The Economic Case for Sustainable Design

by

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Author's Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

Abstract

The Economic Case for Sustainable Design

This thesis considers the potential of engaging the development community as a primary means of solving the environmental crisis. Specifically, it addresses how the principles of sustainable design can be incorporated into communities and buildings while taking into account the economic realities implicit with every successful project. Using case study examples of recent projects where environmental stewardship was a primary consideration, the thesis examines the relationship between sustainable design strategies and their influence on both capital costs and the perceived value of the completed project. It is proposed that a comprehensive understanding of the economic impact of sustainable design is essential for architects to make informed decisions, given a client's environmental and fiscal expectations. In addition, it is the responsibility of building design professionals to encourage a more sustainable society, and design buildings that will be of net positive impact to the environment.

Acknowledgments

I would like to acknowledge the guidance and criticism of my Supervisor professor John McMinn, and my Advisory Committee members Dr. John Straube and Ken Warkentin for their insight. I am grateful to Laura Knap for her critical eye and unwavering commitment to the clarity of the text. The offices of Altus Helyar provided access to exhaustive data used extensively in the case study analysis sections, and invested in the subject of this thesis from the beginning. I thank also Val Rynnimeri for his direction earlier in the process, and Alex Speigel for his perspective on my work at the end.

Thank you friends and family for the support and encouragement along the journey through undergraduate and graduate studies.

Dedication

To my wife Kelly McAuley and our growing family.

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01 Introduction

1.1 About Sustainable Design

The United Nations World Commission on the Environment provided a useful starting point for a definition of sustainability in its 1987 report titled "Our Common Future". It defined sustainable development as:

> *Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*[1]

This definition suggests that amid a continuing pursuit to improve the human condition, we must not unnecessarily disrupt the natural equilibrium of the environment. It acknowledges that the wealth of the earth is a finite resource which can be seriously depleted by our actions, and that the environment has a limited capacity to sustain unbalanced human pressure.

Sustainable design, then, describes the planning process we can use to achieve sustainable development. This thesis investigates the sustainable design of buildings; as such, it considers both the building as an object, and the building in relationship to its broader local, regional, and global contexts. It takes into account the principles of energy and resource efficiency, healthy indoor air quality and a broad understanding of socially responsive design.

These principles are steadily gaining currency in architectural discourse, but ultimately design decisions are made by teams of professionals in collaboration with the client, who has traditionally prioritized economic considerations. For this reason, few clients will commit to sustainable building strategies without a clear understanding of capital cost impacts, coupled with operational savings and the market advantages these strategies accrue. Therefore, involving and engaging client groups is essential if additional measures required by sustainable design are to gain widespread market acceptance.

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1 United Nations Commission on Environment and Development. (1987). Our Common Future (ISBN 0-19-282080-X). Oxford: Oxford University Press., Page 43

The intent of this thesis is to demonstrate that sustainable design is a primary solution to the rising crisis of climate change and that by incorporating sustainable design practices into their buildings, developers can secure a competitive advantage over conventional developments. As such, the thesis works toward establishing a more holistic picture of the economics of development, looking beyond the simple incremental cost calculation for green measures to consider the broader economic advantages and the potential loss of revenue that developers could face by not investing in sustainable design practices.

The thesis can also serve as a reference document for architects who are lacking the necessary information to understand the relationship between major design decisions and construction costs. By focusing on the economics of building and its relationship to the environment, architects can be well-prepared to advocate for green measures with client groups where first costs are a primary concern.

As evidence of global environmental degradation becomes apparent, we can anticipate a maturing and strengthening of public commitment to environmental responsibility. As Dr. Raymond Cole of the University of British Columbia notes, the building industry, alongside other sectors of the economy, will be increasingly scrutinized for the environmental implications of its actions.

1.2 External Pressures of Sustainable Design

Recently in Canada, there has been a groundswell of public support for governmental action on issues of sustainability. This has been reflected in the growth in mainstream media coverage of the topic and the recent political debate at all levels of government. Unfortunately, there is no widespread understanding or consensus for a plan that could achieve measurable progress. Canadian policy-makers have, until recently, failed to take a leadership role in dealing with climate change, allowing a 29 percent national rise in emissions of climate-altering greenhouse gases

(GHG) since 1990.[2]

The research in this thesis complements the recent work of several economists and industry leaders who are predicting serious economic ill-effects due to climate change. Notably, Sir Nicholas Stern, the World Bank's former chief economist, released a report in the fall of 2006 stating that climate change will cost the world between five and twenty percent of global gross domestic product each year if decisive action to stem global warming is not taken. The United Nations echoes these concerns, as do political leaders across Europe and former U.S. vice-president Al Gore. However, if we are to achieve significant reductions in GHG emissions, major industrialized countries including China, the United States and Canada must adopt more progressive approaches to the way they produce and use energy, natural resources and fuel. The economic argument for environmental concerns proposed in the Stern Report complements longer-standing ethical and scientific imperatives to curb global warming raised by environmentalists and ecologists. The result has been increased pressure on developed countries to increase the value given to environmental considerations in policy decisions.

1.3 Triple Bottom Line

The concept of sustainability is typically considered in terms of three broad sets of parameters: economic, environmental and social. This set of factors is commonly referred to as the 'triple bottom line.' In practical terms, triple bottom line accounting means expanding the traditional accounting framework to balance an understanding of economic considerations with the social and environmental implications that are often undervalued in business decision-making.

Economic sustainability means, in essence, that one group does not deprive another in order to advantage itself. It involves the production and distribution of wealth in a manner that provides goods and services for both present and future generations, and that ensures the long-term,

2 Natural Resources Canada. (June 2005). Energy use data handbook (Cat. No. M141-11/2003). Gatineau, QC: Canada. Energy publications, Office of energy efficiency NRCAN.

wide-spread promotion of a high quality of life. Characteristics of economic sustainability include the presence of diverse and viable economic opportunities, the involvement of relevant stakeholders in decision-making, integrated management and responsiveness to changing circumstances.

Social Sustainability refers to the ongoing ability of a community to function as a safe, healthy and viable setting for human interaction, education, employment, recreation and cultural development. Social sustainability is characterized by such fundamental principles as social equality, diversity, urban livability, universal accessibility and self-determination.

Environmental sustainability generally means that we must ensure that we use essential products and processes of nature no more quickly than they can be renewed, and that we discharge wastes no more quickly then they can be absorbed by the environment. It involves minimizing damage to the carrying capacity of the natural environment and ensuring the long-term integrity of a healthy ecosystem. As such, it concerns itself with the maintenance of clean air, soil and water, and the maintenance of diversity in variety of species and habitats. Characteristics of ecological sustainability include self-sufficiency, resilience and adaptability; efficiency, interdependence and biodiversity.

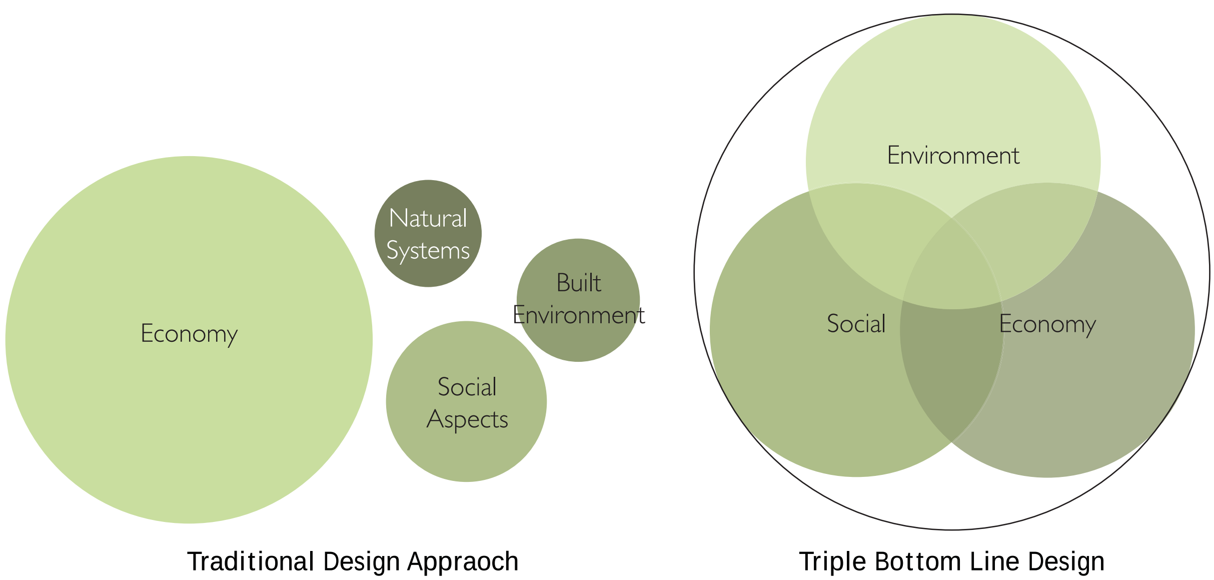

Figure 1.1 Design Considerations The Triple Bottom Line approach to design, values Environmental, Social and Economic aspects equally.

1.4 Methodology and Thesis Structure

This thesis is divided into five chapters providing the research, case study analysis and conclusion to support the economic case for sustainable design. Three appendices provide the back-up calculations for the case study summaries described in chapter three.

Chapter 1, the *Introduction,* provides the background information for the thesis. A brief overview of sustainability is provided along with a summary of the approach that used to explore the thesis statement.

Chapter 2, *The Environmental Impact of Architecture*, demonstrates the critical role that buildings can play in moving the Canadian economy towards achieving its GHG emission targets through the implementation of sustainable design.

In Chapter 3, *Internal Factors Effecting Cost and Success of Sustainable Design*, nine case study projects are used to investigate the cost implications of sustainable design strategies for stakeholders involved in the design and development process. Projects are divided into three sections: Neighbourhood Design, Multi-unit Residential Buildings (MURB), and Commercial Buildings.

In the Neighbourhood Design section, three case studies are used to examine the importance of establishing urban planning guidelines that mandate higher-density land-use patterns; further, these guidelines should be both economically viable and encourage social patterns that minimize the long-term impact of communities on the environment.

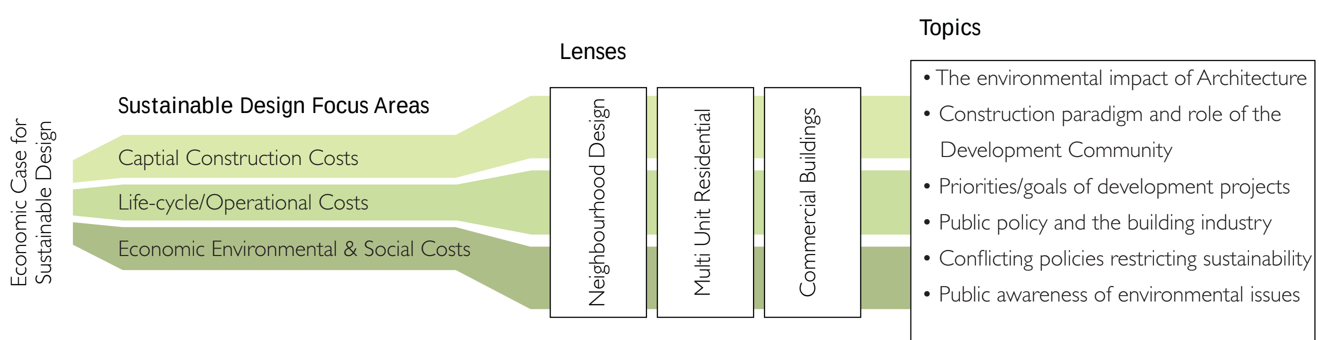

Figure 1.2 Thesis Structure Overview
Economic perspective on sustainable design uses case study analysis to focus in on current obstacles to wide spread market implementation.

In the MURB and Commercial Building sections, the case study projects are compared based on the total incremental cost of a standard building, followed by a commentary on specific measures contributing to the incremental cost. The LEED Canada Green building rating system is used as a method of organizing and presenting cost data. A building value assessment is used to analyze the value of the higher performance buildings. Detailed estimates and project narrative for each case study are provided in appendix A, B, and C of the thesis.

Within each section, the case study projects selected are similar in terms of scale, construction procurement method, and approximate construction start date. The decision to only use case study projects from within Canada ensures that the projects are relevant to developers in Canada.

Chapter 4, *External Factors Effecting Cost and Success of Sustainable Design*, explores sustainable design from the perspective of municipalities, residents and tenants who are typically not part of the design process. Beyond the advantages felt inside the development industry, as outlined in chapter 3, these external groups can benefit significantly as residents of the neighbourhoods and occupants of the buildings. This information supplements the case study section of the thesis.

Chapter 5, *Foundations for Transforming the Market,* exposes a series of indirect or less easily quantifiable economic benefits yielded by sustainably designed development projects; benefit areas include cost to society, productivity gains, and marketing advantages. Chapter five also provides an epilogue to the economic analysis and contemplates how social and environmental perspectives can support a financial approach to questions of sustainability.

02 The Environmental Impact of Architecture

2.1 Introduction

The slow emergence of sustainable design in architecture has been primarily led by design professionals motivated by an ethical conviction that the process of building should be less environmentally destructive than that which we have come to accept from conventional modern construction. While this movement has brought about some degree of positive change, it has ultimately failed to engage the development community and construction industry into a larger dialogue addressing the financial and legal implications of sustainable design. Very few client groups - especially developers - will commit to measures required by sustainable design without a clear understanding of capital cost impacts and the potential payback of these features through operational savings or market advantage.

There is no shortage of recent articles, books and reports addressing issues surrounding sustainable design. Many propose that design professionals, in co-operation with the building sector and manufacturing industry, can play a key role in reducing our dependence on non-renewable resources and lessening the ecological impact of the built environment while furthering social progress and economic prosperity. However, there is a lack of information available to the building industry and the development community that addresses the implications of sustainable design from their perspective.

This chapter will explore how buildings can contribute significantly to Canada's ability to achieve the necessary emission reductions under the Kyoto Protocol through requiring buildings to be constructed to higher standards. From the perspective of the private sector this movement towards greater sustainability provides opportunities such as marketing advantages, corporate branding, increased sales revenue and occupancy premiums.

If buildings are to play a significant role in transforming our society into one that can sustain itself economically, socially, and environmentally there needs to be a paradigm shift from designing buildings with a focus on minimizing first costs, to designing buildings with a primary consideration given to the Value of the proposed development projected over it's useful life.

2.2 The Kyoto Protocol and Sustainable Design

The limitations of a making an economic argument to encourage a more sustainable society become apparent in almost all cases as the Canadian economy, and the global economy in general does not accurately account for the cost to society of environmental destruction. This has resulted in the steady build-up of climate changing Greenhouse Gases (GHG) in our atmosphere. Climatologists predict that not taking decisive action to curb these trends now, could have devastating consequences in the future requiring drastic changes and possible collapse of whole ecosystems.[1]

Addressing this threat is a primary focus of the Kyoto Protocol, which proposes to create an international carbon trading market that would provide a monetary incentive to countries and industries that reduce GHG emissions below the established quota. Carbon credits could be attained by falling below emissions limits, and could be traded to countries and industry who exceeded the set quota. Following the principle of supply and demand, carbon credit 'stocks' would reflect the carbon intensity of the world economy.

Although the Federal US and Canadian governments refused to make any commitment to reducing GHG emissions, in the fall of 2006, many community groups, corporations, municipalities and provinces continue to show strong support for ratification of the Kyoto Protocol. A recent poll of Fortune 500 executives in the United States reported that 34 percent support the Kyoto Protocol, with only 26 percent opposed.[2] Positive industry coalitions are now forming including Alcoa inc., General Electric Co., and Duke Energy Corp., joining environmentalists in calling for mandatory reductions in GHG emissions.[3]

By January 2007, growing public awareness and pressure on the government had forced parties across the political spectrum to take a more progressive stance on environmental issues. The

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1 Diamond, Jared. Collapse: How Societies Choose to Fail or Succeed. New York: Viking: , 2005.

2 Flannery, Tim. The Weather Makers. Australia: HarperCollins Publishers Ltd., 2005. Page 242

3 McKenna, Barrie. (2007, January 23). U.S. CEOs Want Action on Climate Change: Bush faces pressure for tougher rules. Globe and Mail, Retrieved January 23, 2007, from http://www.globeandmail.com.

primary point of debate revolved around questions of the economic repercussions of compliance and the willingness of Canadians to make personal sacrifices in order to meet these targets.

The predictions on the net economic effect of pursuing Kyoto targets vary widely. William Lash of The Center for Study of American Business makes dire economic predictions such as increased domestic energy costs of 86% and a cut to the average American family income of $2700.[4] While Adair Turner, former director general of the Confederation of British Industry suggests a slowdown in growth by only one-tenth of 1%.[5]

In Canada the cost of compliance has not been estimated to date, as a credible plan outlining how Canada could achieve its emission reductions has not been completed. A contentious proposal for meeting Canada's emission reductions was eventually released in the spring of 2002. However a major shortcoming of this report was a failure to address the potential of buildings to play a part in the total reduction commitment. Instead, the focus was primarily on industry, where emission controls have been in place for decades and actual emissions per GDP growth have followed a similar pattern to buildings since 1990 (see Figure 2.02c). Within the same time, the energy requirements (per unit area) of the average building have grown, both in terms of embodied energy of the finished building and the operation of the building during occupancy.[6]

Conventional wisdom is that transportation and industry are at the root of the climate change problem, and in turn are the focus in the Canadian Plan for meeting its Kyoto targets. However when comparing the building sector to the transportation sector, we see that automobiles have improved in fuel consumption drastically. For example, the Chevrolet Malibu was Canada's best-selling car in 1980. The car weighed 1419 kilograms and its 3.8 liter engine used 12.6 liters of gas to drive 100 kilometers in the city and 8.1 liters on the highway. When the car was reintroduced in 2005 it weighed 1439 kilograms and its 2.2 liter engine used 9.8 liters per 100

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4 Flannery, Tim. The Weather Makers. Australia: Harper Collins Publishers Ltd., 2005. Page 233..
5 Ibid., Page 233.
6 Skopek, Jiri. Green Building Value, Ontario Institute of Quantity Surveyors (OIQS) General Meeting, September 12, 2006, The University Club, Toronto.

kilometers in the city and 6.6 litres on the highway. Although the engine in the 2005 version was nearly half the size, it is 32 percent more powerful, generating 145-horsepower, compared with 110-horsepower in the 1980 Malibu.[7] There are considerably more fuel-efficient vehicles than the 2005 Malibu on the road today: many auto manufacturers are substantially raising the bar on expectations for energy efficiency with hybrid models, and by reducing the overall weight and size of vehicles along with total embodied energy required to manufacture a vehicle. Beyond these environmental considerations, comfort and handling have improved while cars have become more affordable to a growing number of people. Companies embracing the movement to more fuel-efficient vehicles have enjoyed growing profit margins and market demand for vehicles within the North American market.

Looking at the data for buildings, one could conclude that the relatively low achievements in efficiency within the construction industry to date offer great opportunities for significant improvements in the energy and resource efficiency of buildings. This could be achieved without threatening the continued growth of the Canadian economy as unlike other sectors, the construction industry does not have to compete with offshore manufacturing that has the potential to jeopardize Canadian employment figures.

For these reasons, the profession of architecture along with the building industry could potentially be the single largest contributor to Canada's solutions for compliance with the Kyoto Protocol. It has been calculated that by reducing the GHG emissions by 25 percent in renovations and new buildings, architects and design teams could have the power to achieve 15 percent of Canada's Kyoto commitment within 5 years.[8]

The following statistics are provided as an overview of the present role that buildings play in Canada's GHG emissions. Approximately 10 billion square meters of building exist in Canada

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7 Keenan, Greg. (2005, May 26). Auto industry steers course to trim the fat from vehicles. Globe and Mail, Retrieved May 26, 2005, from http://www.globeandmail.com.

8 Royal Architectural Institute of Canada (RAIC). (2002). Sustainable Design Fundamentals for Buildings ( ). Ottawa, ON: Canada. Royal Architectural Institute of Canada (RAIC). Chapter 5.1

at present. Of this, 10 million square meters are renovated and an additional six million square meters of building are added every year. In 2004, residential and commercial buildings accounted for 28 percent (144.6 MT) of GHG emissions through direct operating energy consumption (See figure 2.02b). The construction industry contributes another 30% of GHG emissions indirectly through the production transportation and waste of materials. As examples, cement production alone accounts for 8% of GHG emissions, and construction debris accounts for 30-40% of garbage in our landfills. Ultimately, the building industry is responsible for 40 percent of GHG emissions, and 31 percent of total national energy consumption excluding industrial buildings.

As indicated in Figure 2.01c and 2.02c, the overall trend of secondary energy use (energy used by final consumers for residential, agricultural, commercial, industrial and transportation purposes) and GHG emission statistics reveals that between 1990 and 2004 energy use and related GHG emissions have grown by 1.3% per year on average in buildings and by 1.6% percent per year across all sectors. Figure 2.02b shows that in 2004, combining all building types, residential 17%, commercial and institutional, 14% and the proportion of the industrial sector related to building operation and construction, buildings are among the biggest secondary energy consumers in the world. The primary source of GHG emissions from the building sector is directly related to energy usage for building operation. These emissions result from both non-renewable electricity produced at a central power plant, as well as direct on-site combustion of fossil fuels.

Calculating the full benefits of lower energy consumption of more efficient buildings is more complex than a linear energy efficiency scale. This is because energy efficient buildings tend to use disproportionately less energy during peak times when electricity is more valuable, expensive and is typically generated by fossil fuels.[9] Although the environmental and health costs associated with air pollution caused by non-renewable electric power generation and on-site fossil fuel use are generally externalized, and are ignored when making capital investment decisions, the energy reductions realized through the design and construction of green buildings can

9 Hawken, Paul, and Amory Lovins, and L. Hunter Lovins. Natural Capitalism: Creating the Next Industrial Revolution. New York: Back Bay Books/Little, Brown and Company, 1999. Page 266

reduce pollution and lower the environmental impact of conventional power generation.[10]

It is estimated that approximately 40 percent of all energy worldwide is used to build, heat, cool and provide power to operate buildings.[11] In addition to this, as much as 40 percent of the world's raw materials are used in buildings, and the construction and operation of buildings constitute almost 40 percent of all GHG emissions.[12] A major proportion of our hazardous-substance use also occurs in the building sector.[13]

Energy use and GHG emission statistics specific to the Canadian residential sector are for both detached and MURB type developments, and it is difficult to extrapolate the statistics specific to each. It is still interesting to note that the residential sector accounts for only 8 percent of the total increase in energy consumption since 1990 levels while adding 3,292,400 units to the market representing a 30 percent growth since 1990.[14] This was due to the small increase in residential energy use through improvements in housing construction as well as the shift towards less GHG-intensive fuels and improvements in energy codes/standards. However, it is important to note that these figures do not take into account the larger implications of widespread, low-density housing, such as the necessary dependence on passenger vehicles for transportation. This relationship is discussed further in the Neighbourhood Design case study in Chapter 3 of this thesis.

In contrast, energy consumption within the commercial sector represents 19 percent of the total growth, and related GHG emissions are 22 percent of the total growth in emissions between 1990 and 2004. In the industrial sector energy consumption represents 35 percent of the total

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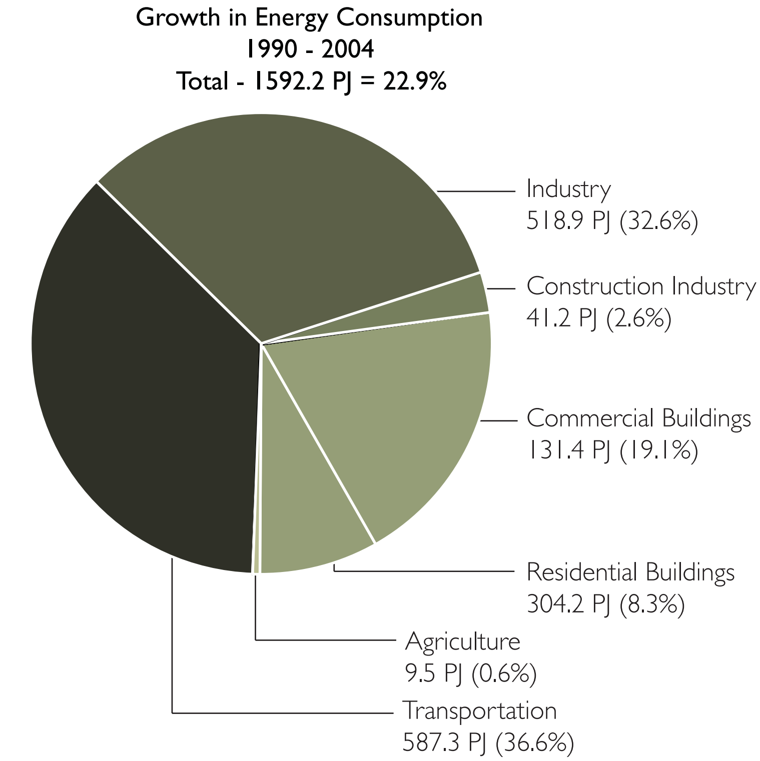
10 Lovins, Amory et al. Small is Profitable: The Hidden Economic Benefits of Making Electrical Resources the Right Size. Snowmass Colourado: Rocky Mountain Institute, 2003..

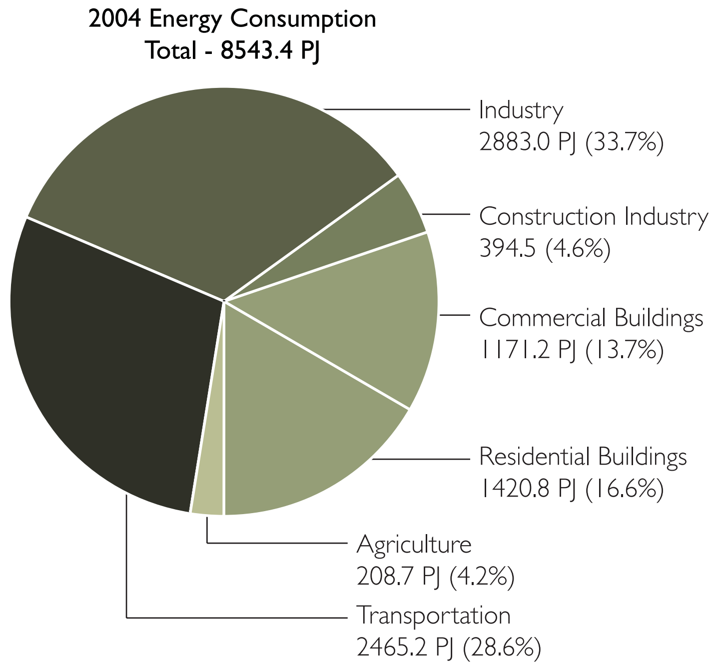
11 Natural Resources Canada. (June 2005). Energy use data handbook (Cat. No. M141-11/2003). Gatineau, QC: Canada. Energy publications, Office of energy efficiency NRCAN.

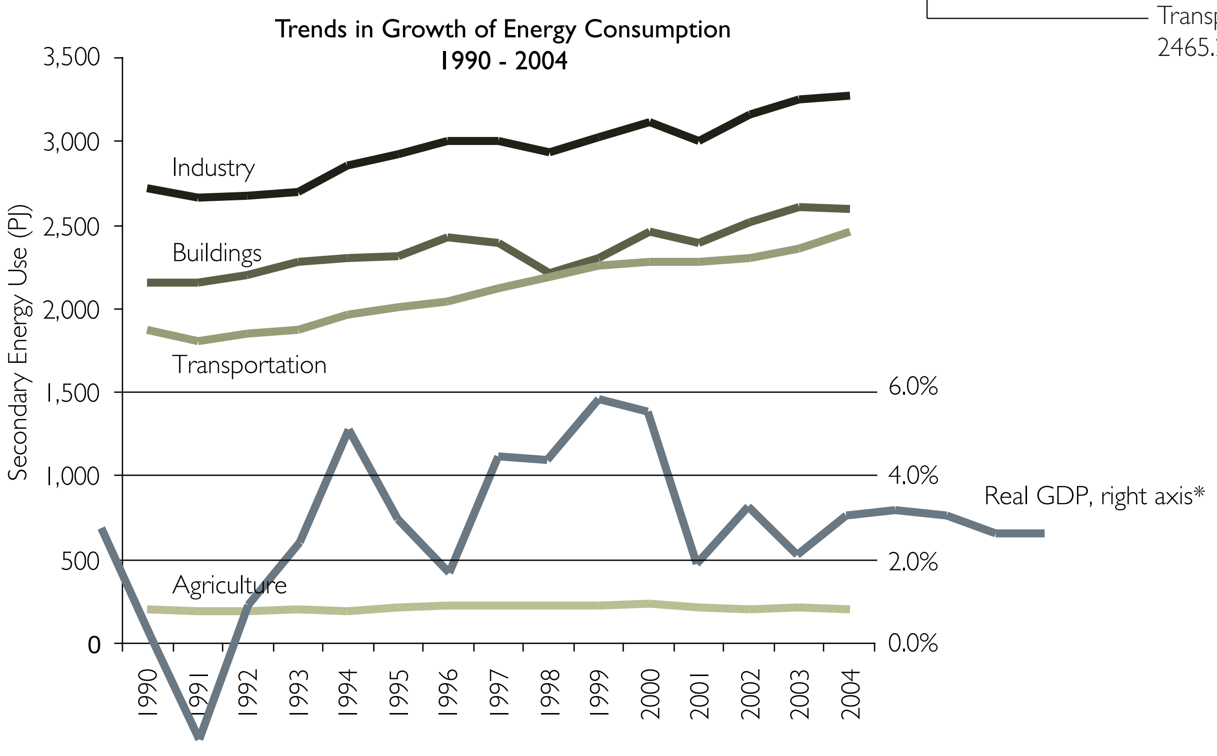
12 Busby, Peter. (2002, July). Building Kyoto. Canadian Architect, 18-19.

13 McDonough, William, and Michael Braungart. Cradle to Cradle: Remaking the Way we Make Things. New York: North Point Press, 2002.

14 Reed Construction Data. (2006, November 10). CanaData Annual Construction Forecast (ISSN 0843-3674). Markham, ON: Canada. Reed Business Information a division of Reed Elsevier Inc.





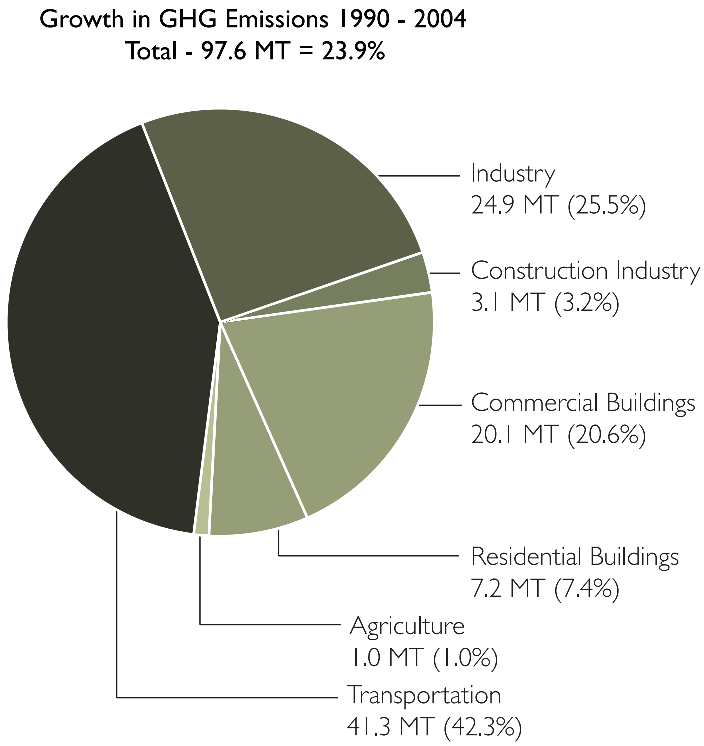


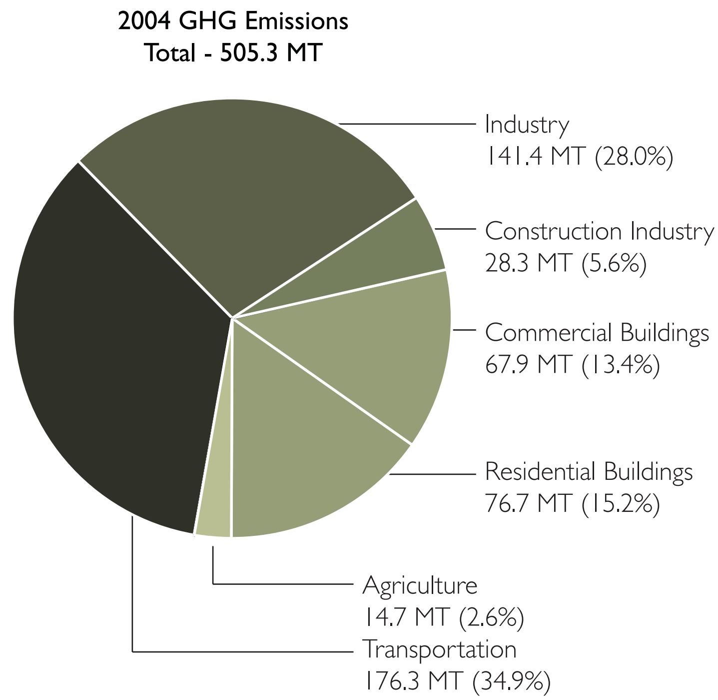
* "Real" means after taking into account price changes (captured in the GDP deflator - 1997 chained dollars).

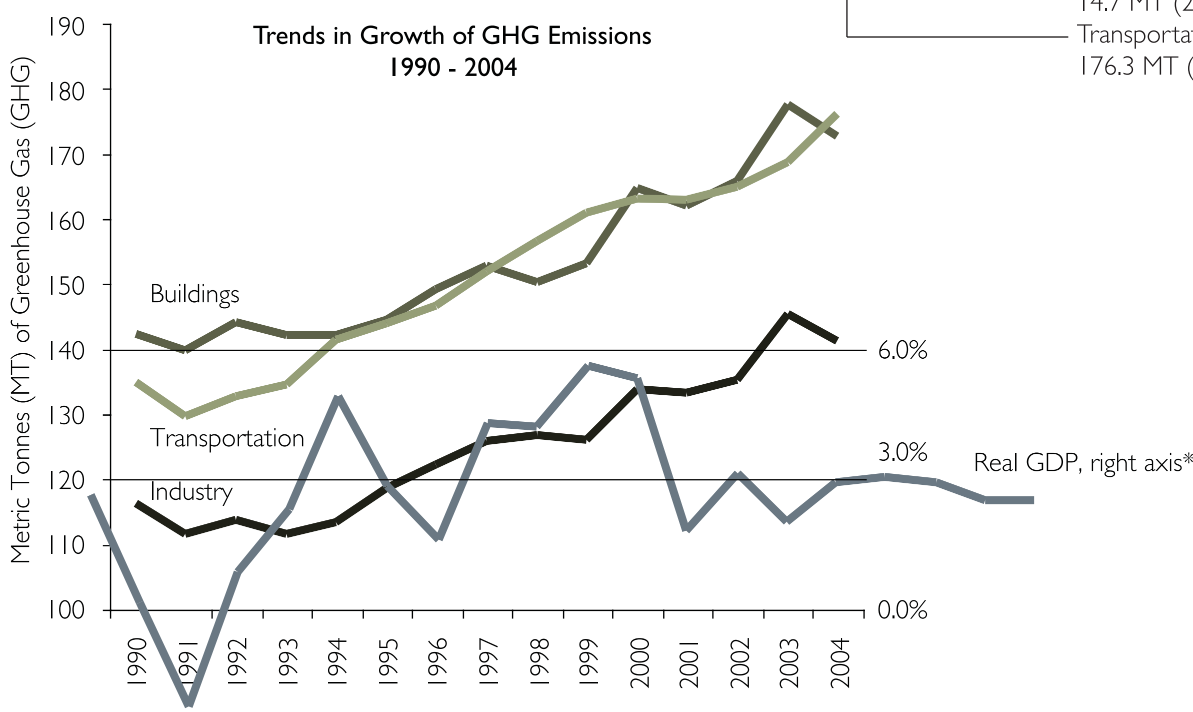
Figure 2.01a Upper Left, Growth in Canadian Energy Consumption by Sector Percentage growth in energy consumption between 1990 and 2004 (1592.5PJ) across four major sectors.

Figure 2.01b Upper Right, 2004 Apportionment of Total Energy Consumption Total energy consumption in 2004 reveals that combined buildings consumed 31 percent of all energy consumed in Canada excluding industrial buildings.

Figure 2.01c Lower Left, Canadian Energy Consumption by Sector Trends in energy consumption between 1990 and 2004 across four major sectors.





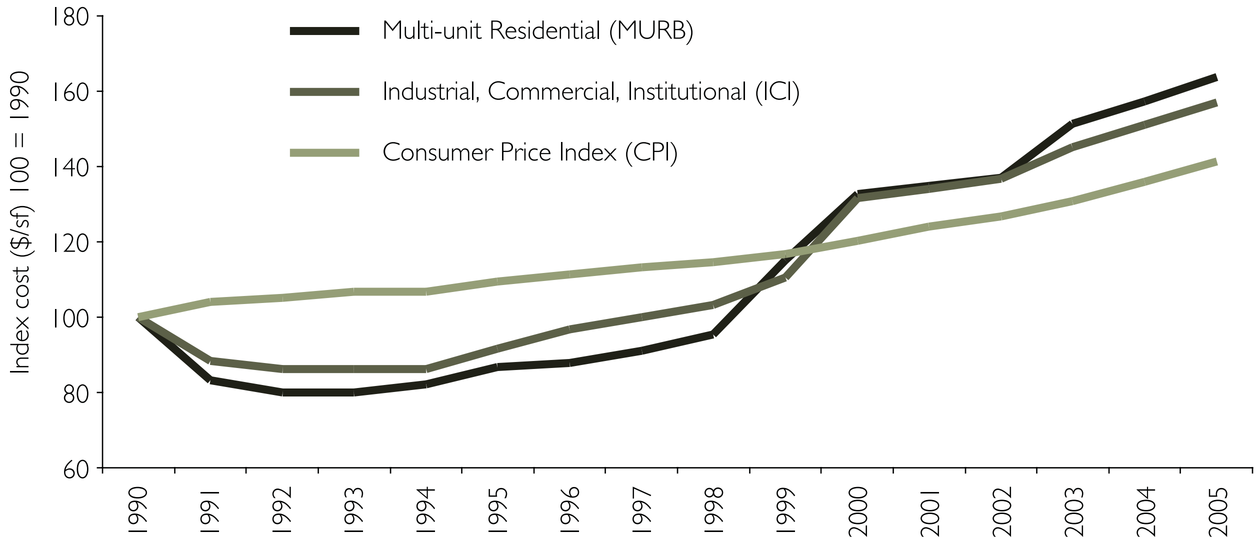


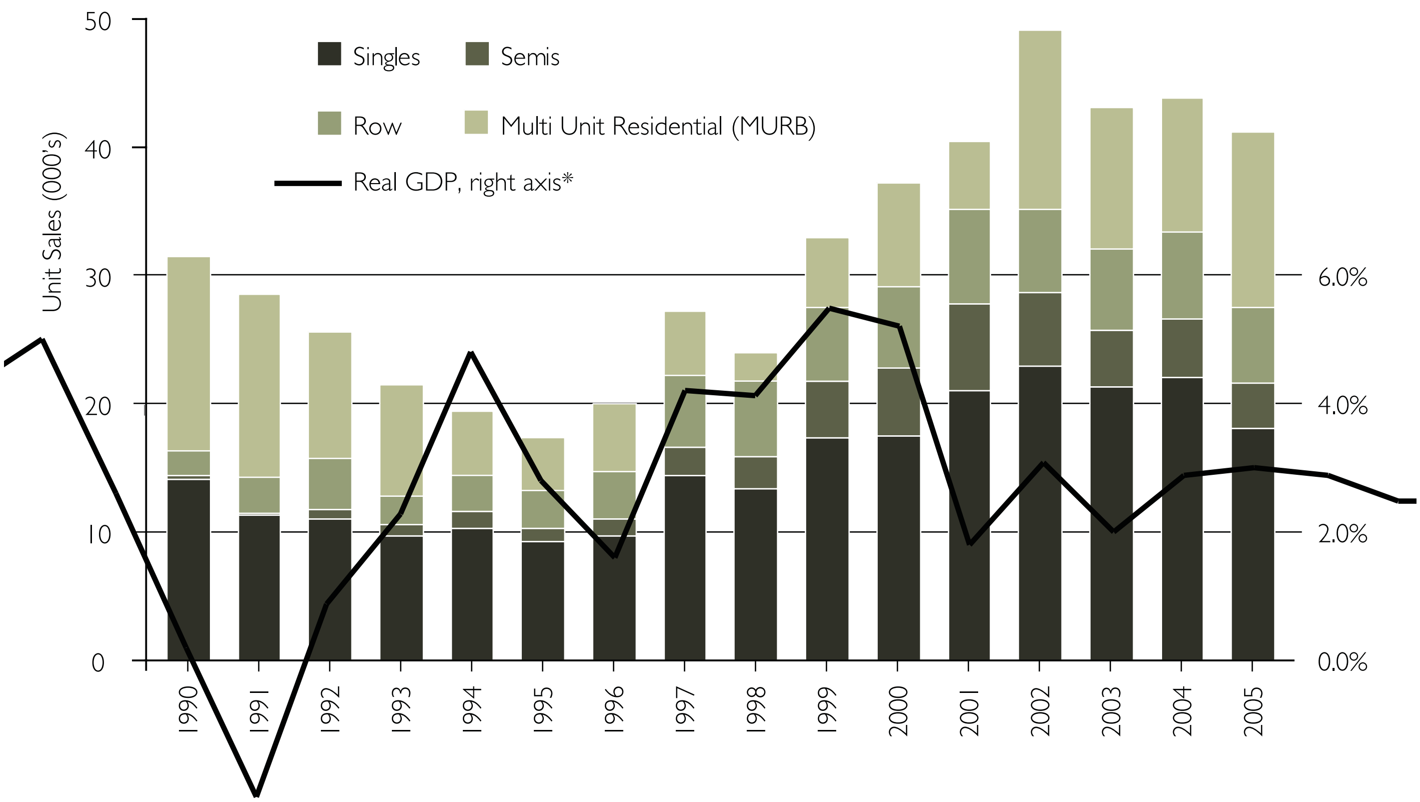
* "Real" means after taking into account price changes (captured in the GDP deflator - 1997 chained dollars).

Figure 2.02a Upper Left, Growth in Canadian Greenhouse Gas Emissions by Sector Percentage growth in Greenhouse Gas Emissions between 1990 and 2004 (97.6MT) across four major sectors.

Figure 2.02b Upper Right, 2004 Apportionment of Total GHG Emissions Total GHG emissions in 2004 reveals that combined buildings account for 28 percent of all GHG emissions in Canada excluding industrial buildings.

Figure 2.02c Lower Left, Canadian GHG Emissions by Sector Trends in GHG emissions 1990 and 2004 across three major sectors (agriculture omitted).





* "Real" means after taking into account price changes (captured in the GDP deflator - 1997 chained dollars).

Figure 2.03 Upper, Toronto Construction Index Trends in Toronto construction costs between 1990 and 2005.

Figure 2.04 Lower, Housing Completions, GTA 1990 - 2005 Trends in residential units sales between 1986 and 2005 across four major building types.

growth and 26 percent of the rise in GHG emissions. In both theses instances, this increase is primarily a result of the growth in the use of air conditioning in buildings; and the growth in development of suburban office/retail and industrial space, especially since 1999, in response to the strong Canadian economy. The paths of each of these sectors can be seen in Figure 2.01c and 2.02c tracked between 1990 and 2004.

2.3 Trends in Energy Intensity of Buildings

The steady growth in the energy use of buildings has been accompanied by a similar rate of escalation in construction costs of buildings. As is evident in a comparison between figure 2.03 and 2.04 construction costs more closely follow supply/demand dynamics compared with the steady Consumer Price Index (CPI) growth trends. Figure 2.03 shows construction costs for the multi-unit residential (MURB) and Industrial Commercial Institutional (ICI) sectors relative to 1990 in Toronto with reference to the CPI. What this graph reveals is that since 1998 construction costs have out-paced the general rate of inflation in Canada. It is not inherently clear where these additional costs are being allocated; however, one could speculate that labour and material cost escalation without an increase in productivity represents a significant portion of this escalation. The theory that there is a correlation between construction costs and energy efficiency of buildings is not supported by these figures, in fact the correlation appears to work in the opposite direction. While this likely comes of little surprise to most people who have been involved with the building industry over the last two decades, it is revealing to look outside this industry to see how buildings have failed to keep pace with other sectors of the Canadian economy.

The construction industry in Canada is a critical component of the Canadian economy, accounting for 11.2 percent of GDP, around $123 billion dollars in 2005 and employing close to 1 million people.[15] Projects commissioned by developers represent a significant portion of the total money spend on buildings in any given year especially in the residential and commercial

15 Canadian Construction Association. February 25, 3007 <http://www.cca-acc.com

building figures.[16] For this reason the buildings they commission have the most potential to influence the construction industry nationally. Traditionally these developers have worked with the same team of architects, engineers and general contractor on these projects lending itself to a more collaborative approach to design, where optimizing systems in the building can lead to greater environmental performance. Furthermore, because of the typical funding structure of developer driven projects, these buildings are historically constructed to minimum building and energy code standards, so the potential to make significant improvements in efficiency is greatest within this sector. For this reason, this thesis focuses on developer-driven projects. It is possible, to some degree, to apply ideas presented for private sector development projects to publicly-financed projects and owner-occupied buildings, as these clients are more likely to consider measures that can be amortized over a longer period and may look more favorably on decisions that show clear environmental or social benefits.

Alongside the a need for the development industry to recognize the marketing advantages of investing in more sustainable type buildings is the need for government leadership in the form of more stringent building and energy codes that will result in lower GHG emissions from the building sector. Although there are few instances where these two groups share a common goal, the opportunities to developers outlined in chapter 3, such as marketing advantages, corporate branding and increased sales revenue and occupancy present clear advantages to this group. If the Government is committed to meeting its Kyoto targets, a plan that requires higher efficiency buildings may be the most affordable means of meeting these GHG emission reduction targets.

Another major advantage of a plan that requires higher efficiencies for buildings is that unlike other industries, the construction industry does not compete internationally for market share.

16 Reed Construction Data. (2006, November 10). CanaData Annual Construction Forecast (ISSN 0843-3674). Markham, ON: Canada. Reed Business Information a division of Reed Elsevier Inc

Therefore, the effect of increasing the capital cost of buildings in Canada may actually stimulate economic growth; and has the potential to put Canadian companies on the leading edge of sustainable building techniques, allowing new products and knowledge to be marketed internationally. However, productivity growth in the construction sector has lagged behind that of the business sector by over 50% since 1960.[17] Its international competitiveness has also been questioned, as Canada's largest companies are dwarfed by more vertically and horizontally integrated companies.[18] The industry also appears to suffer from neglect from the federal government. To date there are no national innovation programs related to construction in Canada despite recommendations made by the National Research Councils Institute for Research in Construction. These recommendations, made an attempt to catch-up with countries like Australia, the UK and the United States, propose that a similar set of 'high-level' national goals for the economic performance, societal benefits and environmental impacts be established for the industry.[19]

The lack of innovation and ability to compete on the international market has also made the industry one of the most volatile sectors in the Canadian economy. Figure 2.05 demonstrates the correlation between Ontario's Gross Domestic Product (GDP) growth year to year since 1990 and total value of construction starts across 5 major sectors including institutional, residential, commercial, industrial buildings and engineering projects such as roads and infrastructure. The residential and commercial building sectors are a primary component of the overall construction start volatility, which are used by economists as a primary indicator of the health of the economy. As a result, any potential threat to the steady growth of the construction industry is seen to have the potential to affect the Canadian economy as a whole. As such, sustainable design initiatives have been marked as a potential threat to the steady growth pace of unit sales,

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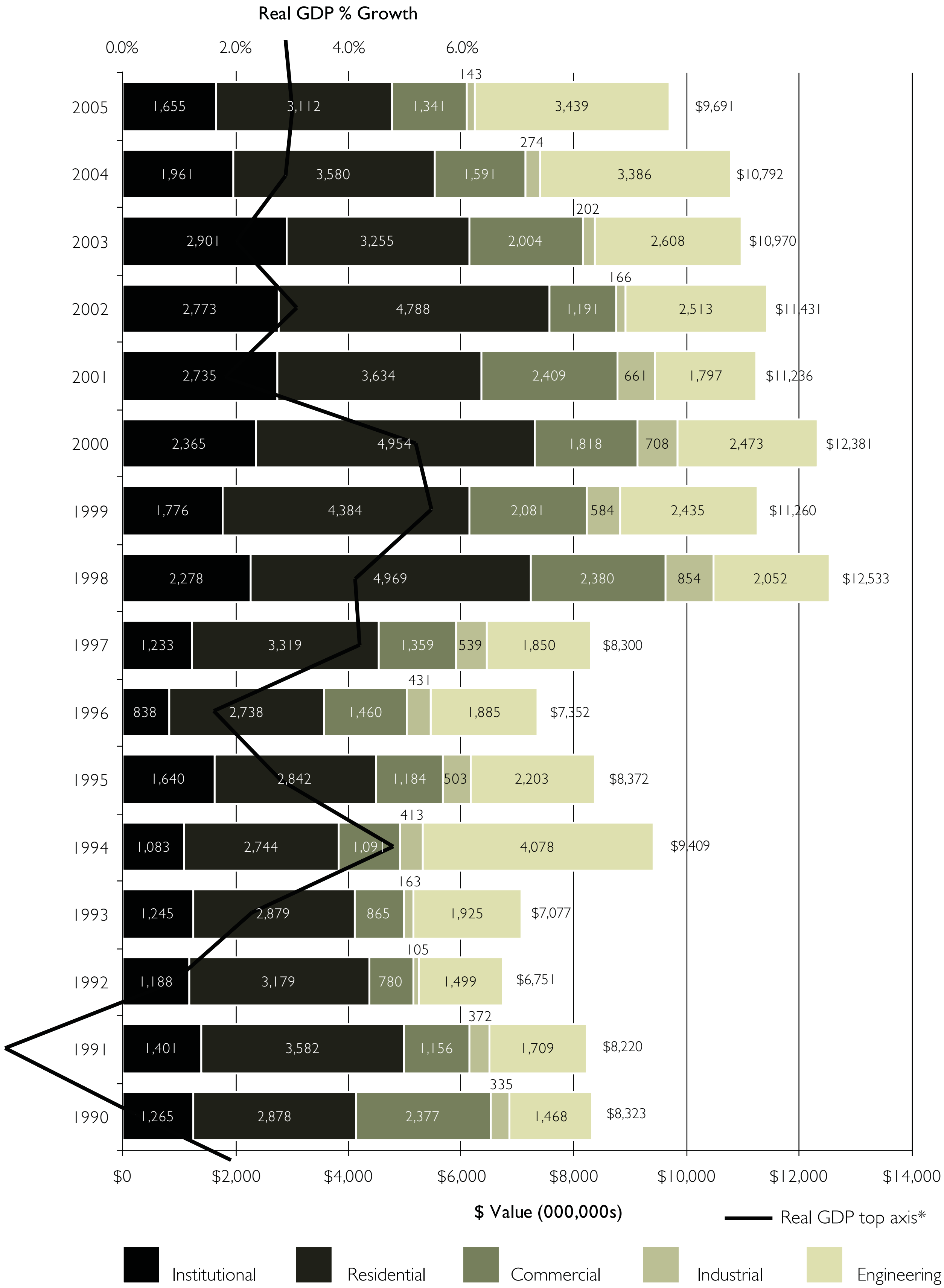
17 "Innovation in Consturction Priorities for Action, A Response to the Federal Government Announcement" Prepared by The National Steering Committee for Innovation in Construction, 2002.

18 Succeeding by Design. Canada's largest construction firm has 3000 employees while intercontinental companies have in the range of 100,000.

19 The Ontario Association of Architects (OAA) (2003, November). Succeeding by Design – A Perspective on Strengthening the Profession of Architecture in Ontario and Canada. Montreal QC: McGill Business Consulting Group.



* “Real” means after taking into account price changes (captured in the GDP deflator - 1997 chained dollars).

Figure 2.05 Ontario Construction Starts between 1990 and 2005 Dollar value by construction type demonstrates that construction expenditure per year follows the Canadian economy as reflected by the Real GDP line overlay.

too onerous a requirement to enforce and having the potential to bring about an economic downturn. When given the choice between jobs and the environment, jobs have historically been the priority of the Canadian government.

However, if we reconsider what defines a strong economy, or account for the cost of unsustainable development to the environment and society, we may arrive at the opposite conclusion. Instead of only looking for results or 'feedback' on our actions, the book "Cradle to Cradle" suggests the concept of looking for a 'feedforward' signal:

> *Traditionally, companies have relied on feedback for signals that influence change, looking backward to assess previous failures and successes, or they have looked around them to discover what the competition is up to. Respecting diversity means widening the scope of input too, to embrace a broader range of ecological and social contexts and a longer temporal framework as well. We can consult "feedforward," asking ourselves not only what has worked in the past and present, but what will work in the future. What kind of world do we intend and how might we design things in keeping with that vision? What will a sustaining global commerce look like ten or even a hundred years from now? How can our products and systems help to create and sustain it?*[20]

Considering this concept, the building industry could benefit from pro-actively adopting the principles of sustainable design before regulations enforce it or it suddenly becomes unfeasible to build in the traditional way. One strong indication that the current building and energy code regulations are not stringent enough is that building owners and developers are increasingly willing to exceed the set minimums by significant margins. Major developers and property management companies such as Tridel[21] and H&R Developments, who have already recognized the value in exceeding minimum standards.[22] These more progressive developers are the exception

20 McDonough, William, and Michael Braungart. Cradle to Cradle: Remaking the Way we Make Things. New York: North Point Press, 2002.
21 See www.tridel.com for a complete description of the company's commitment to higher environmental standards in current and future projects.
22 Downtown Office Development Panel, National Association of Industrial and Office Properties (NAIOP), October 23, 2006, Design Exchange, Toronto, Ontario.

however, with the majority of organizations in the building industry continuing to build at the minimum standards allowable by code. The growing trend towards 'green buildings' is in part a response to environmental and social awareness, but also simple matter of economics when a client considers the building as an asset and evaluates design decisions on this basis. On almost any building, a simple calculation can be done to demonstrate that the minimum building code requirements are not an economic optimum or optimizing energy use and resulting GHG emissions.

For buildings other than those that fall under Part 9, the national and provincial building codes are primarily concerned with life safety and structural integrity with few enforceable standards related to energy efficiency. The Model National Energy Code for Buildings (MNECB) provides a design 'guideline' for the minimum performance recommended for buildings, however, in practice many buildings (especially developer financed MURBs and Commercial buildings) do not actually meet MNECB[23]. In Ontario, municipal building departments have not challenged mechanical engineering calculations nor do they require testing to determine as-built energy consumption.

For residential buildings that fall under Part 9 of the building code, which deals primarily with residential buildings less than 3 storys and under 560 square meters of Gross Floor Area, there are prescriptive thermal performance requirements for the building envelope in addition to the mechanical and electrical systems. However, these minimum standards are equally low and are often established in cooperation with development lobby groups, limiting the potential of significantly increasing the energy performance of this sector. For example, the recent changes to the energy performance requirements of Part 9 to be implemented in 2007 either reflect current practice, or will have minimal impact on the standard practice that has moved beyond the ob-

23 Personal conversation with Mechanical engineer involved with energy modeling of MURB and Commercial buildings in the Southern Ontario market in August 2006.

solete 1999 code.[24] In Parts 3 and 4, governing life safety and accessibility, the building codes in Canada have played a key role in mandating higher standards over the last 25 years. However, over the same time period referenced energy codes such as MNECB and have not shown the same type of leadership with regards to energy efficiency.

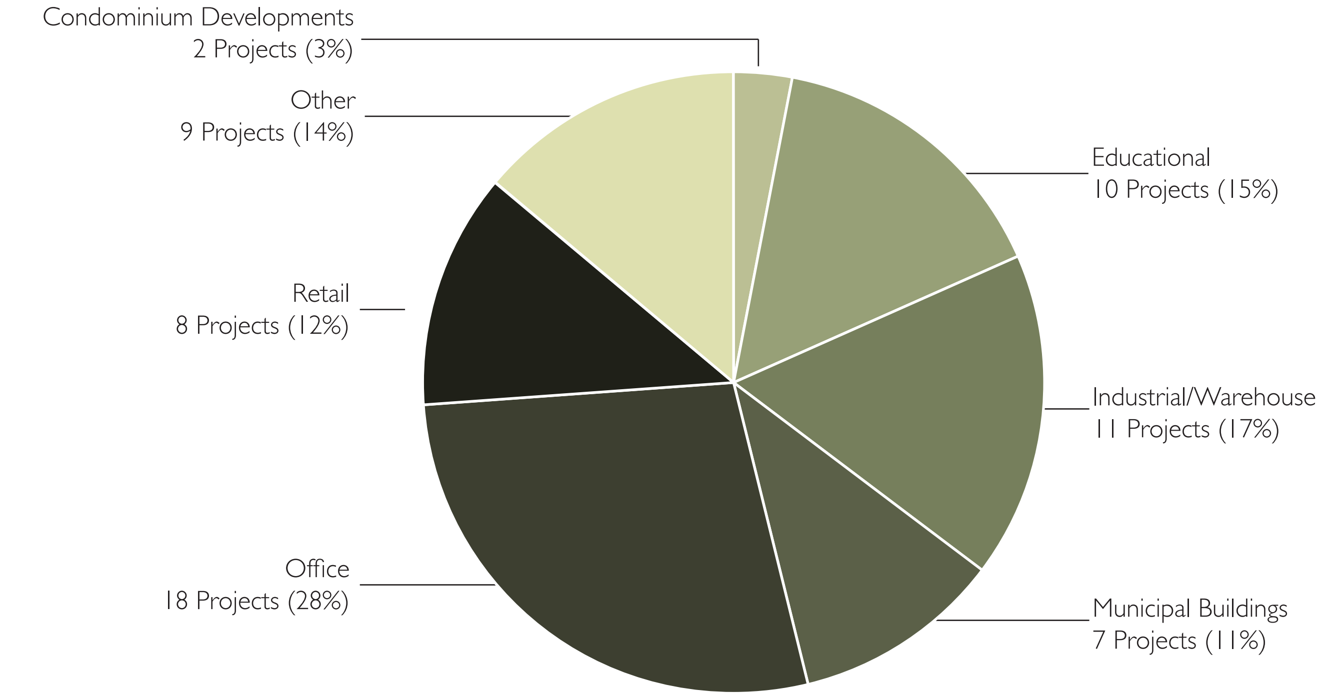
Even in the absence of a clear government-administered standard reflecting the public's growing interest in environmental issues, the green building industry is growing at an estimated rate of 10 percent per year according to the Canadian Green Building Council (CaGBC) website.[25] Many larger municipalities in Canada including Ottawa, Toronto, Calgary and Vancouver in addition to several smaller cities including Kingston and Waterloo, have aligned with or are aligning with green building rating systems such as the CaGBC administered Leadership in Energy and Environmental Design (LEED). Depending on the municipality these standards either provide an incentive to projects who target LEED or in the case of Vancouver where a parallel to the LEED rating system has effectively established a new set of minimum performance requirements to be achieved by qualifying buildings in order to receive building permit approval.

