater to a variety of planning scales recognized in the review of development applications (i.e. Secondary/Block Plan, Draft/Neighbourhood Plan, Site Plan or building scale) and project types (i.e. greenfield, urban infill, corridor intensification, etc.) the sustainability metrics have been differentiated into the categories listed below. It should be noted that many of the sustainability metrics may be applicable at various scales of development and therefore, across multiple plan type applications.

- 1) Block/Secondary Plan;
- 2) Draft/Neighbourhood Plan;
- 3) Site Plan; and
- 4) Building Plan.

The static tool is available for reference, while the intent of the dynamic tool is to improve implementability of the sustainability metrics through the development review and approval process.

2.4 Tiers of Guidelines and Performance Metrics

The performance metrics were identified through review of best-in-class precedents from LEED for Neighbourhood Development (LEED ND) and similar sustainability guidelines implemented by other GTA municipalities, and reviewed through multiple technical stakeholder engagements. Each of the metrics and targets was evaluated against the following criteria:

- Realistic;
- Informative;
- Clear/Transparent;
- Manageable;
- Relevant;
- Measureable; and
- Impactful.

Three performance levels were identified for each of the metric targets:

- Mandatory;
- Recommended Minimum; and
- Aspirational.

All projects must satisfy the mandatory performance requirements to be considered for approval. This is essentially the existing standard or requirement according to relevant legislation and/or policies. The recommended minimum and aspirational target levels vary for each metric, but were informed and defined by the inputs from multiple technical stakeholder engagements. The minimum performance targets are considered as “*doing better than you need to*”, while the aspirational performance targets are considered as “*best in class*”.

Based on input from the Workshops, it became clear that not all metrics should carry the same weighting/point allocation. Metrics that support the municipalities’ priorities and provide multiple sustainability benefits were considered to have a greater weighting/point allocation. The following indicators were considered to align with the municipalities’ sustainability priorities in addition to providing the greatest impact on creating more sustainable built form and healthy communities:

- 1) Energy conservation/District energy;
- 2) Water conservation;
- 3) Stormwater management;
- 4) Walkability and Mobility;
- 5) Natural heritage/Community stewardship; and
- 6) Local food production/distribution.

2.5 How to Use the Guidelines

The metrics form a sustainability checklist organized as a matrix, identifying the indicators, metrics, targets, precedents and point allocation for each metric. This static tool serves as a reference for municipalities and private sector users to follow when developing an application. The checklist identifies the key sustainability priorities for the municipalities and the relative importance (point allocation) against the various metrics. A dynamic tool based on the static tool checklist is being considered to improve the implementation of the sustainability metrics by making it easier to quantify the overall sustainability ranking of a plan.

2.5.1 Metric Point Allocation

LEED for Neighbourhood Development (LEED ND), other municipal sustainability performance guidelines and the sustainability priorities for each of the partner municipalities was used to help inform the point allocation for each metric. Points are awarded when a proposed plan satisfies the recommended minimum or aspirational targets for the various metrics.

Table 1 provides a summary of the draft point breakdown for the various plan types (Building, Site, Draft and Block), broken out by the four categories.

Table 1: Point Allocation by Categories

Categories	Point Allocation			
	Building Plan	Site Plan	Draft Plan	Block Plan
Built Environment	38	84	80	57
Mobility	0	16	22	22
Natural Environment & Open Space	11	29	32	35
Infrastructure & Buildings	63	74	31	18
Total	112	203	165	131

As shown, the totals for each of the plan types varies, depending on the number of metrics that have been defined for the plan type. To simplify the ranking procedure, each of the plan types will be normalized and evaluated based on a 100% score. Table 2 summarizes the percentage breakdown point allocation for some of the key sustainability priorities, as defined by the partner municipalities (see section 2.4).

Table 2: Point Total % Breakdown

Municipal Sustainability Priorities	Point Breakdown (%)		Point Breakdown (%)	
	Building Plan	Site Plan	Draft Plan	Block Plan
Energy	34%	24%	12%	11%
Walkability	22%	37%	49%	62%
Water	21%	12%	8%	5%
Materials and Solid Waste	8%	4%	4%	3%
Food	0%	2%	2%	3%
Natural Systems (soil, tree, biodiversity)	2%	6%	10%	7%
Parking	13%	7%	6%	0%
Economy	0%	5%	7%	9%
Certification	0%	2%	2%	0%
Total	100%	100%	100%	100%

As shown, the Draft and Block plan point accumulation and resulting score are heavily influenced by walkability, comprising of over 49% of the overall score. This weighting emphasizes that new community and neighbourhood developments will need to integrate multiple disciplines and stakeholders into the planning efforts to perform well within the municipalities ranking.

The impact of walkability is still heavily weighted within the Site and Building Plan metrics, but as expected, the building efficiencies start to have a greater influence on the overall score of the plan.

2.5.2 Minimum Point Threshold

In addition to the point allocation identified above, the municipalities have also identified a number of mandatory metrics that need to be satisfied in order for the application to be considered. Mandatory metrics are not assigned point allocations, as shown in Appendix A.

It should be noted that not all plan types will score in every category. Depending on the metric and plan type, the respective points will either be excluded from the total or the plan will be docked points. For example, a plan that only includes single family homes is excluded from Metric 49 (solid waste storage collection areas). As a result, those two points will be excluded from the total. On the other hand, if a plan does not have access to Primary and/or Basic amenities, the plan will be docked points.

It is recommended that a minimum ranking will be required for the municipalities to accept a proposed plan. Furthermore, plans that exceed aspirational thresholds will be considered for potential incentives. These thresholds have not been defined or approved by the municipal partners and will require further discussion with regards to implementation approaches.

2.5.3 Point Structure

Appendix A provides a summary of the points allocated to each of the metrics, broken out by the Recommended Minimum and Aspirational Targets. For the most part, the point allocation is fairly straight forward. If a plan satisfies the Recommended Minimum and/or Aspirational targets, the

relevant points will be awarded to the plan. In certain examples, a sliding scale has been developed to account for the potential variability within the metric. The following provides a high level summary of the metrics that utilize a sliding scale point structure.

Table 3: Point Structure - Sliding Scale

Applicable Plan Type	Metric	Point Structure
Draft/Block Plans Site/Building Plans	Proximity to Principal Amenities	6pts awarded to minimum 6pts awarded to aspirational 2pts awarded per amenity, for a maximum of 3 amenities Maximum pts = 12
Draft/Block Plans Site/Building Plans	Proximity to Basic Amenities	3pts awarded to minimum 3pts awarded to aspirational 1pts awarded per amenity, for a maximum of 3 amenities Maximum pts = 6
Draft/Block Plans Site Plans	Design for Life Cycle Housing	A minimum of 10% is required to be considered for a potential point. <i>Accommodation Type – 3pts</i> - 1pt if 2 of 6 have 10%+ - 2pts if 3 of 6 have 10%+ - 3pts if 4 or more have 10%+ <i>Ownership Type – 3pts</i> - 2pts if 2 of 4 have 10%+ - 3pts if 3 or more have 10%+ <i>Building Type – 1pt</i> - 1pt if 3 buildings types have 10%+
Draft/Block Plans Site Plans	Parks	<i>Minimum Points (2pts)</i> - 2/3 requirements satisfied – 1pt - All requirements satisfied – 2pts <i>Aspirational Points (1pt)</i> - All requirements satisfied – 1pt
Site/Building Plans	Building Energy Efficiency	<i>Minimum Target (3pts)</i> - Achieve 35% better than MNECB and/or EnerGuide 83 (if applicable) <i>Aspirational Target (14pts)</i> - Submetering – 3pts - Commissioning – 3pts - For every 5% improvement in energy efficiency (over 35%), award an additional point (i.e. 60% improvement would yield 8 total points)
Site/Building Plans	Solar Readiness	1pt awarded for minimum target Up to 7 additional points can be awarded for Aspirational target 1pt – 1% renewable energy generation An additional point for every 2% renewable energy generation increment (i.e. 13% generation is 7 points).

3.0 STUDY APPROACH

3.1 Background Research on Sustainability Metrics

The work carried out in Phase I of this project, the *Sustainable Community Development Guidelines* (SCDG) served to inform the sustainability metrics and targets developed in Phase II. The sustainability metrics and targets were further informed by other municipal Sustainability Guidelines. The following is a list of references that were reviewed during the process of developing the sustainability performance metrics to be considered for this project:

- Brampton Official Plan 2006 “*Our Future... Our Brampton*”;
- Brampton Grow Green;
- Brampton Development Design Guidelines;
- Brampton Sustainable Community Development Guidelines (SCDGs);
- Vaughan Vision 2020;
- Green Directions (Vaughan OP 2010);
- Richmond Hill Official Plan – Building a New Kind of Urban;
- Richmond Hill Strategic Plan – A Plan for People, A Plan for Change;
- Places to Grow *Better Choices, Brighter Future*. 2006;
- City of Toronto Green Development Standard;
- Seaton Sustainable Place-Making Guidelines, City of Pickering;
- Health Background Study, Region of Peel, City of Toronto, Heart & Stroke Foundation;
- Thinking Green! Development Standard, Town of East Gwillimbury;
- Sustainable Pickering;
- Markham Centre Performance Measures, Town of Markham;
- Markham Greenprint, Town of Markham;
- York Region Sustainability Strategy, Towards a Sustainable Region, Region of York;
- Vision 2026 Towards a Sustainable Region, Sustainability Progress Report 2010, Region of York; and
- LEED for Neighbourhood Development (LEED ND).

3.2 Selecting Performance Metrics and Increments

Prior to identifying the appropriate indicators, metrics and targets, it was important that the team come to a common understanding of the typical language used to help define sustainability metrics. Indicators, metrics and targets are commonly used in the industry and the meaning can be inconsistent if not properly defined during the initial stages of the project. Although the definitions may vary, the following definitions were considered for this project:

- 1) Indicators: Key impacts within each sector that the municipality will strive to change and report against to represent its sustainability performance. Specific indicators have been developed for each of the plan types (i.e. Block/Secondary Plan, Draft/Neighbourhood Plan, Site Plan, and Building Plan). An example of an indicator is “energy consumption”.

2. Metrics: The outcome(s) that will be reported to define performance in an indicator. Metrics can be qualitative or quantitative. An example of a metric for the indicator “energy consumption” may be ekWh/m^2 .
3. Targets: The desired end-state or goal that the municipality commits to achieving for a particular metric. Targets are derived from current performance efficiencies, policies and external benchmarks. Targets are typically separated into the following hierarchy of thresholds:
 - Mandatory/Prescriptive;
 - Recommended Minimum; and
 - Aspirational.

The precedent research outlined in Section 3.1 highlighted that there are potentially hundreds of sustainability performance indicators, metrics and targets that could be used to help inform future planning. Given the number of precedents, the consultant and municipal Technical Advisory Team (TAT) agreed that, in order to develop an implementable tool, the number of identified performance metrics needs to be manageable, measurable and clear. On projects as diverse and comprehensive as this one, there is often a desire to “cast a wide net” given how broad the idea of sustainability is, and how substantive the potential impact can be.

Identifying appropriate sustainability performance metrics for this project was initiated with a brainstorming session with the consultant team. Synergies between indicators were identified and performance metrics were drafted that align with municipal priorities. Performance metrics that promoted multiple sustainability benefits (i.e. proximity to amenities generally contributes to reduced Vehicle Kilometres Travelled, improved connections, increase active transportation, and improved health) were also identified to help simplify and consolidate the number of metrics. Upon completion of this brainstorming session and research phase, the key performance metrics were identified and presented to the TAT.

The sustainability performance tool developed for this project consists of four categories, twenty four indicators and up to 50 metrics (depending on the plan type). Based on background research of other municipal sustainable guidelines and feedback from the workshops, this appears to be a manageable set of performance metrics that capture the sustainability priorities for the municipalities while being clear and concise enough to maintain current service levels for the planning approvals process.




3.3 Test Sites and Evaluation Criteria

The consultant team worked with the municipal Technical Advisory Team (TAT) to select test sites that would be used to test the proposed sustainability metrics. Various test sites were reviewed for appropriateness and were selected based on the following evaluation criteria:

- Variation in scale and plan application;
- Data availability; and
- One test site per municipality.

The three candidate test sites in Table 44 were selected. Key design/planning characteristics are also summarized in the Table.

Table 4: Test Site Selection

MUNICIPALITY	TEST SITE	KEY CHARACTERISTICS
<p>City of Vaughan</p>	<p>Nashville Heights Community – Block 61</p> 	<p>Scale: Draft Block Plan Type: Greenfield Size: 185 ha Population: 8,000 Jobs: 700 Density: 14 units/ha Parks: 6 Neighbourhood, 2 Public Schools: 2 Elementary</p>
<p>City of Brampton</p>	<p>Queen Street East Redevelopment</p> 	<p>Scale: Site Plan (considered a collection of site plans) Type: Corridor Redevelopment/Intensification Size: 33.37_ha Population: 13,250 Jobs: 2,700</p>
<p>Town of Richmond Hill</p>	<p>Yonge Street and 16th Avenue (NE Corner)</p> 	<p>Scale: Site Plan Type: Urban Node Intensification Size: 9.37 ha Population: 2,500* Jobs: 1,250* Density: 148 units/ha</p>

* Assumes 1.8 ppu and overall resident to employee ratio of 1:2

Evaluating each of the selected sites using a set of proposed sustainability metrics served as a means to test and ensure that the draft metrics are realistic, manageable, impactful, clear and measureable. For each of the test sites selected, information was provided by the TAT and consolidated by the consultant team. Workshop packages were developed for each of the test sites demonstrating how certain sustainability performance metrics would be evaluated for each site.

3.4 Results of the Municipal Workshops

Two full-day municipal workshops were facilitated by the consultant team to review the proposed sustainability tools (sustainability performance checklist and dynamic tool), test the sustainability performance metrics against the test sites and gather feedback on implementation. Municipal staff from the following departments attended:

- Planning – Policy;
- Planning – Development;
- Planning – Engineering;
 - Stormwater Management
 - Transportation
 - Infrastructure;
- Planning - Building Standards;
- Natural Environment;
- Parks and Urban Forestry;
- Solid Waste/Public Works;
- Urban/Community Design; and
- Cultural Heritage.

3.4.1 Municipal Workshop 1 – Metrics Testing

Municipal Workshop #1 was held on September 25, 2012 and included approximately 40 municipal staff from Brampton, Richmond Hill and Vaughan, and representatives from the Clean Air Partnership, the Region of Peel, and the Region of York. The workshop was divided into two sessions:

- 1) Presentation - General project introduction and context.
- 2) Break out groups – Review performance metrics and test against the selected sites.

The intent of the workshop was to:

- Introduce the project and describe the key deliverables;
- Introduce the test sites;
- Demonstrate how the draft metrics would be applied to the test sites; and
- Obtain preliminary technical feedback on the draft sustainability metrics and targets.

The workshop also provided an opportunity for the City of Vaughan to present the initial findings and analysis for their Greenhouse Gas (GHG) and Energy forecasting initiative. The purpose of the initiative is to identify the energy conservation opportunities and resulting GHG implications, by considering various energy reduction and efficiency scenarios.

The feedback from the workshop was consolidated and reviewed by the consultant team and with the municipal TAT, and a metrics revision log (included in Appendix B) was developed to track the

evolution of the sustainability metrics and targets. The log was updated throughout the course of this project to reflect technical feedback received.

The outcome and key takeaways from the Municipal Workshop #1 are summarized below:

Metrics applied to test sites

The workshop was used as a testing exercise to check that the draft sustainability performance metrics could be practically applied to typical planning application types at various scales of development including Greenfield, intensification/redevelopment, and infill. Each breakout group was assigned one of the three test sites outlined in Table 1, and were instructed to apply/consider each of the proposed metrics to assess/determine whether the metrics:

- Were understandable, measurable and quantifiable;
- Applied to the test site in question; and
- Had clear, consistent language/terms.

Draft metrics that required more discussion

The breakout groups served as an opportunity to review each of the draft metrics included under the Secondary/Block Plan, Subdivision/Neighbourhood Plan, Site Plan and Building Plan. Through this exercise, the groups identified metrics that needed more discussion, and in some cases, additional technical input. Although the discussions varied from group-to-group, there was generally agreement that the following metrics needed to be refined and in some cases, better quantitative metrics needed to be established:

- Walkability;
- Proximity to amenities and schools;
- Access to local food;
- Housing mix;
- Energy and water conservation;
- Stormwater management; and
- Parking/bike parking.

3.4.2 Municipal Workshop 2

Municipal Workshop 2 was held after the Developer Forum, on November 7, 2012. Workshop 2 included approximately 35 to 40 municipal staff from Brampton, Richmond Hill and Vaughan, and representatives from the TRCA and the Region of Peel. The intent of the workshop was to update municipal staff on the progress of finalizing a list of draft sustainability metrics, highlight the feedback from the developer forum and getting specific feedback on the following:

- Engineering-related metrics;
- Implementation strategies/considerations;
- Metric point allocation; and
- Dynamic tool functionality.

The outcome and key takeaways from the Municipal Workshop #2 are summarized below:

Engineering-specific metrics

A primary focus of the Municipal Workshop 2 was to discuss certain engineering-related metrics including the following:

- Building energy efficiency;
- District energy viability;
- Stormwater quantity;
- Stormwater quality;
- Stormwater re-use;
- Speed controls; and
- Walkability.

Most of the discussion focussed on setting the mandatory, minimum and aspirational targets. For metrics regarding stormwater, TRCA agreed to work with the team to provide direction on the quantity and quality (including temperature) metrics and targets. The discussion surrounding walkability raised a number of challenges and opportunities, where the current road/sidewalk design standards may conflict with the proposed minimum and aspirational targets presented in the proposed sustainability metrics. It is recognized that during the implementation phase each municipality will need to revisit its current regulations and standards and consider creating alternative design standards to address sustainability objectives.

The municipal workshop also reviewed the key takeaways from the developer forum. The key takeaways and developer concerns included topics surrounding project implementation and tool roll out, developer incentives and transparency/consistency of language. The developer forum feedback is summarized in section 3.6

The metrics feedback was consolidated and revisions were tracked in the sustainability metrics log (Appendix C).

Project implementation and incentives

The workshop was used to help identify the key challenges and opportunities related to the implementation of the proposed sustainability metrics. A priority identified for the implementation of the sustainability metrics was to embed the metrics into existing required documentation and procedures (i.e. address within reports/studies/plans that are already required as part of a complete application). For example, the metrics could be used at the beginning of the planning approvals process (e.g. the pre-submission stage) like a screening tool, clarifying the minimum sustainability performance by setting out what the municipality expects at the outset. The metrics could result in an efficiency improvement by consolidating multiple report requirements into one document (i.e. transportation plan, urban design guidelines, stormwater management plan, etc...) and by quantifying the sustainability performance each development is achieving.

Key implementation questions that came up during the workshop include:

- 1) How can you avoid having the applicant say they will do something but don't follow through, particularly after an incentive has been awarded?
- 2) When in the process is the score confirmed and when is the incentive granted?
- 3) Will a project need to undertake an evaluation more than once?
- 4) Who within the municipalities would be managing this plan evaluation/process?

Potential incentive strategies were also discussed including reducing the approval time for projects that are pushing the sustainability bar. Although the specific mechanisms were not defined, a specific staff structure to expedite approvals for aspirational projects was discussed as an incentive for leading edge projects. The municipal partners will evaluate this as one of the several incentive options.

Point allocation

At the time of Workshop 2, the point allocation had not been defined for each metric relative to Mandatory, Minimum and Aspirational targets. The discussion at the workshop focused on informing municipal staff about how the dynamic tool will be structured on a point based system informed by the municipal priorities relative to development application type.

Points are awarded for a development application based on which Mandatory, Minimum and/or Aspirational targets are achieved. The overall sustainability performance of the development proposal would be quantified and broken out into the four categories (i.e. built environment, mobility, green space/natural environment and infrastructure). The score quickly allows municipal staff to appreciate the overall sustainability performance of the proposed plan, while also identifying key opportunities to further improve the application's performance relative to municipal priorities based on the categories.

Dynamic Tool

A preview of the dynamic tool was presented to the group to highlight the overall layout and general functionality of the tool. This introduction provided municipal staff the opportunity to raise any comments, concerns or opportunities to improve the tool functionality. Generally the group seemed comfortable with the direction and application of the dynamic tool, although prior to releasing the dynamic tool for public use, each municipality will carry out an internal evaluation against existing applications to ensure that the output is reasonable and the sustainability performance score aligns with known project expectations. The roll out plan of the dynamic tool was discussed at a high level and it was agreed that the tool would need to undergo both internal and external validation testing during Phase III (Project Implementation) of this project.

3.5 Results of the Peer Review and Public Comment Period

Both the Toronto and Region Conservation Authority (TRCA) and the Clean Air Partnership (CAP) are providing third party review of the sustainability metrics. Both reviews are still considered a work in progress and the feedback will be integrated into the final version of the report.

CAP's review is primarily focused on the transferability of the metrics and tools outside the three municipalities. TRCA's review is primarily focussed on the natural heritage elements, stormwater, water, biodiversity, and soil and tree quality.

3.6 Results of the Developer Forum

Similar to the municipal Workshop 1, a private sector forum was held October 17, 2012 to introduce the project objectives to the development community, including consultants. Municipal staff identified developers working in their municipalities and also attended the forum. The following table summarizes the private sector representation at the forum:

Table 5: Developer Forum Participation

Greenpark Homes	Brookfield Homes	EMC Group	Tridel
GHD (BILD member)	Amos Environmental + Planning	Savanta Inc (BILD member)	Daniels
Deltera	MMM Group	Starlane Home	Liberty Development
TACC Developments	Metrus Development Inc. (BILD Member)	Stantec	Provident Energy Management
Times Group Corporation	Reliance Comfort	PCL Construction	Clearsphere

The developer forum was held with the intent to:

1. Introduce the project;
2. Introduce the structure of the sustainability metrics;
3. Identify high priority indicators/metrics;
4. Identify and prioritize incentive mechanisms; and
5. Identify current regulatory, policy and industry barriers for sustainable development.

The key takeaways from the developer forum are summarized below.

General Comments

- Language needs to be consistent and transparent;
- Where possible, metrics should be supported by benchmarks and precedents;
- Metric weighting/point allocation should reflect municipal priorities, sustainability impact and potential cost (capital and savings) implications;
- Need to clearly separate Private from Public metric responsibilities;
- How can we actually monitor and measure the performance of a community/plan? We need to ensure that the design and performance intent is supported by a quantifiable result and is monitored over time;
- Need to ensure that metrics align with engineering and regulatory standards. Some standards (i.e. road dimension, sidewalks) are seen as barriers to current development practices; and
- The developer community is accepting of municipalities using this type of evaluation system. The developers want to be more sustainable but they see certain municipal standards as a barrier from a time-perspective.

Review of draft metrics

The forum also provided an opportunity for input on the proposed categories of sustainability metrics. Based on feedback at the Forum, many of the development industry's priorities were already included within the draft categories of sustainability metrics. Additional performance metrics that were proposed include:

- Public Engagement – interest in a metric that incentivizes developers to provide education packages for new residents and signage throughout the community to explain the sustainability features of the project;
- Developer Acknowledgement – interest in an Awards program that recognizes developers that have built sustainable projects.

Incentive Opportunities

The developer forum also provided an opportunity to identify and prioritize potential incentive mechanisms to reward/acknowledge Aspirational projects. The developer group were in agreement that the best incentive is to expedite the approval process for high-performing sustainability projects. Currently, innovative and pioneering initiatives are seen to take longer through the development approvals process, whereas the opposite could occur in order to promote sustainable projects. To provide an accelerated approvals process for innovative and pioneering sustainability projects, the municipalities need to ensure that technical review staff are well informed and engaged in the sustainability metrics, and that a municipal champion is identified, to advance and shepherd the development application through the approvals process.

Development charge rebates and increased density allowances were also discussed. The industry didn't feel that these incentives provide the same emphasis or traction as compared to an expedited approvals process for high-performing sustainability projects.

4.0 PHASE I SUSTAINABLE COMMUNITY DEVELOPMENT GUIDELINES SUMMARY

As mentioned in section 2.2, this project is being completed in two phases, with a pending third phase focused on project implementation. Phase I of the project was led by the City of Brampton and The Planning Partnership, with the goal to develop *Sustainable Community Development Guidelines* (SCDGs). The Phase I SCDG will be a new chapter in the City of Brampton's Development Design Guidelines and will assist the City in the review of development applications and technical reports and documentation. The SCDGs will serve to help describe the qualitative sustainability aspects proposed developments should aim to achieve, including highlighting examples of how they could be achieved.

The focus of the guidelines is on qualitative urban design and community development principles. The guidelines apply to a range of development scales, which include Secondary Plans, Block

Plans, and Draft Plans of Subdivision, and Site Plans. These guidelines helped serve to inform the metric and target priorities for Phase II of the project. The section below summarizes the process, principles and key outcomes from Phase I of the project.

Phase I was initiated with precedent research to help inform the SCDGs. Precedent research included a review of policies, municipal guidelines and recognized standards, including but not limited to:

- Seaton Sustainable Place-Making Guidelines, City of Pickering;
- Health Background Study, Region of Peel, City of Toronto, Heart and Stroke Foundation;
- Thinking Green Development Standard, Town of East Gwillimbury;
- Markham Centre Performance Measures, Town of Markham; and
- LEED 2009 for Neighbourhood Development, Canadian Alternative.

Each of the standards and guidelines were reviewed in detail and summarized in order to appreciate and understand the reporting requirements, overall intent and implementation considerations. The background precedent research was used to help develop the format and delivery of the SCDGs.

Phase I also included a study of five, large scale, City of Brampton sustainability initiatives. This study was used to further reinforce the City's sustainability commitments and ensure these commitments were well established as SCDG priorities. The five precedent initiatives that were evaluated in Phase I include:

- 1) Mount Pleasant Village – Transit-oriented development;
- 2) The Pearson Eco-business Zone – Partners in Project Green;
- 3) The Transportation and Transit Master Plan;
- 4) ZUM – Bus Rapid Transit (BRT) Service; and
- 5) Higher order transit – Hurontario/Main Street Master Plan.

This background research provided a general overview of how the City of Brampton desires to shape its future. The review, while not exhaustive, also identified gaps that need to be further addressed in City policies to assist in the development of the SCDGs.

Based on the City of Brampton's priorities and long term vision, the following guiding principles were developed for the SCDGs:

- 1) Support the mix and diversity of land uses in a compact, transit supportive development form to help balance residential, employment and services and to improve active travel (i.e. walkability, transit use, etc.) between homes, workplaces, schools and amenities;
- 2) Preserve the natural heritage system, urban agricultural and open spaces by directing development to existing communities;
- 3) Provide residents with access to locally grown food;

- 4) Provide for a range and mix of housing opportunities, choices and accessibility for all income levels and needs;
- 5) Create walkable and connected communities with neighbourhood amenities and priority destinations within walking distance of residents. Enhance streetscapes to encourage residents to be physically active and socially engaged;
- 6) Provide a variety of economical, safe and accessible mobility options through the provision of a connected network of streets, sidewalks, bicycle lanes, trails and public transit systems;
- 7) Encourage the responsible use of resources to ensure long-term sustainability, reduce greenhouse gas emissions and demands on energy and water, and improved waste management;
- 8) Create jobs concurrent with residential growth to ensure a long term balanced economy while encouraging live-work opportunities;
- 9) Ensure that growth and development is fiscally sustainable;
- 10) Optimize opportunities for infill, intensification and revitalization;
- 11) Promote place-making that instills a sense of civic pride; and
- 12) Preserve the City's rich cultural heritage through adaptive reuse and restoration.

In order to achieve the sustainability goals of the SCDGs, it is essential that good planning and urban design be prioritized. The form of the built environment influences a person's lifestyle choices, which when considered on a broader scale, can contribute to the success or failure of the sustainability goals. The specifics of achieving the SCDG goals should be set out through performance measures that can be logically and clearly followed, implemented and measured by those who design and build communities, as well as those who administer the review process and manage the community. It should be noted that the onus of achieving these goals falls equally on the public and private sectors.

5.0 SUSTAINABILITY PERFORMANCE METRICS

The guiding principles and performance indicators developed under Phase I of the project served as a basis to help inform the sustainability performance metrics and targets for Phase II of the project. As a result, the overall format, logic and priorities are shared between the two phases.

As identified in section 2.3, the Sustainability Guidelines consists of a grouping of themes, indicators, performance metrics, targets, and precedents. The following section provides a summary of the hierarchy and how the themes and indicators were selected.

5.1 Sustainability Categories

The Sustainability Guidelines are broken down into four categories. The four categories represent the main structuring elements of a community which are required to achieve a sustainable and healthy living environment.

The following provides a description of each theme area and why each is an important component of a sustainable community. Each theme area has a number of corresponding indicators that are listed in the following section.

Built Environment

The indicators for Built Environment speak to how we inform place and connections within the development. The intensity and diversity of land uses influences decisions on where we live, work, and how we move around the community. A mix of housing types and amenities, employment and live-work opportunities located within walking distance, provides the opportunity for residents to meet their day to day needs without reliance on the private automobile. Further provision for life-cycle housing and accessible buildings allows residents to establish and remain in their communities throughout the various periods of their lives.

Mobility

The indicators of Mobility identify how a variety of transportation options must be available to residents to carry out their daily lives within and beyond the community. A sustainable community is one that encourages physical activity, facilitates active transportation, and supports public transit in place of automobile dependence. The most vulnerable population groups (children, elderly, disabled, and low income individuals) are the most affected by choices available to them for mobility and access to services and amenities. Designing a safe, convenient, and accessible environment for walking and cycling encourages these alternative modes of transportation. Emphasis on mobility and active transportation not only reduces energy use and GHG emissions, but contributes directly to improving public health and the quality of life of residents.

