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Dear Joan Jylanne,

On behalf of the Grand River Consulting firm, we would like to thank the City of Cambridge for partnering with Wilfrid Laurier University and the Capstone Urban Sustainability Project. The team at Grand River Consulting Firm has thoroughly analyzed the affordable housing crisis in Cambridge and is confident in our recommendations presented in this final deliverable.

Our team is composed of five highly skilled individuals who are dedicated to improving affordable housing in Cambridge. Our team used Qualtrics surveys for public perspectives, as well as comparative case studies to identify applicable innovative solutions. Moreover, our team assessed the research and found an efficient and financially beneficial solution that helps those in need of affordable housing, and those who are ready to move beyond affordable housing in the City of Cambridge.

Our aim in this response to this Final Deliverable is to present our three-step recommendation in addressing the affordable housing issue through sustainable elements, and how residents can move beyond affordable housing on the housing continuum. Affordable housing in Cambridge is a challenge due to net population growth, as well as insufficient government programs. This causes a lower standard of living as families spend less money on household needs, more time commuting, and face overcrowding. Housing is a necessity, and Grand River Consulting believes access to affordable housing should be a priority. With our recommendations, sourced from an array of research into different solutions across the globe, we have created recommendations that will improve Cambridge residents' access to housing and overall wellbeing.

Thank you for considering our team for this project. We look forward to hearing from you soon. Please see below the best way to contact our team.

Kind Regards,
Grand River Consulting
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Final Deliverable:

Sustainably Addressing the Affordable Housing Crisis

**Prepared for Joan Jylanne, Chief Planner for the City of
Cambridge**

**Prepared by Edi Cadham, Marley Gryfe, Christopher
McDonald, Zoe Pedlar, and Marcus Ruggiero**

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Grand River Consulting would like to thank the City of Cambridge for the opportunity to put forward our ideas and solutions to this critical issue. Our team would also like to thank Professor Laine Young and Ms. Anahid Shirkhodaee for sharing their expertise and supporting us throughout this project, as well as the numerous guest speakers who enlightened us with their knowledge on this topic.

Executive Summary

Grand River Consulting is dedicated to guiding the City of Cambridge in alleviating the pressures of the affordable housing crisis. Our final deliverable outlines how we navigated the intricacies of this complex problem and our recommended solutions. The affordable housing crisis is a deeply rooted and multi-generational problem that will continue to escalate without intervention. With this urgency in mind, our firm focuses on addressing this issue through a sustainable approach to ensure the housing continuum progresses.

Our team puts forth a unique perspective as Environmental Studies majors and future homebuyers. Working together and using our wide range of skills in research, analysis, and communications, Grand River Consulting generates sustainable and thereby affordable solutions for the City of Cambridge.

To acquire foundational information, we conducted a literature review of best practice approaches on a provincial, national, and international scale. As well, we distributed a Qualtrics survey to gain public perspectives and draw on local incentives. Utilizing this information, we were able to create a sustainable three-step approach. Grand River Consulting conveys how the use of sustainable methods will generate more affordable solutions to housing in the City of Cambridge. Our focus on the relationship between affordability and sustainability allows for an unmatched approach to creating the most feasible long-term recommendations.

Introduction

The City of Cambridge is currently experiencing an affordable housing crisis with an inadequate number of available housing units for rent as well as rent prices that are too high for the average resident. Our team, Grand River Consulting, delivers an in-depth recommendation for solutions to this issue. Our final deliverable is heavily focused on providing a sustainable and environmentally friendly approach. This will ensure that our proposed solution not only alleviates the problem in the short term but provides affordable housing for residents of Cambridge in the foreseeable future.

Meet The Team

Grand River Consulting is composed of highly skilled and motivated individuals with the goal of providing sustainable solutions to complex problems, incorporating environmental, economic, and social factors. Working together, our firm utilized a range of skills to find unique and feasible solutions to the City of Cambridge's affordable housing crisis.

Team Member	Role	Reasoning
Edi Cadham	Communications Director	Passionate communicator with experience conveying course material as an Instructional Assistant and editorial experience while working as a Research Assistant on the latest IPCC report.
Marley Gryfe	Graphic Design Supervisor & Editor	Extremely motivated and detail-oriented with a passion for graphic design. Experience in research, writing, editing, and marketing in roles such as instructional assistant and VP of marketing.
Christopher McDonald	Community Engagement Coordinator	Experience bringing people together, organizing events, and considering multiple perspectives as event coordinator for Toronto Spike Ball Association and as an Environmental Studies student.
Zoë Pedlar	Project Manager	Strong leadership and problem-solving experience in multiple coordinating and management roles, including the Toronto and Region Conservation Authority.