2.4 Tools for Analysis of Environmental Impact of Architecture

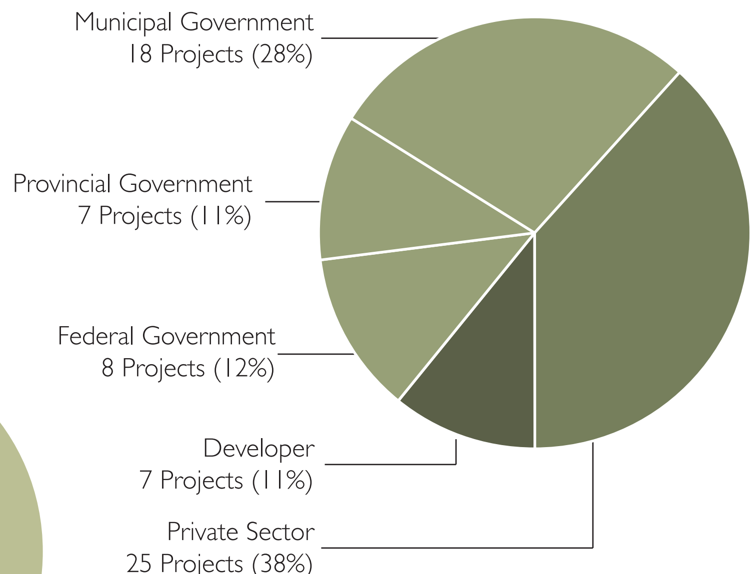
In response to the growing number of buildings claiming to be either 'green' or 'sustainable,' a number of building performance rating systems such as Boma Canada's Go Green[26], LEED and BREEAM[27] have been introduced to compare the relative claims of sustainability. These systems are predicated on scientific assumptions that claim to understand how particular 'green' initiatives affect the overall impact of buildings on the environment. There is much debate around the accuracy of these measurements, and the legitimacy of a private organization endorsing particular buildings as 'sustainable' under their particular definition. However, there is a clear need and desire for measurement in order to benchmark progress and address the public's

24 Personal conversation with Pidel Homes Project Manager Chris Johnstone in January 2007.
25 Canadian Green Building Council. December 15, 2006 <http://www.cagbc.org/>
26 BOMA Go Green. December 15, 2006 < http://www.bomagogreen.com/>
27 BRE Environmental Assessment Method. December 15, 2006 < http://www.breeam.org/>

Percentage of Total by Building Type



Percentage of Total by Client Type



Percentage of Total by LEED Rating

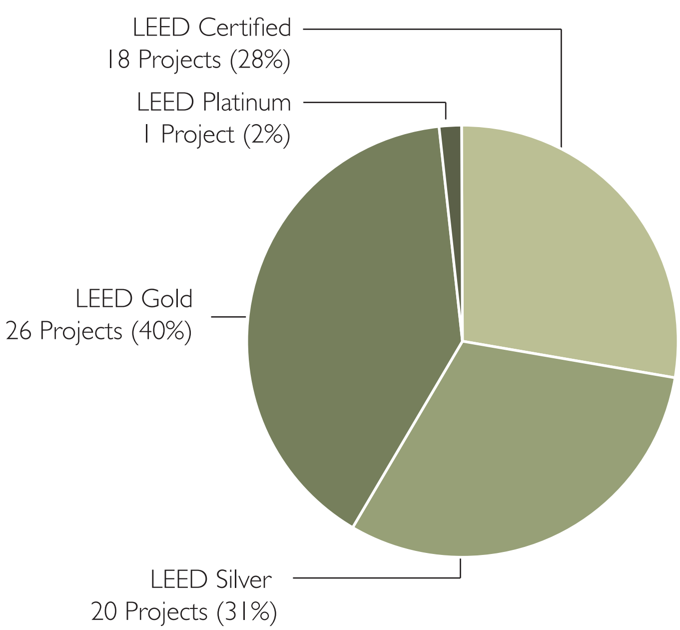


Figure 2.06 LEED Canada Project Overview
Buildings in Canada Certified under the LEED rating system total 65, since its introduction in November 2004.

uncertainty of what constitutes sustainable design, especially in the absence of a national code that recognizes these priorities.

For the purposes of this thesis, the LEED building rating system administered by the CaGBC has been used in order to structure the analysis and provide a common language for comparison. LEED stands for Leadership in Energy and Environmental Design, and is the most widely used and recognized building rating system in North America. Figure 2.06 summarizes some the key market information about LEED buildings in Canada. The following overview of the system is provided for readers who are not familiar with LEED. More information can be found on the CaGBC website[28] as well as the website for the organization's US counterpart, the USGBC.[29]

The LEED green building rating system is predicated on a voluntary, consensus-based, market-driven analysis derived from existing proven technology. The point-based system awards four levels of achievement (Certified, Silver, Gold and Platinum) based on the number of points earned. Each level recognizes a project's environmental performance from a whole building perspective over its life-cycle, providing a definitive standard for what constitutes a 'green building.'

The rating system is organized into five environmental categories:

- Sustainable Sites
- Water Efficiency
- Energy and Atmosphere
- Materials and Resources
- Indoor Environmental Quality

An additional category of 'Innovation and Design' covers measures not covered under the five environmental categories which demonstrate exceptional leadership in building design and

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28 Canadian Green Building Council. December 15, 2006 <http://www.cagbc.org/>

29 United States Green Building Council. December 15, 2006 <http://www.usgbc.org/>

performance.

Since its introduction to the Canadian market in November 2004, LEED has emerged as the preferred rating system for the building industry. Advantages cited by developer clients of Altus Helyar, who are commissioning LEED projects identify with the following attributes:[30]

- Relatively simple to implement – growing understanding of requirements by material suppliers, sub-trades, and municipal building code officials.
- Not overly prescriptive – many credits are evaluated on a performance-basis relative to modeled baselines for the storm water run-off, water use, and energy consumption of a typical building.
- Establishes Canadian reference standards for clear benchmarking, relative to typical buildings constructed to meet national building and energy codes.
- An independent certification of actual building performance relative to industry standard and other green buildings
- Growing rapidly – across North America, as a recognized system that embodies the values of environmentally-conscious society and responsible business practice.
- Marketable – Green projects are attracting an increasing number of tenants or clients who are aware of both the increasing costs of utilities and maintenance, and their role in achieving Canada's Greenhouse Gas emission targets.

Many members of the building industry also appreciate the fact that the rating system serves to level the playing field, foster competition and reward projects that demonstrate environmental leadership. The mission of the CaGBC is to address the top 25 percent of buildings in Canada and continue to encourage the building industry to adopt more sustainable practices.[31] In

30 Altus Helyar Cost Consultants LEED overview presentation
31 Canadian Green Building Council. December 15, 2006 <http://www.cagbc.org/>

the United States, where the system has been in place since 1995, the USGBC has raised the minimum requirements twice to reflect the rapidly evolving construction industry that is keen to adopt the additional requirements of LEED.[32]

2.5 Conclusion

Green building has the potential of moving our society towards greater sustainability; in fact, in light of the building industry's environmental impact, building design professionals could be viewed as accountable for about 40 percent of the innovation and change required in the project of wholesale environmental reform. This assertion presents both a challenge and an opportunity for architects and other building design professionals. The challenges are to develop approaches and practices that address immediate environmental concerns, and that adhere to emerging sustainable development principles. Opportunities exist for both the reinstatement of meaningful and enduring design principles that respond to the ecologies of climate, resources and culture, and for design professionals to provide the visible and creative leadership that will be necessary to create change. The profession of architecture in cooperation with forward-thinking developers have the opportunity to be at the forefront of the environmental public debate and key players in the formation of national and global policy regarding the built environment.

The leadership of the Government in establishing new codes, that challenge the building, transportation and industrial sectors to respond with innovation in meeting these more stringent requirements will also bee critical. Ideally, new legislation would recognise the potential role that the building industry can play in reducing Canada's GHG emissions, reaching for targets beyond those which are being met under the current the voluntary measures being adopted by many organizations who are leaders in their industries.

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32 United States Green Building Council. December 15, 2006 <http://www.usgbc.org/>

03 Internal Factors Effecting Cost and Success of Sustainable Design

3.1 Introduction

The intent of this section is to examine the costs and benefits of sustainable design measures for each of the three project types: Neighbourhood Design, Multi-unit Residential (MURB) and Commercial Buildings. In Neighbourhood Design analysis, the financial implications of a sustainably-designed neighbourhood are examined from the perspective of the developer and the municipality. For MURB and Commercial Buildings, case study analysis and cost summaries explore the specific factors contributing to the LEED cost increment; this information should help designers to better understand how to mitigate costs associated with meeting LEED targets. This cost increment information is balanced against building value calculations, to demonstrate how sustainable design decisions influence long-term operation costs and building value. The building value calculations account for advantages of energy and water efficiency, as well as rent, occupancy and residual value premiums. Detailed back-up data for each case study is included in the appendices. Figure 3.12 and 3.13 on pages 54 and 55 provides a complete description of the methodology for completing the building value assessment for each of the MURB and Commercial Building case studies.

3.1.1 Influencing Factors of Additional Costs

The following case studies explore in detail the relationship between project capital costs and specific measures taken to meet LEED targets. The determination of which costs are included in the base building and which are allocated under the LEED heading is based on recent similar projects completed by the same developer or client type (see Figure 3.01).

The case studies show that in general, sustainable design upgrades have a lesser effect on the budget of a higher quality building than on a developer's standard-spec office building. If a higher level of quality is specified in the base building, then LEED measures can in many cases be built into the base budget; for example, a prestigious institutional building like a library will consider many of the measures required by LEED as base building requirements, and as a result the additional costs of meeting LEED requirements are significantly less. At the other end of the spectrum, achieving a level of LEED certification on a lower-quality office building, where the objective is to immediately maximize return on capital investment, every measure taken beyond achieving minimum code compliance has the potential to increase capital costs.

The total LEED premium is dependent on many factors that are specific to each project, as shown in figure 3.02. Some of the more significant factors that have influenced the varying success of the case study projects are owner/programme flexibility, green market maturity, and team experience.

Especially in the case of MURBs, there are very specific programme expectations and there is little opportunity for alternative floor plan layouts that could optimize energy efficiency. Floor plate design is predicated on optimizing the salable area to building area ratio, and unit layouts are designed to appeal to a very competitive marketplace that prioritizes the optimization of space. Condo buyers are also attracted to energy intensive designs such as floor to ceiling wall to wall glazing, pushing exterior glazing ratios to 85 to 90 percent of total exterior wall area in

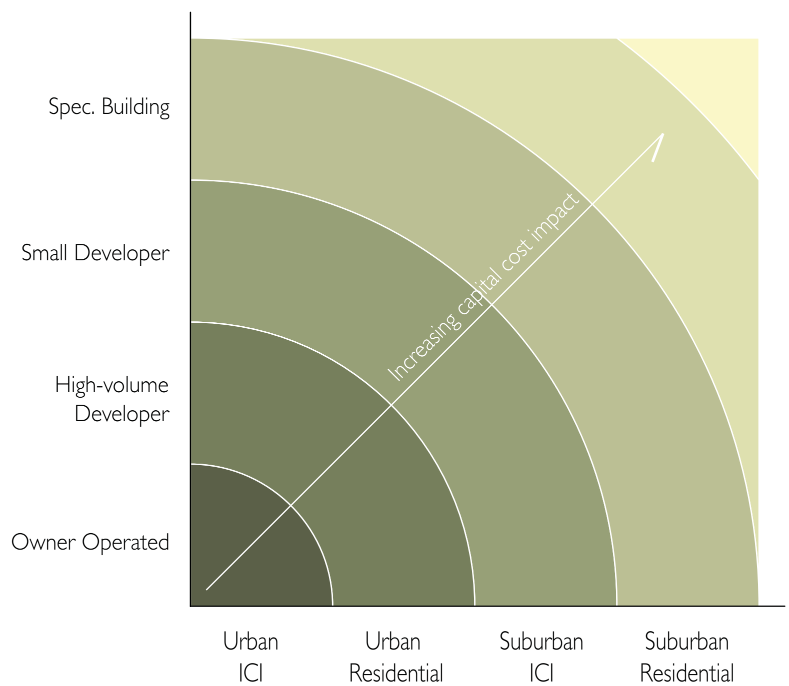


Figure 3.01 Determination of Base Building The LEED cost increment of a project is dependent on the determination of what building features are included in the base. Three primary factors that contribute significantly to the cost increment are developer type, building location and building type.

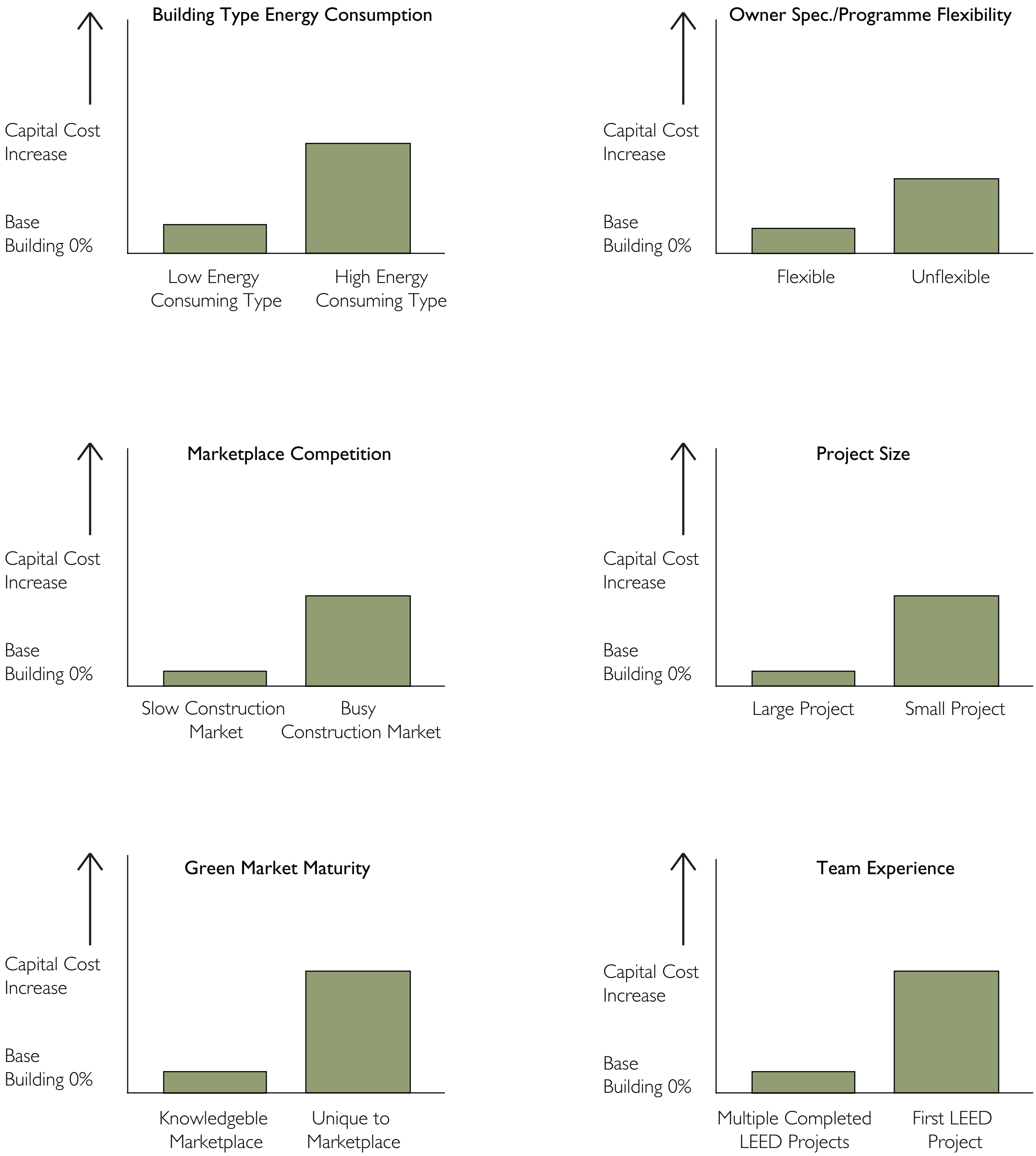
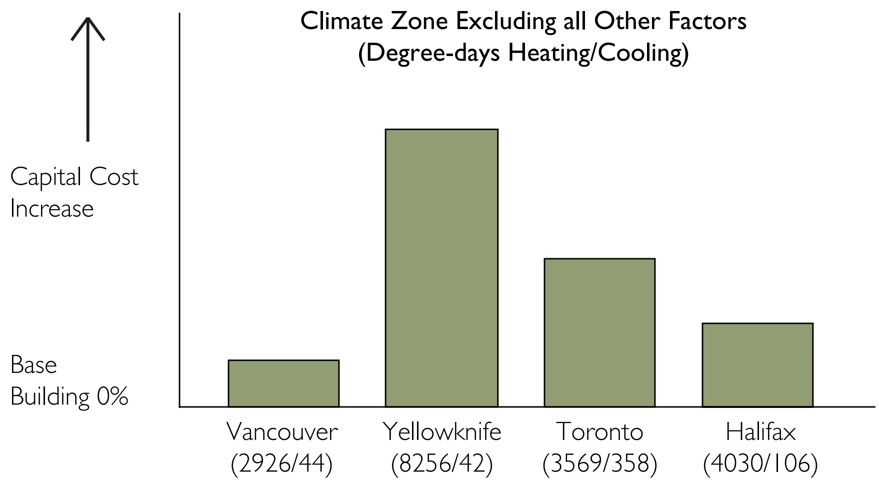
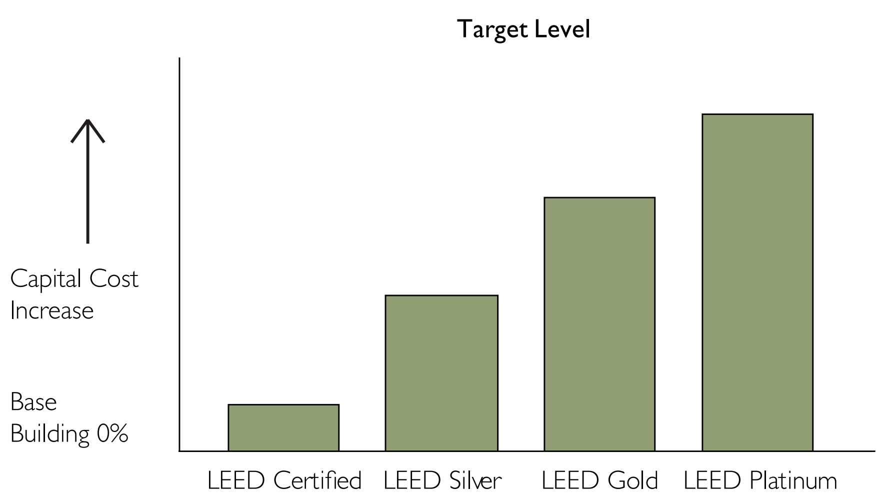


Figure 3.02 Capital Cost Factors The total green premium is dependent on many factors specific to each project to a varying degree.


Climate Zone Excluding all Other Factors
(Degree-days Heating/Cooling)
Capital Cost Increase
Base Building 0%
Vancouver (2926/44)
Yellowknife (8256/42)
Toronto (3569/358)
Halifax (4030/106)


Target Level
Capital Cost Increase
Base Building 0%
LEED Certified
LEED Silver
LEED Gold
LEED Platinum

typical condo buildings. Although highly cost-effective initially, any glazing beyond the 40 percent figure recommended by MNECB makes it progressively more difficult to achieve energy efficiency in an economical way.

The green market maturity factor is changing with the growing popularity of LEED buildings. At recent trade shows such as the Construct Canada 2006 convention, a majority of exhibitors had information on hand detailing how their products contribute to a project's ability to meet LEED. Furthermore, there are countless companies offering products and technologies that are tailored specifically to achieving LEED. Since its introduction to Canada in the autumn of 2004, the construction industry, including suppliers and sub-trades, has been quickly learning how LEED initiatives impact their scope of work. With this knowledge, they are bidding on the growing number of projects seeking LEED designation with more confidence which has reduced the amount of contingencies carried for the unknown implications of LEED.

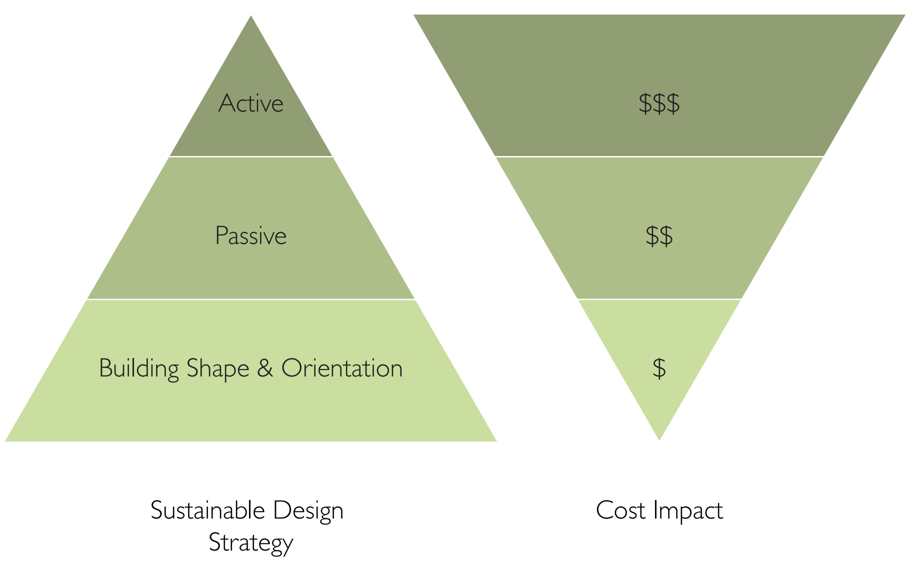


Figure 3.03 Energy Savings Strategy and Cost Impact The over-arching strategy proposed by the design team plays a significant role in determining the cost of meeting these energy savings objectives.

The experience of the project team, including the client, is the other significant factor in each of the case studies. The types of points targeted, and the strategies undertaken to achieve these points contribute significantly to the total LEED premium for any given project. This is especially true for energy savings strategies, which typically account for nearly half of the total LEED premium of a project. Figure 3.03 demonstrates the relationship between design approach to energy savings, and capital cost impact. Energy use reductions for most of the case studies are in the range of 30% less than the Model National Energy Code for Buildings (MNECB) and up to 58% for the Dorset Street apartments. With energy costs averaging $1.50 - $1.80/sf/year for conventional MURBs and $1.70 – 2.10/sf/year for spec. commercial buildings[1], significant savings can accrue over the life span of an energy efficient building, far outweighing additional capital costs.

In each of the case study projects, the design team focused on both passive and active systems to achieve energy savings. Examples of passive systems include increasing the thermal performance of the building envelope, and designing buildings to maximize the potential for natural ventilation and solar heating. Active systems include higher efficiency mechanical equipment and on-site generated power through renewable energy technology. Case study B3 is the only building expressing a clear effort to achieve a level of efficiency through building orientation. Sustainable design approach decisions are typically made by the design team in accordance with the client's operational savings objectives, environmental impact expectations and construction budget.

In order to most effectively realize the client's objectives, the Canadian Green Building Council and other green building advocacies champion the Integrated Design Process (IDP) as a significant cost saving strategy with great potential to optimize building systems. Figure 3.04 illustrates

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1 Romm, Joseph and William D. Browning (1998). Greening the building and the bottom line: Increasing productivity through energy-efficient design. Snowmass, Colourado: Rocky Mountain Institute. Page 3.

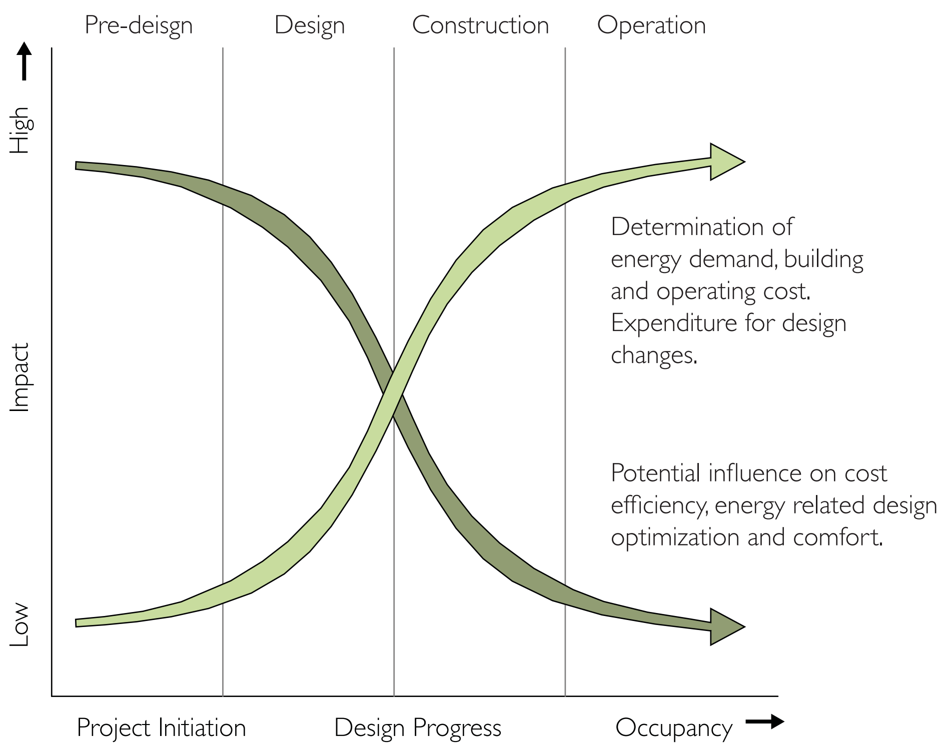


Figure 3.04 Design Phase vs. Design Impact
Decisions made at the outset of a project have the most potential to optimize sustainable design objectives and integrate these strategies into the building at the least cost.

how decisions made at the outset of a project have the most potential to optimize sustainable design objectives and integrate them at the least cost. The reason that the IDP is not commonplace, despite its seemingly obvious benefits as a method of designing a building, stems from the traditional fee calculation structure. As architects and engineers are traditionally paid based directly on a percentage of construction cost itself, there is a financial disincentive on their part to reduce the cost of the building. Designers who attempt to eliminate costly equipment therefore end up with lower fees, or at best with the same fees, having put in the greater amount of work typically required to optimize a system.

Consultant teams inexperienced with the additional requirements of sustainable design have little incentive to change their standard approach, at the risk of spending more time designing and researching the additional requirements than the project fees allow. However, in a study prepared by the McGill Business Group, entitled *Succeeding by Design,* interviews conducted with many building owners exposed that a minimization of operating costs and project life cycle costs is important to most clients. Most clients also believe that consultant costs for sustainable design projects are higher than in conventional building projects, and they want to see enough savings in the building life-cycle costs to offset the extra design costs.[2] One potential solution to establishing consulting fees commensurate with the additional time required to optimize building systems would be to provide a bonus proportionate with the savings realized in the first year of building operations. This would work in the best interest of the client and reward the design team for optimizing the building systems.

Encouraging the design team to work collaboratively from the initial phases of design and having all members committed to meeting the additional measures required by high performance buildings, systems can be optimized or even eliminated while meeting the client's budget and

2 The Ontario Association of Architects (OAA) (2003, November). Succeeding by Design – A Perspective on Strengthening the Profession of Architecture in Ontario and Canada. Montreal QC: McGill Business Consulting Group.

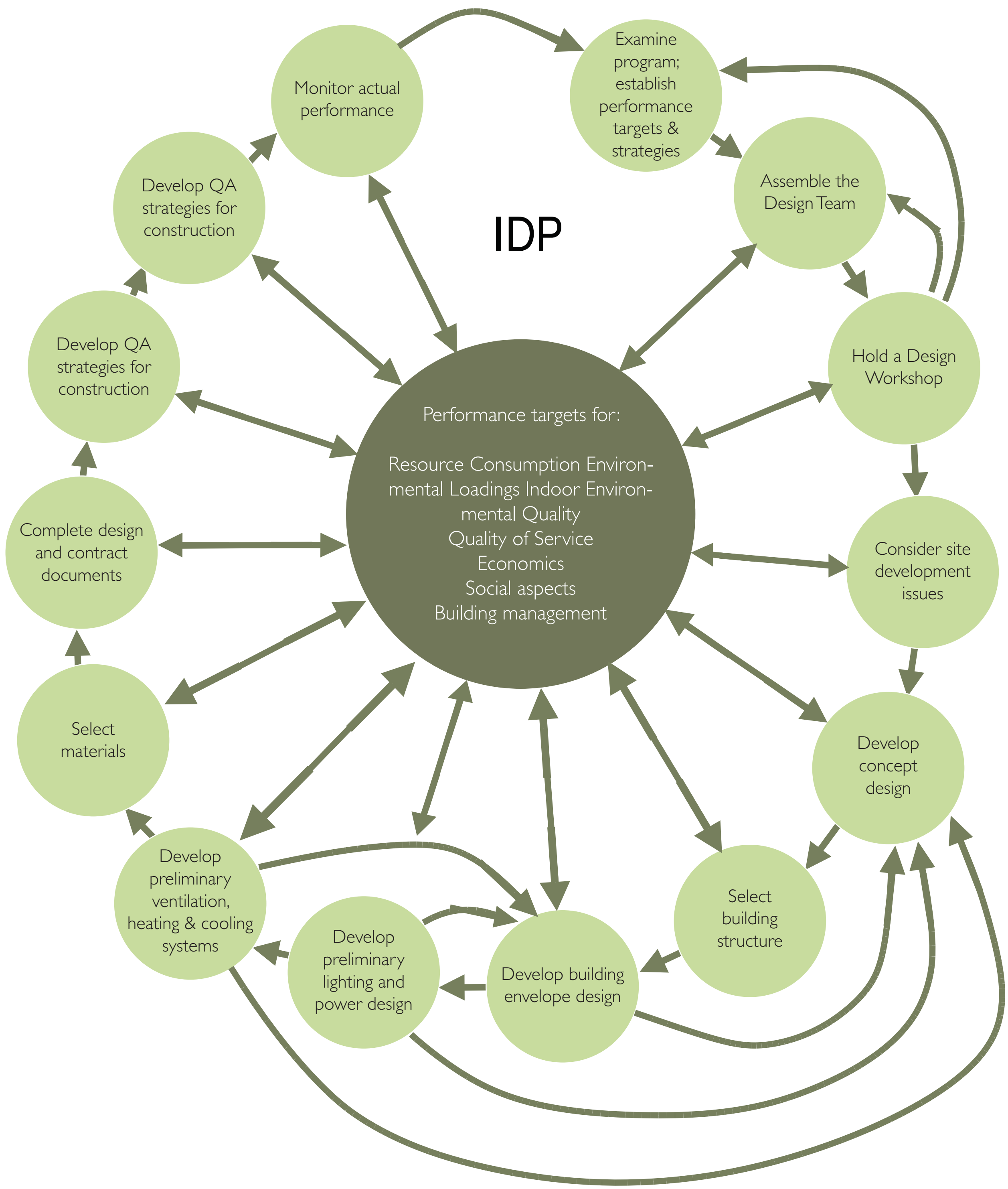


Figure 3.05 Integrated Design Process By making design decisions through a collaborative process the building systems can be integrated to optimize operational performance.

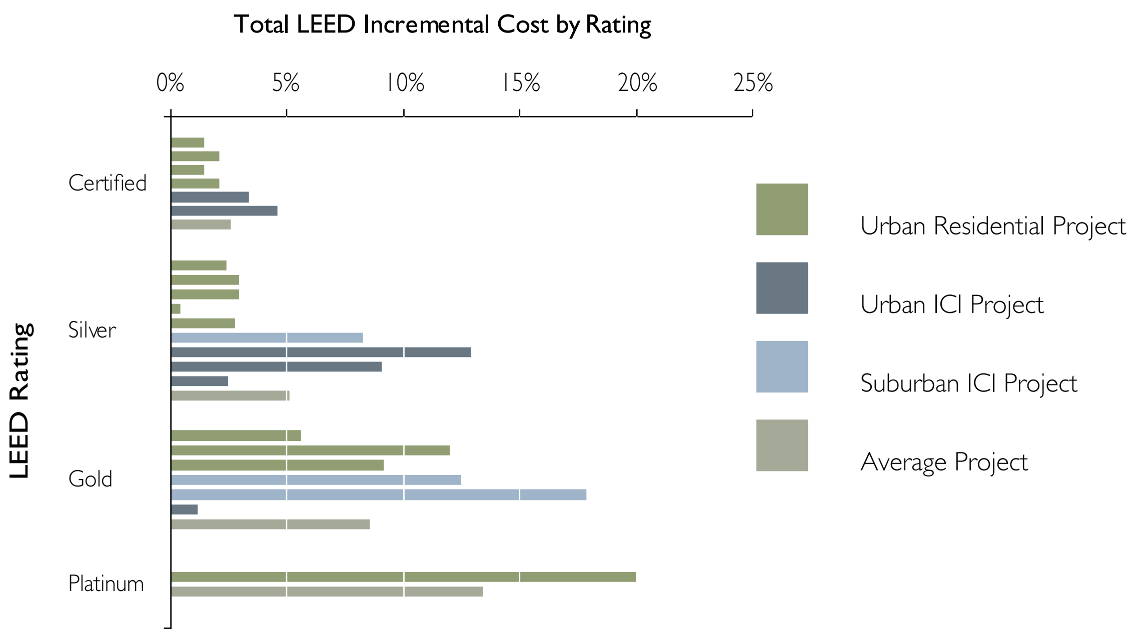
schedule expectations. This approach also reduces the number of revisions that need to be made later in the design process or during construction; these measures can create significant schedule delays and cause cost creep.

The International Institute for a Sustainable Built Environment (iiSBE) recommends the following key steps in the Integrated Design Process:[3]

- *Examine program; establish performance targets and strategies*
- *Assemble the design team*
- *Have the first design session with EVERYONE involved setting clear targets that EVERYONE buys into*
- *Consider the development issues*
- *Identify all brown-field areas of concern*
- *Develop concept design*
- *Select building structure*
- *Develop building envelope design*
- *Develop preliminary lighting and power system designs*
- *Select materials*
- *Complete site, building design and documentation*
- *Develop Q&A strategies for remediation and construction*
- *Develop Q&A strategies for operation*
- *Monitor actual performance*

Ideally, at the end of the design process the client group in consultation with the design team has a building that meets all of the environmental objectives at the lowest possible capital cost.

3 International Initiative for a Sustainable Built Environment, October 5, 2006 <http://www.iisbe.org>



LEED Rating	Points Required	Premium Range Sub. Residential	Premium Range Urban Residential	Premium Range Suburban ICI	Premium Range Urban ICI
Certified	26 - 32	3% - 5%	2% - 4%	3% - 5%	2% - 4%
Silver	33-38	6% - 9%	3% - 5%	5% - 8%	4% - 8%
Gold	39-51	10% - 14%	7% - 12%	9% - 13%	5% - 11%
Platinum	52+	15% +	13% +	14% +	12% +

Notes:

- Total LEED Cost Increment range is dependent on the definition of the Standard/Base building
- Total LEED cost increment excludes all soft costs including land costs and consulting fees

Figure 3.06 Total LEED Cost Increment by Level of Certification Each bar represents the total LEED Cost Increment for a project where a level of LEED Certification has been targeted.

3.1.2 LEED Cost Increment Trends

The following series of graphs (figures 3.06 - 3.11) are a sampling of LEED targeting or certified projects located in Canada that were estimated by Altus Helyar Cost Consulting between 2004 and 2006. These graphs demonstrate trends in LEED points typically targeted, and in the apportionment of capital costs for LEED buildings. Each of these graphs is broken down into Multi Unit Residential Buildings (MURB) and Industrial Commercial Institutional (ICI) buildings on urban and suburban sites. Because of the lack of MURBs seeking LEED certification on suburban properties, there are no reference buildings for this category. It is important to differentiate each project based on building type and siting, as the costs associated with achieving LEED, and points typically targeted for each project, vary significantly on these terms.

The first graph, figure 3.06, shows the total estimated incremental construction cost to achieve varying levels of LEED certification. These are the statistics that many people in the building industry talk about; however, it is important to understand in more detail where the total LEED cost increment is apportioned in the building so that designers can consider these components with an understanding of their impact on project budget.

Figure 3.07 demonstrates the trends in LEED points being targeted in each category as a percentage of the total score out of 70 possible points. There is a clear trend in all projects towards targeting the Sustainable Sites and Indoor Environment Quality points. This trend is in part due to the number of points available in this category, but is also related to relatively modest cost and ease of achieving these points. The other trend to note is the number of Sustainable Sites points targeted by projects on urban sites, while suburban projects appear to target more of the Materials and Resources points.

Figure 3.08 apportions the total estimated LEED cost increment cost across each of the LEED categories, clearly demonstrating that the Energy and Atmosphere points are a significant determinant of the total LEED cost increment of a project. The opposing axis indicates the potential

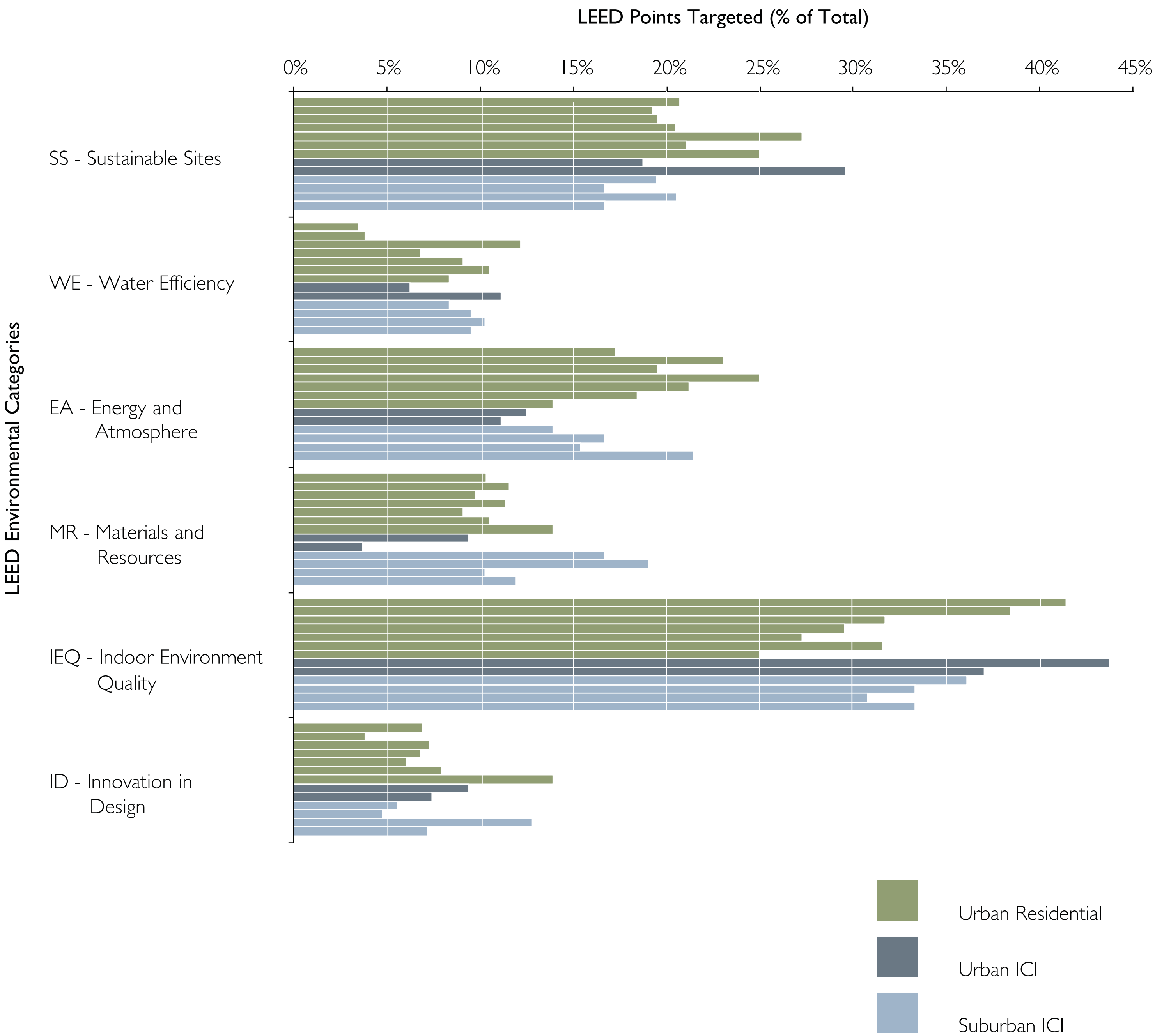


Figure 3.07 LEED Point Targets by Environmental Category Each bar represents a project where a level of LEED Certification has been targeted. Trends in LEED points being targeted reveal the different approach to achieving Certification.

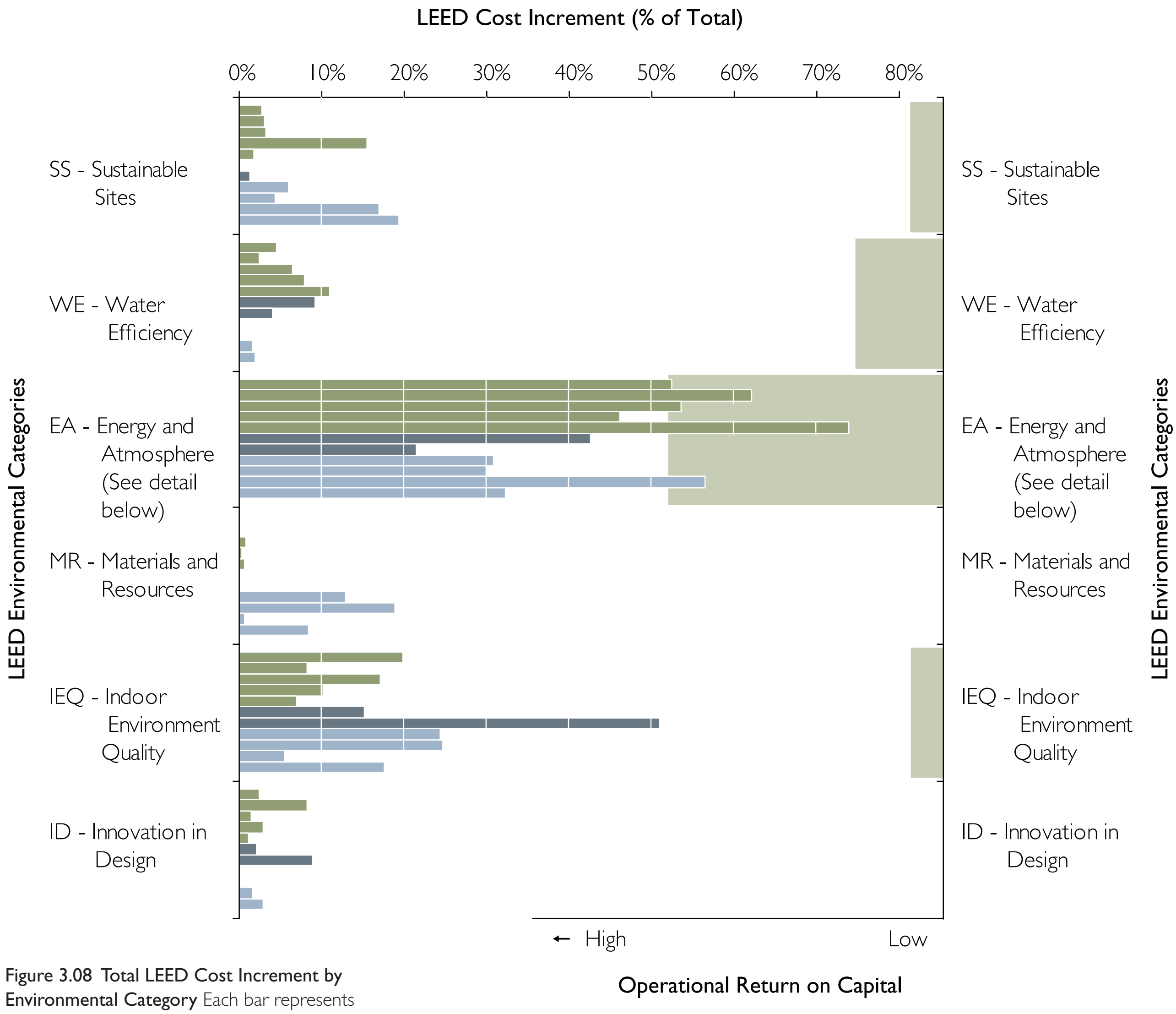
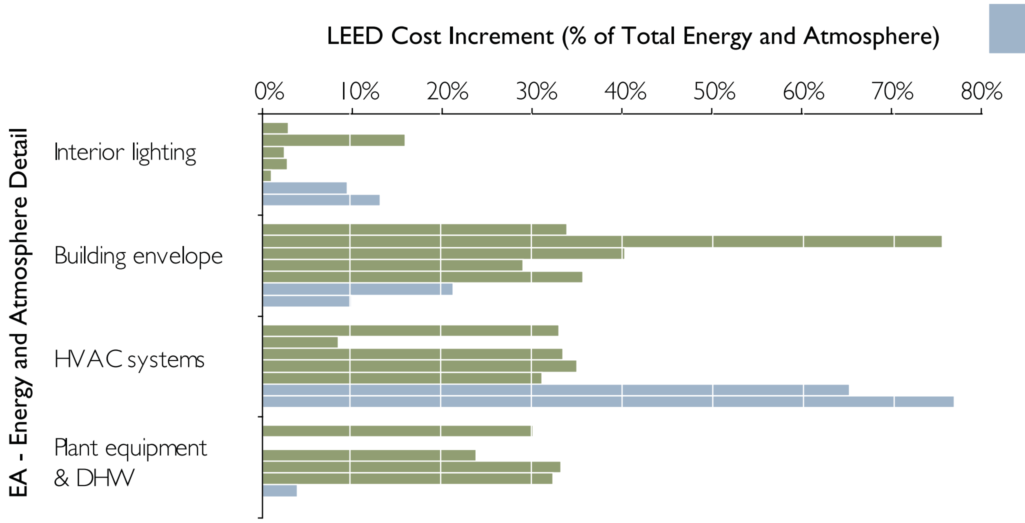


Figure 3.08 Total LEED Cost Increment by Environmental Category Each bar represents a project where a level of LEED Certification has been targeted. Trends in the apportionment of the total incremental cost by environmental category reveals where additional costs are focused.



Lower Figure 3.09 Apportionment of Energy and Atmosphere Cost The apportionment of the energy savings cost is broken down into four primary energy saving strategies.

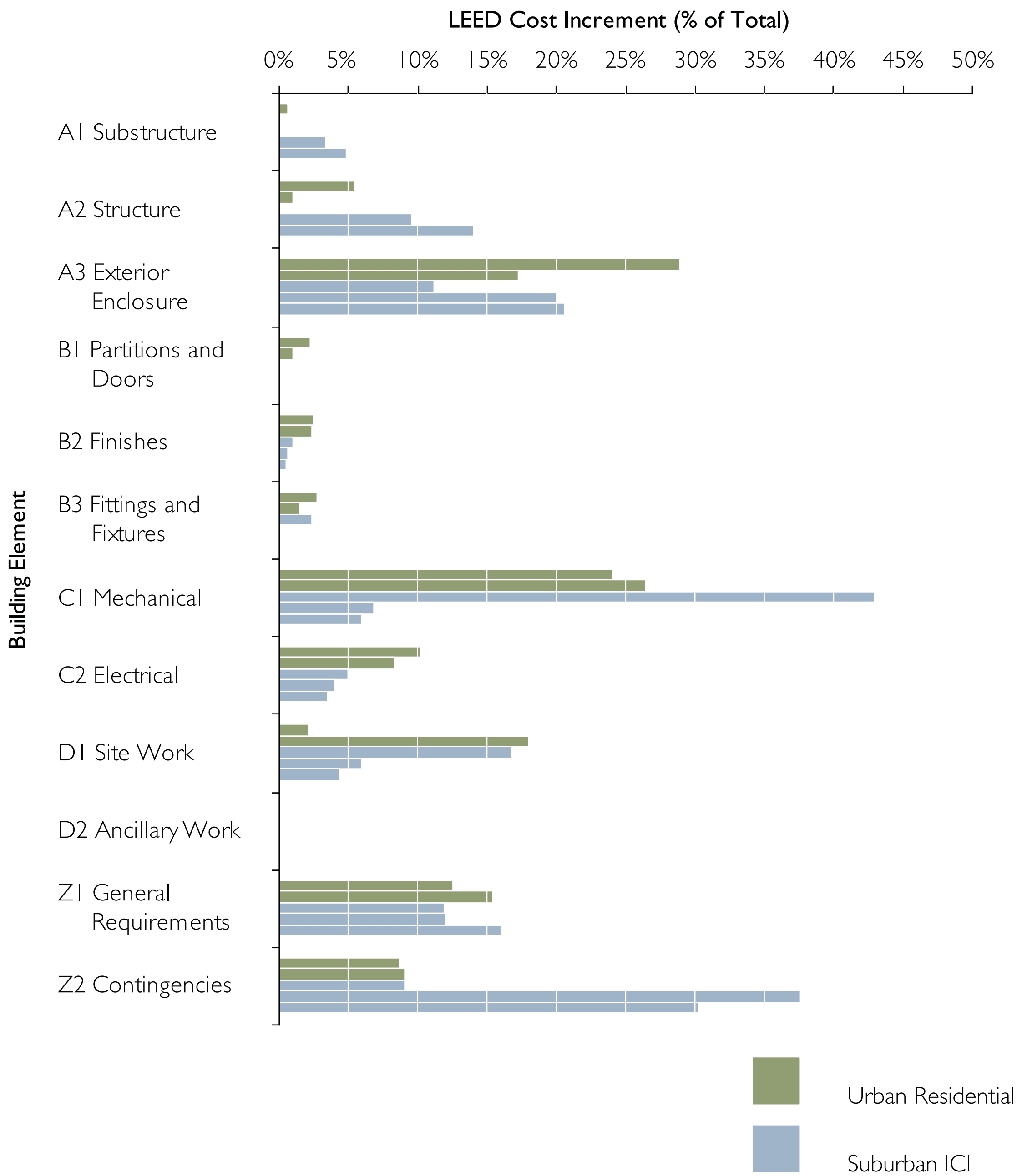


Figure 3.10 Total LEED Cost Increment by Building Element Each bar represents a project where a level of LEED Certification has been targeted. Trends in the apportionment of the total incremental cost by element shows where additional costs are focused.

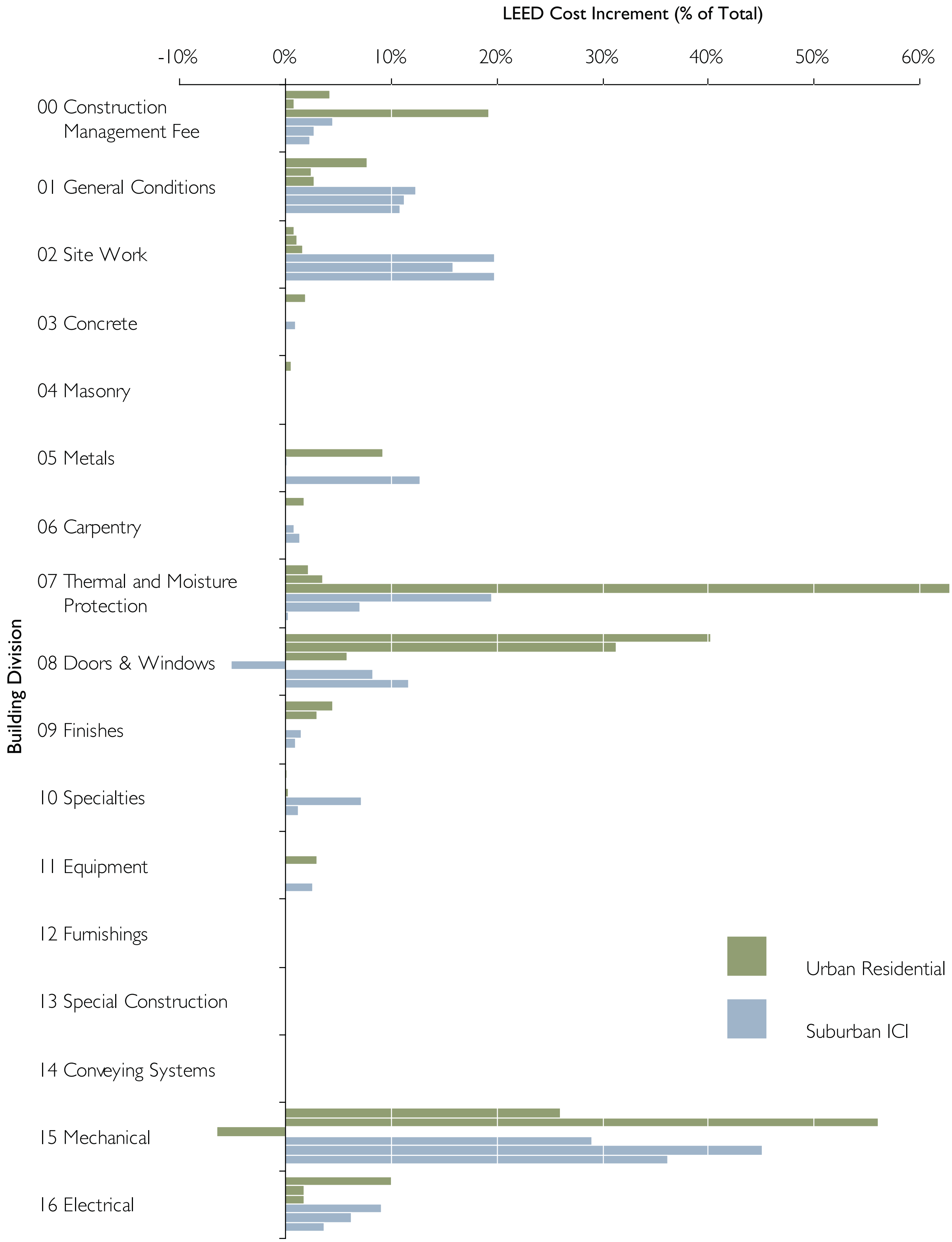


Figure 3.11 Total LEED Cost Increment by Building Division (Trade) Each bar represents a project where a level of LEED Certification has been targeted. Trends in the apportionment of the total incremental cost by building division reveals where additional costs are focused.

operational savings of each environmental category, where we see that the Energy and Atmosphere category is the primary means of recapturing capital investment through operational savings. The costs associated with Energy and Atmosphere category are detailed in figure 3.09, demonstrating that increasing the thermal performance of the building envelope and HVAC systems are significant costs associated with making a building more energy efficient.

Figure 3.10 apportions the total estimated LEED cost increment by Building Element to illustrate that the primary components of the building where there is typically an appreciable increase in cost are in A3 Exterior Enclosure and C1 Mechanical Systems. The final graph figure 3.11 apportions the total estimated LEED cost increment by Building Division (Trade) to illustrate that the primary building Divisions where additional costs are focused include: Division 00, Construction Management Fee; Division 07, Thermal and Moisture Protection; Division 08, Windows and Doors; and Division 15, Mechanical. Both the Elemental and Divisional formats are used in the case study analyses to examine what particular measures were implemented in each building to contribute to the additional costs.

3.1.3 Building Value Assessment Definitions and Methodology

In order to justify the additional capital costs of LEED Certified buildings, this section examines how a developer or building owner could quantify the increased value embodied in 'green' buildings. In addition to the direct economic benefits discussed in this section there are a number of indirect economic benefits such as higher public profile, increased productivity, and improved health and morale of employees. These attributes are discussed more fully in *Chapter 4, External Factors Effecting the Cost and Success of Sustainable Design*. The challenge has been to justify the potential increased costs of higher performance buildings to developers who typically make their return either before or shortly after building occupancy.

A primary difficulty in conveying this value to developers has been the lack of financial instruments to analyze the value of green building attributes. Building finance professionals will use financial tools such as Project Pro-forma, Simple Payback, Life Cycle Costing/Net Present Value, and Life Cycle Analysis depending on the length of term considered and type of financial information expressed. Each of these estimating tools requires a number of assumptions that can significantly influence the projected value of the building or building systems.

The simplest financial tool used commonly by developers to determine residual land value and general project viability is known as the Project Pro-forma. This financial plan considers all the relevant variables including land costs, municipal fees, construction hard and soft costs, financing, allowable density, project schedule, risk profile, and expected rate of return. This tool is most useful in determining the larger implications of investment and is not generally used to identify variances between specific variations in building design strategies.

A second financial tool commonly used to evaluate capital investments is called Simple Payback. It is best used for isolated equipment or building attributes that are clearly defined and have measurable advantages, and can be expressed by the formula:

$SPB = C_i/(B - C_a)$

where

SPB = Time (in years) over which investment is recovered to the breakeven point.

C_i = Dollar value of initial investment costs, as of the base time.

B = Dollar value of annual benefits (or savings)

C_a = Dollar value of annual costs.

An example of an occasion where this tool would be effective, would be in comparing a low-efficiency water heater to a high-efficiency water heater. Here, the initial increased cost can be recovered in a short period of time through reduced energy consumption. The limitation of this calculation is that it does not account for fuel escalation or interest on additional capital; and it assumes that the equipment is worth nothing at the end of the pay-back period.

Life Cycle Costing (LCC) is one of the more prevalent means of analyzing the value of specific building measures given their operational cost benefits. The LCC practice is used to estimate the overall costs of project alternatives and to select the design that will provide the lowest overall cost of ownership consistent with the building's quality and function. The most challenging task initially is to determine the economic effects of alternative building systems and designs, and to quantify these effects in dollar amounts. Building-related costs usually fall into the following categories:

- Initial Costs - Purchase, Acquisition, Construction Costs
- Energy Costs
- Operation, Maintenance, and Repair Costs
- Replacement Costs
- Residual Values - Resale, Salvage Value or Disposal Costs at end of assessment period
- Finance Charges - Loan Interest Payments
- Non-Monetary Benefits or Costs (Generally excluded)

Costs in each of these categories are relevant to decision-making only when they are large enough to make a significant difference in the LCC of a project alternative.

In order to be able to compare cash flows that are encountered at different stages in the life-cycle of a project, they have to be made time-equivalent. To make cash flows time-equivalent, the LCC method converts each of the costs to present values by discounting them to a common point in time. The interest rate used for future expenditures is a rate that reflects an investor's opportunity for returns over time, as an investor wants to achieve a return at least as high as that of her next best investment. Hence, the discount rate (or cap rate) represents the investor's minimum acceptable rate of return. The historical discount rate may be obtained through the Bank of Canada, however it is difficult to predict how it will change over the study period.

After identifying all costs by year and amount and discounting them to present value, they are added to arrive at total life-cycle cost for each alternative:[4]

LCC = I + Repl - Res + E + W + OM&R + O

Where

LCC = Total LCC in present-value (PV) dollars of a given alternative

I = PV investment costs (if incurred at base date, they need not be discounted)

Repl = PV capital replacement costs

Res = PV residual value (resale value, salvage value) less disposal costs

E = PV of energy costs

W = PV of water costs

OM&R = PV of non-fuel operating, maintenance and repair costs.

O = PV of other costs (eg, contract costs for energy service companies)

This overview of LCC is a simplification of a critical and complicated process in the design of buildings that deliver cost effective performance. It is essential that appropriate measures of cost effectiveness are adopted and assumptions that are made in the analysis are clearly stated. Factors such as discount rates fuel escalation, and life span of building equipment are difficult to forecast and yet are critical to the accuracy of the analysis.

LCC is especially useful when comparing project alternatives that fulfill the same performance requirements, but differ with respect to initial costs and operating costs. For example, LCC will help determine whether the incorporation of a high-performance HVAC or glazing system, which may increase initial cost but result in reduced operating and maintenance costs, is cost-effective. However, LCC is less useful for budget allocation and rationalizing building value to short term investors such as developers, for whom more abstract green-building advantages need to be quantified.

LCC is often confused with the more rigorous Life Cycle Assessment (LCA) analysis, which

4 National Institute of Building Sciences, Whole Building Design Guide, 2006 <http:www.wbdg.org>

looks at costs and benefits over the life of a particular product, technology or system. LCA, in contrast, involves accounting for all upstream and downstream costs of a particular activity, and integrating them through a consistent application of financial discounting. The result of this intensive process is a total cradle to grave inventory, assessment and interpretation, which is beyond the scope of this thesis.

Measures that offer a financial benefit to the developer have been difficult to calculate using traditional methods such as those described above which calculate increased value following building occupancy. To address the question of value from a developers perspective an approach termed in this thesis as Building Value Assessment is used. This calculation measures value of a project prior to building occupancy, and considers some factors that are not typically identified in the more traditional formulas described above. This method is especially relevant in the case of Multi-unit Residential Buildings (MURB), where the only opportunity that developers have to make their return is during the initial unit sales, which often occur prior to the start of construction.

Two major factors critical to the success of the Building Value Assessment are that developers understand the additional financial benefits that can be realized and that marketing and sales professionals are able to promote the economic benefits of these buildings for occupants and purchasers. Attributes such as increased energy and water efficiency, building durability, and market differentiation could be sold to purchasers as building premiums that will have bottom line savings reflected in the operational costs of the building. In each of the sales centres for the case study projects, green building features are characterized as 'life-style' choices. If actual figures are instead attached to specific green building upgrades, purchasers are able to also make decisions based on their real value. Both energy and water savings gained through reduced condominium fees have been included into the Building Value Assessment calculation to demonstrate the potential value to the purchaser of increased efficiency.

For the MURB assessment, building value is calculated by collecting the value of potential increased site density permitted by municipality, LEED building project fast tracking, the value of a sales premium, increased sales velocity and value of reduced annual condominium fees (Figure 3.12). These factors are often not explicitly quantified in building investment decisions, but do exert real effects on bottom line revenue. The approach for commercial building case studies is to consider the value of energy and water savings alongside quantified figures which express green building attributes such as rent, occupancy and residual value premiums (Figure 3.13).