Natural Environment and Open Space

The natural environment, urban forest, and the open space system are essential components of a healthy, sustainable community. Firstly, the preservation and enhancement of the natural heritage system ensures the health of the environment and supports recreational and cultural opportunities in a community. Secondly, ensuring residents have convenient access to a connected and diverse range of open spaces, parks, and recreation facilities offers opportunities for improved public health and connections within the community.

Infrastructure

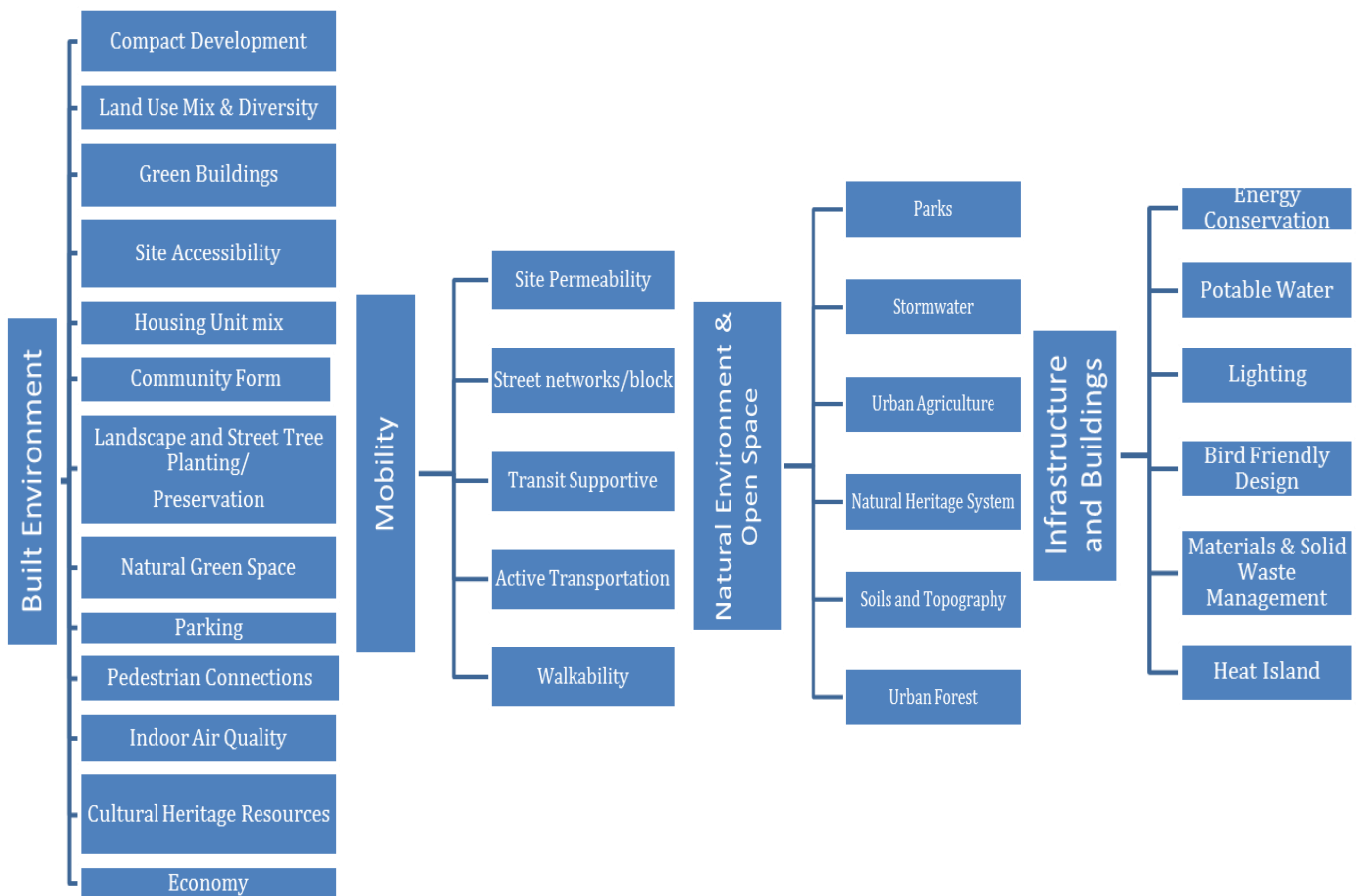
The Infrastructure indicators identify the means to maximize energy and water conservation and minimize the consumption of non-renewable resources. New buildings and communities should be

designed with a focus on reducing water, waste, and energy use. Since human activity is the principal cause of elevated levels of greenhouse gases and demands on energy, water, and waste systems, the measures focus on means of remediating this impact on both the built and natural environments.

5.2 Indicators

For each of the categories, performance indicators have been selected, informed by background research, including other municipal sustainability guidelines, and private and public sector workshop feedback. Within each of the four categories, the performance indicators identify the characteristics that need to be considered in order to achieve the sustainability goals defined for new developments. Figure 1 summarizes all of the sustainability performance indicators that have been selected for the Cities of Brampton and Vaughan and the Town of Richmond Hill.

Figure 1: Sustainability Indicators



As shown, the list of sustainability indicators covers a wide spectrum of built form, mobility, public realm and design issues, all of which will contribute to the overall health, prosperity and performance of a new development. It should be noted that not all indicators will be applicable to all plan

applications. As referenced in section 2.3, the applicability of the various indicators are filtered based on the development application type (i.e. Block plan, draft plan, site plan and building plan).

5.3 Sustainability Metrics and Targets

For each of the sustainability performance indicators listed above, specific performance metrics and mandatory, minimum and aspirational targets have been identified. The metrics and targets have been defined based on internal and stakeholder consultations, in addition to referencing supplemental standards (such as LEED ND and other municipal guidelines).

The sustainability metrics and targets have been reviewed through multiple municipality engagements, with a further review still pending from the TRCA and CAP. For the most part, the partner municipalities expressed a strong level of confidence with most of the metrics being considered. That said, there is a short list of metrics that have been identified that require additional research and consideration. The following lists the indicators, where the metrics are still under review:

- Intersection density;
- Tree Canopy;
- Topography;
- Soil Quality; and
- Stormwater Management.

As is the case with the Toronto Green Standard, the sustainability metrics and targets are expected to evolve and change as market acceptance and implementation of sustainability measures improves with experience. As new priorities are identified, the metrics and targets can be re-evaluated on a regular basis.

A list of the sustainability performance metrics, targets and point allocation is included in Appendix A.

5.4 Sustainability Metric Precedents

As referenced in section 3.1, background research was carried out to help inform the development of the sustainability performance metrics. As shown in Appendix A, a precedent is referenced for over 80% of the metrics, identifying a recognized standard, municipal guideline or provincial policy that has helped inform the mandatory, recommended minimum and aspirational targets. Highlighting these precedents should help improve the adoption and acceptance of the sustainability performance metrics, in both the private and public sectors, as they have already gained acceptance in other development communities.

6.0 IMPLEMENTATION

Implementation will likely become another phase (Phase III) of the project, with collaboration continuing among the municipal partners. Municipal-specific fine tuning of the Guidelines and Metrics will respond to local conditions. Components of this phase may include:

- Amendments to existing documents (OP, Site Plan, Secondary Plans etc.);
- Revisions and/or development of municipal sustainability standards;
- Revisions to Submission Requirements;
- Education and Communication;
- Pilot Projects;
- Governance;
- Staff Resourcing; and
- Update Terms of Reference of various technical background studies (e.g. Transportation Studies, Servicing Reports, Stormwater Plans, etc.) to reference Sustainable Performance Metrics.

6.1 Submission Requirements

The submission requirements will likely be identified during Phase III of the project. To demonstrate compliance against the Municipalities' sustainability requirements, the submission requirements will likely include the following supporting documentation:

- Submit the plan's sustainability score at pre-application consultation meeting (similar to East Gwillimbury), identifying that all Mandatory targets have been satisfied;
- Municipal receipt and review of technical background reports (in conformance with a complete application package) including draft sustainability checklist;
- Municipality reviews background reports, sustainability score and / or sustainability report to confirm targeted performance level of the development; and
- Checklist to reference sustainability metrics/guidelines qualified in supporting background studies (i.e Metric 23 is qualified under Section X of the transportation study management report).

6.2 Recommended Incentive Strategies

Based on the feedback received at the Developer Forum, the most valued incentive to encourage higher sustainability performance targets (i.e. Minimum or Aspirational) is a streamlined approval process. Consistent feedback from the developers, consultants and BILD, identified concerns that the current approvals process takes too long, and is too iterative. As a result of this drawn out process developers are frustrated. Additionally, innovative projects that go beyond standard building practices are often further delayed as current engineering standards don't typically accept "innovative and pioneering" projects.

The following identifies incentive opportunities that could be considered by the partner municipalities to further encourage developers to improve the sustainability performance of new developments. It should be noted that these incentives have been discussed at a high level with the Municipal and Developer workshops but the actual viability or mechanism of each incentive has not been evaluated.

- Establish municipal cross-department working groups/committees to help implement the sustainability tool;
- Increased opportunities for density (in urban centres);
- Development rebates; and
- Recognize builders for environmental stewardship/innovating projects.

6.3 Recommendations for Next Steps

- Consult with Development Industry on Draft Sustainability Metrics – consultation with BILD targeted for May 2013;
- Consult with public on Draft Sustainability metrics – documents to be posted on each municipality’s website for public comment;
- Municipalities to test the tool functionality and output on various plan applications;
- Revise Draft Sustainability Metrics based on consultation feedback, additional testing workshops and peer review from TRCA and CAP; and
- Final Sustainability Metrics to Council for consideration – targeting June to September 2013.

Appendix A
Sustainability Metrics

Site (S) & Building (B) Metrics													
Category	Indicator	Applies To	Metric #	Metric	Mandatory Target	Recommended Minimum Target			Aspirational Target			Precedent	Total Available Points
				Building Type		Single Family Home	Multi-Fam Buildings (>3 storeys)	Commercial/Retail/Inst	Single Family Homes	Multi-Fam Buildings (>3 storeys)	Commercial/Retail/Inst		
Built Environment	Compact Development	S&B	1	Floor area ratio/Floor Space Index (usually applies only to multi-unit medium density and high density)	Satisfy Municipal Official Plan requirements				-			Municipal OP	
	Land use mix and diversity	S&B	2	Proximity to Principal Amenities		<p>50% of DU and jobs are within a 800m walking distance to existing or planned Principal Amenities (Select up to 3 of the Principal Amenities that apply to the plan)</p> <p>Principal amenities include: Grocery store/farmers market, place to buy fresh produce Community/Recreation Centre Pharmacy Library</p> <p>If the amenities are not within the distance specified above and the site is designated as mix use, the mix of population and employment uses achieves a 2:1 ratio on the site.</p> <p>(POINTS AWARDED BASED ON SLIDING SCALE)</p>	<p>75% of DU and jobs are within a 400m walking distance to existing or planned Principal amenities (Select up to 3 of the Principal Amenities that apply to the plan)</p> <p>Principal amenities include: Grocery store/farmers market, place to buy fresh produce Community/Recreation Centre Pharmacy Library</p> <p>If the amenities are not within the distance specified above and the site is designated as mix use, the mix of population and employment uses includes major office space, an anchor commercial/retail tenant or a minimum of 3 stories of employment uses.</p> <p>(POINTS AWARDED BASED ON SLIDING SCALE)</p>	<p>Municipal OP Thinking Green Item 1, 2, 9 LEED NC SSc2</p>	12				
		S&B	3	Proximity to Basic Amenities		<p>50% of DU and jobs are within a 800m walking distance to existing or planned basic amenities (Select up to 3 of the Basic Amenities that apply to the plan)</p> <p>Basic Amenities include: General retail convenience store theatre coffee store Hair salon bank Place of worship Other</p> <p>(POINTS AWARDED BASED ON SLIDING SCALE)</p>	<p>75% of DU and jobs are within a 400m walking distance to existing or planned basic amenities (Select up to 3 Basic Amenities that apply to the plan)</p> <p>Basic Amenities include: General retail convenience store theatre coffee store Hair salon bank Place of worship Other</p> <p>(POINTS AWARDED BASED ON SLIDING SCALE)</p>	<p>Municipal OP Thinking Green Item 1, 2, 9 LEED NC SSc2</p>	6				
	Green Buildings	S	4	Building(s) designed and/or certified under an accredited "green" rating system	Public Buildings greater than 500m ² must be designed to LEED Silver or alternative equivalent	Site includes 1 or more green buildings certified under a recognized third party standard (i.e. Energy Star, LEED NC, CS, CI, EB, Homes) - (2 POINTS)	100% of buildings on site that are certified to green standards (Green Globes, LEED, ASHRAE 189, Recognized) - (2 POINTS) (On site buildings needs to be greater than 2 for additional aspirational points)			<p>Municipal OP Sustainable Design and Construction Policy for Municipal Buildings LEED ND GIBp1</p>	4		

Category	Indicator	Applies To	Metric #	Metric	Mandatory Target	Recommended Minimum Target		Aspirational Target		Precedent	Total Available Points
Built Environment	Site Accessibility	S&B	5	Universal Design	Design 10% of residential units in apartment buildings to provide a barrier-free path of travel from the suite entrance door to the doorway of at least one bedroom at the same level, and at least one bathroom in accordance with OBC.	Design a minimum of 20% of the DU in accordance with ICC/ANSI A117.1 Universal Design Standards (or equivalent) - (1 POINT)		Design a minimum of 30% of the DU in accordance with ICC/ANSI A117.1 Universal Design Standards (or equivalent) - (1 POINT)		Accessibility Act Municipal Accessibility Plan LEED ND NPDc11 OBC Requirement	2
		S&B	6	Number of universally accessible points of entry to buildings and sites	100% of primary entrances	100% of emergency exits - (1 POINT)		100% of all entries and exits - (1 POINT)		Accessibility Act Municipal Accessibility Plan LEED ND NPDc11	2
	Housing Unit mix	S	7	Design for life cycle housing		The housing types includes a diversified mix that caters to singles, families, multi-generational, live-work, affordable/low income, renters, attached, detached, townhome and med-to-high-rise residential. (POINTS AWARDED BASED ON A SLIDING SCALE)	N/A	The housing mix includes a mix of housing types, catering to singles, families, multi-generational, live-work, affordable/low income, renters, attached, detached, townhome and med-to-high-rise residential. (POINTS AWARDED BASED ON A SLIDING SCALE)	N/A	Municipal OP	7
	Landscape and Street Tree Planting / Preservation	S	8	% Tree canopy within proximity to building/pedestrian infrastructure	Satisfy municipal planting requirements	Provide shade within 10 years for at least 50% of the walkways/sidewalk lengths All trees should be selected from the applicable municipal tree list. - (2 POINT)		Provide shade within 10 years for at least 75% of the walkways/sidewalk lengths. All trees should be selected from the applicable municipal tree list. - (2 POINTS)		Municipal OP LEED ND NPDc14	4
		S	9	Maintain existing healthy trees	Arborist Report provided that identifies and evaluates where on-site healthy mature trees will be protected or removed.	Where healthy mature trees must be removed, new trees are provided on site or as determined by the municipality to mitigate the lost canopy coverage of the trees removed. - (2 POINTS)		Healthy mature trees greater than 20 cm. DBH preserved in situ on site. - (2 POINTS) Smaller healthy trees (less than 20 cm. DBH) transplanted. - (1 POINT) (See Glossary for DBH definition)		Municipal Precedent	5
		S	10	Soil Quantity		Pits, trenches or planting beds should have a topsoil layer with an organic matter content of 10 to 15 % by dry weight and a pH of 6.0 to 8.0. The topsoil layer should have a minimum depth of 60 cm. The subsoil should have a total uncompacted soil depth of 90 cm. Minimum soil volume of 30 cubic metres per tree - (2 POINTS)		TBD		TGS TIER I Canadian Cities with Soil Volume Standards TRCA - Preserving and Restoring Healthy Soils: Best Practice Guide for Urban Construction	2
	Natural Green Space	S	11	Proximity to natural green space		Visual connections (such as public access blocks, single loaded roads) are provided to the natural heritage system and parks. - (2 POINTS)		Natural green space within 10 minute walk to 100% of DU and Jobs - (2 POINTS)			4

Category	Indicator	Applies To	Metric #	Metric	Mandatory Target	Recommended Minimum Target		Aspirational Target		Precedent	Total Available Points	
Built Environment	Parking	S&B	12	Bicycle Parking		Provide a minimum 0.6 bike parking spots per unit Provide a minimum 5% of bike parking at grade for visitors (1 POINT)	0.13 bike parking spots for permanent employees for every 100m2 GFA (Non residential buildings). Provide 0.15 bike parking spots for visitors for every 100m2 of GFA. Provide a minimum of 1 shower (for men and women) (1 POINT)		Provide a minimum of 0.8 bike parking spots per unit Provide a minimum 10% of bike parking at grade for visitors (1 POINT)	Place bike parking in weather protected areas Provide 1 shower (for men and women) for every 30 bike parking spots (1 POINT)	TIER I & TIER II	4
		S&B	13	Off-Street Parking	N/A	Locate all new off-street parking at the side or rear of buildings - (1 POINT)	N/A	Less than 20% of the total development area is allocated to new, off-street surface parking facilities. - (1 POINT) No surface parking area is greater than 2 acres (8000m2) - (1 POINT) Consolidate surface parking to parking structures in Intensification Areas. - (5 POINT)	LEED ND NDPc5	8		
		S&B	14	Surface Parking		Develop and implement a strategy to minimize surface parking for permanent employees and residents (1 POINT)						1
		S&B	15	Carpooling and Efficient Vehicle Parking			3% of the site parking spots (or a minimum of 4 parking spots) to be dedicated to car pooling and fuel efficient / hybrid vehicles (does not apply to compact cars). Dedicated parking spots located in preferred areas close to building entries. - (1 POINT)			5% of the site parking spots to be dedicated to car pooling and fuel efficient / hybrid vehicles (does not apply to compact cars). Dedicated parking spots located in preferred areas close to building entries. - (1 POINT)	TGS LEED NC SSc4.3	2
	Indoor Air Quality	B	16	Indoor Air Quality		Building interior finishes must comply with low-emitting material requirements listed under LEED NC 2009 IEQc4.1 to IEQc4.4 - (1 POINT)					LEED NC 2009 IEQc4.1-4.4	1

Category	Indicator	Applies To	Metric #	Metric	Mandatory Target	Recommended Minimum Target	Aspirational Target	Precedent	Total Available Points	
Built Environment	Pedestrian Connections	S	17	Traffic Calming		75% of new residential-only streets designed with traffic calming strategies. - (1 POINT) 50% of new non-residential and/or mixed-use streets are designed with traffic calming strategies - (1 POINTS) (See Glossary for Traffic Calming strategies)	100% of new residential-only streets designed with traffic calming strategies. - (1 POINT) 75% of new non-residential and/or mixed-use streets are designed with traffic calming strategies - (1 POINT) (See Glossary for Traffic Calming strategies)	LEED ND NPDC1	4	
		S	18	School Proximity to Transit routes & Bikeways		All schools are located within a 400m walking distance to transit routes and/or dedicated bike network - (2 POINTS)	All schools are located within a 200m walking distance to transit routes and/or dedicated bike network- (2 POINTS)		4	
		S	19	Proximity to school		50% of dwelling units are within 800 meters walking distance to elementary and middle schools - (2 POINTS) and 50% of dwellings units are within 1600 meters to a high school (1 POINT)	N/A	75% of dwelling units are within 400 meters walking distance to elementary and middle schools - (2 POINTS) and 75% of dwellings units are within 1000 meters to a high school - (1 POINT)	N/A	LEED ND NPDC15
	Cultural Heritage Resources	S	20	Cultural Heritage Conservation	Comply with Cultural Heritage Conservation policies under provincial legislation (i.e. the Ontario Heritage Act, Planning Act and PPS, etc), Standards and Guidelines for Historic Places, municipal Official Plan, municipal by-laws, Municipal Register of Cultural Heritage Resources and/or Municipal Heritage Inventory.	100% evaluation of properties included in the Municipal Heritage Inventory and/or Register, and 100% retention and protection of cultural heritage resources in-situ that qualify for designation under the Ontario Heritage Act. (2 POINT)	100% conservation of cultural heritage resources identified in the Municipal Heritage Register or Inventory and their associated landscapes and ancillary structures in-situ in accordance with the Standards and Guidelines for the Conservation of Historic Places in Canada. (2 POINTS)	Municipal OP policies on Cultural Heritage Ontario Heritage Act Municipal Inventory of Buildings of Architectural and Historical Significance	4	
	Economy	S	21	Jobs/Residents		1:2 - (2 POINTS)	1:1 - (2 POINTS)		4	
Mobility	Site Permeability	S	22	Connectivity	Connect buildings on the site to off-site pedestrian paths, surface transit stops, parking areas (car and bike), existing trails or pathways, or other destinations (e.g. schools). Outdoor waiting areas located on the site must offer protection from weather. Where a transit stop is located within a walking distance of the project site boundary, the building main entrance should have a direct pedestrian linkage to that transit stop		Provide amenities and street furniture (benches, additional bike parking, landscaping) along connections provided on the site and between the site and adjacent destinations. - (2 POINTS)	TGS TIER II Municipal OP	2	

Category	Indicator	Applies To	Metric #	Metric	Mandatory Target	Recommended Minimum Target	Aspirational Target	Precedent	Total Available Points
Mobility	Transit supportive	S	23	Distance to public transit		Site is within 800m walking distance to an existing or planned commuter rail, light rail, bus rapid transit or subway with stops or Site is within 400m walking distance to 1 or more bus stops with frequent service. (3 POINTS)	Site is within 400m walking distance to an existing or planned commuter rail, light rail, bus rapid transit, or subway with frequent stops (see Glossary) or Site is within 200m walking distance to 1 or more bus stops with frequent service. (3 POINTS)	Regional OP (proximity) Municipal OP (if revised to speak to connectivity) LEED NC 2009 SSc4.1	6
	Active Transportation	S	24	Proximity to trail and bike paths		Within 400 meters of 75% of residents/jobs - (2 POINTS)	Within 400 meters of 100% of residents/jobs - (2 POINTS)	ADD PRECEDENT	4
	Walkability	S	25	Promote walkable streets	Sidewalks must be in accordance with the applicable Municipal Standards. Sidewalk width must be at least 1.5 meters.		Continuous sidewalks or equivalent provisions must be provided on both sides of streets, where not a mandatory requirement. - (2 POINTS) Provide pedestrian amenities to further encourage walkable streets. "Pedestrian amenities" include: shelter from rain, wind breaks, shade, seating, pedestrian-oriented lighting, etc. Wider sidewalk widths may also be pedestrian amenities in more urban areas. - (2 POINTS)	LEED ND NPdC1	4
Natural Environment & Open Space	Parks	S	26	Urban Square/Open Space		Size: 200m2 Visibility (road frontage): Distinct edge, defined as focal point Accessibility: 400m walk; 75% of dwelling units Facilities: Benches, Tree canopy, draught tolerant & native plants, public art, hard surfaces (1 POINT IF 2/3 SATISFIED 2 POINTS IF ALL CRITERIA SATISFIED)	Size: 200m2 Visibility (road frontage): Distinct edge, defined as focal point Accessibility: 400m walk; 90% of dwelling units Facilities: Benches, Tree canopy, draught tolerant & native plants, public art, hard surfaces (1 POINT IF ALL CRITERIA SATISFIED)	LEED ND Cornell Community Mt. Pleasant Village Brampton Development Design Guideline Existing Policies	3
		S	27	Parkette		Size: 0.5ha Visibility (road frontage): 3 sides Accessibility: 200m walk; 75% of dwelling units Facilities: Play structure, benches, bicycle parking, tree canopy, benches, draught tolerant & native plants (1 POINT IF 2/3 SATISFIED 2 POINTS IF ALL CRITERIA SATISFIED)	Size: 0.5ha Visibility (road frontage): 4 sides or 100% Accessibility: 200m walk; 90% of dwelling units Facilities: Play structure, benches, bicycle parking, tree canopy, benches, draught tolerant & native plants (1 POINT IF ALL CRITERIA SATISFIED)		3
		S	28	Neighbourhood Park	Visibility (road frontage): 1 side	Size: 1.5ha Visibility (road frontage): 3 sides Accessibility: 400m walk; 75% of dwelling units Facilities: Proximity to elementary school, local transit access, active sports field (soccer, basketball, baseball), play structure, benches, bicycle parking, tree canopy, benches, draught tolerant & native plants (1 POINT IF 2/3 SATISFIED 2 POINTS IF ALL CRITERIA SATISFIED)	Size: 1.5ha Visibility (road frontage): 4 sides or 100% Accessibility: 400m walk; 90% of dwelling units Facilities: Proximity to elementary school, local transit access, active sports field (soccer, basketball, baseball), play structure, benches, bicycle parking, tree canopy, benches, draught tolerant & native plants (1 POINT IF ALL CRITERIA SATISFIED)		3
		S	29	Community Park	Visibility (road frontage): 2 sides	Size: 4ha to 6ha Visibility (road frontage): 2 sides Accessibility: 800m to 1200m walk; 50% of dwelling units Facilities: Proximity to community facilities (high school, community centre, library), local transit access, active sports field (soccer, basketball, baseball), play structure, benches, bicycle parking, tree canopy, benches, draught tolerant & native plants (1 POINT IF 2/3 SATISFIED 2 POINTS IF ALL CRITERIA SATISFIED)	Size: 4ha to 6ha Visibility (road frontage): 3 sides Accessibility: 800m to 1200m walk; 75% of dwelling units Facilities: Proximity to community facilities (high school, community centre, library), local transit access, active sports field (soccer, basketball, baseball), play structure, benches, bicycle parking, tree canopy, benches, draught tolerant & native plants (1 POINT IF ALL CRITERIA SATISFIED)		3
		S&B	30	Stormwater Quantity	Retain runoff volume from the 5mm rainfall event on site. Provide quantity or flood control in accordance with applicable Municipal and TRCA requirements.	Retain runoff volume from the 10mm rainfall event on site. (1 POINT) Strategies should include use of Low Impact Development techniques such as: Greenroofs, bioswales, tree planting, absorbent landscaping, downspot disconnect, rain barrels, rainwater harvesting, permeable pavers/hard surfaces, and rainwater cisterns.	Retain runoff volume from the 15mm rainfall event on site. Strategies should include use of Low Impact Development techniques such as: Greenroofs, bioswales, tree planting, absorbent landscaping, downspot disconnect, rain barrels, rainwater harvesting, permeable pavers/hard surfaces, and rainwater cisterns. (2 POINTS)	TRCA's Stormwater Management Criteria TRCA SWM Criteria Document	3

Category	Indicator	Applies To	Metric #	Metric	Mandatory Target	Recommended Minimum Target		Aspirational Target			Precedent	Total Available Points	
Natural Environment & Open	Stormwater	S&B	31	Stormwater Quality	Remove 80% of Total Suspended Solids (TSS) on an annual loading basis from all runoff leaving the site (based on the post development level of imperviousness). All ponds will be designed with Enhance Level of Protection (Level 1). <i>Enhanced</i> protection corresponds to the end-of-pipe storage volumes required for the long-term average removal of 80% of suspended solids. Strategies included in Glossary	N/A		N/A	90% to 100% of Total Suspended Solids (TSS) removed from a 25mm rainfall event. Strategies should include low impact development measures such as: Stormwater ponds, oil-grit separators, bioswales, filters, treatment train approach, etc. (4 POINTS) (See Glossary for TSS definition)			TGS TIER II	4
		S&B	32	Rainwater Re-use			Buildings designed for rainwater re-use readiness (i.e. plumbing infrastructure included in building) (1 POINT)	Rainwater captured on-site and used for low-grade functions (i.e. toilet/urinal flushing, irrigation) (3 POINTS)				4	
		S	33	Stormwater Architecture/Features		Introduce stormwater amenities that provide both functional and aesthetic benefit to the site. (2 POINTS - see glossary for examples)							2
	Urban Agriculture	S	34	Dedicate land for local food production		Provide the following garden space per site density: DU Density Growing space/DU 17-35 DU/ha 200ft2/DU 36-54 DU/ha 100ft2/DU >54 DU/ha 80ft2/DU (2 POINTS) (See Glossary for Growing Space definition)	N/A		Dedicate 15% of roofspace for local food production (2 POINTS)	N/A	LEED ND NPDc13	4	
Infrastructure and Buildings	Energy conservation	S&B	35	Solar Readiness		100% of all new building designed for solar readiness (i.e. electrical conduit/plumbing riser roughed in) - (1 POINT)		On-site energy generation from renewable energy source (points awarded based on % of renewable energy generated relative to total building) (POINTS AWARDED BASED ON A SLIDING SCALE OF % RENEWABLE ENERGY GENERATION)			LEED NC EAc2	8	
		S	36	Passive solar alignment		Applies to 50% of new buildings: The building(s)'s long axis is within 15degrees of E-W The building(s) E-W lengths are at least as long as the N-S lengths (3 POINTS)		Applies to 75% of new buildings: The building(s)'s long axis is within 15degrees of E-W The building(s) E-W lengths are at least as long as the N-S lengths (3 POINTS)			LEED ND GIBc10	6	
		S&B	37	Building energy efficiency	Design all buildings in accordance with OBC.	Single family homes or multiunit residential buildings (3 storey or lower) must be built to EnerGuide 83 (or equivalent) (3 POINTS)	Buildings must be designed to 35% better than MNECB (3 POINTS - MAXIMUM)	Single family homes or multiunit residential buildings (3 storey or lower) must be built to EnerGuide 85 (or equivalent) (1 POINT)	Buildings energy performance exceeds MNECB by 35% or more (SLIDING SCALE TOTAL OF 8 POINTS 1 PT AWARDED PER 5% ENERGY IMPROVEMENT OVER 35%) Building commissioning required for all buildings (multi unit res above 3 storeys, commercial, inst) - (3 POINTS) Building electricity sub-metering required for all tenants and per residential suite (3 POINTS)			LEED ND GIBp2 TGS TIER I & TIER II	17