<p>Marcus Ruggiero</p>	<p>Research & Policy Analyst</p>	<p>Research experience working for the City of St. Jacobs and Clear Blue Sea. Developed transferable skills with focus on effective research and policy strategies. Extremely hard-working and dedicated to finding the most feasible solution.</p>
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Table 1: Members of Grand River Consulting Firm

Problem Statement

Since 1990, affordable housing in Cambridge has been a consistent issue that has gotten exponentially worse. In Canada, housing is considered affordable if it costs less than 30% of a household’s income before tax (Ayer, 2021). A growing portion of the Cambridge population is either unable to find housing or unable to afford it. This can be attributed to a large increase in the City’s population while development for new homes remains minimal. This limits the number of homes available to new homebuyers and raises demand, meaning high rent costs. The Kitchener-Cambridge-Waterloo Census Metro Area was the fastest-growing metropolitan area in Canada and the United States in the last five years growing by 12% from July 2015 to July 2020. While the population was rapidly increasing, housing builds remained relatively stagnant (Ayer, 2021). For example, in 2021 a recently built townhouse-condo in Cambridge with only 84 units had over 2,500 people interested, highlighting the disproportionate number of homes available for the population (Monteiro, 2021).

It is important to note that the affordable housing crisis does not affect everyone proportionately. Racialized individuals had median total incomes of only 63 cents for every dollar of non-racialized residents in Waterloo Region in 2016. This means that these individuals were more likely to spend over 30% of their income on housing in the region (Ayer, 2021). People living with disabilities in Waterloo Region are disproportionately impacted by a waiting list for subsidized housing. This is due to low employment rates and for those unable to work. Ontario Disability Support Payments are not enough to pay market-rent and living costs (Ayer, 2021). To alleviate the growing burden on both the City of Cambridge and its residents, Grand River Consulting prioritizes addressing the issue of affordable housing through a sustainable and intersectional lens.

Methodology

Grand River Consulting worked to create sustainable solutions to the affordable housing crisis through following research questions, engaging with the public, and analyzing case studies. To begin, we used our specific research questions as a guide for our research and findings. Next, we created and distributed a Qualtrics survey to gain public perspectives and establish community approval. Lastly, we investigated local, national, and international case studies to gain a comprehensive understanding of the issue. We searched for the best practice approaches regarding sustainable housing elements, green technologies, and how to move individuals beyond affordable housing. As we progressed in our research, we were open to following new leads to ensure we created solutions perfectly suited for the City of Cambridge.

Research Questions

In order to guide our methodology, we created a series of research questions:

- What is the root of the affordable housing crisis in Cambridge?
- What current affordable housing approaches are effective and why?
- What current affordable housing approaches are ineffective and why?
- How do Cambridge residents view affordable housing? How do we ensure our approach is well-perceived?
- How can sustainability be incorporated into recommendations to the affordable housing crisis? What benefits will this have both in the short and long term?

Survey Questions

Gaining public perspectives around affordable housing is of the utmost importance as it will largely impact the residents of Cambridge. In order to gauge public interest and knowledge of affordable housing, we created and distributed a survey to residents living in Cambridge and the surrounding Waterloo region. Our survey questions can be found in Appendix A. With the information gathered, our firm recognized areas of importance that we need to address to ensure the recommendations we put forth are something Cambridge residents are on board with and excited about.

Survey Findings

We had 97 residents of Cambridge and the Waterloo Region participate in our public perspectives survey conducted through Qualtrics. Of these, we had 61 surveys with over 70% completion that we were able to analyze and use in this final deliverable. The questions in the

survey were both qualitative and quantitative in order to truly capture the public's needs, desires, and opinions on affordable housing. Note that 64% of participants were from the postal codes N0K, N1R, N1S, N1T, N3C, and N3H, which are all located in the City of Cambridge.

Two key findings:

- 72% of participants did not know of any existing services that individuals or companies can apply to for financial aid for affordable housing (See Graph 1 in Appendix B).
 - This implies that:
 - There are not enough services for financial aid in terms of affordable housing.
 - There is a great possibility the public may not have been properly educated about existing services.
- When asked ‘What would make you more likely to want an affordable housing complex near you?’ The majority of residents expressed the following:
 - Affordable housing should be disbursed throughout the City, as opposed to in one concentrated area in order to keep crime rates down.
 - Housing should be aesthetically pleasing, and therefore greenery/community gardens should be prioritized.
 - If affordable housing is being added to the area, other services like mental health care should also be provided.
 - The security of the community is a concern for residents when it comes to affordable housing.