For financial advantages that can show an income in perpetuity for the owner, a cap rate of 8 percent is applied. A Cap (capitalization) rate is a measure of the ratio between the net income produced by an asset and its capital cost. The rate is calculated in a simple fashion as follows:

Net Income/Capitalization Cost = Cap Rate

The central assumption here is that buildings that incorporate the requirements of sustainable design are better buildings, and are therefore are less risky to invest in, therefore an investor is willing to accept a lower cap rate in purchasing the property. Cap rates used commonly in North America to appraise the value of real-estate however determining the cap rate of a given site is an arbitrary process that is highly dependent on the specific circumstances of the investor. In the residual value premium calculation for commercial buildings, the cap rate is reduced from the industry standard 8 percent to 7.75 percent in the higher performance 'Green Building' to reflect the increased building value and reduced risk to the owner.

A limitation of the Building Value Assessment is that it does not take into account risks such as rapid fuel escalation, major building maintenance due to poor construction methods, or more social factors such as the growing trend towards a more environmentally conscious way of living. Furthermore, the rising costs of environmental inaction are hard to predict exactly. As an example, the estimates for energy savings are conservative if energy costs rise faster than the general rate of inflation or the discount rate. Such an eventuality would effectively result in

The Building Value Assessment for Multi-unit Residential Buildings (MURB) is broken down into four areas, each area having its own value formula. Building value calculations are considered from the perspective of the developer.

Value of Increased Site Density Permitted by Municipality	Rationale	A building where residents will place less demand on municipal infrastructure including water, and energy resources, and traffic patters due to reduced reliance on passenger vehicle transportation, could be rewarded by allowing an increase in the allowable site density from existing zoning bylaw.
	Formula	Assume that allowable site density can be increased by 5 percent beyond existing bylaw for the LEED Certified building.
Value of Reduced Time in Gaining Project Approvals	Rationale	The schedule implications and consulting fees necessary to gain approvals for a project can represent a significant capital soft cost. If municipalities allowed 'fast-tracking' of LEED targeting projects there would be further incentive to incorporate the measures required by LEED. From the perspective of the municipality, this incentive would have minimal cost implications.
	Formula	Assume the LEED Registered MURB gains required approvals in for a project four months quicker than a standard building. The average carrying cost of a project at pre-construction phase is $400/unit/month, including interest on equity of the land design fees and marketing costs for the project.
Value of Sales Premium	Rationale	A building that has better thermal comfort, is more efficient, provides higher indoor air quality and is marketed as a Green building can potentially be sold at a premium over a comparable 'Non-Green' MURB.
	Formula	The market value of a typical MURB is assumed to be $3500/m2 with a $50 premium for a LEED Certified building.
Value of Increased Sales Velocity	Rationale	A building that can be marketed as more environmentally sustainable will appeal to the growing number of purchasers who seek a lower environmental impact lifestyle. In turn this may increase the number of purchasers through market differentiation.
	Formula	Assume the LEED Registered MURB will pre-sell two months quicker than a standard building. The average carrying cost of a project at the pre-sales phase is calculated to be in the order of $750/unit/month, including interest on the equity of the land, design fees and marketing costs for the project.
Value of Reduced Condominium Fees	Rationale	Typical MURB buildings allocate utility costs including suite space conditioning, domestic hot water, building reserve fund, insurance and other common area expenses on the basis of each tenants proportion of total Net Salable Area (NSA). Condo fees for typical condominiums total $5.50/m2/month, a building which incorporates higher efficiency mechanical and electrical systems that are more durable and will reduce energy consumption of the building would potentially reduce Condo fees by an estimated $0.50/m2/month.
	Formula	Assume the monthly condominium fees are reduced by 50 cents/m2/month. These savings are translated into mortgagability of the purchaser over a typical 25 year term using the traditional means of calculating qualification for mortgage.
Total Increase in Building Value	Rationale	A total of the savings calculated above is provided for comparison purposes and to give a sense of the order of magnitude savings that could be realized by investing in the additional strategies required by LEED Certified buildings
	Formula	Add together each of the above Building Value Calculations.

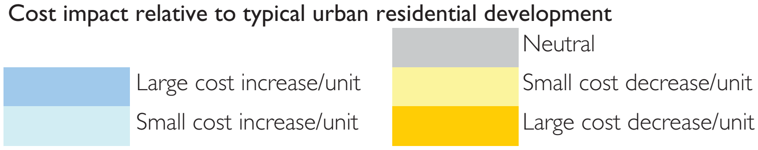
Figure 3.12 Multi-unit Residential Building Value Assessment Methodology To project the financial benefits of specifying the additional requirements of LEED four categories each with a specific formula are used to calculate the increase in building value from the perspective of the developer.

The Building Value Assessment for a Commercial Office Building is broken down into five areas, each area having its own value formula.

Value of Annual Energy Savings	Rationale	Energy costs are the electrical and gas costs based on energy modeling for each proposed case study. The cost of electricity and gas are based on actual 2006 energy costs for Toronto, Ontario.
	Formula	The annual energy savings projection is multiplied by a cap rate of 8%.
Value of Annual Water Savings	Rationale	Water costs for providing all the water needs to the building based on occupancy of each proposed case study. The cost of water is based on actual 2006 water costs for Toronto, Ontario.
	Formula	The annual water savings projection is multiplied by a cap rate of 8%.
Value of Rent Premium	Rationale	A building which maximizes day lighting in office areas, has better thermal comfort, and provides higher indoor air quality can potential secure a higher rate of rent then a comparable office building.
	Formula	The annual rent for a typical office building is assumed to be $300/m2 with a 5% premium for a LEED office building. The annual rent premium over industry average building is multiplied by a cap rate of 8% to arrive at the increased value of the building.
Value of Occupancy Premium	Rationale	A Occupancy premium of 2% could be anticipated because of the positive effect on employee comfort health and productivity of day lighting, views of the outdoors, higher indoor air quality and other advantages.
	Formula	The annual rent for a typical office building is assumed to be $300/m2. An average occupancy of 90% and assume that a LEED building will have an occupancy premium of 2%. The occupancy premium over industry average building amortized over a typical 5 year lease period to arrive at the increased building value.
Residual Value Premium	Rationale	A building which is less costly to operate, has higher occupancy rate and possibly commands a rent premium should be perceived as having a higher overall Residual Value upon resale. For this analysis, it is assumed an exit cap rate benefit of 25 basis points or 7.75% (versus 8%). The building value would increase through the perception of value created by having a certified green building in the competitive-real estate market.
	Formula	The annual rent is assumed to be 8% of total capital costs. The annual net rent is multiplied by a cap rate of 8% to arrive at the increased value of the building. The building value is added to the LEED cost increment to arrive at the total value plus premium. Residual value of the LEED building is calculated by multiplying the net rent by 7.75%. The increased building value is the difference between the building value plus premium at 8% cap rate and 7.75% cap rate.
Total Increase in Building Value	Rationale	A total of the savings calculated above is provided for comparison purposes and to give a sense of the order of magnitude savings that could be realized by investing in the additional strategies required by LEED Certified buildings
	Formula	Add together each of the above Building Value Calculations.

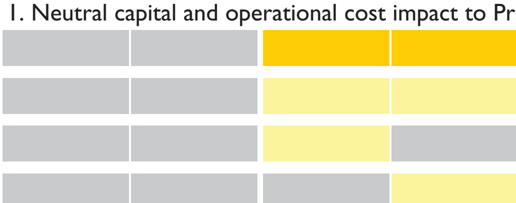
Figure 3.13 Commercial Building Value Assessment Methodology To project the financial benefits of specifying the additional requirements of LEED, five categories each with a specific formula are used to calculate the increase in building value from the perspective of the developer.

Cost impact relative to typical urban residential development



$ Impact to Project		$ Impact to Municipality		
Capital	Operation	Capital	Operation	Potential design impact commentary

1. Neutral capital and operational cost impact to Project. Net decrease in capital and operation to Municipality



Conditions such as these reflect a net neutral cost impact to the project both in terms of capital and operation, while the municipality could potentially benefit both in terms of initial costs and long term operation of the neighborhood. Policies that encourage these characteristics could be introduced with minimal implications for developers and potential long term economic benefit to the municipality.

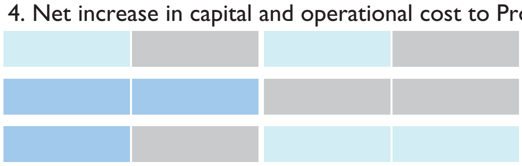
2. Neutral capital and operational cost impact to Project and Municipality

This condition reflects a net neutral cost impact to both the project and the municipality both in terms of capital and operation of the neighborhood. Policies that encourage these characteristics could be introduced with minimal implications for developers and potential long term social and environmental benefit to the municipality.

3. Net increase in capital and operational cost to project. Net decrease in capital and operation to Municipality

This condition reflects a net increased cost impact to the project both in terms of capital and operation, while the municipality could potentially benefit both in terms of initial costs and long term operation of the neighborhood. Policies that encourage these characteristics may need to be reinforced with subsidies or incentives initially in order to encourage these characteristics on a widespread basis. The municipality could recapture these costs through lower operation and/or increased tax revenue of the neighborhood.

4. Net increase in capital and operational cost to Project and Municipality.



This condition reflects a increased capital cost impact and a neutral operational cost impact to both the project and the municipality. Policies that encourage these characteristics would rationalize pursuing these characteristics on the basis of social and/or environmental benefit. Funding to offset the capital cost implications may come from provincial or federal levels of government or private donations.

Figure 3.14 Neighbourhood Design Analysis Legend Typical relationships found in the LEED-ND analysis are described in terms of impact to the project and on the municipality.

even more savings to investors, reflected in either more stable condominium fees for MURBs or increased profit for commercial property owners as a result of energy savings.

For the Neighbourhood design case studies, the advantages of sustainable design are difficult to quantify, given the diversity of characteristics that work together to create neighbourhoods that encourage sustainable living. For this reason the pilot version of LEED for Neighbourhood Developments (LEED-ND) has been used to analyze urban plans that make an effort to account for the environmental impact of design decisions. Capital and operational costs to both the developer and the municipality are contemplated on an order of magnitude basis for each of the LEED-ND points. Further analysis of the future economic viability of these neighbourhoods is examined in Chapter 4: *External Factors Effecting the Cost and Success of Sustainable Design.* Enumerating the actual economic advantages of sustainable neighbourhood design would be an exhaustive exercise that is beyond the scope of this thesis. Further information on this subject can be found in books cited in the bibliography such as *The Death and Life of Great American Cities,* written by Jane Jacobs.

3.2 Neighbourhood Design Overview

This section focuses on the financial aspects of neighbourhood-scale developments through the analysis of case studies. The broader social, cultural, environmental and economic issues that confront Canadian municipalities are summarized in Chapter 4, however it is beyond the scope of this thesis to examine all of the factors that have resulted in the development paradigm that exists today.

In brief, the following case studies begin to redefine conventional Neighbourhood development strategies by adopting a more holistic view of their short and long term implications from the perspective of all stakeholders. They propose that sustainable Neighbourhood design can strive to do more than simply effect less environmental harm; it can actively rebuild community, restore pedestrian safety and access, and reduce the context for crime. And as the case studies demonstrate, it can even develop more profit for developers and municipalities.

Figure 3.15 Neighbourhood Design Case Study Analysis Summary Matrix identifies economic impact from the perspective of developers and municipalities of constructing neighbourhoods that consider the environment in the urban plan.

Cost impact relative to typical urban residential development

- Large cost increase/unit
- Small cost increase/unit
- Neutral
- Small cost decrease/unit
- Large cost decrease/unit

	Regent Park Revitalization, Toronto				Dockside Green, Victoria				Vaughan Oakwood Redevelopment, Toronto			
	$ Impact to Project		$ Impact to Municipality		$ Impact to Project		$ Impact to Municipality		$ Impact to Project		$ Impact to Municipality	
LEED-ND Characteristic Title	Capital	Operation	Capital	Operation	Capital	Operation	Capital	Operation	Capital	Operation	Capital	Operation
Location Efficiency												
LEp1 Transportation Efficiency - Reduce air pollution, energy consumption, and greenhouse gas emissions generated by transportation by encouraging new development in locations that reduce automobile dependence. Promote public health by encouraging new development in locations that provide increased opportunities for walking.	Neutral	Neutral	Large cost decrease/unit	Large cost decrease/unit	Neutral	Neutral	Large cost decrease/unit	Large cost decrease/unit	Neutral	Neutral	Large cost decrease/unit	Large cost decrease/unit
LEp2 Water and storm water infrastructure efficiency - Conserve natural and financial resources required for construction and maintenance of infrastructure. Encourage new development within and near existing communities, in order to reduce multiple environmental impacts caused by haphazard sprawl.	Neutral	Neutral	Large cost decrease/unit	Large cost decrease/unit	Neutral	Neutral	Large cost decrease/unit	Large cost decrease/unit	Neutral	Neutral	Large cost decrease/unit	Large cost decrease/unit
LEc1.1 Contaminated brown fields redevelopment - Conserve land and reduce air, water, and land pollution from contaminated land.					Large cost increase/unit	Neutral	Neutral	Large cost decrease/unit				
LEc1.2 High cost contaminated brown fields redevelopment - Encourage the cleanup of more complicated or challenging contaminated brownfields sites					Large cost increase/unit	Neutral	Neutral	Large cost decrease/unit				
LEc2 Adjacent, infill, or redevelopment site - Encourage development within existing communities and already-developed places to reduce multiple environmental harms associated with haphazard sprawl. Reduce development pressure beyond the limits of existing development. Conserve natural and financial resources required for construction and maintenance of infrastructure.	Neutral	Neutral	Large cost decrease/unit	Large cost decrease/unit	Neutral	Neutral	Large cost decrease/unit	Large cost decrease/unit	Neutral	Neutral	Large cost decrease/unit	Large cost decrease/unit
LEc3 Reduced automobile dependence - Encourage development in locations that exhibit superior performance in providing transportation choices or otherwise reducing motor vehicle use.	Neutral	Neutral	Large cost decrease/unit	Large cost decrease/unit	Neutral	Neutral	Large cost decrease/unit	Large cost decrease/unit	Neutral	Neutral	Large cost decrease/unit	Large cost decrease/unit
LEc4 Contribution to jobs-housing balance - Encourage balanced communities with a diversity of uses and employment opportunities. Reduce energy consumption and pollution from motor vehicles by providing opportunities for shorter vehicle trips and/or use of alternative modes of transportation.	Neutral	Neutral	Large cost decrease/unit	Large cost decrease/unit	Neutral	Neutral	Large cost decrease/unit	Large cost decrease/unit	Neutral	Neutral	Large cost decrease/unit	Large cost decrease/unit
LEc5 School proximity - Promote children's health through physical activity by facilitating walking to school. Promote a sense of community.	Neutral	Neutral	Large cost decrease/unit	Large cost decrease/unit	Neutral	Neutral	Large cost decrease/unit	Large cost decrease/unit	Neutral	Neutral	Large cost decrease/unit	Large cost decrease/unit
LEc6 Access to public space - Provide access to public gathering space in order to promote sense of community.	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
Environmental Preservation												
EPp1 Imperiled species and ecological communities - Protect imperiled species and ecological communities.	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
EPp1 Parkland preservation - Protect natural habitat.	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
EPp3 Wetland & water body protection - Conserve water quality, natural hydrology and habitat through conservation of water bodies and wetlands.	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
EPp4 Erosion & sedimentation control - Reduce water pollution from erosion during construction.	Small cost increase/unit	Neutral	Neutral	Small cost decrease/unit	Small cost increase/unit	Neutral	Neutral	Small cost decrease/unit	Small cost increase/unit	Neutral	Neutral	Small cost decrease/unit
EPp5 Farmland preservation - Preserve irreplaceable agricultural resources by protecting prime and unique farmland from development.	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
EPc1 Support off-site land conservation - Protect land that is important for natural or cultural resources from development.												
EPc2 Site design for habitat or wetlands conservation - Conserve native wildlife habitat, wetlands and water bodies.	Small cost increase/unit	Neutral	Neutral	Neutral	Small cost increase/unit	Neutral	Neutral	Neutral	Small cost increase/unit	Neutral	Neutral	Neutral
EPc3 Restoration of habitat or wetlands - Conserve native wildlife habitat, wetlands and water bodies					Small cost increase/unit	Neutral	Neutral	Neutral				
EPc4 Conservation management of habitat or wetlands - Conserve native wildlife habitat, wetlands and water bodies.					Small cost increase/unit	Neutral	Neutral	Neutral				

Cost impact relative to typical urban residential development	
Large cost increase/unit	Neutral
Small cost increase/unit	Small cost decrease/unit
	Large cost decrease/unit

LEED-ND Characteristic Title	Regent Park Revitalization, Toronto — $ Impact to Project — Capital	Regent Park — $ Impact to Project — Operation	Regent Park — $ Impact to Municipality — Capital	Regent Park — $ Impact to Municipality — Operation	Dockside Green, Victoria — $ Impact to Project — Capital	Dockside Green — $ Impact to Project — Operation	Dockside Green — $ Impact to Municipality — Capital	Dockside Green — $ Impact to Municipality — Operation	Vaughan Oakwood Redevelopment, Toronto — $ Impact to Project — Capital	Vaughan Oakwood — $ Impact to Project — Operation	Vaughan Oakwood — $ Impact to Municipality — Capital	Vaughan Oakwood — $ Impact to Municipality — Operation
EPc5 Steep slope preservation - Minimize erosion to protect habitat, and reduce stress on natural water systems, by preserving steep slopes in a natural, vegetated state.												
EPc6 Minimize site disturbance during construction - Conserve existing natural areas and protect trees to provide habitat and promote biodiversity.	Small increase	Small increase	Neutral	Neutral	Small increase	Small increase	Neutral	Neutral	Small increase	Small increase	Neutral	Neutral
EPc7 Minimize site disturbance through site design - Preserve existing tree canopy, native vegetation and pervious surfaces while encouraging high density, smart growth communities.	Small increase	Neutral	Neutral	Neutral	Small increase	Neutral	Neutral	Neutral	Small increase	Neutral	Neutral	Neutral
EPc8 Maintain storm water runoff rates - Reduce storm water pollution, prevent flooding, and promote aquifer recharge.	Small increase	Large increase	Neutral	Large decrease	Small increase	Large increase	Neutral	Large decrease	Small increase	Large increase	Neutral	Large decrease
EPc9 Reduce storm water runoff rates - Reduce storm water pollution, prevent flooding, and promote aquifer recharge.	Large increase	Large increase	Neutral	Large decrease	Large increase	Large increase	Neutral	Large decrease	Large increase	Large increase	Neutral	Large decrease
EPc10 Storm water treatment - Reduce surface water pollution from storm water.	Large increase	Large increase	Neutral	Large decrease	Large increase	Large increase	Neutral	Large decrease	Large increase	Large increase	Neutral	Large decrease
EPc11 Outdoor hazardous waste pollution prevention - Reduce storm water pollution from the use of pesticides and fertilizers.	Neutral	Small decrease	Neutral	Neutral	Neutral	Small decrease	Neutral	Neutral	Neutral	Small decrease	Neutral	Neutral
Compact, Complete, & Connected Neighborhoods												
CCCNp1 Open community - Promote developments that are good neighbors to their surrounding communities. Foster a sense of community and connectedness beyond the development.	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
CCCNp2 Compact development - Conserve land. Promote livability, transportation efficiency, and walkability.	Large decrease	Neutral	Neutral	Large decrease	Large decrease	Neutral	Neutral	Large decrease	Large decrease	Neutral	Neutral	Large decrease
CCCNp3 Diversity of uses - Promote community livability, transportation efficiency, and walkability.	Small increase	Neutral	Neutral	Small decrease	Small increase	Neutral	Neutral	Small decrease	Small increase	Neutral	Neutral	Small decrease
CCCNc1 Compact development - Conserve land. Promote community livability, transportation efficiency, and walkability.	Large decrease	Neutral	Neutral	Large decrease	Large decrease	Neutral	Neutral	Large decrease	Large decrease	Neutral	Neutral	Large decrease
CCCNc2 Transit-oriented compactness - Maximize walking trips to and from transit stops in the area immediately surrounding the transit stop.	Neutral	Neutral	Large decrease	Large decrease	Neutral	Neutral	Large decrease	Large decrease	Neutral	Neutral	Large decrease	Large decrease
CCCNc3 Diversity of uses - Promote community livability, transportation efficiency, and walkability.	Small increase	Neutral	Neutral	Small decrease	Small increase	Neutral	Neutral	Small decrease	Small increase	Neutral	Neutral	Small decrease
CCCNc4 Housing diversity - To enable citizens from a wide range of economic levels and age groups to live within a community.	Small increase	Neutral	Small increase	Neutral	Small increase	Neutral	Small increase	Neutral	Small increase	Neutral	Small increase	Neutral
CCCNc5 Affordable rental housing - To enable citizens from a wide range of economic levels and age groups to live within a community.	Small increase	Neutral	Small increase	Neutral					Small increase	Neutral	Small increase	Neutral
CCCNc6 Affordable for-sale housing - To enable citizens from a wide range of economic levels and age groups to live within a community.	Small increase	Neutral	Neutral	Neutral	Small increase	Neutral	Neutral	Neutral	Small increase	Neutral	Neutral	Neutral
CCCNc7 Reduced parking footprint - Reduce storm water runoff per capita. Encourage neighborhood walkability and promote public health through physical activity.	Large decrease	Small decrease	Neutral	Small decrease	Large decrease	Small decrease	Neutral	Small decrease	Large decrease	Small decrease	Neutral	Small decrease
CCCNc8 Community outreach and involvement - To encourage community participation in the project design and planning and involve the people who live in a community in deciding how it should be improved or how it should change over time.	Small increase	Neutral	Small increase	Neutral	Small increase	Neutral	Small increase	Neutral	Small increase	Neutral	Small increase	Neutral
CCCNc9 Block perimeter - To promote connectivity.	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
CCCNc10 Locating buildings to shape walkable streets - Encourage pedestrian-oriented streets.	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
CCCNc11 Designing buildings access to shape walkable streets - Encourage pedestrian-oriented streets.	Small increase	Neutral	Neutral	Small decrease	Small increase	Neutral	Neutral	Small decrease	Small increase	Neutral	Neutral	Small decrease
CCCNc12 Designing buildings to shape walkable streets - Encourage pedestrian-oriented streets.	Small increase	Neutral	Neutral	Small decrease	Small increase	Neutral	Neutral	Small decrease	Small increase	Neutral	Neutral	Small decrease

Cost impact relative to typical urban residential development

- Neutral
- Large cost increase/unit
- Small cost decrease/unit
- Small cost increase/unit
- Large cost decrease/unit

LEED-ND Characteristic Title	Regent Park Revitalization, Toronto — $ Impact to Project: Capital	Regent Park — $ Impact to Project: Operation	Regent Park — $ Impact to Municipality: Capital	Regent Park — $ Impact to Municipality: Operation	Dockside Green, Victoria — $ Impact to Project: Capital	Dockside Green — $ Impact to Project: Operation	Dockside Green — $ Impact to Municipality: Capital	Dockside Green — $ Impact to Municipality: Operation	Vaughan Oakwood Redevelopment, Toronto — $ Impact to Project: Capital	Vaughan Oakwood — $ Impact to Project: Operation	Vaughan Oakwood — $ Impact to Municipality: Capital	Vaughan Oakwood — $ Impact to Municipality: Operation
CCCNc13 Comprehensively designed walkable streets - Encourage pedestrian-oriented streets.					Small cost increase/unit	Neutral	Neutral	Small cost decrease/unit	Small cost increase/unit	Neutral	Neutral	Small cost decrease/unit
CCCNc14 Street network - Provide direct and safe connections, for pedestrians and bicyclists as well as drivers, to local destinations and neighborhood centers. Promote public health though increased physical activity.	Small cost increase/unit	Neutral	Neutral	Small cost increase/unit	Small cost increase/unit	Neutral	Neutral	Small cost increase/unit	Small cost increase/unit	Neutral	Neutral	Small cost increase/unit
CCCNc15 Pedestrian network - Provide direct and safe connections, for pedestrians to local destinations and neighborhood centers. Promote public health though increased physical activity.	Small cost increase/unit	Small cost increase/unit	Neutral	Neutral	Small cost increase/unit	Small cost increase/unit	Neutral	Neutral	Small cost increase/unit	Small cost increase/unit	Neutral	Neutral
CCCNc16 Maximize pedestrian safety and comfort - Provide direct, safe, and comfortable connections, for pedestrians and bicyclists, to local destinations and neighborhood centers. Promote public health though increased physical activity.	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
CCCNc17 Superior pedestrian experience - Provide appealing and comfortable pedestrian street environments in order to promote pedestrian activity.												
CCCNc18 Applying regional precedents in Urbanism and Architecture - Promote energy savings, respond to regional climate, increase the life of buildings and materials, provide cultural continuity, and reinforce local distinctiveness.												
CCCNc19 Transit subsidy - Reduce energy consumption and pollution from motor vehicles by encouraging use of public transit.												
CCCNc20 Transit amenities - Reduce energy consumption and pollution from motor vehicles by encouraging use of public transit.	Small cost increase/unit	Neutral	Small cost decrease/unit	Small cost decrease/unit								
CCCNc21 Access to nearby communities - Provide direct and safe connections, for pedestrians and bicyclists as well as drivers, to local destinations and neighborhood centers. Promote public health by facilitating walking and bicycling.	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
CCCNc22 Adaptive reuse of historic buildings - Encourage use of historic buildings in a manner that preserves their historic materials and character.												
Resource Efficiency												
REc1 Certified green buildings - Encourage the design and construction of buildings to utilize green building practices.	Large cost increase/unit	Small cost decrease/unit	Neutral	Neutral	Large cost increase/unit	Small cost decrease/unit	Neutral	Neutral	Large cost increase/unit	Small cost decrease/unit	Small cost decrease/unit	Small cost decrease/unit
REc2 Energy efficiency in buildings - Encourage the design and construction of energy efficient buildings to reduce air, water, and land pollution and environmental impacts from energy production and consumption.	Large cost increase/unit	Large cost decrease/unit	Small cost decrease/unit	Small cost decrease/unit	Large cost increase/unit	Large cost decrease/unit	Small cost decrease/unit	Small cost decrease/unit	Large cost increase/unit	Large cost decrease/unit	Small cost decrease/unit	Small cost decrease/unit
REc3 Water efficiency in buildings - Encourage the design and construction of water efficient buildings to reduce the environmental impacts from water consumption.	Large cost increase/unit	Large cost increase/unit	Small cost decrease/unit	Small cost decrease/unit	Large cost increase/unit	Large cost increase/unit	Small cost decrease/unit	Small cost decrease/unit	Large cost increase/unit	Large cost increase/unit	Small cost decrease/unit	Small cost decrease/unit
REc4 Heat island reduction - Reduce heat island effect to minimize impact on microclimate, human and wildlife habitat, and required energy for cooling.	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
REc5 Infrastructure energy efficiency - Reduce air, water, and land pollution from energy consumption.												
REc6 On-site power generation - Reduce air, water, and land pollution from energy consumption and production by increasing the efficiency of the power delivery system. Increase the reliability of power.	Large cost increase/unit	Large cost decrease/unit	Small cost decrease/unit	Small cost decrease/unit	Large cost increase/unit	Large cost decrease/unit	Small cost decrease/unit	Small cost decrease/unit				
REc7 On-site renewable energy sources - Reduce environmental impacts associated with fossil fuel energy generation by increasing the use of on-site renewable energy sources.					Large cost increase/unit	Small cost increase/unit	Small cost decrease/unit	Small cost decrease/unit				
REc8 Efficient irrigation - Conserve potable water.	Small cost increase/unit	Small cost increase/unit	Neutral	Neutral	Small cost increase/unit	Small cost increase/unit	Neutral	Neutral	Small cost increase/unit	Small cost increase/unit	Neutral	Neutral
REc9 Grey water & storm water reuse - Conserve potable water.	Small cost increase/unit	Small cost increase/unit	Small cost decrease/unit	Small cost decrease/unit	Small cost increase/unit	Small cost increase/unit	Small cost decrease/unit	Small cost decrease/unit	Small cost increase/unit	Small cost increase/unit	Small cost decrease/unit	Small cost decrease/unit

Cost impact relative to typical urban residential development

Neutral	
Large cost increase/unit	Small cost decrease/unit
Small cost increase/unit	Large cost decrease/unit

	Regent Park Revitalization, Toronto				Dockside Green, Victoria				Vaughan Oakwood Redevelopment, Toronto			
	$ Impact to Project		$ Impact to Municipality		$ Impact to Project		$ Impact to Municipality		$ Impact to Project		$ Impact to Municipality	
LEED-ND Characteristic Title	Capital	Operation	Capital	Operation	Capital	Operation	Capital	Operation	Capital	Operation	Capital	Operation
REc10 Wastewater management - Reduce pollution from wastewater and reuse nutrients from the wastewater stream.												
REc11 Reuse of materials - Promote reuse of materials and resources.												
REc12 Recycled content - Promote use of recycled materials.												
REc13 Regionally provided materials - Promote selection of regionally available materials and resources to build local economy and reduce embodied energy.												
REc14 Construction waste management - Promote efficient use of solid waste by diverting construction, demolition and land clearing debris from landfill disposal, and by redirecting resources for recycling and reuse.												
REc15 Comprehensive waste management - Promote safe and efficient disposal or reuse of waste streams generated by occupants.												
REc16 Light pollution reduction - Reduce light pollution.												
REc17 Contaminant reduction in brown fields remediation - Encourage brownfields cleanup methods that reduce contaminant volume or toxicity and thereby minimize long-term remediation or monitoring burdens.												
Other												
Accredited professional Innovation Credits												
Innovation in design												
Total LEED Points	83				88				85			

3.2.1 Case study Analysis Summary

Two of the three case study projects, including Regent Park and Dockside Green have aligned themselves with the LEED-ND pilot program, using it as a tool during the design process[5,6]. Through a hypothetical LEED analysis, each of the projects could score a Gold rating based on current information on each of the projects.

An initial overview of each of the case study projects determined which of the 115 possible points could be achieved by each project, given the proposed design approach. For each of the targeted points, the economic impact on capital and operational costs were estimated from the perspective of both the developer and the municipality. The assessment of each credit is identified as having a net economic benefit, a net negative economic result, or a neutral economic effect on the project. Because of the inherent complexity in determining actual financial analysis of most of the credits, these broad definitions are used as guideline intended to demonstrate general trends for each of the case study projects.

The points exerting a net economic benefit are shaded in progressively brighter tones of yellow, while the credits that have the potential of producing a net negative economic result are shaded in progressively darker shades of blue. Credits that are considered neutral are shaded in grey and credits not pursued are white.

Figure 3.14 provides a narrative for some typical conditions found in the summary analysis, contrasting the economic impact of various points from the perspective of the project and municipality. This analysis is not intended to capture detailed cost, social or environmental implications of each case study, but to provide an overview of how development could become more environmentally sustainable within the current funding structure.

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5 Valentine, Derek. Design Faculty Summit: Building Science and Housing Technology, CMHC, May 26, 27, 2006, University of Ryerson, University of Toronto, Toronto, Ontario.

6 Westeinde, Johnathan Windmill Development Group Ltd., August 10, 2005, Altus Helyar Cost Consulting 212 King Street W Office, Toronto, Ontario.

The Neighbourhood Design case study analysis summary in figure 3.15, comparing each of the projects with the LEED-ND rating system, reveals that the overall economic impact of sustainable design features is predominantly neutral (grey) from the perspective of the developer and predominantly of net benefit (yellow) to the municipality.

Focusing in on each of the four environmental categories, we see that in the *Location Efficiency* category there is a generally a neutral economic impact on the project cost, but a significant economic benefit to the municipality. In the *Environmental Preservation* and *Compact, Complete, & Connected Neighbourhoods* categories, we find a general, modest increase in costs to the project, and an economic benefit to the municipality once again. The fourth category, *Resource Efficiency,* shows a possibly significant increase in cost to the project in several categories, while the municipality derives economic benefit from these strategies.

From this analysis we can see that there is a significant economic benefit to the municipality for encouraging infill projects which, similar to the case studies cited, reduce the environmental impact of development. A more detailed analysis of each case study is provided in Appendix A, including a brief description of the potential strategies that contribute to the achievement of each of the credits.

3.3 Multi-unit Residential Buildings Overview

This section examines how sustainable design strategies can be incorporated into developer commissioned Multi-unit Residential Buildings (MURBs) while responding to constraints of the traditional industry approach.

The condominium market over the past three years has been one of the fastest growing sectors of LEED registered buildings. In the United States, between July 2003 and September 2005, the number of MURBs registered under LEED grew by 52%.[7] In Canada, where the system was

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7 Yudelson, Jerry. Developing Green: Strategies for Success. Herndon: National Association of Industrial and Office Properties (NAIOP), 2006. Page 21

introduced only two years ago (November 2004), there are three Certified Condominiums and 55 Registered[8] buildings, indicating a growing level of interest in LEED among developers. In cities such as Toronto and Vancouver, resource saving features such as energy star appliances, dual flush toilets, and green roof areas are now commonly incorporated in building marketing material, alongside the usual interior finish upgrades. In addition to such fashionable interpretations of green features, the buildings identified in the case studies are reducing overall energy consumption by upwards of 30%, through specifying energy efficient HVAC, including in-suite HRV's and common area lighting systems, as well as individual suite metering of water, and heating and cooling loads. By investing in a higher performance building, residents are insulated from volatile energy prices, the costs of which have represented a significant portion of the rising condominium fees in some older, inefficient buildings.[9]

In Toronto, progressive developers like Tridel, Remington and Minto have committed to certifying all future projects under the LEED system[10,11]. This move towards environmental responsibility is driven by competition between developers seeking to position themselves as market leaders in a climate of growing consumer environmental-awareness. Although MURB developers make their return upon building occupancy, their reputations hang on the success of past projects.

The three case study MURB projects cover a range of relationships between the developer and the end-user, from the most typical developer-buyer model to less common rental models. The important commonality is that, in all cases, the developer has absorbed the extra LEED costs within the typical proforma calculations.[12] Since the cancellation of the Federal Commercial Building Incentive Programme (CBIP) grant, significant sources of additional funding for sustainable features in condominiums are not available. Within the Toronto market, one of the first

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8 Canadian Green Building Council. January, 2006 <http://www.cagbc.org/>
9 Altus Helyar Costing Database
10 Tridel Developments. January 10, 2007 <http://www.tridel.com/>
11 Minto Developments. January 10, 2007 <http://www.mintocom/>
12 Altus Helyar Costing Database

LEED condominiums, The Verve developed by Tridel, qualified for a $1.4 million Green Loan from the Toronto Atmospheric Fund; however, this funding has not been available to subsequent developer projects. Although these incentives effectively initially worked to create awareness and demand to start transforming the market, it remains to be seen how this market trend will play out in the long term.

3.3.1 Multi-unit Residential Building (MURB) Graph Content Summary Information

Figure 3.16 - Provides key statistics for each of the three Multi-unit Residential Building (MURB) case studies.

Figure 3.17 - Detailed apportionment of LEED cost increment, apportioned by Building Division.

Figure 3.18 - Overview matrix of key building information, along with a capital cost summary and the building value assessment calculation summary for each case study.

Figure 3.19a,b - Detailed apportionment of LEED cost increment, apportioned by LEED Environmental Category.

A complete analysis specific to each project is provided in Appendix B including project diagrams, narrative on building features and detailed estimate of project costs including LEED cost increment.

3.3.2 Factors Influencing the Viability of Sustainable Design

As shown in Figure 3.02 pages 34-35 there are a number of factors that affect the viability of green measures in any project. Factors specific to MURBs include: density of mechanical distribution zones; amount of glazing typically designed/desired; and approach to ventilation which, if conventional, provides little opportunity for economical energy saving systems. Another issue is energy and water use, which in residential buildings is largely discretionary and influenced significantly by the occupants.

Some inherent advantages that most MURBs have in scoring LEED points include a preference

Ref.	Design Criteria/Characteristics - Multi-unit Residential Building (MURB)		Reference MURB Building	b1 Residential Case Study	b2 Residential Case Study	b3 Residential Case Study	Key Indicators
1.00	**Project Statistics**						
1.01	Location		Urban Canada	Toronto, Ontario	Toronto, Ontario	Waterloo, Ontario	
1.02	Gross Livable Area (m2 GLA)			21,332	38,598	1703	
1.03	Stories	Parking	-	3	6	-	
1.04		Tower A	-	8	40	5	
1.05		Tower B	-	22	-	-	
1.06	Number of suites			221	424	11	
2.00	**Construction Cost Estimate**						
2.01	Below Grade (parking/basement)		-	$3,465,000	$15,360,200	$149,960	
2.02	Podium		-	$3,316,000	-	-	
2.03	Residential Floors Tower A		-	$9,167,000	$49,877,500	$2,114,312	
2.04	Residential Floors Tower B		-	$18,463,000	-	-	
2.05	Site Development		-	$593,000	$801,300	$151,318	
2.06	**Subtotal Excluding Contingencies**		**-**	**$35,004,000**	**$66,039,000**	**$2,415,590**	
2.07	Design Contingency/Allowance		-	$1,750,000	$1,320,780	$0	
2.08	Escalation Contingency		-	$0	$0	$0	
2.09	Post Contract		-	$1,050,120	$1,981,000	$50,000	
2.10	**Total Construction Cost (Excl. GST)**		**-**	**$37,804,120**	**$69,341,000**	**$2,466,000**	
2.11		**$/m2 (GLA)**	**-**	**$1,772**	**$1,796**	**$1,448**	
3.00	**Estimated LEED Cost Increment (Included above)**						
3.01	$ Budget		-	$3,983,000	$1,487,000	$184,000	
3.02	$/m2		-	$187	$39	$108	
3.03	$/credit		-	$90,523	$41,306	$4,600	
3.04	**% increase**		**-**	**11.8%**	**2.2%**	**8.1%**	
4.00	**Exterior Enclosure (Overall System)**						
4.01	Wall R-Value		R-12	R-17	R-12	R-20	
4.02	Roof R-Value		R-20	R-20	R-20	R-20	
4.03	Glazing U-factor / SHGC / visible light trans.		2.30/0.60/0.71	1.00/0.26/0.50	1.70/0.33/0.63	1.41/0.40/0.70	
4.04	Amount of glazing (% of building skin area)		85%	60%	90%	17%	
5.00	**Building Environmental Performance**						
5.01	Energy Intensity (Base/LEED)	KWh/m2/a		349/155		250/105	
5.02	Percent of MNECB baseline		MNECB	58.9% MNECB	35% MNECB	62% MNECB	
5.03	Water use (Base/LEED)	L/m2/a	-				
5.04	Percent water reduction		-	30%	20%	0%	
5.05	Greenhouse Gas reduction	tonnes CO2/a	-	787.9	-	-	
5.06		tonnes CO2/a/unit	-	3.57	-	-	
6.00	**Sustainable Design Strategies by LEED Environmental Category**						
6.01.00	SS - Sustainable Site Strategies						
6.01.01	Points targeted		0	9	9	9	
6.01.02	Rainwater tank	Volume (m3)	-	15	11.2	0	
6.01.03	Green Roof	Area (m2)	-	1075	3851	293	
6.02.00	WE - Water Efficiency Strategies						
6.02.01	Points targeted		0	3	3	3	
6.02.02	Reduce/eliminate municipal water irrigation		No	Yes	Yes	Yes	
6.02.03	Grey water sewage conveyance		No	Yes	No	No	

Ref.	Design Criteria/Characteristics - Multi-unit Residential Building (MURB)	Reference MURB Building	b1 Residential Case Study	b2 Residential Case Study	b3 Residential Case Study	Key Indicators
6.02.04	Low flow fixtures	None	Toilets, showers and faucets	Toilets, showers and faucets	showers and faucets	
6.03.00	EA - Energy and Atmpsphere Strategies					
6.03.01	Points targeted	0	11	5	10	
6.03.02	Exterior enclosure	None	Increase thermal performance of envelope	Increase thermal performance of wall assembly	Increase thermal performance of envelope	
6.03.03	HVAC	None	In-suite ERV, C02 controlled ventilation, District CHP	In-suite ERV, Condensing boiler, VSD on heating & cooling tower pumps	In-slab heating, ductless mini splits, power exhaust with passive make up	
6.03.04	Electrical	None	High efficiency fixtures, occupancy & daylight sensors	High efficiency fixtures in common areas, & occupancy sensors	High efficiency fixtures, occupancy & daylight sensors	
6.04.00	MR - Materials and Resources					
6.04.01	Points targeted	0	5	5	5	
6.04.02	Construction waste diversion	0%	75%	75%	50%	
6.04.03	Post-consumer recycled content materials	0%	25%	7.5%	7.5%	
6.04.04	Regionally manuf. & extracted materials	0%	20%	10%	10%	
6.05.00	IEQ - Indoor Environment Quality					
6.05.01	Points targeted	0	13	9	9	
6.05.02	Low emitting materials	None	Sealants, paints, carpet, composite wood	Sealants, paints, carpet	Sealants, paints, no carpet	
6.06.00	ID - Innovation & Design Process					
6.06.01	Points targeted	0	3	5	4	
6.06.02	Additional building features	None	Green building education, water efficiency exceptional performance	Green building education, suite metering, energy star appliances, chiller heat recovery	Building monitoring, Building durability, Passive ventilation	
7.00	**Estimated LEED Score**					
	Points Targeted of 70 potential	less than 26	44	36	40	

Figure 3.16 Multi-unit Residential Building (MURB) Comparison Summary Key points of each case study project are included for comparison purposes.

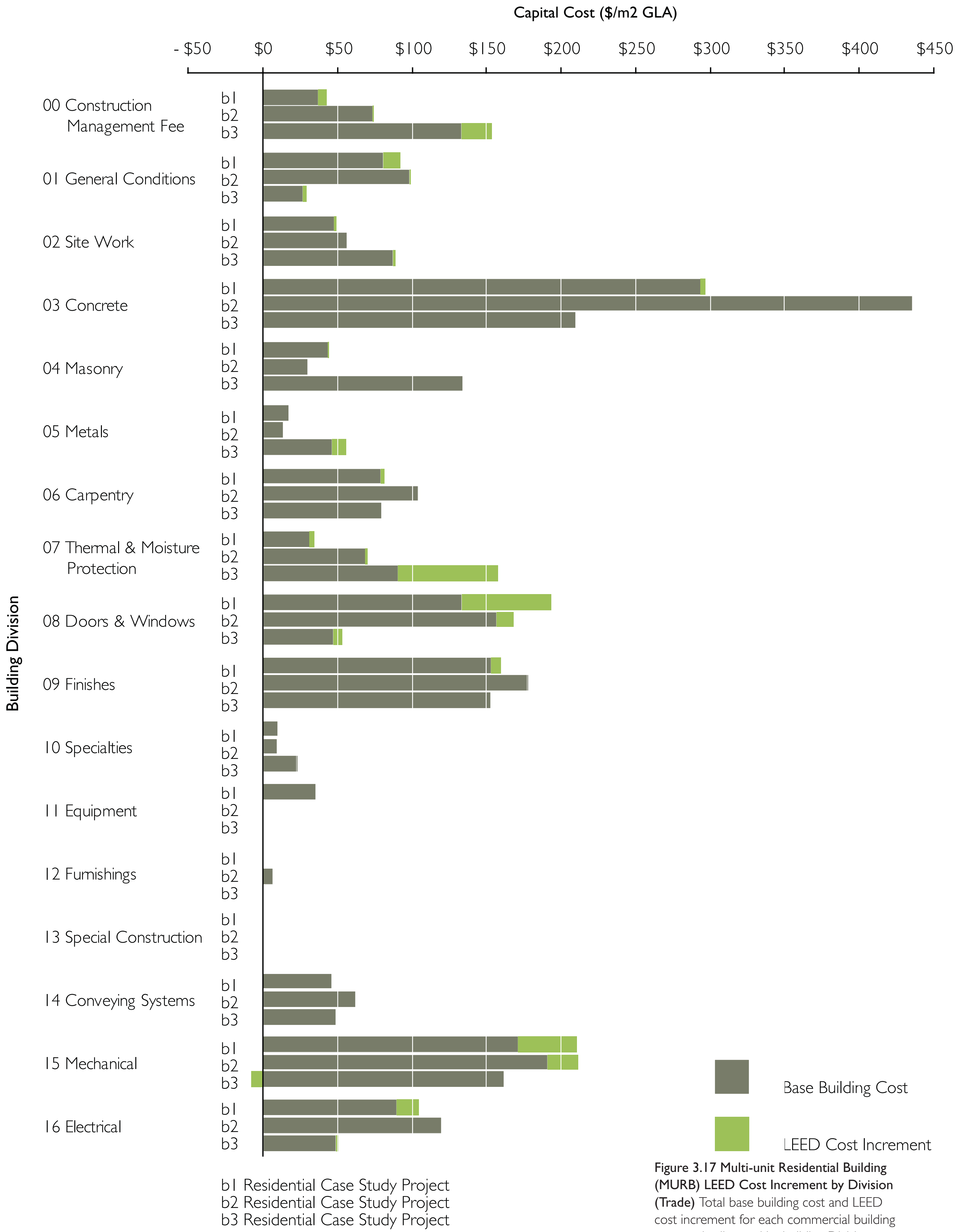


Figure 3.17 Multi-unit Residential Building (MURB) LEED Cost Increment by Division (Trade) Total base building cost and LEED cost increment for each commercial building case study allocated by building Division.

Base Building Figures

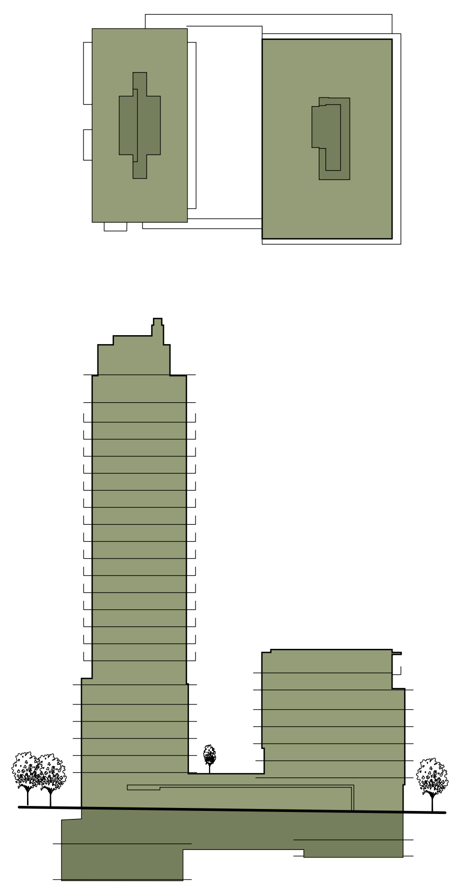
LEED Building Figures

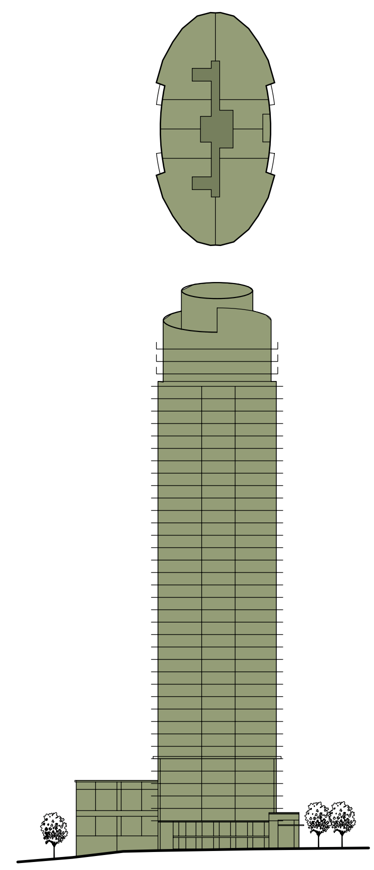
Total Variance

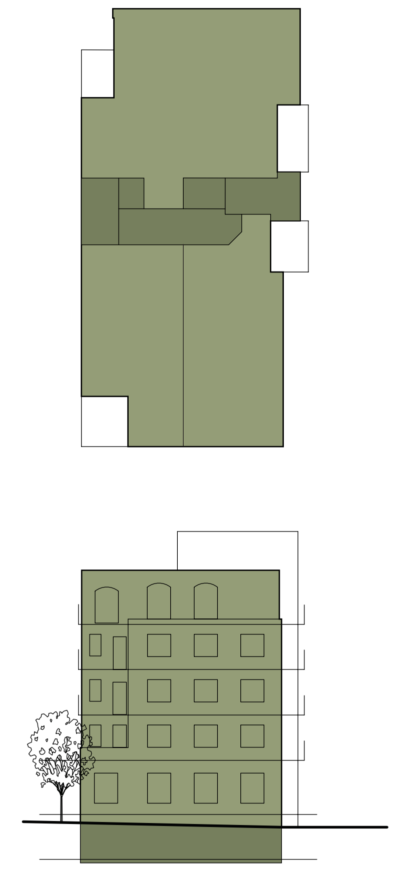
	B1 - Residential Case Study	B2 - Residential Case Study	B3 - Residential Case Study
	Toronto, Ontario	Toronto, Ontario	Waterloo, Ontario

Project Overview

Building Typical Floor Plan and Elevation Diagrams







	B1	B2	B3
Gross Livable Area (GLA)	21,332 m2	38,598 m2	1703 m2
Number of Storys (Excl.)	8/22 Storys	40 Storys	5 Storys
Number of Suites	221 Suites	424 Suites	11 Suites

LEED Target Level

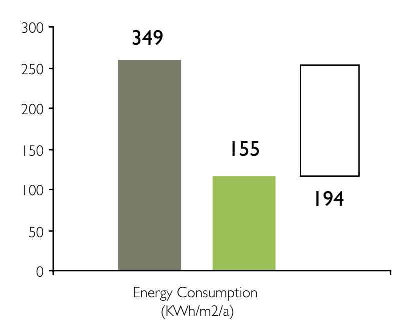
Certified 26 - 32 | Silver 33 - 38 | Gold 39 - 51 | Platinum 52 - 70

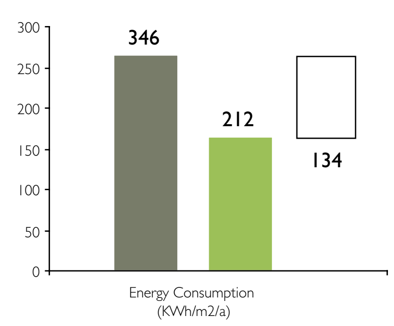
B1	B2	B3
44 Points - Gold	36 Points - Silver	40 Points - Gold

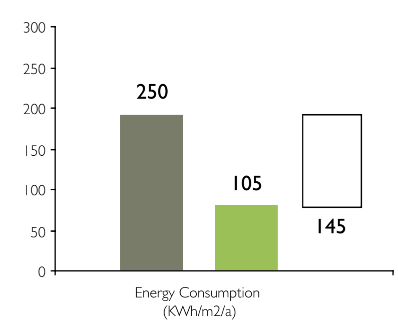
Environmental Performance

Energy Consumption

Total modeled energy consumption for the building operation in accordance with MNECB standards including electrical and on-site fuel consumption. Energy consuming components of the building including building envelope, heating ventilating and air conditioning, service water heater, electric power distribution, electric motors and drives, and lighting. Excludes on-site generated renewable energy, and non-regulated plug loads. Energy conservation strategies included increased thermal performance of building envelope, higher efficiency mechanical systems and lighting, occupancy and daylight sensors on lighting systems.

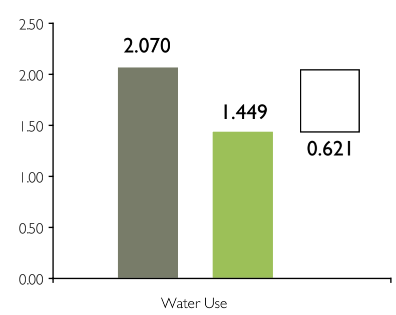


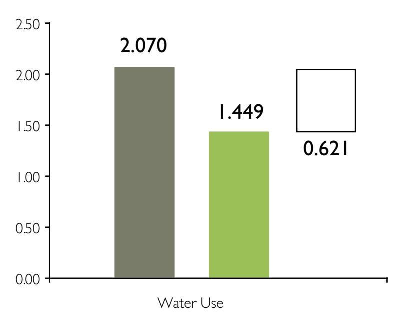


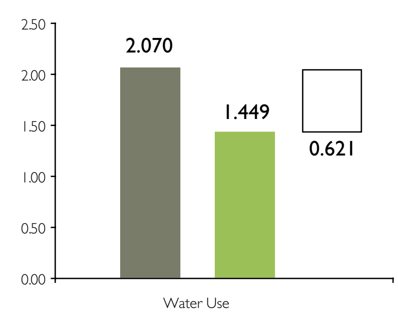


Municipal Water Consumption

Total modeled water consumption for building operation including drinking water, water for sewage conveyance and irrigation. Excludes water harvested on site from rain water catchment.
Water conservation strategies included xeriscape landscaping, efficient fixtures including waterless urinals low flow toilets, grey water systems, and rainwater collection.

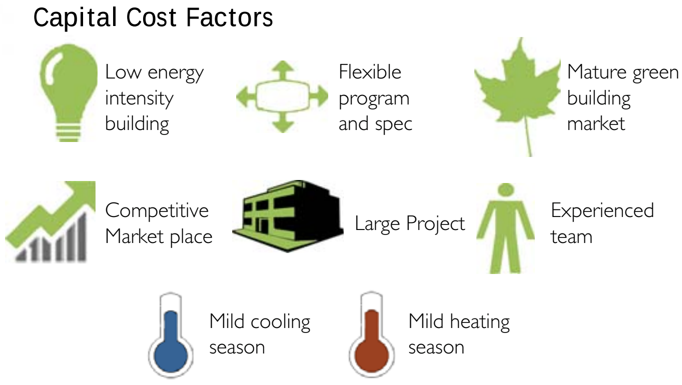






Capital Costs

Capital Cost Factors



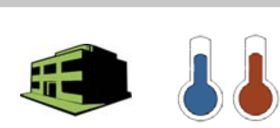
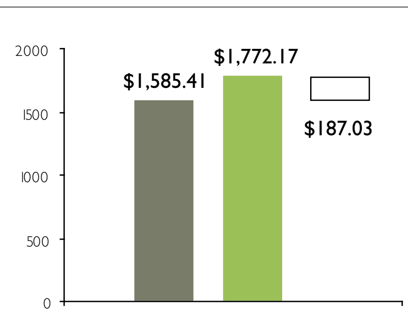
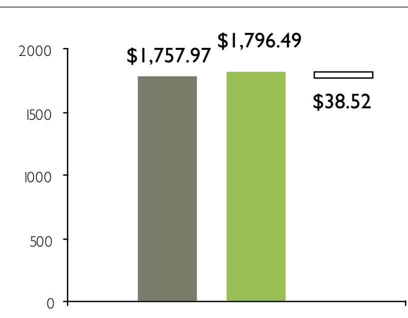


Figure 3.18 Multi-unit Residential Building (MURB) Matrix Comparison provides an overview of the building along with a summary of the capital costs and building value caculations for each of the case studies.

Capital Cost

Total Construction Costs including site work, construction and design contingencies and construction management fee. Excludes all soft costs, Including land acquisition costs, consultant fees, and profit.





	B1 - Residential Case Study Toronto, Ontario	B2 - Residential Case Study Toronto, Ontario	B3 - Residential Case Study Waterloo, Ontario

LEED Cost Increment

LEED Cost Increment

Total building LEED Cost Increment compared with a building constructed to meet building code

	B1	B2	B3
LEED Cost Increment ($/m2 GLA)	$186.76	$38.53	$108.00
LEED Cost Increment (% Capital)	11.8%	2.2%	8.1%

Building Value Assessment

Value of Increased Site Density Permitted by Municipality

Rational A building where residents will place less demand on municipal infrastructure including water, and energy resources, and traffic patters due to reduced reliance on passenger vehicle transportation, could be rewarded by allowing an increase in the allowable site density from existing zoning bylaw.
Formula Assume that allowable site density can be increased by 5 percent beyond existing bylaw for the LEED Certified building.

	B1	B2	B3
Increased Building Value ($/m2 GLA)	$15.54	$16.48	$8.07
Increased Building Value (% Capital)	0.9%	0.9%	0.6%
Payback on LEED Cost Increment (Years)	12.0 Years	2.3 Years	13.4 Years

Value of Reduced Time in Gaining Project Approvals

Rational The schedule implications and consulting fees necessary to gain approvals for a project can represent a significant capital soft cost. If municipalities allowed 'fast-tracking' of LEED targeting projects there would be further incentive to incorporate the measures required by LEED. From the perspective of the municipality, this incentive would have minimal cost implications.
Formula Assume the LEED Registered MURB gains required approvals in for a project four months quicker than a standard building. The average carrying cost of a project at pre-construction phase is $400/unit/month, including interest on equity of the land design fees and marketing costs for the project.

	B1	B2	B3
Increased Building Value ($/m2 GLA)	$16.58	$13.18	$7.75
Increased Building Value (% Capital)	0.9%	0.7%	0.5%
Payback on LEED Cost Increment (Years)	11.3 Years	2.9 Years	13.9 Years

Value of Sales Premium

Rational A building that has better thermal comfort, is more efficient, provides higher indoor air quality and is marketed as a Green building can potentially be sold at a premium over a comparable 'Non-Green' MURB.
Formula The market value of a typical MURB is assumed to be $3500/m2 with a $50 premium for a LEED Certified building.

	B1	B2	B3
Increased Building Value ($/m2 GLA)	$17.50	$17.50	$17.50
Increased Building Value (% Capital)	0.8%	0.8%	0.8%
Payback on LEED Cost Increment (Years)	12.6 Years	2.6 Years	7.3 Years

Value of Increased Sales Velocity

Rational A building that can be marketed as more environmentally sustainable will appeal to the growing number of purchasers who seek a lower environmental impact lifestyle. In turn this may increase the number of purchasers through market differentiation.
Formula Assume the LEED Registered MURB will pre-sell two months quicker than a standard building. The average carrying cost of a project at the pre-sales phase is calculated to be in the order of $750/unit/month, including interest on the equity of the land, design fees and marketing costs for the project.

	B1	B2	B3
Increased Building Value ($/m2 GLA)	$15.54	$16.48	$9.69
Increased Building Value (% Capital)	0.9%	0.9%	0.7%
Payback on LEED Cost Increment (Years)	12.0 Years	2.3 Years	11.2 Years

Value of Reduced Annual Condominium Fees

Rational Typical MURB buildings allocate utility costs including suite space conditioning, domestic hot water, building reserve fund, insurance and other common area expenses on the basis of each tenants proportion of total Net Salable Area (NSA). Condo fees for typical condominiums total $5.50/m2/month, a building which incorporates higher efficiency mechanical and electrical systems that are more durable and will reduce energy consumption of the building would potentially reduce Condo fees by an estimated $0.50/m2/month.
Formula Assume the monthly condominium fees are reduced by 50 cents/m2/month. These savings are translated into mortgagability of the purchaser over a typical 25 year term using the traditional means of calculating qualification for mortgage.

	B1	B2	B3
Increased Building Value ($/m2 GLA)	$41.44	$54.93	$25.84
Increased Building Value (% Capital)	2.3%	3.1%	1.8%
Payback on LEED Cost Increment (Years)	4.5 Years	0.7 Years	4.2 Years

Total Increase in Building Value

Rational A total of the savings calculated above is provided for comparison purposes and to give a sense of the order of magnitude savings that could be realized by investing in the additional strategies required by LEED Certified buildings
Formula Add together each of the above Building Value Calculations.