Category	Indicator	Applies To	Metric #	Metric	Mandatory Target	Recommended Minimum Target	Aspirational Target	Precedent	Total Available Points	
Infrastructure and Buildings		S	38	District energy viability		Develop an energy strategy for the development, identifying opportunities for conservation, energy sharing, renewables, etc... (2 POINTS)	In an intensification area, where district energy has been deemed viable by the municipality, carry out a district energy feasibility study. The feasibility study should include a high level assessment of the thermal and electricity load profiles (seasonally and hourly) and potential thermal network maps (3 POINTS)		5	
	Potable Water	S&B	39	Reduce potable water used for irrigation		Reduce potable water used for irrigation by 50%, compared to a midsummer baseline case. (2 POINTS) Achieved by: - planting drought tolerant and native plants - efficient irrigation controls (drip irrigation, soil moisture sensors) - rainwater harvesting - recycled/treated greywater	No potable water is used for irrigation. (4POINTS)	LEED NC WEc1 TIER I	6	
		S&B	40	Water Conserving Fixtures	Include plumbing fixtures with the following maximum flow rates: Residential: Toilets: 6LPF Faucets: 8.3LPM Showerhead: 9.5LPM CRI Same as Residential with: Urinals 3.8LPF Faucets 8.3LPM (private applications only), 1.9LPM all other	Include water fixtures that obtain a 20% reduction over the baseline fixture (Mandatory target fixture)	Include water fixtures that obtain a 30% reduction over the baseline fixture (Mandatory target fixture) - (3 POINTS)	LEED ND GIBp3 TIER I and TIER II TGS	6	
	Lighting	S&B	41	Parking garage lighting	Minimum level of illumination of 50 lux		Use occupancy sensors (motion and thermal) on 2/3 of parking lighting fixtures, while always maintaining a minimum illumination of at least 10 lux (1 POINT)			1
		S&B	42	Reduce light pollution	Satisfy applicable municipal standards	Shield exterior light fixtures >1000 lumens to provide night sky lighting No uplighting allowed - (1 POINT)		Develop lighting controls that reduces night time spillage of light by 50% from 11pm to 5am (non residential) No architectural lighting allowed between 11pm and 5am - (1 POINT)	LEED NC SSc8 TIER I and TIER II	2
		S&B	43	Energy Conserving Lighting			Use LEDs and photocells on all exterior (exposed) lighting fixtures (2 POINTS)			2

Category	Indicator	Applies To	Metric #	Metric	Mandatory Target	Recommended Minimum Target		Aspirational Target			Precedent	Total Available Points	
Infrastructure and Buildings	Bird friendly design	S&B	44	Bird Friendly Design			<p>Use a combination of strategies listed below to treat at least 85% of the exterior glazing located within the first 12m of the building above-grade (including interior courtyards).</p> <p>Visual markers on the glass should have a spacing no greater than 10cm x 10cm</p> <p>Where a greenroof is constructed with adjacent glass surfaces, ensure the glass is treated 12m above greenroof surface (2 POINT)</p> <p>Bird friendly design strategies include: window fritt, films, decals, grills, louvres, internal screens, awnings, overhangs, artwork, etc.</p>				TGS TIER 1 City of Toronto Bird Friendly Design Guidelines	2	
	Materials & Solid Waste Management	S&B	45	Solid Waste	Satisfy applicable municipal standards		Storage and collection areas for recycling and organic waste are within or attached to the building or deep collection recycling and organic waste storage facilities are provided. (1 POINT)		Three chute system is provided. (1POINT)			TGS TIER I	2
		S&B	46	Recycled / Reclaimed Materials			Minimum 25% of recycled/reclaimed materials should be used for new infrastructure including roadways, parking lots, sidewalks, unit paving, etc. - (1POINT)		Minimum 30% of recycled/reclaimed materials should be used for new infrastructure including roadways, parking lots, sidewalks, unit paving, etc. - (1POINT)			LEED ND GIBc15	2
		S&B	47	Material Re-use and Recycled Content			<p>At least 5% reused content in building materials and/or landscaping materials (hardscaping such as paving or walkways) is provided. - (1POINT)</p> <p>At least 10% recycled content in building materials and/or landscaping materials (hardscaping such as paving or walkways). - (1POINT)</p>		<p>At least 10% reused content in building materials and/or landscaping materials (hardscaping such as paving or walkways) is provided. - (1POINT)</p> <p>At least 15% recycled content in building materials and/or landscaping materials (hardscaping such as paving or walkways). - (1POINT)</p>			TGS TIER II	4
		S&B	48	Reduce heat island effect from the built form - Non Roof			<p>For 50% of the site's hardscape, include any combination of the following:</p> <ul style="list-style-type: none"> - Underground/covered parking - Hardscape shading - Hardscape material with an SRI > 29 - Open grid pavers (>50% pervious) <p>(2 POINTS)</p>		<p>For 75% of the site's hardscape, include any combination of the following:</p> <ul style="list-style-type: none"> - Underground/covered parking - Hardscape shading - Hardscape material with an SRI > 29 - Open grid pavers (>50% pervious) <p>(1 POINT)</p>			Municipal OP LEED NC SSC7.1/7.2 TGS TIER I & II	3

Category	Indicator	Applies To	Metric #	Metric	Mandatory Target	Recommended Minimum Target		Aspirational Target		Precedent	Total Available Points
Infrastructure and Buildings	Heat Island	S&B	49	Reduce heat island effect from the built form - Roof		<p><i>Cool Roof</i> For 75% of the roof area, include roofing materials with solar reflective index (SRI) of: Low-sloped roof: 78 Steep-sloped roof: 29 (2 POINTS)</p> <p><i>Vegetated Roof</i> Install vegetated roof for 50% of the roof area (4 POINTS) An additional 2 points is awarded if a <i>Cool</i> roof is installed on the remaining 50%</p>	<p><i>Cool Roof</i> For 90% of the roof area, include roofing materials with solar reflective index (SRI) of: Low-sloped roof: 78 Steep-sloped roof: 29 (1 POINT)</p> <p><i>Vegetated Roof</i> Install vegetated roof for 75% of the roof area (2 POINT) An additional 1 point is awarded if a <i>Cool</i> roof is installed on the remaining 25%</p>	<p>Municipal OP LEED NC SSC7.1/7.2 TGS TIER I & II</p>	8		

Block Plan (B) & Draft Plan (D) Metrics

Category	Indicator	Applies To	Metric #	Metric	Mandatory Target	Minimum Target	Aspirational Target	Precedents	Available Points
Built Environment	Compact Development	B&D	1	Floor area ratio (usually applies only to multi-unit medium density and high density)	Satisfy Municipal Official Plan requirements		_____		
		B&D	2	Persons & Jobs per hectare <i>Note:</i> Each municipality defines density ranges by land use types within the Official Plan and the Secondary Plans	Places to Grow - 50 (min) ppl+jobs/ha or as further defined in the municipal Official Plan York Region - 70 (min) ppl+jobs/ha or as further defined in the municipal Official Plan		30-40 u/ha or as further defined in the municipal Official Plan - (1 POINT)		1
		B&D	3	Location Efficiency	Height and/or density conforms to the minimum or maximum targets established in the applicable Municipal Official Plan	For Greenfield Applications: 2x the average density along transit corridors (within 200m from transit) - (2 POINTS)			2
	Land use Mix and diversity	B&D	4	Proximity to principal amenities		50% of DU and jobs are within a 800m walking distance of at least 3 existing or planned Principal Amenities (Amenities listed below) (6 POINTS - SLIDING SCALE) Principal amenities include: Grocery store/farmers market, place to buy fresh produce Community/Recreation Centre Pharmacy Library	75% of DU and jobs are within a 400m walking distance of at least 3 existing or planned Principal Amenities (Amenities listed below) (6 POINTS - SLIDING SCALE) Principal amenities include: Grocery store/farmers market, place to buy fresh produce Community/Recreation Centre Pharmacy Library	Thinking Green Item 1, 2, 9 LEED NDPC3	12
		B&D	5	Proximity to basic amenities		50% of DU and jobs are within a 800m walking distance of at least 3 existing or planned basic amenities (Amenities listed below) (3 POINTS - SLIDING SCALE) Basic Amenities include: General retail convenience store theatre coffee store Hair salon bank Place of worship Other	75% of DU and jobs are within a 400m walking distance of at least 3 existing or planned basic amenities (Amenities listed below) (3 POINTS - SLIDING SCALE) Basic Amenities include: General retail convenience store theatre coffee store Hair salon bank Place of worship Other.	Thinking Green Item 1, 2, 9 LEED NDPC3	6

Block Plan (B) & Draft Plan (D) Metrics

Category	Indicator	Applies To	Metric #	Metric	Mandatory Target	Minimum Target	Aspirational Target	Precedents	Available Points
Built Environment	Landscape and Street Tree Planting / Preservation	D	6	Urban Tree Diversity	Where trees are planted in a row in an urban area (e.g. street trees, trees in a parking area, park, etc.), alternate tree species at least every 2 trees or in accordance with approved municipal standards.				
		D	7	Maintain existing healthy trees	Arborist Report provided that identifies and evaluates where on-site healthy mature trees will be protected or removed.	Where healthy mature trees must be removed, new trees are provided on site or as determined by the municipality to mitigate the lost canopy coverage of the trees removed. - (2 POINTS)	Healthy mature trees greater than 20 cm. DBH preserved in situ on site. - (2 POINTS) Smaller healthy trees (less than 20 cm. DBH) transplanted. - (1 POINT) (See Glossary for DBH definition)	Municipal Precedent	5
		D	8	Soil Quantity		Pits, trenches or planting beds should have a topsoil layer with an organic matter content of 10 to 15 % by dry weight and a pH of 6.0 to 8.0. The topsoil layer should have a minimum depth of 60 cm. The subsoil should have a total uncompacted soil depth of 90 cm. Minimum soil volume of 30 cubic metres per tree - (2 POINTS)	TBD	TGS TIER I Canadian Cities with Soil Volume Standards TRCA - Preserving and Restoring Healthy Soils: Best Practice Guide for Urban Construction	2
	Green Buildings	D	9	Building(s) designed and/or certified under an accredited "green" rating system	Public Buildings greater than 500m ² must be designed to LEED Silver or alternative equivalent	Site includes 1 or more green buildings certified under a recognized third party standard (i.e. Energy Star, LEED NC, CS, CI, EB, Homes) - (2 POINTS)	100% of buildings on site that were certified to green standards (Green Globes, LEED, ASHRAE 189, Recognized) (2 POINTS) (On site buildings needs to be greater than 2 for additional aspirational points)	Municipal OP Sustainable Design and Construction Policy for Municipal Buildings LEED ND GIBp1	4

Block Plan (B) & Draft Plan (D) Metrics

Category	Indicator	Applies To	Metric #	Metric	Mandatory Target	Minimum Target	Aspirational Target	Precedents	Available Points
Built Environment	Housing Unit Mix	B&D	10	Design for life cycle housing:		The housing types include a diversified mix that caters to singles, families, multi-generational, live-work, affordable/low income, renters, attached, detached, townhome and med-to-high-rise residential. (POINTS AWARDED BASED ON A SLIDING SCALE)	The housing types include a diversified mix that caters to singles, families, multi-generational, live-work, affordable/low income, renters, attached, detached, townhome and med-to-high-rise residential. (POINTS AWARDED BASED ON A SLIDING SCALE)	Thinking Green Item 3 LEED NDPC4	7
	Community Form	B&D	11	Community and Neighbourhood Scale		Community form based on a hierarchy of the following: <i>Community</i> - formed by a clustering of neighbourhoods, typically 6 to 9 (depending on topography and natural features), to sustain a viable mixed use node and public transit. <i>Neighbourhood</i> - shape and size defined by 400 metres (5 minute walk) from centre to perimeter with a distinct edge or boundary defined by other neighbourhoods or larger open spaces. <i>Neighbourhood centre</i> - acts as a distinct centre or focus with a compatible mix of uses that include medium and high-density, retail or community facilities, and a parkette/village square. <i>Mixed use node</i> - central to the cluster of neighbourhoods the node should include higher residential densities, retail, employment opportunities, be accessible, and served by public transit. (4 POINTS)			4
		D	12	Bicycle Parking		Single Family - N/A Multi Family - Provide a minimum 0.6 bike parking spots per unit Provide a minimum 5% of bike parking at grade for visitors (1 POINT) Commerical/Residential/Institutional - 0.13 bike parking spots for permanent employees for every 100m2 GFA (Non residential buildings). Provide 0.15 bike parking spots for visitors for every 100m2 of GFA. Provide a minimum of 1 shower (for men and women) (1 POINT)	Single Family - N/A Multi Family - Provide a minimum of 0.8 bike parking spots per unit Provide a minimum 10% of bike parking at grade for visitors (1 POINT) Commercial/Residential/Institutional - Place bike parking in weather protected areas Provide 1 shower (for men and women) for every 30 bike parking spots (1 POINT)	TIER I & TIER II	4

Block Plan (B) & Draft Plan (D) Metrics

Category	Indicator	Applies To	Metric #	Metric	Mandatory Target	Minimum Target	Aspirational Target	Precedents	Available Points	
Built Environment	Parking	D	13	Off-Street Parking		<p>Single Family - N/A</p> <p>Multi Family/CRI - Locate all new off-street parking at the side or rear of buildings (1 POINT)</p>	<p>Single Family - N/A</p> <p>Multi Family/CRI - Less than 20% of the total development area is allocated to new, off-street surface parking facilities. (1 POINT)</p> <p>No surface parking area is greater than 2 acres. (1 POINT)</p> <p>Consolidate surface parking to parking structures in Intensification Areas. (1 POINT)</p>	LEED ND NDPc5	4	
		D	14	Surface Parking		<p>Single Family - N/A</p> <p>Multi Family/CRI - Develop a strategy to minimize surface parking for permanent employees and residents (1 POINT)</p>			1	
		D	15	Carpool and Fuel Efficient Vehicle Parking		<p>Single Family/Multi Family - N/A</p> <p>CRI - 3% of the site parking spots (or a minimum of 4 parking spots) to be dedicated to car pooling and fuel efficient / hybrid vehicles (does not apply to compact cars). Dedicated parking spots located in preferred areas close to building entries. (1 POINT)</p>	<p>Single Family/Multi Family - N/A</p> <p>CRI -5% of the site parking spots to be dedicated to car pooling and fuel efficient / hybrid vehicles (does not apply to compact cars). Dedicated parking spots located in preferred areas close to building entries. (1 POINT)</p>	TGS LEED NC SSc4.3	2	
		Natural Green Space	B&D	16	Proximity to Natural green space		<p>Natural green space within 800m (10 minute) walk to 75% of DU and Jobs. Visual connections (such as public access blocks, single loaded roads) are provided to 25% of the natural heritage system and parks. (2 POINTS)</p>	<p>Natural green space within 800m (10 minute) walk to 100% of DU and Jobs. Visual connections (such as public access blocks, single loaded roads) are provided to 50% OF the natural heritage system and parks. (2 POINTS)</p>		4
	Pedestrian Connections		B&D	17	Traffic Calming		<p>75% of new residential-only streets designed with traffic calming strategies. (1 POINT)</p> <p>50% of new non-residential and/or mixed-use streets are designed with traffic calming strategies (1 POINT)</p>	<p>100% of new residential-only streets designed with traffic calming strategies. (1 POINT)</p> <p>75% of new non-residential and/or mixed-use streets are designed with traffic calming strategies (1 POINT)</p>	LEED ND NPDc1	4
			B&D	18	School Proximity to Transit routes & Bikeways		<p>All schools are located within a 400m walking distance to transit routes and/or bikeways (2 POINTS)</p>	<p>All schools are located within a 200m walking distance to transit routes and/or bikeways (2 POINTS)</p>		4

Block Plan (B) & Draft Plan (D) Metrics

Category	Indicator	Applies To	Metric #	Metric	Mandatory Target	Minimum Target	Aspirational Target	Precedents	Available Points
Built Environment	Connections	B&D	19	Proximity to school		50% of dwelling units are within 800 meters walking distance to elementary and middle schools (2 POINTS) and 50% of dwellings units are within 1600 meters to a high school (1 POINT)	75% of dwelling units are within 400 meters walking distance to elementary and middle schools (2 POINTS) and 75% of dwellings units are within 1000 meters to a high school (1 POINT)	LEED ND NPDc15	6
	Cultural Heritage Resources	B&D	20	Cultural Heritage Conservation	Comply with Cultural Heritage Conservation policies under provincial legislation (i.e. the Ontario Heritage Act, Planning Act and PPS, etc), Standards and Guidelines for Historic Places, municipal Official Plan, municipal by-laws, Municipal Register of Cultural Heritage Resources and/or Municipal Heritage Inventory.	100% evaluation of properties included in the Municipal Heritage Inventory and/or Register, and 100% retention and protection of cultural heritage resources in-situ that qualify for designation under the Ontario Heritage Act. (2 POINT)	100% conservation of cultural heritage resources identified in the Municipal Heritage Register or Inventory and their associated landscapes and ancillary structures in-situ in accordance with the Standards and Guidelines for the Conservation of Historic Places in Canada. (2 POINTS)		4
	Economy	B&D	21	Jobs/Residents		1:2 - (2 POINTS)	1:1 (2 POINTS)		4

Block Plan (B) & Draft Plan (D) Metrics

Category	Indicator	Applies To	Metric #	Metric	Mandatory Target	Minimum Target	Aspirational Target	Precedents	Available Points
Mobility	Street networks/block	B&D	22	Block perimeter/length		Block perimeters should generally not exceed 550m and block lengths should generally not exceed 250m, Where necessary, provide a through block pedestrian and/or bicycle linkage. (2 POINTS)	_____	Thinking Green Item 3	2
		B&D	23	Intersection density		Street Intersections per sq km = 40 (2 POINTS)	Street Intersections per sq km >50 (2 POINTS)		4
	Transit supportive	B&D	24	Distance to public transit		50% of residents/employment is within 800m walking distance to existing or planned commuter rail, light rail or subway with frequent stops or 50% of residents/employment is within 400m walking distance to 1 or more bus stops with frequent service. (3 POINTS)	75% of residents/employment is within 400m walking distance to existing or planned commuter rail, light rail or subway with frequent stops or 75% of residents/employment is within 200m walking distance to 1 or more bus stops with frequent service. (3 POINTS)	LEED NC 2009 SSc4.1	6
	Active Transportation	B&D	25	Creation of Trail or Bike Paths			Advances the objectives of the applicable Pedestrian and Cycling Master Plan (2 POINTS)		2
		B&D	26	Proximity to trails and bike paths		Within 400 meters of 75% of residents/jobs (2 POINTS)	Within 400m of 100% of residents/jobs (2 POINTS)		4
	Walkability	B&D	27	Promote walkable streets	Sidewalks must be in accordance with the applicable Municipal Standards. Sidewalk width must be at least 1.5 meters.		Continuous sidewalks or equivalent provisions must be provided on both sides of streets, where not a mandatory requirement. (2 POINTS) Provide pedestrian amenities to further encourage walkable streets. (2 POINTS) "Pedestrian amenities" include: shelter from rain, wind breaks, shade, seating, pedestrian-oriented lighting, etc. Wider sidewalk widths may also be pedestrian amenities in more urban areas.	LEED ND NPDc1	4

Block Plan (B) & Draft Plan (D) Metrics

Category	Indicator	Applies To	Metric #	Metric	Mandatory Target	Minimum Target	Aspirational Target	Precedents	Available Points
Natural Environment & Open Space	Parks	B&D	28	Urban Square/Open Space		Size: 200m2 Visibility (road frontage): Distinct edge, defined as focal point Accessibility: 400m walk, 400m to transit stop, 75% of dwelling units Facilities: Benches, Tree canopy, draught tolerant & native plants, public art, hard surfaces, bicycle parking (1 POINT IF 2/3 SATISFIED 2 POINTS IF ALL CRITERIA SATISFIED)	Size: 200m2 Visibility (road frontage): Distinct edge, defined as focal point Accessibility: 400m walk, 400m to transit stop, 90% of dwelling units Facilities: Benches, Tree canopy, draught tolerant & native plants, public art, hard surfaces, bicycle parking (1 POINT IF ALL CRITERIA SATISFIED)	LEED ND Cornell Community Mt. Pleasant Village Existing Policies	3
		B&D	29	Parkette		Size: 0.5ha Visibility (road frontage): 2 sides Accessibility: 200m walk; 75% of dwelling units Facilities: Play structure, benches, bicycle parking, tree canopy, benches, drought tolerant & native plants (1 POINT IF 2/3 SATISFIED 2 POINTS IF ALL CRITERIA SATISFIED)	Size: 0.5ha Visibility (road frontage): 3 sides Accessibility: 200m walk; 90% of dwelling units Facilities: Play structure, benches, bicycle parking, tree canopy, benches, drought tolerant & native plants (1 POINT IF ALL CRITERIA SATISFIED)		3
		B&D	30	Neighbourhood Park	Visibility (road frontage): 1 side	Size: 1.5ha Visibility (road frontage): 3 sides Accessibility: 400m walk; 75% of dwelling units Facilities: Proximity to elementary school, local transit access, active sports field (soccer, basketball, baseball), play structure, benches, bicycle parking, tree canopy, benches, drought tolerant & native plants (1 POINT IF 2/3 SATISFIED 2 POINTS IF ALL CRITERIA SATISFIED)	Size: 1.5ha Visibility (road frontage): 4 sides Accessibility: 400m walk; 90% of dwelling units Facilities: Proximity to elementary school, local transit access, active sports field (soccer, basketball, baseball), play structure, benches, bicycle parking, tree canopy, benches, drought tolerant & native plants (1 POINT IF ALL CRITERIA SATISFIED)		3
		B&D	31	Community Park	Visibility (road frontage): 2 sides	Size: 4ha to 6ha Visibility (road frontage): 2 sides Accessibility: 800m to 1200m walk; 50% of dwelling units Facilities: Proximity to community facilities (high school, community centre, library), local transit access, active sports field (soccer, basketball, baseball), play structure, benches, bicycle parking, tree canopy, benches, drought tolerant & native plants (1 POINT IF 2/3 SATISFIED 2 POINTS IF ALL CRITERIA SATISFIED)	Size: 4ha to 6ha Visibility (road frontage): 3 sides Accessibility: 800m to 1200m walk; 75% of dwelling units Facilities: Proximity to community facilities (high school, community centre, library), local transit access, active sports field (soccer, basketball, baseball), play structure, benches, bicycle parking, tree canopy, benches, drought tolerant & native plants (1 POINT IF ALL CRITERIA SATISFIED)		3
			B&D	32	Stormwater Quantity	Retain runoff volume from the 5mm rainfall event on site. Provide quantity or flood control in accordance with applicable Municipal and TRCA requirements	Retain runoff volume from the 10mm rainfall event on site. (1 POINT) Strategies should include use of Low Impact Development techniques such as: Greenroofs, bioswales, tree planting, absorbent landscaping, downspot disconnect, rain barrels, rainwater harvesting, permeable pavers/hard surfaces, and rainwater cisterns.	Retain runoff volume from the 15mm rainfall event on site. Strategies should include use of Low Impact Development techniques such as: Greenroofs, bioswales, tree planting, absorbent landscaping, downspot disconnect, rain barrels, rainwater harvesting, permeable pavers/hard surfaces, and rainwater cisterns. (2 POINTS)	TGS TIER II TRCA DIRECTION

Block Plan (B) & Draft Plan (D) Metrics

Category	Indicator	Applies To	Metric #	Metric	Mandatory Target	Minimum Target	Aspirational Target	Precedents	Available Points
Natural Environment & Open Space	Stormwater	B&D	33	Stormwater Quality	Remove 80% of Total Suspended Solids (TSS) on an annual loading basis from all runoff leaving the site (based on the post development level of imperviousness). All ponds will be designed with Enhance Level of Protection (Level 1). Enhanced protection corresponds to the end-of-pipe storage volumes required for the long-term average removal of 80% of suspended solids. Strategies include low impact development measures such as: Stormwater ponds, oil-grit separators, bioswales, filters, treatment train approach, etc... (See Glossary for TSS definition)		Remove 90% to 100% of Total Suspended Solids (TSS) on an annual loading basis from all runoff leaving the site (based on the post development level of imperviousness). Strategies include: Stormwater ponds, oil-grit separators, bioswales, filters, etc... (4 POINTS)	TGS TIER II TRCA DIRECTION	4
	Urban agriculture	B&D	34	Dedicate land for local food production		Provide the following garden space per site density: DU Density Growing space/DU 17-35 DU/ha 200ft2/DU 36-54 DU/ha 100ft2/DU >54 DU/ha 80ft2/DU (4 POINTS)		LEED ND NPDc13	4
	Natural Heritage System	B&D	35	Natural Heritage System Enhancements	Satisfy Municipal Official Plan requirements		Demonstrate ecological gain above and beyond the municipal natural heritage requirements. (2 POINTS)		2
	Soils and Topography	B&D	36	Restore and enhance soils	Undertake a Topsoil Fertility Test according to Municipal Standards	Undertake a Topsoil Fertility Test for the entire site and implement its recommendations. (1 POINT)	Development on highly permeable soils is avoided following TRCA and CVC Low Impact Development Stormwater Management Planning and Design Guide. For all areas to be re-vegetated, restore soils disturbed by previous development and soils disturbed during construction, including restoring micro-topography variation. (2 POINTS)	TRCA DIRECTION	3

Block Plan (B) & Draft Plan (D) Metrics

Category	Indicator	Applies To	Metric #	Metric	Mandatory Target	Minimum Target	Aspirational Target	Precedents	Available Points		
Natural Environment & Open Space	Urban forest	B&D	37	% canopy coverage	Provide street trees on both sides of streets according to Municipal Standards.	<p>Tree-Lined Streets Provide street trees on both sides of new and existing streets within the project and on the project side of bordering streets, between the vehicle travel lane and walkway, at intervals averaging no more than 9 meters. (1 POINT)</p> <p>Shaded Streets Provide shade within 10 years of planting for at least 50% of sidewalk lengths. Trees to be drought tolerant and native (selected from Municipal Standards) (1 POINT)</p>	<p>Tree-Lined Streets Provide street trees on both sides of new and existing streets within the project and on the project side of bordering streets, between the vehicle travel lane and walkway, at intervals averaging no more than 6 meters. (1 POINT)</p> <p>Shaded Streets Provide shade within 10 years of planting for at least 75% of sidewalk lengths. Trees to be drought tolerant and native (selected from Municipal Standards) (1 POINT)</p>	LEED ND NPDc14	4		
Infrastructure & Buildings	Energy conservation	B&D	38	Passive solar alignment		50% (or more) of the blocks have one axis within 15 degrees of E-W. E-W lengths of those blocks are at least as long as the N-S lengths of blocks (3 POINTS)	75% (or more) of the blocks have one axis within 15degrees of E-W E-W lengths of those blocks are at least as long as the N-S lengths of blocks (3 POINTS)	LEED ND GIBc10	6		
		D	39	Building energy efficiency	Single Family Homes: Design all buildings in accordance with OBC.	Single family homes or multiunit residential buildings (3 storey or lower) must be built to EnerGuide 83 (or equivalent) (3 POINTS)	Single family homes or multiunit residential buildings (3 storey or lower) must be built to EnerGuide 85 (or equivalent) (1 POINT)				4
		B&D	40	District energy viability		Develop an energy strategy for the development, identifying opportunities for conservation, energy sharing, renewables, etc... (2 POINTS)	In an intensification area, where district energy has been deemed viable by the municipality, carry out a district energy feasibility study. The feasibility study should include a high level assessment of the thermal and electricity load profiles (seasonally and hourly) and potential therrmal network maps (3 POINTS)				
	Potable Water	D	41	Reduce potable water used for irrigation		Redcue potable water used for irrigation by 50%, compared to a midsummer baseline case. Achieved by: - planting drought tolerant and native plants -efficient irrigation controls (drip irrigation, soil moisture sensors) - rainwater harvesting - recycled/treated greywater (2 POINTS)	No potable water is used for irrigation. (4 POINTS)	LEED NC WEc1 TIER I	6		

Block Plan (B) & Draft Plan (D) Metrics

Category	Indicator	Applies To	Metric #	Metric	Mandatory Target	Minimum Target	Aspirational Target	Precedents	Available Points
Infrastructure & Buildings	Lighting	B&D	42	Reduce light pollution		Shield exterior light fixtures >1000 lumens to provide night sky lighting No uplighting allowed (1 POINT)	Single Family - N/A Multi Family/Commercial/Residential/Institutional - Develop lighting controls that reduces night time spillage of light by 50% from 11pm to 5am (non residential) No architectural lighting allowed between 11pm and 5am (1 POINT)	LEED NC SSc8 TIER I and TIER II	2
		B&D	43	Energy Conserving Lighting		Single Family - N/A Multi Family/Commercial/Residential/Institutional - Use LEDs and/or photocells on all exterior (exposed) lighting fixtures (2 POINTS)			2
	Materials & Solid Waste Management	B&D	44	Material Re-use and Recycled Content		At least 5% reused content in building materials and/or landscaping materials (hardscaping such as paving or walkways) is provided. (1 POINT) At least 10% recycled content in building materials and/or landscaping materials (hardscaping such as paving or walkways). (1 POINT)	At least 10% reused content in building materials and/or landscaping materials (hardscaping such as paving or walkways) is provided. (1 POINT) At least 15% recycled content in building materials and/or landscaping materials (hardscaping such as paving or walkways). (1 POINT)	TGS TIER II LEED NC MRc3 and MRc4	4
		D	45	Recycled / Reclaimed Materials		Minimum 25% of recycled/reclaimed materials should be used for new infrastructure including roadways, parking lots, sidewalks, unit paving, etc. (1 POINT)	Minimum 30% of recycled/reclaimed materials should be used for new infrastructure including roadways, parking lots, sidewalks, unit paving, etc. (1 POINT)		2

Appendix B
Metrics Rationale

APPENDIX B – Rationale and Sources Used to Inform Metrics

Built Environment - Compact Development - Persons and jobs per ha

Rationale: To conserve land and promote active transportation, transit efficiency, liveability and improve public health.