Our findings of public perspectives have been of significant importance and influence on our solutions for the affordable housing crisis in the City of Cambridge. It is integral to the success of our recommendations to have public approval and support.

Housing Focus

Guided by our research questions and survey results, we have identified our focus on a rent-g geared-to-income (RGI) housing type, which includes community housing. This means that “tenants living in community housing units pay approximately 30% of their gross income towards rent and the Region pays the remaining portion of the market rent” (Region of Waterloo, 2019). Specifically, we believe this is an area in need of improvement because of 4,798 households on the community housing waiting list in Waterloo Region in 2019 (Region of Waterloo, 2019). Although these are the most recent statistics, it is following the COVID-19 pandemic that this number has increased (Region of Waterloo, 2019). While these housing options can be made suitable for families as well as individuals from all backgrounds and age categories, it is important to note that 24% of senior led houses were on the community waiting list in 2019 (Region of Waterloo, 2019). Similarly, Indigenous peoples are more likely to

pay above 30% of their income on housing in the Waterloo Region (Region of Waterloo, 2019). Single-parent families have the lowest median income of all family types (Region of Waterloo, 2019). Moreover, survivors of domestic violence and human trafficking will be given priority from the community housing waiting list. With these factors in mind, we understand it is important to consider the needs of these specific groups when addressing affordable housing (Region of Waterloo, 2019).

Case Studies

Grand River Consulting analyzed provincial, national, and international case studies to form and support our affordable housing recommendations in the City of Cambridge. Specifically, we looked at the best practice approaches in Guelph, Ontario; Halifax, Nova Scotia; and Freiburg, Germany. Through this process, we uncovered sustainable strategies that address affordable housing and utilized this information to create well-suited solutions for the City of Cambridge.

Guelph, Ontario, Canada

Guelph provides a closely comparable case study to Cambridge due to similar demographics, resources, efforts, and provincial policies. This information is helpful to provide a basis for what opportunities are within reach for Cambridge. To begin, the population sizes between Guelph and Cambridge are very similar with only a 4.1% difference in 2016. Although Guelph is slightly larger, both regions are growing rapidly with Cambridge and the surrounding Waterloo Region following a 10.1% growth pattern from the last five years (Thomson, 2022). With these rising populations, there is pressure to ensure the human right to housing is met for all. Guelph and Cambridge both follow similar legislation. For example, both Guelph and Cambridge follow the Promoting Affordable Housing Act, 2016, c.25 Bill 7. This provincial Bill promotes the necessity for affordable housing while considering inclusionary zoning, house services, development charges, planning acts, and smart growth (Ontario, 2016).

Specifically, we were inspired by Guelph's recent Net Zero Village initiative. This approach to affordable housing provides a subdivision of 118 single-detached homes completely powered with solar panels and energy recovery ventilation as well as temperature moderated with an air-to-air pump and a backup natural gas furnace as well as drain water heat recovery. Utilizing these resources is effective as they emit no carbon emissions on-site contributing to over 50% less energy consumption than an average house (Building Knowledge, 2022). These comparisons can be visualized in Appendix C. We will use this case study example as a model for the sustainable elements to include in our affordable housing plans for steps one and two. Overall, Guelph's efforts demonstrate an attainable step towards sustainable affordable housing, while contributing to the federal goal of net zero emissions by 2050.

Halifax, Nova Scotia, Canada

Although Halifax and Cambridge have different-sized populations, we believe their affordable housing initiatives are greatly relevant. The City of Halifax has a population of 403,390 (Government of Canada, 2021a) whereas the City of Cambridge has a population of 129,920 (Government of Canada, 2021b). Ontario has mandated population growth for the region of Cambridge, therefore using a more populous city as a comparable case study is important for future housing prospects (Government of Ontario, 2019). Halifax is working to address the affordable housing crisis and has provided insight into federal legislation and funding as well as sustainable building techniques which could be useful for the City of Cambridge. Beyond attaining funding from the federal government to help with the issue, Nova Scotia also has a Conservative provincial government. This works to increase the feasibility of similar applications for provincial funding in the City of Cambridge as they are currently working with a provincial Conservative government as well (Nova Scotia Legislature, 2017).