	B1	B2	B3
Increased Building Value ($/m2 GLA)	$103.97	$115.94	$66.23
Increased Building Value (% Capital)	5.9%	6.5%	4.6%
Payback on LEED Cost Increment (Years)	1.8 Years	0.3 Years	1.6 Years

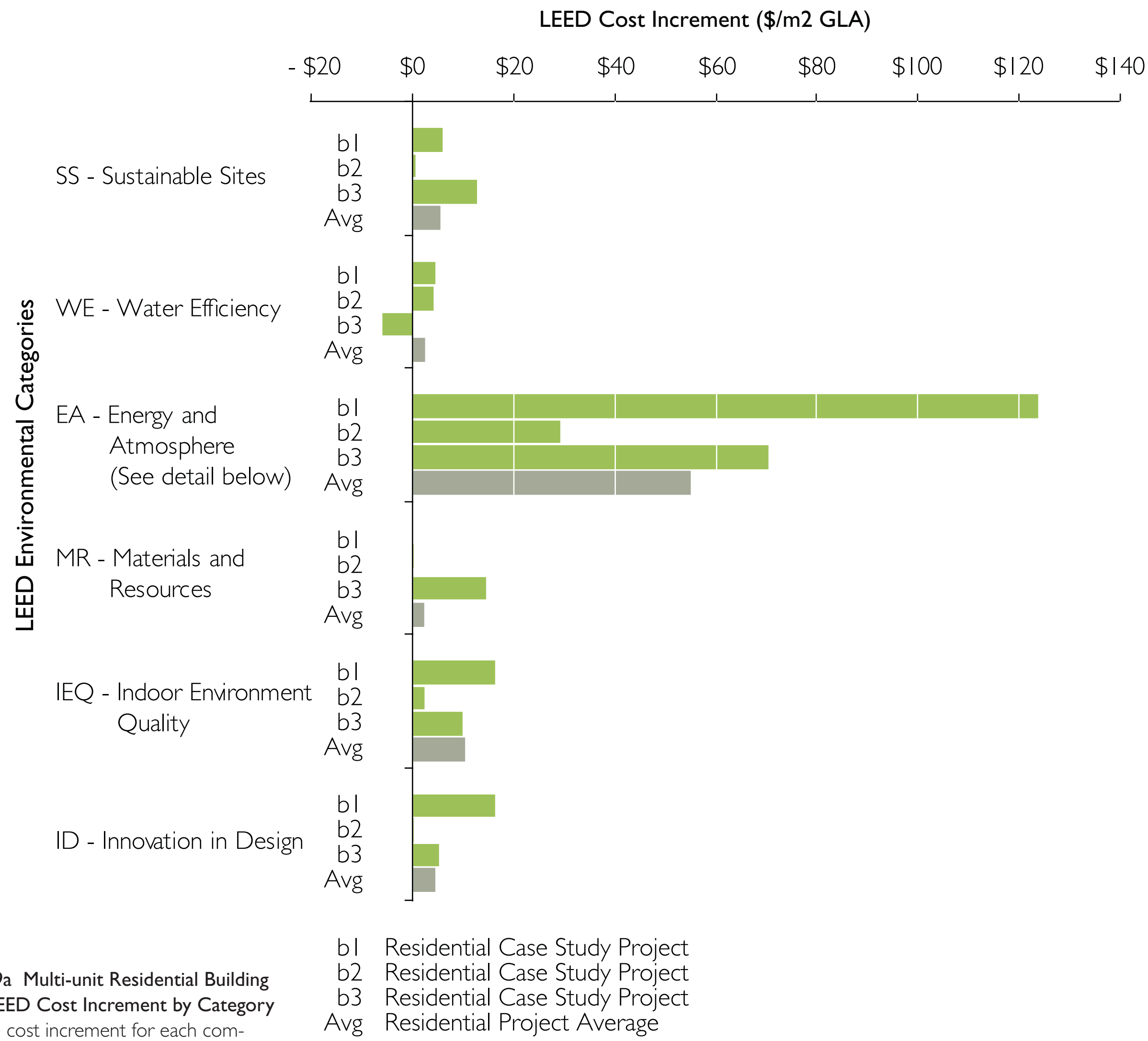


Figure 3.19a Multi-unit Residential Building (MURB) LEED Cost Increment by Category Total LEED cost increment for each commercial building case study allocated by LEED environmental category.

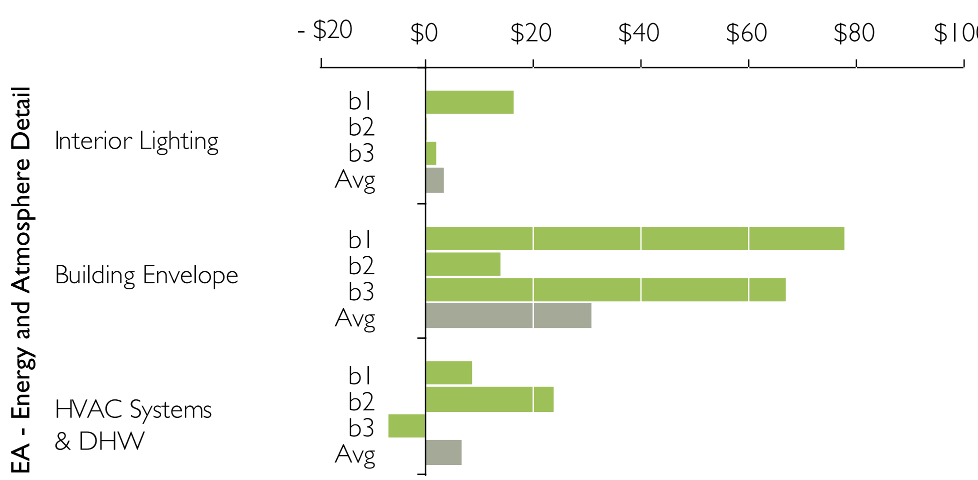


Figure 3.19b Multi-unit Residential Building (MURB) Apportionment of Energy and Atmosphere Cost The apportionment of the energy savings cost for each commercial building case study is broken down into three primary energy saving strategies.

for high-density urban sites with access to public transit, lower parking requirements, green roofs often incorporated as building amenity spaces, day lighting and natural ventilation. Another major advantage that residential buildings have over other building types is that people usually live in places that are consistent with personal values. With today's growing environmental consciousness, buildings that feature environmental attributes have another level of market differentiation within the highly competitive residential sector.

By appealing to a social desire to be identified with environmental stewardship through the building that one chooses to live in, it is anticipated that the residents of a 'green' building will collectively move towards a culture of environmentalism, where conservation becomes a communal goal.

3.4 Commercial Building Overview

The commercial market is perhaps the largest market for sustainable design and has the greatest scope to improve over current standards. We can see this trend towards higher performance commercial office buildings reflected in the number LEED Registered projects in Canada; commercial projects now make up 66 of 361, or 18 percent of the all buildings registered.[13] The figure in the United States is 21%, excluding multiple use buildings.[14] Another indicator of the size of this market is the type of client commissioning LEED buildings. The figures from the USGBC show that in 2005, for-profit corporations (26%), and non-profit corporations (20%), made up 46% of the total number of LEED Registered buildings.

Most of these buildings are commissioned under the traditional design-bid-build or construction management process, where the developer or general contractor passes off the building to a Real-estate Income Trust (REIT) or in some cases the building occupier/owner. The most significant advantage that the commercial sector has over other building sectors such as the aforementioned MURB sector is that commercial buildings are perceived as assets that provide

13 Canadian Green Building Council. January 15, 2006 <http://www.cagbc.org/>

14 Yudelson, Jerry. Developing Green: Strategies for Success. Herndon: National Association of Industrial and Office Properties (NAIOP), 2006. page 16.

income. For this reason, commercial building owners are generally interested in minimizing operational costs of buildings in order to remain competitive in the marketplace.

As outlined in the case studies section there is a great deal of evidence to support investment in sustainable design within this sector where a developer can realize higher returns in addition to providing valuable but less tangible benefits to the building occupier such as worker productivity, corporate branding, and attracting/retaining key employees.

3.4.1 Commercial Building Graph Content Summary Information

Figure 3.20 - Provides key statistics for each of the three Commercial Building case studies for comparison purposes

Figure 3.21 - Detailed apportionment of LEED cost increment, apportioned by Building Division

Figure 3.22 - Overview matrix of key building information, along with a capital cost summary and the building value assessment calculation summary for each case study.

Figure 3.23a,b - Detailed apportionment of LEED cost increment, apportioned by LEED Environmental Category.

A complete analysis specific to each project is provided in Appendix C including project diagrams, narrative on building features and detailed estimate of project costs including LEED cost increment.

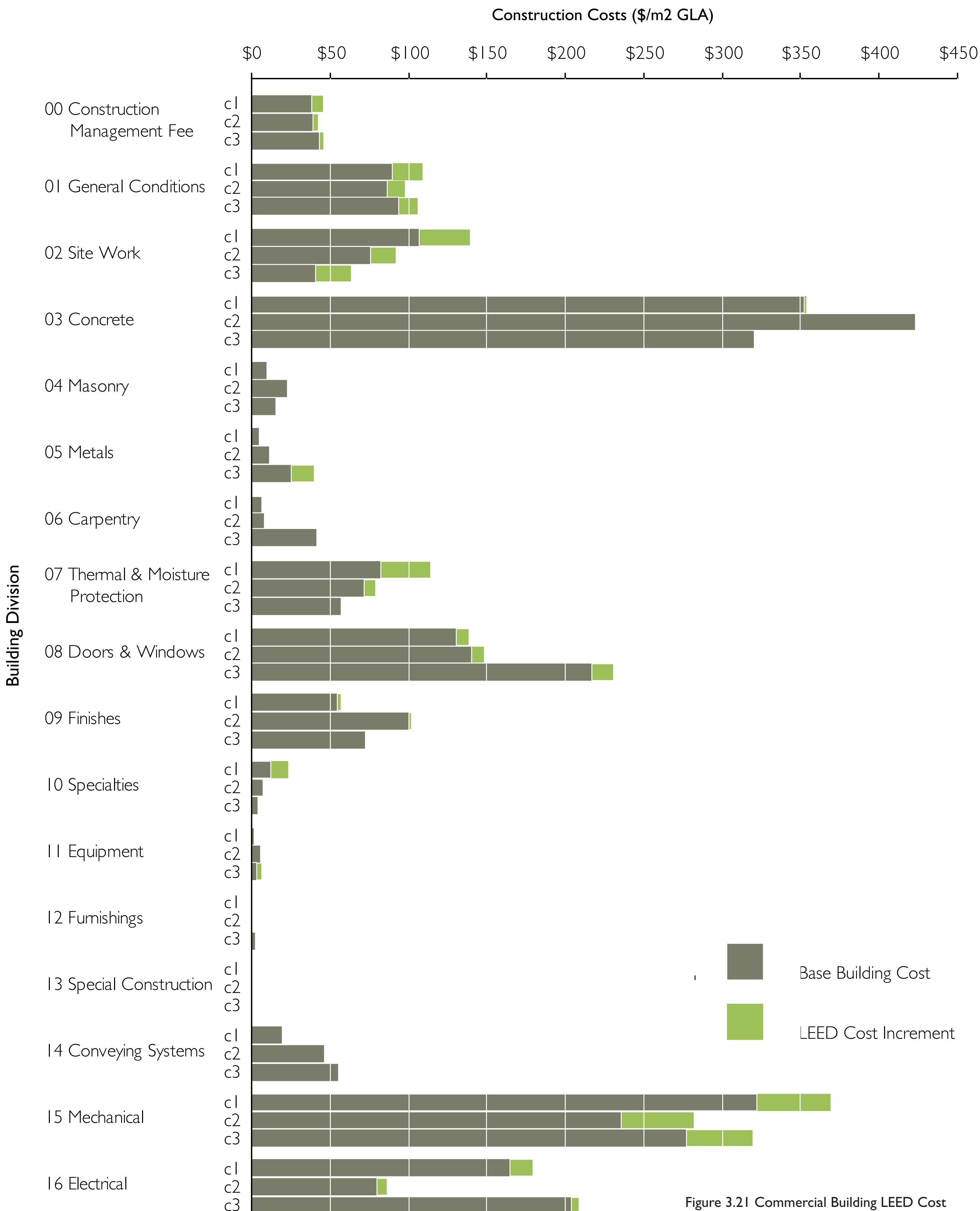
3.4.2 Factors Influencing the Viability of Sustainable Deisgn

As mentioned in chapter 2, current codes and regulations for buildings in Canada that fall outside of Part 9 of the building code, which deals primarily with residential buildings less than 3 storys in building height and under 560 square meters of Gross Floor Area, have extremely low energy performance targets and in practice are not enforced by building officials. The Model National Energy Code for Buildings (MNECB) provides a design guideline for minimum performance recommended for buildings; however, MURB and Commercial buildings constructed by

Ref.	Design Criteria/Characteristics - Commercial Building		Reference MURB Building	c1 Commercial Case Study	c2 Commercial Case Study	c3 Commercial Case Study	Key Indica tors
1.00	**Project Statistics**						
1.01	Location		Urban Canada	Halifax, Nova Scotia	Markham, Ontario	Markham, Ontario	
1.02	Gross Floor Area (m2 GFA)		-	15,775	14,454	12,254	
1.03	Stories		-	3	6	5	
2.00	**Construction Cost Estimate**						
2.01	Office building (excl. tenant impr		-	$21,441,699	$19,819,621	$18,858,151	
2.02	Site Development		-	$2,090,080	$1,286,274	$678,849	
2.03	**Subtotal Excluding Contingencies**		**-**	**$23,532,000**	**$21,106,000**	**$19,537,000**	
2.04	Design Contingency/Allowance		-	$1,177,000	$1,055,000	$586,000	
2.05	Escalation Contingency		-	$0	$0	$0	
2.06	Post Contract			$1,177,000	$1,055,000	$977,000	
2.07	Tenant Improvements Allowance		-	-	-	-	
2.08	**Total Construction Cost (Excl. GST)**		**-**	**$25,886,000**	**$23,216,000**	**$21,100,000**	
2.09		**$/m2 (GLA)**	**-**	**$1,641**	**$1,606**	**$1,722**	
3.00	**Estimated LEED Cost Increment (Included above)**						
3.01	$ Budget		-	$2,673,000	$1,636,000	$1,554,000	
3.02	$/m2		-	$169	$113	$127	
3.03	$/credit		-	$63,643	$41,949	$48,563	
3.04	**% increase**		**-**	11.5%	7.6%	8.0%	
4.00	**Exterior Enclosure (Overall System)**						
4.01	Wall R-Value		R-12	R-17	R-17	R-20	
4.02	Roof R-Value		R-20	R-26	R-26	R-26	
4.03	Floor R-Value		R-12	R-15	R-15	R-15	
4.04	Glazing U-factor / SHGC / visible light trans.		2.30/0.60/0.71	2.16/0.55/0.65	1.66/0.43/0.60	1.66/0.43/0.60	
4.05	Amount of glazing (% of building skin area)		85%	40%	58%	62%	
5.00	**Building Environmental Performance**						
5.01	Energy Intensity (Base/LEED)	KWh/m2/a		-	260/149	219.1/144.7	
5.02	Percent of MNECB baseline		MNECB	40% MNECB	53.5% MNECB	38.6% MNECB	
5.03	Water use (Base/LEED)	L/m2/a	-				
5.04	Percent water reduction		-	30%	30%	30%	
5.05	Greenhouse Gas reduction	tonnes CO2/a	-	-	440.9	-	
5.06		tonnes CO2/a/m2	-	-	0.031	-	
6.00	**Sustainable Design Strategies by LEED Environmental Category**						
6.01.00	SS - Sustainable Site Strategies						
6.01.01	Points targeted		0	7	8	7	
6.01.02	Rainwater tank	Volume (m3)	0	45	15	60	
6.01.03	Green Roof	Area (m2)	0	0	0	584	
6.02.00	WE - Water Efficiency Strategies						
6.02.01	Points targeted		0	4	4	4	

Ref.	Design Criteria/Characteristics - Commercial Building	Reference MURB Building	c1 Commercial Case Study	c2 Commercial Case Study	c3 Commercial Case Study	Key Indicators
6.02.02	Reduce/eliminate municipal water irrigation	No	Yes	Yes	Yes	
6.02.03	Grey water sewage conveyance	No	Yes	Yes	No	
6.02.04	Low flow fixtures	None	Toilets, urinals, showers and faucets	Toilets, urinals, showers and faucets	Toilets, urinals, showers and faucets	
6.03.00	EA - Energy and Atmpsphere Strategies					
6.03.01	Points targeted	0	9	6	6	
6.03.02	Exterior enclosure	None	Increase thermal performance of envelope	Increase thermal performance of envelope	Increase thermal performance of envelope	
6.03.03	HVAC	None	ERV, C02 controlled ventilation, condensing boiler/water heater	ERV on fan coils, C02 controlled ventilation, upgrade fan & pumping efficiency, district CHP	ERV on fan coils, C02 controlled ventilation, upgrade fan & pumping efficiency, district CHP	
6.03.04	Electrical	None	High efficiency fixtures, occupancy & daylight sensors	High efficiency fixtures, occupancy & daylight sensors	High efficiency fixtures, occupancy & daylight sensors	
6.04.00	MR - Materials and Resources					
6.04.01	Points targeted	0	5	4	3	
6.04.02	Construction waste diversion	0%	75%	75%	50%	
6.04.03	Post-consumer recycled content materials	0%	7.5%	7.5%	7.5%	
6.04.04	Regionally manuf. & extracted materials	0%	10%	10%	10%	
6.05.00	IEQ - Indoor Environment Quality					
6.05.01	Points targeted	0	14	12	9	
6.05.02	Low emitting materials	None	Sealants, paints, carpet	Sealants, paints, carpet, composite wood	Sealants, paints, carpet	
6.06.00	ID - Innovation & Design Process					
6.06.01	Points targeted	0	3	5	3	
6.06.02	Additional building features	None	Green building education, green house keeping	Green building education, green house keeping, Low-emmiting furniture, exceptional water usage reduction	Green building education, exceptional water usage reduction (47%)	
7.00	**Estimated LEED Score**					
	Points Targeted of 70 potential	less than 26	42	39	32	

Figure 3.20 Commercial Building Comparison Summary Key points of each case study project are included for comparison purposes.



c1 - Commercial Case Study Project
c2 - Commercial Case Study Project
c3 - Commercial Case Study Project

Figure 3.21 Commercial Building LEED Cost Increment by Division (Trade) Total base building cost and LEED cost increment for each commercial building case study allocated by building Division.

Base Building Figures

LEED Building Figures

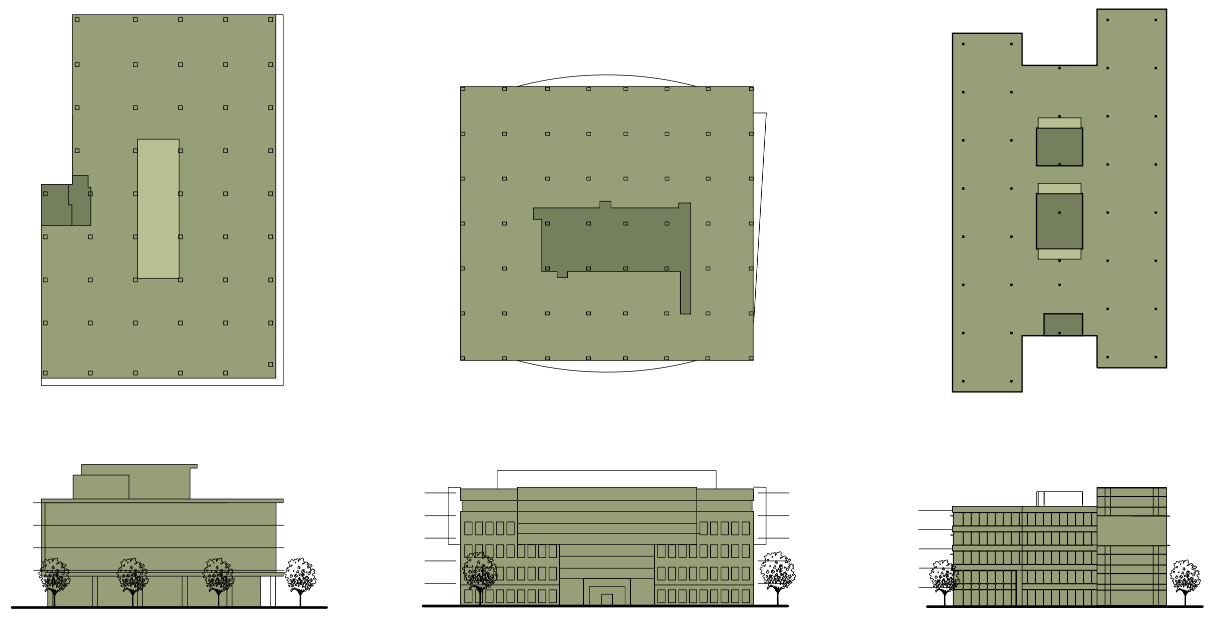
Total Variance

	c1 Commercial Case Study	c2 Commercial Case Study	c3 Commercial Case Study
	Halifax, Nova Scotia	Marham, Ontario	Markham, Ontario

Project Overview

Building Typical Floor Plan

and Elevation Diagrams



	c1	c2	c3
Gross Livable Area (GLA)	15,775 m2	14,454 m2	12,254 m2
Number of Stories (Excl. MPH)	3 Stories	6 Stories	5 Stories

LEED Target Level

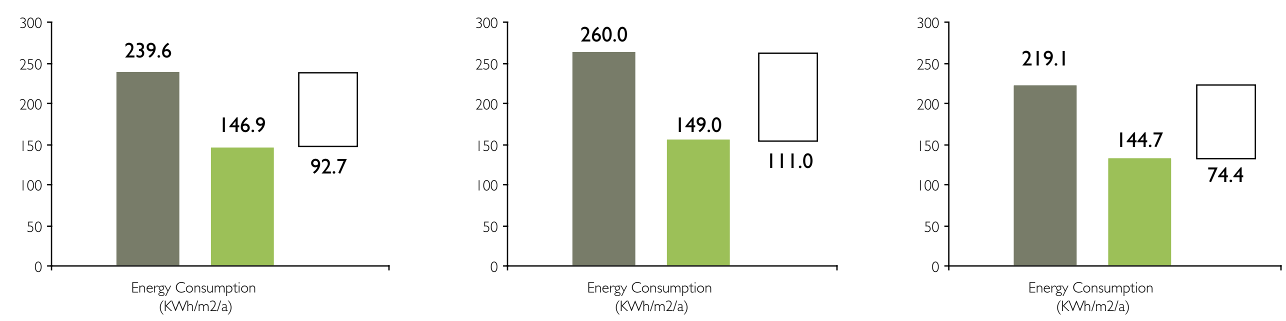
Certified 26 - 32 | Silver 33 - 38 | Gold 39 - 51 | Platinum 52 - 70

c1	c2	c3
43 Points - Gold	39 Points - Gold	32 Points - Silver

Environmental Performance

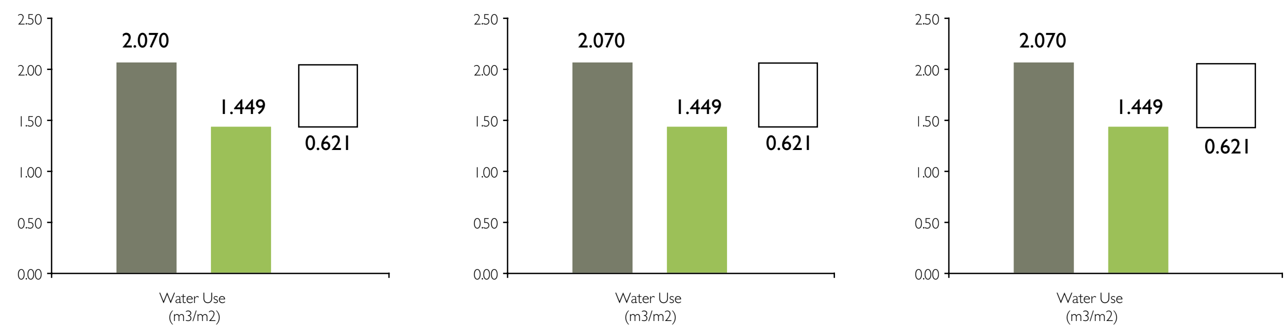
Energy Consumption

Total modeled energy consumption for the building operation in accordance with MNECB standards including electrical and on-site fuel consumption. Energy consuming components of the building including building envelope, heating ventilating and air conditioning, service water heater, electric power distribution, electric motors and drives, and lighting. Excludes on-site generated renewable energy, and non-regulated plug loads. Energy conservation strategies included increased thermal performance of building envelope, higher efficiency mechanical systems and lighting, occupancy and daylight sensors on lighting systems.



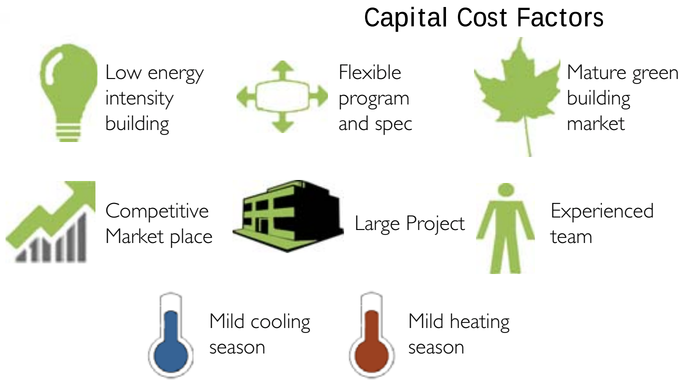
Municipal Water Consumption

Total modeled water consumption for building operation including drinking water, water for sewage conveyance and irrigation. Excludes water harvested on site from rain water catchment.
Water conservation strategies included xeriscape landscaping, efficient fixtures including waterless urinals low flow toilets, grey water systems, and rainwater collection.



Capital Costs

Capital Cost Factors



Capital Cost

Total Construction Costs including site work, construction and design contingencies and construction management fee. Excludes all soft costs, Including land acquisition costs, consultant fees, and profit.

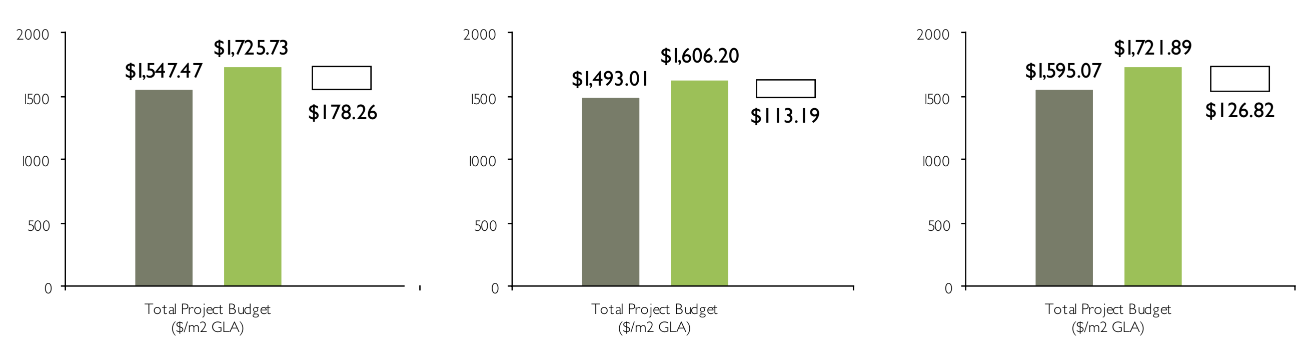


Figure 3.22 Commercial Building Matrix Comparison provides an overview of each of the case study buildings along with a summary of the capital costs and building value caculations for each.

	c1 Commercial Case Study Halifax, Nova Scotia	c2 Commercial Case Study Marham, Ontario	c3 Commercial Case Study Markham, Ontario

LEED Cost Increment

LEED Cost Increment

Total building LEED Cost Increment compared with a building constructed to meet building code

	c1	c2	c3
LEED Cost Increment ($/m2 GLA)	$178.26	$113.19	$126.82
LEED Cost Increment (% Capital)	11.5%	7.6%	8.0%

Building Value Assessment

Value of Annual Energy Savings

Rational Energy costs are the electrical and gas costs based on energy modeling for each proposed case study.The cost of electricity and gas are based on actual 2006 energy costs for Toronto, Ontario

Formula The annual energy savings projection is multiplied by a cap rate of 8%

	c1	c2	c3
Increased Building Value ($/m2/a GLA)	$71.83	$93.98	$65.00
Increased Building Value (% Capital)	4.2%	5.9%	3.8%
Payback on LEED Cost Increment (Years)	2.5 Years	1.2 Years	2.0 Years

Value of Annual Water Savings

Rational Water costs for providing all the water needs to the building based on occupancy of each proposed case study. The cost of water is based on actual 2006 water costs for Toronto, Ontario.

Formula The annual water savings projection is multiplied by a cap rate of 8%

	c1	c2	c3
Increased Building Value ($/m2/a GLA)	$9.31	$9.32	$9.31
Increased Building Value (% Capital)	0.5%	0.6%	0.5%
Payback on LEED Cost Increment (Years)	19.1 Years	12.2 Years	13.6 Years

Value of Rent Premium

Rational A building which maximizes day lighting in office areas, has better thermal comfort, and provides higher indoor air quality can potential secure a higher rate of rent then a comparable office building.

Formula The annual rent for a typical office building is assumed to be $300/m2 with a 5% premium for a LEED office building. The annual rent premium over industry average building is multiplied by a cap rate of 8% to arrive at the increased value of the building.

	c1	c2	c3
Increased Building Value ($/m2/a GLA)	$165.00	$165.00	$165.00
Increased Building Value (% Capital)	9.6%	10.3%	9.6%
Payback on LEED Cost Increment (Years)	1.1 Years	0.7 Years	0.8 Years

Value of Occupancy Premium

Rational A Occupancy premium of 2% could be anticipated because of the positive effect on employee comfort health and productivity of day lighting, views of the outdoors, higher indoor air quality and other advantages.

Formula The annual rent for a typical office building is assumed to be $300/m2. An average occupancy of 90% and assume that a LEED building will have an occupancy premium of 2%. The occupancy premium over industry average building amortized over a typical 5 year lease period to arrive at the increased building value.

	c1	c2	c3
Increased Building Value ($/m2/a GLA)	$5.28	$5.28	$5.28
Increased Building Value (% Capital)	0.3%	0.3%	0.3%
Payback on LEED Cost Increment (Years)	33.8 Years	21.4 Years	24.0 Years

Residual Value Premium

Rational A building which is less costly to operate, has higher occupancy rate and possibly commands a rent premium should be perceived as having a higher overall Residual Value upon resale. For this analysis, it is assumed an exit cap rate benefit of 25 basis points or 7.75% (versus 8%). The building value would increase through the perception of value created by having a certified green building in the competitive-real estate market.

Formula The annual rent is assumed to be 8% of total capital costs. The annual net rent is multiplied by a cap rate of 8% to arrive at the increased value of the building. The building value is added to the LEED cost increment to arrive at the total value plus premium. Residual value of the LEED building is calculated by multiplying the net rent by 7.75%. The increased building value is the difference between the building value plus premium at 8% cap rate and 7.75% cap rate.

	c1	c2	c3
Increased Building Value ($/m2/a GLA)	$276.77	$276.77	$276.77
Increased Building Value (% Capital)	16.0%	17.2%	16.1%
Payback on LEED Cost Increment (Years)	0.6 Years	0.4 Years	0.5 Years

Total Increase in Building Value

Rational A total of the savings calculated above is provided for comparison purposes and to give a sense of the order of magnitude savings that could be realized by investing in the additional strategies required by LEED Certified buildings

Formula Add together each of the above Building Value Calculations.

	c1	c2	c3
Increased Building Value ($/m2/a GLA)	$287.80	$385.35	$521.37
Increased Building Value (% Capital)	16.7%	24.0%	30.3%
Payback on LEED Cost Increment (Years)	0.6 Years	0.3 Years	0.2 Years

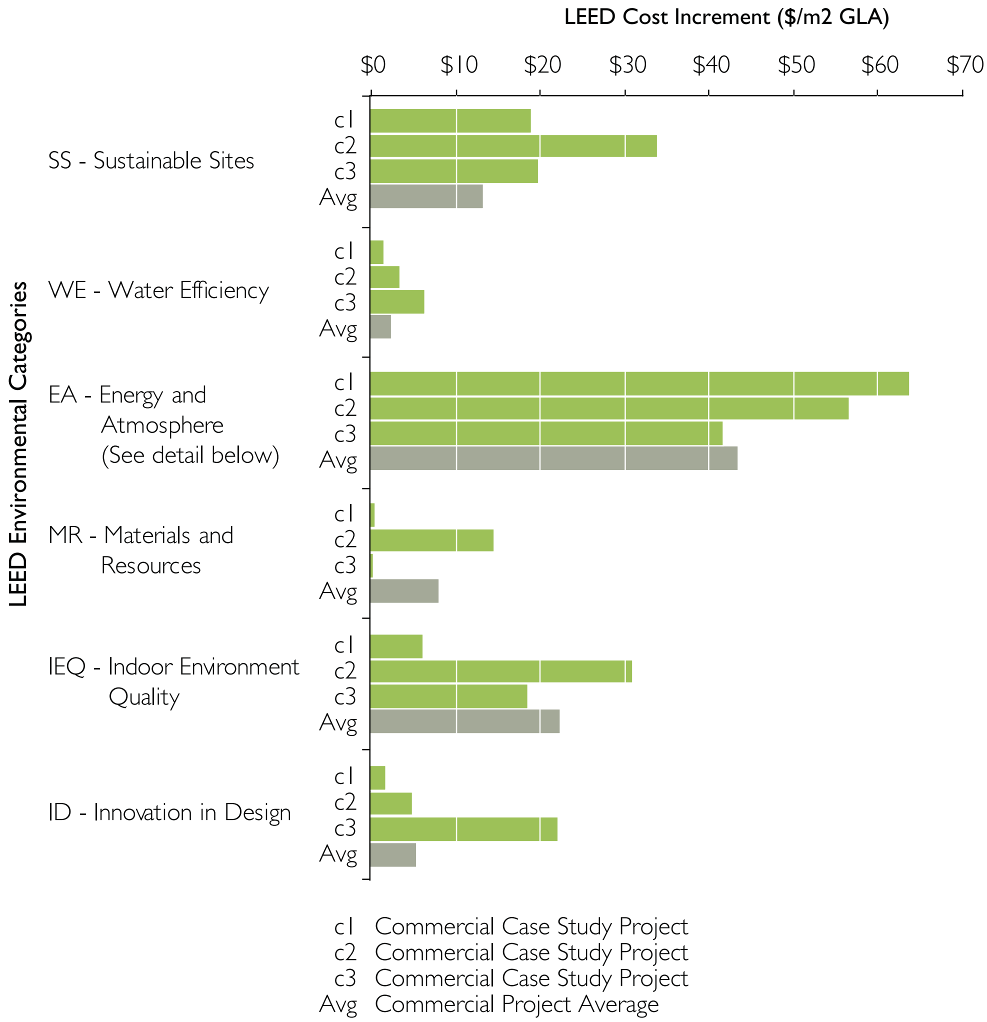


Figure 3.23a Commercial Building LEED Cost Increment by Environmental Category
Total LEED cost increment for each commercial building case study allocated by LEED environmental category.

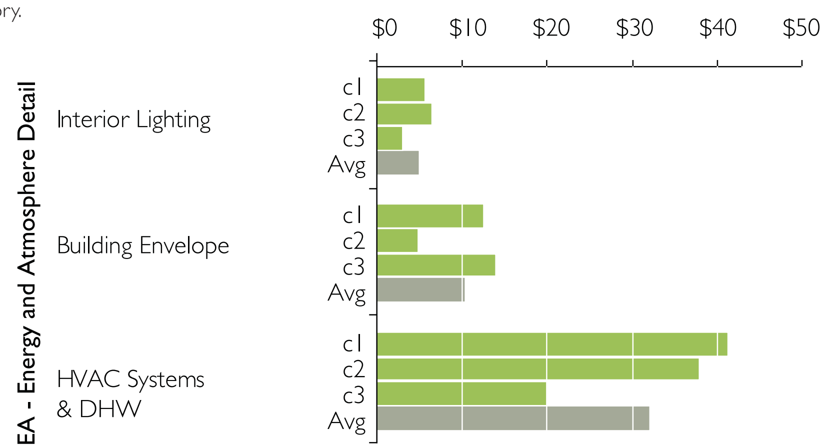


Figure 3.23b Commercial Building Apportionment of Energy and Atmosphere Cost
The apportionment of the energy savings cost for each commercial building case study is broken down into three primary energy saving strategies.

the development industry do not commonly meet the voluntary standard.[15]

This is not to say that the MNECB standard sets an unreasonably high standard for what can be achieved using the traditional methods of construction, but that there is a lack of incentives to meet the code. Municipal building departments do not challenge mechanical engineering calculations, nor do they require testing to determine as-built energy consumption of the building. In effect, the standards meant to establish minimum performance requirements have, with time, come to be misinterpreted as best practice or as an economic optimum. This is an example of what Paul Hawken in his book *Natural Capitalism* refers to as a "split incentive," where people who choose technologies often are not the same people who will pay the energy bills. He goes on to propose one possible incentive that has been used to encourage exceeding minimum code requirements:

> *Minimum acceptable conditions, like "meets code" (euphemism for "the worst building you can put up without being sent to jail") … should have provisions to reward even better performance. Regulators often have indirect ways to address such minimal-compliance issues. To encourage developers to exceed the minimal energy-saving requirements of building codes, Santa Barbara County entitled those over-complying by 15-45 percent to jump ahead in the queue for approvals, saving them a lot of time. This is a valuable reward for the builders, but it costs the county nothing.*[16]

Some municipalities in Canada are starting to encourage developers to exceed applicable building codes, usually by referencing LEED as a supplementary guideline.[17] However, there are no mechanisms to enforce these higher standards, as building codes are written by provincial level government and indirectly by the federal government.

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15 Personal conversation with Mechanical engineer involved with energy modeling of MURB and Commercial buildings in the Southern Ontario market

16 Hawken, Paul, and Amory Lovins, and L. Hunter Lovins. Natural Capitalism: Creating the Next Industrial Revolution. New York: Back Bay Books/Little, Brown and Company, 1999. Page 274.

17 Municipal websites for Kingston, Toronto, Waterloo and Vancouver all make reference to the LEED green building rating system

Despite the low bar established by building codes, there is mounting evidence that the movement towards greater sustainability has been embraced, especially in the Class-A office space market. Large office towers such as Telus, Bay-Adelaide, and RBC towers in Toronto have all incorporated sustainable design measures and are registered under the LEED program.[18] Smaller office buildings throughout the country are also following this trend. A survey conducted for the United States Green Building Council (USGBC) in the fall of 2005 projected near-term market growth of the LEED oriented commercial office building sector to be 48%.[19] If even a fraction of this growth is realized in the Canadian market, a significant percentage of commercial building property owners will seek LEED certification in coming years.

As mentioned, the most significant advantage that the commercial market has in comparison to other sectors is that Real-Estate Income Trusts (REITs) typically own these buildings. The primary interest of these property owners is to maximize risk-adjusted return on investment for shareholders; recently, the risks associated with volatile and rising energy pricing have gained the potential of making energy-consumptive assets uncompetitive in the market. Within the structure of a typical gross office space lease, there are only a few factors that are variable and within the control of the REIT to make properties price-competitive. These factors include management fees, maintenance costs, and most significantly, the operating cost of the building. If the building owner can reduce the operational costs of the building by 30%, as many LEED office buildings do,[20] he can gain a significant competitive advantage in pricing. This 'hard' benefit, combined with the appeal of other 'softer' benefits that LEED buildings offer will generally tip the balance in the minds of most sophisticated office building developers.

In his book *Developing Green*, Jerry Yudelson explains how in the current economy, measuring

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18 Canadian Green Building Council. December 15, 2006 <http://www.cagbc.org/>

19 Yudelson, Jerry. Developing Green: Strategies for Success. Herndon: National Association of Industrial and Office Properties (NAIOP), 2006. Page 15.

20 Canadian Green Building Council. December 15, 2006 <http://www.cagbc.org/>

energy efficiency as you would any investment shows that operational savings can provide an owner with a relatively low risk that currently tips the balance in favour of even greater investment in building efficiency.

> *Lower interest rates have the effect of encouraging capital investments that yield long-term operating cost savings, because the present value of future savings is larger today than in a higher-interest-rate environment. In addition, the relative lack of investment in energy-supply infrastructure in recent years may have the effect of guaranteeing higher future energy prices. As a result, the payback of capital investments for energy and water conservation, for example becomes more favorable with each passing year. It is fairly easy to justify a 10 year payback (return of initial investment in annual energy savings) for energy conservation and efficiency investments, at least on rational economic grounds, which could lead buildings to be built 30 to 50% more efficient than current codes.*[21]

Following this macroeconomic perspective it could be pointed out that investing in more durable buildings with equipment and construction detailing that maximizes service life can also be advantageous from an building owners perspective; this stems from the fact that since 1998 capital has been relatively cheap to borrow and returns on more traditional forms of investment are low.[22] At the same time, escalation of construction costs is high, approaching around 8% per year currently in Toronto and significantly higher in western Canada (see figure 2.03 on page 18).[23] Utility costs are also rising: current estimates range from 5 to 8 percent per year averaged over the next 25 years. Therefore it is important to show that money invested now in a better building will in fact produce a return. Annual savings translate into money available to pay back the cost of construction, and this amount will increase every year. By extending the service life of equipment installed initially, a building owner can delay costly retrofit of the building or

21 Yudelson, Jerry. Developing Green: Strategies for Success. Herndon: National Association of Industrial and Office Properties (NAIOP), 2006. Page 87.
22 Bank of Canada. January 10, 2007 <http://www.boc.ca/>
23 Altus Helyar Costing Database

replacement of expensive mechanical systems because of premature failure. In this way, the building will continue to be price competitive with newer energy efficient buildings that it will be competing with; so that first, second and possibly third lease contracts can be negotiated, before the need arises to invest in a major retrofit of the building.

3.4.3 Green Retrofit of Existing Building Stock

The case study section of the thesis has focused primarily on the need for improvements in construction standards of new buildings because of the primary focus on buildings commissioned by the development industry. However, new buildings only represent 0.06 percent of the total building stock in Canada each year. For this reason, it is clear that if the building sector is going to have a significant impact on the total GHG emissions in Canada there needs to be an equal focus on retrofitting existing buildings that are inefficient. Although this sub-section does not form a complete analysis of the problems and solutions it does give an overview of the economic potential of retrofitting buildings to be even more efficient than new, conventionally-constructed buildings.

When considering the total ecological footprint of a building, including embodied energy, a building retrofit can be the most environmentally benign option. For this reason, it is surprising that of the 43 LEED Certified buildings in Canada only 2 are listed as being retrofit projects.[24] Most buildings become functionally obsolete well in advance of becoming structurally unsafe to the point where the building needs to be demolished.[25] If the structure can be made to meet the requirements of the new use, significant cost savings can be put towards renovations. However, as all developers and contractors know, building retrofits are more prone to cost overruns and unforeseen complications that arise during construction. This is especially true when working with historic buildings, or where the character of the building is being retained, as is the case

24 Canadian Green Building Council. December 15, 2006 <http://www.cagbc.org/>

25 Canadian Green Building Council. (December 2004). LEED-NC 1.0 Reference Package ( ). Ottawa, ON: Canada. Canadian Green Building Council. Page 267

with many of the industrial-to-loft conversions that are happening across major cities in Canada.

From an urban perspective, existing buildings are located in the urban fabric, with all the services and infrastructure already in place. These projects also have the potential of revitalizing entire communities that have fallen into disuse.

Depending on the type of building and intended new use, the scope of work involved in an energy retrofit varies drastically from replacing only the mechanical systems to stripping the building back to the shell and reusing only the primary structure. The LEED point system only addresses major retrofit in the Materials and Resources category, where one point is achieved for retaining 75 percent of the building shell, two points for retaining 95 percent of the building shell, and a total of three points for retaining 50 percent of the interior non-structural elements of the building.[26] These points likely do not adequately reflect the environmental benefit of reusing such a significant amount of material; however, the clear emphasis on new buildings in the Canadian version of LEED will hopefully be balanced by a future set of guidelines based on the American version of LEED for existing buildings.

Despite all of the clear environmental benefits of reusing buildings, the reasons behind a decision to retrofit versus demolish are generally more related to an aesthetic ideal than a desire to have the most positive impact on the environment. Independent of this, the following example of an energy saving retrofit demonstrates how a whole-systems approach to design can substantially increase the value of an existing building.

> *Analysis revealed that changing the renovation design to a whole-systems approach could dramatically improve comfort, quadruple energy efficiency, and cost about the same as normal renovations. Super-windows, deep day lighting, and efficient lights and office equipment could reduce the cooling load (except that caused by the occupants) by 85%. This in turn could make the replacement cooling equipment three-fourths smaller than the original sys-*

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26 Canadian Green Building Council. December 15, 2006 <http://www.cagbc.org/>

tem, four times as efficient, and $200,000 cheaper – a energy bill would then fall by 75%, or by $1.10 per square foot per year – at least ten times the competitive rent difference in the local market.[27]

Studies such as these demonstrate a clear financial benefit to retrofitting existing building stock and investing in energy saving measures to increase the value of the asset to a building owner. Alongside these tangible energy savings, other advantages implicit with sustainable design are found in improved indoor environment quality, measured by access to daylight, better air quality, and exposure to fewer indoor pollutants that can have a significant influence on the health of building occupants.

3.5 Conclusion

As demonstrated in the case studies examined in this section, there is a strong case for developers to invest in sustainable design strategies in order to remain competitive in future markets.

In neighbourhood design, developers, and especially municipalities stand to gain significantly from encouraging infill development that incorporates sustainable urban planning practices. From the developer's perspective the return on investment for either the low or the high-density options is similar, leaving little incentive from their perspective to embark on a unique model that has an unproven market. This will continue to be the case as long as municipalities do not provide the necessary financial instruments to encourage developers to build higher density and reward residents of these projects through lower property tax assessments.

For multi-unit residential case study buildings, incorporating the necessary measures to achieve LEED Certification averaged 7.2 percent. Considering increased value to the developer alone the case study b2 would fully recapture the initial LEED costs and potentially increase their profit by $77.41/m2 GLA through advantages such project fast tracking, increased sales velocity,

27 Hawken, Paul, and Amory Lovins, and L. Hunter Lovins. Natural Capitalism: Creating the Next Industrial Revolution. New York: Back Bay Books/Little, Brown and Company, 1999. Page 120.

and sales premiums related to higher quality building. These same advantages in the other two case studies did not show that the LEED cost increment could be fully recaptured in the current real-estate market. To rationalize the added cost in these projects a developer would have to recognize less tangible aspects of LEED buildings such as corporate branding as market leading developer, or considering more significant cost advantages than those listed in the building value assessment. It is noted that these projects could likely reduce the total LEED cost increment by prioritizing environmental building features through the design process or by targeting fewer of the more costly points and a lower level of Certification.

For the Commercial Building the capital cost data demonstrates that these case studies paid on average 9.0 percent more initially to incorporate the necessary measures to achieve LEED certification. Considering the increased value to the developer through tangible operational savings alone, after one year of occupancy on average 62 percent of this initial capital investment would be recaptured primarily in the form of energy savings. If a developer also considers the value of less tangible attributes such as rent or sales premium, increased building occupancy and residual value premium, the buildings on average would be worth $258.75/m2 GLA more than the conventionally constructed reference buildings.

This section focused on sustainable design factors internal to the building and development process, addressing them from the perspective key stakeholders of specific case study projects, including municipalities, building residents, developers and building owners. The challenge of appealing to the interests of all groups provides the greatest potential for widespread implementation of the principles of sustainable design within the shortest time period. This chapter begins to provide clues to the areas of appeal for each group, ultimately showing that in one way or another, everyone has something to gain from sustainable design initiatives.

04 External Factors Effecting Cost and Success of Sustainable Design

4.1 Introduction

This chapter explores sustainable design from the perspective of municipalities, residents and tenant groups who are typically not part of the design process. These external groups, however, can benefit significantly as residents of the neighbourhoods and occupants of buildings that incorporate the principles of sustainable design. Advantages include access to existing public transit, reduced operating costs, and a healthier indoor environment. Main areas of focus in this chapter include, conflicting policies that deter more sustainable development, potential of incentives for developers and residents that invest in sustainable design, and rationalizing investment in sustainable design from the perspective of the building industry.

From the perspective of municipalities, there are significant advantages to encouraging more infill developments that create more density within the existing urban fabric. These neighbourhoods have the potential to transform underutilized parts of the city and increase the tax revenue at minimal increased operating cost to the municipality. However, within the current paradigm of taxation and preferred development patterns, there are numerous mechanisms that encourage the development of neighbourhoods that can pose a long term burden the municipality. To address these obstacles, a series of incentives including land based property tax assessment, locationally efficient mortgages to address affordability of urban properties, and development fees that accurately reflect the cost of servicing new developments, and would directly reward developers who build more sustainable buildings and communities.

Motivations behind a developers decision to invest in more sustainable buildings vary significantly depending on the target market of the project. Beyond the tangible benefits cited in Chapter 3, intangible attributes of sustainable design such as, enhanced marketing capabilities, market positioning, and public relations that will all appeal to certain purchasers who are considering environmental issues.

From the perspective of the purchaser or building occupant sustainable design features can offer significant advantages over conventional buildings. These are most pronounced in commercial buildings where sustainable design can enhance employee productivity, employee retention, recruitment of new staff, and corporate branding as a leader in environmental issues.

For sustainable design to achieve widespread marketability it is important that the interests of these external groups are understood and developers understand the broader implications that these projects will have on the viability of the larger context of the projects.

4.2 Detractors to Sustainable Neighbourhood Design

The constraints determined by urban-plan-level decisions are central to the movement towards sustainable design. Especially in the case of greenfield development the site has often been selected before the design team is involved in the project, predetermining allowable site density, property size, infrastructure, and sometimes building orientation. All these constraints may inhibit a project from achieving a measure of sustainability economically.

Even when the municipal planners and city councilors are committed to establishing official plans with environmental protection concerns at the forefront, municipalities in Ontario have not been able to successfully defend these policies when challenged at the Ontario Municipal Board (OMB). An example of this is currently working its way through the courts is a proposed 19 storey tower in the King Street West neighbourhood of Toronto. Despite strong opposition from the neighbourhood, city planners and the mayor, the OMB ruled in favor of the developer allowing another generic condominium tower to built with little reference to the existing low-rise fabric of the surrounding buildings.[1]

Ingrained in the policies and processes governing the way that neighbourhoods and buildings are planned and constructed is a lack of representation of the long term consequences that these types of 'communities' will have. Although property tax revenue is critical to the functioning

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1 Ross, Val. (2007, January 13). The Gladstone's birthday lament: After a year in business, the renovated hotel faces the massive urban change that is hot on its heels. Globe and Mail, pp. M3.

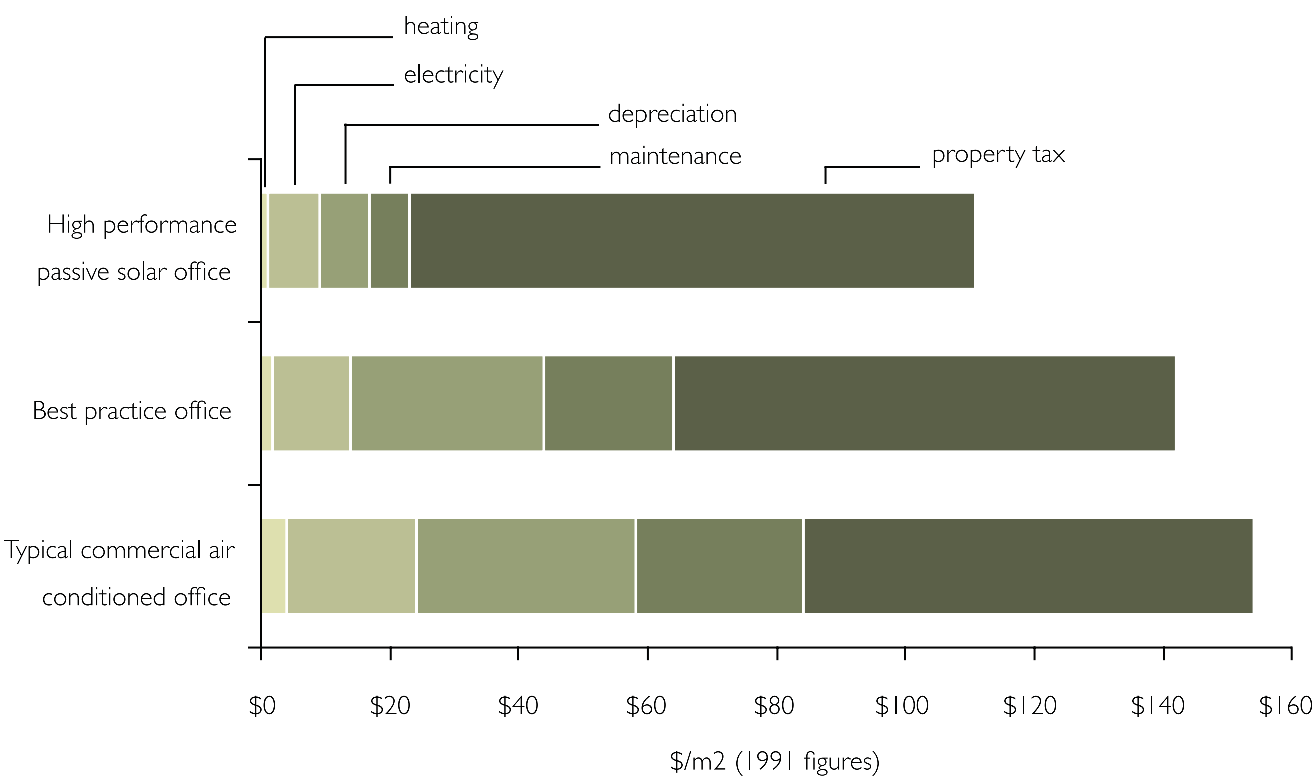

Figure 4.01 Annual Office Building Operating Costs Projected operating costs (excluding debt-service) for three office building scenarios

of municipalities, the correlation between the cost of providing municipal services to various types of development, and the potential tax revenue from these developments has not been clearly understood. Because of this, decisions made by the planning department in establishing master plans with an emphasis on single family dwellings, have had a long-term implications for tax revenues of the city, resulting in a legacy of suburban communities that can no longer sustain themselves without the financial support of more established neighbourhoods in their cities. In his book, *Natural Capitalism*, Paul Hawken summarizes some inherent disincentives to building more sustainable developments.

> *Sensible land use would make many trips unnecessary by clustering within walking distance the main places where people want to be. Developers who do this are actually succeeding in the marketplace. Many U.S. jurisdictions, however, prohibit clustering by enforcing obsolete zoning rules enacted, as the key 1927 Supreme Court decision put it, to "keep the pigs out of the parlor." Current zoning typically mandates land-use patterns that maximize distance and dispersion, forbid proximity and density, segregate uses and income levels, and require universal car traffic on wide, highly engineered roads. Such zoning, once designed to increase amenity and protect from pollution, now makes every place polluted, costly, and unlivable.*
>
> *Mortgage and tax rules that subsidize dispersed suburbs are another long-standing cause of sprawl. Especially since 1945 when they were reinforced by subsidized cars and roads, such provisions have encouraged America's exodus to the suburbs. The suburbs thus have received roughly 86% percent of the nation's growth since 1970. Europe largely avoided this decentralization, and now has four times the central-city density. In Europe, 40 to 50% of trips are taken by walking and biking, and about 10% by transit – versus America's 87% by car and 3% by transit.*[2]

In addition there are financial deterrents to living in urban communities; for example, the approval on a home mortgage does not account for the location of the home that can predispose

2 Hawken, Paul, and Amory Lovins, and L. Hunter Lovins. Natural Capitalism: Creating the Next Industrial Revolution. New York: Back Bay Books/Little, Brown and Company, 1999. Page 45.

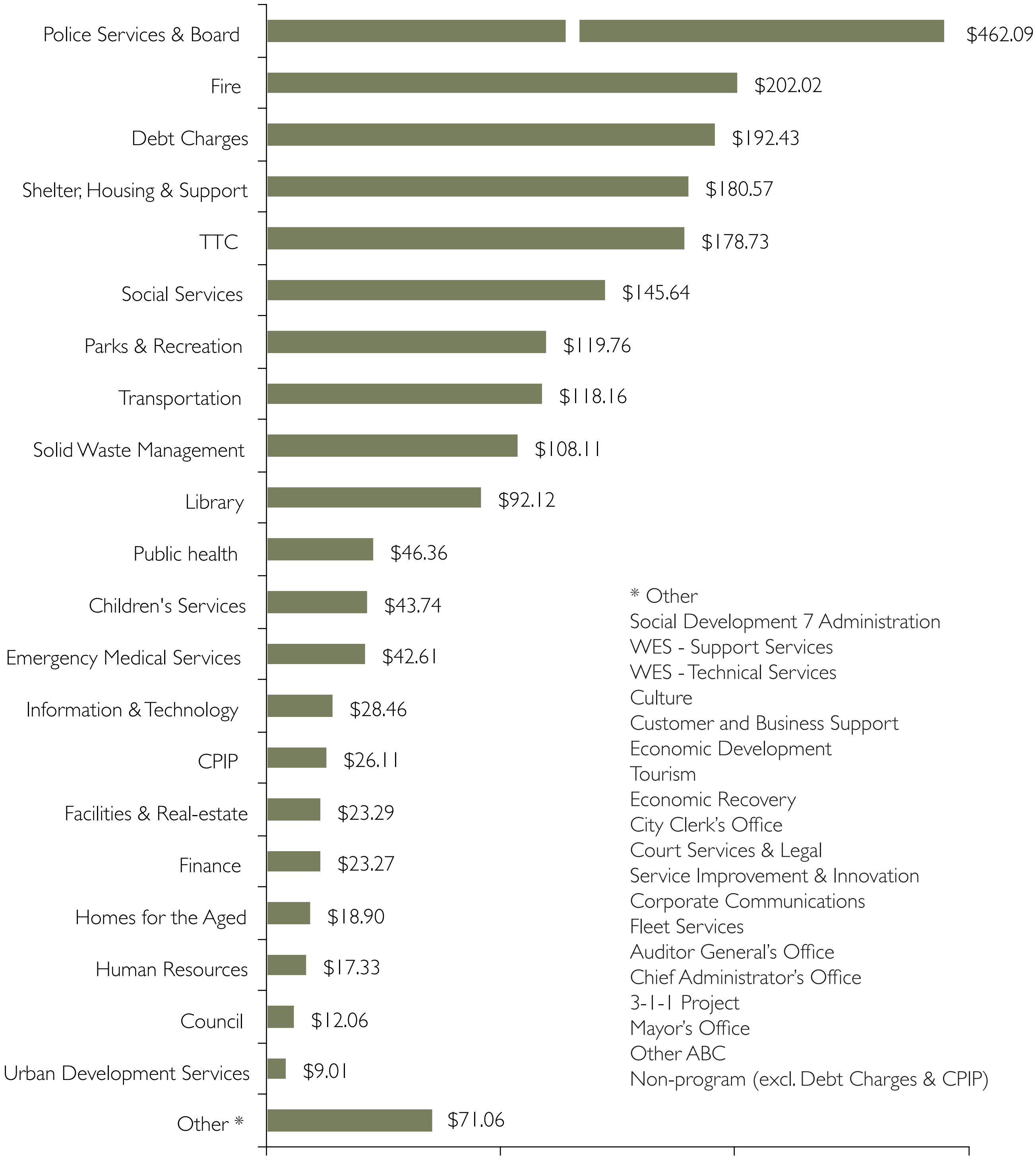

Figure 4.02 Residential Property Tax Dollar Apportionment Based on property tax of $2019.70 for an average house in Toronto with an assessed value of $330,700 the city's annual budget is allocated across these categories.

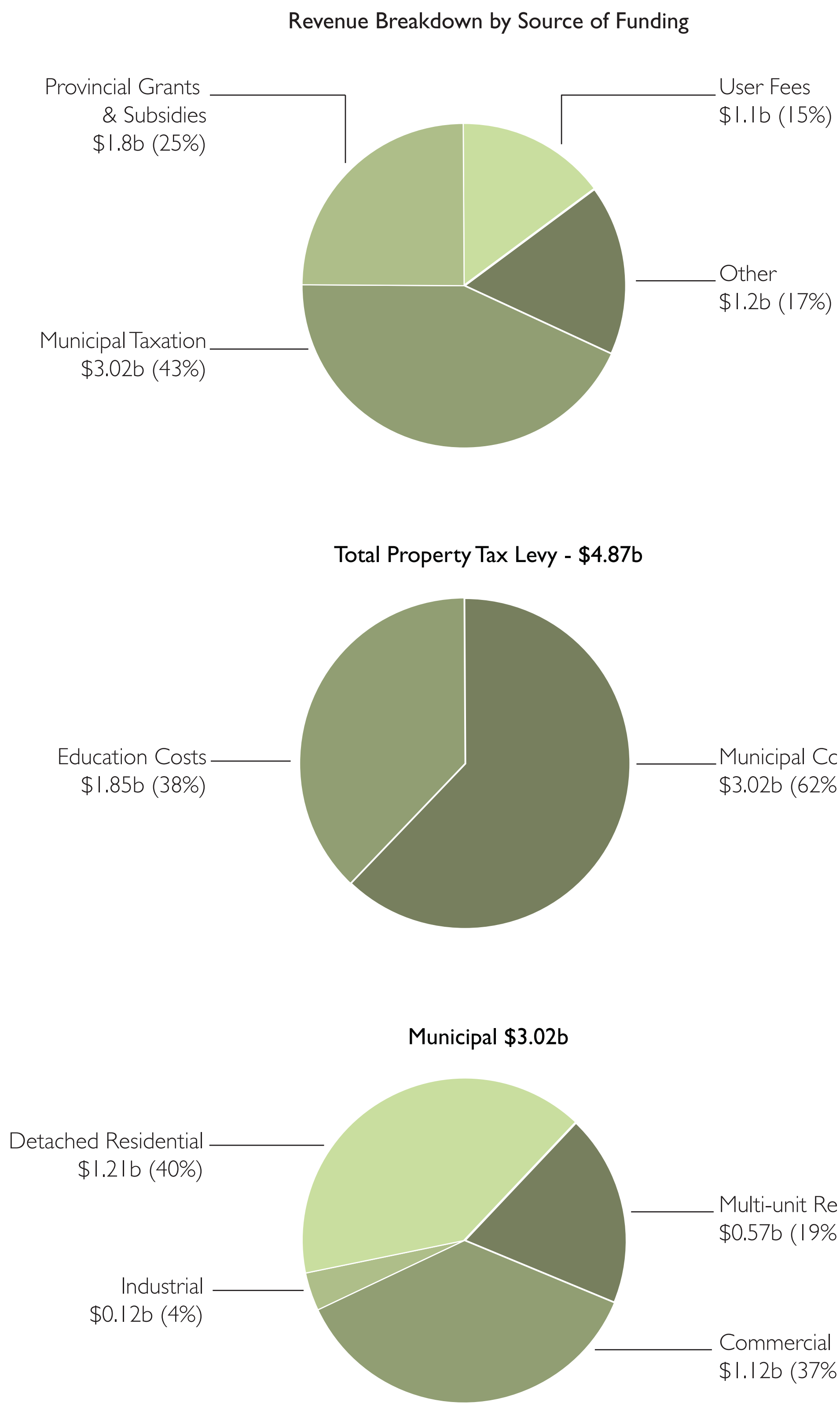

Figure 4.03 Municipal Revenue Sources
Sources of income for the City of Toronto operating budget.