Sources: Growth Plan for the Greater Golden Horseshoe; York Region OP 5.6.3 and New Community Guidelines (criterion CC2 refers to 20 residential uph and 70 residents and jobs per hectare as the required target in new greenfield areas); Emerald Hills Performance Assessment.

Built Environment - Compact Development – Floor area ratio/Floor space index

Rationale: Municipal official plans include land use designations and density schedules that apply to existing urban areas to achieve municipal growth management strategies with attention to placemaking, built form and urban design.

Built Environment - Compact Development – Location efficiency

Rationale: Promote multi-modal transportation choices and reduced vehicle use.

Sources: Emerald Hills Performance Assessment; LEED 2009 for Neighbourhood Development with Canadian Alternative Compliance Paths (2011) – NPD Credit 3.

Built Environment - Land Use Mix and Diversity - Proximity to principal amenities

Rationale: Recognize sites with good community connections to services and/or promote services to encourage compact communities and multi-modal transportation options. Recognizes a fine grain mix of uses as promoted in municipal official plans. The metric and targets are adapted from the point scoring system used in LEED ND.

Sources: LEED Canada 2009 for New Construction, SS Credit 2; LEED 2009 for Neighbourhood Development with Canadian Alternative Compliance Paths (2011) - SLL Credit 3; VOP 2010 Policy 4.2.2.14 (“To encourage the provision of transit service within 500 metres of at least 90% of residences and the majority of jobs, and consistent with approved YRT service standards and guidelines and within 200 metres of at least 50% of residents in the *urban area*.”)

Built Environment – Site Accessibility – Universal design

Rationale: Improve accessibility for people of diverse abilities.

Built Environment – Green Buildings – Third-party certification

Rationale: Recognize appropriate independent third-party certification systems incorporated into development proposals.

Sources: LEED 2009 for Neighbourhood Development with Canadian Alternative Compliance Paths (2011) – Green Infrastructure and Buildings (GIB) Prerequisite 1.

Built Environment - Housing Mix - Design for life cycle housing

Rationale: Enable residents from a wide range of economic levels, household sizes, and age groups to live in a community.

Sources: LEED 2009 for Neighbourhood Development with Canadian Alternative Compliance Paths (2011) – NPD Credit 4; VOP 2010 policy 2.1.3.2.j.

Built Environment – Tree Planting/Preservation – Percent tree canopy

Rationale: As part of the urban forest, street trees provide a range of ecosystem services including: cleaning air; intercepting rainfall that helps to mediate storm flows; evaporative cooling and summer shade to reduce building cooling loads; wind breaks; and carbon sequestration. As community amenities, street trees promote active transportation by providing a more walkable pedestrian environment.

Sources: LEED 2009 for Neighbourhood Development with Canadian Alternative Compliance Paths (2011) – NPD Credit 14.

Built Environment - Community Form - Community and neighbourhood scale

Rationale: Focus retail, personal, human and community services within community core areas (neighbourhood centre and mixed-use node) so that people can meet their daily needs within their own communities.

Sources: York Region OP policy 5.6.5, policy 4.4.1, and York Region New Community Guidelines (criterion CC5).

Built Environment – Public Health - Proximity to green space

Rationale: The human health and amenity benefits of proximity to nature and green spaces have been documented in peer-reviewed journals (e.g. Sullivan, Kuo and DePooter, 2004; Faber-Taylor and Kuo, 2001).

Sources: VOP 2010 policy 7.3.1.2 c (Neighbourhood Parks should generally be located within a 10-minute walk of the majority of the community served); Sustainable Sites Initiative: Guidelines and Performance Benchmarks, 2009, Credit 6.7.

Built Environment – Public Health - Parking

Rationale: Encourage active transportation, promote efficient use of developable land, discourage the location of parking in front of buildings in order to support on-street retail and pedestrianization, and minimize the adverse environmental impacts of parking facilities.

Sources: LEED Canada 2009 for New Construction, SS Credit 4.4; LEED 2009 for Neighbourhood Development with Canadian Alternative Compliance Paths (2011) - NPD Credit 5.

Built Environment – Public Health – Traffic calming

Rationale: Provide walkable streets to encourage active transportation.

Sources: LEED 2009 for Neighbourhood Development with Canadian Alternative Compliance Paths (2011) – NPD Credit 1; Gilbert and Obrien. 2009. Child- and Youth-Friendly Land-Use And Transport Planning Guidelines for Ontario, Version 2.

(<http://www.kidsonthemove.ca/uploads/Guidelines%20Ontario%20v2.7.pdf>)

Built Environment – Public Health – School proximity to transit and bikeways

Rationale: Promote walking and cycling to schools and reduce traffic congestion at school sites.

Sources: LEED 2009 for Neighbourhood Development with Canadian Alternative Compliance Paths (2011) – NPD Credit 15; Forum: School Siting and School Site Design for a Healthy Community, 2012, City of Hamilton Public Health Services.

Built Environment – Public Health - Proximity to schools

Rationale: Promote schools as community hubs and support students' health by encouraging walking and bicycling to school.

Sources: LEED 2009 for Neighbourhood Development with Canadian Alternative Compliance Paths (2011) – NPD Credit 15; Forum: School Siting and School Site Design for a Healthy Community, 2012.

Built Environment – Public Health – Indoor air quality

Rationale: Improve indoor air quality by reducing sources of potential contaminants.

Source: LEED Canada 2009 for New Construction, Indoor Environmental Quality Credit 4.1-4.4.

Mobility – Site Permeability - Connectivity

Rationale: Encourage walking and transit use.

Source: Toronto Green Standard Tier 1 requirement (Pedestrian Infrastructure).

Mobility - Street Networks/Blocks - Block perimeter/length

Rationale: Blocks of dwelling units with a perimeter less than 550 metres promote connectivity of neighbourhoods, allows pedestrians to choose between a variety of routes to their destination, and should be flexible to accommodate both residential and commercial lot sizes.

Sources: Pickering Sustainable Development Guidelines (criterion 6.6); East Gwillimbury “Thinking Green” Item 3.

Mobility - Street Networks/Blocks – Intersection density

Rationale: Promote well-connected street networks that allow for multiple active transportation routes through the neighbourhood, and reduces traffic through alternative vehicular routes.

Sources: Pickering Sustainable Development Guidelines (criterion 6.5); Neptis Foundation “Shaping the Toronto Region” report (see Figure 35).

References:

Taylor, Z.T and von Nostrand, J. 2008. Shaping the Toronto region past, present and future: an exploration of potential effectiveness of changes to planning policies governing greenfield land development in the Greater Golden Horseshoe. Neptis Foundation. 198 pp

Mobility – Transit Supportive - Distance to transit

Rationale: Support alternative transportation modes to vehicle use.

Sources: LEED Canada 2009 for New Construction, SS Credit 4.1; Pickering Sustainable Development Guidelines (criterion 6.10).

Mobility – Walkability - Promote safe and walkable streets

Rationale: Promote walking and other forms of active transportation by providing safe and comfortable street environments.

Sources: Pickering Sustainable Development Guidelines criterion 7.2; LEED 2009 for Neighbourhood Development with Canadian Alternative Compliance Paths (2011) – NPD Credit 1 (Walkable Streets).

Natural Environment and Open Space – Stormwater – Stormwater quantity

Rationale: Implement a treatment-train approach to stormwater management that emphasizes source controls and conveyance controls to promote infiltration, evaporation, and/or re-use of rainwater. The objective is to maintain stream flows and thermal regimes within natural ranges of variation.

Sources: TRCA Stormwater Management Criteria (2012); MOE Stormwater Management Practices Planning and Design Manual; TGS Tier I and Tier II; LEED 2009 for Neighbourhood Development with Canadian Alternative Compliance Paths (2011) – Green Infrastructure and Buildings Credit 8.

Natural Environment and Open Space – Stormwater – Stormwater quality

Rationale: Protect receiving water bodies from the water quality degradation that may result from development and urbanization (TRCA 2012)

Sources: Stormwater Management Criteria (TRCA 2012) (<http://www.sustainabletechnologies.ca/Portals/Rainbow/Documents/72d1cb7b-eea6-4582-8e9e-87e668af62d5.pdf>); Toronto Green Standard (Stormwater Quality – Stormwater Run-off).

Natural Environment and Open Space – Stormwater – Rainwater re-use

Rationale: Reduce potable water use.

Sources: Toronto Green Standard (Water Efficiency); York Region Official Plan (policy 5.2.32).

Natural Environment and Open Space – Stormwater – Stormwater architecture/features

Rationale: Naturalize stormwater management facilities to enhance the municipal natural heritage system and integrate into the open space system as visually and physically accessible amenities.

Sources: The Sustainable Sites Initiative: Guidelines and Performance Benchmarks, 2009 (Credit 3.7)

Natural Environment and Open Space – Urban Agriculture – Dedicate land for local food production

Rationale: Promote community-based food production and provide alternative passive recreational uses.

Sources: LEED 2009 for Neighbourhood Development with Canadian Alternative Compliance Paths (2011) – NPD Credit 13.

Natural Environment and Open Space – Natural Heritage System – Enhancing Biodiversity

Rationale: Improve natural heritage system function with respect to wildlife habitat and/or ecological functions, including ecosystem services.

Sources: Municipal natural heritage system plans.

Explanatory Note: Point allocation has not yet been defined for different types natural heritage system enhancements. This metric will be the subject of ongoing research.

Natural Environment and Open Space – Soils and Topography – Restore and enhance soils

Rationale: Limit disturbance of healthy soil to: protect soil horizons and maintain soil structure; support biological communities (above-ground and below-ground); minimize runoff and maximize water holding capacity; improve biological decomposition of pollutants; and moderate peak stream flows and temperatures.

Sources: The Sustainable Sites Initiative: Guidelines and Performance Benchmarks, 2009; Low Impact Development Stormwater Management Planning and Design Guide (CVC and TRCA 2010); Preserving and Restoring Healthy Soil: Best Practices for Urban Construction (TRCA 2012).

References:

The Sustainable Sites Initiative: Guidelines and Performance Benchmarks, 2009 (http://www.sustainablesites.org/report/Guidelines%20and%20Performance%20Benchmarks_2009.pdf)

Natural Environment and Open Space – Soils and Topography – Topography and landform conservation

Rationale: Minimize the negative impacts of grading and other soil and landform disturbances from construction activities. Retaining natural topography is a factor in maintaining pre-development water balance and stream flow regimes as well as the aesthetic appeal of cultural heritage landscapes.

Explanatory Note: Point allocation has not yet been defined for various approaches to either (1) minimize the area graded or otherwise disturbed or (2) where lands are disturbed, the grades are kept within certain slope thresholds to minimize changes to natural topography. This metric will be the subject of ongoing research.

Natural Environment and Open Space – Urban Forest – Percent canopy cover

Rationale: Enhance the urban forest and provision ecosystem services including: cleaning air; intercepting rainfall that helps to mediate storm flows; evaporative cooling and summer shade to reduce building cooling loads; wind breaks; and carbon sequestration. As community amenities, street trees promote active transportation by providing a more walkable pedestrian environment.

Sources: LEED 2009 for Neighbourhood Development with Canadian Alternative Compliance Paths (2011) – NPD Credit 14.

Infrastructure and Buildings – Energy Conservation – Solar readiness

Rationale: Encourage on-site renewable energy generation.

Sources: LEED NC EA Credit 2; York Region Official Plan (policy 5.2.26).

Infrastructure and Buildings - Energy Conservation – Passive solar alignment

Rationale: Promote energy efficiency by creating the conditions for the use of passive solar design as well as solar photovoltaic and/or solar thermal strategies.

Sources: LEED 2009 for Neighbourhood Development with Canadian Alternative Compliance Paths (2011) – GIB Credit 10.

Infrastructure and Buildings - Energy Conservation – Building energy efficiency

Rationale: Reduce energy use and greenhouse gas emissions with consequent reductions in air, water, and land pollution and adverse environmental effects from energy production and consumption.

Sources: Toronto Green Standard (Minimum Energy Performance); LEED 2009 for Neighbourhood Development with Canadian Alternative Compliance Paths (2011) – GIB Prerequisite 2 and Credit 2.

Infrastructure and Buildings - Energy Conservation – District energy viability

Rationale: District energy systems can provide more efficient heating and cooling for residential and commercial customers (providing there is density of development). This aids governments in reaching reduction targets for greenhouse gas emissions while also benefitting customers in reduced ongoing energy expenses and reduced one-time first costs for mechanical equipment.

Sources: Canadian District Energy Association (Web site, <https://www.cdea.ca/faq/what-are-main-advantages-district-energy>); York Region Official Plan (policy 5.6.10 regarding community energy planning); LEED 2009 for Neighbourhood Development with Canadian Alternative Compliance Paths (2011) – GIB Credit 12.

Infrastructure and Buildings – Potable Water - Reduce Potable Water Used for Irrigation

Rationale: Promote water use efficiency.

Sources: Toronto Green Standard (Water Efficiency); York Region Official Plan (policy 5.2.31); LEED 2009 for Neighbourhood Development with Canadian Alternative Compliance Paths (2011) – GIB Credit 4; LEED Canada 2009 for New Construction, WE Prerequisite 1.

Infrastructure and Buildings – Potable Water – Water conserving fixtures

Rationale: Promote water use efficiency.

Sources: Toronto Green Standard (Water Efficiency); York Region Official Plan (policy 5.2.21 and 5.2.23); LEED 2009 for Neighbourhood Development with Canadian Alternative Compliance Paths (2011) – GIB Credit 3; LEED Canada 2009 for New Construction, WE Credit 1.

Infrastructure and Buildings – Lighting - Parking Garage Lighting

Precedents and rationale to be provided in the Final Comprehensive Report.

Infrastructure and Buildings - Lighting - Reduce light pollution

Rationale: Reduce nighttime glare and light trespass from the building and the site

Sources: Toronto Green Standard (Light Pollution Tier I and Tier II); LEED Canada 2009 for New Construction, SS Credit 8.

Infrastructure and Buildings - Lighting – Energy conserving lighting

Precedents and rationale to be provided in the Final Comprehensive Report

Infrastructure and Buildings - Bird-Friendly Design

Rationale: Ensure that design features minimize the risk for migratory bird collisions.

Sources: Toronto Green Standard

Infrastructure and Buildings - Materials and Solid Waste Management - Recycled/Reclaimed Materials

Rationale: Reduce the adverse environmental effects of extracting and processing virgin materials.

Sources: LEED 2009 for Neighbourhood Development with Canadian Alternative Compliance Paths (2011) – GIB Credit 15 (LEED ND credit 15 refers to a mix of recycled and reclaimed materials exceeding 50% of the mass of new infrastructure); Toronto Green Standard (Use of Recycled Materials); The Sustainable Sites Initiative: Guidelines and Performance Benchmarks – Credit 5.4 and 5.5.

Infrastructure and Buildings - Materials and Solid Waste Management – Solid Waste

Rationale: Promote waste reduction and diversion of materials from landfills.

Sources: LEED 2009 for Neighbourhood Development with Canadian Alternative Compliance Paths (2011) – GIB Credit 16; Toronto Green Standard (Storage and Collection of Recycling and Organic Waste); City of Vaughan Waste Collection Standards and Waste Collection By-Law 217-210.

Infrastructure and Buildings - Materials and Solid Waste Management- Material re-use and recycled content

Rationale: Reduce demand for new materials and promote diversion of materials from landfills.

Sources: Toronto Green Standard (Reuse of Building Materials); The Sustainable Sites Initiative: Guidelines and Performance Benchmarks – Credit 5.4 and 5.5.

Infrastructure and Buildings - Heat Island – Reduce heat island effects

Rationale: Reduce ambient surface temperatures, and provide shade for human health and comfort.

Sources: Toronto Green Standard (Urban Heat Island Reduction: At Grade and Roof); LEED Canada 2009 for New Construction – SS Credit 7.1 and 7.2; LEED 2009 for Neighbourhood Development with Canadian Alternative Compliance Paths (2011) – GIB Credit 9.

Appendix C
Revisions Log

Sustainability Metrics – Log

November 8, 2012 – Feedback from Municipal Workshop #2

(highlighted cells are proposed metrics that are still under review but haven't been included in the list of draft sustainable performance metrics)

Log#	Metric	Revisions / Additions / Deletions	Changes applied to:
1	Stormwater Quantity	Revise metric <ul style="list-style-type: none"> • Mandatory target: 5mm event • Minimum target: 15mm event • Aspirational target: 25mm event (to be confirmed/informed by TRCA) 	Community and Site Metric
2	Stormwater Temperature	Add metric <ul style="list-style-type: none"> • To be informed by TRCA 	Community and Site Metrics
3	Energy efficiency	Revise metric <ul style="list-style-type: none"> • Mandatory target: 25% better than MNECB • Minimum target: 35% better than MNECB • Aspirational target: 45% better Additional points awarded up to 75% energy savings	Site/Building metrics
4	Grey water re-use	Add metric <ul style="list-style-type: none"> • Minimum: grey water readiness (same as rainwater readiness metric) • Aspirational: Grey water re-used on site for low grade functions (toilet flushing, irrigation) 	Site/Building Metrics
5	Walkability	<ul style="list-style-type: none"> • Aspirational: provide pedestrian amenities to further encourage walkable streets. "Pedestrian amenities" include: shelter from rain, wind breaks, shade, seating, etc... 	Community and Site Metrics
6	Parking	Add metric	Site/Building metrics

		<ul style="list-style-type: none"> Aspirational (CRI only) Paid parking is included for commercial, retail, institutional parking lots 	
7	Speed control	Revise metric <ul style="list-style-type: none"> Remove reference to speed bumps Include " use good road design strategies to reduce vehicular speeds. Supplemental measures can also include the traffic calming strategies listed" 	Community and Site metrics
8	Cycling Infrastructure	Add metric <ul style="list-style-type: none"> Minimum: Adopt dedicated bike lanes on streets with high traffic volume and speeds greater than 40km/hr Aspirational: Adopt dedicated and protected bike lanes on streets with high traffic volumes and speeds that exceed 40km/hr. Protected bike lane strategies include: Buffered lanes and floating parking (recommended by Portland 2030 bicycle plan, adopted in NYC), bollards or posts (used in Montreal), extruded curbs, raised lanes (preferred in Germany), etc... 	Community and Site metrics
9	Speed Control	Renamed metric to traffic calming	Community and Site metrics
10	% Tree canopy	Tree growth extended from 5 years to 10 – based on LEED ND precedent	Community and Site metrics
11	Stormwater re-use	Deleted	Community metrics
12	Existing Building Re-use	Expanded minimum target. Revised thresholds to 5%/10% (min) and 10%/15% Aspirational	Community and Site metrics
13	Passive solar alignment	Revised language	Community metrics
14	Intersection density	Revised targets based on municipal direction	Community metrics
15	Heat Island	Added aspirational metric 90% and 75%	Site metrics
16	Road Design Standard	Add metric: (Min) Municipality to carry out a Municipal Road Design Standard review to identify any	Community and Site Metrics

		potential sustainability opportunities	
17	Public Transit Accessibility	Add metric: (Min) Municipality to carry out a Public Transit Study to identify potential integration of public transit opportunities within the site	Community and Site metrics
18	School Accessibility	Add metric: (Min) Municipality to carry out a School Accessibility Study identify the potential opportunities to improve access to schools and synergies with active and public transit.	Community and Site metrics

Oct 26, 2012 – Revisions based on Municipal feedback

Log#	Metric	Revisions / Additions / Deletions	Changes applied to:
1	Compact Development	<ul style="list-style-type: none"> Removed reference to FSI Revised to reflect Municipal OP 	Community and Site Metric
2	Location Efficiency	<p>Minimum target revised to: Greenfield Applications:</p> <ul style="list-style-type: none"> 2x the average density along transit corridors (within 200m from transit) <p>All other Applications:</p> <ul style="list-style-type: none"> Height and/or density conforms to the minimum or maximum targets established in the applicable Municipal Official Plan 	Community Metrics
3	Proximity to amenities	<p>Added site specific metric</p> <ul style="list-style-type: none"> (Minimum) If the amenities are not within the distance specified above and the site is designated as mix use, the mix of population and employment uses achieves 	Site Metrics

		2:1 ratio on the site (Aspirational) If the amenities are not within the distance specified above and the site is designated as mix use, the mix of population and employment uses includes major office space, an anchor commercial/retail tenant or a minimum of 3 stories of employment uses.	
4	Soil Quality	Revised metric <ul style="list-style-type: none"> • Provide a minimum soil volume of 30m³ per tree. The soil volumes should be based on a minimum soil depth of 0.8m and a maximum of 1.2m of high quality soil above a well drained sub soil or drainage layer. Ensure that groups of trees planted in hardscape can share soil volume, for example, through the use of continuous soil planters. The use of soil cells is also encouraged 	Site Metrics
5	Proximity to natural green space	Minimum target revised. Aspirational metric maintained. <ul style="list-style-type: none"> • Visual connections (such as public access blocks, single loaded roads) are provided to the natural heritage system and parks. 	Site Metrics
6	Bicycle Parking	Revised Metric <ul style="list-style-type: none"> • Removed additional visitor parking requirements and provide a minimum of 5%/10 of bike parking at grade for visitors (MURBs) • Added reference to shower for CRI 	Site Metrics
7	Parking Allocation	Removed prescriptive parking allocation. Replaced with % of total area	Site Metrics
8	Parking Designation	<ul style="list-style-type: none"> • Revised metric to include minimum # of spots and compact cars are exempt from 	Site Metrics

		target	
9	Safe routes to schools	Deleted metric	Community and Site Metrics
10	Proximity to natural green space	Minimum target revised. Aspirational metric maintained. <ul style="list-style-type: none"> Visual connections (such as public access blocks, single loaded roads) are provided to the natural heritage system and parks. 	Site Metrics
11	Connectivity	Revised Metric Minimum: Connect buildings on the site to off-site pedestrian paths, surface transit stops, parking areas (car and bike) or other destinations (schools) Aspirational: Provide amenities and street furniture (benches, additional bike parking, landscaping) along connections provided on the site and between the site and adjacent destinations	Site Metrics
12	Stormwater Quantity	Revised based on municipal feedback. 5mm and 15mm retention	Site Metrics
13	Stormwater Quality	Metric revised 80%/100% of Total Suspended Solids (TSS) removed from a 25mm rainfall event. Strategies should include low impact development measures such as: Stormwater ponds, oil-grit separators, bioswales, filters, treatment train approach, etc...	Site Metrics
14	Rainwater Re-use	Does not apply to single family homes	Site Metrics
15	Stormwater Features	Target moved to minimum	Site Metrics
16	Existing building reuse	Added metric At least 5% reused content in building materials and landscaping materials (hardscaping such as paving or walkways) is	Site Metrics

		provided. At least 15% recycled content in building materials and landscaping materials (hardscaping such as paving or walkways).	
17	Solid Waste	Minimum target added. Storage and collection areas for recycling and organic waste are within or attached to the building. Aspirational target under review	Site Metrics
18	Shade/Comfort	Revised indicator to Tree Planting/reservation	Site Metrics
19	Maintain healthy trees	Added metric (Minimum) Arborist Report provided that identifies and evaluates where on-site healthy mature trees will be protected or removed. Where healthy mature trees must be removed, new trees are provided on site to compensate for the lost canopy coverage of the trees removed (Aspirational) Healthy mature trees greater than 20 cm. DBH preserved in situ on site. Smaller healthy trees (less than 20 cm. DBH) transplanted.	Site Metrics
20	Bird friendly	Revised minimum target Treat glass with a density pattern between 10-28cm for the first 12m of the building above grade. Where a greenroof is constructed with adjacent glass surfaces, ensure the glass is treated 12m above greenroof surface Bird friendly design strategies include: window fritt, films, decals, grills, louvers, internal screens, awnings, overhangs, artwork, etc	Site Metrics
21	Reduced Parking	Removed reference to parking spot allocation.	Site Metrics

	Footprint	<p>Replaced with: (Minimum) Use no more than 20% of the total development area for all new off-street surface parking facilities, with no surface parking lot greater than 2 acres</p> <p>(Aspirational) Locate all new off-street surface parking at the site or rear of buildings</p>	
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Oct 12, 2012 – Notes from TAT Conference call

The following summarizes the key changes from the October 9th Draft Metrics.

Log#	Metric	Revisions / Additions / Deletions	Changes applied to:
1	Building Certification	<ul style="list-style-type: none"> Deleted minimum target as it can't be required at site plan approval. Aspiration target maintained 	Site Metrics
2	Exposure to Second Hand Smoke	<ul style="list-style-type: none"> Moved minimum target to aspirational (as it can't be required at site plan approval) 	Site Metrics
3	Parks	<ul style="list-style-type: none"> Removed reference to "Public" Parks as the indicator should be applied to accessible parks. "Accessible" definition to be included in Glossary "10-15 min" reference revised to "800m to 1200m" 	Community and Site Metrics
4	Rainwater Re-use	<ul style="list-style-type: none"> "Grey water" reference deleted in minimum target 	Community and Site Metrics
5	Stormwater Amenities	<ul style="list-style-type: none"> Indicator name created confusion. Changed 	Site Metrics

		to Stormwater Architecture/Features	
6	Bird Friendly Design	<ul style="list-style-type: none"> Removed City of Toronto reference. Bird Friendly Design Guidelines to be defined in the Glossary 	Site Metrics

Metrics to be added:

- Stormwater Temperature – Aspirational Target. TRCA to inform target.
- Maintain/Preserve Healthy & Mature Trees – Minimum Target. Halsall and Michelle to inform target.

Metrics to be revised / expanded with Input from Team:

Community and Site Metrics

- Compact Development – FSI may not be the appropriate metric to inform density. Michelle to review with Richmond Hill team.
- Proximity to Natural Green Space – Michelle to gather additional feedback as metric benefit/applicability was questioned during the workshop.
- Parking Allocation – Municipal teams to circulate parking metrics/targets and ensure appropriateness for each development type
- Exposure to Second Hand Smoke – Tony to discuss corridor pressurization requirements under current building code
- Safe routes to schools – Tony to review and reevaluate metric/targets
- Cultural/Heritage – Mike to circulate metrics with appropriate Brampton staff to help inform metrics/targets
- Site Permeability – Halsall/TPP to inform appropriate targets (reference LEED/best practices)
- Walkability – Expand metrics to include pedestrian buffers, etc... (LEED ND references). TPP to inform
- Stormwater Quality & Quantity – Tony to gain feedback from TRCA. Needs to consider the various soil types/capacities
- Energy Efficiency – Tony to follow up with building official. What, if anything, can we advocate for the minimum energy performance?
- Solid Waste – Designate area for waste stream separation (Multi-use residential and Commercial). Halsall to inform.