Delving into the specifics of Halifax's approach to affordable housing, with funding from Canada's National Housing Strategy, a co-op in Nova Scotia has chosen to repurpose an old parking lot to build a 6-story affordable housing complex (Chiu, 2021). This is one step toward a solution to the affordable housing crisis, but the executive director of the Affordable Housing Association of Nova Scotia, emphasized the importance of increasing the overall percentage of affordable housing by 12-15% as seen in some European countries (Chiu, 2021). One key aspect of attaining sufficient funding for affordable housing is incorporating multiple levels of government (McMillan, 2021). With the repurposed parking lot example, Halifax was able to attain 3 million dollars of funding from the Conservative provincial government and 1.5 million dollars of federal funding from the National Housing Strategy (Chiu, 2021). In other affordable housing solutions, the City of Halifax has worked to incorporate mixed-use housing strategies (McMillan, 2021). This way, the more expensive rental units located in the same complex as the affordable housing units are used to support the cost of the affordable units.

Freiburg, Saxony, Germany

Freiburg, Germany has a larger population than Cambridge, with over 220 000 people living in the city (Barber, 2020). While this region differs from Cambridge in size and is located on a different continent, there are many things to be learned from Freiburg's unique approach to affordable housing. Freiburg, Germany set out to solve the affordable housing crisis in a way that simultaneously minimized overall emissions and created a mixed housing approach (Sustain Europe, 2019). Freiburg is considered one of the most sustainable and livable cities (Barber, 2020), making it an ideal City to model solutions for Cambridge's affordable housing crisis after. This location has already inspired change around the globe with Cities in Italy and the U.S. modelling themselves after Freiburg's sustainable solutions (Barber, 2020). One aspect

of sustainability that could be easily incorporated into Cambridge is the use of widened bike lanes and pedestrian lanes along with accessible public transportation all to make it easier for people in affordable housing to travel where needed without relying on cars. Freiburg hosts the world's first ever passive energy high rise building, where excess heat from appliances, body warmth and lightbulbs are used to heat the building (Barber, 2020). The city also utilizes roof top gardens and solar panels. Moreover, Freiburg is home to the first plus energy system in the world. The Town hall produces excess energy through solar panels which feeds back into the electrical grid (Barber, 2020), a system such as this being implemented on new and existing affordable housing complexes could allow for continued funding to Cambridge's affordable housing program.

Beyond established sustainable elements in Freiburg Germany, the City approved a new affordable housing development that will be climate neutral and have appropriate public transportation and ride share programs (Sustain Europe, 2019). The use of solar panels, energy efficient buildings, green roofs, and even waste being used as a heat source will ensure the community remains climate neutral (Sustain Europe, 2019). The main resistance to this development was the location on a wildlife corridor (Sustain Europe, 2019). Freiburg citizens expressed a preference for the units to be built over top of existing parking lots or existing buildings (Sustain Europe, 2019). One important legislative decision in Freiburg is the quota of 50% social housing units (Sustain Europe, 2019). Modelling Cambridge affordable housing solutions after these environmentally efficient approaches will save money to ensure the solutions are economically feasible and long lasting.

Recommendations

Our recommendations for the City of Cambridge are divided into three stages and sequentially ordered. Utilizing the information gathered from our survey and case study analyses, we believe that this series of suggestions is perfectly suited to encourage the sustainable development of affordable housing.

1. Implement Sustainable Elements to Existing Affordable Housing

We first suggest the implementation of green technology and sustainable elements into existing housing complexes such as co-ops and Waterloo Region affordable housing. Our consulting firm recommends following the lead of the City of Guelph and the City of Freiburg by including elements such as solar panels, green roofs, low-flow toilets, and tankless water heaters. The use of sustainable housing elements will allow price reductions in housing maintenance, energy, and development. These implementations do not require long construction times and can therefore be added in the short term.

Looking beyond adding sustainable elements to housing, we believe general improvements should be made regarding nearby infrastructure. Following suit of Freiburg, ensuring public transportation, car-sharing programs, and adequate spacing for bike lanes and pedestrian lanes will enable people to access amenities and employment more easily. This will prevent the need for the additional cost of a family car and accompanying fuel expenses.

2. Apply Sustainable Elements to a New Affordable Housing Complex

After implementing the strategies in stage one, the sustainable elements used to reduce housing costs will be applied to the development of new affordable housing complexes in the City of Cambridge. Through the consultation regional bylaws, we suggest the City constructs these new complexes using sustainable materials such as cross-laminated timber (CLT), green technology, and energy-efficient retrofits. As well, by following the Accessibility for Ontarians with Disability Act (AODA), we will ensure to include ramps and elevators in all new builds. We recommend the creation of these units in the location of specific city-owned parking lots near the downtown area of Galt. These areas are strategically close to public transportation and businesses that will provide job opportunities. Our team suggests building complexes on the parking lots located at 21 Wellington Street South, 60 Ainslie Street South, and 31 Dickson Street. A map demonstrating these locations can be identified in Figure 1 below.