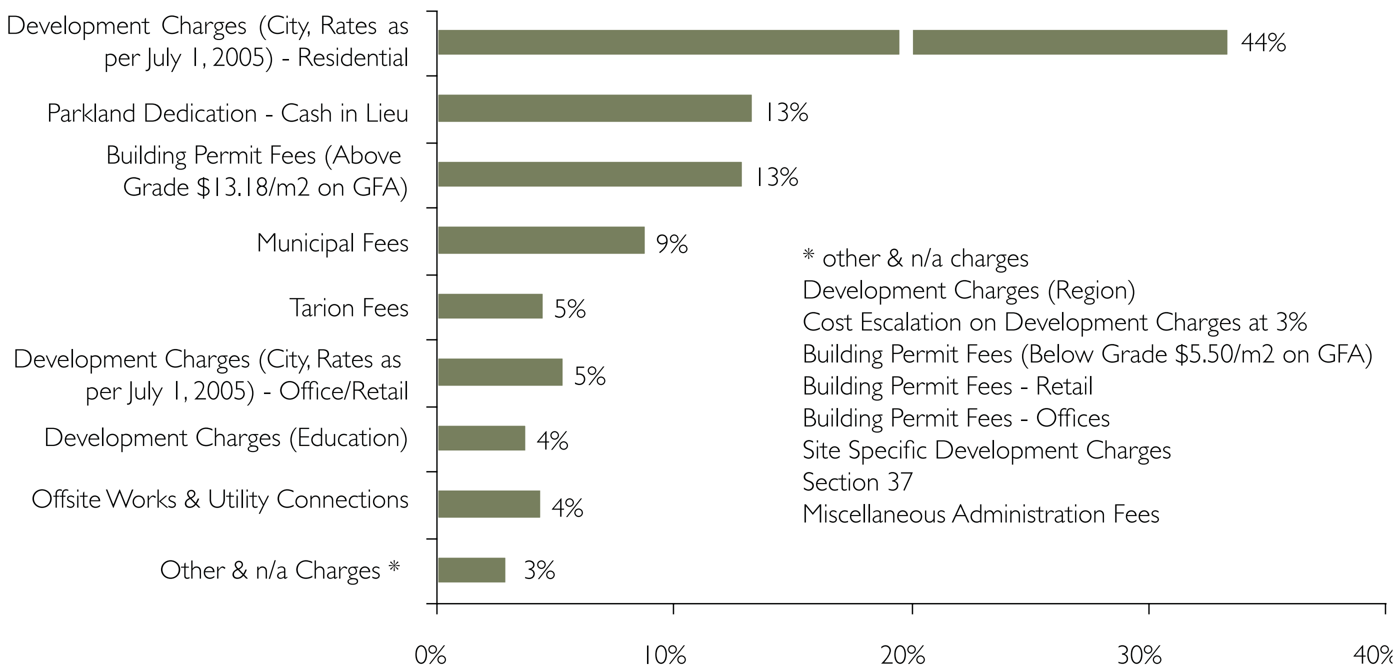

Figure 4.04 Municipal Development Fees Apportionment Based on Mid-rise Mixed use Development with a project budget of 4.7 million the fees are allocated across these categories.

the occupants to relying on the automobile as a primary means of transportation. The other more significant deterrent is that property taxes are assessed on the basis of property value and not the cost of providing services to that property resulting in low revenues for the city in low cost suburban properties.

4.3 Conflicting Regulations and Potential for Incentives

The current municipal tax system works on the premise that those who can pay the most are targeted independent of their impact on municipal infrastructure. Inherent in this system is a disincentive to buy property or locate business in urban areas where real-estate values are typically higher. Property taxes proportionate to the actual cost of providing municipal services are the most effective tool cities have for encouraging both home buyers and commercial tenants to live and work in areas where the cost to the environment and municipality is most internalized.

As shown in figure 4.01, property taxes for commercial buildings are traditionally the largest operating expense of a business aside from debt service.[3] For this reason, property taxes are a primary consideration when businesses are deciding on where to locate an office. The other fact that this graph reveals is that a high performance building that incorporates the principles of sustainable design is taxed at a higher rate than a conventional office property because it has a higher value. These conflicting practices are also true for the residential market discussed later in this section.

To examine where municipal taxes are spent, the breakdown of the apportionment of a typical 2005 City of Toronto residential property tax assessment is provided in Figure 4.02. The breakdown of these figures would be different for each municipality, however we can conclude then that higher density communities, which condense and intensify services could lower many of the

3 Edwards, Brian. Green Buildings Pay. London: SPON press c/o Taylor and Francis Group. 2003.

key municipal expenses including police services, public transit, and transportation.

Related to this consideration is the fact that the potential municipal tax revenue from the high-density neighbourhood is significantly higher than that available from the low-density model, as is detailed in each of the Neighbourhood Design case studies in Appendix A. Figure 4.03 provides a breakdown of revenue sources for the City of Toronto, showing property tax as the primary income source at 43%. Cities would stand to gain significantly by encouraging communities that embrace densities described in the LEED-ND rating system, while capitalizing on the reduced long-term costs associated with providing services to these communities. This characteristic is shown in each of the case study examples summarized in figure 3.15 on pages 54-57.

One alternative to the current taxing system that has been used successfully in more than a dozen US cities, as well as in Australia and New Zealand, is a shift to systems that reduce or eliminate taxation on buildings and instead focus on land.[4] The advantage being that property owners, especially landlords, would have a greater incentive to make improvements to buildings without the threat of the property being reassessed beyond what the local rental market will

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4 Hawken, Paul, and Amory Lovins, and L. Hunter Lovins. Natural Capitalism: Creating the Next Industrial Revolution. New York: Back Bay Books/Little, Brown and Company, 1999. Page 45

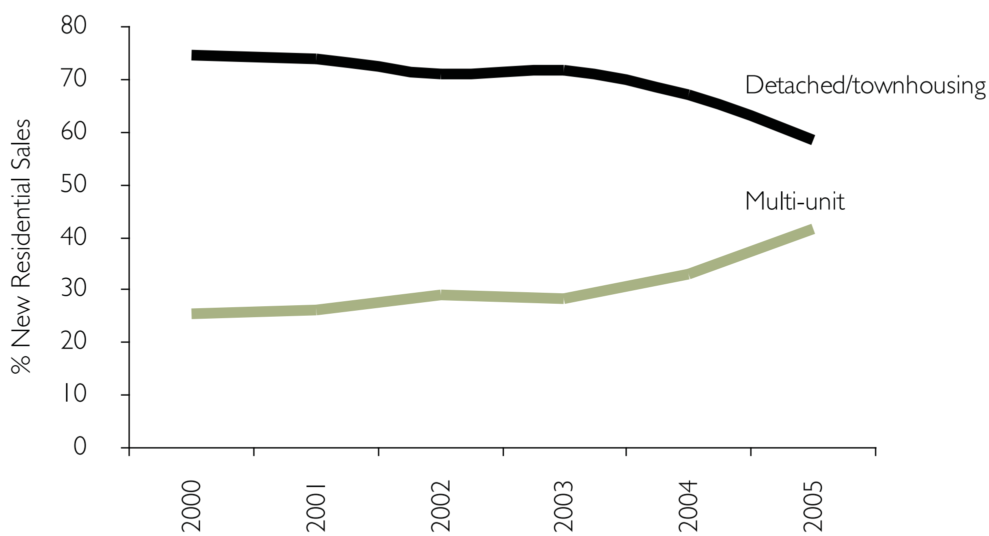

Figure 4.05 Residential Sales Mix in Toronto
Growth in multi-unit residential unit sales in Toronto since 2000.

bear. Development charges are another means of recognizing the impact of land use patterns, and can directly reward developers who build on sites with lower infrastructure costs, such as areas with existing urban fabric. As shown in figure 4.04, the current structure of development charges do not take into account the amount of land consumed. For example, the development charge for a detached home is the same if it is on a small lot or a large lot.[5] As a result, development charges can also discourage efficient land use patterns. In addition, clear and reasonable development fee policies for innovative development do not exist at present; such policies could recognize the benefits of mixed-use buildings or green buildings recognized under programs such as CBIP, LEED or Energy Star.

Paul Hawken, author of *Natural Capitalism,* provides a potential private sector solution to make higher density communities more financially attractive to home buyers.

> *"Locationally efficient mortgages" that effectively allow home-buyers to capitalize the avoided costs of the car they no longer need in order to get to work. Existing Fannie Mae and Freddie Mac rules qualify energy-efficient American homes for a bigger mortgage on less income, because their low energy costs can support more debt service with less risk of default. Dr. David Goldstein… suggested that including in the same formula a neighbourhood's typical commuting costs (which are many fold larger per household than direct energy bills) would make urban housing cheaper and suburban sprawl more expensive, better reflecting their relative social impact.*[6]

Alongside a financial imperative for higher residential densities, several independent factors are challenging current assumptions in the residential development paradigm. Firstly, residential unit sales in Toronto are at an all time high, reflecting strong economic and population growth. In this type of climate, new types of development can be introduced and gain exposure to a

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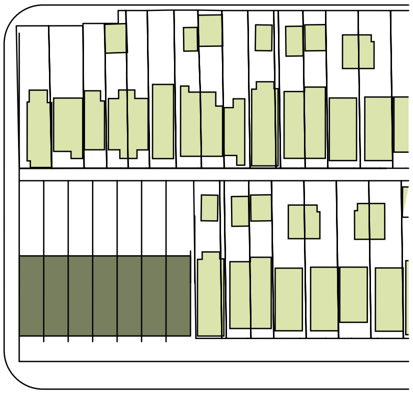
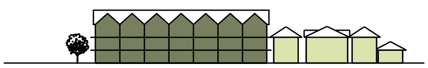
5 Altus Helyar Costing database

6 Hawken, Paul, and Amory Lovins, and L. Hunter Lovins. Natural Capitalism: Creating the Next Industrial Revolution. New York: Back Bay Books/Little, Brown and Company, 1999. Page 45.

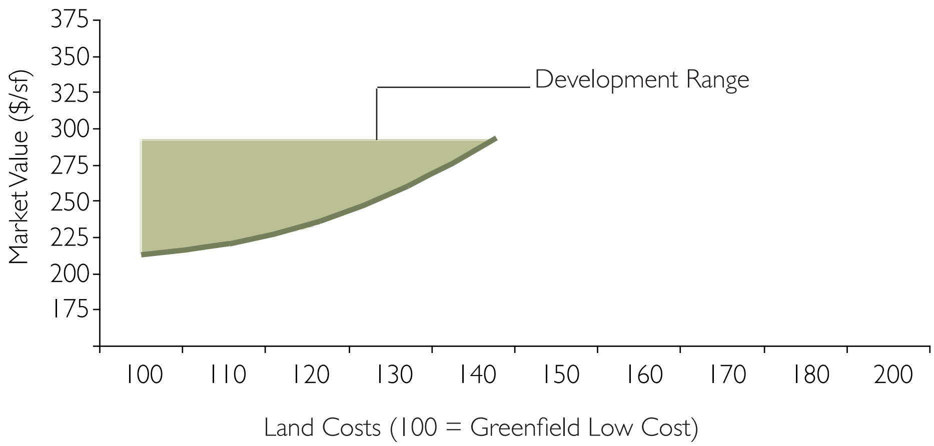




Development Type Statistics

Market Value	$/sf	$210 - $280
Construction Hard Cost	$/sf	$95 - $110
Units per Development Property Building	no.	8 - 100
Floor Area Ratio	sf site/sf gfa	0.5
Net Development Density	units/hectare	40 - 60
Gross Development Density	units/hectare	25 - 35
Typical Land Cost Range	$/unit buildable	$80,000
Typical 2 Bedroom (1200sf) Unit Cost	$	$320,000
Family Income to Support Typical Unit	$/a	$90,000

Land Cost vs Market Value



Percent Project Budget

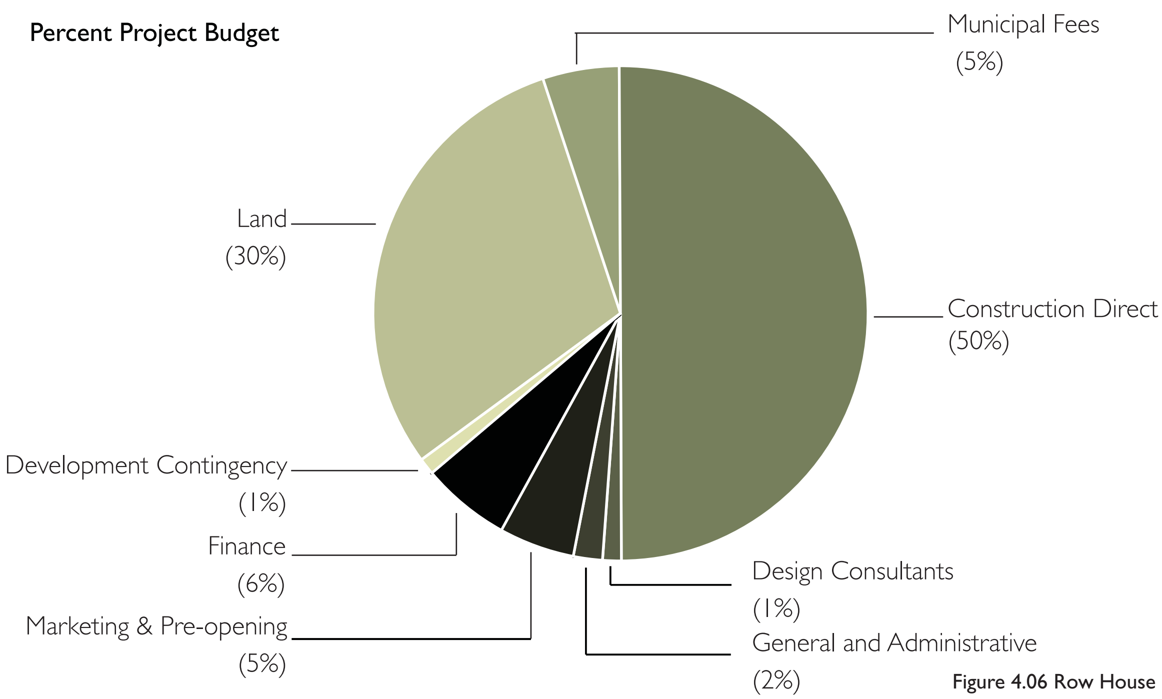
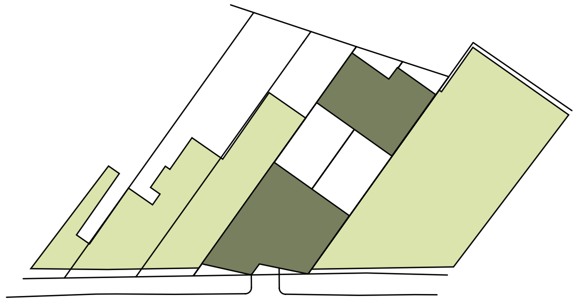
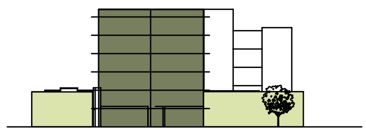


Figure 4.06 Row House Development Cost Factors Overview of comparable development costs for a typical row house scale project

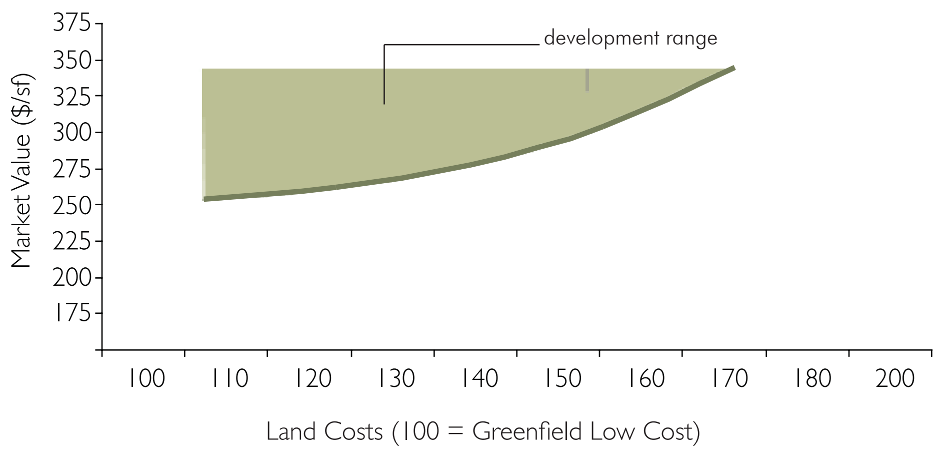




Development Type Statistics

Market Value	$/sf	$250 - $390
Construction Hard Cost	$/sf	$120 - $150
Units per Development Property Building	no.	50 - 75
Floor Area Ratio	sf site/sf gfa	1.4
Net Development Density	units/hectare	160 - 190
Gross Development Density	units/hectare	75 - 100
Typical Land Cost Range	$/sf buildable	$30 - 60
Typical 2 Bedroom (1200sf) Unit Cost	$	$350,000
Family Income to Support Typical Unit	$/a	$98,000

Land Cost vs Market Value



Percent Project Budget

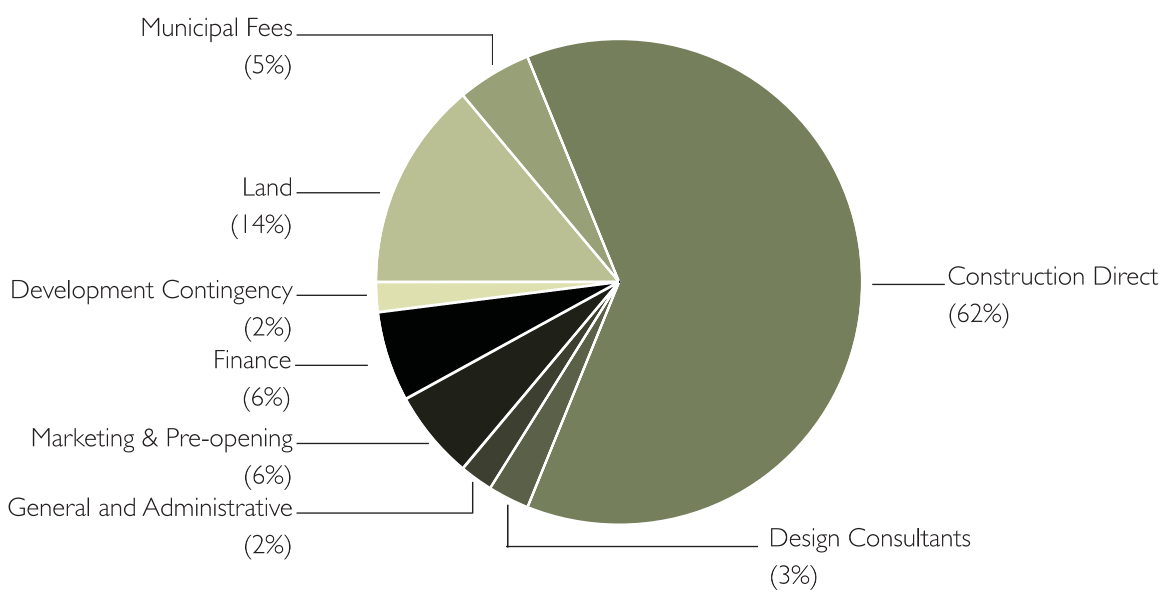
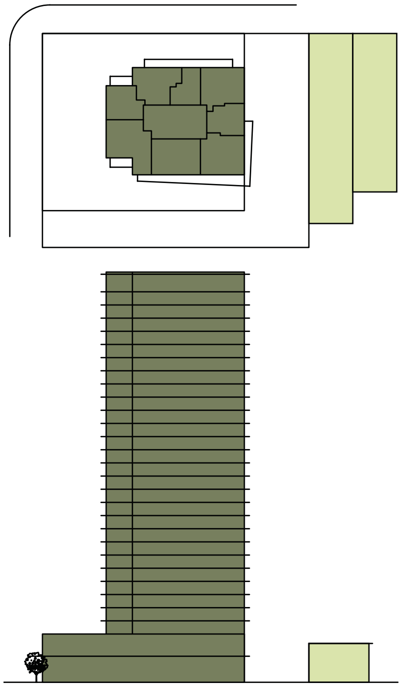


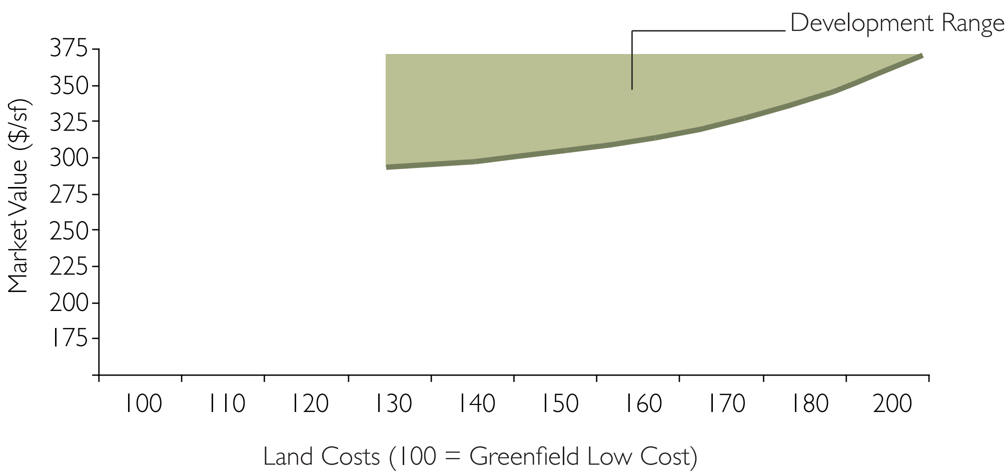
Figure 4.07 Mid-rise Development Cost Factors Overview of comparable development costs for a typical mid-rise scale project



Development Type Statistics

Market Value	$/sf	$300 - $425+
Construction Hard Cost	$/sf	$140 - $160
Units per Development Property Building	no.	300 - 450
Floor Area Ratio	sf site/sf gfa	7.34
Net Development Density	units/hectare	500 - 525
Gross Development Density	units/hectare	190 - 250
Typical Land Cost Range	$/sf buildable	$30 - $75
Typical 2 Bedroom (1200sf) Unit Cost	$	$410,000
Family Income to Support Typical Unit	$/a	$137,000

Land Cost vs Market Value



Percent Project Budget

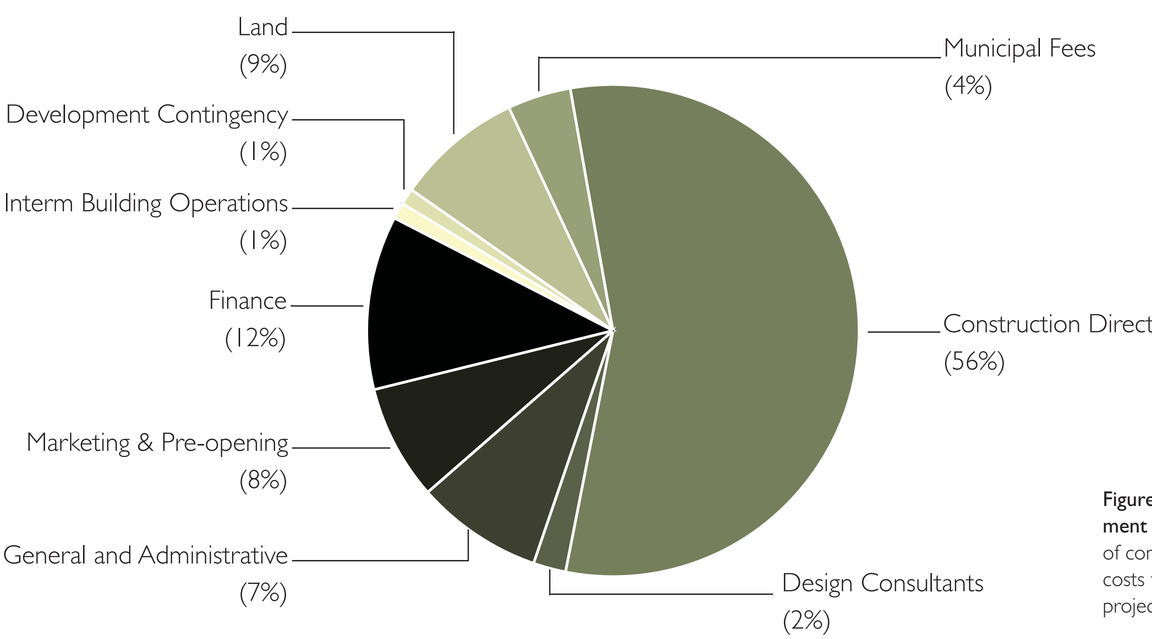


Figure 4.08 High-rise Development Cost Factors Overview of comparable development costs for a typical High-rise scale project

relatively large market. Secondly, as shown in Figure 4.05, over 40% of new unit sales in the GTA are in multi-unit buildings; this growth trend is inversely proportionate to a decline in the sale of detached units. These realities are indicative of the market trend, especially among first time home buyers, towards living in urban areas. Lastly, growing public awareness of environmental policy and the impact of rising energy costs have already had a major impact on the automotive and manufacturing sectors in Ontario adding significant costs to their operation. These factors will soon become important and necessary considerations for new home buyers, and neighbourhoods that demand a primary reliance on the car may become less attractive or financially feasible.

Not only have the suburbs proven to be an economic burden to cities in and of themselves, they also have contributed to the decline in population and health of established communities located in the post WWII, midtown section of many cities in Canada. An example of this on the site of the Vaughan and Oakwoods case study project where in the 2006 census the population had declined by 20 percent in the last five years. It was the only area in the Greater Toronto Area where the population was declining so rapidly and persistently.[7] This effect has come to be known as the 'donut effect' where people leave the more costly midtown areas for the suburban alternatives. The result is that these areas become under utilized sections of the city prone to vacancy and ultimately lower tax revenues for the municipality.

Figure 4.06, 4.07 and 4.08 demonstrates that within the current real-estate and building climate, mid-rise housing is a feasible development strategy in midtown areas of large cities, if land costs are kept to a minimum. Land costs can be controlled by municipalities through neighbourhood-specific zoning bylaws that set standards such as minimum and maximum allowable densities for redevelopment of properties, specifying allowable building use, and by encouraging design practices such as those listed in the LEED for Neighbourhood Design checklist provided in the case study section.

7 Gerson, Jen. (2007, March 16). The Dufferin exodus. Toronto Star, pp. A1, A16.

By writing strict urban guidelines that mandate a mid-rise model, and forcing developers to adhere to these guidelines, municipalities can discourage the typical approach to providing new urban housing, which to date has been limited to either high-rise condominiums or row-housing alternatives. High-rise and row-house models of infill development have not been shown to provide affordable family-oriented housing, nor do they effectively revitalize neighbourhoods in the midtown fabric.[8]

The other prevalent pattern of transformation in these gentrified neighbourhoods is to tear down the post WW1 bungalows and infill with a 3 storey luxury home. Although these new homes are larger, they do not incorporate higher densities into the existing fabric and are rarely an affordable alternative to the suburban house.

If cities are committed to building communities that can sustain themselves socially, environmental and financially, there needs to be an exploration of ways to encourage the regeneration of existing under-utilized areas of cities. These areas have the potential to accommodate the next generation of families who have traditionally looked to the suburbs for affordable safe communities in which to live.

4.4 Single Family Dwellings and Sustainable Design

As mentioned in the methodology section, green buildings in the detached residential sector have not been included in this analysis. Although the residential sector is shown to contribute 15.5% of the national GHG emissions[9] through energy usage, this figure does not account for the systemic problems of low-density land use patterns. As the low-density of these communities predisposes residents to using the automobile as their primary means of transportation, and as they are inefficient to service, their effective emissions are perhaps double or even triple

8 Reasons for this are explored by several authors including: Russel Mawby, "Rethinking Ownership," A Practitioners Guide to Urban Intensification, Emeneau, Janice (ed.), (Toronto: Canadian Urban Institute, 1996)

9 Natural Resources Canada. (June 2005). Energy use data handbook (Cat. No. M141-11/2003). Gatineau, QC: Canada. Energy publications, Office of energy efficiency NRCAN.

this figure. The fact that the transportation sector's energy use is the second largest, is primarily due to the land use policies allowing for sprawling residential development. Currently there is insufficient information to allow for a true assessment of the environmental impact of sprawl however there is plenty of data that supports that this negative feedback loop has in large part contributed to the current climate crisis.

In addition to the environmental fallout, there is a growing awareness of the lack of community and social services that are available to residents in suburban communities which has lead to significant social and health issues in these neighbourhoods. The Globe and Mail ran a four part series on this topic in the Fall of 2006 discussing the social impact that suburban communities are having especially for new immigrant families, lured to the suburbs of major Canadian cities like Vancouver, Calgary and Toronto by the dream of having their own home.[10]

The apparent conclusion, that low-density detached housing provide almost no positive long-term advantages over higher density alternatives, has been argued from many angles through countless books. One perspective that points out the economic realities of suburban living is given by professor Richard Harris, author of *Creeping Conformity: How Canada Became Suburban* who explains the suburban life in terms of a "package" of factors.

> *It really is a package, and it is not found only in suburbia. In suburbia, however, that's all there is: Middle-class families with long-term mortgage debt and high-consumption lifestyles, chained for life to at least two jobs per household in order to pay for both, enslaved to their cars in the absence of any other means of traversing increasingly long distances, helpless as steadily worsening congestions steals more and more of their over-structured lives.*[11]

10 *Mahoney, Jill. (2006, July 31). Suburban myths demolished. Globe and Mail. Retrieved August 4, 2006, from http://www.globeandmail.com.*l

11 Barber, John. (2006, March 14). There's no escaping our suburban mistake. Globe and Mail. Retrieved March 21, 2006, from http://www.globeandmail.com.

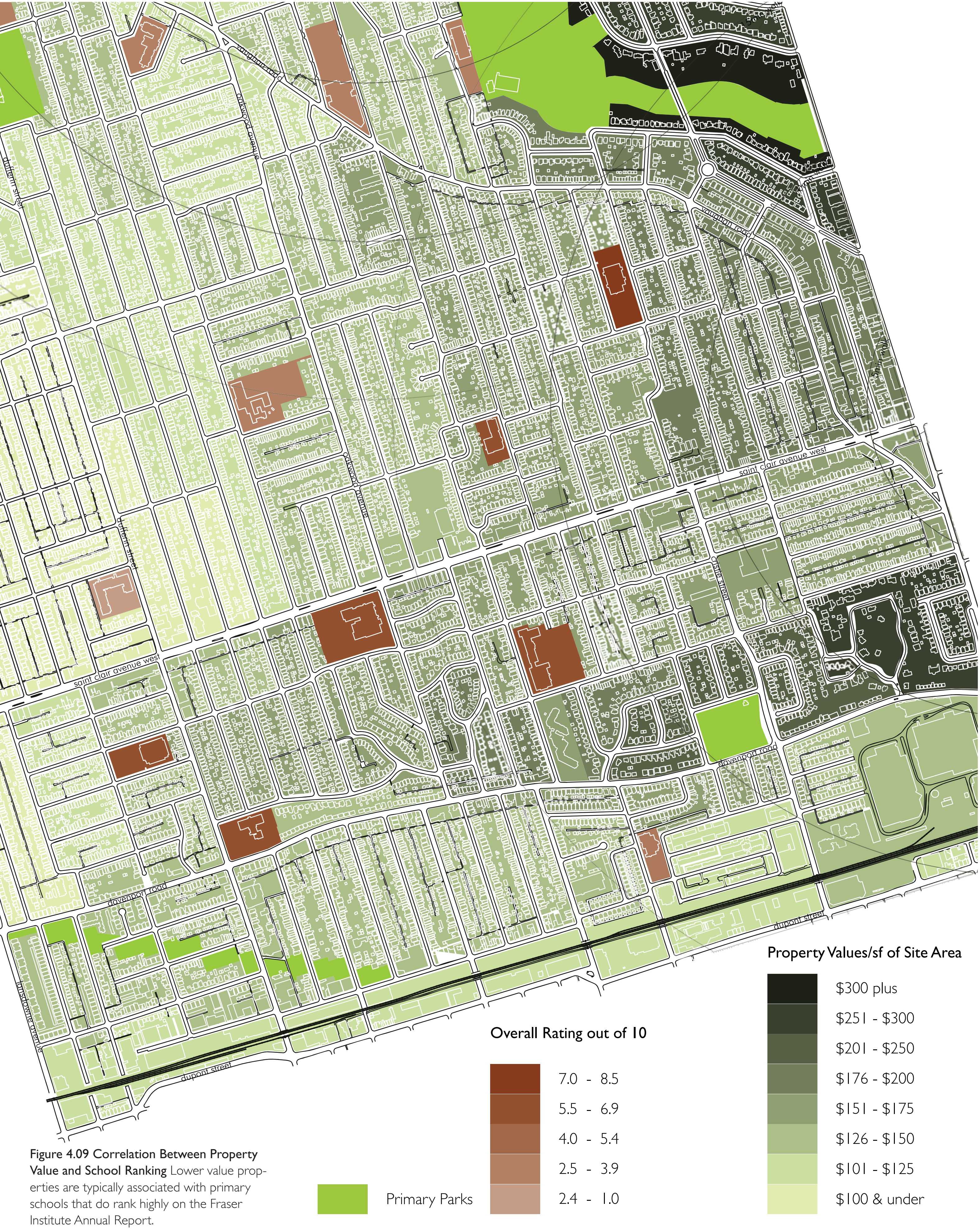


Figure 4.09 Correlation Between Property Value and School Ranking Lower value properties are typically associated with primary schools that do rank highly on the Fraser Institute Annual Report.

4.5 Attractors to Regeneration

In major cities in Canada, two primary factors that home buyers consider are proximity to public transit and the quality of education at the local public school as determined by the standardized testing system.[12] Each of the three case study projects is located in existing city fabric, with access to existing public transit corridors that have the capacity to become primary transit routes as density increases. The schools in these areas often vary drastically in ranking, closely following the property values within the geographical draw area of the school. Figure 4.09 provides a composite map for the Vaughan and Oakwood case study, showing the correlation between property value and overall school ranking on the site. This trend is likely relevant for each of the case studies and to some degree accurate of many cities in Canada.[13]

Within this backbone of municipal infrastructure is the capacity to increase density and update services with the tax revenue generated by new development. The other advantage is that at the densities proposed in each of the case studies, other community scale infrastructure services become feasible. These could include centralized, efficient, structured parking, rainwater catchment for irrigation and sewage conveyance, and community energy systems that provides heat and electricity to buildings in the community. All of these systems can benefit the community both in terms of the environmental impact of its residents and in potentially increasing the property values in the community. Through reducing demand on municipal services and increasing property value to home-buyers seeking environmentally preferable housing these neighbourhoods may become more attractive to future markets.

From the municipalities perspective, decentralizing services traditionally provided at a municipal level would reduce the cost of operating them and could extend the life of primary municipal

12 These decisions are based on many variables however an informal poll of several home buyers and real-estate agents revealed that these were primary considerations. This is somewhat confirmed by the correlation between housing prices and proximity to high ranking schools and mass public transit stations.

13 Personal conversation with Celene McAuley, supply teacher in Barrie Ontario in February 2006.

Key Issue	% owners mentioning
Energy cost increases/utility rebates	74
Achieving superior energy performance	68
Lower life cycle operating costs	64
Have a positive environmental impact	60
Easier to get LEED certification now	54
Secure a competitive advantage	53
Respond to government regulations	53
Secure productivity benefits	53

Figure 4.10 Green Building Triggers for Building Owners Key issues that owners mentioned as having a significant influence in rationalizing sustainable design

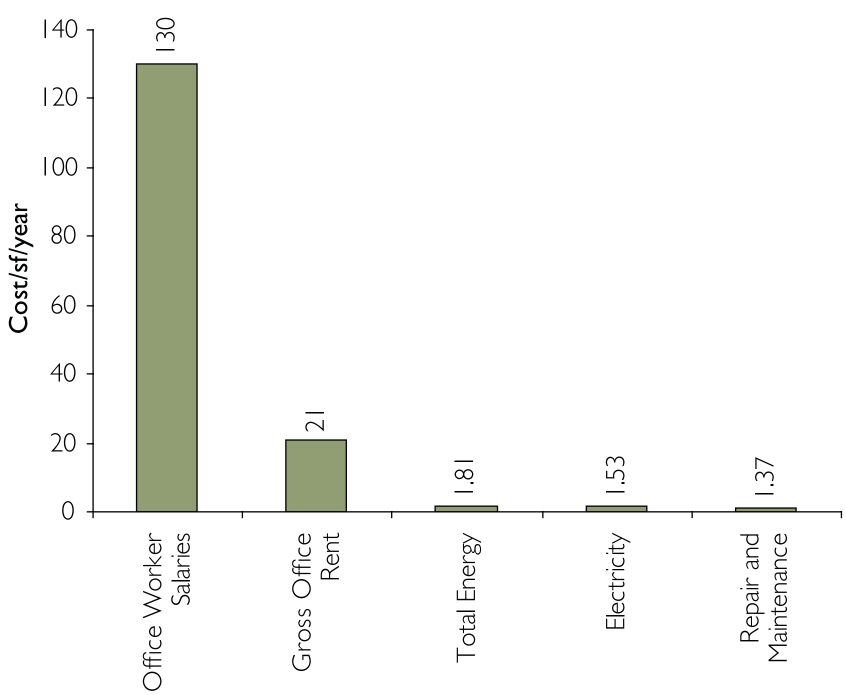


Figure 4.11 Breakdown of Typical Commercial Building Operating Costs Apportionment of building operating costs are dominated by employee salaries, however annual energy costs are a significant factor especially when projected over the life of the building.

services such as centralized transformer transfer stations, potable water services, sewage treatment plants, and storm water management systems.

A more significant economic benefit to the municipality that is more difficult to associate with the principles of sustainable design is the correlation between poor urban planning and criminal activity. In all three of the case studies, the development is occurring in areas where social problems have plagued the community, and as a result have a tendency to become centres where increased rates of criminal activity occur. This factor significantly increases the cost to the city of providing police services to the area, almost certainly exceeding the revenue generated through property taxes generated by the neighbourhood.

By encouraging infill development in these areas, municipalities could ideally benefit by both increasing the social health of the area and to reducing the cost of providing municipal services such as public transit, police services and public schools to the area, as well as potentially increasing the tax base of the area. In all three case study examples there is an emphasis on providing a family housing alternative to the suburban model.

These neighbourhoods have the potential to grow within the existing character of the neighbourhood and establish an alternative to the traditional housing model available to lower income families in major Canadian cities. Property values in central areas of many major Canadian cities put detached homes out of financial reach of most young families, who as a result look to the suburbs for affordable housing.

Given the choice between urban community models such as those described in the case studies, and conventional suburban family housing, a segment of the population would choose to live in the denser, urban condition. However, leadership in sustainable development is unlikely to occur without clear planning guidelines requiring higher site density and providing incentives to developers pursuing projects in these areas. Another challenge in the inherently conservative development sector is that few builders or developers will invest in research to arrive at a

Examples of Measurable Economic Benefits Inside the Building

Type of Benefit/ Building Owner	Energy Savings Investment	Water Savings Investment	Productivity Enhancements	Sales Enhancement
Commercial Buildings				
Speculative Developer	Justify only with higher rents	Justify only with higher rents	Must add to sales value	Not likely
Owner-occupied	Reduced operating costs	Reduced operating costs	Add day lighting and views to outside	Add day lighting to retail
Institutional				
Owned or Leased	Reduced operating costs	Reduced operating costs	Reduce number of employees	Not applicable

Examples of Measurable Economic Benefits Outside the Building

Type of Benefit/ Building Owner	Public Relations	Public Policy	Marketing and Sales	Company or Organization Brand/ Image
Commercial Buildings				
Speculative Developer	Somewhat important	Not applicable	May help with loans or leases	Could be useful for developers
Owner-occupied	Very important	Not applicable	Very important	Very important
Institutional				
Owned	Very important	Crucial	Not applicable	Very important
Leased	Very important	Crucial	Not applicable	Very important

Figure 4.12 Value of Green Building Features
Depending on the client type the economic benefits of sustainable design are rationalized in different ways.

product that has an unproven market. An understanding of the broader implications of zoning bylaws and the restrictions of the existing development paradigm in North America is essential for cities to establish clear master plans that will direct future development to meet both environmental and fiscal needs of the municipality.

4.6 Justification for Sustainable Design

A primary consideration for municipalities who establish master plans for future growth should be to understand the motivations behind a developer's decision to invest in more sustainable buildings. These reasons vary significantly. Perhaps not surprisingly, environmental benefit is not cited as the primary motivation. As shown in figure 4.10, the most recognized incentive to green building amongst building owners reflects the current focus on energy costs.[14]

Beyond the measurable energy and water conservation advantages that LEED buildings offer, there are many less tangible benefits. To organize these green building attributes identified by building owners, Yudelson suggests organizing these in two broad categories: those that occur inside the building, and those that occur outside the building.

> *Inside-the-building value may be created by increased productivity of workers or increased net operating income (NOI), while outside-the-building value may be created by the enhanced image of a company or institution. Other measures of value include risk management reductions, improved recruitment and retention of key employees and increased value of real estate investment.*[15]

This approach is summarized in Figure 4.12 which outlines how clients will assign different value to inside and outside the building attributes. As shown, depending on the owner or developer, the intangible attributes of LEED buildings may be of more value than those that are easily quan-

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14 Yudelson, Jerry. Developing Green: Strategies for Success. Herndon: National Association of Industrial and Office Properties (NAIOP), 2006. Page 62.

15 Yudelson, Jerry. Developing Green: Strategies for Success. Herndon: National Association of Industrial and Office Properties (NAIOP), 2006. Page 72.

tifiable and reflected in the building operation costs. LEED buildings can also offer clear advantages to the building occupants if direct non-economic benefits are considered such as:[16]

- Brand image
- Public relations
- Enhanced marketing capability
- Market positioning
- Reduced risk of lawsuits
- Employee productivity
- Employee loyalty and attractiveness to new employees
- Doing the right thing

Specific to worker productivity gains and employee retention, the relative cost of employee salaries in comparison to all other building costs makes even a modest advantage of a LEED building in these areas a very attractive investment with returns that would far outweigh the capital costs identified in the case study analysis projects.

4.7 Productivity and Sustainable Design

Another major advantage inherent with buildings that incorporate the principles of sustainable design is the focus in indoor environment quality. Emphasis of on these less tangible benefits afford occupants greater visual, thermal, and acoustic comfort which creates a low stress, high –performance environment which can yield valuable gains in labour productivity, retail sales, and manufacturing quality and output. These improvements in turn create a key competitive advantage, and hence further improve real-estate value and market performance.

16 Yudelson, Jerry. Developing Green: Strategies for Success. Herndon: National Association of Industrial and Office Properties (NAIOP), 2006. Page 74-76.

On the topic of indoor air quality and exposure to toxic substances the Canadian government has few regulations in place that control what types of chemicals can be used in appliances, carpets, wall paper adhesives, paints, building materials, insulation, or anything else.[17] These combined make the average indoor air more contaminated than outdoor air. One study of household contaminants found that more than half of the households showed concentrations of seven toxic chemicals that are known to cause cancer in animals and are suspected to cause cancer in humans. Allergies, asthma, and sick building syndrome are on the rise. Yet legislation establishing mandatory standards for indoor air quality is practically nonexistent.

Measuring the exact financial impact of healthier and more comfortable buildings is difficult to quantify. The costs of poor indoor environmental and air quality - including higher absenteeism and increased respiratory ailments, allergies and asthma-are hard to measure and have generally been "hidden in sick days, lower productivity, and in some of the worst cases in unemployment insurance and medical costs.

However, four of the attributes associated with sustainable design including increased ventilation control, increased temperature control, increased lighting control and increased day-lighting have been positively and significantly correlated with increased productivity. Reports written on the subject have found that at the low end of the range a productivity gain of one to one and a half percent could be anticipated.[18]

Rationalizing even this modest increase in productivity becomes a surprisingly significant cost advantage over a short period. A one percent increase in productivity (equal to about 5 minutes per working day) is equal to $600 to $700 per employee per year, or $3/sf per year. A one and a half percent increase in productivity translates to $1000 per year, or $4 to $5/sf per year.

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17 Canadian Green Building Council. (December 2004). LEED-NC 1.0 Reference Package ( ). Ottawa, ON: Canada. Canadian Green Building Council. Page 329.

18 Romm, Joseph and William D. Browning (1998). Greening the building and the bottom line: Increasing productivity through energy-efficient design. Snowmass, Colourado: Rocky Mountain Institute.

Over 20 years and at a 5 percent real discount rate, the present value of the productivity benefits is about $35/sf assuming the one percent productivity increase and $55/sf assuming a one and a half percent increase. The relatively large impact of productivity and health gains reflects the fact that the direct and indirect cost of employees is far larger than the cost of construction or energy consumption. Consequently, even small changes in productivity and health translate into large financial benefits.

4.8 Conclusion

The benefits of sustainable design to municipalities, residents and tenant groups who are typically not part of the design process can provide returns far in excess of those that benefit developers directly. Advantages include access to existing public transit, reduced operating costs, and a healthier indoor environment. However many of these attributes cannot be easily quantified by conventional measurements of value.

Despite these advantages there are several deterrents that exist with the current approach to development and municipal property tax assessments. To address these obstacles a series of incentives including land based property tax assessment, locationally efficient mortgages to address affordability of urban properties, and development fees that accurately reflect the cost of servicing new developments and would directly reward developers who build more sustainable buildings and communities. As shown, these incentives can be introduced into major Canadian cities at minimal cost but have the potential of significantly reducing the operating costs of providing service to these neighbourhoods in the future.

To encourage more sustainable design, incentives should consider motivations behind a developers decision to invest in more environmental type projects. These less tangible aspects include enhanced marketing capabilities, market positioning, and public relations that will all appeal to certain purchasers who are considering environmental issues.

From the perspective of the purchaser or building occupant sustainable design features can offer significant advantages over conventional buildings. These are most pronounced in commercial buildings where sustainable design can enhance worker productivity, employee retention, recruitment of new staff, and corporate branding as a leader in environmental issues. As an example one study found that the return on an increase in employee productivity in an office environment of just 1 percent could be worth $30/m2 annually. This type of savings goes a long way in paying for capital improvements required by higher performance buildings.

For sustainable design to reach a broader market, developers must also become advocates and be aware of the advantages that green strategies will offer purchasers and occupants of these projects. If the green attributes of a project are highlighted by the sales team and are expressed as advantages that building occupants will realize, any additional capital costs incurred by the developer could be recaptured up-front either through increased sales revenue, occupancy premiums, and reduced operating costs.

The purely financial analysis of sustainable design has its limitations. For this reason municipalities and other levels of government must actively encourage more people to and work in a more sustainable way.

05 Foundations for Market Transformation

5.1 Summary of Key Conclusions

The recent groundswell of public awareness and concern about the implications of climate change has overshadowed debate on every other public policy issue in Canada.[1] This interest has been reflected in the growth in mainstream media coverage of the topic and the recent political debate at all levels of government. Unfortunately there is no widespread understanding or consensus for a plan that could achieve measurable progress in slowing climate change. As a result, there is not only confusion about appropriate solutions which could make Canadian society more sustainable, but also a systemic failure to account for the social, economic and environmental costs of inaction.

If society is to build on this momentum of public support for the environment, it is imperative that we channel this awareness and provide opportunities for Canadians to curb their environmental impact. Leadership must come both from the Government and from progressive private enterprise who have the opportunity to capitalize on the good economics of more sustainable practices. Architects and engineers can play a key role in promoting sustainable initiatives by informing themselves about the full range of implications of green building and planning, so that they may be informed advocates of specific sustainable design strategies.

The development industry is well positioned to respond to this growth in public environmental concern, through providing people an alternative place to live and work where their environmental impact is minimized. As shown in the case study examples cited in this thesis, the additional capital costs required to transform typical developer driven projects into more progressive, sustainable developments can be incorporated within conventional pro-forma calculations, while offering marketing and sales advantages from the perspective of the developer.

The capital cost data presented in Chapter 3 demonstrates that the Multi-unit Residential Building (MURB) case studies paid on average 7.2 percent more initially to incorporate the necessary

1 Poll by environics between November 2nd and 6th, 2006. Globe and Mail, Retrieved November 10, 2006, from www.globeandmail.com.

measures to achieve LEED certification. Considering increased value to the developer alone, it is estimated that in case study b2 would be fully recaptured and potentially increase the profit to the developer by as much as $77.41/m2 GLA through advantages such project fast tracking, increased sales velocity, and sales premiums related to higher quality building. These same advantages in the other two case studies did not show that the LEED cost increment could be fully recaptured in the current real-estate market. To rationalize the added cost in these projects a developer would have to recognize less tangible aspects of LEED buildings such as corporate branding as market leading developer, or considering more significant cost advantages than those listed in the building value assessment. It is noted that these projects could likely reduce the total LEED cost increment by prioritizing environmental building features through the design process or by targeting fewer of the more costly points and a lower level of Certification.

For the Commercial Building the capital cost data demonstrates that these case studies paid on average 9.0 percent more initially to incorporate the necessary measures to achieve LEED certification. Considering the increased value to the developer through tangible operational savings alone, after one year of occupancy on average 62 percent of this initial capital investment would be recaptured primarily in the form of energy savings. If a developer also considers the value of less tangible attributes such as rent or sales premium, increased building occupancy and residual value premium, the buildings on average would be worth $258.75/m2 GLA more than the conventionally constructed reference buildings.

Effectively, what the case studies reveal is that if a client is committed to achieving a measure of sustainability in their building, it will be the design choices that are made during design process which will ultimately determine whether a building will be sustainable, not the budget. With these types of returns it may be more useful to determine the theoretical break point or 'sweet-spot' where the maximum capital outlay could be recaptured during operation of a given project over a specified period of time.

For clients who are committed to sustainable design, the first question in budgeting should not be 'how much more will it cost?,' but 'how will we achieve this?' By approaching the design in this way the design team is forced to identify the goals and build an appropriate cost model for them. If these measures are seen as upgrades or additions, the cost of the elements will also be seen as an addition. By prioritizing goals, such as a level of LEED certification or reduced operating costs, the approach to design will be focused more on optimizing systems and finding synergies between them, and less on focusing on isolated building components. Mark Rosenbaum of Energysmiths responds to the frequently asked question of 'how much more do green buildings cost' in the following way:

> *Buildings are like ecosystems - complex assemblages of interwoven, interacting elements. The best buildings result from consistent attention throughout the design process to the overall performance. Although the final performance is certainly dependent on many independent decisions, disaggregating the whole into component strategies, and attempting to individually quantify their cost/benefit, frequently undervalues those strategies. Often a price tag can't be assigned to the most significant benefits.*[2]

In each of the case studies the LEED cost increment identified, reflects the components of the building that could be easily identified as contributing to the ability of the project to achieve LEED certification and had a measurable cost premium. The payback calculations also focused on measurable returns to the developer. Although it is clear that there are many advantages to building in a more sustainable way, the most significant benefits are typically to the building occupants where the traditional economic tools do not effectively of express the advantages over conventional buildings.

5.2 Intangible Benefits of Sustainable Design

Although this thesis focuses primarily on financial issues, it acknowledges that the purely economic argument for sustainability has its limitations. As a result, the economic case needs to be underpinned by a sensitivity to the requirements of natural systems and by the consideration of

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2 Rosenbaum, Marc. Whole Systems Analysis as a Basis For Decision-Making in Green Buildings. BuildingGreen.com. Retrieved January 13, 2007, from http://www.buildinggreen.com.

future generations of life.[3]

To understand these intangible benefits, the concept of externalization of costs as applied to the current capital-cost-focused development paradigm can bring some clarity to the discussion. Externalization of cost can be defined as the ability of a process to off-load production costs to areas such as the environment where a society does not accurately account for the long term implications to society.[4] This is a long established concept for industrial processes however buildings constructed using the principles of sustainable design, to one degree or another, internalize more of their real costs to the environment and future generations. Accounting fully for the cost benefit to society of providing healthy indoor environments, consuming less fossil fuel, fresh water resources or embodied energy, and rejecting toxic construction materials in favour of renewable materials may ultimately be impossible, but it is certainly of greater value than the incremental cost identified in any of the case study projects.

There are other intangible considerations that may swing the balance in favour of more sustainable type development. Market differentiation, which can be achieved by being able to claim LEED certification, is critical to maximizing the equity that a condominium unit owner has invested when she chooses to sell. The evolving awareness of environmental issues and willingness of purchasers to consider their ecological footprint when making key decisions such as where to live may make recognized green buildings even more attractive in the future.

From the developers' perspective, one of the key motivations for pursuing LEED certification on their buildings is the threat of not keeping up in the market.[5] If we look to the auto industry as an indication of where the building industry could be in five years, the situation is dire for established developers who do not keep pace with the growing trend towards environmental buildings. For perhaps the first time the Federal government has proposed an incentive for

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3 For a comprehensive discussion on the culture of environmentalism see Alex Lukachko's thesis titled: *A Culture of Environmentalism: An Ethics Based Response to to the Environmental Crisis.*

4 Wikipedia. March 2006 http://wikipedia.org/

5 Yudelson, Jerry. Developing Green: Strategies for Success. Herndon: National Association of Industrial and Office Properties (NAIOP), 2006. Page 62.

Canadians to buy imported fuel efficient vehicles while placing a levy on domestically produced high consumption vehicles.[6] In the face of growing unemployment in the auto-industry the Conservative government effectively chose the environment over jobs.

With the recent growth in the green building sector, steadily rising public interest in sustainability, and the cost benefits available to experienced green building teams, investing in the additional requirements of sustainable design could at a minimum be considered investing in a learning process. With the growth in awareness of environmental issues we can anticipate a maturing and strengthening of public commitment to environmental responsibility. The market for providing solutions to people who want to mitigate their impact on the environment will follow quickly.

Currently the marketing material for LEED Certified buildings makes broad claims of 'green building' design or other vague references to sustainability. In the future the purchasers may actively look for figures that reflect the energy and water consumption of the suite, or even CO2 emission reduction of the suite relative to standard construction. In one of the case studies presented here, the CO2 reductions were 3.4 tonnes per year per suite. The Verve building being developed by Tridel, claims a 1.5 tonne reduction in CO2 emissions per suite. Although these numbers may not resonate with most purchasers at present, they could become factors in decision making in the future and developers at the leading edge of this wave will have a marketing advantage over their competitors.

At present, few design teams or contractors have worked on even one project where environmental standards were a consideration. The slow growth in expertise within the building industry may soon find that it is being outpaced by demand for higher performance buildings. As mentioned earlier in Chapter 2, the Canadian construction industry lags behind many areas of the United States and especially European countries where countries like Sweden and the

6 Curry, Bill and Greg Keenan. (2007, March 20). Environment: New levy can add $4000 to the price of SUVs: Fuel efficienct cars get big discounts. Globe and Mail, Retrieved March 20, 2007, from http://www.globeandmail.com.

United Kingdom have a plan to tighten building regulations over the next decade to require all new homes be carbon neutral by 2016 before gaining approval for construction.[7] To encourage early adoption, houses meeting the more stringent code in advance of 2016 do not have to pay building permit and development fees, giving developers a direct financial incentive to build high efficiency housing.

5.3 Constraints to Widespread Adoption of Sustainable Design

The terminology specific to climate change is just starting to be understood by the Canadian public, however solutions to help Canadians realize measurable change need to be offered so that there isn't a sudden move to a feeling of despair. The awareness in terminology also needs to be reinforced by keeping track of the progress so that people and business can be more accountable for their impact on the environment and organizations who do make progress are recognized for their accomplishments.

Legislation at all levels of government encouraging environmental conservation through a financial deterrent such as the carbon credit programme proposed as part of the Kyoto Protocol will foster a business solution to the problem, and encourage the creative free market to self organize given the right incentives. By pricing GHG intensive activities or products like fuel more accurately, consumers will naturally move away from discretionary GHG emission causing activities.

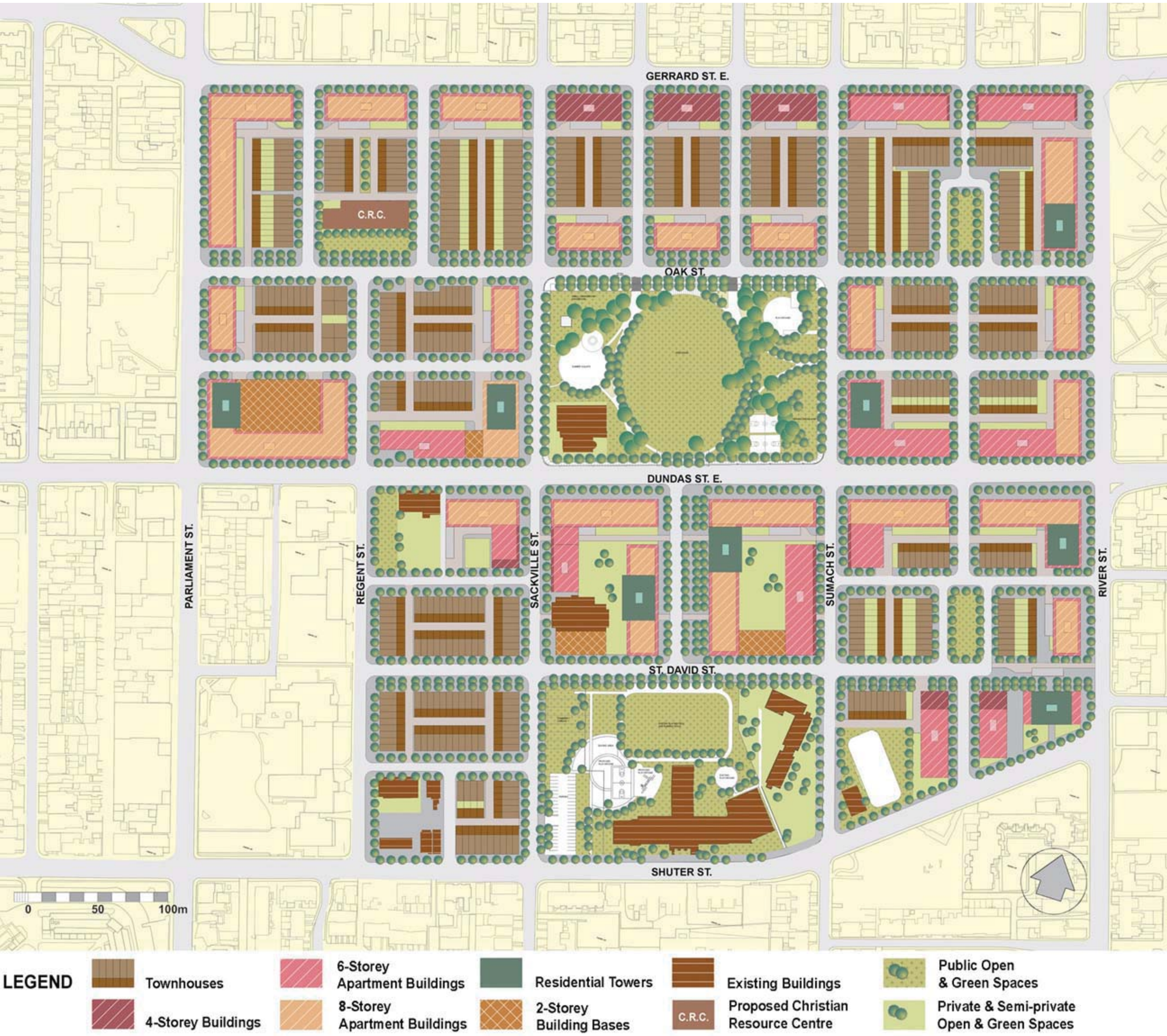
The construction industry and associated regulatory policy hold responsibility for a huge portion of national GHG emissions. If Canada is committed to meeting its commitments of reducing GHG emissions under the Kyoto protocol, buildings constructed today need to work in service of that goal. New constructions, which will be in service for the next century, will have a significant impact on the ability of future generations to continue to build a more sustainable society. It's in everyone's best interest to begin building that society today.

