

Integrating a Climate Action Approach to City Real Estate Decisions - Mass Timber Pilot Program

Date: June 3, 2022

To: Board of Directors, CreateTO

From: Chief Executive Officer

Wards: All

SUMMARY

As the City's strategic real estate arm in the delivery of city-building outcomes, climate action is at the forefront of CreateTO's thinking in order to advance the City's objectives to reduce community-wide greenhouse gas (GHG) emissions in Toronto to net-zero by 2040. In this regard, CreateTO, partnering with various City divisions, has undertaken various actions to advance these objectives; a selection of these initiatives is outlined below:

- Defining pathways and cost estimates to achieve the various Toronto Green Standard ("TGS") performance levels to inform the Housing Now Initiative's due diligence and business cases.
- Implementation of a geothermal-based district energy system to provide low carbon heating and cooling to support the development of the City's first near net-zero community at the Bloor-Kipling (Six-Points) area.
- Application to the Federation of Canadian Municipalities for funding to support near net-zero design and construction for the site at 150 Queens Wharf Road, which is a current Housing Now and future not-for-profit site.

In addition to the above, CreateTO staff, with the assistance of the City's Environment and Energy Division, identified a program idea to explore using mass timber construction (such as cross-laminated timber structural materials) to reduce carbon emissions in the delivery of affordable housing. Mass timber, contrary to other structural materials such as steel and concrete, actually encapsulates rather than emits carbon which results in a lower carbon development. CreateTO, in partnership with Environment and Energy, approached the Housing Secretariat, City Planning, and Corporate Real Estate Management, to develop a staff team to advance this work program and establish a Pilot Program to advance this approach.

This collaborative work program has resulted in City Council's adoption of a new Pilot Program on May 11, 2022, referred to as the Mass Timber Affordable Housing Pilot Program (the "Pilot Program"). This Pilot Program has the potential to deliver a new scalable affordable and market housing solution that can be developed with the

objective of replicating the method across other City-owned sites in the future to support climate action while enhancing the delivery of affordable and market housing in the City.

The Pilot Program has identified two building typologies for further review:

1. Typology 1 - Mid-rise building

- 10-storey building modelled on 1113-1117 Dundas Street West
- 12-storey building modelled on 1627 Danforth Avenue, Parcel A

2. Typology 2 - Tall Building

- 18-storey building modelled on 150 Queens Wharf Road

The selection of the two typologies is based on:

- Advanced design concepts that support the efficient use of mass timber design while eliminating costly carbon producing materials such as steel and concrete;
- Opportunity to advance the use of mass timber for mid-rise construction along the City's many main streets and *Avenues*;
- Mid-rise building typologies that are anticipated to comply with upcoming Ontario Building Code (the "OBC") compliance requirements for mass timber construction (i.e. maximum of 12-storey mid-rise typologies);
- A tall building typology, up to 18-storeys, that will seek to comply with the OBC compliance requirements for mass timber construction through the "alternative solutions" process, based on other tall tower mass timber precedents and codified building codes (i.e. the International Building Code); and
- Building typologies that are generally supported by City of Toronto Building and Fire Services, subject to further review.

The purpose of this report is to provide an overview of the Pilot Program objectives and work plan to date with a follow-up report in Q3, 2022 that will report on:

- Proof of the viability of utilizing mass timber and other low carbon materials for building construction to deliver new mixed-income housing and new affordable rental housing;
- Construction costs and timing to deliver mass timber and/or near net-zero construction;
- Potential long term operational savings; and
- Opportunities to replicate this approach across other City-owned and other sites in the future.

The Pilot Program presents an opportunity to develop a scalable development model with a climate action approach that will add a new tool to the City's affordable housing toolkit, demonstrate the viability of this form of building to the real estate industry and help position the City to move quickly to optimize any future government funding opportunities that may become available.

RECOMMENDATIONS

The Chief Executive Officer, CreateTO, recommends that the Board of Directors of CreateTO:

1. Direct the Chief Executive Officer, CreateTO, in collaboration with the Executive Director, Housing Secretariat, and the Executive Director, Environment and Energy, Chief Building Official and Executive, Fire Chief and General Manager and other City Divisions as required, to:

a. report to the Board of Directors of CreateTO on the progress of the Mass Timber Affordable Housing Pilot Program in the third quarter of 2022; and

b. report on future City real estate assets suitable for mass timber construction in delivering affordable and market rental housing units based on the outcomes of the Mass Timber Affordable Housing Pilot Program, in the fourth quarter of 2023.

FINANCIAL IMPACT

There is no financial impact to CreateTO arising out of the recommendation in this report.

CreateTO is recovering due diligence costs for the Pilot Program from the City's Environment and Energy Division in line with the division's current approved budget.