Community Specific Metrics

- Intersection Density – Halsall to reference Neptus figures
- Restore and Enhance Soils – Halsall to include details within targets
- Enhance Biodiversity – Tony to help define “Enhance” and minimum/aspirational targets
- Site dedicated to Parking/car infrastructure – Halsall/TPP to inform (based on Emmerald Hills metrics)

October 9, 2012 – Draft metric revisions post Workshop 1 Feedback

Log#	Metric	Revisions / Additions / Deletions	Changes applied to:
1	Proximity to Amenities	<ul style="list-style-type: none"> • Amenities split between basic and principal. • Amenity provided for both categories. • Principal amenities will carry a higher point allocation 	Community and Site Metrics
2	Building Certification	<ul style="list-style-type: none"> • % of buildings (no longer number of buildings) • Minimum target – designed to green standard • Aspirational target – certified to green standard 	Site Metrics
3	Universal Design	<ul style="list-style-type: none"> • “or equivalent” added for Universal Design standard • ANSI A117 Standard to be defined in Glossary • Aspirational target – increased to 30% (previous version, aspirational and minimum target were equal) 	Site Metrics
4	Universal Design – Access	<ul style="list-style-type: none"> • “emergency exits” added to minimum target • Aspirational target – 100% of all entries/exits 	Site Metrics
5	Housing Unit Mix	<ul style="list-style-type: none"> • Metric revised to include all housing mixes • Points will be allocated depending on % and diversity of housing mix (point allocation) 	Community and Site Metrics

		TBD)	
6	% Tree Canopy	<ul style="list-style-type: none"> • Minimum and Aspirational target increased from 20% and 40% to 50% and 75% • Time period of 5 years added • Drought tolerant and native added 	Community and Site Metrics
7	Soil Quality	<ul style="list-style-type: none"> • Metric added. Precedent based on LEED ND 	Site Metrics
8	Pesticide Use	<ul style="list-style-type: none"> • Removed metric. Considered a maintenance requirement, not related to design 	Site Metrics
9	Speed Control	<ul style="list-style-type: none"> • Removed reference to speed limit • Replaced with traffic calming strategies • Traffic calming strategies defined in Glossary 	Community and Site Metrics
10	School Proximity to Transit and bikeways	<ul style="list-style-type: none"> • Metric added • Minimum and Aspirational target set based on workshop #1 feedback 	Community and Site Metrics
11	Safe Routes to Schools	<ul style="list-style-type: none"> • Metric added 	Community and Site Metrics
12	Parks	<ul style="list-style-type: none"> • Relabeled as "Public Parks" • Distance changed to 400m walk (from 5min walk) • Parkette distance reduced to 200m • "Open Space" added to Urban Square 	Community and Site Metrics
13	Stormwater	<ul style="list-style-type: none"> • Metrics simplified to focus on: Quality, Quantity, Re-Use, Amenities (site metrics only) • Precedents based on TGS TIER II 	Community and Site Metrics
14	Local Food Production Dedicate Land	<ul style="list-style-type: none"> • Garden space moved to Minimum target • Aspirational target – Dedicate rooftop space for food production (Site metrics only) • 	Community and Site Metrics
15	Local Food Distribution	<ul style="list-style-type: none"> • "Non-Permanent" added • "Designate land" added 	Community and Site Metrics
16	Solar Readiness	<ul style="list-style-type: none"> • "100% of all" added 	Site Metrics
17	District Energy	<ul style="list-style-type: none"> • "Consider connecting to a district energy 	Site Metrics

		system (if applicable") added	
18	Fixture Efficiency	• Relabeled to "Water Conserving Fixtures"	Site Metrics
19	Land Use Separation	• Removed	Community and Site Metrics
20	Efficient Lighting Fixtures	• Relabeled "Energy Conserving Lighting"	Site Metrics

Additional Site Metrics that were requested but haven't been included:

- Preserve / Enhance Wildlife Habitat
- Preserve / Enhance Wildlife Corridors
- Mental Health Amenities
- Design buildings to reflect community character
- Connection/Integration with existing land use/community
- Maintain existing healthy trees
- Bike paths leading to destination

Additional Community Metrics that were requested but haven't been included:

- Embodied Energy

Metrics that require further work/expansion

- Walkability
 - Intersection safety
 - Buffer between pedestrians and vehicles
- Cultural / Heritage Site
- Proximity to Green Space

Appendix D
Glossary

Appendix D - Glossary of Terms

Term	Definition	Source	Examples
Affordable Housing	<p>Affordable housing costs less than 30% of before-tax household income. Shelter costs include the following:</p> <ul style="list-style-type: none"> •For renters: rent and any payments for electricity, fuel, water and other municipal services; •For owners: mortgage payments (principal and interest), property taxes, and any condominium fees, along with payments for electricity, fuel, water and other municipal services. 	<p>CMHC - Canadian Mortgage and Housing Corporation (http://cmhc.beyond2020.com/HICODefinitions_EN.html)</p> <p>HSC - Housing Services Corporation (http://www.hscorp.ca/resources/glossary/)</p>	N/A
Crown Diameter	The area shaded by a tree when the sun is directly overhead.	<p>USGBC LEED New Development Reference Guide and Website (https://new.usgbc.org/node/1731823?view=language)</p> <p>Toronto Shade Guidelines - Additional Reference (http://www.toronto.ca/children/operators/pdf/shade_guidelines.pdf)</p>	N/A
Frequent Stops	<p>Frequent service is defined as, access to public transit in intervals of no more than 30 minutes during peak times for each line in each direction and available during hours of building operation.</p> <p style="text-align: center;">OR</p> <p>Is atleast 50 transit rides per day total, at all stops (half-hourly service 24 hours per day or more frequent service for less than 24 hours per day) and available during hours of building operation.</p>	LEED NC v2009 SSC4.1	N/A
Traffic Calming Techniques	<p>Traffic Calming is the combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behavior and improve conditions for non-motorized street users.</p> <p>Traffic calming goals include:</p> <ul style="list-style-type: none"> -Increasing the quality of life; -Incorporating the preferences and requirements of the people using the area (e.g., working, playing, residing) along the street(s), or at intersection(s); -Creating safe and attractive streets; -Helping to reduce the negative effects of motor vehicles on the environment (e.g., pollution, sprawl); and promoting pedestrian, cycle and transit use. <p>Traffic calming objectives include:</p> <ul style="list-style-type: none"> -Achieving slow speeds for motor vehicles, -Reducing collision frequency and severity, -Increasing the safety and the perception of safety for non-motorized users of the street(s), -Reducing the need for police enforcement, -Enhancing the street environment (e.g., street scaping), -Encouraging water infiltration into the ground, -Increasing access for all modes of transportation, and -Reducing cut-through motor vehicle traffic. 	Institute of Transportation Engineers. Lockwood, Ian. ITE Traffic Calming Definition. ITE Journal, July 1997, pg. 22. (http://www.ite.org/traffic/index.asp)	<p>Speed Bumps, Speed Tables, Raised Crosswalks, Raised Intersections, Textured Pavement, Traffic Circles, Roundabouts, Chicanes, Re-aligned Intersections, Neckdowns, Center Island Narrowings, Chokers, Parking on Both Sides of Street</p> <p>Examples of Each Available Here (http://trafficcalming.fehrandpeers.net/measures/)</p>
Bird Friendly Design	Reducing the likelihood of bird strikes through the use of materials, form and site lighting. Applying bird friendly strategies to the entire building is ideal, however the critical area is the 12m above grade (12m relate to a city's typical tree height)	City of Toronto - Bird Friendly Design Guidelines - March 2007	<p>Bird friendly design features include:</p> <ul style="list-style-type: none"> - visual patterns on glass - window films -fenestration patterns - angled glass downwards -sunshades -reduced night sky lighting
Growing space	<p>Garden spaces that include:</p> <ul style="list-style-type: none"> - Quality Soil (see metrics) - Sun access - Water access - Pedestrian access <p>And may include:</p> <ul style="list-style-type: none"> - Fencing - Garden bed enhancements (raised beds) - Greenhouses - Secured storage for tools 	LEED ND NPDC13	
Total Suspended Solids (TSS)	The solids found in waste water or in a stream which can be removed by filtration through a 0.45 micro filter. The origin of the TSS may be manmade or natural such as silt	LEED NC v2009	
Solar Reflected Index (SRI)	Measure of a material's ability to reject solar heat, as shown by a small temperature rise. Standard white color SRI is 100, while the standard black SRI is 0. The higher the value, the cooler the material will be when exposed to radiant solar energy.	LEED NC v2009 SSC7.1	<p>SRI values for various materials:</p> <ul style="list-style-type: none"> -white-coated gravel on built up roof (SRI 79) -white coating on metal roof (SRI 82) -white cement tile (SRI 90) -new gray concrete (SRI 35)
Intersection Counts	<p>The number of publicly accessible street intersections per square kilometer. Includes intersection of streets with dedicated alleys, transit right-of-ways, and non-motorized right-of-ways. Intersections leading only to cul-de-sacs should not be counted.</p> <p>The calculation of the square kilometer should exclude:</p> <ul style="list-style-type: none"> -water bodies -parks larger than 1/2 acre, -public facility campuses -slopes over 15% 	LEED ND NPDC6	
Diameter at Breast Height (DBH)	A standard method of expressing the diameter of a tree. The diameter of the tree is measured at the height of an adult's breast, considered at 1.3m above the ground	Wikipedia	

DRAFT: Energy Use and Greenhouse Gas Emissions Forecasting Report

Measuring the Sustainability Performance of New Development in Brampton, Richmond Hill, and
Vaughan

February 2013

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DRAFT

1.0 Overview

1.1 General

Sustainable design is the art of designing physical objects, the built environment and services to comply with the principles of economic, social, and ecological sustainability. It ranges from the microcosm of designing small objects for everyday use, through to the macrocosm of designing buildings, cities, and the earth's physical surface.

The issues of sustainability have become increasingly important in the development and wellbeing of cities. Concerns over climate change, energy, public health, resource use and related provincial policies have brought sustainability issues to the forefront of planning and operating cities in Ontario and across Canada. This is evident from recent changes to the Provincial Policy Statement (PPS 2005), the Planning Act (Bill 51), programs such as the Federation of Canadian Municipalities' Green Municipal Fund, and changing mission statements of organizations such as the Canadian Green Building Council to emphasize sustainable neighbourhoods in addition to green buildings.

Over half of the world's population lives in cities, and in Canada that proportion is closer to 80% (Statistics Canada, 2009). The homes and buildings we live and work in use over 30% of all energy in the country and consume more than half of all the electricity (Natural Resources Canada [NRCAN], 2006). Cities are increasingly recognizing that the quality of life and competitiveness will in part be driven by how effectively they manage the use of their energy and water resources.

Improving energy performance in buildings is considered one of the fastest, most accessible and cost-effective opportunities to save energy, create jobs, increase energy security and reduce greenhouse gas emissions (National Energy Board, 2008; NRCAN, 2012). Implementing sustainability guidelines in the development review process is one comprehensive approach to address sustainability issues towards reducing the overall ecological footprint of new development and redevelopment projects. While sustainable development frameworks exist as independent, third-party certification systems, such as Leadership in Energy and Environmental Design (LEED™), R-2000, ASHRAE and Green Globes, third-party certification is still more of a market niche than an industry standard. A framework for measuring sustainability performance of development through the municipal planning process can complement independent certification systems by rating all development projects, not just industry leaders. It will be important to incorporate appropriate energy efficiency and CO₂ reduction targets in sustainability guidelines being implemented by Ontario municipalities in order to achieve some of the most urgent sustainability objectives.

1.2 Measuring Sustainability Performance of New Development

In November 2010, the City of Brampton in collaboration with the City of Vaughan and the Town of Richmond Hill (the partner municipalities) received support from the Federation of Canadian Municipalities' Green Municipal Fund to complete a project entitled "Measuring the Sustainability Performance of New Development in Brampton, Richmond Hill, and Vaughan". Once complete, the project will establish Sustainability Guidelines as one set of planning tools to achieve healthy, complete sustainable communities in the three neighbouring municipalities.

Implementing sustainability guidelines as part of the development review process will aid in reducing the overall ecological footprint of new development and redevelopment projects. The guidelines will complement and support other municipal requirements for development, such as master environment servicing plans, environmental impact studies, natural heritage evaluations, growth management plans, community design guidelines, urban design briefs, and other standard requirements.

The project is being completed in two phases. Phase 1 of the project, currently underway as a separate contract, is being led by the City of Brampton with a goal to develop Sustainable Community Development Guidelines (SCDGs) as part of the City of Brampton's Development Design Guidelines (DDG). The focus of the SCDGs is on qualitative urban design and community development principles. The SCDGs, in part, provide the framework for Phase 2 of the project. Phase 2 focuses on the preparation of sustainability metrics (i.e., quantitative performance targets that new development applications will be reviewed against as part of the planning process) that quantify, where appropriate, the qualitative principles outlined in the SCDGs prepared as part of Phase 1.

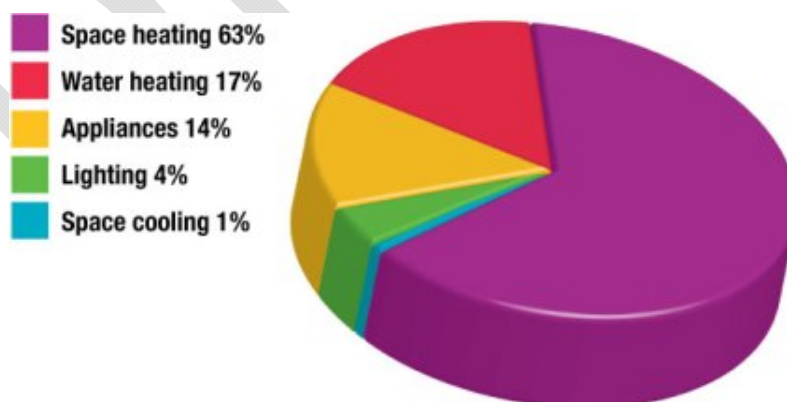
In some municipalities throughout Southern Ontario, such as Guelph and East Gwillimbury, comprehensive Community Energy Planning has taken place to "create a healthy, reliable and sustainable energy future by continually increasing the effectiveness of how we use and manage our energy and water resources" (City of Guelph, 2007, p.13). These plans focus on several sectors affecting sustainability, energy use and greenhouse gas emissions including housing, commercial and industrial practices, transportation and community waste.

While this exercise does not intend to develop a framework for future community-based energy planning, nor does it discuss energy use and GHG emissions from other sectors such as transportation, it is expected that this report will be a component of a broader community energy plan to include an expanded focus beyond the built environment.

1.3 Current Trends in Energy Use and GHG Emissions

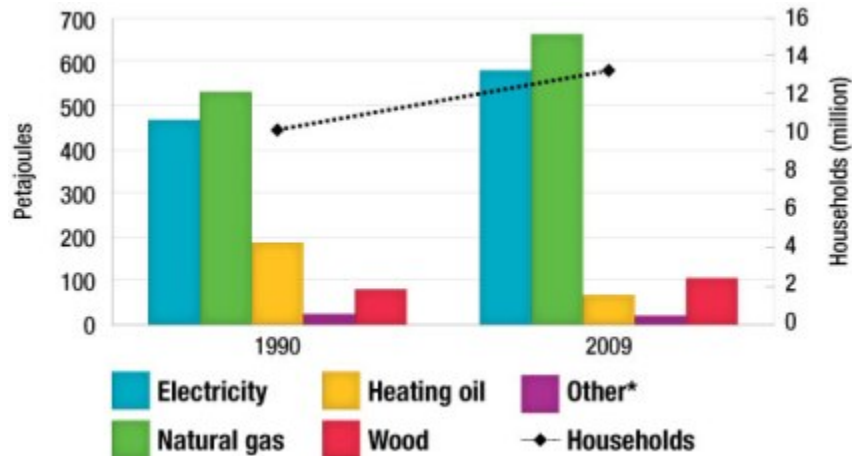
Energy is used in all five sectors of the economy: residential, commercial/institutional, industrial, transportation and agriculture. In 2009, these sectors used a total of 8,542 petajoules (PJ) of energy; an increase of 23% since 1990. Total GHG emissions associated with the energy use of the five sectors was 464 megatonnes (Mt) in 2009. Residential GHG emissions accounted for 68 Mt of that number, or 15% of all secondary energy use-related GHGs emitted in Canada. This reflects an 11% rise in residential energy use since 1990; equal to the increase in the average size of living spaces during that time frame. In 2009, total household energy use was 17% of all energy used (1,422 PJ), costing Canadians \$26.8 billion on household energy needs (NRCan, 2011a). The majority of this energy use can be attributed to space and water heating (Figure 1), and is drawn primarily from natural gas and electricity (Figure 2).

Figure 1: Distribution of residential energy use by end-use, 2009



Source: Natural Resources Canada, 2011

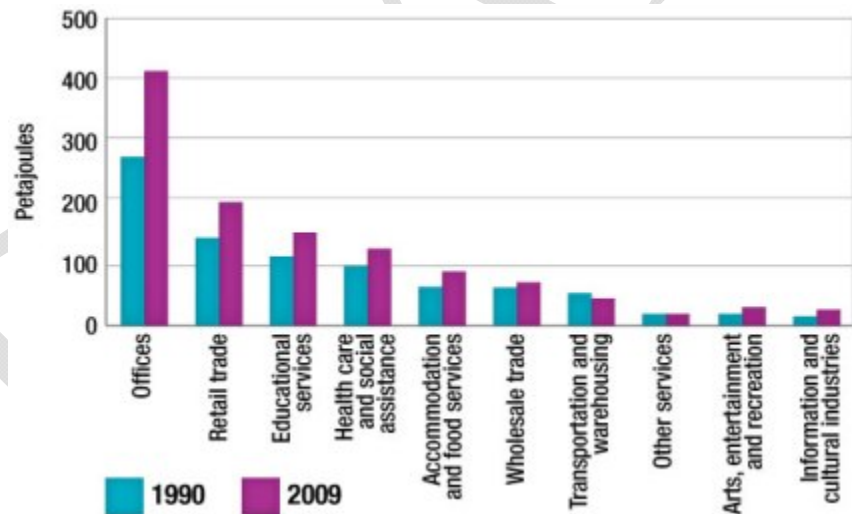
Figure 2: Residential energy use by fuel type and number of households, 1990 and 2009



Source: Natural Resources Canada, 2011

The commercial/institutional sector was responsible for 14% of the total energy use in Canada, an increase of 37% (from 867 PJ to 1,186 PJ) since 1990. 13% of the associated GHG emissions in 2009 were a result of commercial activity (a 29% increase since 1990), stemming primarily from energy use in office buildings (35% of commercial GHGs), retail trade (17%) and education services (13%) (Figure 3). Industrial uses accounted for 37% of the total energy use and 31% of end-use GHG emissions (NRCan, 2011a).

Figure 3: Commercial/institutional energy use by activity type, 1990 and 2009



Source: Natural Resources Canada, 2011

2.0 Energy Use and Greenhouse Gas Emissions Forecasting

2.1 Purpose

The focus of this report is to estimate the energy use and GHG emissions associated with the performance of residential and non-residential buildings in Brampton, Richmond Hill and Vaughan. This study will apply existing and anticipated energy standards for buildings to the current and projected building stock for the three partner municipalities in order to understand the magnitude of savings that can be gained from energy improvements. The report will also explore

more aggressive energy conservation and retrofit scenarios to establish a more complete understanding of how energy efficient buildings contribute to the overall reduction of municipal greenhouse gas emissions.

The analysis resulting from this study will inform the sustainability performance metrics for energy use of buildings in the sustainability guidelines being developed by partner municipalities. It is anticipated that the methodology and findings of this report may be further refined, adapted and applied to other municipalities as the dialogue and technology surrounding energy conservation and greenhouse gas reductions continues to evolve.

2.2 Methodology

In order to develop an accurate, flexible approach to quantifying the energy usage and associated greenhouse gas emissions of the residential and non-residential buildings within the partner municipalities, a series of spreadsheets were constructed to utilize a range of variable inputs and calculate the total energy use and greenhouse gas emissions for both residential buildings – characterized by detached, semi-detached, row and apartment dwellings; and non-residential uses, including commercial and office uses, warehousing, education and health care, and other employment uses. With regards to the latter, an estimate of only the energy use consumed as a result of regular building operations was considered.

The energy use and GHG emissions from the unique industrial processes that occur within the partner municipalities were not included in the calculations. Although large industrial uses account for a major portion of the energy used in the partner municipalities, the analysis of industrial energy use is best evaluated at the level of a specific industrial process type. Therefore, this report does not assess the industrial use of other energy commodities such as fuel oil, propane, oxygen and other combustion gases. In many industrial processes these can be significant components of the energy mix and should not be overlooked in more detailed site-specific assessments.

Two approaches provide a comparison to test assumptions in the analysis. One approach uses the Toronto and Region Conservation Authority's (TRCA) *Getting to Carbon Neutral Toolkit* to compare the more detailed calculations in our approach with a higher-level approach that also considers GHG emissions from transportation, waste and water use. An additional comparison was made with actual electricity and natural gas consumption values for Vaughan in 2006. While the comparisons are not expected to align completely, it provides a method to understand the variability in our approach.

For many variables, provincial averages found in the online *Getting to Carbon Neutral Toolkit* were verified with NRCAN data and applied to the scenarios used. The online tool also provided a way to verify and compare the results of this study with the data provided by the TRCA.

A breakdown of the sources for each of the variables used in the energy use forecasting model is as follows:

- Baseline data regarding unit numbers and floor space of residential dwellings and floor space of employment buildings;
- baseline data for energy intensities of the existing building stock
- GHG emissions intensities;
- Variables that define energy use scenarios considering anticipated and aspirational energy efficiency improvements, retrofitting and the incorporation of renewable energy generation.

2.2.1 Baseline Data

2.2.1.1 Population and Number of Dwelling Units

The Vaughan Official Plan 2010 identifies a 2006 population of 249,300. The estimated growth between 2006 and 2031 is 167,300 new residents for a total estimated population of 416,600. The 2006 population figures for Richmond Hill and Brampton are 169,800 and 453,000 respectively. By 2031, these figures are expected to grow to 242,200 people in Richmond Hill and 738,000 people in the City of Brampton.

For the purposes of forecasting energy use, it was necessary to determine how these population figures are allocated among the different residential dwelling types in order to establish the total gross floor area for each housing category. This information was provided for the City of Vaughan and Town of Richmond Hill through York Region's 2031 Land Budget (2010). Population and dwelling unit estimates for the City of Brampton are provided in their City-Wide Population and Employment Forecasts report (2009). 2006 and 2031 dwelling units and floor space estimates for Brampton, Richmond Hill and Vaughan can be found in Appendix A.

2.2.2 Conversion Factor and Gross Floor Area

2.2.2.1 Residential

To determine the energy use of existing residential buildings, an estimate of the total gross floor area for each housing typology was calculated. As a preliminary analysis, data from the Municipal Property Assessment Corporation (MPAC) for the Town of Richmond Hill was analyzed and used to estimate the size of various dwelling units across the partner municipalities (Table 1). Calculations can be found in Appendix A. Localized data may show that the average sizes of dwelling units in Brampton, Richmond Hill and Vaughan differ substantially from one another. However, using a consistent unit size serves to maintain an approach to energy use and greenhouse gas emissions forecasting that is adaptable to all municipalities across the GTA.

Comprehensive Energy Use Database Tables from Natural Resources Canada (NRCAN) provide total floor space and unit counts for each dwelling type in Ontario. Using this information, the average size of Ontario dwelling units was calculated (NRCAN, 2013a). These figures can be seen in Table 1, below and provide further reference for municipalities across Ontario.

Table 1: Average Sizes of Dwelling Units

Dwelling Type	Average Size (MPAC)	Provincial Average (NRCAN)
Single Detached	241 m ²	170 m ²
Single Attached		126 m ²
<i>Semi-detached</i>	136 m ²	-
<i>Row Houses</i>	148 m ²	-
Apartment	90 m ²	94 m ²

2.2.2.2 Non-residential

To determine the total gross floor area for the non-residential building stock, information from the York Region Development Charge Background Study of April 2010 was used. The Background Study estimates the floor space per employee for three types of employment buildings: Employment Land Employment, Population-Related Employment and Major Office. These numbers were multiplied by the number of jobs in each setting and added together for a total non-residential GFA of 25,141,803 m² across the partner municipalities. Refer to Appendix A for the floor space estimates of the different employment-based building types for Brampton, Richmond Hill and Vaughan.

2.2.2.3 Average Annual Energy Demand and Total Energy Use of Each Building Type

Calculating the total energy use for each building type required the average annual energy demand per unit floor space (GJ/m^2), or energy intensity. The baseline figures used for this study (Table 2, below) were calculated using updated data within the Comprehensive Energy Use Database Tables published by NRCAN (2013a). These numbers are generally consistent with the energy intensities provided by the Carbon Neutral City Planner developed by the Toronto and Region Conservation Authority in consultation with the Sustainable Infrastructure Group and the Department of Civil Engineering at the University of Toronto.

Table 2: Baseline Energy Intensities

Building Type	Average Annual Energy Demand (GJ/m^2)
<i>Residential</i>	
Single Detached	0.82
Single Attached	0.77
Apartment	0.74
<i>Non-Residential¹</i>	1.59

The average annual energy demands are calculated using the total provincial energy use from all sources (electricity, natural gas, heating oil, coal, propane, wood, and other sources) and the total floor space for each housing type, therefore creating an average energy intensity. Hence, all ages and efficiencies of buildings within a particular building type are averaged, rather than establishing age-specific energy demands for each building type. In other words, each building type is assumed to use the same energy load per floor space unit despite the year the building was constructed. It is understood that given the varied building stock in the partner municipalities, not all buildings are operating at 2006 consumption levels. Although a number of buildings will likely be operating at less or more efficient levels, it is assumed that the average of all buildings in a certain category will be comparable to the information provided by NRCAN.

Once the average annual energy demands are determined, they can then be multiplied by the total gross floor area for each building type in order to determine the total energy use for each category of built form.

The City of Vaughan obtained electricity and natural gas usage data from Power Stream and Enbridge which provide the total kilowatt hours of electricity and metres cubed of natural gas consumed for residential, commercial and industrial uses in 2006. Although these totals do not isolate the consumption data specific to the operation of the building, they do provide a reference point to help ensure accurate estimations.

2.2.3 GHG Emissions

2.2.3.1 Residential GHG Emission Intensities

The GHG emission intensity value for electricity generation was calculated based on information provided by Environment Canada in the *National Inventory Report 1990-2010* (2012) and accounts for a 12% loss of energy due to transmission line and other losses. Emission intensities for other residential energy sources including natural gas, heating oil, oil, propane and wood

¹ The "Commercial/Institutional Sector" information published by NRCAN (2013b) was used for the non-residential energy use calculations and includes the following building types: Wholesale trade; retail trade; transportation and warehousing; information and cultural industries; offices; educational services; health care and social assistance; arts, entertainment and recreation; accommodation and food services, and; other services.

were derived from provincial energy use tables published by NRCAN (2013a), and include energy used for appliances and lighting in addition to space heating, space cooling and water heating.

The proportions of demand for the end uses in each type of building are as follows (NRCAN, 2013a):

Single Detached	%	Single Attached	%	Apartment	%
○ Space Heating	65%	○ Space Heating	57%	○ Space Heating	47%
○ Water Heating	16%	○ Water Heating	21%	○ Water Heating	30%
○ Appliances	11%	○ Appliances	13%	○ Appliances	18%
○ Lighting	4%	○ Lighting	4%	○ Lighting	2%
○ Space Cooling	4%	○ Space Cooling	4%	○ Space Cooling	2%

The GHG emission intensities for each building type were calculated using the applicable energy intensities (Table 2), the energy breakdowns for each building type (above), and the GHG intensities of the applicable fuel types as provided by Environment Canada. For all three residential unit types, the GHG intensities were calculated at 0.05 tonnes of CO₂ equivalents per gigajoule of energy produced (t-CO₂e/GJ). Detailed calculations can be found in Appendix B.

2.2.3.2 Non-residential GHG Emission Intensities

The same calculations and references were used to determine the GHG emission intensities for non-residential buildings. In addition to space heating, space cooling and water heating, energy consumption for this building group also includes end uses such as lighting, auxiliary motors and equipment and street lighting (NRCAN, 2013b). The provincial averages for proportions of demand of end uses in these buildings are as follows:

Non-Residential	%
○ Space Heating	47%
○ Water Heating	9%
○ Lighting	8%
○ Space Cooling	11%
○ Auxiliary Motors	7%
○ Auxiliary Equipment	17%
○ Street Lighting	1%

The GHG emission intensity resulting from non-residential energy use in Ontario is 0.05 t-CO₂e/GJ. Detailed calculations can be found in Appendix B.

2.2.3.3 Total GHG Emissions & GHG Emissions per Capita

By multiplying the total energy use for each building type by the respective GHG emission intensities, the total GHG emissions were calculated. The current and future population figures for each of the partner municipalities were then used to calculate per capita emissions figures.

2.2.4 Current Energy Consumption and Greenhouse Gas Emissions

Using the data from the York Region's 2031 Land Budget (2010) and the conversion factors as noted above, over 246,000 residential units accommodating for nearly 47 million square metres of floor space exist in the partner municipalities as of 2006. Combined with more than 25.1 million square metres of commercial floor space, the combined building stock for the study area consumes approximately 78 million GJ of energy each year (Brampton: 34.5 million GJ; Richmond Hill: 13.7 million GJ; Vaughan: 29.4 million GJ). This in turn results in a total GHG emissions output of nearly 4 million tonnes of CO₂ equivalents per annum. Distributed among the

2006 population for each municipality, this results in 3.9 t-CO₂e/capita in Brampton, 4.15 t-CO₂e/capita in Richmond Hill and 6.0 t-CO₂e/capita in Vaughan being emitted each year. To verify these estimates, population and floor space information were entered into the TRCA's Carbon Neutral City Planner for the City of Vaughan. Table 3, below, compares the calculated energy use and GHG emissions estimates used in this report with the outputs of the Carbon Neutral City Planner for the City of Vaughan.

Table 3: Calculations for 2006 energy use and GHG emissions for Vaughan's building sector

	Results from Energy Use and GHG Emissions Forecasting Exercise	Results from Carbon Neutral City Planner
Population	249,300	249,300
Energy Use (TJ)	29,415	29,425
GHG Emissions (MtCO₂e)	1.5	1.6
Energy Use/Capita (GJ)	118.0	118.0
Emissions/Capita (tCO₂e)	6.0	6.4

3.0 Projection Scenarios

3.1 Overview

A total of 188,280 new residential units and 20.4 million m² of non-residential space will be constructed across the partner municipalities to accommodate the total projected population in 2031. In determining the projected energy use and GHG emission scenarios for the year 2031, variable energy improvements were assigned to the existing and projected building stock as a percentage of increased efficiency over the 2006 Baseline.

To appreciate the implications of the current form of development on the energy consumption levels and overall GHG output in the partner municipalities, a scenario was tested using 2006 energy intensity data, which assumed no reduction in average annual energy demands would occur for buildings constructed between 2006 and 2031. In this example, no retrofits were applied to the existing building stock. The resulting outputs are as follows:

Table 4: 2006 Baseline Scenario

		Population	Total Development (m ²)	Annual Energy Use (GJ)	Energy Use (GJ)/Capita	GHG Emissions (t-CO ₂ e)	GHG Emissions (t-CO ₂ e)/Capita
Brampton	2006	453,000	33,050,636	34,546,773	76.3	1,750,589	3.9
	2031	738,000	59,658,279	63,893,061	86.6	3,239,396	4.4
Richmond Hill	2006	169,800	13,564,448	13,750,120	81.0	704,085	4.2
	2031	242,200	20,371,562	20,908,458	86.3		4.4
Vaughan	2006	249,300	25,418,894	29,415,120	118.0	1,495,626	6.0
	2031	416,600	43,350,343	49,884,062	119.7	2,535,925	6.1
TOTALS	2006	872,100	72,033,978	77,712,013	89.1	3,950,301	4.5
	2031	1,396,800	123,380,184	134,685,582	96.4	6,842,167	4.9

The differences in Energy Use and GHG Emissions per Capita between the three municipalities are reflective of the population and development characteristics in each. Despite having a significantly larger population than both Richmond Hill and Vaughan, greater land use densities in Brampton have resulted in lower per capita figures for both energy use and emissions.