Figure 1: Suggested affordable housing complex locations

We plan to maintain the city-owned parking spaces used by residents and build above the parking lots. A similar proposition in this affordable housing technique is observed in our case study of the City of Halifax (Chiu, 2021). Moreover, while some members of the City of Freiburg were opposed to the implementation of a new affordable housing development being located on a wildlife corridor, the citizens suggested units be built on existing parking lots and added to existing buildings (Sustain Europe, 2019). Given this information, we believe citizens of Cambridge will support the creation of sustainable complexes at these locations.

This step furthers the success from step one, reaching greater cost reduction and environmental sustainability. Through this adaptive endeavor, we will create affordable housing units that are easier to maintain, environmentally friendly, and sustainable long-term. We believe this will have remarkable success as on average, green buildings consume 25-35% less energy than non-green buildings, quickly offsetting the construction costs (Hamad, 2020). Following the lead of Freiburg, it is even possible to achieve an energy surplus (Barber, 2020), which could be used to continue to fund affordable housing.

3. Help Individuals Move Beyond Affordable Housing

Following the implementation of the two steps above will help facilitate a reduction in housing costs, thus allowing space for new residents as old tenants are able to afford housing elsewhere. As mentioned in our survey findings, our data uncovered a knowledge gap around the affordable housing solutions available for Cambridge residents. Our team suggests the City of Cambridge markets the affordable housing programs and other related services, such as mental health services, to reduce barriers in accessing affordable housing.

The location of an affordable housing complex close to job opportunities and amenities will reduce transportation costs and increase opportunities to move beyond affordable housing. This process will influence an economically and socially sustainable solution to break the long-term cycle of individuals in affordable housing. Grand River Consulting's approach will help the City of Cambridge make it feasible for residents to progress in the housing continuum; however, our team understands there is immense value in consulting with individuals who have themselves moved beyond homelessness and beyond affordable housing, as their ideas and voices come from first-hand experience. For this reason, we further recommend the City of Cambridge involves individuals with lived experience in the decisions to ensure residents have all the tools necessary to move beyond affordable housing.

Consultation and Engagement Plan

In collaboration with these recommendations, Grand River Consulting suggests utilizing the information gathered in this report to implement a marketing campaign and town hall forum. We suggest the marketing campaign is geared towards educating the public on current affordable housing initiatives as well as upcoming projects. This can be achieved through utilizing physical posters, virtual posters, and newspaper advertisements. As well, we believe the implementation of a town hall meeting will be imperative to maintain open communication among stakeholders. This will provide a fantastic opportunity for residents to voice their ideas and concerns. Overall, we believe that these are crucial steps towards community engagement and support.

Feasibility and Planning Justification

As part of our multi-step approach to addressing the affordable housing crisis in Cambridge, feasibility through sustainability was our main focus. Implementing sustainable technologies into affordable housing will not only reduce monthly expenses for residents but will also act as part of the solution to addressing the climate crisis. The sustainable elements we recommend are divided into three main categories: savings through energy conservation, savings through water conservation, and construction savings. Following the construction savings section, we will also address cost benefits overall. Through survey responses, we were able to identify a common concern voiced by residents which is safety. We also wanted to address this problem through sustainability and have provided a recommendation to solve this issue among residents.

Savings Through Energy Conservation

According to data from Natural Resources Canada, Ontario has the fifth largest potential to produce solar energy in all of Canada. On average, solar systems in Ontario can produce 1166kWh of electricity per kW of solar panels per year. The yearly average increases as you move farther south in the province. The average Ontario household uses around 9,500 kWh of electricity per year (Urban, 2018). With the introduction of a 5kW solar system on existing affordable housing units, residents could see a 60% decrease in their monthly utility bills.