7 British Broadcasting Corporation (BBC). (2006, December 13). Zero carbon homes plan unveiled. BBC, Retrieved March 23, 2007, from http://www.bbc.co.uk

Appendix A

Neighbourhood Design Case Study Analysis Back-up

n1.1 Project Images



n1.3 LEED-ND Scorecard

Cost impact relative to typical urban residential development

Large cost increase	Neutral
Small cost increase/unit	Small cost decrease/unit
	Large cost decrease/unit

LEED-ND Characteristic Title	LEED Targets Y	?	N	$ Impact to Project: Capital	$ Impact to Project: Operation	$ Impact to Municipality: Capital	$ Impact to Municipality: Operation	Potential design impact commentary
Location Efficiency								
LEp1 Transportation Efficiency - Reduce air pollution, energy consumption, and greenhouse gas emissions generated by transportation by encouraging new development in locations that reduce automobile dependence. Promote public health by encouraging new development in locations that provide increased opportunities for walking.	Y							Reduction in road construction and resulting maintenance
LEp2 Water and storm water infrastructure efficiency - Conserve natural and financial resources required for construction and maintenance of infrastructure. Encourage new development within and near existing communities, in order to reduce multiple environmental impacts caused by haphazard sprawl.	Y							Reduction in storm sewer network
LEc1.1 Contaminated brown fields redevelopment - Conserve land and reduce air, water, and land pollution from contaminated land.			4					Not pursued
LEc1.2 High cost contaminated brown fields redevelopment - Encourage the cleanup of more complicated or challenging contaminated brown fields sites			1					Not pursued
LEc2 Adjacent, infill, or redevelopment site - Encourage development within existing communities and already-developed places to reduce multiple environmental harms associated with haphazard sprawl. Reduce development pressure beyond the limits of existing development. Conserve natural and financial resources required for construction and maintenance of infrastructure.	8		2					Reduction in infrastructure construction and maintenance
LEc3 Reduced automobile dependence - Encourage development in locations that exhibit superior performance in providing transportation choices or otherwise reducing motor vehicle use.	5		1					Optimize use of existing public transit system
LEc4 Contribution to jobs-housing balance - Encourage balanced communities with a diversity of uses and employment opportunities. Reduce energy consumption and pollution from motor vehicles by providing opportunities for shorter vehicle trips and/or use of alternative modes of transportation.	4							Increase in local commercial property tax revenue
LEc5 School proximity - Promote children's health through physical activity by facilitating walking to school. Promote a sense of community.	1							Optimize use of existing education facilities
LEc6 Access to public space - Provide access to public gathering space in order to promote sense of community.	2							
Environmental Preservation								
EPp1 Imperiled species and ecological communities - Protect imperiled species and ecological communities.	Y							
EPp1 Parkland preservation - Protect natural habitat.	Y							
EPp3 Wetland & water body protection - Conserve water quality, natural hydrology and habitat through conservation of water bodies and wetlands.	Y							
EPp4 Erosion & sedimentation control - Reduce water pollution from erosion during construction.	Y							Reduction in maintenance cost of storm sewers downstream
EPp5 Farmland preservation - Preserve irreplaceable agricultural resources by protecting prime and unique farmland from development.	Y							
EPc1 Support off-site land conservation - Protect land that is important for natural or cultural resources from development.			2					Not pursued
EPc2 Site design for habitat or wetlands conservation - Conserve native wildlife habitat, wetlands and water bodies.	1							Specification of native species landscaping
EPc3 Restoration of habitat or wetlands - Conserve native wildlife habitat, wetlands and water bodies			1					Not pursued

Cost impact relative to typical urban residential development	
Large cost increase	Neutral
Small cost increase/unit	Small cost decrease/unit
	Large cost decrease/unit

LEED-ND Characteristic Title	LEED Targets Y	?	N	$ Impact to Project: Capital	$ Impact to Project: Operation	$ Impact to Municipality: Capital	$ Impact to Municipality: Operation	Potential design impact commentary
EPc4 Conservation management of habitat or wetlands - Conserve native wildlife habitat, wetlands and water bodies.			1					Not pursued
EPc5 Steep slope preservation - Minimize erosion to protect habitat, and reduce stress on natural water systems, by preserving steep slopes in a natural, vegetated state.			1					Not pursued
EPc6 Minimize site disturbance during construction - Conserve existing natural areas and protect trees to provide habitat and promote biodiversity.	1							Buildings on site targeting construction sedimentation controls
EPc7 Minimize site disturbance through site design - Preserve existing tree canopy, native vegetation and pervious surfaces while encouraging high density, smart growth communities.	1							Not pursued
EPc8 Maintain storm water runoff rates - Reduce storm water pollution, prevent flooding, and promote aquifer recharge.	1							Buildings on site targeting rainwater harvesting
EPc9 Reduce storm water runoff rates - Reduce storm water pollution, prevent flooding, and promote aquifer recharge.	1							Buildings on site targeting rainwater harvesting
EPc10 Storm water treatment - Reduce surface water pollution from storm water.	2							Buildings on site targeting rainwater harvesting
EPc11 Outdoor hazardous waste pollution prevention - Reduce storm water pollution from the use of pesticides and fertilizers.	1							Investment in pest resistant landscaping would reduce ongoing landscaping costs
Compact, Complete, & Connected Neighborhoods								
CCCNp1 Open community - Promote developments that are good neighbors to their surrounding communities. Foster a sense of community and connectedness beyond the development.	Y							
CCCNp2 Compact development - Conserve land. Promote livability, transportation efficiency, and walkability.	Y							Increased density allows more unit revenue and increase tax base
CCCNp3 Diversity of uses - Promote community livability, transportation efficiency, and walkability.	Y							Optimizing use of existing city services
CCCNc1 Compact development - Conserve land. Promote community livability, transportation efficiency, and walkability.	5							Increased density allows more unit revenue and increase tax base
CCCNc2 Transit-oriented compactness - Maximize walking trips to and from transit stops in the area immediately surrounding the transit stop.	1							Optimize use of existing public transit system
CCCNc3 Diversity of uses - Promote community livability, transportation efficiency, and walkability.	3							Optimizing use of existing city services
CCCNc4 Housing diversity - To enable citizens from a wide range of economic levels and age groups to live within a community.	4							Increased construction cost due to variability in unit layout
CCCNc5 Affordable rental housing - To enable citizens from a wide range of economic levels and age groups to live within a community.	2							Pending market conditions
CCCNc6 Affordable for-sale housing - To enable citizens from a wide range of economic levels and age groups to live within a community.	2							Pending market conditions
CCCNc7 Reduced parking footprint - Reduce storm water runoff per capita. Encourage neighborhood walkability and promote public health through physical activity.	2							Assume reduction in number of parking stalls required
CCCNc8 Community outreach and involvement - To encourage community participation in the project design and planning and involve the people who live in a community in deciding how it should be improved or how it should change over time.	1							Additional consulting and design
CCCNc9 Block perimeter - To promote connectivity.	3		1					

Cost impact relative to typical urban residential development	
Large cost increase	Neutral
Small cost increase/unit	Small cost decrease/unit
	Large cost decrease/unit

LEED-ND Characteristic Title	LEED Targets Y	?	N	$ Impact to Project: Capital	$ Impact to Project: Operation	$ Impact to Municipality: Capital	$ Impact to Municipality: Operation	Potential design impact commentary
CCCNc10 Locating buildings to shape walkable streets - Encourage pedestrian-oriented streets.	1							
CCCNc11 Designing buildings access to shape walkable streets - Encourage pedestrian-oriented streets.	1							Additional design costs
CCCNc12 Designing buildings to shape walkable streets - Encourage pedestrian-oriented streets.	1							
CCCNc13 Comprehensively designed walkable streets - Encourage pedestrian-oriented streets.			2					Not pursued
CCCNc14 Street network - Provide direct and safe connections, for pedestrians and bicyclists as well as drivers, to local destinations and neighborhood centers. Promote public health though increased physical activity.	1							Assume road widths are reduced and overall site density increases
CCCNc15 Pedestrian network - Provide direct and safe connections, for pedestrians to local destinations and neighborhood centers. Promote public health though increased physical activity.	1							Modest increase in site development
CCCNc16 Maximize pedestrian safety and comfort - Provide direct, safe, and comfortable connections, for pedestrians and bicyclists, to local destinations and neighborhood centers. Promote public health though increased physical activity.	1							
CCCNc17 Superior pedestrian experience - Provide appealing and comfortable pedestrian street environments in order to promote pedestrian activity.			2					Not pursued
CCCNc18 Applying regional precedents in Urbanism and Architecture - Promote energy savings, respond to regional climate, increase the life of buildings and materials, provide cultural continuity, and reinforce local distinctiveness.			1					Not pursued
CCCNc19 Transit subsidy - Reduce energy consumption and pollution from motor vehicles by encouraging use of public transit.			3					Not pursued
CCCNc20 Transit amenities - Reduce energy consumption and pollution from motor vehicles by encouraging use of public transit.	1							Not pursued
CCCNc21 Access to nearby communities - Provide direct and safe connections, for pedestrians and bicyclists as well as drivers, to local destinations and neighborhood centers. Promote public health by facilitating walking and bicycling.	1							
CCCNc22 Adaptive reuse of historic buildings - Encourage use of historic buildings in a manner that preserves their historic materials and character.			2					Not pursued
Resource Efficiency								
REc1 Certified green buildings - Encourage the design and construction of buildings to utilize green building practices.	4		1					Increase in building costs/ reduced municipal service load
REc2 Energy efficiency in buildings - Encourage the design and construction of energy efficient buildings to reduce air, water, and land pollution and environmental impacts from energy production and consumption.	3							Increase in building costs/ reduced municipal service load
REc3 Water efficiency in buildings - Encourage the design and construction of water efficient buildings to reduce the environmental impacts from water consumption.	2							Increase in building costs/ reduced municipal service load
REc4 Heat island reduction - Reduce heat island effect to minimize impact on microclimate, human and wildlife habitat, and required energy for cooling.	1							U/G parking included in base
REc5 Infrastructure energy efficiency - Reduce air, water, and land pollution from energy consumption.			1					Not pursued

Cost impact relative to typical urban residential development	
Large cost increase	Neutral
Small cost increase/unit	Small cost decrease/unit
	Large cost decrease/unit

	LEED Targets			$ Impact to Project		$ Impact to Municipality		
LEED-ND Characteristic Title	Y	?	N	Capital	Operation	Capital	Operation	Potential design impact commentary
REc6 On-site power generation - Reduce air, water, and land pollution from energy consumption and production by increasing the efficiency of the power delivery system. Increase the reliability of power.	1							Reduced operating cost of municipal services
REc7 On-site renewable energy sources - Reduce environmental impacts associated with fossil fuel energy generation by increasing the use of on-site renewable energy sources.			1					Not pursued
REc8 Efficient irrigation - Conserve potable water.	1							Buildings on site targeting rainwater harvesting & drip irrigation
REc9 Grey water & storm water reuse - Conserve potable water.	1		1					Buildings on site targeting rainwater harvesting & drip irrigation
REc10 Wastewater management - Reduce pollution from wastewater and reuse nutrients from the wastewater stream.	1							
REc11 Reuse of materials - Promote reuse of materials and resources.	1							Demolition material used as aggregate in new buildings
REc12 Recycled content - Promote use of recycled materials.	1							Demolition material used as aggregate in new buildings
REc13 Regionally provided materials - Promote selection of regionally available materials and resources to build local economy and reduce embodied energy.			1					Not pursued
REc14 Construction waste management - Promote efficient use of solid waste by diverting construction, demolition and land clearing debris from landfill disposal, and by redirecting resources for recycling and reuse.	1							Buildings on site targeting
REc15 Comprehensive waste management - Promote safe and efficient disposal or reuse of waste streams generated by occupants.	1							Buildings on site targeting
REc16 Light pollution reduction - Reduce light pollution.	1							Buildings on site targeting
REc17 Contaminant reduction in brown fields remediation - Encourage brown fields cleanup methods that reduce contaminant volume or toxicity and thereby minimize long-term remediation or monitoring burdens.			1					Not pursued
Other								
Accredited professional Innovation Credits	2							LEED AP on design team - additional consulting
Innovation in design	3		1					TBD
Total LEED Points	83	0	31					

Certified 46 - 56 Points
Silver 57 - 67 Points
Gold 68 - 90 Points
Platinum 91 - 114 Points

n2.1 Project Images

n2.3 LEED-ND Scorecard

Cost impact relative to typical urban residential development

	Large cost increase/unit		Neutral
	Small cost increase/unit		Small cost decrease/unit
			Large cost decrease/unit

LEED-ND Characteristic Title	LEED Targets Y	?	N	$ Impact to Project: Capital	$ Impact to Project: Operation	$ Impact to Municipality: Capital	$ Impact to Municipality: Operation	Potential cost impact narrative
Location Efficiency								
LEp1 Transportation Efficiency - Reduce air pollution, energy consumption, and greenhouse gas emissions generated by transportation by encouraging new development in locations that reduce automobile dependence. Promote public health by encouraging new development in locations that provide increased opportunities for walking.	Y							Reduction in road construction and resulting maintenance
LEp2 Water and storm water infrastructure efficiency - Conserve natural and financial resources required for construction and maintenance of infrastructure. Encourage new development within and near existing communities, in order to reduce multiple environmental impacts caused by haphazard sprawl.	Y							Reduction in storm sewer network
LEc1.1 Contaminated brown fields redevelopment - Conserve land and reduce air, water, and land pollution from contaminated land.	4							Providing property tax revenue on previously undeveloped land
LEc1.2 High cost contaminated brown fields redevelopment - Encourage the cleanup of more complicated or challenging contaminated brown fields sites	1							Providing property tax revenue on previously undeveloped land
LEc2 Adjacent, infill, or redevelopment site - Encourage development within existing communities and already-developed places to reduce multiple environmental harms associated with haphazard sprawl. Reduce development pressure beyond the limits of existing development. Conserve natural and financial resources required for construction and maintenance of infrastructure.	8		2					Reduction in infrastructure construction and maintenance
LEc3 Reduced automobile dependence - Encourage development in locations that exhibit superior performance in providing transportation choices or otherwise reducing motor vehicle use.	5		1					Optimize use of existing public transit system
LEc4 Contribution to jobs-housing balance - Encourage balanced communities with a diversity of uses and employment opportunities. Reduce energy consumption and pollution from motor vehicles by providing opportunities for shorter vehicle trips and/or use of alternative modes of transportation.	4							Increase in local commercial property tax revenue
LEc5 School proximity - Promote children's health through physical activity by facilitating walking to school. Promote a sense of community.	1							Optimize use of existing education facilities
LEc6 Access to public space - Provide access to public gathering space in order to promote sense of community.	2							
Environmental Preservation								
EPp1 Imperiled species and ecological communities - Protect imperiled species and ecological communities.	Y							
EPp1 Parkland preservation - Protect natural habitat.	Y							
EPp3 Wetland & water body protection - Conserve water quality, natural hydrology and habitat through conservation of water bodies and wetlands.	Y							
EPp4 Erosion & sedimentation control - Reduce water pollution from erosion during construction.	Y							Reduction in maintenance cost of storm sewers downstream
EPp5 Farmland preservation - Preserve irreplaceable agricultural resources by protecting prime and unique farmland from development.	Y							
EPc1 Support off-site land conservation - Protect land that is important for natural or cultural resources from development.			2					Not pursued
EPc2 Site design for habitat or wetlands conservation - Conserve native wildlife habitat, wetlands and water bodies.	1							Specification of native species landscaping
EPc3 Restoration of habitat or wetlands - Conserve native wildlife habitat, wetlands and water bodies	1							

Cost impact relative to typical urban residential development	
Large cost increase/unit	Neutral
Small cost increase/unit	Small cost decrease/unit
	Large cost decrease/unit

LEED-ND Characteristic Title	LEED Targets Y	?	N	$ Impact to Project: Capital	$ Impact to Project: Operation	$ Impact to Municipality: Capital	$ Impact to Municipality: Operation	Potential cost impact narrative
EPc4 Conservation management of habitat or wetlands - Conserve native wildlife habitat, wetlands and water bodies.	1			Small cost increase/unit	Neutral	Neutral	Neutral	
EPc5 Steep slope preservation - Minimize erosion to protect habitat, and reduce stress on natural water systems, by preserving steep slopes in a natural, vegetated state.			1					Not pursued
EPc6 Minimize site disturbance during construction - Conserve existing natural areas and protect trees to provide habitat and promote biodiversity.	1			Small cost increase/unit	Small cost increase/unit	Neutral	Neutral	Buildings on site targeting construction sedimentation controls
EPc7 Minimize site disturbance through site design - Preserve existing tree canopy, native vegetation and pervious surfaces while encouraging high density, smart growth communities.	1			Small cost increase/unit	Neutral	Neutral	Neutral	Not pursued
EPc8 Maintain storm water runoff rates - Reduce storm water pollution, prevent flooding, and promote aquifer recharge.	1			Small cost increase/unit	Large cost increase/unit	Neutral	Large cost decrease/unit	Buildings on site targeting rainwater harvesting
EPc9 Reduce storm water runoff rates - Reduce storm water pollution, prevent flooding, and promote aquifer recharge.	1			Large cost increase/unit	Large cost increase/unit	Neutral	Large cost decrease/unit	Buildings on site targeting rainwater harvesting
EPc10 Storm water treatment - Reduce surface water pollution from storm water.	2			Large cost increase/unit	Large cost increase/unit	Neutral	Large cost decrease/unit	Buildings on site targeting rainwater harvesting
EPc11 Outdoor hazardous waste pollution prevention - Reduce storm water pollution from the use of pesticides and fertilizers.	1			Neutral	Small cost decrease/unit	Neutral	Neutral	Investment in pest resistant landscaping would reduce ongoing landscaping costs
Compact, Complete, & Connected Neighborhoods								
CCCNp1 Open community - Promote developments that are good neighbors to their surrounding communities. Foster a sense of community and connectedness beyond the development.	Y			Neutral	Neutral	Neutral	Neutral	
CCCNp2 Compact development - Conserve land. Promote livability, transportation efficiency, and walkability.	Y			Large cost decrease/unit	Neutral	Neutral	Large cost decrease/unit	Increased density allows more unit revenue and increase tax base
CCCNp3 Diversity of uses - Promote community livability, transportation efficiency, and walkability.	Y			Small cost increase/unit	Neutral	Neutral	Small cost decrease/unit	Optimizing use of existing city services
CCCNc1 Compact development - Conserve land. Promote community livability, transportation efficiency, and walkability.	5			Large cost decrease/unit	Neutral	Neutral	Large cost decrease/unit	Increased density allows more unit revenue and increase tax base
CCCNc2 Transit-oriented compactness - Maximize walking trips to and from transit stops in the area immediately surrounding the transit stop.	1			Neutral	Neutral	Large cost decrease/unit	Large cost decrease/unit	Optimize use of existing public transit system
CCCNc3 Diversity of uses - Promote community livability, transportation efficiency, and walkability.	3			Small cost increase/unit	Neutral	Neutral	Small cost decrease/unit	Optimizing use of existing city services
CCCNc4 Housing diversity - To enable citizens from a wide range of economic levels and age groups to live within a community.	2		2	Small cost increase/unit	Neutral	Small cost increase/unit	Neutral	Increased construction cost due to variability in unit layout
CCCNc5 Affordable rental housing - To enable citizens from a wide range of economic levels and age groups to live within a community.			2					Not pursued
CCCNc6 Affordable for-sale housing - To enable citizens from a wide range of economic levels and age groups to live within a community.	2			Small cost increase/unit	Neutral	Neutral	Neutral	Pending market conditions
CCCNc7 Reduced parking footprint - Reduce storm water runoff per capita. Encourage neighborhood walkability and promote public health through physical activity.	2			Large cost decrease/unit	Small cost decrease/unit	Neutral	Small cost decrease/unit	Assume reduction in number of parking stalls required
CCCNc8 Community outreach and involvement - To encourage community participation in the project design and planning and involve the people who live in a community in deciding how it should be improved or how it should change over time.	1			Small cost increase/unit	Neutral	Small cost increase/unit	Neutral	Additional consulting and design
CCCNc9 Block perimeter - To promote connectivity.	3		1	Neutral	Neutral	Neutral	Neutral	

Cost impact relative to typical urban residential development

(blue)	Large cost increase/unit	(grey)	Neutral
(light blue)	Small cost increase/unit	(light yellow)	Small cost decrease/unit
		(dark yellow)	Large cost decrease/unit

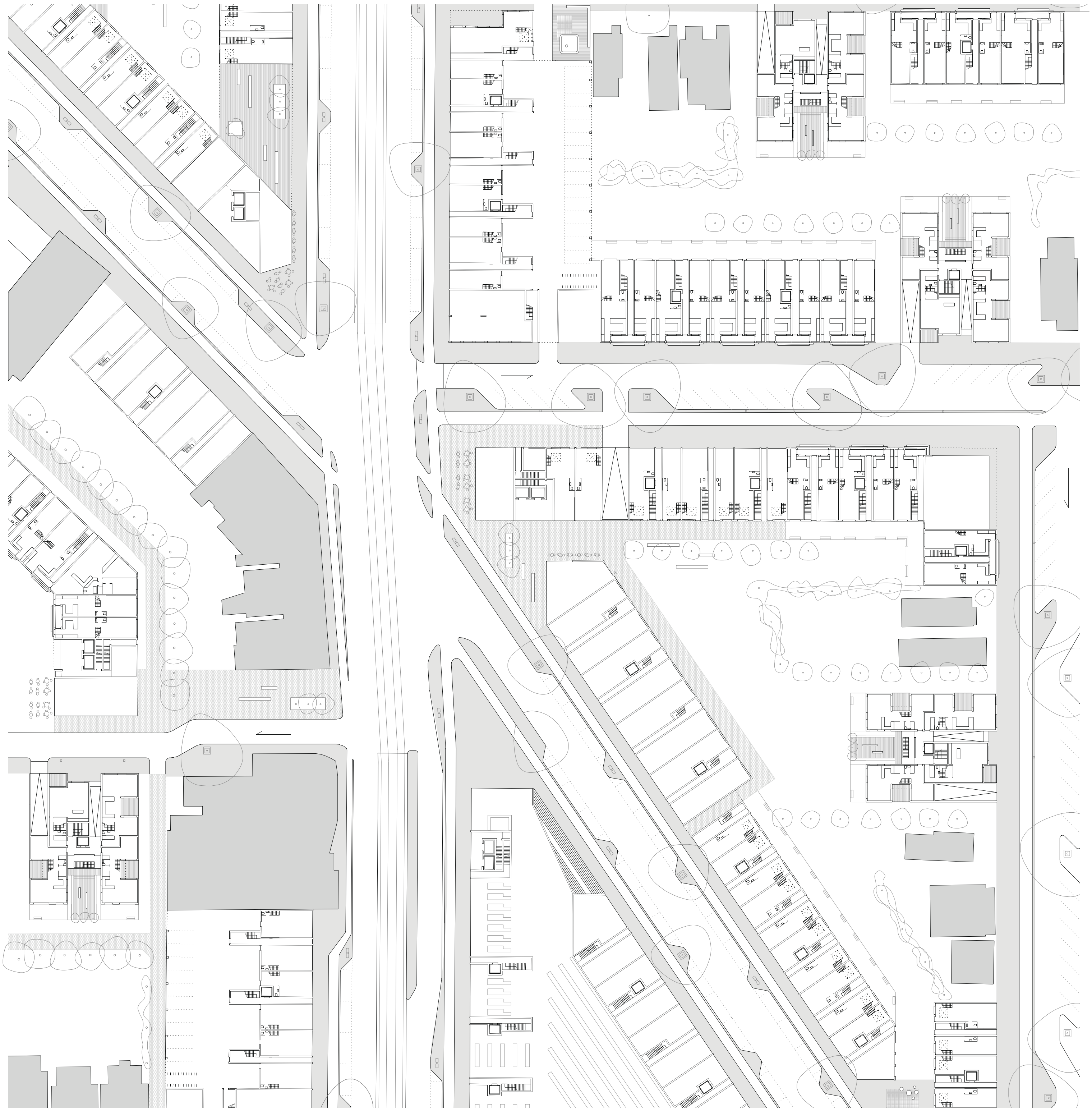
LEED-ND Characteristic Title	LEED Targets Y	?	N	$ Impact to Project: Capital	$ Impact to Project: Operation	$ Impact to Municipality: Capital	$ Impact to Municipality: Operation	Potential cost impact narrative
CCCNc11 Designing buildings access to shape walkable streets - Encourage pedestrian-oriented streets.	1							Additional design costs
CCCNc12 Designing buildings to shape walkable streets - Encourage pedestrian-oriented streets.	1							
CCCNc13 Comprehensively designed walkable streets - Encourage pedestrian-oriented streets.	1		1					
CCCNc14 Street network - Provide direct and safe connections, for pedestrians and bicyclists as well as drivers, to local destinations and neighborhood centers. Promote public health though increased physical activity.	1							Assume road widths are reduced and overall site density increases
CCCNc15 Pedestrian network - Provide direct and safe connections, for pedestrians to local destinations and neighborhood centers. Promote public health though increased physical activity.	1							Modest increase in site development
CCCNc16 Maximize pedestrian safety and comfort - Provide direct, safe, and comfortable connections, for pedestrians and bicyclists, to local destinations and neighborhood centers. Promote public health though increased physical activity.	1							
CCCNc17 Superior pedestrian experience - Provide appealing and comfortable pedestrian street environments in order to promote pedestrian activity.			2					Not pursued
CCCNc18 Applying regional precedents in Urbanism and Architecture - Promote energy savings, respond to regional climate, increase the life of buildings and materials, provide cultural continuity, and reinforce local distinctiveness.			1					Not pursued
CCCNc19 Transit subsidy - Reduce energy consumption and pollution from motor vehicles by encouraging use of public transit.			3					Not pursued
CCCNc20 Transit amenities - Reduce energy consumption and pollution from motor vehicles by encouraging use of public transit.			1					Not pursued
CCCNc21 Access to nearby communities - Provide direct and safe connections, for pedestrians and bicyclists as well as drivers, to local destinations and neighborhood centers. Promote public health by facilitating walking and bicycling.	1							
CCCNc22 Adaptive reuse of historic buildings - Encourage use of historic buildings in a manner that preserves their historic materials and character.			2					Not pursued
Resource Efficiency								
REc1 Certified green buildings - Encourage the design and construction of buildings to utilize green building practices.	4		1					Increase in building costs/ reduced municipal service load
REc2 Energy efficiency in buildings - Encourage the design and construction of energy efficient buildings to reduce air, water, and land pollution and environmental impacts from energy production and consumption.	3							Increase in building costs/ reduced municipal service load
REc3 Water efficiency in buildings - Encourage the design and construction of water efficient buildings to reduce the environmental impacts from water consumption.	2							Increase in building costs/ reduced municipal service load
REc4 Heat island reduction - Reduce heat island effect to minimize impact on microclimate, human and wildlife habitat, and required energy for cooling.	1							U/G parking included in base
REc5 Infrastructure energy efficiency - Reduce air, water, and land pollution from energy consumption.			1					Not pursued
REc6 On-site power generation - Reduce air, water, and land pollution from energy consumption and production by increasing the efficiency of the power delivery system. Increase the reliability of power.	1							Reduced operating cost of municipal services

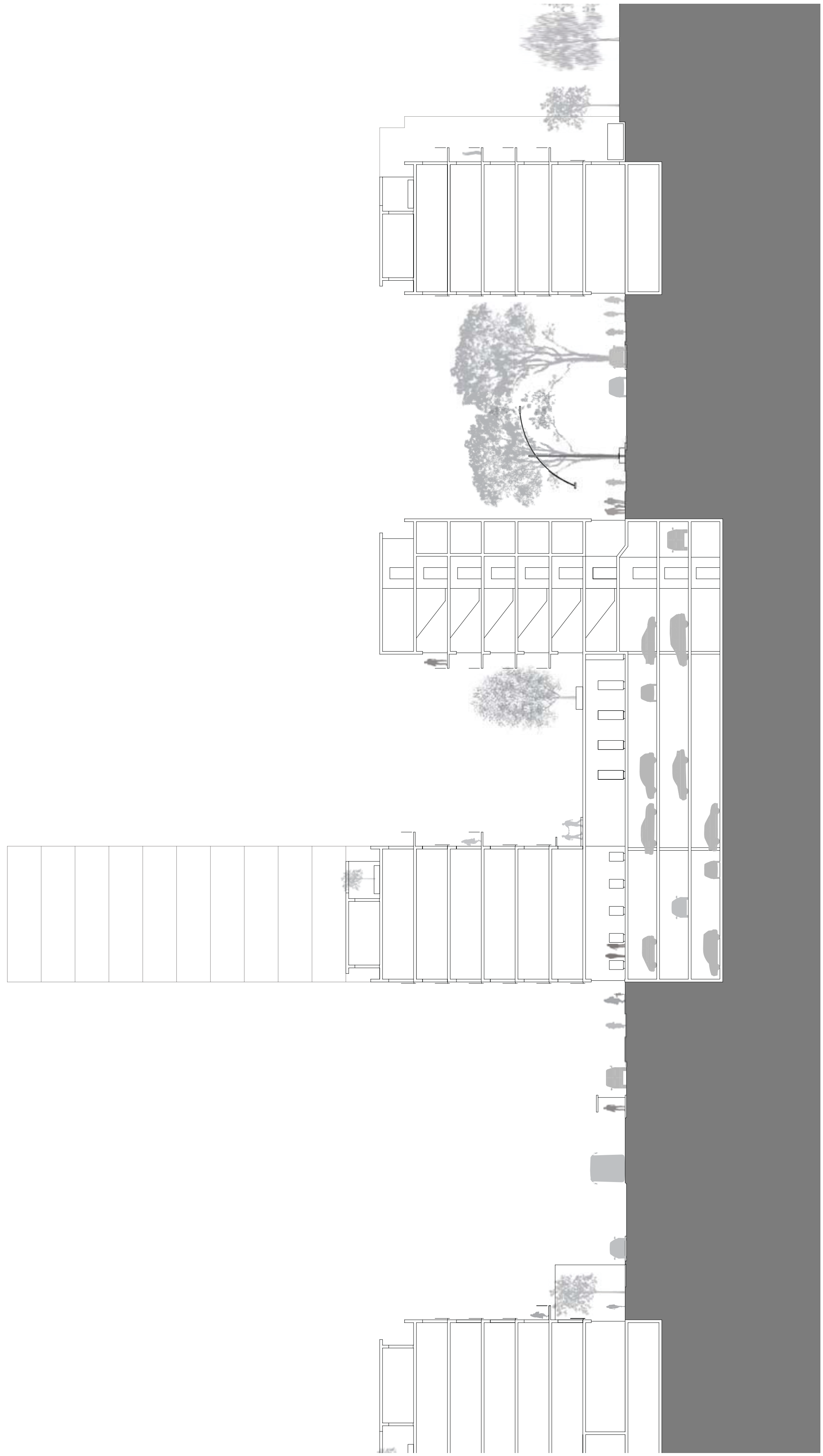
Cost impact relative to typical urban residential development	
Large cost increase/unit	Neutral
Small cost increase/unit	Small cost decrease/unit
	Large cost decrease/unit

LEED-ND Characteristic Title	LEED Targets Y	?	N	$ Impact to Project Capital	$ Impact to Project Operation	$ Impact to Municipality Capital	$ Impact to Municipality Operation	Potential cost impact narrative
REc7 On-site renewable energy sources - Reduce environmental impacts associated with fossil fuel energy generation by increasing the use of on-site renewable energy sources.	1							Reduced operating cost of municipal services
REc8 Efficient irrigation - Conserve potable water.	1							Buildings on site targeting rainwater harvesting & drip irrigation
REc9 Grey water & storm water reuse - Conserve potable water.	2							Buildings on site targeting rainwater harvesting & drip irrigation
REc10 Wastewater management - Reduce pollution from wastewater and reuse nutrients from the wastewater stream.	1							
REc11 Reuse of materials - Promote reuse of materials and resources.	1							Demolition material used as aggregate in new buildings
REc12 Recycled content - Promote use of recycled materials.	1							Demolition material used as aggregate in new buildings
REc13 Regionally provided materials - Promote selection of regionally available materials and resources to build local economy and reduce embodied energy.			1					Not pursued
REc14 Construction waste management - Promote efficient use of solid waste by diverting construction, demolition and land clearing debris from landfill disposal, and by redirecting resources for recycling and reuse.	1							Buildings on site targeting
REc15 Comprehensive waste management - Promote safe and efficient disposal or reuse of waste streams generated by occupants.	1							Buildings on site targeting
REc16 Light pollution reduction - Reduce light pollution.	1							Buildings on site targeting
REc17 Contaminant reduction in brown fields remediation - Encourage brown fields cleanup methods that reduce contaminant volume or toxicity and thereby minimize long-term remediation or monitoring burdens.			1					Not pursued
Other								
Accredited professional Innovation Credits	2							LEED AP on design team - additional consulting
Innovation in design	3		1					TBD
Total LEED Points	88	0	26					

Certified 46 - 56 Points
Silver 57 - 67 Points
Gold 68 - 90 Points
Platinum 91 - 114 Points

n3.1 Project Images





n3.3 LEED-ND Scorecard

Cost impact relative to typical urban residential development

- Neutral
- Large cost increase/unit
- Small cost decrease/unit
- Small cost increase/unit
- Large cost decrease/unit

LEED-ND Characteristic Title	LEED Targets Y	?	N	$ Impact to Project Capital	Operation	$ Impact to Municipality Capital	Operation	Potential cost impact narrative
Location Efficiency								
LEp1 Transportation Efficiency - Reduce air pollution, energy consumption, and greenhouse gas emissions generated by transportation by encouraging new development in locations that reduce automobile dependence. Promote public health by encouraging new development in locations that provide increased opportunities for walking.	Y							Reduction in road construction and resulting maintenance
LEp2 Water and storm water infrastructure efficiency - Conserve natural and financial resources required for construction and maintenance of infrastructure. Encourage new development within and near existing communities, in order to reduce multiple environmental impacts caused by haphazard sprawl.	Y							Reduction in storm sewer network
LEc1.1 Contaminated brown fields redevelopment - Conserve land and reduce air, water, and land pollution from contaminated land.			4					Not pursued
LEc1.2 High cost contaminated brown fields redevelopment - Encourage the cleanup of more complicated or challenging contaminated brown fields sites			1					Not pursued
LEc2 Adjacent, infill, or redevelopment site - Encourage development within existing communities and already-developed places to reduce multiple environmental harms associated with haphazard sprawl. Reduce development pressure beyond the limits of existing development. Conserve natural and financial resources required for construction and maintenance of infrastructure.	10							Reduction in infrastructure construction and maintenance
LEc3 Reduced automobile dependence - Encourage development in locations that exhibit superior performance in providing transportation choices or otherwise reducing motor vehicle use.	5		1					Optimize use of existing public transit system
LEc4 Contribution to jobs-housing balance - Encourage balanced communities with a diversity of uses and employment opportunities. Reduce energy consumption and pollution from motor vehicles by providing opportunities for shorter vehicle trips and/or use of alternative modes of transportation.	4							Increase in local commercial property tax revenue
LEc5 School proximity - Promote children's health through physical activity by facilitating walking to school. Promote a sense of community.	1							Optimize use of existing education facilities
LEc6 Access to public space - Provide access to public gathering space in order to promote sense of community.	2							
Environmental Preservation								
EPp1 Imperiled species and ecological communities - Protect imperiled species and ecological communities.	Y							
EPp1 Parkland preservation - Protect natural habitat.	Y							
EPp3 Wetland & water body protection - Conserve water quality, natural hydrology and habitat through conservation of water bodies and wetlands.	Y							
EPp4 Erosion & sedimentation control - Reduce water pollution from erosion during construction.	Y							Reduction in maintenance cost of storm sewers downstream
EPp5 Farmland preservation - Preserve irreplaceable agricultural resources by protecting prime and unique farmland from development.	Y							
EPc1 Support off-site land conservation - Protect land that is important for natural or cultural resources from development.			2					Not pursued
EPc2 Site design for habitat or wetlands conservation - Conserve native wildlife habitat, wetlands and water bodies.	1							Specification of native species landscaping
EPc3 Restoration of habitat or wetlands - Conserve native wildlife habitat, wetlands and water bodies			1					Not pursued
EPc4 Conservation management of habitat or wetlands - Conserve native wildlife habitat, wetlands and water bodies.			1					Not pursued

Cost impact relative to typical urban residential development

Legend	
Large cost increase/unit	Neutral
Small cost increase/unit	Small cost decrease/unit
	Large cost decrease/unit

LEED-ND Characteristic Title	LEED Targets Y	LEED Targets ?	LEED Targets N	$ Impact to Project: Capital	$ Impact to Project: Operation	$ Impact to Municipality: Capital	$ Impact to Municipality: Operation	Potential cost impact narrative
EPc5 Steep slope preservation - Minimize erosion to protect habitat, and reduce stress on natural water systems, by preserving steep slopes in a natural, vegetated state.			1					Not pursued
EPc6 Minimize site disturbance during construction - Conserve existing natural areas and protect trees to provide habitat and promote biodiversity.	1			Small cost increase/unit	Small cost increase/unit	Neutral	Neutral	Buildings on site targeting construction sedimentation controls
EPc7 Minimize site disturbance through site design - Preserve existing tree canopy, native vegetation and pervious surfaces while encouraging high density, smart growth communities.	1			Small cost increase/unit	Neutral	Neutral	Neutral	Not pursued
EPc8 Maintain storm water runoff rates - Reduce stormwater pollution, prevent flooding, and promote aquifer recharge.	1			Small cost increase/unit	Large cost increase/unit	Neutral	Large cost decrease/unit	Can be incorporated into buildings on site by targeting rainwater harvesting
EPc9 Reduce storm water runoff rates - Reduce stormwater pollution, prevent flooding, and promote aquifer recharge.	1			Large cost increase/unit	Large cost increase/unit	Neutral	Large cost decrease/unit	Can be incorporated into buildings on site by targeting rainwater harvesting
EPc10 Storm water treatment - Reduce surface water pollution from stormwater.	2			Large cost increase/unit	Large cost increase/unit	Neutral	Large cost decrease/unit	Can be incorporated into buildings on site by targeting rainwater harvesting
EPc11 Outdoor hazardous waste pollution prevention - Reduce stormwater pollution from the use of pesticides and fertilizers.	1			Neutral	Small cost decrease/unit	Neutral	Neutral	Investment in pest resistant landscaping would reduce ongoing landscaping costs
Compact, Complete, & Connected Neighborhoods								
CCCNp1 Open community - Promote developments that are good neighbors to their surrounding communities. Foster a sense of community and connectedness beyond the development.	Y			Neutral	Neutral	Neutral	Neutral	
CCCNp2 Compact development - Conserve land. Promote livability, transportation efficiency, and walkability.	Y			Large cost decrease/unit	Neutral	Neutral	Large cost decrease/unit	Increased density allows more unit revenue and increase tax base
CCCNp3 Diversity of uses - Promote community livability, transportation efficiency, and walkability.	Y			Small cost increase/unit	Neutral	Neutral	Small cost decrease/unit	Optimizing use of existing city services
CCCNc1 Compact development - Conserve land. Promote community livability, transportation efficiency, and walkability.	5			Large cost decrease/unit	Neutral	Neutral	Large cost decrease/unit	Increased density allows more unit revenue and increase tax base
CCCNc2 Transit-oriented compactness - Maximize walking trips to and from transit stops in the area immediately surrounding the transit stop.	1			Neutral	Neutral	Large cost decrease/unit	Large cost decrease/unit	Optimize use of existing public transit system
CCCNc3 Diversity of uses - Promote community livability, transportation efficiency, and walkability.	3			Small cost increase/unit	Neutral	Neutral	Small cost decrease/unit	Optimizing use of existing city services
CCCNc4 Housing diversity - To enable citizens from a wide range of economic levels and age groups to live within a community.	4			Small cost increase/unit	Neutral	Small cost increase/unit	Neutral	Increased construction cost due to variability in unit layout. Low income housing subsidy provided by municipality
CCCNc5 Affordable rental housing - To enable citizens from a wide range of economic levels and age groups to live within a community.	1		1	Small cost increase/unit	Neutral	Small cost increase/unit	Neutral	Increased construction cost due to variability in unit layout. Low income housing subsidy provided by municipality
CCCNc6 Affordable for-sale housing - To enable citizens from a wide range of economic levels and age groups to live within a community.	2			Small cost increase/unit	Neutral	Neutral	Neutral	Pending market conditions
CCCNc7 Reduced parking footprint - Reduce stormwater runoff per capita. Encourage neighborhood walkability and promote public health through physical activity.	2			Large cost decrease/unit	Small cost decrease/unit	Neutral	Small cost decrease/unit	Assume reduction in number of parking stalls required
CCCNc8 Community outreach and involvement - To encourage community participation in the project design and planning and involve the people who live in a community in deciding how it should be improved or how it should change over time.	1			Small cost increase/unit	Neutral	Small cost increase/unit	Neutral	Additional consulting and design
CCCNc9 Block perimeter - To promote connectivity.	3		1	Neutral	Neutral	Neutral	Neutral	
CCCNc10 Locating buildings to shape walkable streets - Encourage pedestrian-oriented streets.	1			Neutral	Neutral	Neutral	Neutral	

Cost impact relative to typical urban residential development

Large cost increase/unit	Neutral
Small cost increase/unit	Small cost decrease/unit
	Large cost decrease/unit

LEED-ND Characteristic Title	LEED Targets Y	?	N	$ Impact to Project Capital	Operation	$ Impact to Municipality Capital	Operation	Potential cost impact narrative
CCCNc11 Designing buildings access to shape walkable streets - Encourage pedestrian-oriented streets.	1							Additional design costs
CCCNc12 Designing buildings to shape walkable streets - Encourage pedestrian-oriented streets.	1							
CCCNc13 Comprehensively designed walkable streets - Encourage pedestrian-oriented streets.	1		1					
CCCNc14 Street network - Provide direct and safe connections, for pedestrians and bicyclists as well as drivers, to local destinations and neighborhood centers. Promote public health though increased physical activity.	1							Assume road widths are reduced and overall site density increases
CCCNc15 Pedestrian network - Provide direct and safe connections, for pedestrians to local destinations and neighborhood centers. Promote public health though increased physical activity.	1							Modest increase in site development
CCCNc16 Maximize pedestrian safety and comfort - Provide direct, safe, and comfortable connections, for pedestrians and bicyclists, to local destinations and neighborhood centers. Promote public health though increased physical activity.	1							
CCCNc17 Superior pedestrian experience - Provide appealing and comfortable pedestrian street environments in order to promote pedestrian activity.			2					Not pursued
CCCNc18 Applying regional precedents in Urbanism and Architecture - Promote energy savings, respond to regional climate, increase the life of buildings and materials, provide cultural continuity, and reinforce local distinctiveness.			1					Not pursued
CCCNc19 Transit subsidy - Reduce energy consumption and pollution from motor vehicles by encouraging use of public transit.			3					Not pursued
CCCNc20 Transit amenities - Reduce energy consumption and pollution from motor vehicles by encouraging use of public transit.			1					Not pursued
CCCNc21 Access to nearby communities - Provide direct and safe connections, for pedestrians and bicyclists as well as drivers, to local destinations and neighborhood centers. Promote public health by facilitating walking and bicycling.	1							
CCCNc22 Adaptive reuse of historic buildings - Encourage use of historic buildings in a manner that preserves their historic materials and character.			2					Not pursued
Resource Efficiency								
REc1 Certified green buildings - Encourage the design and construction of buildings to utilize green building practices.	4		1					Increase in building costs/ reduced municipal service load
REc2 Energy efficiency in buildings - Encourage the design and construction of energy efficient buildings to reduce air, water, and land pollution and environmental impacts from energy production and consumption.	3							Increase in building costs/ reduced municipal service load
REc3 Water efficiency in buildings - Encourage the design and construction of water efficient buildings to reduce the environmental impacts from water consumption.	2							Increase in building costs/ reduced municipal service load
REc4 Heat island reduction - Reduce heat island effect to minimize impact on microclimate, human and wildlife habitat, and required energy for cooling.	1							U/G parking included in base
REc5 Infrastructure energy efficiency - Reduce air, water, and land pollution from energy consumption.			1					Not pursued
REc6 On-site power generation - Reduce air, water, and land pollution from energy consumption and production by increasing the efficiency of the power delivery system. Increase the reliability of power.			1					Not pursued

Cost impact relative to typical urban residential development

- Large cost increase/unit
- Small cost increase/unit
- Neutral
- Small cost decrease/unit
- Large cost decrease/unit

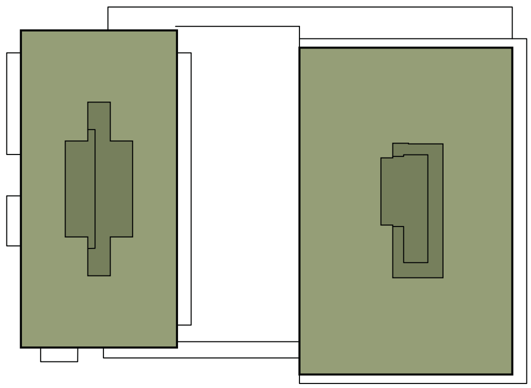
	LEED Targets			$ Impact to Project		$ Impact to Municipality		
LEED-ND Characteristic Title	**Y**	**?**	**N**	**Capital**	**Operation**	**Capital**	**Operation**	**Potential cost impact narrative**
REc7 On-site renewable energy sources - Reduce environmental impacts associated with fossil fuel energy generation by increasing the use of on-site renewable energy sources.			1					Not pursued
REc8 Efficient irrigation - Conserve potable water.	1							Buildings on site could target rainwater harvesting & drip irrigation
REc9 Grey water & storm water reuse - Conserve potable water.	2							Buildings on site could target rainwater harvesting & drip irrigation
REc10 Wastewater management - Reduce pollution from wastewater and reuse nutrients from the wastewater stream.	1							
REc11 Reuse of materials - Promote reuse of materials and resources.	1							Demolition material used as aggregate in new buildings
REc12 Recycled content - Promote use of recycled materials.	1							Demolition material used as aggregate in new buildings
REc13 Regionally provided materials - Promote selection of regionally available materials and resources to build local economy and reduce embodied energy.	1							Buildings on site could target with minimal cost impact
REc14 Construction waste management - Promote efficient use of solid waste by diverting construction, demolition and land clearing debris from landfill disposal, and by redirecting resources for recycling and reuse.	1							Buildings on site targeting
REc15 Comprehensive waste management - Promote safe and efficient disposal or reuse of waste streams generated by occupants.	1							Buildings on site could target
REc16 Light pollution reduction - Reduce light pollution.	1							Buildings on site could target
REc17 Contaminant reduction in brown fields remediation - Encourage brown fields cleanup methods that reduce contaminant volume or toxicity and thereby minimize long-term remediation or monitoring burdens.			1					Not pursued
Other								
Accredited professional Innovation Credits	2							LEED AP on design team - additional consulting excluded
Innovation in design	3		1					TBD
Total LEED Points	**85**	**0**	**29**					

Certified 46 - 56 Points
Silver 57 - 67 Points
Gold 68 - 90 Points
Platinum 91 - 114 Points

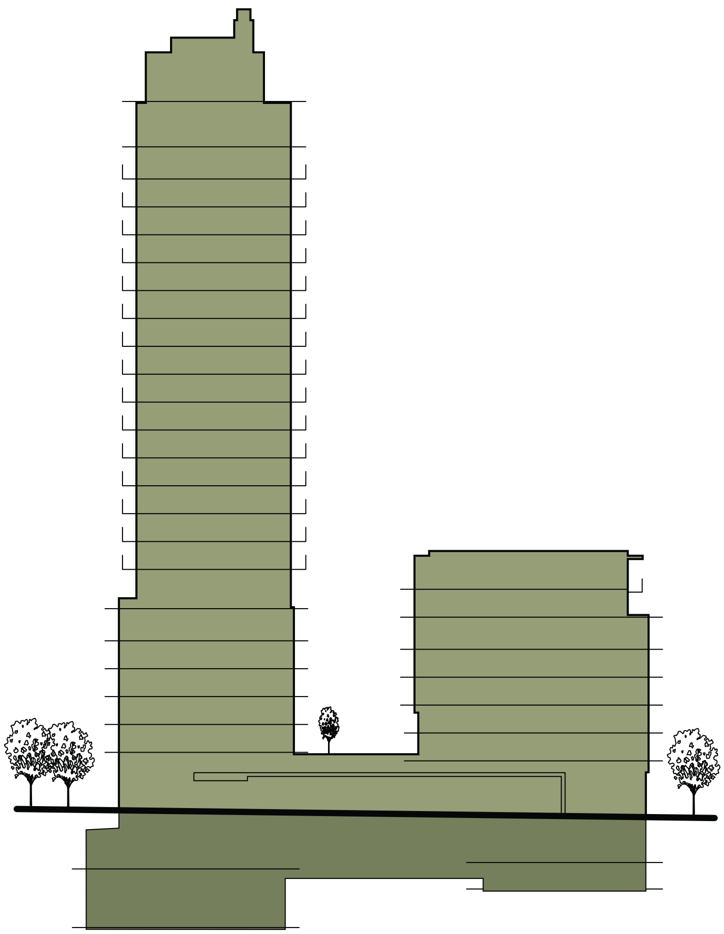
Appendix B

Multi-unit Residential Buildings Case Study Analysis Back-up

b1.1 Project Diagrams and Overview



Typical Floor Plan Diagram



Building Section Diagram

Ref.	Design Criteria/Characteristics			b1 Residential Case Study	Key Indicators
1.00	**Project Statistics**				
1.01	Location			Toronto, Ontario	
1.02	Gross Livable Area (m2 GLA)			21,332	
1.03	Stories	Parking		3	
1.04		Tower A		8	
1.05		Tower B		22	
1.06	Number of suites			221	
2.00	**Construction Cost Estimate**				
2.01	Below Grade (parking/basement)			$3,465,000	
2.02	Podium			$3,316,000	
2.03	Residential Floors Tower A			$9,167,000	
2.04	Residential Floors Tower B			$18,463,000	
2.05	Site Development			$593,000	
2.06	**Subtotal Excluding Contingencies**			**$35,004,000**	
2.07	Design Contingency/Allowance			$1,750,000	
2.08	Escalation Contingency			$0	
2.09	Post Contract			$1,050,120	
2.10	**Total Construction Cost (Excl. GST)**			**$37,804,120**	
2.11			**$/m2 (GLA)**	**$1,772**	
3.00	**Estimated LEED Cost Increment (Included above)**				
3.01	$ Budget			$3,983,000	
3.02	$/m2			$187	
3.03	$/credit			$90,523	
3.04	**% increase**			**11.8%**	
4.00	**Exterior Enclosure (Overall System)**				
4.01	Wall R-Value			R-17	
4.02	Roof R-Value			R-20	
4.03	Glazing U-factor / SHGC / visible light trans.			1.00/0.26/0.50	
4.04	Amount of glazing (% of building skin area)			60%	
5.00	**Building Environmental Performance**				
5.01	Energy Intensity (Base/LEED)		KWh/m2/a	349/155	
5.02	Percent of MNECB baseline			58.9% MNECB	
5.03	Water use (Base/LEED)		L/m2/a		
5.04	Percent water reduction			30%	
5.05	Greenhouse Gas reduction		tonnes CO2/a	787.9	
5.06			tonnes CO2/a/unit	3.57	

b1.2 Project Statistics

Ref.	Item	Unit	Case Study Value	Industry Standard Value	Key Indicators
1.00	**Project Totals**				
1.01	Below Grade Area (GPA)	sf	68,372	186,234	
1.02	GLA	sf	228,387	393,275	
1.03	GFA (TCA)	sf	296,759	579,509	
1.04	# Levels Below Grade	no	3	3	
1.05	# Towers	no	2	1	
1.06	# Floors Tower A/Tower B	no	22/8	27	
1.07	# Suites	no	224	384	
1.08	# Parking	no	90	454	
1.09	# Lockers	no	-	335	
1.10	Site Area	sf	11,260	80,238	
2.00	**Below Grade (Including CHP Shell Space)**				
2.01	Total Area Parking	sf	68,372	186,234	
2.01.01	Net Parking Area (incl. Circulation)	sf	36,651	168,926	
2.01.02	Service / Mechanical	sf	30,623	7,200	
2.01.03	Lockers / Storage	sf	1,098	10,107	
2.01.04	Amenity	sf	0	-	
2.02	Stalls	no	90	454	
2.03	No. of levels	no	3	3	
2.04	Gross Parking Area / Stall	sf	760	410	
2.05	Net parking area / Stall	sf	407	372	
2.06	Stalls / Unit	no	0.40	1.18	
2.07	Exterior Wall Area	sf	87,552	31,744	
2.08	Exterior wall / GPA (Below Grade)	ratio	1.28	0.17	
2.09	Excavation Volume	m3	24,548	58,653	
2.10	Excavation/Parking Area ratio (M3/M2)	m3/m2	2.79	3.18	
2.11	Below Grade (GPA) / Total Construction Area(TCA)	ratio	0.23	0.32	
2.12	# Elevator Cabs	no	4	4	
2.13	# Elevator Stops	no	78	108	
3.00	**Above Grade**				
3.01	Total Above Grade Area (GLA)	sf	228,387	393,275	
3.01.01	Residential - High Rise	sf	109,727	326,598	
3.01.02	Residential - Low Rise	sf	59,492	-	
3.01.03	Retail /Commercial	sf	0	-	
3.01.04	Amenity	sf	12,884	10,202	
3.01.05	Storage / Lockers	sf	0	-	
3.01.06	Service Areas (mechanical/electrica	sf	17,082	10,185	
3.01.07	Circulation	sf	29,202	46,290	
3.02	Net saleable area	sf	169,219	326,598	
3.05	**Suite Breakdown**				
3.05.01	Bachelor / Studio	no	0	5	
3.05.02	1 bedroom	no	149	62	
3.05.03	1 bedroom + Den	no	8	100	
3.05.04	2 bedroom	no	34	117	
3.05.05	2 bedroom + Den / Study	no	2	85	
3.05.06	3 bedroom	no	20	8	
3.05.07	3 bedroom + Den	no	6	6	
3.05.08	4 bedroom + den	no	5	0	
3.05.09	Penthouse	no	0	3	
3.06	No. of units	no	224	384	
3.07	GLA / Unit	sf	490	850	
3.08	2 bedroom / 1 bedroom Ratio		0.23	1.25	

Ref.	Item	Unit	Case Study Value	Industry Standard Value	Key Indicators
3.12	**Floors**				
3.12.01	No. of Floors - Tower 1 / Tower 2	no	22/8	27	
3.12.02	Typical floor to floor height	lf	9.51	8.71	
3.12.03	Window Area	sf	102,160	94,324	
3.12.04	Exterior wall area	sf	115,571	164,848	
3.12.05	Exterior wall / GLA (Above Grade)		0.51	0.42	
3.12.06	# Elevator Cabs	no	4	4	
3.12.07	# Elevator Stops	no	78	**108**	
3.13	**Saleable**				
3.13.01	Total Saleable Area	sf	109,727	326,598	
3.13.02	Residential	sf	109,727	326,598	
3.13.03	Retail/Commercial	sf	0	**0**	
3.14	**Statistical Efficiency Ratios**				
3.15	Building Efficiency (Net Saleable / GLA)	ratio	0.48	0.83	
3.16	Typical floor Efficiency (Net Saleable / GLA)	ratio	0.89	0.89	
3.17	Average Selling Area/Unit (Average Unit Size)	sf	490	850	
3.18	Exterior wall / Net Saleable Area (Above Grade)	ratio	1.05	0.50	
3.19	Window / Ext.wall ratio	ratio	0.88	0.57	
3.22	Retail ratio - (Retail area / GLA)	ratio	0.00	0.00	
3.23	GFA / Unit	sf	1,325	**1,508**	
3.26	**Construction Ratios**				
3.27	Formwork contact area	m2	697,815	1,078,230	
3.28	Concrete volume (including Waste)	m3	9,245	20,332	
3.29	Rebar Weight	kg	1,256,734	1,905,831	
3.30	Rebar / Concrete Volume ratio	kg/m3	135.9	93.7	
3.31	Rebar / GLA	kg/m2	5.50	4.85	
3.32	Rebar / GFA	kg/m2	4.23	3.29	
3.33	Formwork / GFA	m2/m3	2.35	1.96	
3.34	Concrete / GFA	m3/m2	0.34	0.38	
3.35	Concrete / GLA	m3/m2	0.44	0.56	
3.36	Number of fan coils/heat pump units	no	276	489	
3.37	Fan Coils / unit, heat pumps/unit	no	1.23	1.27	
3.38	Net saleable area per Fan coil	sf	398	**668**	
4.00	**Site**				
4.01	Gross Site Area (55768sf)	acre	0.26	1.84	
4.02	Site Density (UPA)	unit/acre	868.71	209	
4.03	Site Area/Unit	sf	50.27	**208.73**	
5.00	**Construction Cost (Including CHP Shell Space)**				
6.00.01	Below Grade Cost	$	$5,241,000	$8,965,725	
6.00.02	Above Grade Cost (Incl Site Work)	$	$27,360,000	**$39,513,933**	
6.01	**Total Cost**	$	**$32,601,000**	$48,479,658	
6.02	Cost / Stall	$/Unit	$58,233.33	$19,759	
6.03	Cost / GLA	$/sf	$142.74	$123	
6.04	Cost / GFA	$/sf	$109.86	$84	
6.05	Cost / Unit	$/Unit	$145,540.18	$126,112	
6.06	Cost / Saleable Area	$/sf	$297.11	$148	

b1.3 Project Narrative - By Building Element

A1 Sub-Structure

Parking Garage
Standard Condo
• Conventional foundations with spread footing.
• Shoring to all sides.
• Allowance for dewatering. Under slab and perimeter drainage.
• Allowance for obstructions during excavation.

LEED Initiatives:
• Use fly-ash as partial substitute of Portland cement in concrete mix
• Use portion of slag as aggregate for concrete mix.

A2 Structure

Parking Garage
Standard Condo
• Reinforced concrete structure with columns
• Pre-cast exit stairs
• Ground floor slab above parking garage included in Parking estimate

LEED Initiatives:
• Use fly-ash as partial substitute of Portland cement in concrete mix
• Use slag as aggregate for concrete mix.
• Use of rebar with recycled content

Condo Building
Standard Condo
• Concrete slab on grade.
• Reinforced concrete structure with columns and shear walls.
• Transfer beams at ground level.
• Pre-cast exit stairs ground floor to roof.

LEED Initiatives:
• Use fly-ash as partial substitute of Portland cement in concrete mix
• Use slag as aggregate for concrete mix.
• Use of rebar with recycled content

A3 Exterior Enclosure

Parking Garage
Standard Condo
• Cast in place concrete perimeter basement wall.
• Overhead garage door and insulated hollow metal doors and frames.
• Ground floor slab over parking garage included in Parking estimate

LEED Initiatives:
• Use fly-ash as partial substitute of Portland cement in concrete mix
• Use slag as aggregate for concrete mix.
• Use of rebar with recycled content
• Two doors with vestibule provided at all doors into the parking garage

Standard Condo
Walls
• Architectural brick veneer (metric module size) wall with drywall / concrete wall back up.
• Prefinished metal clad wall with drywall/concrete wall back up.
• Window wall system with Low-E coating and operable awning type sections
• Insulated hollow metal doors and frames.
Roof
• Built-up insulated roof finish.