DECISION HISTORY

On October 2, 2019, City Council adopted Item MM10.3 "Declaring a Climate Emergency and Accelerating Toronto's Climate Action Plan", which confirmed Council's declaration of a climate emergency for the purpose of naming, framing, and deepening our commitment to protecting our economy, our ecosystems and our community from climate change, and Council committed to, among other matters, accelerating the implementation of TransformTO climate actions at every opportunity.

<http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2019.MM10.3>

On July 23, 2020, the Board of Directors of CreateTO adopted item RA14.1 "Toronto Parking Authority Real Estate Program", and requested the Chief Executive Officer, CreateTO, to ensure that any redevelopment or disposition of TPA property and all future CreateTO initiated projects meet or exceed the Toronto Green Building Standard and that all future reports list opportunities to address climate change and city building.

<http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2020.RA14.1>

On July 14, 2021, City Council adopted Item PH25.17 "Toronto Green Standard Review and Update" which brought into effect the Toronto Green Standards Version 4 (2022) performance measures and requested CreateTO to require the application of the Toronto Green Standard Version 4, Tier 2 for all development agreements.

<http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2021.PH25.17>

On November 22, 2021, the Board of Directors of CreateTO adopted Item RA27.3 "Housing Now Progress Update" and requested a report to the Board to outline and confirm how all new buildings will achieve net-zero carbon emissions or Tier 3, Version 4 of the Toronto Green Standard.

<http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2021.RA27.3>

On December 15, 2021, City Council adopted Item IE26.16 "TransformTO - Critical Steps for Net Zero by 2040" which endorsed the targets and actions outlined in the report (December 2, 2021) from the Interim Director, Environment and Energy, titled "TransformTO Net Zero Strategy", and among other items, requested the Chief Planner to continue to ensure the Official Plan, Zoning By-laws, and planning policies and various Planning guidelines support the recommendations in the Net Zero Strategy, including to enhance building energy efficiency and reduce embedded carbon during construction.

<http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2021.IE26.16>

On May 11, 2022, City Council adopted Item PH33.7 "Delivering Affordable Rental Housing at 1113-1117 Dundas Street West", which authorized the Mass Timber Affordable Housing Pilot Program and funding requirements to assess the viability of mass timber as an approach to expeditiously deliver housing in a high-quality form that achieves near-zero Green House Gas emissions for City-owned site at 1113-1117 Dundas Street West (Car Park #204).

<http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2022.PH33.7>

COMMENTS

The climate crisis grows more urgent every year. City Council has taken leadership with the endorsement of key policy documents that provide an implementation framework for the City and for City real estate assets.

In July 2017, City Council unanimously adopted the TransformTO climate action strategy. It includes a set of long-term, low-carbon goals and strategies to reduce local greenhouse gas emissions and improve our health, grow our economy, and improve social equity.

City's Sustainability Policy Framework

Since the initial adoption of the Toronto Green Standard (TGS) and the TransformTO strategy, the City has continued to advance the call for climate action to address key challenges related to climate change and sustainability. This has included the advancement and adoption of progressive versions of the TGS, the adoption of a more ambitious TransformTO Net Zero Strategy, and modifications in the City's Official Plan to advance policies related to environmental design. In addition to various policy documents, the City has declared a climate emergency for the purpose of naming, framing, and deepening the City's commitment to protecting our economy, our ecosystems and our community from climate change.

The following represents a brief overview of the City's policy documents and key objectives.

TransformTO Net Zero Strategy

In December 2021, City Council adopted a new goal of achieving net-zero emissions by 2040, including near-zero emissions for new development by 2028.

As stated within the TransformTO Net Zero Strategy, Toronto's most recent Greenhouse Gas (GHG) Inventory identifies that 57 percent of local GHG emissions come from the energy used in our buildings. Buildings are a source of GHGs when using fossil fuels for heating, cooking and other end-uses, and during manufacturing and construction. Natural gas for heating continues to be the largest source of emissions, accounting for approximately 50 percent of all GHG emissions in Toronto.

The pathway to net-zero represents a transformation of the energy system and the built environment, requiring a coordinated mobilization of the City and the Toronto community at a scale with few precedents. Key objectives of the TransformTO Net Zero Strategy include:

- Reduce community-wide greenhouse gas (GHG) emissions in Toronto to net-zero by 2040 – 10 years earlier than initially proposed
- Ensure that Toronto is on track to reach net-zero by 2040, with the following goals:
 - Buildings - All new buildings will be designed and built to be near-zero greenhouse gas emissions by 2028
 - Energy - 50 percent of community-wide energy will come from renewable or low-carbon sources by 2030
 - Transportation - 75 percent of school/work trips under 5km will be walked, biked or by transit by 2030
 - Waste - 70 percent residential waste diversion from the City of Toronto's waste management system by 2030