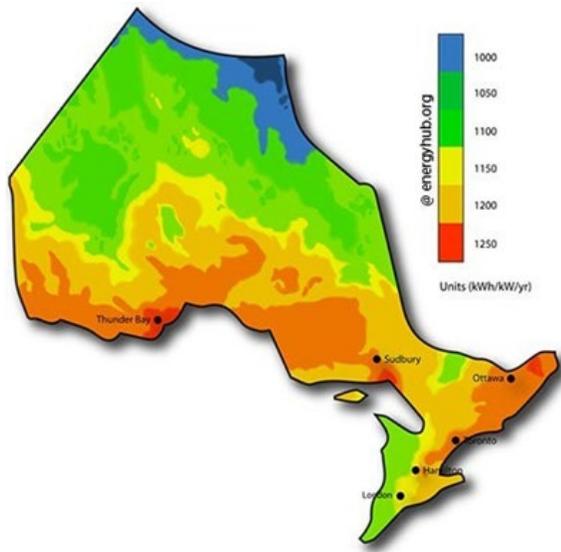


Figure 2: Solar irradiance potential for Ontario (Urban, 2018)

The cost of solar panels has reduced dramatically in the past decade, making it more feasible for Ontarians to add panels on top of their homes. Depending on supplier and installer, residential solar panels systems today can be installed at a cost between \$2.5 and \$3.5 per Watt. Using our 5kW recommendation, the cost per installation could range between \$12,500 and \$17,500.

Savings Through Water Conservation

The main source of water use in homes is toilets, accounting for nearly 30% of a home's indoor water consumption (EPA, 2021a). However, with many advancements made with efficiency, a new type of toilet has emerged, consuming much less water than the conventional toilet. Low-flow toilets use only 7 liters of water per flush whereas older conventional ones can use anywhere from 15 to 30 liters (about 7.93 gal). With an upgrade to low-flow toilets in Cambridge affordable housing units, residents could see up to a 20% reduction in monthly utility costs.

In conventional water heaters, water is heated in a tank until the thermostat setpoint is reached. It is estimated that the average water heater can waste anywhere from 1.4-8.3kWh of heat due to standby losses from the storage tank as a result of the tank losing heat to the surrounding environment (CFAES, 2022). Considering this, we were interested in tankless water heaters which can avoid standby heat losses because there is no tank with this model and water is heated on demand. Energy Star states switching from a standard water heater to an energy star certified tankless water heater, a family of four saves on average \$95 per year or \$1,800 over its lifetime (Energy Star, n.d.).

Construction Savings

As recommended in step two of our solution to addressing the affordable housing crisis in Cambridge, our team proposed the construction of a new affordable housing complex using sustainable elements. Cross-Laminated Timber (or CLT) is an emerging construction material made from gluing together layers of solid-sawn lumber and offers many benefits including the following:

1. Cost and Time Benefits

Unlike concrete and steel construction, much of the labour and fabrication for CLT buildings is done at a factory and assembled on site. This allows for labour costs to be cut with shorter construction times (Structurlam Mass Timber, 2017).

2. Durability

While being five times lighter than concrete, CLT has a similar strength per weight ratio (Structurlam Mass Timber, 2017). Each layer is placed perpendicular to the adjacent layers increasing its strength and stability. If a fire occurs in the building, the outer layer of timber chars in an effective way that self-extinguishes and shields the interior (Roberts, 2020).

3. Environmental Benefits

With concrete being responsible for about 8% of carbon dioxide emissions worldwide, CLT brings environmental benefits not previously available in the construction industry (Rothman, 2021). Multiple life cycle assessments prove wood outperforms both steel and concrete in terms of energy, air pollution, and water pollution. One important aspect of CLT is its ability to cut and store carbon emissions the same way a tree would (Fairley, 2021).

Cost Benefits

We recognize that the majority of funding and resources will come from the Region of Waterloo as well as federal and provincial governments, as the City of Cambridge is a lower-tier municipality. We further recognize that a financial impact assessment of a new affordable housing complex is subjective to the time of the build. Development costs can change between the time of recommendation and the time of construction. Also, development costs can be impacted due to changing construction costs, changes in the real estate market due to COVID-19 and other unexpected circumstances. The tables below highlight some of the elements we suggest considering for steps one and two of our recommendations and the associated cost range.

Description	Low Estimate	High Estimate	Citation
<i>Tankless Water Heater (per unit)</i>	\$1700	\$2500	(Wideman, 2021)
<i>Low Flow Toilets (per unit)</i>	\$112	\$568	(Downsview Advocate, 2017)
<i>Solar Panels (per Watt)</i>	\$2.50	\$3.50	(Urban, 2018)
<i>Green Roof (per square foot)</i>	\$10	\$30	(HomeAdvisor, 2022)

Table 2: Expected costs in stage one of recommendations

Description	Low Estimate	High Estimate	Actual Cost	Citation
<i>Record of Site Condition</i>	Not applicable	Not applicable	\$ 1 975	(Building Experts Canada, 2015)
<i>3-ply CLT (per square foot)</i>	\$12	\$15	Not applicable	(Seagate Mass Timber, 2019)
<i>5-ply CLT (per square foot)</i>	\$42.50	\$45.50	Not applicable	(Seagate Mass Timber, 2019)