3.2 Introduction of the 2012 Ontario Building Code

The 2012 Ontario Building Code (OBC 2012) applies to all buildings constructed after January 1, 2012. To develop the projection scenarios for energy use and GHG emissions modelling, this standard was used as a base level of improvement. As such, it was necessary to estimate the energy intensities of buildings complying with the new Ontario Building Code for each of the different building typologies. The new building code states that all houses must meet the performance level that is equal to a rating of 80 or more when evaluated in accordance with the EnerGuide Rating System (Ministry of Municipal Affairs and Housing [MMAH], 2012a). This standard brings the energy performance level of new homes in Ontario in line with the R-2000 energy standard:

The R-2000 standard is a national initiative that outlines requirements to build environmentally friendly homes. [...] R-2000 Standard homes are about 30 percent more energy efficient than conventional new homes and must achieve a minimum energy efficiency rating of 80 on the EnerGuide rating scale.

-NRCAN, 2011b

The OBC 2012 further states that buildings other than residential must conform to Supplementary Standard SB-10 of the Building Code which indicates that the energy efficiency levels of non-residential buildings can be achieved by exceeding the energy efficiency level of the 1997 Model National Energy Code for Buildings (MNECB) by 25 per cent (MMAH, 2012a).

The following table demonstrates these improvements using average annual consumption data for MNECB 1997 buildings in the City of Toronto, as well as average energy consumption for R-2000 certified homes, published by NRCAN (2007; 2011c).

Table 5: OBC 2012 energy intensities

	MNECB 1997 Baseline (GJ/m ²)	OBC 2012 (GJ/m ²)	2006 Baseline (GJ/m ²)	Improvement of OBC 2012 over 2006 Baseline
Single Detached	--	0.63 ²	0.82	23.2%
Single Attached	--	0.59 ³	0.77	23.2%
Apartment (Multi Unit Residential Building)	0.83	0.62	0.74	15.9%
Non-residential	1.13 ⁴	0.85	1.59	46.7%

NOTE: Numbers may differ slightly due to rounding

3.3 Energy Use and GHG Forecasting Scenarios

3.3.1 Scenario Parameters

Five scenarios were tested for the projected growth in the partner municipalities, ranging from a “status quo” baseline to aggressive energy efficiency improvements. While the more aggressive energy improvement scenarios may not be feasible at this time, they provide important information about the rate of change required to significantly reduce the energy demand and GHG emissions from anticipated growth.

For the projected building stock, two levels of improvements were considered; a “base level” of improvement reflective of the 2012 Ontario Building Code and a higher level of improvement

² National average of total consumption for R-2000 home (107.05 GJ) divided by average size of Ontario single detached home (170 m²).

³ It is assumed that the same percentage improvement over the 2006 baseline for single detached homes will be achieved for single attached homes constructed under OBC 2012

⁴ Average consumption of large and small office buildings, big box retail, warehouses, schools and extended care facilities

reflective of varying aspirational targets. All buildings constructed prior to January 1, 2012 were assumed to be built with 2006 energy intensities.

In order to model these changes, it was assumed that the projected growth in the partner municipalities would be distributed evenly from 2006 to 2031. As such, the first 6 years of development from the beginning of 2006 to the end of 2011 are assumed to be constructed with the average energy intensities calculated for the existing building stock (Table 2). This equates to 24% of the projected development.

For those scenarios that include retrofitting, it was assumed that all buildings being retrofit would be brought up to OBC 2012 energy intensity levels.

Table 6 outlines the parameters of the five energy use forecasting scenarios tested in this report, identifying the percentage of new and existing buildings that will achieve each improvement level. Detailed tables containing precise figures for all variables can be found in Appendix C.

Table 6: Scenario Parameters

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
	Percentage of Buildings Constructed after 2006				
No change	24%	24%	24%	24%	24%
OBC 2012	76%	20%	20%	20%	20%
OBC 2017	--	56%	56%	--	--
75% Improvement	--	--	--	56%	--
Net Zero	--	--	--	--	56%
	Percentage of Buildings Constructed prior to 2006				
Retrofitting	--	--	50%	100%	100%

3.3.2 Scenario 1

This scenario assumes that the energy efficiency improvements introduced in the 2012 Ontario Building Code will apply to all buildings constructed as of January 1, 2012 and remain in effect until the end of the projection period. Using the same population and floor space estimates from the 2006 Baseline, the improvements to average annual energy demands from Table 5 (above) were applied to all buildings constructed from 2012 to 2031. No retrofits were applied to the existing building stock.

Figure 4 below compares the energy use and GHG emissions resulting from this scenario for each municipality.

Figure 4: Scenario 1: Energy Use and GHG Emissions

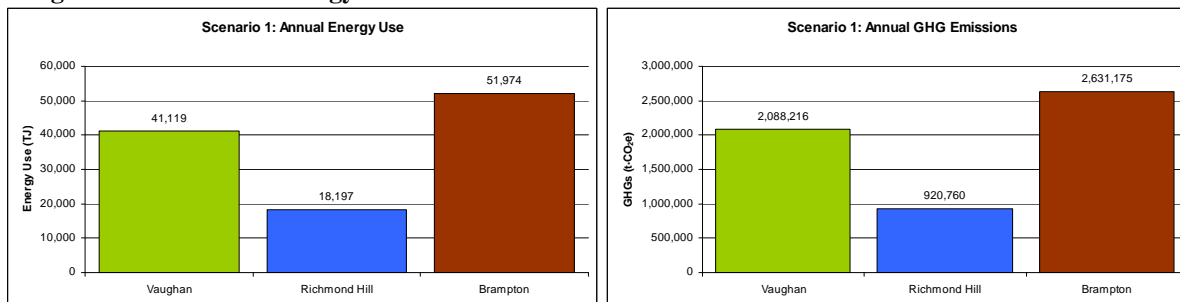


Table 7 compares the energy use and GHG emissions resulting from this scenario with the results of the 2006 Baseline Scenario developed above.

Table 7: Projected Energy Use and GHGs for the Partner Municipalities

Year/Scenario	Annual Energy Use by 2031 (GJ)	Annual GHG Emissions by 2031 (t-CO ₂ e)	2031 Energy Use (GJ)/Capita	2031 GHG Emissions (t-CO ₂ e)/Capita
2006 Baseline	134,685,582	6,842,167	96.4	4.9
Scenario 1	111,289,771	5,640,151	79.7	4.0

3.3.3 Scenarios 2 & 3

These scenarios build upon Scenario 1 by introducing energy efficiency improvements for all buildings constructed as of January 1, 2017, using estimated energy intensities to reflect the anticipated 2017 Ontario Building Code (OBC 2017).

In November of 2012, the Ministry of Municipal Affairs and housing issued a news release stating that “all new houses constructed in 2017 will consume 50 per cent less energy than homes built before 2006, and large buildings will only consume 65 per cent of what they did before 2006” (MMAH, 2012b). This information was used to calculate the energy intensities for low-rise dwelling units and apartment buildings (50% and 35% improvement over 2006 energy intensity values, respectively) in Scenarios 2 and 3.

The non-residential component of the building stock contains a range of building heights that use varying amounts of energy. For this reason, information provided by the Ontario Power Authority and MMAH was used to determine the OBC 2017 energy intensities for non-residential buildings.

Figure 5 demonstrates the forecasted trajectory of energy intensity performance improvements for new commercial buildings compared to those built circa 2005. Assuming commercial buildings constructed in 2005 were built to MNECB 1997 standards, a 45% improvement over MNECB 1997 for buildings constructed to the 2017 OBC would equate to a 60.9% improvement over the entire 2006 building stock for the partner municipalities. This assumption was used to estimate the OBC 2017 energy improvement for non-residential buildings in the forecasting scenarios.

Figure 5: Roadmap for Energy Performance in Ontario

Year	Roadmap for Energy Performance for New Commercial Buildings	
	% Improvement in Overall Building Energy Use	% Improvement in Electricity End-Use Intensity
2012	25% - 30%	30% - 35%
2017	40% - 50%	35% - 40%
2022	60% - 70%	40% - 45%
2025	70% - 80%	45% - 50%

Note: Estimated improvement relative to new buildings circa 2005
Source: Raffaele, n.d.

Table 8 identifies the differences in energy consumption and GHG emissions between the first three scenarios. In each scenario, all buildings constructed between 2006 and 2017 were assigned the OBC 2012 energy intensities developed in Scenario 1. No retrofits were applied to

the existing building stock for Scenario 2. In Scenario 3, 50% of the existing building stock was retrofit to conform to OBC 2012 energy intensities.

Table 8: Comparison of Results for Scenarios 1-3 across the Partner Municipalities

	Annual Energy Use by 2031 (GJ)	Annual GHG Emissions by 2031 (t-CO ₂ e)	2031 Energy Use (GJ)/Capita	2031 GHG Emissions (t-CO ₂ e)/Capita
Scenario 1	111,289,771	5,640,151	79.7	4.0
Scenario 2	105,192,362	5,331,721	75.3	3.8
Scenario 3	93,894,376	4,754,695	67.2	3.4

3.3.4 Scenarios 4 and 5

In the final two scenarios, more ambitious energy reduction targets were applied to establish a more complete understanding of the impacts of future development and population growth in the partner municipalities.

Scenario 4 applies a 75% reduction in energy intensities from the 2006 baseline for all building typologies. It also reflects more aggressive retrofitting, with 100% of the pre-2012 building stock being retrofit to OBC 2012 standards.

Scenario 5 assumes that all buildings constructed as of January 1, 2017 will be Net Zero, achieving very low energy intensities offset by renewable energy sources at the building, site or community scale. This scenario assumes the same retrofitting targets as Scenario 4.

Table 9 compares the total annual energy consumption and annual GHG emissions for the partner municipalities across all five scenarios. The breakdown of each scenario by municipality can be seen in Figure 5 Figure 6, below. Scenarios 4 and 5 each reflect a future decrease in annual GHG emissions from levels currently present with the 2006 population.

Table 9: Comparison of Results for Scenarios 1-5 across the Partner Municipalities

	Annual Energy Use by 2031 (GJ)	Annual GHG Emissions by 2031 (t-CO ₂ e)	2031 Energy Use (GJ)/Capita	2031 GHG Emissions (t-CO ₂ e)/Capita
Scenario 1	111,289,771	5,640,151	79.7	4.0
Scenario 2	105,192,362	5,331,721	75.3	3.8
Scenario 3	93,894,376	4,754,695	67.2	3.4
Scenario 4	76,273,360	3,857,793	54.6	2.8
Scenario 5	68,297,061	3,452,931	48.9	2.5

Figure 6: Energy Consumption resulting from each Scenario

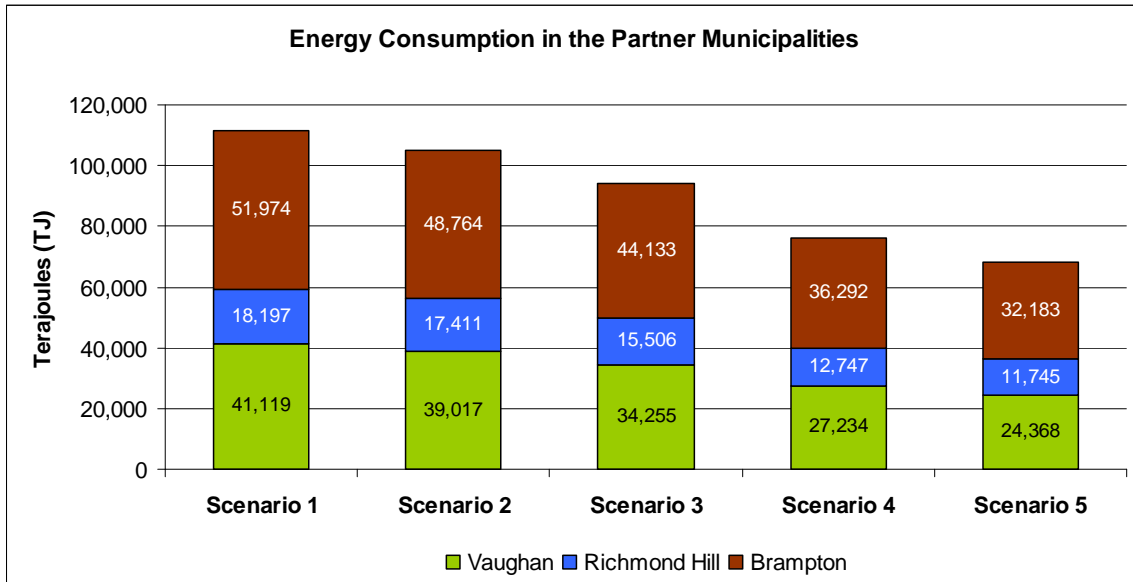
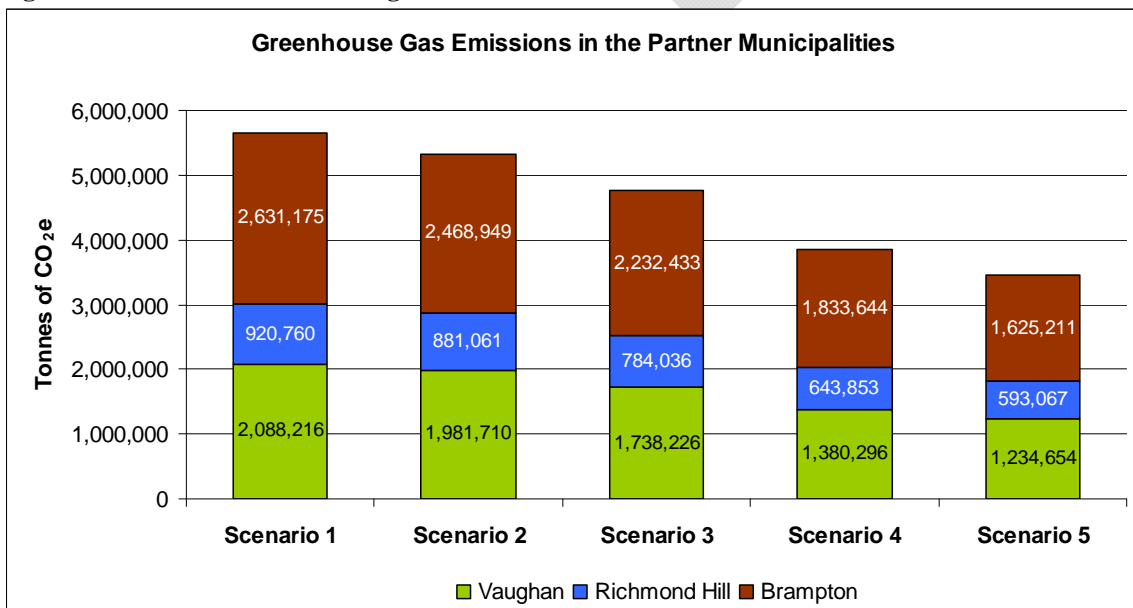


Figure 7: GHG Emissions resulting from each Scenario



3.3.5 Cumulative Total Energy Consumption

[The cumulative total energy consumption will be inserted into this section once calculated. A comparison of cumulative energy use will be more representative of the magnitude of energy use and GHG emissions than the incremental changes in annual energy consumption, as CO₂ resident times in the atmosphere are much longer than one year.]

4.0 Conclusions

4.1 General

Recently, the Ontario Environmental Commissioner released the second volume of his *2011 Annual Energy Conservation Progress Report*, which reviews energy usage, increases in energy efficiency and barriers to conservation. The report found that the province is lagging behind a culture of conservation and that governments “need to make conservation the new normal” (Novae Res Urbis [NRU], 2013, p.3).

Generally speaking, the results in this report echo the importance of energy conservation. With aggressive action in the building sector, large increases in development do not necessarily have to result in large increases in energy use and associated emissions.

This report provides a preliminary look into the potential energy use and greenhouse gas emissions resulting from the increases in development across the partner municipalities to the year 2031. Through five scenarios, each reflecting more ambitious energy conservation targets than the last, future greenhouse gas emissions ranged from an average annual rate of 5.6 million tonnes of carbon dioxide emissions in the first scenario to 3.5 million tonnes in the fifth scenario. Though aggressive, the final scenario reflects a decrease in annual emissions from present day levels by approximately half a million tonnes, despite a population growth of 1.4 million people and the addition of over 51 million square metres of development. Conversely, the minimum building requirements of the 2012 and 2017 Ontario Building Code presented in the first two scenarios resulted in minor incremental change in both annual energy consumption and GHG emissions, with expected increases in overall energy use and emissions corresponding to the growth in population.

It is important to note that this report covers only one sector of the local contributors to energy use and greenhouse gas emissions. Other sectors such as transportation and municipal services will need to be examined to develop a full picture of the energy demands in the partner municipalities. In doing so, additional opportunities to increase energy conservation and reduce GHG emissions may become present.

The findings of this report can be used in conjunction with future studies to create a comprehensive community energy plan. On its own, the findings of this report provide a foundation for the sustainability performance metrics being developed by the partner municipalities. Moreover, they help to make clear the current and projected energy demands being faced by municipalities in the Greater Toronto Area, with insight into the magnitude of change needed to accommodate growth without drastically increasing the emissions associated with existing development trends.

4.2 Retrofitting

Although retrofit programs were not the focus of this report, the analysis does show strong support for further study of the potential impacts retrofitting can have in each of the partner municipalities. The scenarios modelled in this study showed that even aggressive changes to future development, though significant contributors to the reduction of energy use and emissions, do not provide the same degree of positive impact as aggressive retrofitting can.

Other municipalities have already begun to consider this potential. In the Region of Durham, a key component of their climate change action plan includes a comprehensive residential retrofit program (Baldassi, 2013). According to an article recently published in the journal *Novae Res Urbis*, the retrofit program is capable of delivering 40% of the greenhouse gas reductions in the Region and will be a significant contributor to positive economic impacts. The program will be implemented by building upon local improvement charges, a financial tool found in the *Municipal Act* and the *City of Toronto Act* (Baldassi, 2013).

Locally, the 2011 MPAC data for Richmond Hill shows similar potential for retrofit programs in the partner municipalities. The Town currently has more than 25,000 dwelling units built prior to 1991, which represents 46% of the Town's total dwelling units as of 2011. With nearly half of the Town's buildings stock being more than 20 years old, widespread retrofitting programs could have a major impact in reducing GHGs and energy consumption.

4.2 Limitations of this Study

Certain limitations, including the availability and access to certain data sets, technological barriers and the ability to accurately segregate building typologies and their energy demands have resulted in final figures that may not be precise representations of the consumption patterns in each municipality. However, this should not deter from the general trends presented in this report.

Data from MPAC provides information relating to the size, age and supply of all building typologies in each municipality. This report used information from MPAC for Richmond Hill to estimate the sizes of dwelling units in each of the three partner municipalities. Further examination of this data will allow for a more detailed analysis which may provide a more accurate picture of the existing building stock in Brampton and Vaughan, and help determine the potential retrofitting rates based on the age of dwelling units.

The analysis of Richmond Hill's MPAC data revealed that 74% of the GFA in the Town is residential, 14% is employment-land employment, 8% is population-related employment and 2% is major office. The remaining 2% is institutional. Although not all of these categories may have been captured in their entirety, the majority of the GFA in the Town has been accounted for in the analyses conducted for this report.

With respect to industrial, office and institutional buildings that may fall within the employment-land, population-related employment and major office categories, further analysis may provide a clearer makeup of the non-residential component of the building stock. This will largely be dependent on the availability of data to identify both the number and type of buildings in the partner municipalities, as well as the energy intensities for the unique commercial, industrial and institutional processes that occur within each.

Further error analysis can be found in Appendix D to this report.

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APPENDIX A:
2006 & 2031 Dwelling Unit and Floor Space Estimates for Brampton, Richmond Hill and Vaughan

Floor Space Estimates for Employment Built Form

City of Brampton 2006 Baseline Year

	Employment Land	Major Office	Population Related	Totals
No. of Jobs	79,200	9,300	67,400	155,900
Conversion Factor (square metres per job)	78.97	23.23	55.74	
Estimated GFA (Millions of square metres)	6.25	0.22	3.76	10.23

City of Brampton 2031 Growth Forecast

	Employment Land	Major Office	Population Related	Totals
No. of Jobs	167,900	37,400	113,500	318,800
Conversion Factor (square metres per job)	78.97	23.23	55.74	
Estimated GFA (Millions of square metres)	13.26	0.87	6.33	20.45

Town of Richmond Hill 2006 Baseline Year

	Employment Land	Major Office	Population Related	Totals
No. of Jobs	26,031	13,063	21,996	61,090
Conversion Factor (square metres per job)	78.97	23.23	55.74	
Estimated GFA (Millions of square metres)	2.06	0.23*	1.23	3.51

Town of Richmond Hill 2031 Growth Forecast

	Employment Land	Major Office	Population Related	Totals
No. of Jobs	42,351	21,253	35,786	99,390
Conversion Factor (square metres per job)	78.97	23.23	55.74	
Estimated GFA (Millions of square metres)	3.34	0.44*	1.99	5.78

City of Vaughan 2006 Baseline Year

	Employment Land	Major Office	Population Related	Totals
No. of Jobs	111,080	8,919	42,162	162,160
Conversion Factor (square metres per job)	78.97	23.23	55.74	
Estimated GFA (Millions of square metres)	8.77	0.21*	2.35	11.33

City of Vaughan 2031 Growth Forecast

	Employment Land	Major Office	Population Related	Totals
No. of Jobs	189,000	15,179	70,992	275,170

Conversion Factor (square metres per job)	78.97	23.23	55.74	
Estimated GFA (Millions of square metres)	14.13	0.35	3.96	19.23

* Value not calculated, but provided in Table 13 of the of the York Region 2031 Land Budget (March 2010)

Floor Space Estimates for Residential Built Form

BRAMPTON		Single	Semi	Row	Apt	TOTAL
2006	Unit Count	65565	17000	14125	29240	125930
2006	Est. Prop of Total	52.1%	13.5%	11.2%	23.2%	100.0%
2006	Conversion Factor (sq m)	241.0	136.0	148.0	90.0	
2006	Est. GFA (M sq m)	15.80	2.31	2.09	2.63	

2031	Unit Count	108500	33800	29300	46000	217600
2031	Est. Prop of Total	49.9%	15.5%	13.5%	21.1%	100.0%
2031	Conversion Factor (sq m)	241.0	136.0	148.0	90.0	
2031	Est. GFA (M sq m)	26.15	4.60	4.34	4.14	

RICHMOND HILL		Single	Semi	Row	Apt⁵	TOTAL
2006	Unit Count	32440	2080	7030	9375	51000
2006	Est. Prop of Total	63.6%	4.1%	13.8%	18.4%	99.9%
2006	Conversion Factor (sq m)	241.0	136.0	148.0	90.0	
2006	Est. GFA (M sq m)	7.82	0.28	1.04	0.84	

2031	Unit Count	41380	5140	12820	22015	81355
2031	Est. Prop of Total	50.9%	6.3%	15.8%	27.1%	100.0%
2031	Conversion Factor (sq m)	241.0	136.0	148.0	90.0	
2031	Est. GFA (M sq m)	9.97	0.70	1.90	1.98	

VAUGHAN		Single	Semi	Row	Apt⁵	TOTAL
2006	Unit Count	47910	5702	6397	9179	69535
2006	Est. Prop of Total	68.9%	8.2%	9.2%	13.2%	99.5%
2006	Conversion Factor (sq m)	241.0	136.0	148.0	90.0	
2006	Est. GFA (M sq m)	11.55	0.78	0.95	0.83	

2031	Unit Count	69220	10632	17407	38109	135367
2031	Est. Prop of Total	51.1%	7.9%	12.9%	28.2%	100.0%
2031	Conversion Factor (sq m)	241.0	136.0	148.0	90.0	
2031	Est. GFA (M sq m)	16.68	1.45	2.58	3.43	

Note: Totals may not add due to rounding.

⁵ The York Region March 2012 Land Budget assumes that the duplex forecast of 9,065 units was to locate within the Designated Greenfield Area and is included with the apartment category.

Calculation of Average Gross Floor Area (GFA) using MPAC Data of Richmond Hill's Residential Building Stock

The average GFA of the Town's residential building stock was obtained using Municipal Property Assessment Corporation (MPAC) data. The MPAC data used to calculate the GFA was from the latest available year (2011), as 2006 data could not retroactively be obtained.

The first step in this process was to determine the MPAC data that accurately represented each of the housing categories of single detached, semi-detached, townhouse and apartment dwelling units. MPAC assigns a 3-digit property code (a SAS Code) to each property in Ontario. The property code is based on both the physical characteristics and the predominate use of the overall property. Additional considerations include zoning and the number of units for each property type.

Using the same methodology the Planning Department uses to prepare Richmond Hill's *Housing Supply Update* (2010), the following SAS Codes provide an accurate representation of the Town's residential built stock:

Property SAS Codes for Residential Buildings

Single Detached	Semi-detached	Townhouse	Apartment
211	311	127	333
221	322	309	334
231		350	335
244		352	336
261		370 ⁶	340
301		374	341
302			370 ⁶
303			471
304			626
305			
313			
332			
365			
391			

Note: These SAS Codes provide an accurate representation of Richmond Hill's residential built stock. They may not give an accurate representation of the residential built stock of every municipality, as they omit property codes of some residential uses.

It was also necessary to filter and refine the residential data based on MPAC's property description using the 'Structure_1' category. The property descriptor was used to filter out entries such as garages, pools, sheds, etc. that were captured as separate entities to the main residential structure. Likewise, entries described as a 'virtual structure for roll numbers without any physical structure' were also excluded. Once the data was filtered, the total GFA and the average GFA by unit type was calculated. In addition, the data was organized by 'year built', to capture the changes made from the base year (2006) to the present. This raw data was then organized geographically by concession block to understand the average GFA by geographic area.

Average Residential GFA by Housing Typology (2006)

	Single Detached	Semi-Detached	Townhouse	Apartment
Total Number of Units	35,153	2,249	7,020	6,363

⁶ SAS Code 370 can represent either a Town or Apartment dwelling unit; entries were filtered into the Townhouse or Apartment category based on their property description (provided by the 'Structure_1' category).