The TransformTO Net Zero Strategy identifies buildings as "the largest source of GHG emissions in Toronto"⁽¹⁾. Net-zero buildings are critical to achieving a net-zero Toronto. In addition, the Strategy outlines a Short-term Implementation Plan 2022-2025. Included in this Short-term Implementation Plan are actions specifically related to buildings as follows:

- Action Item 1 - Ensure near-zero emissions for all new construction. New construction activities 2022-2025 include:
 - Implement the Toronto Green Standard, which requires net zero emissions for new development applications in 2028.
 - Review options to advance higher levels of uptake of Tier 2 and 3 buildings to facilitate transformation to net zero earlier than 2028.
- Action Item 2 - Evaluate and limit impacts of embodied carbon in construction
 - More information is needed to understand what kinds of materials and construction techniques should be used for Toronto. The City will study the impacts and set embodied carbon limits for building materials and construction practices in new buildings.

1. <https://www.toronto.ca/legdocs/mmis/2021/ie/bgrd/backgroundfile-173758.pdf>

Toronto Green Standard (TGS)

Since 2010 the TGS has been required for development applications and, per Council direction, to be updated approximately every four years. The objective of the TGS is to influence and support change to achieve sustainable development in the City. Based on tiers of increasingly stringent performance requirements the TGS provides a clear understanding of the City's climate change objectives and expectations for future updates. Builders who are market leaders in sustainability are eligible for a partial Development Charge refund incentive under the City's Toronto Green Standard Development Charge Refund Program if meeting higher voluntary tiers.

The TGS performs an important role as a market transformation tool to progressively push development beyond the minimum standards of the Ontario Building Code towards Toronto's net zero emissions targets as set out in TransformTO and City Council's 2019 declaration of a climate emergency. It also responds to the Climate Change & Resilience actions to support recovery and rebuild set out in the Council adopted item EX17.1, "Towards Recovery and Building a Renewed Toronto".

In July 2021, Council adopted TGS V4, and directed CreateTO to consider the requirement of TGS V4, Tier 2 for all development agreements, including the Housing Now Initiative. In November 2021, the CreateTO Board of Directors requested CreateTO staff to continue to examine how to ensure Tier 2 is met at a minimum while understanding ways to achieve net-zero carbon emissions or Tier 3, V4 of the TGS.

City of Toronto Official Plan

The City's Official Plan supports these sustainability objectives with policies that intend to:

- Ensure that the City of Toronto evolves, improves and realizes its full potential in areas such as transit, land use development, and the environment.
- Support the development of the City while protecting and enhancing the natural environment is the aim of good stewardship.
- Consider the impacts of a changing climate need in new development and redevelopment activities, in our stewardship of the natural environment and in infrastructure planning and watercourse management.

Collectively, these policies provide key strategic actions to ensure the City is leading the campaign for a better housing and climate future for the City's current and future residents. Together, these policies provide an opportunity to apply a climate action approach toward the delivery of city-building projects on City-owned real estate assets.

Current CreateTO Initiatives

CreateTO staff have continued to take a leadership role in supporting the City in the implementation of its sustainability objectives and targets. In addition to ensuring Housing Now projects achieve at a minimum TGS, Version 3, Tier 2, CreateTO is undertaking studies to support the City's climate action goal for city-building projects. A selection of these initiatives is summarized below.

Net Zero Emissions Feasibility Study

In December 2020, CreateTO, in collaboration with Environment & Energy Division, undertook a net-zero emissions feasibility study. The feasibility study was prepared through a collaboration of architects, mechanical and electrical engineers, energy modellers and cost consultants with inputs from City staff. Architectural plans were used to build energy models for three building typologies. After the energy modellers performed an extensive optimization exercise, key design parameters that affect energy, water use, and GHG emissions were discussed. The resulting energy design guidelines provided details of envelope and energy systems that will meet the requirements of TGS Tier 1, Tier 2, or Tier 4 while at the same time remain appealing to the market. Simultaneously architectural design outlines were prepared for the typologies and were used for construction cost estimates for each Tier of the TGS. The study concluded with a pathway to Tier 4 buildings and a construction cost premium (ranging between 5.7-6.9%) with a cost impact of \$20/square feet compared to the construction costs for Tier 1 buildings. The performance pathways and cost premium identified through this analysis have informed city asset business cases.

Low Carbon Thermal Energy

CreateTO, in collaboration with Environment & Energy Division and a Thermal Energy (TE) provider, has designed a low carbon district energy system to serve the Housing Now Bloor-Kipling (Six Points) site. From an energy centre located in the parkade of the new Etobicoke Civic Centre (ECC), the TE Provider will provide heating and cooling to the ECC and surrounding affordable housing development blocks through a geo-exchange-based district energy system, which will enable approximately 3 million square feet of development to achieve near net-zero emissions.