Table 3: Expected costs in stage two of recommendations

Community Benefits

Through our public outreach phase of research, we were able to find out that residents felt less safe if they were to live next to an affordable housing complex. To solve this, our team proposes the addition of green roofs on existing and newly constructed affordable housing complexes. Doing so would solve many environmental and urban living issues. Working or living near a green roof brings people together. Green roofs provide a higher perceived and user experience allowing for positive effects on social cohesion in neighborhoods. Areas with more greenery suffer less from aggression, violence, and vandalism (Rezaei et al, 2021). Not only do these spaces provide mental benefits but they also solve an abundance of urban sustainability issues. Green roofs increase local biodiversity. The seeds, herbs, grasses, and plants that are included on a green roof promote habitat for birds, butterflies, and insects. The plants on a green roof filter particulate matter from the air and convert CO2 into oxygen, contributing to air purification (Sempergreen, 2022). When solar panels are used in conjunction with green roofs, roof temperature decreases, increasing solar panel efficiency (Moharram et al, 2013). On a traditional concrete rooftop, heat from the sun is absorbed and stored. However, grasses and

plants on green roofs absorb heat and convert it into chemical energy, lowering the temperature of the building and surrounding air (EPA, 2021b).



Figure 3: Green Roof (Watson, 2020)

Zoning and By-Laws

Prior to deciding on the locations for our proposed development projects, it was imperative that our team extensively research the zoning by-laws which would impact how and where our project could be constructed. We diligently educated ourselves on Cambridge’s zoning by-law no. 150-85 and the Ontario Building Code to ensure that the project we are proposing falls within the guidelines and requirements for development. Our team used this information to carefully select three locations that would be suitable for an affordable housing development project.

The three locations we are proposing for development are in parking lots owned by the City of Cambridge. Since our project will require government funding, our team suggests using a location already owned by the city as a time and cost-effective solution. Our three proposed locations include 31 Dickson Road, 21 Wellington Street South, and 60 Ainslie Street South.

Each of these locations are classified under zoning code C1RM1. Zone symbol C1 is defined for use in the City of Cambridge zoning by-law no. 150-85 as “commercial uses in the city center, the Preston community’s central area and central Hespeler” (City of Cambridge, 1987). Zone symbol RM is designated to “accommodate apartment houses and other multiple-unit residential buildings” (City of Cambridge, 1987). RM1 is defined as “in the City Centre” (Zoning by-law no.150-85, 1987). Although the zoning code classification for these 3 locations shows that the development project, we are proposing is within the confines outlined in the by-law no. 150-85, we understand that parking lots owned and operated by the City of Cambridge are classified under the commercial use class. In order to transition a parking lot for residential use, there is a record of site condition that must be completed at the building permit stage (City of Cambridge, 1987). Furthermore, as our development project does not incorporate any commercial uses, such as a retail store on the property, these are viable locations.

In accordance with Section 2.1.9 and Map Z7 of the Cambridge zoning by-law no. 150-85 a building at 31 Dickson Street Road and 21 Wellington Street South will not exceed 15 meters (City of Cambridge, 1987). As well, in accordance with the same resources, a building at 60 Ainslie Street South will not exceed 21 meters (City of Cambridge, 1987). This means that depending on which location is chosen, the development project can be either 15 metres or 21 metres tall. All three of these locations are exclusive of any mechanical, electrical, or elevator equipment on the roof. Additionally, after considering costs addressed in the feasibility section, we concluded that this project would be cost-effective and highly beneficial to Cambridge residents struggling to find affordable housing.

Conclusion

Our plan is feasible as a multi-step approach to address numerous areas of concern for both the government and residents. To review, we plan to tackle current affordable housing initiatives, future affordable housing initiatives, and the housing continuum. Grand River Consulting's proposed recommendations are environmentally sustainable, logistically viable, and specifically designed to aid Cambridge residents in moving beyond affordable housing. If this project comes to fruition, it will act as a long-term solution to alleviate the strain of the affordable housing crisis in Cambridge. To increase the success of our recommendations, we suggest the City of Cambridge continuously engages with individuals who have overcome homelessness and moved beyond affordable housing. Being flexible in this regard will lead to the strongest solutions to the affordable housing crisis. From our team at Grand River Consulting, we thank you for your consideration of our project which will prove to have long-term sustainable solutions that consider the environment, society, and the economy.