Total GFA of Units (sqm)	8,470,518.65	306,629.76	1,037,852.66	569,890.40
Average GFA of Unit Type (sqm)	240.96	136.34	147.84	89.56
Number of Units Built before 1985	9,709	913	538	2,682
Percentage of Units Built before 1985	27.6%	40.6%	7.7%	42.1%

Average Residential GFA by Housing Typology (2011)

	Single Detached	Semi-Detached	Townhouse	Apartment
Total Number of Units	36,949	2,407	7,523	7,425
Total GFA of Units (sqm)	8,954,044.36	334,590.55	1,119,359.61	651,805.11
Average GFA of Unit Type (sqm)	242.34	139.01	148.79	87.79
Number of Units Built before 1991	17,765	913	1,057	5,307
Percentage of Units Built before 1991	48.1%	37.9%	14.1%	71.5%

Average Residential GFA by Concession Block (2011)

	Single Detached	Semi-Detached	Townhouse	Apartment
Block #	Square Metres	Square Metres	Square Metres	Square Metres
1	221.74	165.42	140.53	103.55
2	227.94	150.45	170.78	100.32
3	158.00	-	-	55.77
4	195.33	-	-	-
5	199.98	-	-	-
6	221.85	173.67	-	-
7	206.77	166.59	171.57	59.50
8	231.46	161.71	152.00	-
9	259.96	251.79	182.23	-
10	278.72	-	126.98	-
11	430.02	-	-	196.92
12	208.56	-	-	55.64
13	183.45	-	-	-
14	200.64	-	-	-
15	240.73	-	145.33	91.41
16	248.11	170.25	167.21	-
17	228.56	171.30	155.71	74.22
18	122.05	98.67	93.76	79.29
19	231.46	160.84	151.48	-
20	210.58	-	-	-
21	210.04	-	-	-
22	391.70	-	-	-
23	185.12	93.96	128.24	91.60
24	192.93	-	136.03	110.38
25	261.48	195.81	160.59	122.06
26	274.73	162.31	145.46	69.88
27	287.22	-	159.91	102.50
28	-	-	-	97.29

Dwelling Unit Summary by Concession Block (2011)

	Single Detached	Semi-Detached	Townhouse	Apartment
Block #	# of Units	# of Units	# of Units	# of Units
1	2,200	106	327	11
2	1,707	124	197	7
3	5	-	-	6
4	16	-	-	-
5	17	-	-	-
6	116	48	-	-
7	1,080	344	286	20
8	2,249	106	577	-
9	1,567	3	150	-
10	634	-	66	-
11	214	-	-	1
12	50	-	-	2
13	9	-	-	-
14	16	-	-	-
15	2,369	-	149	158
16	3,090	148	697	-
17	2,887	6	169	697
18	1,794	851	9	1,092
19	3,447	237	1,434	-
20	3	-	-	-
21	7	-	-	-
22	2,707	-	-	-
23	2,091	58	737	2,717
24	2,947	-	1,048	1,178
25	2,004	2	20	6
26	1,294	374	1,423	1,214
27	2,429	-	234	28
28	-	-	-	288
TOTALS	36,949	2,407	7,523	7,425

APPENDIX B: GHG Emission Intensities Calculations

RESIDENTIAL - SINGLE DETACHED

End Use	Fuel Type	Energy % Breakdown	Building Energy Intensity (GJ/m ²)	GHG Intensity by Fuel Type (tCO ₂ e/GJ)	% GHG Emissions (tCO ₂ e/GJ)	GHG Emissions (tCO ₂ e/m ²)
Space Heating	Natural Gas	65.3%	0.82	0.04955	0.03236	0.02653
Water Heating	Natural Gas	15.9%	0.82	0.04955	0.00788	0.00646
Appliances	Electricity	10.7%	0.82	0.05326	0.00570	0.00467
Lighting	Electricity	4.3%	0.82	0.05326	0.00229	0.00188
Space Cooling	Electricity	3.9%	0.82	0.05326	0.00208	0.00170
					0.05030	0.04125

RESIDENTIAL - SINGLE ATTACHED

End Use	Fuel Type	Energy % Breakdown	Building Energy Intensity (GJ/m ²)	GHG Intensity by Fuel Type (tCO ₂ e/GJ)	% GHG Emissions (tCO ₂ e/GJ)	GHG Emissions (tCO ₂ e/m ²)
Space Heating	Natural Gas	57.5%	0.77	0.04843	0.02785	0.02144
Water Heating	Natural Gas	20.7%	0.77	0.04843	0.01003	0.00772
Appliances	Electricity	13.4%	0.77	0.05326	0.00714	0.00550
Lighting	Electricity	4.1%	0.77	0.05326	0.00218	0.00168
Space Cooling	Electricity	4.3%	0.77	0.05326	0.00229	0.00176
					0.04948	0.03810

RESIDENTIAL - APARTMENT

End Use	Fuel Type	Energy % Breakdown	Building Energy Intensity (GJ/m ²)	GHG Intensity by Fuel Type (tCO ₂ e/GJ)	% GHG Emissions (tCO ₂ e/GJ)	GHG Emissions (tCO ₂ e/m ²)
Space Heating	Natural Gas	47.3%	0.74	0.04960	0.02346	0.01736
Water Heating	Natural Gas	29.8%	0.74	0.04960	0.01478	0.01094
Appliances	Electricity	18.2%	0.74	0.05326	0.00969	0.00717
Lighting	Electricity	2.4%	0.74	0.05326	0.00128	0.00095
Space Cooling	Electricity	2.3%	0.74	0.05326	0.00122	0.00091
					0.05044	0.03732

NON-RESIDENTIAL

End Use	Fuel Type	Energy % Breakdown	Building Energy Intensity (GJ/m ²)	GHG Intensity by Fuel Type (tCO ₂ e/GJ)	% GHG Emissions (tCO ₂ e/GJ)	GHG Emissions (tCO ₂ e/m ²)
Space Heating	Natural Gas	47.0%	1.59	0.04950	0.02327	0.03699
Water Heating	Natural Gas	9.4%	1.59	0.04950	0.00465	0.00740
Lighting	Electricity	8.2%	1.59	0.05326	0.00437	0.00694
Space Cooling	Electricity	11.3%	1.59	0.05326	0.00602	0.00957
Auxiliary Motors	Electricity	6.9%	1.59	0.05326	0.00367	0.00584
Auxiliary Equipment	Electricity	16.6%	1.59	0.05326	0.00884	0.01406
Street Lighting	Electricity	0.8%	1.59	0.05326	0.00043	0.00068
					0.05125	0.08148

City of Vaughan: 2006 Baseline

Population: 249,300

Building Type	Number of Units	Conversion Factor (m ² /unit)	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	Total Annual GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
Residential, Single Detached:	47,910	241.0	11,544,394	0.82	9,466,403	0.05030	476,167	1.91
Residential, Single Attached:								
Semi-detached	5,702	136.3	1,723,143	0.77	1,326,820	0.04948	65,655	0.26
Row	6,397	147.8	822,071	0.74	608,333	0.05044	30,683	0.12
Residential, Apartment:	9,179	89.6	11,329,286	1.59	18,013,565	0.05125	923,121	3.70
Non-Residential:								
Total:	69,188		25,418,894		29,415,120		1,495,626	6.00

City of Vaughan: 2031 Growth Forecast (Assuming No Change)

Population: 416,600

Building Type	Number of New Units	Conversion Factor (m ² /unit)	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	Total Annual GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
Residential, Single Detached:	21,310	241.0	5,134,858	0.82	4,210,583	0.05030	211,795	1.27
Residential, Single Attached:								
Semi-detached	4,930	136.3	2,299,875	0.77	1,770,903	0.04948	87,630	0.52
Row	11,010	147.8	2,590,971	0.74	1,917,318	0.05044	96,706	0.58
Residential, Apartment:	28,930	89.6	7,905,746	1.59	12,570,137	0.05125	644,168	3.85
Non-Residential:								
Total:	66,180		17,931,449		20,468,942		1,040,299	6.22
GRAND TOTAL:	135,368		43,350,343		49,884,062		2,535,925	6.09

City of Vaughan: 2031 Scenario 1

RESIDENTIAL

NON-RESIDENTIAL

Single Detached, Single Attached, Row		Apartments		Retrofit	
Percent Improvement of Retrofits:	23.2%	Percent Improvement of Retrofits:	15.9%	Percent Improvement of Retrofits:	46.7%
Proportion of Existing Units:	0%	Proportion of Existing Units:	0%	Proportion of Baseline:	0%
New Build		New Build		New Build	
Base Level Improvement:	23.2%	Base Level Improvement:	15.9%	Base Level Improvement:	46.7%
Proportion of New Build:	20%	Proportion of New Build:	20%	Proportion of New Build:	20%
Higher Level Improvement:	23.2%	Higher Level Improvement:	15.9%	Higher Level Improvement:	46.7%
Proportion of New Build:	56.0%	Proportion of New Build:	56.0%	Proportion of New Build:	56.0%
Population: 416,600					

unchanged units	Building Type	Number of Unchanged Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	53,024	241.0	12,776,759	0.82	10,476,943	0.05030	526,998	1.26
Residential, Single Attached:									
Semi-detached	6,885	136.3	2,275,113	0.77	1,751,837	0.04948	86,686	0.21	
Row	9,039	147.8							
Residential, Apartment:	16,122	89.6	1,443,904	0.74	1,068,489	0.05044	53,893	0.13	
Non-Residential:			11,329,286	1.59	18,013,565	0.05125	923,121	2.22	
Total:	85,071		27,825,063		31,310,833		1,590,698	3.82	

retrofit units	Building Type	Number of Retrofit Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	0	241.0	0	0.63	0	0.05030	0	0.00
Residential, Single Attached:									
Semi-detached	0	136.3	0	0.59	0	0.04948	0	0.00	
Row	0	147.8							
Residential, Apartment:	0	89.6	0	0.62	0	0.05044	0	0.00	
Non-Residential:			0	0.85	0	0.05125	0	0.00	
Total:	0		0		0		0	0.00	

new building stock 'A'	Building Type	Number of New Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	4,262	241.0	1,026,972	0.63	646,746	0.05030	32,532	0.08
Residential, Single Attached:									
Semi-detached	986	136.3	459,975	0.59	272,011	0.04948	13,460	0.03	
Row	2,202	147.8							
Residential, Apartment:	5,786	89.6	518,194	0.62	322,493	0.05044	16,266	0.04	
Non-Residential:			1,581,149	0.85	1,339,977	0.05125	68,668	0.16	
Total:	13,236		3,586,290		2,581,226		130,926	0.31	

new building stock 'B'	Building Type	Number of New Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	11,934	241.0	2,875,520	0.63	1,810,888	0.05030	91,089	0.22
Residential, Single Attached:									
Semi-detached	2,761	136.3	1,287,930	0.59	761,630	0.04948	37,688	0.09	
Row	6,166	147.8							
Residential, Apartment:	16,201	89.6	1,450,944	0.62	902,980	0.05044	45,545	0.11	
Non-Residential:			4,427,218	0.85	3,751,934	0.05125	192,271	0.46	
Total:	37,061		10,041,612		7,227,432		366,593	0.88	

GRAND TOTAL:	135,368		41,452,964		41,119,492		2,088,216	5.01
					98.70 per capita			5.01

Town of Richmond Hill: 2006 Baseline

Population: 169,800

Building Type	Number of Units	Conversion Factor (m ² /unit)	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	Total Annual GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
Residential, Single Detached:	32,440	241.0	7,816,742	0.82	6,409,729	0.05042	323,159	1.90
Residential, Single Attached:								
Semi-detached	2,080	136.3	1,322,902	0.77	1,018,635	0.05052	51,464	0.30
Row	7,030	147.8	839,625	0.74	621,323	0.05052	31,391	0.18
Residential, Apartment:	9,375	89.6	3,585,179	1.59	5,700,434	0.05229	298,072	1.76
Non-Residential:								
Total:	50,925		13,564,448		13,750,120		704,085	4.15

Town of Richmond Hill: 2031 Growth Forecast (Assuming No Change)

Population: 242,200

Building Type	Number of New Units	Conversion Factor (m ² /unit)	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	Total Annual GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
Residential, Single Detached:	8,940	241.0	2,154,182	0.82	1,766,430	0.05030	88,853	1.23
Residential, Single Attached:								
Semi-detached	3,060	136.3	1,273,194	0.77	980,359	0.04948	48,511	0.67
Row	5,790	147.8	1,132,038	0.74	837,708	0.05044	42,252	0.58
Residential, Apartment:	12,640	89.6	2,247,699	1.59	3,573,841	0.05125	183,145	2.53
Non-Residential:								
Total:	30,430		6,807,114		7,158,338		362,761	5.01
GRAND TOTAL:	81,355		20,371,562		20,908,458		1,066,846	4.40

Town of Richmond Hill: 2031 Scenario 1

RESIDENTIAL

NON-RESIDENTIAL

Single Detached, Single Attached, Row		Apartments		Retrofit	
Retrofit		Retrofit		Retrofit	
Percent Improvement of Retrofits:	23.2%	Percent Improvement of Retrofits:	15.9%	Percent Improvement of Retrofits:	46.7%
Proportion of Existing Units:	0%	Proportion of Existing Units:	0%	Proportion of Baseline:	0%
New Build		New Build		New Build	
Base Level Improvement:	23.2%	Base Level Improvement:	15.9%	Base Level Improvement:	46.7%
Proportion of New Build:	20%	Proportion of New Build:	20%	Proportion of New Build:	20%
Higher Level Improvement:	23.2%	Higher Level Improvement:	15.9%	Higher Level Improvement:	46.7%
Proportion of New Build:	56.0%	Proportion of New Build:	56.0%	Proportion of New Build:	56.0%
Population: 242,200					

unchanged units	Building Type	Number of Unchanged Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	34,586	241.0	8,333,746	0.82	6,833,672	0.05030	343,739	1.42
Residential, Single Attached:									
Semi-detached Row	2,814	136.3	1,628,469	0.77	1,253,921	0.04948	62,048	0.26	
Residential, Apartment:	8,420	147.8	1,111,314	0.74	822,373	0.05044	41,479	0.17	
Non-Residential:	12,409	89.6	3,585,179	1.59	5,700,434	0.05125	292,124	1.21	
Total:	58,228		14,658,708		14,610,399		739,389	3.05	

retrofit units	Building Type	Number of Retrofit Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	0	241.0	0	0.63	0	0.05030	0	0.00
Residential, Single Attached:									
Semi-detached Row	0	136.3	0	0.59	0	0.04948	0	0.00	
Residential, Apartment:	0	147.8	0	0.62	0	0.05044	0	0.00	
Non-Residential:	0	89.6	0	0.85	0	0.05125	0	0.00	
Total:	0		0		0		0	0.00	

new building stock 'A'	Building Type	Number of New Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	1,788	241.0	430,836	0.63	271,324	0.05030	13,648	0.06
Residential, Single Attached:									
Semi-detached	612	136.3	254,639	0.59	150,583	0.04948	7,451	0.03	
Row	1,158	147.8							
Residential, Apartment:	2,528	89.6	226,408	0.62	140,903	0.05044	7,107	0.03	
Non-Residential:			449,540	0.85	380,971	0.05125	19,523	0.08	
Total:	6,086		1,361,423		943,781		47,729	0.20	

new building stock 'B'	Building Type	Number of New Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	5,006	241.0	1,206,342	0.63	759,706	0.05030	38,214	0.16
Residential, Single Attached:									
Semi-detached	1,714	136.3	712,989	0.59	421,633	0.04948	20,864	0.09	
Row	3,242	147.8							
Residential, Apartment:	7,078	89.6	633,942	0.62	394,527	0.05044	19,899	0.08	
Non-Residential:			1,258,711	0.85	1,066,720	0.05125	54,665	0.23	
Total:	17,041		3,811,984		2,642,586		133,642	0.55	

GRAND TOTAL:	81,355		19,832,114		18,196,766		920,760	3.80
					75.13 per capita			3.80

City of Brampton: 2006 Baseline

Population:		453,000						
Building Type	Number of Units	Conversion Factor (m ² /unit)	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	Total Annual GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
Residential, Single Detached:	65,565	241.0	15,798,542	0.82	12,954,805	0.05030	651,636	1.44
Residential, Single Attached:								
Semi-detached	17,000	136.3	4,406,020	0.77	3,392,635	0.04948	167,878	0.37
Row	14,125	147.8						
Residential, Apartment:	29,240	89.6	2,618,734	0.74	1,937,863	0.05044	97,742	0.22
Non-Residential:			10,227,339	1.59	16,261,469	0.05125	833,333	1.84
Total:	125,930		33,050,636		34,546,773		1,750,589	3.86

City of Brampton: 2031 Growth Forecast (Assuming No Change)

Population:		738,000						
Building Type	Number of New Units	Conversion Factor (m ² /unit)	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	Total Annual GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
Residential, Single Detached:	42,935	241.0	10,345,618	0.82	8,483,406	0.05030	426,722	1.50
Residential, Single Attached:								
Semi-detached	16,800	136.3	4,533,984	0.77	3,491,168	0.04948	172,753	0.61
Row	15,175	147.8						
Residential, Apartment:	16,760	89.6	1,501,026	0.74	1,110,759	0.05044	56,025	0.20
Non-Residential:			10,227,016	1.59	16,260,955	0.05125	833,307	2.92
Total:	91,670		26,607,643		29,346,288		1,488,806	5.22
GRAND TOTAL:	217,600		59,658,279		63,893,061		3,239,396	4.39

City of Brampton: 2031 Scenario 1

RESIDENTIAL

NON-RESIDENTIAL

Single Detached, Single Attached, Row		Apartments		Retrofit	
Retrofit		Retrofit		Retrofit	
Percent Improvement of Retrofits:	23.2%	Percent Improvement of Retrofits:	15.9%	Percent Improvement of Retrofits:	46.7%
Proportion of Existing Units:	0%	Proportion of Existing Units:	0%	Proportion of Baseline:	0%
New Build		New Build		New Build	
Base Level Improvement:	23.2%	Base Level Improvement:	15.9%	Base Level Improvement:	46.7%
Proportion of New Build:	20%	Proportion of New Build:	20%	Proportion of New Build:	20%
Higher Level Improvement:	23.2%	Higher Level Improvement:	15.9%	Higher Level Improvement:	46.7%
Proportion of New Build:	56.0%	Proportion of New Build:	56.0%	Proportion of New Build:	56.0%
Population: 738,000					

unchanged units	Building Type	Number of Unchanged Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	75,869	241.0	18,281,491	0.82	14,990,822	0.05030	754,049	1.02
Residential, Single Attached:									
Semi-detached Row	21,032	136.3	5,494,176	0.77	4,230,516	0.04948	209,338	0.28	
Residential, Apartment:	17,767	147.8	2,978,981	0.74	2,204,446	0.05044	111,188	0.15	
Non-Residential:	33,262	89.6	10,227,339	1.59	16,261,469	0.05125	833,333	1.13	
Total:	147,931		36,981,986		37,687,253		1,907,909	2.59	

retrofit units	Building Type	Number of Retrofit Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	0	241.0	0	0.63	0	0.05030	0	0.00
Residential, Single Attached:									
Semi-detached Row	0	136.3	0	0.59	0	0.04948	0	0.00	
Residential, Apartment:	0	147.8	0	0.62	0	0.05044	0	0.00	
Non-Residential:	0	89.6	0	0.85	0	0.05125	0	0.00	
Total:	0		0		0		0	0.00	

new building stock 'A'	Building Type	Number of New Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	8,587	241.0	2,069,124	0.63	1,303,051	0.05030	65,544	0.09
Residential, Single Attached:									
Semi-detached	3,360	136.3	906,797	0.59	536,243	0.04948	26,535	0.04	
Row	3,035	147.8							
Residential, Apartment:	3,352	89.6	300,205	0.62	186,830	0.05044	9,423	0.01	
Non-Residential:			2,045,403	0.85	1,733,418	0.05125	88,831	0.12	
Total:	18,334		5,321,529		3,759,542		190,333	0.26	
new building stock 'B'	Building Type	Number of New Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	24,044	241.0	5,793,546	0.63	3,648,543	0.05030	183,524	0.25
Residential, Single Attached:									
Semi-detached	9,408	136.3	2,539,031	0.59	1,501,481	0.04948	74,298	0.10	
Row	8,498	147.8							
Residential, Apartment:	9,386	89.6	840,574	0.62	523,123	0.05044	26,385	0.04	
Non-Residential:			5,727,129	0.85	4,853,570	0.05125	248,725	0.34	
Total:	51,335		14,900,280		10,526,718		532,933	0.72	
GRAND TOTAL:	217,600		57,203,795		51,973,513		2,631,175	3.57	
					70.42 per capita			3.57	

City of Vaughan: 2031 Scenario 2

RESIDENTIAL

NON-RESIDENTIAL

Single Detached, Single Attached, Row		Apartments		Retrofit	
Percent Improvement of Retrofits:	23.2%	Percent Improvement of Retrofits:	15.9%	Percent Improvement of Retrofits:	46.7%
Proportion of Existing Units:	0%	Proportion of Existing Units:	0%	Proportion of Baseline:	0%
New Build		New Build		New Build	
Base Level Improvement:	23.2%	Base Level Improvement:	15.9%	Base Level Improvement:	46.7%
Proportion of New Build:	20%	Proportion of New Build:	20%	Proportion of New Build:	20%
Higher Level Improvement:	50.0%	Higher Level Improvement:	35.0%	Higher Level Improvement:	60.9%
Proportion of New Build:	56.0%	Proportion of New Build:	56.0%	Proportion of New Build:	56.0%
Population: 416,600					

unchanged units	Building Type	Number of Unchanged Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	53,024	241.0	12,776,759	0.82	10,476,943	0.05030	526,998	1.26
Residential, Single Attached:									
Semi-detached	6,885	136.3	2,275,113	0.77	1,751,837	0.04948	86,686	0.21	
Row	9,039	147.8							
Residential, Apartment:	16,122	89.6	1,443,904	0.74	1,068,489	0.05044	53,893	0.13	
Non-Residential:			11,329,286	1.59	18,013,565	0.05125	923,121	2.22	
Total:	85,071		27,825,063		31,310,833		1,590,698	3.82	

retrofit units	Building Type	Number of Retrofit Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	0	241.0	0	0.63	0	0.05030	0	0.00
Residential, Single Attached:									
Semi-detached	0	136.3	0	0.59	0	0.04948	0	0.00	
Row	0	147.8							
Residential, Apartment:	0	89.6	0	0.62	0	0.05044	0	0.00	
Non-Residential:			0	0.85	0	0.05125	0	0.00	
Total:	0		0		0		0	0.00	

new building stock 'A'	Building Type	Number of New Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	4,262	241.0	1,026,972	0.63	646,746	0.05030	32,532	0.08
Residential, Single Attached:									
Semi-detached	986	136.3	459,975	0.59	272,011	0.04948	13,460	0.03	
Row	2,202	147.8							
Residential, Apartment:	5,786	89.6	518,194	0.62	322,493	0.05044	16,266	0.04	
Non-Residential:			1,581,149	0.85	1,339,977	0.05125	68,668	0.16	
Total:	13,236		3,586,290		2,581,226		130,926	0.31	

new building stock 'B'	Building Type	Number of New Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	11,934	241.0	2,875,520	0.41	1,178,963	0.05030	59,303	0.14
Residential, Single Attached:									
Semi-detached	2,761	136.3	1,287,930	0.39	495,853	0.04948	24,536	0.06	
Row	6,166	147.8							
Residential, Apartment:	16,201	89.6	1,450,944	0.48	697,904	0.05044	35,201	0.08	
Non-Residential:			4,427,218	0.62	2,752,357	0.05125	141,047	0.34	
Total:	37,061		10,041,612		5,125,077		260,087	0.62	

GRAND TOTAL:	135,368		41,452,964		39,017,137		1,981,710	4.76
					93.66 per capita			4.76

Town of Richmond Hill: 2031 Scenario 2

RESIDENTIAL

NON-RESIDENTIAL

Single Detached, Single Attached, Row		Apartments		Retrofit	
Retrofit		Retrofit		Retrofit	
Percent Improvement of Retrofits:	23.2%	Percent Improvement of Retrofits:	15.9%	Percent Improvement of Retrofits:	46.7%
Proportion of Existing Units:	0%	Proportion of Existing Units:	0%	Proportion of Baseline:	0%
New Build		New Build		New Build	
Base Level Improvement:	23.2%	Base Level Improvement:	15.9%	Base Level Improvement:	46.7%
Proportion of New Build:	20%	Proportion of New Build:	20%	Proportion of New Build:	20%
Higher Level Improvement:	50.0%	Higher Level Improvement:	35.0%	Higher Level Improvement:	60.9%
Proportion of New Build:	56.0%	Proportion of New Build:	56.0%	Proportion of New Build:	56.0%
Population: 242,200					

unchanged units	Building Type	Number of Unchanged Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	34,586	241.0	8,333,746	0.82	6,833,672	0.05030	343,739	1.42
Residential, Single Attached:									
Semi-detached Row	2,814	136.3	1,628,469	0.77	1,253,921	0.04948	62,048	0.26	
Residential, Apartment:	8,420	147.8	1,111,314	0.74	822,373	0.05044	41,479	0.17	
Non-Residential:	12,409	89.6	3,585,179	1.59	5,700,434	0.05125	292,124	1.21	
Total:	58,228		14,658,708		14,610,399		739,389	3.05	

retrofit units	Building Type	Number of Retrofit Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	0	241.0	0	0.63	0	0.05030	0	0.00
Residential, Single Attached:									
Semi-detached Row	0	136.3	0	0.59	0	0.04948	0	0.00	
Residential, Apartment:	0	147.8	0	0.62	0	0.05044	0	0.00	
Non-Residential:	0	89.6	0	0.85	0	0.05125	0	0.00	
Total:	0		0		0		0	0.00	

new building stock 'A'	Building Type	Number of New Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	1,788	241.0	430,836	0.63	271,324	0.05030	13,648	0.06
Residential, Single Attached:									
Semi-detached	612	136.3	254,639	0.59	150,583	0.04948	7,451	0.03	
Row	1,158	147.8							
Residential, Apartment:	2,528	89.6	226,408	0.62	140,903	0.05044	7,107	0.03	
Non-Residential:			449,540	0.85	380,971	0.05125	19,523	0.08	
Total:	6,086		1,361,423		943,781		47,729	0.20	

new building stock 'B'	Building Type	Number of New Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	5,006	241.0	1,206,342	0.41	494,600	0.05030	24,879	0.10
Residential, Single Attached:									
Semi-detached	1,714	136.3	712,989	0.39	274,501	0.04948	13,583	0.06	
Row	3,242	147.8							
Residential, Apartment:	7,078	89.6	633,942	0.48	304,926	0.05044	15,380	0.06	
Non-Residential:			1,258,711	0.62	782,528	0.05125	40,101	0.17	
Total:	17,041		3,811,984		1,856,555		93,943	0.39	

GRAND TOTAL:	81,355		19,832,114		17,410,735		881,061	3.64
					71.89 per capita			3.64

City of Brampton: 2031 Scenario 2

RESIDENTIAL

NON-RESIDENTIAL

Single Detached, Single Attached, Row		Apartments		Retrofit	
Retrofit		Retrofit		Retrofit	
Percent Improvement of Retrofits:	23.2%	Percent Improvement of Retrofits:	15.9%	Percent Improvement of Retrofits:	46.7%
Proportion of Existing Units:	0%	Proportion of Existing Units:	0%	Proportion of Baseline:	0%
New Build		New Build		New Build	
Base Level Improvement:	23.2%	Base Level Improvement:	15.9%	Base Level Improvement:	46.7%
Proportion of New Build:	20%	Proportion of New Build:	20%	Proportion of New Build:	20%
Higher Level Improvement:	50.0%	Higher Level Improvement:	35.0%	Higher Level Improvement:	60.9%
Proportion of New Build:	56.0%	Proportion of New Build:	56.0%	Proportion of New Build:	56.0%
Population: 738,000					

unchanged units	Building Type	Number of Unchanged Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	75,869	241.0	18,281,491	0.82	14,990,822	0.05030	754,049	1.02
Residential, Single Attached:									
Semi-detached	21,032	136.3	5,494,176	0.77	4,230,516	0.04948	209,338	0.28	
Row	17,767	147.8							
Residential, Apartment:	33,262	89.6	2,978,981	0.74	2,204,446	0.05044	111,188	0.15	
Non-Residential:			10,227,339	1.59	16,261,469	0.05125	833,333	1.13	
Total:	147,931		36,981,986		37,687,253		1,907,909	2.59	

retrofit units	Building Type	Number of Retrofit Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	0	241.0	0	0.63	0	0.05030	0	0.00
Residential, Single Attached:									
Semi-detached	0	136.3	0	0.59	0	0.04948	0	0.00	
Row	0	147.8							
Residential, Apartment:	0	89.6	0	0.62	0	0.05044	0	0.00	
Non-Residential:			0	0.85	0	0.05125	0	0.00	
Total:	0		0		0		0	0.00	

new building stock 'A'	Building Type	Number of New Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	8,587	241.0	2,069,124	0.63	1,303,051	0.05030	65,544	0.09
Residential, Single Attached:									
Semi-detached	3,360	136.3	906,797	0.59	536,243	0.04948	26,535	0.04	
Row	3,035	147.8							
Residential, Apartment:	3,352	89.6	300,205	0.62	186,830	0.05044	9,423	0.01	
Non-Residential:			2,045,403	0.85	1,733,418	0.05125	88,831	0.12	
Total:	18,334		5,321,529		3,759,542		190,333	0.26	
new building stock 'B'	Building Type	Number of New Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	24,044	241.0	5,793,546	0.41	2,375,354	0.05030	119,482	0.16
Residential, Single Attached:									
Semi-detached	9,408	136.3	2,539,031	0.39	977,527	0.04948	48,371	0.07	
Row	8,498	147.8							
Residential, Apartment:	9,386	89.6	840,574	0.48	404,316	0.05044	20,393	0.03	
Non-Residential:			5,727,129	0.62	3,560,499	0.05125	182,461	0.25	
Total:	51,335		14,900,280		7,317,696		370,707	0.50	
GRAND TOTAL:	217,600		57,203,795		48,764,490		2,468,949	3.35	
					66.08 per capita			3.35	

City of Vaughan: 2031 Scenario 3

RESIDENTIAL

NON-RESIDENTIAL

Single Detached, Single Attached, Row		Apartments		Retrofit	
Percent Improvement of Retrofits:	23.2%	Percent Improvement of Retrofits:	15.9%	Percent Improvement of Retrofits:	46.7%
Proportion of Existing Units:	50%	Proportion of Existing Units:	50%	Proportion of Baseline:	50%
New Build		New Build		New Build	
Base Level Improvement:	23.2%	Base Level Improvement:	15.9%	Base Level Improvement:	46.7%
Proportion of New Build:	20%	Proportion of New Build:	20%	Proportion of New Build:	20%
Higher Level Improvement:	50.0%	Higher Level Improvement:	35.0%	Higher Level Improvement:	60.9%
Proportion of New Build:	56.0%	Proportion of New Build:	56.0%	Proportion of New Build:	56.0%
Population: 416,600					

unchanged units	Building Type	Number of Unchanged Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	29,069	241.0	7,004,563	0.82	5,743,741	0.05030	288,914	0.69
Residential, Single Attached:									
Semi-detached	4,034	136.3	1,413,541	0.77	1,088,427	0.04948	53,859	0.13	
Row	5,841	147.8							
Residential, Apartment:	11,533	89.6	1,032,869	0.74	764,323	0.05044	38,551	0.09	
Non-Residential:			5,664,643	1.59	9,006,782	0.05125	461,560	1.11	
Total:	50,477		15,115,616		16,603,273		842,885	2.02	

retrofit units	Building Type	Number of Retrofit Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	26,512	241.0	6,388,380	0.63	4,023,146	0.05030	202,367	0.49
Residential, Single Attached:									
Semi-detached	3,443	136.3	1,137,557	0.59	672,705	0.04948	33,287	0.08	
Row	4,520	147.8							
Residential, Apartment:	8,061	89.6	721,952	0.62	449,300	0.05044	22,662	0.05	
Non-Residential:			5,664,643	0.85	4,800,615	0.05125	246,012	0.59	
Total:	42,536		13,912,531		9,945,766		504,328	1.21	

new building stock 'A'	Building Type	Number of New Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	4,262	241.0	1,026,972	0.63	646,746	0.05030	32,532	0.08
Residential, Single Attached:									
Semi-detached	986	136.3	459,975	0.59	272,011	0.04948	13,460	0.03	
Row	2,202	147.8							
Residential, Apartment:	5,786	89.6	518,194	0.62	322,493	0.05044	16,266	0.04	
Non-Residential:			1,581,149	0.85	1,339,977	0.05125	68,668	0.16	
Total:	13,236		3,586,290		2,581,226		130,926	0.31	

new building stock 'B'	Building Type	Number of New Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	11,934	241.0	2,875,520	0.41	1,178,963	0.05030	59,303	0.14
Residential, Single Attached:									
Semi-detached	2,761	136.3	1,287,930	0.39	495,853	0.04948	24,536	0.06	
Row	6,166	147.8							
Residential, Apartment:	16,201	89.6	1,450,944	0.48	697,904	0.05044	35,201	0.08	
Non-Residential:			4,427,218	0.62	2,752,357	0.05125	141,047	0.34	
Total:	37,061		10,041,612		5,125,077		260,087	0.62	