The City and CreateTO continue to explore other low carbon thermal energy opportunities, including standalone geo-exchange and wastewater heat recovery, both at the building and district scale.

Mass Timber Affordable Housing Pilot Program (the Pilot Program)

To further opportunities to advance and innovate the City's building sector and explore and understand how to achieve TGS Tier 3, Version 4 (or near net-zero carbon emissions), CreateTO staff, in collaboration with the City's Environment and Energy Division, the Housing Secretariat, and City Planning, have identified an opportunity to assess and demonstrate developing new housing with mass timber.

A building is considered a mass timber building when the primary load-bearing structure is made of mass timber (including engineered wood) rather than steel or concrete. Mass timber buildings may incorporate various heavy timber components for its structure and envelope. These components are often manufactured off-site. Apart from the significant environmental benefits of using mass timber (i.e. reduced greenhouse gas emissions, embodied carbon and energy consumption), one study suggests that pre-engineered mass timber buildings are about one-fifth the weight of comparable concrete buildings, which means that foundation size and cost can be substantially reduced.⁽²⁾ In addition,

² <https://www.evergreen.ca/blog/entry/mass-timber-building-construction-is-an-emerging-trend-around-the-world-is-it-time-for-more-timber-in-canada/>

timber buildings can be erected in as little as half of the time required for a concrete building.

The objective of the Pilot Program is to showcase how the City can help to innovate and simplify the development and construction process to support the delivery of affordable and market housing as quickly and economically as possible within mid-rise and tall building forms that also align with the City's climate action plan and TGS requirements.

The Pilot Program seeks to demonstrate the ability to achieve new affordable rental and market housing in a sustainable development approach that balances maximizing the use of mass timber to increase the project's embodied carbon with cost efficiencies to reduce capital costs and expedite housing construction. Proceeding through a full due diligence and feasibility program, the Pilot Program provides the opportunity to ensure the selected development concepts are feasible from a cost, marketing, and delivery perspective, while meeting the stated goals of achieving a housing (affordable and market) solution based on a climate action approach.

The objectives of the Pilot Program are to assess and achieve future development opportunities on City-owned real estate assets that can deliver on the following pillars:

- New housing, both affordable and market;
- Development that is grounded in sustainability and climate action;
- Development that is cost-effective and efficient to construct, and that helps to innovate the residential construction sector in the City; and
- Development that achieves a high quality of life.

The Pilot Program focuses on mid-rise and tall building typologies at three sites where design work was underway, they include:

Typology 1

- 10-12 storey mid-rise, residential or mixed-use
- Encapsulated Mass Timber Construction (EMTC)
- Sites:
 - 1113-1117 Dundas Street West - 10 storey building; and
 - 1675 Danforth Avenue (Danforth Garage) - 12-storey building

Typology 2

- 18-storey high-rise, mixed use
- EMTC/Hybrid construction
- Site: modelled on the 150 Queens Wharf Road design

CreateTO has retained a team of consultants ("Consultants") to advance the Pilot Program, which include:

Architectural
Structural Engineer
Mechanical, Electrical, and Plumbing Engineer
Energy Modeling Engineer

Fire and Code Costing/Quantity Surveyor

The Consultants have advanced architectural, structural, mechanical/electrical, building/fire code, and energy modelling technical briefs which will inform cost estimates for each of the building typologies. A comprehensive and collaborative exercise will continue between energy modellers, architects, engineers, and cost consultants, seeking to demonstrate the approaches taken to deliver cost-effective, affordable housing that maximizes the use of mass timber to increase embodied carbon, achieving and striving for net-zero or near net-zero carbon emissions. The findings of the due diligence phase of the Pilot Program will be reported to the CreateTO Board in Q3, 2022.

Next Steps and Conclusion

The TransformTO Net Zero Strategy identifies buildings as the largest source of GHG emissions in Toronto. Net-zero buildings are critical to achieving a net-zero Toronto. According to Toronto's most recent Greenhouse Gas Inventory, 57 percent of local GHG emissions come from energy used in our buildings. To achieve the City's net-zero goal, a change is required to address building design and systems that increase efficiencies and move to clean and renewable forms of energy.

The Pilot Program examines the feasibility of mass timber construction as a new cost-effective building option to increase the supply of affordable housing, while also achieving a lower carbon operating and construction footprint than traditional steel and concrete construction.

Should the Pilot Program demonstrate the feasibility of mass timber construction, this work will provide the opportunity to replicate mass timber projects across future City-owned sites to advance the City's housing and climate action objectives through sustainable city-building.

CreateTO staff will report back to the Board of Directors, CreateTO, on the due diligence findings of the Mass Timber Pilot Program in Q3, 2022, including opportunities to implement mass timber for future city-building projects.

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SIGNATURE

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