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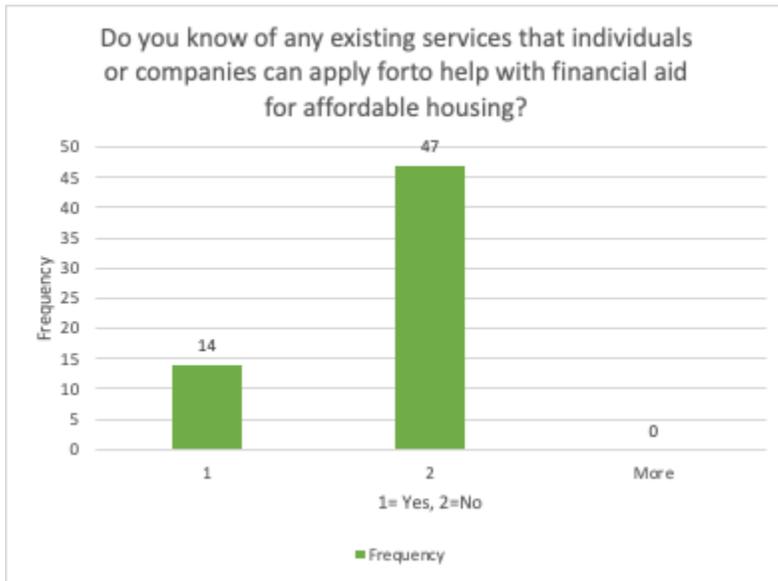
Appendices

Appendix A

1. What are the first 3 characters of your postal code?
2. What does affordable housing mean to you?
3. A. Do you know of any existing services that individuals or companies can apply for to help with financial aid for affordable housing?
 - Yes
 - No
- 6B. If Yes, What?
4. Considering the definition of affordable housing being “housing for low to moderate income households priced at or below the average market rent” - How much does the following statement resonate with you?
 - I am comfortable with having affordable housing in my neighborhood (Likert scale)
 - Strongly Agree
 - Agree
 - Neutral
 - Disagree
 - Strongly Disagree
5. What would make you more likely to want an affordable housing complex near you?
6. If there was affordable housing in Cambridge and you were eligible, would you take advantage of the opportunity?
 - Yes
 - No
 - Maybe
7. What is your current living situation?
 - a. Roommate(s)
 - b. Family
 - c. Live alone
 - d. Unhoused
8. What tax bracket do you belong to?
 - a. \$0-\$46,226
 - b. \$46,226- \$50,197
 - c. \$50,197- \$81,411
 - d. \$81,411- \$92,454
 - e. \$92,454- \$95,906
 - f. \$95,906- \$100,392
 - g. \$100,392-\$150,000
 - h. \$150,000 and over

- i. Prefer not to say
9. Age Range?
- a. 18- 25
 - b. 25- 34
 - c. 34- 49
 - d. 50-65
 - e. 66 or older
10. Which gender do you most Identify with?
- a. Female
 - b. Male
 - c. Trans gender female
 - d. Trans gender male
 - e. Non-binary
 - f. 2 Spirit
 - g. Other
 - h. Prefer not to say
11. How many children do you have?
- a. 0
 - b. 1
 - c. 2
 - d. 3
 - e. 4
 - f. 5 or more

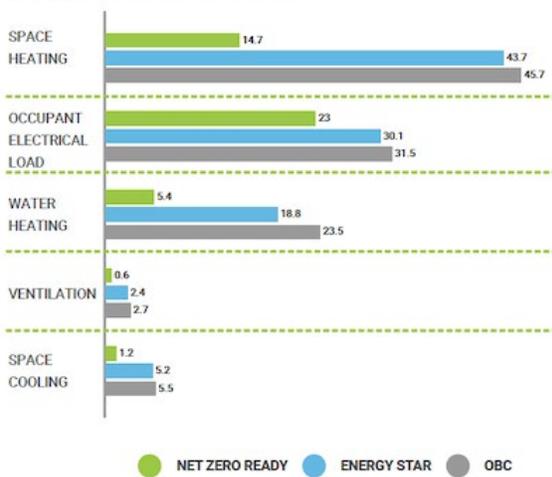
Appendix B



Graph 1: Survey results of resident awareness of existing housing services

Appendix C

ENERGY CONSUMPTION



ANNUAL ENERGY CONSUMPTION **45 GJ/yr**



ANNUAL ENERGY WHEN 5.0 KW SOLAR IS INSTALLED **21 GJ/yr**

Figure 4: Energy consumption of Guelph's net-zero housing (Building Knowledge, 2022)