GRAND TOTAL:	143,310		42,656,048		34,255,343		1,738,226	4.17
					82.23 per capita			4.17

Town of Richmond Hill: 2031 Scenario 3

RESIDENTIAL

NON-RESIDENTIAL

Single Detached, Single Attached, Row		Apartments		Retrofit	
Retrofit		Retrofit		Retrofit	
Percent Improvement of Retrofits:	23.2%	Percent Improvement of Retrofits:	15.9%	Percent Improvement of Retrofits:	46.7%
Proportion of Existing Units:	50%	Proportion of Existing Units:	50%	Proportion of Baseline:	50%
New Build		New Build		New Build	
Base Level Improvement:	23.2%	Base Level Improvement:	15.9%	Base Level Improvement:	46.7%
Proportion of New Build:	20%	Proportion of New Build:	20%	Proportion of New Build:	20%
Higher Level Improvement:	50.0%	Higher Level Improvement:	35.0%	Higher Level Improvement:	60.9%
Proportion of New Build:	56.0%	Proportion of New Build:	56.0%	Proportion of New Build:	56.0%
Population: 242,200					

unchanged units	Building Type	Number of Unchanged Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	18,366	241.0	4,425,375	0.82	3,628,807	0.05030	182,532	0.75
Residential, Single Attached:									
Semi-detached Row	1,774	136.3	967,018	0.77	744,604	0.04948	36,845	0.15	
Residential, Apartment:	4,905	147.8	691,502	0.74	511,711	0.05044	25,810	0.11	
Non-Residential:	7,721	89.6	1,792,589	1.59	2,850,217	0.05125	146,062	0.60	
Total:	32,766		7,876,484		7,735,339		391,249	1.62	

retrofit units	Building Type	Number of Retrofit Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	17,293	241.0	4,166,873	0.63	2,624,130	0.05030	131,996	0.54
Residential, Single Attached:									
Semi-detached Row	1,407	136.3	814,234	0.59	481,506	0.04948	23,826	0.10	
Residential, Apartment:	4,210	147.8	555,657	0.62	345,808	0.05044	17,442	0.07	
Non-Residential:	6,204	89.6	1,792,589	0.85	1,519,166	0.05125	77,851	0.32	
Total:	29,114		7,329,354		4,970,609		251,115	1.04	

new building stock 'A'	Building Type	Number of New Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	1,788	241.0	430,836	0.63	271,324	0.05030	13,648	0.06
Residential, Single Attached:									
Semi-detached	612	136.3	254,639	0.59	150,583	0.04948	7,451	0.03	
Row	1,158	147.8							
Residential, Apartment:	2,528	89.6	226,408	0.62	140,903	0.05044	7,107	0.03	
Non-Residential:			449,540	0.85	380,971	0.05125	19,523	0.08	
Total:	6,086		1,361,423		943,781		47,729	0.20	

new building stock 'B'	Building Type	Number of New Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	5,006	241.0	1,206,342	0.41	494,600	0.05030	24,879	0.10
Residential, Single Attached:									
Semi-detached	1,714	136.3	712,989	0.39	274,501	0.04948	13,583	0.06	
Row	3,242	147.8							
Residential, Apartment:	7,078	89.6	633,942	0.48	304,926	0.05044	15,380	0.06	
Non-Residential:			1,258,711	0.62	782,528	0.05125	40,101	0.17	
Total:	17,041		3,811,984		1,856,555		93,943	0.39	

GRAND TOTAL:	85,007		20,379,244		15,506,284		784,036	3.24
					64.02 per capita			3.24

City of Brampton: 2031 Scenario 3

RESIDENTIAL

NON-RESIDENTIAL

Single Detached, Single Attached, Row		Apartments		Retrofit	
Retrofit		Retrofit		Retrofit	
Percent Improvement of Retrofits:	23.2%	Percent Improvement of Retrofits:	15.9%	Percent Improvement of Retrofits:	46.7%
Proportion of Existing Units:	50%	Proportion of Existing Units:	50%	Proportion of Baseline:	50%
New Build		New Build		New Build	
Base Level Improvement:	23.2%	Base Level Improvement:	15.9%	Base Level Improvement:	46.7%
Proportion of New Build:	20%	Proportion of New Build:	20%	Proportion of New Build:	20%
Higher Level Improvement:	50.0%	Higher Level Improvement:	35.0%	Higher Level Improvement:	60.9%
Proportion of New Build:	56.0%	Proportion of New Build:	56.0%	Proportion of New Build:	56.0%
Population: 738,000					

unchanged units	Building Type	Number of Unchanged Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	43,087	241.0	10,382,219	0.82	8,513,420	0.05030	428,231	0.58
Residential, Single Attached:									
Semi-detached Row	12,532	136.3	3,291,166	0.77	2,534,198	0.04948	125,400	0.17	
Residential, Apartment:	10,705	147.8	1,669,613	0.74	1,235,514	0.05044	62,317	0.08	
Non-Residential:	18,642	89.6	5,113,670	1.59	8,130,735	0.05125	416,667	0.56	
Total:	84,966		20,456,668		20,413,866		1,032,615	1.40	

retrofit units	Building Type	Number of Retrofit Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	37,935	241.0	9,140,745	0.63	5,756,476	0.05030	289,555	0.39
Residential, Single Attached:									
Semi-detached Row	10,516	136.3	2,747,088	0.59	1,624,518	0.04948	80,386	0.11	
Residential, Apartment:	8,884	147.8	1,489,490	0.62	926,969	0.05044	46,755	0.06	
Non-Residential:	16,631	89.6	5,113,670	0.85	4,333,681	0.05125	222,083	0.30	
Total:	73,965		18,490,993		12,641,645		638,779	0.87	

new building stock 'A'	Building Type	Number of New Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	8,587	241.0	2,069,124	0.63	1,303,051	0.05030	65,544	0.09
Residential, Single Attached:									
Semi-detached	3,360	136.3	906,797	0.59	536,243	0.04948	26,535	0.04	
Row	3,035	147.8							
Residential, Apartment:	3,352	89.6	300,205	0.62	186,830	0.05044	9,423	0.01	
Non-Residential:			2,045,403	0.85	1,733,418	0.05125	88,831	0.12	
Total:	18,334		5,321,529		3,759,542		190,333	0.26	
new building stock 'B'	Building Type	Number of New Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	24,044	241.0	5,793,546	0.41	2,375,354	0.05030	119,482	0.16
Residential, Single Attached:									
Semi-detached	9,408	136.3	2,539,031	0.39	977,527	0.04948	48,371	0.07	
Row	8,498	147.8							
Residential, Apartment:	9,386	89.6	840,574	0.48	404,316	0.05044	20,393	0.03	
Non-Residential:			5,727,129	0.62	3,560,499	0.05125	182,461	0.25	
Total:	51,335		14,900,280		7,317,696		370,707	0.50	
GRAND TOTAL:	228,600		59,169,470		44,132,749		2,232,433	3.02	
					59.80 per capita			3.02	

City of Vaughan: 2031 Scenario 4

RESIDENTIAL

NON-RESIDENTIAL

Single Detached, Single Attached, Row		Apartments		Retrofit	
Percent Improvement of Retrofits:	23.2%	Percent Improvement of Retrofits:	15.9%	Percent Improvement of Retrofits:	46.7%
Proportion of Existing Units:	100%	Proportion of Existing Units:	100%	Proportion of Baseline:	100%
New Build		New Build		New Build	
Base Level Improvement:	23.2%	Base Level Improvement:	15.9%	Base Level Improvement:	46.7%
Proportion of New Build:	20%	Proportion of New Build:	20%	Proportion of New Build:	20%
Higher Level Improvement (Low-Rise):	75.0%	Higher Level Improvement:	75.0%	Higher Level Improvement:	75.0%
Proportion of New Build:	56.0%	Proportion of New Build:	56.0%	Proportion of New Build:	56.0%
Population:		416,600			

unchanged units	Building Type	Number of Unchanged Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	5,114	241.0	1,232,366	0.82	1,010,540	0.05030	50,831	0.12
Residential, Single Attached:									
Semi-detached	1,183	136.3	551,970	0.77	425,017	0.04948	21,031	0.05	
Row	2,642	147.8							
Residential, Apartment:	6,943	89.6	621,833	0.74	460,156	0.05044	23,209	0.06	
Non-Residential:			0	1.59	0	0.05125	0	0.00	
Total:	15,883		2,406,169		1,895,713		95,071	0.23	

retrofit units	Building Type	Number of Retrofit Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	53,024	241.0	12,776,759	0.63	8,046,292	0.05030	404,734	0.97
Residential, Single Attached:									
Semi-detached	6,885	136.3	2,275,113	0.59	1,345,411	0.04948	66,575	0.16	
Row	9,039	147.8							
Residential, Apartment:	16,122	89.6	1,443,904	0.62	898,599	0.05044	45,324	0.11	
Non-Residential:			11,329,286	0.85	9,601,230	0.05125	492,023	1.18	
Total:	85,071		27,825,063		19,891,532		1,008,656	2.42	

new building stock 'A'	Building Type	Number of New Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	4,262	241.0	1,026,972	0.63	646,746	0.05030	32,532	0.08
Residential, Single Attached:									
Semi-detached	986	136.3	459,975	0.59	272,011	0.04948	13,460	0.03	
Row	2,202	147.8							
Residential, Apartment:	5,786	89.6	518,194	0.62	322,493	0.05044	16,266	0.04	
Non-Residential:			1,581,149	0.85	1,339,977	0.05125	68,668	0.16	
Total:	13,236		3,586,290		2,581,226		130,926	0.31	
new building stock 'B'	Building Type	Number of New Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	11,934	241.0	2,875,520	0.21	589,482	0.05030	29,651	0.07
Residential, Single Attached:									
Semi-detached	2,761	136.3	1,287,930	0.19	247,926	0.04948	12,268	0.03	
Row	6,166	147.8							
Residential, Apartment:	16,201	89.6	1,450,944	0.19	268,425	0.05044	13,539	0.03	
Non-Residential:			4,427,218	0.40	1,759,819	0.05125	90,183	0.22	
Total:	37,061		10,041,612		2,865,652		145,642	0.35	
GRAND TOTAL:	151,251		43,859,133		27,234,123		1,380,296	3.31	
					65.37 per capita			3.31	

Town of Richmond Hill: 2031 Scenario 4

RESIDENTIAL

NON-RESIDENTIAL

Single Detached, Single Attached, Row		Apartments	
Retrofit		Retrofit	
Percent Improvement of Retrofits:	23.2%	Percent Improvement of Retrofits:	15.9%
Proportion of Existing Units:	100%	Proportion of Existing Units:	100%
New Build		New Build	
Base Level Improvement:	23.2%	Base Level Improvement:	15.9%
Proportion of New Build:	20%	Proportion of New Build:	20%
Higher Level Improvement (Low-Rise):	75.0%	Higher Level Improvement:	75.0%
Proportion of New Build:	56.0%	Proportion of New Build:	56.0%

Retrofit		New Build	
Percent Improvement of Retrofits:	46.7%	Base Level Improvement:	46.7%
Proportion of Baseline:	100%	Proportion of New Build:	20%
Higher Level Improvement:	75.0%	Higher Level Improvement:	75.0%
Proportion of New Build:	56.0%	Proportion of New Build:	56.0%

Population: 242,200

unchanged units	Building Type	Number of Unchanged Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	2,146	241.0	517,004	0.82	423,943	0.05030	21,325	0.09
Residential, Single Attached:									
Semi-detached Row	734	136.3	305,567	0.77	235,286	0.04948	11,643	0.05	
Residential, Apartment:	1,390	147.8	271,689	0.74	201,050	0.05044	10,141	0.04	
Non-Residential:	3,034	89.6	0	1.59	0	0.05125	0	0.00	
Total:	7,303		1,094,260		860,279		43,108	0.18	

retrofit units	Building Type	Number of Retrofit Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	34,586	241.0	8,333,746	0.63	5,248,260	0.05030	263,991	1.09
Residential, Single Attached:									
Semi-detached Row	2,814	136.3	1,628,469	0.59	963,011	0.04948	47,653	0.20	
Residential, Apartment:	8,420	147.8	1,111,314	0.62	691,615	0.05044	34,884	0.14	
Non-Residential:	12,409	89.6	3,585,179	0.85	3,038,331	0.05125	155,702	0.64	
Total:	58,228		14,658,708		9,941,218		502,230	2.07	

new building stock 'A'	Building Type	Number of New Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	1,788	241.0	430,836	0.63	271,324	0.05030	13,648	0.06
Residential, Single Attached:									
Semi-detached	612	136.3	254,639	0.59	150,583	0.04948	7,451	0.03	
Row	1,158	147.8							
Residential, Apartment:	2,528	89.6	226,408	0.62	140,903	0.05044	7,107	0.03	
Non-Residential:			449,540	0.85	380,971	0.05125	19,523	0.08	
Total:	6,086		1,361,423		943,781		47,729	0.20	

new building stock 'B'	Building Type	Number of New Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	5,006	241.0	1,206,342	0.21	247,300	0.05030	12,439	0.05
Residential, Single Attached:									
Semi-detached	1,714	136.3	712,989	0.19	137,250	0.04948	6,792	0.03	
Row	3,242	147.8							
Residential, Apartment:	7,078	89.6	633,942	0.19	117,279	0.05044	5,915	0.02	
Non-Residential:			1,258,711	0.40	500,338	0.05125	25,640	0.11	
Total:	17,041		3,811,984		1,002,167		50,787	0.21	

GRAND TOTAL:	88,658		20,926,374		12,747,446		643,853	2.66
					52.63 per capita			2.66

City of Brampton: 2031 Scenario 4

RESIDENTIAL

NON-RESIDENTIAL

Single Detached, Single Attached, Row		Apartments	
Retrofit		Retrofit	
Percent Improvement of Retrofits:	23.2%	Percent Improvement of Retrofits:	15.9%
Proportion of Existing Units:	100%	Proportion of Existing Units:	100%
New Build		New Build	
Base Level Improvement:	23.2%	Base Level Improvement:	15.9%
Proportion of New Build:	20%	Proportion of New Build:	20%
Higher Level Improvement (Low-Rise):	75.0%	Higher Level Improvement:	75.0%
Proportion of New Build:	56.0%	Proportion of New Build:	56.0%

Retrofit	
Percent Improvement of Retrofits:	46.7%
Proportion of Baseline:	100%
New Build	
Base Level Improvement:	46.7%
Proportion of New Build:	20%
Higher Level Improvement:	75.0%
Proportion of New Build:	56.0%

Population: 738,000

unchanged units	Building Type	Number of Unchanged Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	10,304	241.0	2,482,948	0.82	2,036,018	0.05030	102,413	0.14
Residential, Single Attached:									
Semi-detached	4,032	136.3	1,088,156	0.77	837,880	0.04948	41,461	0.06	
Row	3,642	147.8							
Residential, Apartment:	4,022	89.6	360,246	0.74	266,582	0.05044	13,446	0.02	
Non-Residential:			0	1.59	0	0.05125	0	0.00	
Total:	22,001		3,931,351		3,140,480		157,320	0.21	

retrofit units	Building Type	Number of Retrofit Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	75,869	241.0	18,281,491	0.63	11,512,952	0.05030	579,110	0.78
Residential, Single Attached:									
Semi-detached	21,032	136.3	5,494,176	0.59	3,249,036	0.04948	160,772	0.22	
Row	17,767	147.8							
Residential, Apartment:	33,262	89.6	2,978,981	0.62	1,853,939	0.05044	93,509	0.13	
Non-Residential:			10,227,339	0.85	8,667,363	0.05125	444,167	0.60	
Total:	147,931		36,981,986		25,283,289		1,277,558	1.73	

new building stock 'A'	Building Type	Number of New Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	8,587	241.0	2,069,124	0.63	1,303,051	0.05030	65,544	0.09
Residential, Single Attached:									
Semi-detached	3,360	136.3	906,797	0.59	536,243	0.04948	26,535	0.04	
Row	3,035	147.8							
Residential, Apartment:	3,352	89.6	300,205	0.62	186,830	0.05044	9,423	0.01	
Non-Residential:			2,045,403	0.85	1,733,418	0.05125	88,831	0.12	
Total:	18,334		5,321,529		3,759,542		190,333	0.26	

new building stock 'B'	Building Type	Number of New Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	24,044	241.0	5,793,546	0.21	1,187,677	0.05030	59,741	0.08
Residential, Single Attached:									
Semi-detached	9,408	136.3	2,539,031	0.19	488,763	0.04948	24,185	0.03	
Row	8,498	147.8							
Residential, Apartment:	9,386	89.6	840,574	0.19	155,506	0.05044	7,843	0.01	
Non-Residential:			5,727,129	0.40	2,276,534	0.05125	116,663	0.16	
Total:	51,335		14,900,280		4,108,480		208,433	0.28	

GRAND TOTAL:	239,601		61,135,146		36,291,792		1,833,644	2.48
					49.18 per capita			2.48

City of Vaughan: 2031 Scenario 5

RESIDENTIAL

NON-RESIDENTIAL

Single Detached, Single Attached, Row		Apartments		Retrofit	
Percent Improvement of Retrofits:	23.2%	Percent Improvement of Retrofits:	15.9%	Percent Improvement of Retrofits:	46.7%
Proportion of Existing Units:	100%	Proportion of Existing Units:	100%	Proportion of Baseline:	100%
New Build		New Build		New Build	
Base Level Improvement:	23.2%	Base Level Improvement:	15.9%	Base Level Improvement:	46.7%
Proportion of New Build:	20%	Proportion of New Build:	20%	Proportion of New Build:	20%
Higher Level Improvement (Low-Rise):	100.0%	Higher Level Improvement:	100.0%	Higher Level Improvement:	100.0%
Proportion of New Build:	56.0%	Proportion of New Build:	56.0%	Proportion of New Build:	56.0%
Population:		416,600			

unchanged units	Building Type	Number of Unchanged Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	5,114	241.0	1,232,366	0.82	1,010,540	0.05030	50,831	0.12
Residential, Single Attached:									
Semi-detached	1,183	136.3	551,970	0.77	425,017	0.04948	21,031	0.05	
Row	2,642	147.8							
Residential, Apartment:	6,943	89.6	621,833	0.74	460,156	0.05044	23,209	0.06	
Non-Residential:			0	1.59	0	0.05125	0	0.00	
Total:	15,883		2,406,169		1,895,713		95,071	0.23	

retrofit units	Building Type	Number of Retrofit Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	53,024	241.0	12,776,759	0.63	8,046,292	0.05030	404,734	0.97
Residential, Single Attached:									
Semi-detached	6,885	136.3	2,275,113	0.59	1,345,411	0.04948	66,575	0.16	
Row	9,039	147.8							
Residential, Apartment:	16,122	89.6	1,443,904	0.62	898,599	0.05044	45,324	0.11	
Non-Residential:			11,329,286	0.85	9,601,230	0.05125	492,023	1.18	
Total:	85,071		27,825,063		19,891,532		1,008,656	2.42	

new building stock 'A'	Building Type	Number of New Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	4,262	241.0	1,026,972	0.63	646,746	0.05030	32,532	0.08
Residential, Single Attached:									
Semi-detached	986	136.3	459,975	0.59	272,011	0.04948	13,460	0.03	
Row	2,202	147.8							
Residential, Apartment:	5,786	89.6	518,194	0.62	322,493	0.05044	16,266	0.04	
Non-Residential:			1,581,149	0.85	1,339,977	0.05125	68,668	0.16	
Total:	13,236		3,586,290		2,581,226		130,926	0.31	
new building stock 'B'	Building Type	Number of New Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	11,934	241.0	2,875,520	0.00	0	0.05030	0	0.00
	Residential, Single Attached:								
	Semi-detached	2,761	136.3	1,287,930	0.00	0	0.04948	0	0.00
	Row	6,166	147.8						
	Residential, Apartment:	16,201	89.6	1,450,944	0.00	0	0.05044	0	0.00
	Non-Residential:			4,427,218	0.00	0	0.05125	0	0.00
Total:	37,061		10,041,612		0		0	0.00	
GRAND TOTAL:	151,251		43,859,133		24,368,471		1,234,654	2.96	
					58.49 per capita			2.96	

Town of Richmond Hill: 2031 Scenario 5

RESIDENTIAL

NON-RESIDENTIAL

Single Detached, Single Attached, Row		Apartments	
Retrofit		Retrofit	
Percent Improvement of Retrofits:	23.2%	Percent Improvement of Retrofits:	15.9%
Proportion of Existing Units:	100%	Proportion of Existing Units:	100%
New Build		New Build	
Base Level Improvement:	23.2%	Base Level Improvement:	15.9%
Proportion of New Build:	20%	Proportion of New Build:	20%
Higher Level Improvement (Low-Rise):	100.0%	Higher Level Improvement:	100.0%
Proportion of New Build:	56.0%	Proportion of New Build:	56.0%

Retrofit		New Build	
Percent Improvement of Retrofits:	46.7%	Base Level Improvement:	46.7%
Proportion of Baseline:	100%	Proportion of New Build:	20%
Higher Level Improvement:	100.0%	Proportion of New Build:	56.0%

Population: 242,200

unchanged units	Building Type	Number of Unchanged Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	2,146	241.0	517,004	0.82	423,943	0.05030	21,325	0.09
Residential, Single Attached:									
Semi-detached Row	734	136.3	305,567	0.77	235,286	0.04948	11,643	0.05	
Residential, Apartment:	1,390	147.8	271,689	0.74	201,050	0.05044	10,141	0.04	
Non-Residential:	3,034	89.6	0	1.59	0	0.05125	0	0.00	
Total:	7,303		1,094,260		860,279		43,108	0.18	

retrofit units	Building Type	Number of Retrofit Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	34,586	241.0	8,333,746	0.63	5,248,260	0.05030	263,991	1.09
Residential, Single Attached:									
Semi-detached Row	2,814	136.3	1,628,469	0.59	963,011	0.04948	47,653	0.20	
Residential, Apartment:	8,420	147.8	1,111,314	0.62	691,615	0.05044	34,884	0.14	
Non-Residential:	12,409	89.6	3,585,179	0.85	3,038,331	0.05125	155,702	0.64	
Total:	58,228		14,658,708		9,941,218		502,230	2.07	

new building stock 'A'	Building Type	Number of New Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	1,788	241.0	430,836	0.63	271,324	0.05030	13,648	0.06
Residential, Single Attached:									
Semi-detached	612	136.3	254,639	0.59	150,583	0.04948	7,451	0.03	
Row	1,158	147.8							
Residential, Apartment:	2,528	89.6	226,408	0.62	140,903	0.05044	7,107	0.03	
Non-Residential:			449,540	0.85	380,971	0.05125	19,523	0.08	
Total:	6,086		1,361,423		943,781		47,729	0.20	

new building stock 'B'	Building Type	Number of New Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	5,006	241.0	1,206,342	0.00	0	0.05030	0	0.00
Residential, Single Attached:									
Semi-detached	1,714	136.3	712,989	0.00	0	0.04948	0	0.00	
Row	3,242	147.8							
Residential, Apartment:	7,078	89.6	633,942	0.00	0	0.05044	0	0.00	
Non-Residential:			1,258,711	0.00	0	0.05125	0	0.00	
Total:	17,041		3,811,984		0		0	0.00	

GRAND TOTAL:	88,658		20,926,374		11,745,278		593,067	2.45
					48.49 per capita			2.45

City of Brampton: 2031 Scenario 5

RESIDENTIAL

NON-RESIDENTIAL

Single Detached, Single Attached, Row		Apartments	
Retrofit		Retrofit	
Percent Improvement of Retrofits:	23.2%	Percent Improvement of Retrofits:	15.9%
Proportion of Existing Units:	100%	Proportion of Existing Units:	100%
New Build		New Build	
Base Level Improvement:	23.2%	Base Level Improvement:	15.9%
Proportion of New Build:	20%	Proportion of New Build:	20%
Higher Level Improvement (Low-Rise):	100.0%	Higher Level Improvement:	100.0%
Proportion of New Build:	56.0%	Proportion of New Build:	56.0%

Retrofit		New Build	
Percent Improvement of Retrofits:	46.7%	Base Level Improvement:	46.7%
Proportion of Baseline:	100%	Proportion of New Build:	20%
Higher Level Improvement:	100.0%	Proportion of New Build:	56.0%

Population: 738,000

unchanged units	Building Type	Number of Unchanged Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	10,304	241.0	2,482,948	0.82	2,036,018	0.05030	102,413	0.14
Residential, Single Attached:									
Semi-detached	4,032	136.3	1,088,156	0.77	837,880	0.04948	41,461	0.06	
Row	3,642	147.8							
Residential, Apartment:	4,022	89.6	360,246	0.74	266,582	0.05044	13,446	0.02	
Non-Residential:			0	1.59	0	0.05125	0	0.00	
Total:	22,001		3,931,351		3,140,480		157,320	0.21	

retrofit units	Building Type	Number of Retrofit Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	75,869	241.0	18,281,491	0.63	11,512,952	0.05030	579,110	0.78
Residential, Single Attached:									
Semi-detached	21,032	136.3	5,494,176	0.59	3,249,036	0.04948	160,772	0.22	
Row	17,767	147.8							
Residential, Apartment:	33,262	89.6	2,978,981	0.62	1,853,939	0.05044	93,509	0.13	
Non-Residential:			10,227,339	0.85	8,667,363	0.05125	444,167	0.60	
Total:	147,931		36,981,986		25,283,289		1,277,558	1.73	

new building stock 'A'	Building Type	Number of New Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	8,587	241.0	2,069,124	0.63	1,303,051	0.05030	65,544	0.09
Residential, Single Attached:									
Semi-detached	3,360	136.3	906,797	0.59	536,243	0.04948	26,535	0.04	
Row	3,035	147.8							
Residential, Apartment:	3,352	89.6	300,205	0.62	186,830	0.05044	9,423	0.01	
Non-Residential:			2,045,403	0.85	1,733,418	0.05125	88,831	0.12	
Total:	18,334		5,321,529		3,759,542		190,333	0.26	
new building stock 'B'	Building Type	Number of New Units	Conversion Factor	Gross Floor Space (m ²)	Average Annual Energy Demand (GJ/m ²)	Total Annual Energy Use (GJ)	GHG Emission Intensities (t-CO ₂ e/GJ)	GHG Emissions (t-CO ₂ e)	GHG Emissions per Capita (t-CO ₂ e/capita)
	Residential, Single Detached:	24,044	241.0	5,793,546	0.00	0	0.05030	0	0.00
Residential, Single Attached:									
Semi-detached	9,408	136.3	2,539,031	0.00	0	0.04948	0	0.00	
Row	8,498	147.8							
Residential, Apartment:	9,386	89.6	840,574	0.00	0	0.05044	0	0.00	
Non-Residential:			5,727,129	0.00	0	0.05125	0	0.00	
Total:	51,335		14,900,280		0		0	0.00	
GRAND TOTAL:	239,601		61,135,146		32,183,311		1,625,211	2.20	
					43.61 per capita			2.20	

APPENDIX D: Error Analysis

Commercial Energy Intensity

As part of the peer review for this report conducted by Halsall Associates Limited, it was noted that the provincial average energy intensity published by NRCAN for commercial buildings (1.59 GJ/m²), though not unreasonable for the purposes of this study, was slightly higher than the information in their database. Halsall has noted that their database of over 1000 commercial buildings in the Greater Toronto Area indicates that 1.15 GJ/m² is a more representative average energy intensity for local commercial buildings. In order to keep the sourcing of data consistent, however, the national averages published by NRCAN were used in the calculations for this report. This difference accounts for 20 million GJ of total energy use and 1 million tonnes of CO₂e across the partner municipalities in the 2006 Baseline Scenario to 2031.

Apartment Energy Intensity

A comparison is provided by Kesic and Miller (2008) who model a baseline condominium building to meet MNECB requirements. Appendix A of the Kesic and Miller report describes a 20 storey building with a conditioned area of 250,000 square feet and using 22,641 GJ per year. The energy intensity is calculated to be 0.97 GJ/m² and is noted in the report as 270 kWhe/m², which is much higher than the value provided by NRCAN for multi unit residential buildings (0.74 GJ/m²). A 25% improvement to the Kesic and Miller model would yield an energy intensity of 0.72 GJ/m². This difference results in an additional 1.7 million GJ of total energy use and minimal variation from the overall GHG emissions across the partner municipalities for Scenario 1, which adjusts for OBC 2012 requirements from 2012 to 2031. It is important to note that apartment buildings in Vaughan range from low- and mid-rise units to high-rise developments; hence, a lower energy intensity may be more representative of Vaughan's building typologies.

Energy Use Breakdowns

The peer review for this report also identified differences with industry experience and the NRCAN provincial average data for the breakdowns of both apartment and commercial energy end uses. The following tables compare the numbers used in this report with those of Halsall Associates Limited database:

Apartment				Commercial Buildings			
NRCAN Data		Peer Reviewer's Data		NRCAN Data		Peer Reviewer's Data	
Space Heating	47%	Space Heating	37%	Space Heating	47%	Space Heating	31%
Water Heating	30%	Water Heating	18%	Water Heating	9%	Water Heating	1%
Appliances	18%	Equipment	16%	Lighting	8%	Lighting	22%
Lighting	2%	Lighting	10%	Space Cooling	11%	Space Cooling	8%
Space Cooling	2%	Space Cooling	8%	Auxiliary Motors	7%	Pumps/Fans	18%
		Fans/Pumps	11%	Auxiliary Equipment	17%	Equipment	20%
				Street Lighting	1%		

The differences in these allocations will not affect the outcome since both natural gas and electricity have a GHG emission intensity of 0.05 t-CO₂e/GJ at this time. As new data becomes available on Ontario's changing electricity generation sources (i.e., less coal and more renewables), distinguishing the end use breakdown of energy will become increasingly important as the energy intensity for electricity generation may change significantly.