LEED Initiatives:
Walls
• Increase thermal performance of wall assemblies including details to minimize thermal bridging
• Provide minimum of R-6 over all structural members
• Increase thermal performance of window assemblies to include 19mm thermal break, 38mm triple glazing with 2 soft coat low-E coatings, argon and warm edge spacers, overall u value 1.25
• Recycled content specified for aluminum framing
• Two doors with vestibule provided at all exterior doors including doors into the parking garage

• Allowance for additional air and water leakage testing of sample units
• Allowance for durable building details and construction methods
• Allowance for Low VOC Materials
Roof
• Inverted roof fully adhered to structural deck
• Extensive green roof system
•Allowance for additional water leakage testing
• Allowance for durable building details and construction methods
• Allowance for Low VOC materials inside of air barrier
• Increase thermal performance of wall assemblies to overall R-17
• Increase spandrel panel insulation to R-12

B1 Partitions and Doors

Parking Garage

Standard Condo
• Concrete shear wall, concrete block walls and drywall partitions.
• Fire rated Hollow metal doors

LEED Initiatives:
• Recycled content specified for Gypsum board
• Recycled content specified for steel framing

Condo Building

Standard Condo
• Concrete shear wall, concrete block walls and drywall partitions.
• Fire rated stairwell doors. Solid core suite entry doors.
• Hollow core wood interior doors.
• Hard board sliding closet doors
• Hollow metal doors and solid core wood doors to common areas.

LEED Initiatives:
• Power operators on doors to Laundry room, common washrooms, all doors leading from entrance or elevator to above rooms
• Power outlet for barrier-free accessible units located inside, above the door head to accommodate future power operator
• Floor sweep and air tight seals around all suite entry doors.
• Hollow core sliding doors to closets
• 19mm plywood sheathing provided behind drywall in all suite washrooms for wall hung fixtures and grab bars
• Plywood blocking for closet shelving wall hung washroom fixtures and grab bars in all common washrooms
• Specification of FSC Certified wood
• Recycled content specified for Gypsum board
• Recycled content specified for steel framing
• Allowance for durable building details and construction methods
• Allowance for Low VOC Materials

B2 Finishes

Parking Garage

Standard Condo
• Concrete sealer to slab on grade and traffic topping to parking garage suspended slabs.
• Painted concrete soffit to garage with insulated drywall to underside of podium

Condo Building

Standard Condo
Floors
• Carpet/wood floor to Amenity areas.
• Premium plank laminate wood floor to foyer, living, dining, den/kitchen.
• Ceramic floor tiles to washrooms, and showers. Ceramic to laundry & garbage chute.
• Carpet to bedrooms in town homes and towers.
Ceilings
• Suspended drywall ceiling to kitchen, and bath. Suspended drywall ceiling to Corridors, amenity rooms, lobby to tower.
• Sprayed texture to concrete soffit in suites.
Walls
• Paint to drywall and concrete block walls.
• Vinyl wall covering to corridors.
• Ceramic tile to tub and shower surrounds in suites.
• Paint finish, contemporary styled baseboards and door casing to suites.

LEED Initiatives:

• Engineered wood flooring in place of laminate and carpeting
• Acoustical/thermal underlayment where radiant ceiling heating/cooling used (Tower B).
• Linoleum sheet flooring in place of VCT tile
• Specification of FSC Certified wood
• Allowance for durable building details and construction methods
• Allowance for Low VOC Materials
• Materials that have recycled and/or post consumer/industrial content.
• Materials that have FSC wood content
• Materials that have been manufactured and/or harvested regionally.

B3 Fittings and Equipment

B31 Fittings and Fixtures

Parking Garage
Standard Condo
• Allowance for storage lockers at parking garage.

LEED Gold Initiatives:
• None

Condo Building
Standard Condo
• Medium quality washroom accessories to bathrooms
• Kitchen cabinets with granite counter tops and vanities with cultured marble counter tops.
• $500,000 Allowance

LEED Gold Initiatives:
• Low VOC millwork
• Acrylic solid-surface counter tops
• Specification of FSC Certified wood
• Allowance for durable building details and construction methods

B32 Equipment

Parking Garage
• None

Condo Building
Standard Condo
• Allowance for 1no Garbage compactor and garbage bins.
• Allowances of $3,000 for five appliances per suite in tower units and six appliances per suite in town homes.
• Allowances for window washing roof anchors.
• Allowance for exercise equipment

LEED Gold Initiatives:
• High efficiency refrigerator, and cloths washer in tower suites and town homes
• High efficiency dishwasher in town homes

B33 Conveying Systems

Parking Garage
Standard Condo
• 4 nos x 3 stop = 12 stop passenger elevators to parking garage

LEED Gold Initiatives:
• None

Condo Building
Standard Condo
• Building A: 2nos x 11 stop = 16 stop passenger elevators to Tower/podium
• Building B: 2nos x 25 stop = 50 stop passenger elevators to Tower/podium

LEED Initiatives:
• None

C1 Mechanical

Parking Garage
Standard Condo
• Parking garage areas to be sprinklered.

LEED Initiatives:
• Allowance for CO controlled ventilation

Condo Building
Standard Condo
• Medium quality plumbing fixtures.
• Residential floors to have full standpipe cover-

age.
• Make up air units
• Vertical 2-pipe fan-coil unit in each suite
• Kitchen and washroom exhaust directly vented
• Microwave with built-in hood fan (cost included in architectural)
• A gas hot water boiler provides domestic hot water
• Gas fired building heating

EXCLUDED
• Allowance for storm water retention tank and grey water piping
• Allowance for water softener
• Allowance for green roof irrigation
• Allowance for CO2 demand control
• Individual suite metering
• Heat recovery ventilator
• Suite dishwasher rough-ins

LEED Initiatives:
• Dual flush toilets in suites
• Domestic hot water supplied by CES
• Allowance for domestic booster pump
• Allowance for duplex sanitary and storm pump
• Common area electronic faucet lavatory and low flow urinal
• Allowance for rough-ins for common area laundry
• Building heating and chilled water supply by CES
• Allowance for tie in to incoming services and metering corridor fresh air unit with HRV
• Variable frequency drives
• Common area fan coil unit individual heating and cooling metering for suite
• Allowance for silencers
• Allowance for glycol snow melting system
• Allowance for DDC controls on major equipment
• Medium/high quality plumbing fixtures
• Low-flow lavatory and shower heads
• Allowance for storm water retention tank and grey water piping
• Individual suite water metering
• Allowance for water softener
• Allowance for green roof irrigation
• Allowance for silencers and duct insulation

EXCLUDED
• Same as above

C2 Electrical

Parking Garage
Standard Condo
• Incoming power service connected to the local hydro authority.
• Lighting and power as per standard condo parking garage specifications.
• Fire alarm system provided.
• Security system is included

LEED Initiatives:
• Lighting control system
• Occupancy sensors in corridors and stair cases

Condo Building
Standard Condo
• Medium quality lighting fixtures
• Suite devices are assumed to be standard condominium quality
• Building access control system is included
• Digital metering is included
• Lighting control system is included
• Allowance for glycol snow melting system
• Allowance for tie in to incoming services

EXCLUDED
• Hydro charges
• Communication cables – are provided by local provider
• Lighting protection
• H.V. substation
• Suite security system
• TPA requirements in the parking garage
• In slab heating and cooling
• Variable frequency drives
• DDC controls on major equipment

LEED Gold Initiatives:
• Connection to common area electronic faucet lavatory and urinal controls

• Allowance for rough-ins for common area laundry
• Medium/High quality lighting fixtures
• Perimeter lighting photo control
• Occupancy sensors in corridors/stair cases and amenity
• Efficient lighting design in amenity, corridors, suites, and bedrooms
• Daylight sensors for lighting in common areas
• Suite master switch

EXCLUDED
• Same as above

D1 Site Development

Standard Condo
• Allowances for site development includes unit pavers, concrete paving and soft landscaping, site improvements.
• Allowance made for Mechanical site services.
• Allowance made for Electrical site services.

LEED Initiatives:
• Size parking to meet but not exceed local bylaw requirements
• Reduce site disturbance to vicinity immediately around proposed building footprint and site work completed
• Provide storm water retention cistern for sewage conveyance and site irrigation
• Atlantis storm water management filtration system
• Grey water irrigation
•Adaptive species landscaping
• Limit the amount of light trespass from the site and limit up lighting to enhance night sky and nocturnal environs
• Perimeter lighting photo control
• Erosion and sedimentation control documentation and implementation
• Atlantis rainwater infiltration/detention system

D2 Ancillary Work

• None

b1.4 Project Cost Summary

Construction Cost Item		GFA(M2)	Total Project Excluding LEED & Central Heating Plant (CHP) $ Budget	$/m2	Total Project Including LEED Excluding Central Heating Plant (CHP) $ Budget	$/m2	No. Units/ Spaces	$ /Unit	% increase	Key incremental cost factors
U/G Parking - 2 levels		3,453	$3,465,000	$1,003	$3,465,000	$1,003	89	$38,900	0.0%	
U/G Central Plant Shell Space - 3 levels		-	Excluded	-	Excluded	-	-	-	-	
U/G Central Plant Shell Equipment		-	Excluded	-	Excluded	-	-	-	-	
Podium - 2 Storey		2,640	$3,046,000	$1,154	$3,316,000	$1,256	4	$829,000	8.9%	Additional requirements of LEED
Residential Floors - South Tower - 7 Storey		6,421	$8,094,000	$1,261	$9,167,000	$1,428	61	$150,300	13.3%	Additional requirements of LEED
Residential Floors - North Tower - 21 Storey		12,271	$16,172,000	$1,318	$18,368,000	$1,497	156	$117,700	13.6%	Additional requirements of LEED
Site Development - Allowance		1,046	$546,000	$522	$593,000	$567	221	$2,700	8.6%	Additional requirements of LEED
General Conditions - LEED		21,332	n/a	-	$95,000	$4	221	$400	-	
Subtotal Construction Costs		21,332	$31,315,000	$1,468	$35,004,000	$1,641	221	$158,400	11.8%	
Design Contingency-Allowance	5.0%	21,332	$1,565,750	$73	$1,750,200	$82	221	$7,900	11.8%	Contingency on incremental costs
Subtotal - GLA (including Design Allowance)		21,332	$32,880,800	$1,541	$36,754,200	$1,723	221	$166,300	11.8%	
Escalation Contingency	0.0%	21,332	$0	$0	$0	$0	221	$0	0.0%	
Post-contract Construction Contingency	3.0%	21,332	$939,450	$44	$1,050,120	$49	221	$4,800	11.8%	Contingency on incremental costs
Total Construction Costs		**21,332**	**$33,820,000**	**$1,585**	**$37,804,000**	**$1,772**	**221**	**$171,100**	**11.8%**	
Project Soft Costs										
Land (Reality taxes only)		-	Excluded	-	Excluded	-	-	-	-	
Municipal Fees		-	Excluded	-	Excluded	-	-	-	-	
Construction (Excluded above)		-	Excluded	-	Excluded	-	-	-	-	
Design Consultants		-	Excluded	-	Excluded	-	-	-	-	
General and Administrative		-	Excluded	-	Excluded	-	-	-	-	
Furniture Fixtures and Equipment		-	Excluded	-	Excluded	-	-	-	-	
Marketing and Sales		-	Excluded	-	Excluded	-	-	-	-	
Finance		-	Excluded	-	Excluded	-	-	-	-	
Interim Building Operations		-	Excluded	-	Excluded	-	-	-	-	
Government Taxes		-	Excluded	-	Excluded	-	-	-	-	
Development Contingency		-	Excluded	-	Excluded	-	-	-	-	
Total Soft Costs		-	Excluded	-	Excluded	-	-	-	-	
Total Project Budget		**21,332**	**$33,820,000**	$1,585	**$37,804,000**	$1,772	**221**	**$171,100**	11.8%	

Notes
1. GST is excluded
2. Removal of any contaminated material and abnormal soil conditions are excluded
3. Any construction cost escalation beyond January 2007 has been excluded
4. LEED consulting costs are Excluded

b1.5 Elemental Cost Summary - Total Project

Gross Livable Area (GLA): 21,332 m2

Element		Elemental Amount	Cost/m2	Total	%	Elemental Amount	Cost/m2	Total	%	LEED % increase	Key Incremental Cost Factor
		Total Project Excluding LEED & Central Heating Plant (CHP)				Total Project Including LEED Excluding Central Heating Plant (CHP)					
A SHELL											
A1 SUBSTRUCTURE			$47.97				$82.98				
A11 Foundation		$322,170	$15.10			$322,170	$26.12				
A12 Basement Excavation		$701,150	$32.87	$1,023,320	3.0%	$701,150	$56.86	$1,023,320	2.7%	0.0%	
A2 STRUCTURE			$227.21				$393.03				
A21 Lowest Floor Construction		$71,672	$3.36			$71,672	$5.81				
A22 Upper Floor Construction		$3,617,233	$169.57			$3,617,233	$293.32				
A23 Roof Construction		$1,157,906	$54.28	$4,846,811	14.3%	$1,157,906	$93.89	$4,846,811	12.8%	0.0%	
A3 EXTERIOR ENCLOSURE			$239.92				$553.41				
A31 Walls Below Grade		$301,257	$14.12			$301,257	$24.43				
A32 Walls Above Grade		$441,027	$20.67			$448,109	$36.34				Increase thermal performance of building envelope
A33 Windows & Entrance		$3,199,121	$149.97			$4,877,376	$395.51				Increase thermal performance of glazing
A34 Roof Covering		$283,320	$13.28			$288,640	$23.41				
A35 Projections		$893,227	$41.87	$5,117,952	15.1%	$909,286	$73.73	$6,824,668	18.1%	33.3%	
B INTERIORS											
B1 PARTITIONS & DOORS			$205.46				$355.40				
B11 Partitions		$3,666,556	$171.88			$3,666,556	$297.32				
B12 Doors		$716,265	$33.58	$4,382,821	13.0%	$716,265	$58.08	$4,382,821	11.6%	0.0%	
B2 FINISHES			$120.58				$224.32				
B21 Floor Finishes		$1,460,264	$68.45			$1,602,321	$129.93				Low VOC specification
B22 Ceiling Finishes		$446,805	$20.95			$455,189	$36.91				Low VOC specification
B23 Wall Finishes		$665,250	$31.19	$2,572,319	7.6%	$708,846	$57.48	$2,766,356	7.3%	7.5%	Low VOC specification
B3 FITTING & EQUIPMENT			$175.04				$308.58				
B31 Fitting & Fixtures		$1,713,950	$80.35			$1,785,350	$144.77				
B32 Equipment		$876,000	$41.07			$876,000	$71.03				
B33 Conveying Systems		$1,144,000	$53.63	$3,733,950	11.0%	$1,144,000	$92.77	$3,805,350	10.1%	1.9%	
C SERVICES											
C1 MECHANICAL			$192.57				$405.37				
C11 Plumbing & Drainage		$1,505,447	$70.57			$1,743,120	$81.71				Low-flow plumbing fixtures
C21 Fire Protection		$411,722	$19.30			$453,679	$21.27				
C13 HVAC		$2,108,697	$98.85			$2,711,874	$127.13				Energy saving equipment
C14 Controls		$81,988	$3.84	$4,107,854	12.1%	$90,343	$4.24	$4,999,016	13.2%	21.7%	DDC controls for major equipment
C2 ELECTRICAL			$100.02				$201.10				
C21 Service & distribution		$1,546,060	$72.48			$1,770,758	$143.59				
C22 Lighting, Devices & Heating		$587,557	$27.54			$709,256	$57.51				
C23 Systems & Ancillaries		$0	$0.00	$2,133,617	6.3%	$0	$0.00	$2,480,014	6.6%	16.2%	
NET BUILDING COST (Excluding Site)			$1,308.77	$27,919,000	82.5%		$2,524.19	$31,128,000	82.3%	11.5%	
D SITE											
D1 SITE WORK			$23.23				$43.63				
D11 Site Development		$306,717	$14.38			$306,717	$24.87				Rainwater harvesting system for irrigation
D12 Mechanical Site Services		$117,500	$5.51			$160,000	$12.97				Drip irrigation in lieu of standard sprinklers
D13 Electrical Site Services		$71,360	$3.35	$495,577	1.5%	$71,360	$5.79	$538,077	1.4%	8.6%	
D2 ANCILLARY WORK			$0.00				$7.70				
D21 Demolition		$0	$0.00			$0	$7.70				
D22 Alterations		$0	$0.00	$0	0.0%	$0	$0.00	$0	0.0%	0.0%	
NET BUILDING COST (Including Site)			$1,332.00	$28,415,000	84.0%		$2,575.53	$31,666,000	83.8%	11.4%	
Z MARKUPS											
Z1 GENERAL REQUIREMENTS	9.5%		$136.00			$95,000	$262.96				
Z11 General Requirements	9.5%	$1,989,000	$93.24			$2,223,300	$180.29				
Z12 Fee	0.0%	$912,100	$42.76	$2,901,100	8.6%	$1,019,500	$82.67	$3,337,800	8.8%	15.1%	Additional documentation related to LEED
TOTAL CONSTRUCTION ESTIMATE (Excluding Contingencies)			$1,468.00	$31,316,000	92.6%		$2,838.49	$35,004,000	92.6%	11.8%	
Z2 CONTINGENCIES	6.0%		$117.44				$227.08				
Z21 Design Contingency	1.0%	$1,565,800	$73.40			$1,750,200	$141.92				
Z22 Escalation Contingency	2.5%	$0	$0.00			$0	$0.00				
Z23 Construction Contingency	2.5%	$939,500	$44.04	$2,505,300	7.4%	$1,050,100	$85.15	$2,800,300	7.4%	11.8%	Contingency on incremental costs
GOOD & SERVICES TAX	0%	$0	$0.00	$0	0.0%	$0	$0.00	$0	0.0%	0.0%	
TOTAL CONSTRUCTION ESTIMATE (Including Allowances)			$1,585.44	$33,821,000	100.0%		$3,065.56	$37,804,000	100.0%	11.8%	

		Cost/m2	Cost/m2	
GLA :	21,332 m2	$1,585.46	$1,772.17	11.8%
GLA :	229,616 sf	$147.29	$164.64	11.8%
Unit/Spa :	244 no	$138,610.66	$154,934.43	11.8%

b1.6 Trade Summary

Division			Total Project Excluding LEED & Central Heating Plant (CHP)		Total Project Including LEED Excluding Central Heating Plant (CHP)				LEED/TCHC	
			Budget	Cost/ GLA (m2)	Budget	Cost/ GLA (m2)	Cost/ Unit	% of Total	% Increase	Comments
0	Construction Management Fee		$912,096	$42.78	$1,067,143	$50.05	$4,829	2.82%	0.0%	
1	General Conditions		$1,988,995	$93.28	$2,272,161	$106.56	$10,281	6.01%	14.2%	Includes LEED documentation
2	Site Work		$1,178,989	$55.29	$1,212,012	$56.84	$5,484	3.21%	2.8%	Drip irrigation and raing water havesting
3	Concrete		$7,242,160	$339.66	$7,313,838	$343.02	$33,094	19.35%	1.0%	Durable construction details
4	Masonry		$1,074,022	$50.37	$1,094,115	$51.31	$4,951	2.89%	1.9%	Durable construction details
5	Metals		$432,650	$20.29	$432,650	$20.29	$1,958	1.14%	0.0%	
6	Carpentry		$1,942,509	$91.10	$2,009,366	$94.24	$9,092	5.32%	3.4%	Low VOC millwork
7	Thermal and Moisture Protection		$771,703	$36.19	$849,936	$39.86	$3,846	2.25%	10.1%	Increased thermal performance
8	Doors & Windows		$3,278,800	$153.78	$4,764,273	$223.44	$21,558	12.60%	45.3%	Increased thermal performance glazing
9	Finishes		$3,777,204	$177.15	$3,942,100	$184.88	$17,838	10.43%	4.4%	Low VOC finishes
10	Specialties		$248,850	$11.67	$253,950	$11.91	$1,149	0.67%	2.0%	
11	Equipment		$876,000	$41.08	$876,000	$41.08	$3,964	2.32%	0.0%	
12	Furnishings		$9,000	$0.42	$9,000	$0.42	$41	0.02%	0.0%	
13	Special Construction		$8,000	$0.38	$8,000	$0.38	$36	0.02%	0.0%	
14	Conveying Systems		$1,144,000	$53.65	$1,144,000	$53.65	$5,176	3.03%	0.0%	
15	Mechanical		$4,225,354	$198.17	$5,182,249	$243.05	$23,449	13.71%	22.6%	Increased mechanical equipment costs
16	Electrical		$2,204,977	$103.41	$2,573,330	$120.69	$11,644	6.81%	16.7%	Increased energy efficiency
Subtotal			$31,315,000	$1,468.69	$35,004,000	$1,641.69	$158,390	92.59%	11.8%	
	Design Contingency	5.0 %	$1,565,750	$73.43	$1,750,200	$82.08	$7,919	4.63%	11.8%	Contingency on incremental Costs
	Escalation Contingency	0.0 %	$0	$0.00	$0	$0.00	$0	0.00%	0.0%	
	Post Contract Contingency	3.0 %	$939,450	$44.06	$1,050,120	$49.25	$4,752	2.78%	11.8%	Contingency on incremental Costs
Subtotal			$33,820,000	$1,586.18	$37,804,000	$1,773.03	$171,061	100.00%	11.8%	
	GST (Excluded)		$0	$0.00	$0	$0.00	$0	0.00%	0.0%	
Total Project Construction Cost			**$33,820,000**	**$1,586.18**	**$37,804,000**	**$1,773.03**	**$171,061**	100.00%	11.8%	

b1.7 LEED Incremental Costing - Total Project

Total Gross Floor Area: 21,218 m2

	LEED prerequisite/credit	LEED points Y	?	N	cost factor description	quantity	Incremental from Standard Condo to LEED: unit rate	sub total	total	cost/m2 total gfa	comments
Sustainable Sites	**SSp1 Erosion & Sedimentation Control -** Control erosion to reduce negative impacts on water and air quality.	Y			None	0 m2	$0.00	$0	$0	$0.00 $0.00	Included in base - municipal requirement
	SSc1 Site Selection - Avoid development of inappropriate sites and reduce the environmental impact from the location of a building on a site.	1			None	0 m2	$0.00	$0	$0	$0.00 $0.00	Included in base
	SSc2 Development Density - Channel development to urban areas with existing infrastructure, protect green fields and preserve habitat and natural resources.	1			None	0 m2	$0.00	$0	$0	$0.00	Included in base
	SSc3 Brownfield Redevelopment - Rehabilitate damaged sites where development is complicated by real or perceived environmental contamination, reducing pressure on undeveloped land.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	Pending ESA/MOE report
	SSc4.1 Alternative Transportation: Public Transportation Access - Reduce pollution and land development impacts from automobile use.	1			None	0 m2	$0.00	$0	$0	$0.00 $0.00	Included in base
	SSc4.2 Alternative Transportation: Bicycle Storage & Changing Rooms - Reduce pollution and land development impacts from automobile use.	1			Bike racks	34 no	$150.00	$5,100	$5,100	$0.24 $0.24	53 racks shown in base building additional 34 req'd for credit
	SSc4.3 Alternative Transportation: Alternative Fuel Refueling Stations - Reduce pollution and land development impacts from automobile use.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED
	SSc4.4 Alternative Transportation: Parking Capacity - Reduce pollution and land development impacts from single occupancy vehicle use.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED
	SSc5.1 Reduced Site Disturbance: Protect or restore open space - Conserve existing natural areas and restore damaged areas to provide habitat and promote biodiversity.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED
	SSc5.2 Reduced Site Disturbance: Development Footprint - Conserve existing natural areas and restore damaged areas to provide habitat and	1			Included in SSc7.2	0 m2	$0.00	$0	$0	$0.00 $0.00	See SSc7.2
	SSc6.1 Storm water Management: Rate And Quantity - Limit disruption and pollution of natural water flows by managing storm water runoff.	1			Storm water tank, grey piping, pumps, etc	1 sum	$100,000.00	$100,000	$100,000	$4.71 $4.71	related to SSc7.2
	SSc6.2 Storm water Management, Treatment - Limit disruption of natural water flows by eliminating storm water runoff, increasing on-site infiltration and eliminating contaminants.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED
	SSc7.1 Landscape & Exterior Design to Reduce Heat Island Effect: Non-Roof - Reduce heat islands to minimize impact on microclimate and human and wildlife habitat.	1			None	0 m2	$0.00	$0	$0	$0.00 $0.00	50% U/G parking - included in base
	SSc7.2 Landscape & Exterior Design to Reduce Heat Islands: Roof - Reduce heat islands to minimize impact on microclimate and human and wildlife habitat.	1			Allowance for green roof irrigation Extensive green roof	1 sum 19 m2	$20,000.00 $280.00	$20,000 $5,320	$25,320	$1.19 $0.94 $0.25	In addition to base building requirement for roof terrace
	SSc8 Light Pollution Reduction - Eliminate light trespass from the building and site, improve night sky access and reduce development impact on nocturnal environments.	1			None	0 m2	$0.00	$0	$0	$0.00 $0.00	Included in base
Water Efficiency	**WEc1.1 Water Efficient Landscaping:** Reduce by 50% - Limit or eliminate the use of potable water for landscape irrigation.			1	Atlantis Irrigation system Increase size of storm water tank and pumps - Incl in SSc6.1	1 sum 1 sum	$70,000.00 $0.00	$70,000 $0	$70,000	$3.30 $3.30 $0.00	See SSc6.1
	WEc1.2 Water Efficient Landscaping: No potable use or no Irrigation - Limit or eliminate the use of potable water for landscape irrigation.			1	Included in WEc1.1	0 m2	$0.00	$0	$0	$0.00 $0.00	See WEc1.1
	WEc2 Innovative Wastewater Technologies - Reduce generation of wastewater and potable water demand, while increasing the local aquifer recharge.	1			Dual flush toilets (suites and amenity)	1 sum	$30,600.00	$30,600	$30,600	$1.44 $1.44	
	WEc3.1 Water Use Reduction: 20% - Maximize water efficiency within buildings to reduce the burden on municipal water supply and wastewater systems.	1			Low-flow shower heads & faucets	1 sum	$37,950.00	$37,950	$37,950	$1.79 $1.79	Included in EAc1.1
	WEc3.2 Water Use Reduction: 30% - Maximize water efficiency within buildings to reduce the burden on municipal water supply and wastewater	1			Included in WEc3.1	0 m2	$0.00	$0	$0	$0.00 $0.00	Included in EAc1.1

Total Gross Floor Area: 21,218 m2

	LEED prerequisite/credit	LEED points Y	?	N	cost factor description	quantity	Incremental from Standard Condo to LEED: unit rate	sub total	total	cost/m2 total gfa	comments
Energy & Atmosphere	EAp1 Fundamental Commissioning - Verify and ensure that fundamental building elements and systems are designed, installed and calibrated to operate as intended.	Y			None	0 m2	$0.00	$0	$0	$0.00 $0.00	Included in base
	EAp2 Minimum Energy Performance - Establish the minimum level of energy efficiency for the base building and systems.	Y			Included in EAc1.1	0 m2	$0.00	$0	$0	$0.00 $0.00	See EAc1.1
	EAp3 CFC Reduction and Elimination of Halons - Reduce ozone depletion.	Y			None	0 m2	$0.00	$0	$0	$0.00 $0.00	Included in base
	EAc1.1 Optimize Energy Performance: 20% - Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associate with excessive energy use.	2			Interior lighting Building envelope HVAC systems Plant equipment & DHW	1 sum 1 sum 1 sum 1 sum	$346,475.00 $1,654,023.00 $185,140.00 $0.00	$346,475 $1,654,023 $185,140 $0	$2,185,638	$103.01 $16.33 $77.95 $8.73 $0.00	See detail in Scenario comparison spreadsheet
	EAc1.2 Optimize Energy Performance: 30% - Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associate with excessive energy use.	2			Included in EAc1.1	0 m2	$0.00	$0	$0	$0.00 $0.00	See EAc1.1
	EAc1.3 Optimize Energy Performance: 40% - Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associate with excessive energy use.	2			Included in EAc1.1	0 m2	$0.00	$0	$0	$0.00 $0.00	See EAc1.1
	EAc1.4 Optimize Energy Performance: 50% - Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associate with excessive energy use.	2			Included in EAc1.1	0 m2	$0.00	$0	$0	$0.00 $0.00	See EAc1.1
	EAc1.5 Optimize Energy Performance: 60% - Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associate with excessive energy use.			2	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED
	EAc2.1 Renewable Energy: 5% - Encourage and recognize increasing levels of on-site renewable energy self-supply in order to reduce environmental impacts associated with fossil fuel energy use.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED
	EAc2.2 Renewable Energy: 10% - Encourage and recognize increasing levels of on-site renewable energy self-supply in order to reduce environmental impacts associated with fossil fuel energy use.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED
	EAc2.3 Renewable Energy: 20% - Encourage and recognize increasing levels of on-site renewable energy self-supply in order to reduce environmental impacts associated with fossil fuel energy use.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED
	EAc3 Best Practice Commissioning - Verify and ensure that the entire building is designed, constructed and calibrated to operate as intended.	1			Engage a independent commissioning authority	1 sum	$30,000.00	$30,000	$30,000	$1.41 $1.41	
	EAc4 Ozone Protection: Elimination of HCFCs - Reduce ozone depletion and support early compliance with the Montreal Protocol.	1			None	0 m2	$0.00	$0	$0	$0.00 $0.00	Included in base
	EAc5 Measurement & Verification - Provide for the ongoing accountability and optimization of building energy and water consumption performance over time.	1			Individual suite cold/hot water metering	1 sum	$143,650.00	$143,650	$143,650	$6.77 $6.77	
	EAc6 Green Power - Encourage the development and use of grid-source, renewable energy technologies on a net zero pollution basis.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED
	MRp1 Storage & Collection of Recyclables - Facilitate the reduction of waste generated by building occupants that is hauled to and disposed of in landfills.	Y			None	0 m2	$0.00	$0	$0	$0.00 $0.00	Included in base
	MRc1.1 Building Reuse: Maintain 75% of Existing Walls, Floors, and Roof - Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED
	MRc1.2 Building Reuse: Maintain 95% of Existing Walls, Floors and Roof - Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED

Total Gross Floor Area: 21,218 m2

	LEED prerequisite/credit	LEED points Y	?	N	cost factor description	quantity	Incremental from Standard Condo to LEED unit rate	sub total	total	cost/m2 total gfa	comments
Materials & Resources	**MRc1.3 Building Reuse:** Maintain 50% of Interior Non-Structural Elements - Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED
	MRc2.1 Construction Waste Diversion: Divert 50% From Landfill - Divert construction, demolition and land clearing debris from landfill disposal. Redirect recyclable recovered resources back to the manufacturing process. Redirect reusable materials to appropriate sites.	1			Included in Gen. Requirements	0 m2	$0.00	$0	$0	$0.00 $0.00	See General Requirements
	MRc2.2 Construction Waste Diversion: Divert 75% from Landfill - Divert construction, demolition and land clearing debris from landfill disposal. Redirect recyclable recovered resources back to the manufacturing process. Redirect reusable materials to appropriate sites.	1			Included in Gen. Requirements	0 m2	$0.00	$0	$0	$0.00 $0.00	See General Requirements
	MRc3.1 Resource Reuse: 5% - Reuse building materials and products in order to reduce demand for virgin materials and to reduce waste, thereby reducing impacts associated with the extraction and processing of virgin resources.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED
	MRc3.2 Resource Reuse: 10% - Reuse building materials and products in order to reduce demand for virgin materials and to reduce waste, thereby reducing impacts associated with the extraction and processing of virgin resources.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED
	MRc4.1 Recycled Content : 7.5% (Post-Consumer + 1/2 Post-Industrial) - Increase demand for building products that incorporate recycled content materials, therefore reducing impacts resulting from extraction and processing of new virgin materials and by-passing energy and green house gas-intensive industrial and manufacturing processes.	1			15 - 25% slag or fly-ash	12000 m3	$0.00	$0	$0	$0.00 $0.00	Subject to weather and schedule conditions Material cost savings assumed to be offset by accelerator admixtures
	MRc4.2 Recycled Content: 15% (Post-Consumer + 1/2 Post-Industrial - Increase demand for building products that incorporate recycled content materials, therefore reducing impacts resulting from extraction and processing of new virgin materials and by-passing energy and green house gas-intensive industrial and manufacturing processes.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED
	MRc5.1 Regional Material: 10% Extracted and Manufactured Regionally - Increase demand for building materials and products that are extracted and manufactured within the region, thereby supporting the use of indigenous resources and reducing the environmental impacts resulting from transportation.	1			None	0 m2	$0.00	$0	$0	$0.00 $0.00	Included in base - proximity to industry
	MRc5.2 Regional Materials: 20% Extracted and Manufactured Regionally - Increase demand for building materials and products that are extracted and manufactured within the region, thereby supporting the use of indigenous resources and reducing the environmental impacts resulting from transportation.	1			None	0 m2	$0.00	$0	$0	$0.00 $0.00	Included in base - proximity to industry
	MRc6 Rapidly Renewable Materials - Reduce the use and depletion of finite raw materials and long-cycle renewable materials by replacing them with rapidly renewable materials.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED
	MRc7 Certified Wood - Encourage environmentally responsible forest management.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED
	MRc8 Durable Building - Minimize materials use and construction waste over a building's life resulting from premature failure of the building and its constituent components and assemblies.			1	Pending compliance with CSA S478-95 (R2001) - EXCLUDED	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED
	EQp1 Minimum IAQ Performance - Establish minimum indoor air quality (IAQ) performance to enhance indoor air quality in buildings, thus contributing to the comfort and well-being of the occupants.	Y			None	0 m2	$0.00	$0	$0	$0.00 $0.00	Included in base
	EQp2 Environmental Tobacco Smoke (ETS) Control - Prevent or minimize exposure of building occupants, indoor surfaces, and systems to Environmental Tobacco Smoke (ETS).	Y			Suite upgrades Blower door testing	221 no 17 no	$200.00 $700.00	$44,200 $11,900	$56,100	$0.56 $0.56	Weather stripping and floor sweep for residential units Sampling of units
	EQc1 Carbon Dioxide (CO2) Monitoring - Provide capacity for indoor air quality (IAQ) monitoring to help sustain long-term occupant comfort and well-being.	1			Install CO sensors at combustion equipment CO2 demand control Indoor air quality testing	0 no 1 sum 17 no	$0.00 $48,500.00 $400.00	$0 $48,500 $6,800	$55,300	$2.61 $0.00 $2.29 $0.32	No combustions equipment in condo, CHP excluded from estimate

Total Gross Floor Area: 21,218 m2

	LEED prerequisite/credit	LEED points Y	LEED points ?	LEED points N	cost factor description	quantity	Incremental from Standard Condo to LEED: unit rate	sub total	total	cost/m2 total gfa	comments
Indoor Environmental Quality	**EQc2 Increase Ventilation Effectiveness:** Provide for effective delivery and mixing of supply air to support the safety, comfort and well-being of building occupants.			1					$0	$0.00	
					Not pursued	0 m2	$0.00	$0		$0.00	EXCLUDED
	EQc3.1 Construction IAQ Management Plan: During Construction - Prevent indoor air quality problems resulting from the construction/renovation process in order to help sustain the comfort and well-being of construction workers and building occupants.	1							$2,500	$0.12	
					Completion of standardized schedules.	1 sum	$2,000.00	$2,000		$0.09	
					Photograph documentation.	1 sum	$500.00	$500		$0.02	
	EQc3.2 Construction IAQ Management Plan: Testing Before Occupancy - Minimize indoor air quality problems resulting from the construction/renovation process in order to help sustain the comfort and well-being of construction workers and building occupants.	1							$10,200	$0.48	
					Includes testing for; particulate matter (PM10), formaldehyde, total volatile organic compounds, carbon monoxide, 4-phenycyclohexane (4pc)	17 no	$600.00	$10,200		$0.48	
	EQc4.1 Low-Emitting Materials: Adhesives & Sealants - Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.	1							$0	$0.00	
					None	0 m2	$0.00	$0		$0.00	Included in base
	EQc4.2 Low-Emitting Materials: Paints & Coatings - Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.	1							$89,839	$4.23	
					Low-VOC paint to wall and ceiling in common areas and in suites	68285 m2	$1.32	$89,839		$4.23	
	EQc4.3 Low-Emitting Materials: Carpet - Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.	1							$58,989	$2.78	
					CRI Green label to common areas and residential suites	7929 m2	$7.44	$58,989		$2.78	
	EQc4.4 Low-Emitting Materials: Composite Wood & Laminates - Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.	1							$148,010	$6.98	
					Low-VOC flooring	10343 m2	$7.90	$81,710		$3.85	Engineered wood flooring in lieu of base laminate
					Low-VOC cabinets	221 sum	$300.00	$66,300		$3.12	
	EQc5 Indoor Chemical & Pollutant Source Control - Minimize exposure of building occupants to potentially hazardous particulates, biological contaminants and chemical pollutants that adversely impact air and water quality.	1							$8,000	$0.38	
					Permanent entryway systems to capture dirt	2 no	$0.00	$0		$0.00	Included in base Requirement of LEED Gold
					Provide contaminant drains for areas with hazardous liquid waste and/or chemical mixing will occur	0 no	$0.00	$0		$0.00	Assume no hazardous waste and/or chemical mixing will occur in building - CHP associated costs excluded
					MERV 13 filters in all air-handling equipment	4 no	$2,000.00	$8,000		$0.38	
	EQc6.1 Controllability of Systems: Perimeter Spaces - Provide a high level of thermal, ventilation and lighting system control by individual occupants or specific groups in multi-occupant spaces to promote the productivity, comfort and well-being of building occupants.	1							$0	$0.00	
					Operable windows in residential suites	0 m2	$0.00	$0		$0.00	Included in base
					Provide operable windows in common room, seminar room, and computer classroom	0 no	$0.00	$0		$0.00	Included in EAc1.1 Scenario 10c
					Provide operable windows classroom, residential amenity senior amenity, senior lobby	0 no	$0.00	$0		$0.00	Included in EAc1.1 Scenario 10c
	EQc6.2 Controllability of Systems: Non-Perimeter Spaces - Provide a high level of thermal, ventilation and lighting system control by individual occupants or specific groups in multi-occupant spaces to promote the productivity, comfort and well-being of building occupants.	1							$0	$0.00	
					None	0 m2	$0.00	$0		$0.00	Dependent on finalized floor plans and program for common amenity spaces
	EQc7.1 Thermal Comfort: Compliance - Provide a thermally comfortable environment that supports the productivity and well-being of building occupants.	1							$0	$0.00	
					None	0 m2	$0.00	$0		$0.00	Included in base
	EQc7.2 Thermal Comfort: Monitoring - Provide a thermally comfortable environment that supports the productivity and well-being of building occupants.			1					$0	$0.00	
					Not pursued	0 m2	$0.00	$0		$0.00	EXCLUDED
	EQc8.1 Daylight and Views: Daylight 75% of Spaces - Provide for the building occupants a connection between indoor spaces and the outdoors through the introduction of daylight and views into the regularly occupied area of the building.	1							$0	$0.00	
					None	0 m2	$0.00	$0		$0.00	Included in base

Total Gross Floor Area: 21,218 m2

	LEED prerequisite/credit	LEED points Y	?	N	cost factor description	quantity	Incremental from Standard Condo to LEED: unit rate	sub total	total	cost/m2 total gfa	comments
	EQc8.2 Daylight and Views: Daylight 90% of Spaces - Provide for the building occupants a connection between indoor spaces and the outdoors through the introduction of daylight and views into the regularly occupied area of the building.	1							$0	$0.00	
					None	0 m2	$0.00	$0		$0.00	Included in base
Innovation & Design Process											
	IDc1.1 Innovation in Design: Green Building Education	1							$15,000	$0.71	
					Instate a public education program that includes; An interactive kiosk / display describing LEED features; Distributed signage highlighting building LEED features; A case study or design manual about LEED features.	1 sum	$15,000.00	$15,000		$0.71	
	IDc1.2 Innovation in Design: Water Efficiency Exceptional Performance	1							$0	$0.00	
					Additional measures to use 100% non potable water for sewage conveyance, or reduce potable water use by 40% relative to baseline (not including irrigation)	0 m2	$0.00	$0		$0.00	Included in WEc2
	IDc1.3 Innovation in Design: Specific Title			1					$0	$0.00	
					Not pursued	0 m2	$0.00	$0		$0.00	EXCLUDED
	IDc1.4 Innovation in Design: Specific Title			1					$0	$0.00	
					Not pursued	0 m2	$0.00	$0		$0.00	EXCLUDED
	IDc2 LEED® Accredited Professional:	1							$16,540	$0.78	
					LEED® Consulting EXCLUDED	1 sum	$0.00	$0		$0.00	EXCLUDED
					LEED® Registration	1 sum	$2,581.00	$2,581		$0.12	
					LEED® Certification	1 sum	$13,959.00	$13,959		$0.66	
	Miscellaneous implications of LEED Initiatives								$257,697	$12.15	
					Implications of CHP shell space	1 sum	$0.00	$0		$0.00	None
					Arch Req'ts not above	1 sum	$0.00	$0		$0.00	None
					Mech Req'ts not above	1 sum	$257,697	$257,697		$12.15	See detail estimate for breakdown
					Elec Req'ts not above	1 sum	$0.00	$0		$0.00	None
	NET COST INCLUDING SITE	44		26					$3,346,433	$157.72	
	General Requirements & Fees								$341,671		
	General requirements on additional cost (7.0%)							$234,250			
	Construction Management Fees (3%)							$107,420			
	LEED Consulting/ Design Fees (Excluded)							$0			
	TOTAL ESTIMATE (Excluding Allowances)								$3,688,000	$173.81	
	Allowances								$295,040		
	Design Allowances (5%)							$184,400			
	Escalation Allowances (Excluded)							$0			
	Construction Allowances (3%)							$110,640			
	TOTAL ESTIMATE (Including Allowances)								$3,983,000	$187.72	

GFA:	21218	$187.72	/m2
GFA:	228,389	$17.44	/sf
Suites:	221	$18,023	/suite
Points:	44	$90,523	/credit

b1.8 EAc1.1 Optimize Energy Performance Strategies

Total Gross Floor Area 21,332 m2

Category	Energy Saving Scenario	Quantity	Unit Rate	Sub-Total	Incremental from Standard Condo to LEED Gold	Comments
Interior Lighting	1. Efficient Lighting Design in Ammenity Corridor				$0	Included in base
	Reduce installed lighting power to meet ASHRAE 90.1-2004	0 m2	$0.00	$0		
	2. Efficient Lighting design in apartment				$248,625	
	Install compact fluorescent in living room, dining room, kitchen and bathroom (2-13W bulbs/bathroom)	1105 no	$225.00	$248,625		
	3. Efficient lighting design in bedroom				$73,575	
	Install compact fluorescent in bedrooms	327 no	$225.00	$73,575		
	4. Occupancy sensors for lighting				$21,125	
	Installed in utility rooms, ground floor and 7th floor amenity areas and corridors	65 no	$325.00	$21,125		
	5. Daylighting sensors for Lighting				$3,150	
	Installed in lobby and 7th floor ammenity. Multiple step dimming control.	7 no	$450.00	$3,150		
	Total Interior Lighting				$346,475	
Building Envelope	6. Increase roof insulation				-	Not pursued
	Increase from R-20 to R-32 (add 50mm polyisocyanurate insulation)	-	-	-		
	7. Increase brick wall insulation				$7,068	
	Increase from R-12 to R-17 (add 25mm XPS)	1210 m2	$5.84	$7,068		
	8. Increase spandrel insulation				-	Included in 10b/c
	Increase from R-6 to R-12 (add 38mm XPS)	-	-	-		
	9. Change window-wall to curtainwall				-	Not pursued
	Install R12 Spandrel	-	-	-		
	10a. Upgrade window glazing				-	Included in 10c
	Add argon and warm-edge spacers	-	-	-		
	10b. Upgrade window frames and glazing				-	Included in 10c
	Increase thermal break to 19mm and add agron and warm edge spacers U-value = 1.7	-	-	-		
	10c. Upgrade window glazing to triple glazed				$1,646,955	
	Triple glazing window with 2 soft-coat lowe-e coatings, argon and warm-edge spacers, 19mm thermal break	8543 m2	$185.00	$1,646,955		
	11. Reduce window-to wall ratio to 40%				-	Not pursued
	Replace vision glass with spancrel	-	-	-		
	Mechanical equipment resized	-	-	-		
	Total Building Envelope				$1,654,023	
HVAC Systems	12. Energy recovery ventilator for townhouse				$16,000	
	Ventilation for townhouses provided by ERV located in each townhouse	4 no	$4,000.00	$16,000		
	13. Energy recovery ventilator for common areas				$31,680	
	enthalpy wheel (75% effective) in central make-up air unit serving apartments	2640 m2	$12.00	$31,680		
	14. Energy recovery ventilator for apartments				$93,460	
	enthalpy wheel (75% effective) in central make-up air unit serving apartments	18692 m2	$5.00	$93,460		
	15. Upgrade overall fan efficiency				-	EXCLUDED - Associated with CHP
	Central supply and exhaust fans - 57%	-	-	-		
	16. Demand control ventilation in common areas				$44,000	

Total Gross Floor Area 21,332 m2

	Energy Saving Scenario	Quantity	Unit Rate	Sub-Total	Incremental from Standard Condo to LEED Gold	Comments
	Use CO2 sensors to control ventilation for common areas	1 sum	$44,000.00	$44,000		
	17. Radiant floors in townhouses				-	Not pursued
	Replace fan coil units with radiant floor for heating and cooling	-	-	-		
	18. Radiant floors in common areas				-	Not pursued
	Replace fan coil units with radiant floor for heating and cooling	-	-	-		
	Total HVAC Systems				$185,140	
Plant Equipment & DHW	19a. Modulating boiler				-	Included in 19c
	Fully-modulating burner.	-	-	-		
	19b. High efficiency boiler				-	Included in 19c
	Fully-modulating burner + efficiency = 85%	-	-	-		
	19c. Condensing boiler				-	EXCLUDED - Associated with CHP
	Fully-modulating burner + efficiency = 85%	-	-	-		
	20. Double bundle chiller				-	Not pursued
	Waste heat from chiller used to cool building	-	-	-		
	21. Increase pumping efficiency				-	EXCLUDED - Associated with CHP
	Combined impeller/motor efficiency - 70%	-	-	-		
	22a. Low-flow fixtures				-	Included in WEc3.1
	Shower heads 5.7 L/min.	-	-	-		
	Lavatory faucets 1.9 L/min.	-	-	-		
	22b. Low-flow fixtures and GFX				-	Included in EAc5
	Same as above with 50% efficient drainwater heat recovery to preheat cold water for domestic use	-	-	-		
	23. Condensing water heater				-	EXCLUDED - Associated with CHP
	Increase water heater efficiency to 93%	-	-	-		
	24. High efficiency appliances				-	
	Refrigerator = 417 kWh, Dishwasher = 365 kWh (only in townhouses), cloths washer = 282 kWh	-	-	-		
	Total Plant Equipment & DHW				$0	

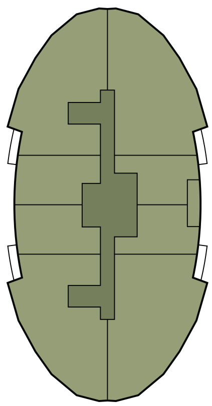
NET COST EXCLUDING GENERAL REQUIREMENTS AND ALLOWANCES		$2,185,638
	21,332 m2	$102.46
	229,616 sf	$9.52
	221 suites	$9,889.76

b1.9 Building Value Assessment

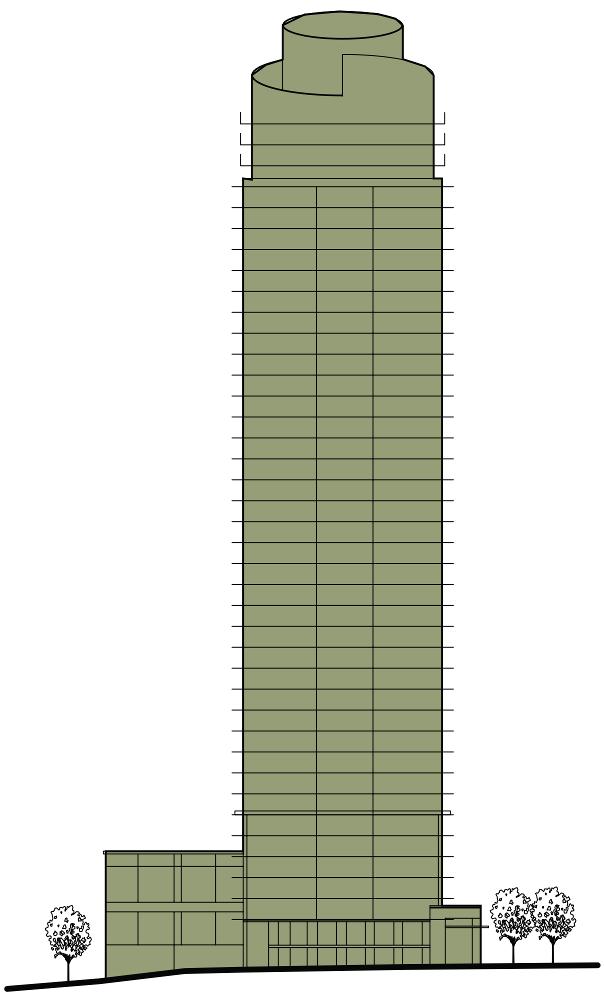
Ref.	Design Criteria/Characteristics		MNECB Reference Building		b1 - Multi-unit Residential Case Study		Key Indicators
1.00	**Construction Cost Summary**						
1.01	Building Area (GLA)		21,332 m2		21,332 m2		
1.02	Number of Suites		221 no		221 no		
1.03	Total Construction Hard Costs (Excl. LEED)		$33,820,000	$1,585.41 /m2	$33,820,000	$1,585.41 /m2	
1.04	Total LEED Incremental Construction Cost		$0	$0.00 /m2	$3,984,000	$186.76 /m2	
1.05	Total Construction Hard Costs (Incl. LEED)		$33,820,000	$1,585.41 /m2	$37,804,000	$1,772.17 /m2	
1.06	Total Project Soft Costs		Excluded	- /m2	Excluded	- /m2	
1.07	**Total Project Budget**		$33,820,000	$1,585.41 /m2	$37,804,000	$1,772.17 /m2	
2.00	**Building Environmental Performance**						
2.01	Energy Use per year	KWh/a	7,444,868	349.0 /m2	3,306,460	155.0 /m2	
2.02	Energy Cost per year	$	$435,905	$20.43 /m2	$220,065	$10.32 /m2	
2.03	Percent of MNECB baseline		100.0%		58.9%		
2.04	Water Use per year	m3	44,157	2.070 m3/m2	30,910	1.449 m3/m2	
2.05	Water Cost per year (@ $1.20/m3)	$	$52,989	$2.48 /m2	$37,092	$1.74 /m2	
2.06	Percent water reduction		0%		30%		
2.07	Greenhouse Gas reduction	Tonnes CO2/a	0.0	0.00 /m2	787.9	0.04 /m2	
2.08		Tonnes CO2/a/unit	0.0		3.57		
3.00	**Value of Increased Site Density Permitted by Municipality**						
3.01	Number of suites permitted by zoning	no	221		232		
3.02	Increase in site density beyond zoning	%	0.0%		5.0%		
3.03	Developer revenue	$	$6,630,000	$30,000 /suite	$6,961,500	$30,000 /suite	
3.04	Increased deveoper revenue	$	$0	$0.00 /m2	$331,500	$15.54 /m2	
3.05	Increased building value (% of Capital)	%	0%		0.9%		
3.06	Payback on LEED Cost Increment	Years	0.0		12.0		
4.00	**Value of Reduced time in Gaining Project Approvals**						
4.01	Duration of Permiting and Approvals	Months	14		10		
4.02	Carrying costs of pre-construction	$/Month	$88,400	$400 /suite	$88,400	$400 /suite	
4.03	Estimated carrying cost pre-construction	$	$1,237,600	$58.02 /m2	$884,000	$41.44 /m2	
4.04	Savings from Schedule Advantage	$	$0	$0.00 /m2	$353,600	$16.58 /m2	
4.05	Increased building value (% of Capital)	%	0%		0.9%		
4.06	Payback on LEED Cost Increment	Years	0.0		11.3		
5.00	**Value of Sales Premium (Note 1)**						
5.01	Sales Revenue (GSA = 85% of GLA)	$	$6,346,270	$350.00 /m2 (GSA)	$6,663,584	$367.50 /m2 (GSA)	
5.02	Sales Revenue Premium	%	0.0%		5.0%		
5.03	Additional Sales Revenue	$	$0	$0.00 /m2 (GSA)	$317,314	$17.50 /m2 (GSA)	
5.06	Increased building value (% of Capital)	%	0%		0.8%		
5.07	Payback on LEED Cost Increment	Years	0.0		12.6		
6.00	**Value of Increased Sales Velocity**						
6.01	Duration of Pre-Construction Sales	Months	8		6		
6.02	Carrying costs during pre-sales	$/Month	$165,750	$750 /suite	$165,750	$750 /suite	
6.03	Estimated carrying cost pre-const. sales	$	$1,326,000	$62.16 /m2	$994,500	$46.62 /m2	
6.04	Savings from Schedule Advantage	$	$0	$0.00 /m2	$331,500	$15.54 /m2	
6.05	Increased building value (% of Capital)	%	0%		0.9%		
6.06	Payback on LEED Cost Increment	Years	0.0		12.0		
7.00	**Value of Reduced Condominium Fees (Note 2, 3)**						
7.01	Condo fees (GSA = 85% of GLA)	$/Month	$99,727.10	$5.50 /m2	$90,661.00	$5.00 /m2	
7.02	Condo fees	$/Year	$1,196,725	$5,415 /suite	$1,087,932	$4,923 /suite	
7.03	Savings available for debt service	$/Month	$0	$0.00 /suite	$9,066	$41.02 /suite	
7.04	Value of reduced condo fee in qualifying for additional mortgage	$	$0	$0.00 /m2	$884,000	$4,000 /suite	
7.05	Building premium on condo fee savings	$	$0	$0.00 /m2	$884,000	$41.44 /m2	
7.06	Increased building value (% of Capital)	%	0%		2.3%		
7.07	Payback on LEED Cost Increment	Years	0.0		4.5		
8.00	**Total Increase in Building Value**						
8.01	Increase in buliding value (sum 3 to 7)	$	$0	$0.00 /m2	$2,217,914	$103.97 /m2	
8.02	Increased building value (% of Capital)	%	0%		5.9%		
8.03	Payback on LEED Cost Increment	Years	0.0		1.8		

1. Sales revenue based on similar building sales information provided by Altus Helyar Valuation Consulting
2. Condo fees based on Altus Helyar Cost Consulting data
3. Mortgage qualification figures by Invis Financial on-line calculator

b2.1 Project Diagrams and Overview



Typical Floor Plan Diagram



Building Section Diagram

Ref.	Design Criteria/Characteristics		b2 Residential Case Study	Key Indicators
1.00	**Project Statistics**			
1.01	Location		Toronto, Ontario	
1.02	Gross Livable Area (m2 GLA)		38,598	
1.03	Stories	Parking	6	
1.04		Tower A	40	
1.05		Tower B	-	
1.06	Number of suites		424	
2.00	**Construction Cost Estimate**			
2.01	Below Grade (parking/basement)		$15,360,200	
2.02	Podium		-	
2.03	Residential Floors Tower A		$49,877,500	
2.04	Residential Floors Tower B		-	
2.05	Site Development		$801,300	
2.06	**Subtotal Excluding Contingencies**		**$66,039,000**	
2.07	Design Contingency/Allowance		$1,320,780	
2.08	Escalation Contingency		$0	
2.09	Post Contract		$1,981,000	
2.10	**Total Construction Cost (Excl. GST)**		**$69,341,000**	
2.11		**$/m2 (GLA)**	**$1,796**	
3.00	**Estimated LEED Cost Increment (Included above)**			
3.01	$ Budget		$1,487,000	
3.02	$/m2		$39	
3.03	$/credit		$41,306	
3.04	**% increase**		**2.2%**	
4.00	**Exterior Enclosure (Overall System)**			
4.01	Wall R-Value		R-12	
4.02	Roof R-Value		R-20	
4.03	Glazing U-factor / SHGC / visible light trans.		1.70/0.33/0.63	
4.04	Amount of glazing (% of building skin area)		90%	
5.00	**Building Environmental Performance**			
5.01	Energy Intensity (Base/LEED)	KWh/m2/a		
5.02	Percent of MNECB baseline		35% MNECB	
5.03	Water use (Base/LEED)	L/m2/a		
5.04	Percent water reduction		20%	
5.05	Greenhouse Gas reduction	tonnes CO2/a	-	
5.06		tonnes CO2/a/unit	-	

b2.2 Project Statistics

Ref.	Item	Unit	Case Study Value	Industry Standard Value	Key Indicators
1.00	**Project Totals**				
1.01	Below Grade Area (GPA)	sf	275,654	186,234	
1.02	GLA	sf	415,466	393,275	
1.03	GFA (TCA)	sf	691,120	579,509	
1.04	# Levels Below Grade	no	6	3	
1.05	# Towers	no	1	1	
1.06	# Floors Tower	no	40	27	
1.07	# Suites	no	424	384	
1.08	# Parking	no	776	454	
1.09	# Lockers	no	424	335	
1.10	Site Area	sf	124,011	80,238	
2.00	**Below Grade (Including CHP Shell Space)**				
2.01	Total Area Parking	sf	275,654	186,234	
2.01.01	Net Parking Area (incl. Circulation)	sf	259,174	168,926	
2.01.02	Service / Mechanical	sf	7,297	7,200	
2.01.03	Lockers / Storage	sf	3,100	10,107	
2.01.04	Retail	sf	6,083	-	
2.02	Stalls	no	776	454	
2.03	No. of levels	no	6	3	
2.04	Gross Parking Area / Stall	sf	355	410	
2.05	Net parking area / Stall	sf	334	372	
2.06	Stalls / Unit	no	1.83	1.18	
2.07	Exterior Wall Area	sf	52,374	31,744	
2.08	Exterior wall / GPA (Below Grade)	ratio	0.19	0.17	
2.09	Excavation Volume	m3	32,831	58,653	
2.10	Excavation/Parking Area ratio (m3/m2)	m3/m2	1.28	3.18	
2.11	Below Grade (GPA) / Total Construction Area(TCA)	ratio	0.40	0.32	
2.12	# Elevator Cabs	no	5	4	
2.13	# Elevator Stops	no	200	108	
3.00	**Above Grade**				
3.01	Total Above Grade Area (GLA)	sf	415,466	393,275	
3.01.01	Residential - High Rise	sf	325,275	326,598	
3.01.02	Residential - Low Rise	sf	0	-	
3.01.03	Retail /Commercial	sf	0	-	
3.01.04	Amenity	sf	12,852	10,202	
3.01.05	Storage / Lockers	sf	11,647	-	
3.01.06	Service Areas (mechanical/electrica	sf	10,775	10,185	
3.01.07	Circulation	sf	54,917	46,290	
3.02	Net saleable area	sf	325,275	326,598	
3.05	**Suite Breakdown**				
3.05.01	Bachelor / Studio	no	0	5	
3.05.02	1 bedroom	no	71	62	
3.05.03	1 bedroom + Den	no	108	100	
3.05.04	2 bedroom	no	161	117	
3.05.05	2 bedroom + Den / Study	no	51	85	
3.05.06	3 bedroom	no	33	8	
3.05.07	3 bedroom + Den	no	0	6	
3.05.08	4 bedroom + den	no	0	0	
3.05.09	Penthouse	no	0	3	
3.06	No. of units	no	424	384	
3.07	GLA / Unit	sf	767	850	
3.08	2 bedroom / 1 bedroom Ratio		1.18	1.25	

Ref.	Item	Unit	Case Study Value	Industry Standard Value	Key Indicators
3.12	**Floors**				
3.12.01	No. of Floors - Tower 1 / Tower 2	no	40	27	
3.12.02	Typical floor to floor height	lf	8.66	8.71	
3.12.03	Window Area	sf	147,715	94,324	
3.12.04	Exterior wall area	sf	164,128	164,848	
3.12.05	Exterior wall / GLA (Above Grade)		0.40	0.42	
3.12.06	# Elevator Cabs	no	5	4	
3.12.07	# Elevator Stops	no	200	**108**	
3.13	**Saleable**				
3.13.01	Total Saleable Area	sf	331,358	326,598	
3.13.02	Residential	sf	325,275	326,598	
3.13.03	Retail/Commercial	sf	6,083	**0**	
3.14	**Statistical Efficiency Ratios**				
3.15	Building Efficiency (Net Saleable / GLA)	ratio	0.80	0.83	
3.16	Typical floor Efficiency (Net Saleable / GLA)	ratio	0.88	0.89	
3.17	Average Selling Area/Unit (Average Unit Size)	sf	767	850	
3.18	Exterior wall / Net Saleable Area (Above Grade)	ratio	0.50	0.50	
3.19	Window / Ext.wall ratio	ratio	0.90	0.57	
3.22	Retail ratio - (Retail area / GLA)	ratio	0.01	0.00	
3.23	GFA / Unit	sf	1,630	**1,508**	
3.26	**Construction Ratios**				
3.27	Formwork contact area	m2	1,269,119	1,078,230	
3.28	Concrete volume (including Waste)	m3	23,767	20,332	
3.29	Rebar Weight	kg	2,376,693	1,905,831	
3.30	Rebar / Concrete Volume ratio	kg/m3	100.0	93.7	
3.31	Rebar / GLA	kg/m2	5.72	4.85	
3.32	Rebar / GFA	kg/m2	3.44	3.29	
3.33	Formwork / GFA	m2/m3	1.84	1.96	
3.34	Concrete / GFA	m3/m2	0.37	0.38	
3.35	Concrete / GLA	m3/m2	0.62	0.56	
3.36	Number of fan coils/heat pump units	no	440	489	
3.37	Fan Coils / unit, heat pumps/unit	no	1.04	1.27	
3.38	Net saleable area per Fan coil	sf	753	**668**	
4.00	**Site**				
4.01	Gross Site Area (55768sf)	acre	2.84	1.84	
4.02	Site Density (UPA)	unit/acre	149.30	209	
4.03	Site Area/Unit	sf	292.48	**208.73**	
5.00	**Construction Cost**				
6.00.01	Below Grade Cost	$	$8,912,900	$8,965,725	
6.00.02	Above Grade Parking Cost	$	$7,013,000	-	
6.00.03	Above Grade Cost (Incl Site Work)	$	$51,356,300	**$39,513,933**	
6.01	**Total Cost**	$	**$67,282,200**	$48,479,658	
6.02	Cost / Stall	$/Unit	$20,523	$19,759	
6.03	Cost / GLA	$/sf	$161.94	$123	
6.04	Cost / GFA	$/sf	$97.35	$84	
6.05	Cost / Unit	$/Unit	$121,123	$126,112	
6.06	Cost / Saleable Area	$/sf	$203.05	$148	

b2.3 Project Narrative - By Building Element

A1 Sub-Structure

Parking Garage
Standard Condo
• Conventional foundations with spread footing.
• Shoring assumed to three sides.

LEED Gold Initiatives:
• Use fly-ash as partial substitute of Portland cement in concrete mix
• Use portion of slag as aggregate for concrete mix.

A2 Structure

Parking Garage (above & below grade)
Standard Condo
• Reinforced concrete structure with columns
• Pre-cast exit stairs
• Ground floor slab above parking garage included in Parking estimate

LEED Initiatives:
• Use fly-ash as partial substitute of Portland cement in concrete mix
• Use slag as aggregate for concrete mix.
• Use of rebar with recycled content

Condo Building
Standard Condo
• Reinforced concrete structure with columns and shear walls.
• Transfer beams at ground level.
• Pre-cast exit stairs ground floor to roof.

LEED Initiatives:
• Use fly-ash as partial substitute of Portland cement in concrete mix
• Use slag as aggregate for concrete mix.
• Use of rebar with recycled content

A3 Exterior Enclosure

Parking Garage
Standard Condo
• Cast in place concrete perimeter basement wall.
• Overhead garage door and insulated hollow metal doors and frames.
• Ground floor slab over parking garage included in Parking estimate
• Architectural precast with concrete back-up
• Commercial storefront glazing
• Waterproof membrane on protection board

LEED Initiatives:
• Use fly-ash as partial substitute of Portland cement in concrete mix
• Use slag as aggregate for concrete mix.
• Use of rebar with recycled content
• Vestibule provided at all doors into the parking garage

Standard Condo
Walls
• Architectural precast with drywall/concrete wall back-up.
• Prefinished metal clad wall with drywall/concrete wall back up.
• Window-wall system with Low-E coating and operable awning type sections
• Insulated hollow metal doors and frames.
Roof
• 4-ply built-up insulated roof finish.
• Terrace pavers in areas.
• Balconies/terraces
• Allowance for roof feature.

LEED Initiatives:
Walls
• Increase thermal performance of wall assemblies including details to minimize thermal bridging
• Provide minimum of R-6 over all structural members
• Increase thermal performance of window assemblies to include 19mm thermal break, Cavity space (13mm) to include warm edge spacer, soft coat low-E coating (e=0.05), argon filled, overall U-value 1.94, SHGC 0.39
• Recycled content specified for aluminum framing
• Two doors with vestibule provided at all exterior doors including doors into the parking garage

• Allowance for additional air and water leakage testing of sample units
• Allowance for durable building details and construction methods
• Allowance for Low VOC Materials
Roof
• Inverted roof fully adhered to structural deck
• Extensive green roof system
•Allowance for additional water leakage testing
• Allowance for durable building details and construction methods
• Allowance for Low VOC materials inside of air barrier
• Increase thermal performance of wall assemblies to overall R-17
• Increase spandrel panel insulation to R-12

B1 Partitions and Doors

Parking Garage
Standard Condo
• Concrete shear wall, concrete block walls and drywall partitions.
• Fire rated Hollow metal doors

LEED Initiatives:
• Recycled content specified for Gypsum board
• Recycled content specified for steel framing

Condo Building
Standard Condo
• Concrete shear wall, concrete block walls and drywall partitions.
• Fire rated stairwell doors. Solid core suite entry doors.
• Hollow core wood interior doors.
• Hard board sliding closet doors
• Hollow metal doors and solid core wood doors to common areas.

LEED Initiatives:
• Floor sweep and air tight seals around all suite entry doors.
• 19mm plywood sheathing provided behind drywall in all suite washrooms and for closet shelving for wall hung fixtures and grab bars
• Recycled content specified for Gypsum board
• Recycled content specified for steel framing
• Allowance for durable building details and construction methods
• Allowance for Low VOC Materials

B2 Finishes

Parking Garage
Standard Condo
• Concrete sealer to slab on grade and traffic topping to parking garage suspended slabs.
• Painted concrete soffit to garage with insulated drywall to underside of podium
• Ceramic tile to elevator lobbies

Condo Building
Standard Condo
Floors
• Carpet to corridors.
• Carpet and wood floor to amenity areas.
• Engineered hardwood floor to foyer, living, dining, den/kitchen.
• Carpet to bedrooms in town homes and towers.
• Ceramic floor tiles to washrooms, and showers. Ceramic to laundry & garbage chute.
Ceilings
• Suspended drywall ceiling to kitchen, and bath. Suspended drywall ceiling to Corridors, amenity rooms, lobby to tower.
• Sprayed texture to concrete soffit in suites.
• Allowance for feature ceilings.
Walls
• Paint to drywall and concrete block walls.
• Ceramic tile to tub and shower surrounds in suites.
• Paint finish, contemporary styled baseboards and door casing to suites.

LEED Initiatives:
• Allowance for durable building details and construction methods
• Allowance for Low VOC Materials
• Materials that have recycled and/or post consumer/industrial content.
• Materials that have been manufactured and/or harvested regionally.

B3 Fittings and Equipment

B31 Fittings and Fixtures

Parking Garage
Standard Condo
• Allowance for storage lockers, misc. metals, signage, bike racks.

LEED Initiatives:
• Additional signage for LEED requirements

Condo Building
Standard Condo
• Medium quality washroom accessories to bathrooms
• Kitchen cabinets with granite counter tops and vanities with cultured marble counter tops.
• Allowance for steam room and whirlpool.

LEED Initiatives:
• Allowance for durable building details and construction methods

B32 Equipment

Parking Garage
• Garbage compactor and tri-sorter.
• Control equipment at entry.

Condo Building
Standard Condo
• Allowances for suite appliances
• Allowances for window washing roof anchors.
• Allowance for exercise equipment

LEED Initiatives:
• High efficiency refrigerator, and cloths washer in suites

B33 Conveying Systems

Parking Garage
Standard Condo
• 5 nos x 6 stop = 30 stop passenger elevators to parking garage

LEED Initiatives:
• None

Condo Building
Standard Condo
• 5nos x 40 stop = 200 stop passenger elevators to tower/podium

LEED Initiatives:
• None

C1 Mechanical

Parking Garage
Standard Condo
• Parking garage areas to be sprinklered.

LEED Gold Initiatives:
• Allowance for CO_2 controlled ventilation

Condo Building
Standard Condo
• Medium quality plumbing fixtures.
• Residential floors to have full standpipe coverage.
• Make up air units gas heat & DX cooled
• Vertical 2-pipe fan-coil unit in each suite
• Kitchen and washroom exhaust directly vented.
• Microwave with built-in hood fan (cost included in architectural)
• A gas hot water boiler provides domestic hot water
• Gas fired building heating
• Allowance for swimming pool equipment, pumps, piping
• Allowance for pool Dry-O-Tron unit
• Allowance for rough-ins to retail
• Allowance for rough-in to steam room
• Allowance for common area fancoil unit
• Allowance for water softener
• Allowance for silencers
• Allowance for green roof irrigation
• Allowance for glycol snow melting system

EXCLUDED
• Individual suite metering
• Site service connections

LEED Initiatives:
• Allowance for storm water retention tank and grey water piping for irrigation
• Allowance for duplex sanitary and storm pump
• Common area electronic faucet lavatory and low flow urinal
• Allowance for tie in to incoming services and metering corridor fresh air unit with HRV
• Variable frequency drives
• Individual heating and cooling metering for suite
• Individual suite water metering
• Medium/high quality plumbing fixtures
• Dual flush toilets in suites
• Low-flow lavatory and shower heads

EXCLUDED
• Site service connections

C2 Electrical

Parking Garage

Standard Condo
• Incoming power service connected to the local hydro authority.
• Lighting and power as per standard condo parking garage specifications.
• Fire alarm system provided.
• Security system is included

LEED Initiatives:
• Lighting control system
• Occupancy sensors in corridors and stair cases

Condo Building

Standard Condo
• Medium quality lighting fixtures
• Suite devices are assumed to be standard condominium quality
• Pipe tracing is included
• Lightning protection is included
• Building access control system is included
• Digital metering is included
• Lighting control system is included
• Allowance for tie in to incoming services
• H.V. substation

EXCLUDED
• Hydro charges
• Communication cables – assumed by local provider
• Suite security system
• In slab heating
• DDC controls on major equipment

LEED Initiatives:
• Connection to common area electronic faucet lavatory and urinal controls
• Occupancy sensors in corridors/stair cases and amenity
• Efficient lighting design in amenity, corridors, suites, and bedrooms

EXCLUDED
• Same as above

D1 Site Development

Standard Condo

• Allowances for site development includes unit pavers, concrete paving and soft landscaping, site improvements.
• Allowance made for Mechanical site services.
• Allowance made for Electrical site services.

LEED Initiatives:
• Size parking to meet but not exceed local bylaw requirements
• Reduce site disturbance to vicinity immediately around proposed building footprint and site work completed
• Rain water harvesting system for site irrigation
• Drip irrigation in lieu of standard sprinklers
•Adaptive species landscaping
• Erosion and sedimentation control documentation and implementation

D2 Ancillary Work

• None

b2.4 Project Cost Summary

			Total Project Excluding LEED		Total Project Including LEED					
Construction Cost Item		**GFA(M2)**	**$ Budget**	**$/m2**	**$ Budget**	**$/m2**	**No. Units/ Spaces**	**$ /Unit**	**% increase**	**Key incremental cost factors**
Parking (2 levels below grade)		13,193	$8,591,300	$651	$8,574,100	$650	384	$22,300	-0.2%	Reduction in painted area
Parking (4 levels above grade)		12,412	$6,764,900	$545	$6,786,100	$547	392	$17,300	0.3%	Additional vestibule requirements
Residential tower - 40 floors (excl. MPH)		38,598	$48,509,400	$1,257	$49,877,500	$1,292	424	$117,600	2.8%	Additional requirements of LEED
Site Development			$757,600		$801,300		424	$1,900	5.8%	Rainwater harvesting and drip irrigation
Subtotal Construction Costs		38,598	$64,623,200	$1,674	$66,039,000	$1,711	424	$155,800	2.2%	
Design Contingency-Allowance	2.0%	38,598	$1,292,464	$33	$1,320,780	$34	424	$3,100	2.2%	Contingency on incremental costs
Subtotal - GLA (including Design Allowance)		38,598	$65,915,700	$1,708	$67,359,800	$1,745	424	$158,900	2.2%	
Escalation Contingency	0.0%	38,598	$0	$0	$0	$0	424	$0	0.0%	
Post-contract Construction Contingency	3.0%	38,598	$1,938,696	$50	$1,981,170	$51	424	$4,700	2.2%	Contingency on incremental costs
Total Construction Costs		**38,598**	**$67,854,000**	**$1,758**	**$69,341,000**	**$1,796**	**424**	**$163,500**	**2.2%**	
Project Soft Costs										
Land (Reality taxes only)		-	Excluded	-	Excluded	-	-	-	-	
Municipal Fees		-	Excluded	-	Excluded	-	-	-	-	
Construction (Excluded above)		-	Excluded	-	Excluded	-	-	-	-	
Design Consultants		-	Excluded	-	Excluded	-	-	-	-	
General and Administrative		-	Excluded	-	Excluded	-	-	-	-	
Furniture Fixtures and Equipment		-	Excluded	-	Excluded	-	-	-	-	
Marketing and Sales		-	Excluded	-	Excluded	-	-	-	-	
Finance		-	Excluded	-	Excluded	-	-	-	-	
Interim Building Operations		-	Excluded	-	Excluded	-	-	-	-	
Government Taxes		-	Excluded	-	Excluded	-	-	-	-	
Development Contingency		-	Excluded	-	Excluded	-	-	-	-	
Total Soft Costs		-	Excluded	-	Excluded	-	-	-	-	
Total Project Budget		38,598	$67,854,000	$1,758	$69,341,000	$1,796	424	$163,500	2.2%	

Notes
1. GST is excluded
2. Removal of any contaminated material and abnormal soil conditions are excluded
3. Any construction cost escalation beyond January 2007 has been excluded
4. LEED consulting costs are Excluded

b2.5 Elemental Cost Summary - Total Project

Gross Livable Area (GLA): 38,598 m2

		Total Project Excluding LEED				Total Project Including LEED				LEED	
Element		Elemental Amount	Cost/m2	Total	%	Elemental Amount	Cost/sf	Total	%	% increase	Key incremental cost factors
A SHELL											
A1 SUBSTRUCTURE			$45.85				$134.14				
A11 Foundation		$535,700	$13.88			$535,700	$40.60				
A12 Basement Excavation		$1,234,000	$31.97	$1,769,700	2.6%	$1,234,000	$93.53	$1,769,700	2.6%	0.0%	
A2 STRUCTURE			$298.85				$594.48				
A21 Lowest Floor Construction		$245,400	$6.36			$245,400	$18.60				
A22 Upper Floor Construction		$8,365,100	$216.72			$8,365,100	$371.38				
A23 Roof Construction		$2,924,700	$75.77	$11,535,200	17.0%	$2,924,700	$204.50	$11,535,200	16.6%	0.0%	
A3 EXTERIOR ENCLOSURE			$245.10				$402.86				
A31 Walls Below Grade		$224,100	$5.81			$224,100	$16.99				
A32 Walls Above Grade		$1,440,200	$37.31			$1,440,200	$82.30				Increase thermal performance of building envelope
A33 Windows & Entrance		$5,202,000	$134.77			$5,644,500	$168.56				Increase thermal performance of glazing
A34 Roof Covering		$1,235,900	$32.02			$1,235,900	$80.81				
A35 Projections		$1,358,300	$35.19	$9,460,500	13.9%	$1,358,300	$54.22	$9,903,000	14.3%	4.7%	
B INTERIORS											
B1 PARTITIONS & DOORS			$225.16				$259.73				
B11 Partitions		$7,261,400	$188.13			$7,312,200	$221.56				Additional partitions for vestibules at all entrances
B12 Doors		$1,429,400	$37.03	$8,690,800	12.8%	$1,429,400	$38.17	$8,741,600	12.6%	0.6%	Additional doors for vestibules at all entrances
B2 FINISHES			$125.36				$169.32				
B21 Floor Finishes		$2,599,400	$67.35			$2,627,200	$94.72				Low VOC specification
B22 Ceiling Finishes		$1,041,300	$26.98			$1,041,300	$40.76				Low VOC specification
B23 Wall Finishes		$1,198,100	$31.04	$4,838,800	7.1%	$1,212,300	$33.85	$4,880,800	7.0%	0.9%	Low VOC specification
B3 FITTING & EQUIPMENT			$205.08				$219.14				
B31 Fitting & Fixtures		$3,769,400	$97.66			$3,769,400	$102.80				
B32 Equipment		$1,761,400	$45.63			$1,761,400	$49.06				
B33 Conveying Systems		$2,385,000	$61.79	$7,915,800	11.7%	$2,385,000	$67.28	$7,915,800	11.4%	0.0%	
C SERVICES											
C1 MECHANICAL			$190.82				$255.08				
C11 Plumbing & Drainage		$2,699,200	$69.93			$2,836,300	$89.14				Low-flow plumbing fixtures
C21 Fire Protection		$738,200	$19.13			$738,200	$39.18				
C13 HVAC		$3,780,800	$97.95			$4,412,600	$121.66				Energy saving equipment
C14 Controls		$147,000	$3.81	$7,365,200	10.9%	$147,000	$5.10	$8,134,100	11.7%	10.4%	DDC controls for major equipment
C2 ELECTRICAL			$127.23				$170.98				
C21 Service & distribution		$1,769,400	$45.84			$1,769,400	$54.23				
C22 Lighting, Devices & Heating		$2,275,600	$58.96			$2,301,000	$77.72				Energy savings fixtures
C23 Systems & Ancillaries		$865,800	$22.43	$4,910,800	7.2%	$865,800	$39.03	$4,936,200	7.1%	0.5%	
NET BUILDING COST (Excluding Site)		$0	$1,463.46	$56,486,800	83.2%	$0	$2,205.73	$57,816,400	83.4%	2.4%	
D SITE											
D1 SITE WORK			$17.36				$61.64				
D11 Site Development		$500,000	$12.95			$500,000	$43.40				Rainwater harvesting system for irrigation
D12 Mechanical Site Services		$87,500	$2.27			$127,500	$11.07				Drip irrigation in lieu of standard sprinklers
D13 Electrical Site Services		$82,600	$2.14	$670,100	1.0%	$82,600	$7.17	$710,100	1.0%	6.0%	
D2 ANCILLARY WORK			$0.00				$0.00				
D21 Demolition		$0	$0.00			$0	$0.00				
D22 Alterations		$0	$0.00	$0	0.0%	$0	$0.00	$0	0.0%	0.0%	
NET BUILDING COST (Including Site)			$1,480.83	$57,157,000	84.2%		$2,267.37	$58,526,500	84.4%	2.4%	
Z MARKUPS											
Z1 GENERAL REQUIREMENTS			$193.44				$291.05				
Z11 General Requirements		$4,626,200	$119.86			$4,661,300	$180.59				
Z12 Fee (Excluding LEED Consulting)		$2,840,100	$73.58	$7,466,300	11.0%	$2,851,200	$110.46	$7,512,500	10.8%	0.6%	Contingency on incremental costs
TOTAL CONSTRUCTION ESTIMATE (Excluding Contingencies)			$1,674.26	$64,623,000	95.2%		$2,558.42	$66,039,000	95.2%	2.2%	
Z2 CONTINGENCIES	5.0%		$83.71				$127.92				
Z21 Design Contingency	2.0%	$1,292,500	$33.49			$1,320,800	$51.17				
Z22 Escalation Contingency	0.0%	$0	$0.00			$0	$0.00				
Z23 Construction Contingency	3.0%	$1,938,600	$50.23	$3,231,100	4.8%	$1,981,100	$76.75	$3,301,900	4.8%	2.2%	Contingency on incremental costs
GOOD & SERVICES TAX (EXCLUDED)	0%	$0	$0.00	$0	0.0%	$0	$0.00	$0	0.0%	0.0%	
TOTAL CONSTRUCTION ESTIMATE (Including Allowances)			$1,757.97	$67,854,000	100.0%		$2,686.33	$69,341,000	100.0%	2.2%	

		Cost/m2	Cost	
GLA :	38,598 m2	$1,757.97	$1,796.49	2.2%
GLA :	415,465 sf	$163.32	$166.90	2.2%
Unit/Spa :	424 no	$160,033.02	$163,540	2.2%

b2.6 Trade Summary - Total Project

Division			Total Project Excluding LEED		Total Project Including LEED					
			Budget	Cost/ GLA (m2)	Budget	Cost/ GLA (m2)	Cost/ Unit	% of Total	LEED % Increase	Key incremental cost factors
0	Construction Management Fee		2,840,110	$73.58	2,851,110	$73.87	$6,724	4.11%	0.0%	
1	General Conditions		3,778,200	$97.89	3,813,160	$98.79	$8,993	5.50%	0.9%	Includes LEED documentation (excl. consulting)
2	Site Work		2,145,020	$55.57	2,160,020	$55.96	$5,094	3.12%	0.7%	Storm water management and drip irrigation
3	Concrete		16,806,669	$435.43	16,806,669	$435.43	$39,638	24.24%	0.0%	
4	Masonry		1,140,025	$29.54	1,140,025	$29.54	$2,689	1.64%	0.0%	
5	Metals		497,700	$12.89	497,700	$12.89	$1,174	0.72%	0.0%	
6	Carpentry		4,009,930	$103.89	4,009,930	$103.89	$9,457	5.78%	0.0%	
7	Thermal and Moisture Protection		2,633,760	$68.24	2,684,640	$69.55	$6,332	3.87%	1.9%	Increased thermal performance
8	Doors & Windows		6,036,255	$156.39	6,478,665	$167.85	$15,280	9.34%	7.3%	Increased thermal performance glazing
9	Finishes		6,824,154	$176.80	6,866,153	$177.89	$16,194	9.90%	0.6%	
10	Specialties		339,000	$8.78	339,000	$8.78	$800	0.49%	0.0%	
11	Equipment		2,082,200	$53.95	2,082,200	$53.95	$4,911	3.00%	0.0%	
12	Furnishings		245,000	$6.35	245,000	$6.35	$578	0.35%	0.0%	
13	Special Construction		57,000	$1.48	57,000	$1.48	$134	0.08%	0.0%	
14	Conveying Systems		2,385,000	$61.79	2,385,000	$61.79	$5,625	3.44%	0.0%	
15	Mechanical		7,365,143	$190.82	8,159,023	$211.38	$19,243	11.77%	10.8%	Increased mechanical equip. costs
16	Electrical		4,589,943	$118.92	4,615,343	$119.57	$10,885	6.66%	0.6%	Increased energy efficiency
19	Suite Deficiency - Pre PDI		212,000	$5.49	212,000	$5.49	$500	0.31%	0.0%	
30	Suite Deficiency		636,000	$16.48	636,000	$16.48	$1,500	0.92%	0.0%	
Subtotal			$64,623,000	$1,674.26	$66,039,000	$1,710.93	$155,752	95.24%	2.2%	
	Design Contingency	2.0 %	$1,292,460	$33.49	$1,320,780	$34.22	$3,115	1.90%	2.2%	Contingency on incremental costs
	Escalation Contingency	0.0 %	$0	$0.00	$0	$0.00	$0	0.00%	0.0%	
	Post Contract Contingency	3.0 %	$1,938,690	$50.23	$1,981,170	$51.33	$4,673	2.86%	2.2%	Contingency on incremental costs
Subtotal			$67,854,000	$1,757.97	$69,341,000	$1,796.48	$163,539	100.00%	2.2%	
	GST (Excluded)		$0	$0.00	$0	$0.00	$0	0.00%	0.0%	
Total Project Construction Cost			**$67,854,000**	**$1,757.97**	**$69,341,000**	**$1,796.48**	**$163,539**	**100.00%**	**2.2%**	

b2.7 LEED Incremental Costing - Total Project

Total Gross Floor Area 38,598 m2
suites 424 no

	LEED prerequisite/credit	Targeted	Pending	Not Pursued	cost factor description	quantity	unit rate	sub total	total	cost/m2 total gfa	comments	Division impact
							Incremental from Standard Condo to LEED					
Sustainable Sites	**SSp1 Erosion & Sedimentation Control -** Control erosion to reduce negative impacts on water and air quality.	Y							$0	$0.00	Included in Base - Municipal Requirement, Good practice	
					None	0 m2	$0.00	$0		$0.00		2000
	SSc1 Site Selection - Avoid development of inappropriate sites and reduce the environmental impact from the location of a building on a site.	1							$0	$0.00	Minimal cost impact - additional documentation included in General requirements.	
					None	0 m2	$0.00	$0		$0.00		1000
	SSc2 Development Density - Channel development to urban areas with existing infrastructure, protect green fields and preserve habitat and natural resources.	1							$0	$0.00	Included in Base - site location meets requirements - documentation included in General Requirements	
					None	0 m2	$0.00	$0				1000
	SSc3 Brownfield Redevelopment - Rehabilitate damaged sites where development is complicated by real or perceived environmental contamination, reducing pressure on undeveloped land.		1						$0	$0.00	Remediation costs excluded from estimate - Pending ESA/MOE report - additional documentation and consulting excluded	
					Further documentation required	0 m2	$0.00	$0		$0.00		1000
	SSc4.1 Alternative Transportation: Public Transportation Access - Reduce pollution and land development impacts from automobile use.	1							$0	$0.00	Minimal cost impact - additional documentation included in General requirements.	
					None	0 m2	$0.00	$0		$0.00		1000
	SSc4.2 Alternative Transportation: Bicycle Storage & Changing Rooms - Reduce pollution and land development impacts from automobile use.	1							$0	$0.00	Included in base - assume bike racks provided in parking garage area - no building area increase	
					None	0 no	$0.00	$0		$0.00		10000
	SSc4.3 Alternative Transportation: Alternative Fuel Refueling Stations - Reduce pollution and land development impacts from automobile use.	1							$0	$0.00	Contract with Autoshare car rentals with hybrid vehicles	
					None	0 m2	$0.00	$0		$0.00		-
	SSc4.4 Alternative Transportation: Parking Capacity - Reduce pollution and land development impacts from single occupancy vehicle use.	1							$3,000	$0.08	Current parking capacity meets requirements. Additional signage and documentation for LEED	
					Additional signage	1 sum	$3,000.00	$3,000		$0.08		10000
	SSc5.1 Reduced Site Disturbance: Protect or restore open space - Conserve existing natural areas and restore damaged areas to provide habitat and promote biodiversity.			1					$0	$0.00	EXCLUDED	
					Not Pursued	0 m2	$0.00	$0		$0.00		2000
	SSc5.2 Reduced Site Disturbance: Development Footprint - Conserve existing natural areas and restore damaged areas to provide habitat and promote biodiversity.			1					$0	$0.00	EXCLUDED	
					Not Pursued	0 m2	$0.00	$0		$0.00		2000
	SSc6.1 Storm water Management: Rate And Quantity - Limit disruption and pollution of natural water flows by managing storm water runoff.	1							$25,000	$0.65	Pending - existing SWM controls related to WEc1.1	
					Documentation and report	0 sum	$0.00	$0		$0.00	Included in General requirements	1000
					Precast cistern	1 sum	$15,000.00	$15,000		$0.39	Assume 15 m3	15000
					Additional piping to irrigation	1 sum	$10,000.00	$10,000		$0.26	Related to WEc1.1	15000
	SSc6.2 Storm water Management, Treatment - Limit disruption of natural water flows by eliminating storm water runoff, increasing on-site infiltration and eliminating contaminants.			1					$0	$0.00	EXCLUDED	
					Not Pursued	0 m2	$0.00	$0		$0.00		2000
	SSc7.1 Landscape & Exterior Design to Reduce Heat Island Effect: Non-Roof - Reduce heat islands to minimize impact on microclimate and human and wildlife habitat.	1							$0	$0.00	50% U/G parking included in base	
					None	0 m2	$0.00	$0		$0.00		2000
	SSc7.2 Landscape & Exterior Design to Reduce Heat Islands: Roof - Reduce heat islands to minimize impact on microclimate and human and wildlife habitat.	1							$0	$0.00	Landscaped podium roof terrace considered to be base building requirement	
					None	0 m2	$0.00	$0		$0.00		2000, 7100
	SSc8 Light Pollution Reduction - Eliminate light trespass from the building and site, improve night sky access and reduce development impact on nocturnal environments.			1					$0	$0.00		
					Not Pursued	0 m2	$0.00	$0		$0.00		
	9											
Water Efficiency	**WEc1.1 Water Efficient Landscaping:** Reduce by 50% - Limit or eliminate the use of potable water for landscape irrigation.	1							$15,000	$0.39	Related to SSc6.1	
					Documentation and report	0 sum	$0.00	$0		$0.00	Included in General requirements	2000
					Drip Irrigation system	1 sum	$15,000.00	$15,000		$0.39	Drip irrigation to indigenous landscaping	
	WEc1.2 Water Efficient Landscaping: No potable use or no Irrigation - Limit or eliminate the use of potable water for landscape irrigation.	1							$0	$0.00	See WEc1.1	
					Included in WEc1.1	0 m2	$0.00	$0		$0.00		1000
	WEc2 Innovative Wastewater Technologies - Reduce generation of wastewater and potable water demand, while increasing the local aquifer recharge.			1					$0	$0.00	EXCLUDED	
					Not Pursued	0 m2	$0.00	$0		$0.00		2000, 15000
	WEc3.1 Water Use Reduction: 20% - Maximize water efficiency within buildings to reduce the burden on municipal water supply and wastewater systems.	1							$138,080	$3.58		
					Dual-flush w/c: 3/6 LPF	682 no	$65.00	$44,330		$1.15	dual flush valve in place of 6l single	15000
					Urinals: 1.9 LPF	2 no	$0.00	$0		$0.00	Manual dual flush valve in place of auto (amenity areas)	15000
					Kitchen/lav faucet: 1.9 L/min.	1105 no	$75.00	$82,875		$2.15		15000
					Showerhead: 6.8L/min.	145 no	$75.00	$10,875		$0.28		15000
	WEc3.2 Water Use Reduction: 30% - Maximize water efficiency within buildings to reduce the burden on municipal water supply and wastewater systems.			1					$0	$0.00	EXCLUDED	
					Not Pursued	0 m2	$0.00	$0		$0.00		15000
	3											
	EAp1 Fundamental Commissioning - Verify and ensure that fundamental building elements and systems are designed, installed and calibrated to operate as intended.	Y							$2,000	$0.05	Related to EAc3	
					Engage a commissioning authority	1 sum	$2,000.00	$2,000		$0.05	In addition to standard building commissioning	1000
	EAp2 Minimum Energy Performance - Establish the minimum level of energy efficiency for the base building and systems.	Y							$0	$0.00	See EAc1.1	
					Included in EAc1.1	0 m2	$0.00	$0		$0.00		misc
	EAp3 CFC Reduction and Elimination of Halons - Reduce ozone depletion.	Y							$0	$0.00	Standard for new building equipment	
					None	0 m2	$0.00	$0		$0.00		15000
	EAc1.1 Optimize Energy Performance: 20% - Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associate with excessive energy use.	2							$1,069,610	$23.49	See Scenarios for detail	
					Interior Lighting	1 sum	$15,400.00	$15,400		$0.40		16000
					Building Envelope	1 sum	$442,410.00	$442,410		$11.46		misc
					HVAC Systems	1 sum	$449,000.00	$449,000		$11.63		15000
					Plant Equipment & DHW	1 sum	$162,800.00	$162,800		$4.22		15000
	EAc1.2 Optimize Energy Performance: 30% - Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associate with excessive energy use.			2					$0	$0.00	EXCLUDED	
					Not Pursued	0 m2	$0.00	$0		$0.00		misc

Total Gross Floor Area 38,598 m2
suites 424 no

	LEED prerequisite/credit	Targeted	Pending	Not Pursued	cost factor description	quantity	unit rate	sub total	total	cost/m2 total gfa	comments	Division impact
							Incremental from Standard Condo to LEED					
Energy & Atmosphere	**EAc1.3 Optimize Energy Performance:** 40% - Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associate with excessive energy use.			2					$0	$0.00	EXCLUDED	
					Not Pursued	0 m2	$0.00	$0		$0.00		misc
	EAc1.4 Optimize Energy Performance: 50% - Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associate with excessive energy use.			2					$0	$0.00	EXCLUDED	
					Not Pursued	0 m2	$0.00	$0		$0.00		misc
	EAc1.5 Optimize Energy Performance: 60% - Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associate with excessive energy use.			2					$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		misc
	EAc2.1 Renewable Energy: 5% - Encourage and recognize increasing levels of on-site renewable energy self-supply in order to reduce environmental impacts associated with fossil fuel energy use.			1					$0	$0.00	EXCLUDED	
					Not Pursued	0 m2	$0.00	$0		$0.00		misc
	EAc2.2 Renewable Energy: 10% - Encourage and recognize increasing levels of on-site renewable energy self-supply in order to reduce environmental impacts associated with fossil fuel energy use.			1					$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		16000
	EAc2.3 Renewable Energy: 20% - Encourage and recognize increasing levels of on-site renewable energy self-supply in order to reduce environmental impacts associated with fossil fuel energy use.			1					$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		16000
	EAc3 Best Practice Commissioning - Verify and ensure that the entire building is designed, constructed and calibrated to operate as intended.	1							$10,000	$0.26	Related to EAp1	
					Engage a independent commissioning authority	1 sum	$10,000.00	$10,000		$0.26		1000
	EAc4 Ozone Protection: Elimination of HCFCs - Reduce ozone depletion and support early compliance with the Montreal Protocol.	1							$10,000	$0.26		
					Specification of no HCFC HVAC&R equipment	1 sum	$10,000.00	$10,000		$0.26	Related to EAp3	15000
	EAc5 Measurement & Verification - Provide for the ongoing accountability and optimization of building energy and water consumption performance over time.	1							$10,000	$0.26	Cost includes meters for all major base building systems and 1-year analysis to compare actual performance to anticipated performance	
					Lighting system and controls	1 sum	$10,000.00	$10,000		$0.26		16000
					Air distribution static pressures/ ventilation air volumes	0 sum	$0.00	$0		$0.00	Included in base - Standard BAS requirement	15000
					Boiler efficiencies	0 sum	$0.00	$0		$0.00		15000
	EAc6 Green Power - Encourage the development and use of grid-source, renewable energy technologies on a net zero pollution basis.			1					$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		-
	5											
Materials & Resources	**MRp1 Storage & Collection of Recyclables -** Facilitate the reduction of waste generated by building occupants that is hauled to and disposed of in landfills.	Y							$0	$0.00	Minimal cost impact - assume no increase in area	
					Permanent recycling area in the building	0 m2	$0.00	$0		$0.00		misc
	MRc1.1 Building Reuse: Maintain 75% of Existing Walls, Floors, and Roof - Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.			1					$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		misc
	MRc1.2 Building Reuse: Maintain 95% of Existing Walls, Floors and Roof - Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.			1					$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		misc
	MRc1.3 Building Reuse: Maintain 50% of Interior Non-Structural Elements - Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.			1					$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		misc
	MRc2.1 Construction Waste Diversion: Divert 50% From Landfill - Divert construction, demolition and land clearing debris from landfill disposal. Redirect recyclable recovered resources back to the manufacturing process. Redirect reusable materials to appropriate sites.	1							$10,000	$0.26		
					Additional lifting and dumpster rental fees	0 sum	$0.00	$0		$0.00	Additional costs assumed to be absorbed by reduced tipping fees for recyclable materials	1000
					Documentation and sorting of Wood, Masonry Metal, and GWB	1 sum	$10,000.00	$10,000		$0.26	Photographs and LEED standard documents	1000
	MRc2.2 Construction Waste Diversion: Divert 75% from Landfill - Divert construction, demolition and land clearing debris from landfill disposal. Redirect recyclable recovered resources back to the manufacturing process. Redirect reusable materials to appropriate sites.	1							$0	$0.00	See MRc2.1	
					Included in MRc2.1	0 m2	$0.00	$0		$0.00		1000
	MRc3.1 Resource Reuse: 5% - Reuse building materials and products in order to reduce demand for virgin materials and to reduce waste, thereby reducing impacts associated with the extraction and processing of virgin resources.			1					$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		misc
	MRc3.2 Resource Reuse: 10% - Reuse building materials and products in order to reduce demand for virgin materials and to reduce waste, thereby reducing impacts associated with the extraction and processing of virgin resources.			1					$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		misc
	MRc4.1 Recycled Content : 7.5% (Post-Consumer + 1/2 Post-Industrial) - Increase demand for building products that incorporate recycled content materials, therefore reducing impacts resulting from extraction and processing of new virgin materials and by-passing energy and green house gas-intensive industrial and manufacturing processes.	1							$0	$0.00	Subject to weather and schedule constraints. Material cost savings assumed to be offset by accelerator admixtures.	
					25% slag or fly-ash	0 m2	$0.00	$0		$0.00	Documentation costs allowed for in IDc2.	misc
					Specification of high recycled content materials such as asphalt GWB steel and Brick	0 m2	$0.00	$0		$0.00	Minimal cost impact	misc
					Misc. materials and finishes	0 m2	$0.00	$0		$0.00	Minimal cost impact	misc
					Documentation and report	0 sum	$0.00	$0		$0.00	Included in General requirements	1000

b2-12

Total Gross Floor Area	38,598	m2
suites	424	no

	LEED prerequisite/credit	Targeted	Pending	Not Pursued	cost factor description	quantity	unit rate	sub total	total	cost/m2 total gfa	comments	Division impact
							Incremental from Standard Condo to LEED					
	MRc4.2 Recycled Content: 15% (Post-Consumer + 1/2 Post-Industrial - Increase demand for building products that incorporate recycled content materials, therefore reducing impacts resulting from extraction and processing of new virgin materials and by-passing energy and green house gas-intensive industrial and manufacturing processes.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED	misc
	MRc5.1 Regional Material: 10% Extracted and Manufactured Regionally - Increase demand for building materials and products that are extracted and manufactured within the region, thereby supporting the use of indigenous resources and reducing the environmental impacts resulting from transportation.	1			None	0 m2	$0.00	$0	$0	$0.00 $0.00	Minimal cost impact - proximity to industry	misc
	MRc5.2 Regional Materials: 20% Extracted and Manufactured Regionally - Increase demand for building materials and products that are extracted and manufactured within the region, thereby supporting the use of indigenous resources and reducing the environmental impacts resulting from transportation.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED	misc
	MRc6 Rapidly Renewable Materials - Reduce the use and depletion of finite raw materials and long-cycle renewable materials by replacing them with rapidly renewable materials.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED	misc
	MRc7 Certified Wood - Encourage environmentally responsible forest management.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED	6000
	MRc8 Durable Building - Minimize materials use and construction waste over a building's life resulting from premature failure of the building and its constituent components and assemblies.	1			None	0 m2	$0.00	$0	$0	$0.00 $0.00	Minimal cost impact - Standard Tridel specification - Documentation costs included in general requirements	misc
	5											
Indoor Environmental Quality	**EQp1 Minimum IAQ Performance -** Establish minimum indoor air quality (IAQ) performance to enhance indoor air quality in buildings, thus contributing to the comfort and well-being of the occupants.	Y			None	0 m2	$0.00	$0	$0	$0.00 $0.00	Minimal cost impact - Standard building specification	15000, misc
	EQp2 Environmental Tobacco Smoke (ETS) Control - Prevent or minimize exposure of building occupants, indoor surfaces, and systems to Environmental Tobacco Smoke (ETS).	Y			Suite weather-stripping Blower door testing of sample units	424 no 42 no	$50.00 $700.00	$21,200 $29,680	$50,880	$1.32 $0.55 $0.77	Weather stripping and floor sweep for residential units Sampling of units	15000, misc
	EQc1 Carbon Dioxide (CO2) Monitoring - Provide capacity for indoor air quality (IAQ) monitoring to help sustain long-term occupant comfort and well-being.			1	Not Pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED	15000
	EQc2 Increase Ventilation Effectiveness: Provide for effective delivery and mixing of supply air to support the safety, comfort and well-being of building occupants.			1	Not Pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED	15000
	EQc3.1 Construction IAQ Management Plan: During Construction - Prevent indoor air quality problems resulting from the construction/renovation process in order to help sustain the comfort and well-being of construction workers and building occupants.			1	Not Pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED	1000
	EQc3.2 Construction IAQ Management Plan: Testing Before Occupancy - Minimize indoor air quality problems resulting from the construction/renovation process in order to help sustain the		1		Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED	1000
	EQc4.1 Low-Emitting Materials: Adhesives & Sealants - Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.	1			Low VOC spec - all regularly occupied areas	0 m2	$0.00	$0	$0	$0.00 $0.00	Minimal cost impact - additional costs for documentation included in General Requirements	7920
	EQc4.2 Low-Emitting Materials: Paints & Coatings - Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.	1			Low VOC spec - all regularly occupied areas	141,513 m2	$0.10	$14,151	$14,151	$0.37 $0.37	Low VOC Specification	9900
	EQc4.3 Low-Emitting Materials: Carpet - Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.	1			Green seal carpet common area Green seal carpet to suites	2950 m2 8189 m2	$2.50 $2.50	$7,375 $20,473	$27,848	$0.72 $0.19 $0.53	Low VOC Specification	9685 9685
	EQc4.4 Low-Emitting Materials: Composite Wood & Laminates - Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.			1	Not Pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED	6400
	EQc5 Indoor Chemical & Pollutant Source Control - Minimize exposure of building occupants to potentially hazardous particulates, biological contaminants and chemical pollutants that adversely impact air and water quality.	1			Completion of standardized schedules. Allowance for premium filters in AHU Testing of sample suites	0 m2 2 no 3 no	$0.00 $2,000.00 $2,000.00	$0 $4,000 $6,000	$10,000	$0.26 $0.00 $0.10 $0.16	Additional costs for documentation included in General Requirements Allownace for MERV filters on AHU's	15000
	EQc6.1 Controllability of Systems: Perimeter Spaces - Provide a high level of thermal, ventilation and lighting system control by individual occupants or specific groups in multi-occupant spaces to promote the productivity, comfort and well-being of building occupants.	1			None	0 m2	$0.00	$0	$0	$0.00 $0.00	Operable windows included in base - additional costs for documentation included in General Requirements	8520
	EQc6.2 Controllability of Systems: Non-Perimeter Spaces - Provide a high level of thermal, ventilation and lighting system control by individual occupants or specific groups in multi-occupant spaces to promote the productivity, comfort and well-being of building occupants.	1			None	0 m2	$0.00	$0	$0	$0.00 $0.00	Minimal cost impact - Standard Tridel specification	15000
	EQc7.1 Thermal Comfort: Compliance - Provide a thermally comfortable environment that supports the productivity and well-being of building occupants.	1			None	0 m2	$0.00	$0	$0	$0.00 $0.00	Minimal cost impact - Standard Tridel specification	15000
	EQc7.2 Thermal Comfort: Monitoring - Provide a thermally comfortable environment that supports the productivity and well-being of building occupants.			1	Not Pursued	0 no	$0.00	$0	$0	$0.00 $0.00	EXCLUDED	15000

Total Gross Floor Area	38,598	m2	
suites	424	no	

	LEED prerequisite/credit	Targeted	Pending	Not Pursued	cost factor description	quantity	unit rate (Incremental from Standard Condo to LEED)	sub total	total	cost/m2 total gfa	comments	Division impact
	EQc8.1 Daylight and Views: Daylight 75% of Spaces - Provide for the building occupants a connection between indoor spaces and the outdoors through the introduction of daylight and views into the regularly occupied area of the building.	1							$0	$0.00		
					None	0 m2	$0.00	$0		$0.00	Included in base - additional costs for documentation included in General Requirements	n/a
	EQc8.2 Daylight and Views: Daylight 90% of Spaces - Provide for the building occupants a connection between indoor spaces and the outdoors through the introduction of daylight and views into the regularly occupied area of the building.	1							$0	$0.00		
					None	0 m2	$0.00	$0		$0.00	Included in base - additional costs for documentation included in General Requirements	n/a
Innovation & Design Process	9											
	IDc1.1 Innovation in Design: Breathing wall demonstration	1							$0	$0.00	EXCLUDED	
					In-suite metering	0 m2	$0.00	$0		$0.00	Owner to confirm breathing wall fulfills requirements of ID point	10900
	IDc1.2 Innovation in Design: Specific Title	1							$0	$0.00	Included in EAc1.1	
					Chiller Heat Recovery	0 m2	$0.00	$0		$0.00		15000
	IDc1.2 Innovation in Design: Specific Title	1							$0	$0.00	Marketing costs excluded	
					Green living guide	0 m2	$0.00	$0		$0.00		-
	IDc1.4 Innovation in Design: Specific Title	1							$0	$0.00		
					Energy star washing machines	424 no	$0.00	$0		$0.00	Included in base	11451
	IDc2 LEED® Accredited Professional:	1							$16,960	$0.44		
					LEED® Consulting - EXCLUDED	1 sum	$0.00	$0		$0.00		1000
					LEED® Registration	1 sum	$2,650.00	$2,650		$0.07		1000
					LEED® Certification	1 sum	$14,310.00	$14,310		$0.37		1000
	NET COST (Including Site)	36	2	32					$1,412,529	$36.60		
	General Requirements & Fees								$0			
	General requirements on additional cost **(Excluded)**							$0				
	Construction Management Fees **(Excluded)**							$0				
	Design Fees **(Excluded)**							$0				
	TOTAL ESTIMATE (Excluding Contingencies)								$1,412,529	$36.60		
	Allowances								$74,600			
	Design Allowances							$29,800				
	Escalation Allowances **(Excluded)**							$0				
	Construction Allowances							$44,800				
	TOTAL ESTIMATE (Including Allowances)								$1,487,129	$38.53		

GFA:	38,598	**$38.53**	/m2
GFA:	415,465	**$3.58**	/sf
Suites	424	**$3,507.38**	/suite
Points	36	**$41,309**	/credit

b2.8 EAc1 - Optimize Energy Performance Strategies

Total Gross Floor Area 38,598
suites 424

Category	Scenario	Quantity	Unit Rate	Sub-Total	$ Budget	Comments
Interior Lighting	1. Efficient Lighting Design Reduce installed lighting power to meet ASHRAE 90.1-2004 Use fluorescent (T8 and/or T5 with electronic ballasts), 4-pin compact fluorescent, LED and HID fixtures to avoid high lighting power densities. Eliminate halogen, incandescent and mercury vapour fixtures.	0 m2	$0.00	$0	$0	Included in base
	2. Occupancy sensors for lighting Provide occupancy sensors to control lighting in the building (e.g. exit stairwells, amenity areas, parking garage storage rooms, utility rooms and maintenance closets). Exceptions may included reception areas, areas where safety may be a concern and areas prohibited under the Ontario Building Code	140 no	$110.00	$15,400	$15,400	
	Total Interior Lighting				$15,400	
Building Envelope	1. Increase thermal performance of spandrel panel Increase spandrel R-Value from R6 to R12 by adding 25mm of extruded polystyrene or spray applied polyurethane to interior surface of metal back pan. Alternatively, add 50mm of rigid mineral fibre or rigid fibreglass	4096 m2	$0.00	$0	$0	Included in base
	2. Increase thermal performance of exterior brick wall assemblies Upgrade effective R-value (i.e. including effects of thermal bridging) from R-12 to R-17 by adding 25mm of extruded polystyrene outboard of the dens glass gold sheathing	0 m2	$15.00	$0	$0	Not Pursued
	3. Increase thermal performance of exterior precast panels Upgrade effective R-value (i.e. including effects of thermal bridging) from R-12 to R-17 by adding 25mm of extruded polystyrene	2167 m2	$0.00	$0	$0	Included in base
	4. Upgrade Window Performance Specify windows with the following thermal performance in accordance with CSA-A440.2: U = 1.94 W/m2C, SHGC = 0.39 Note: Cavity space (13mm) to include insulating non-metal spacer and argon fill. Frames to include 19mm thermal break. Glazing to include soft coat low-e (e=0.05).	14747 m2	$30.00	$442,410	$442,410	Base assumes double glazing with low E coating and 3/8" thermal break
	Total Building Envelope				$442,410	
HVAC Systems	1. Outdoor Air Reset				$14,000	
	Control the supply air temperature using outdoor air reset.	2 no	$5,000.00	$10,000		
	Additional filters for outdoor air	2 no	$2,000.00	$4,000		
	2. Energy Recovery Ventilator in VAV systems Add enthalpy wheel (75% effective) to serve all ventilation air. Note: this measure must be implemented with measure #1 (Outdoor Air Reset) to maximize energy recovery savings.	58000 cfm	$7.50	$435,000	$435,000	
	3. Upgrade Fan Efficiency in VAV Systems				$0	No VAV System
	Specify supply fans 55% efficiency	0 no	$0.00	$0		
	Specify central exhaust fans: 35% efficiency	8 no	$0.00	$0		
	Total HVAC Systems				$449,000	
	1. In-suite energy recovery ventilator				$0	Included in base
	75% effective ERV to be installed in apartments, recovering heat from bathrooms & kitchen exhaust.	424 no	$0.00	$0		
	Downsizing of corridor make-up air unit for towers	1 sum	$0.00	$0		
	Reduce kitchen exhaust ductwork and perimeter penetration	424 no	$0.00	$0		
	Elimination of bathroom exhaust fan and ducting to perimeter	669 no	$0.00	$0		

Total Gross Floor Area 38,598
suites 424

	Scenario	Quantity	Unit Rate	Sub-Total	$ Budget	Comments
Plant Equipment & DHW	2. Modulating Boiler				$0	Not Pursued
	Add fully-modulating burner to the boiler to standard efficiency DHW boiler.	0 no	$0.00	$0		
	Add fully-modulating burner to the boiler to standard efficiency Building Heating boiler.	0 no	$0.00	$0		
	3. Condensing Boiler				$60,800	
	Upgrade from standard efficiency boiler to condensing boiler for DHW system (efficiency = 93%)	2 no	$5,500.00	$11,000		For building hot water
	Upgrade from standard efficiency boiler to condensing boiler for Building Heating system (efficiency = 93%)	4 no	$12,500.00	$50,000		For domestic hot water
	4. VSD on Pumps				$68,000	
	Add variable speed drives on all heating pumps.	8 m2	$8,500.00	$68,000		
	5. Increase Pumping Efficiency				$0	Not Pursued
	Increased combined impeller/motor efficiency to 70% for all heating pumps.	0 sum	$0.00	$0		
	6. High Efficiency Water Cooled Chiller				$0	Not Pursued
	Upgrade water cooled chiller to a high efficiency model with a COP = 7.0 Note: This measure will only apply if a central chiller system is used as opposed to high efficiency DX cooling roof top units (see measure 3.2). This measure assumes a standard efficiency water cooled chiller is part of the base design	0 m2	$0.00	$0		
	7. VSD on Cooling Tower Pump				$34,000	
	Add variable speed drive to cooling tower pump.	4 no	$8,500.00	$34,000		
	8. Low-Flow Fixtures				$0	Included in WEc3.1
	Upgrade to lavatory faucets with a flow rate of 1.9L/min. @552KPa (0.5 gpm@80psi).	0 m2	$0.00	$0		
	Total Plant Equipment & DHW				$162,800	

NET COST EXCLUDING GENERAL REQUIREMENTS AND ALLOWANCES	$1,069,610

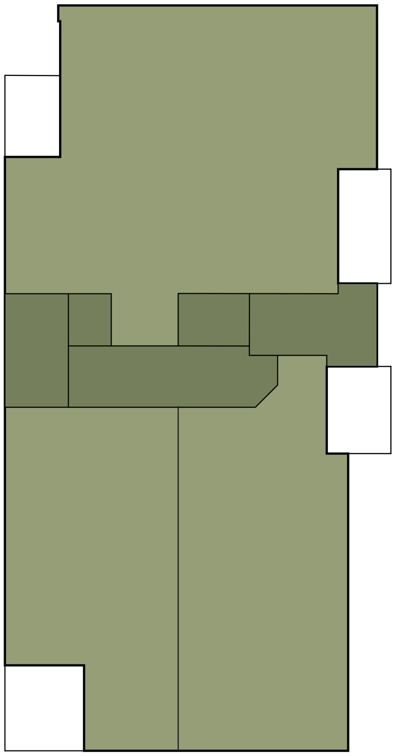
38,598 m2	$27.71
415,465 sf	$2.57
424 suites	$2,522.67

b2.9 Building Value Assessment

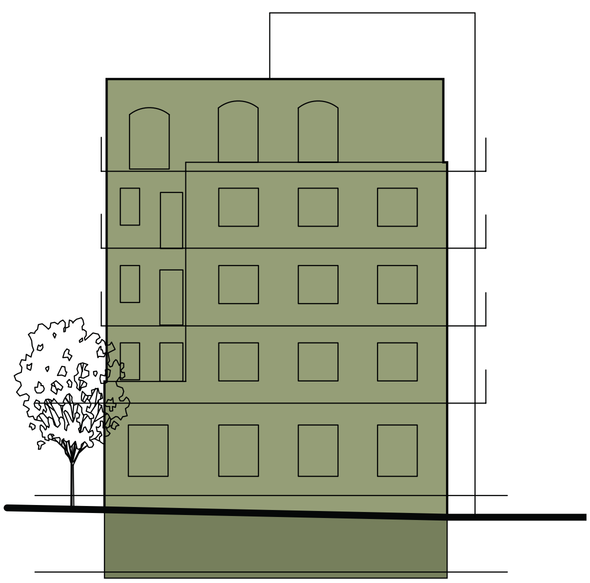
Ref.	Design Criteria/Characteristics		MNECB Reference Building		b2 - Multi-unit Residential Case Study		Key Indicators
1.00	**Construction Cost Summary**						
1.01	Building Area (GLA)		38,598 m2		38,598 m2		
1.02	Number of Suites		424 no		424 no		
1.03	Total Construction Hard Costs (Excl. LEED)		$67,854,000	$1,757.97 /m2	$67,854,000	$1,757.97 /m2	
1.04	Total LEED Incremental Construction Cost		$0	$0.00 /m2	$1,487,000	$38.53 /m2	
1.05	Total Construction Hard Costs (Incl. LEED)		$67,854,000	$1,757.97 /m2	$69,341,000	$1,796.49 /m2	
1.06	Total Project Soft Costs		Excluded	- /m2	Excluded	- /m2	
1.07	**Total Project Budget**		$67,854,000	$1,757.97 /m2	$69,341,000	$1,796.49 /m2	
2.00	**Building Environmental Performance**						
2.01	Energy Use per year	KWh/a	13,354,908	346 /m2	8,182,776	212 /m2	
2.02	Energy Cost per year	$	$859,984	$22.28 /m2	$551,893	$14.30 /m2	
2.03	Percent of MNECB baseline		100.0%		58.9%		
2.04	Water Use per year	m3	79,898	2.070 m3/m2	55,929	1.449 m3/m2	
2.05	Water Cost per year (@ $1.20/m3)	$	$95,877	$2.48 /m2	$67,114	$1.74 /m2	
2.06	Percent water reduction		0%		30%		
2.07	Greenhouse Gas reduction	Tonnes CO2/a	-		-		
2.08		Tonnes CO2/a/unit	-		-		
3.00	**Value of Increased Site Density Permitted by Municipality**						
3.01	Number of suites permitted by zoning	no	424		445		
3.02	Increase in site density beyond zoning	%	0.0%		5.0%		
3.03	Developer revenue	$	$12,720,000	$30,000 /suite	$13,356,000	$30,000 /suite	
3.04	Increased deveoper revenue	$	$0	$0.00 /m2	$636,000	$16.48 /m2	
3.05	Increased building value (% of Capital)	%	0%		0.9%		
3.06	Payback on LEED Cost Increment	Years	0.0		2.3		
4.00	**Value of Reduced time in Gaining Project Approvals**						
4.01	Duration of Permiting and Approvals	Months	14		10		
4.02	Carrying costs of pre-construction	$/Month	$127,200	$300 /suite	$127,200	$300 /suite	
4.03	Estimated carrying cost pre-construction	$	$1,780,800	$46.14 /m2	$1,272,000	$32.96 /m2	
4.04	Savings from Schedule Advantage	$	$0	$0.00 /m2	$508,800	$13.18 /m2	
4.05	Increased building value (% of Capital)	%	0%		0.7%		
4.06	Payback on LEED Cost Increment	Years	0.0		2.9		
5.00	**Value of Sales Premium (Note 1)**						
5.01	Sales Revenue (GSA = 85% of GLA)	$	$11,482,905	$350.00 /m2 (GSA)	$12,057,050	$367.50 /m2 (GSA)	
5.02	Sales Revenue Premium	%	0.0%		5.0%		
5.03	Additional Sales Revenue	$	$0	$0.00 /m2 (GSA)	$574,145	$17.50 /m2 (GSA)	
5.06	Increased building value (% of Capital)	%	0%		0.8%		
5.07	Payback on LEED Cost Increment	Years	0.0		2.6		
6.00	**Value of Increased Sales Velocity**						
6.01	Duration of Pre-Construction Sales	Months	8		6		
6.02	Carrying costs during pre-sales	$/Month	$318,000	$750 /suite	$318,000	$750 /suite	
6.03	Estimated carrying cost pre-const. sales	$	$2,544,000	$65.91 /m2	$1,908,000	$49.43 /m2	
6.04	Savings from Schedule Advantage	$	$0	$0.00 /m2	$636,000	$16.48 /m2	
6.05	Increased building value (% of Capital)	%	0%		0.9%		
6.06	Payback on LEED Cost Increment	Years	0.0		2.3		
7.00	**Value of Reduced Condominium Fees (Note 2, 3)**						
7.01	Condo fees (GSA = 85% of GLA)	$/Month	$180,445.65	$5.50 /m2	$164,041.50	$5.00 /m2	
7.02	Condo fees	$/Year	$2,165,348	$5,107 /suite	$1,968,498	$4,643 /suite	
7.03	Savings available for debt service	$/Month	$0	$0.00 /suite	$16,404	$38.69 /suite	
7.04	Value of reduced condo fee in qualifying for additional mortgage	$	$0	$0.00 /m2	$2,120,000	$5,000 /suite	
7.05	Building premium on condo fee savings	$	$0	$0.00 /m2	$2,120,000	$54.93 /m2	
7.06	Increased building value (% of Capital)	%	0%		3.1%		
7.07	Payback on LEED Cost Increment	Years	0.0		0.7		
8.00	**Total Increase in Building Value**						
8.01	Increase in buliding value (sum 3 to 7)	$	$0	$0.00 /m2	$4,474,945	$115.94 /m2	
8.02	Increased building value (% of Capital)	%	0%		6.5%		
8.03	Payback on LEED Cost Increment	Years	0.0		0.3		

1. Sales revenue based on similar building sales information provided by Altus Helyar Valuation Consulting
2. Condo fees based on Altus Helyar Cost Consulting data
3. Mortgage qualification figures by Invis Financial on-line calculator

b3.1 Project Diagrams and Overview



Typical Floor Plan Diagram



Building Elevation Diagram

Ref.	Design Criteria/Characteristics		b3 Residential Case Study	Key Indicators
1.00	**Project Statistics**			
1.01	Location		Waterloo, Ontario	
1.02	Gross Livable Area (m2 GLA)		1703	
1.03	Stories	Parking	-	
1.04		Tower A	5	
1.05		Tower B	-	
1.06	Number of suites		11	
2.00	**Construction Cost Estimate**			
2.01	Below Grade (parking/basement)		$149,960	
2.02	Podium		-	
2.03	Residential Floors Tower A		$2,114,312	
2.04	Residential Floors Tower B		-	
2.05	Site Development		$151,318	
2.06	**Subtotal Excluding Contingencies**		**$2,415,590**	
2.07	Design Contingency/Allowance		$0	
2.08	Escalation Contingency		$0	
2.09	Post Contract		$50,000	
2.10	**Total Construction Cost (Excl. GST)**		**$2,466,000**	
2.11		**$/m2 (GLA)**	**$1,448**	
3.00	**Estimated LEED Cost Increment (Included above)**			
3.01	$ Budget		$184,000	
3.02	$/m2		$108	
3.03	$/credit		$4,600	
3.04	**% increase**		**8.1%**	
4.00	**Exterior Enclosure (Overall System)**			
4.01	Wall R-Value		R-20	
4.02	Roof R-Value		R-20	
4.03	Glazing U-factor / SHGC / visible light trans.		1.41/0.40/0.70	
4.04	Amount of glazing (% of building skin area)		17%	
5.00	**Building Environmental Performance**			
5.01	Energy Intensity (Base/LEED)	KWh/m2/a	250/105	
5.02	Percent of MNECB baseline		62% MNECB	
5.03	Water use (Base/LEED)	L/m2/a		
5.04	Percent water reduction		0%	
5.05	Greenhouse Gas reduction	tonnes CO2/a	-	
5.06		tonnes CO2/a/unit	-	

b3.2 Project Statistics

Ref.	Item	Unit	Case Study Value	Industry Standard Value	Key Indicators
1.00	**Project Totals**				
1.01	Below Grade Area (GPA)	sf	3,175	33,229	
1.02	GLA	sf	18,332	70,630	
1.03	GFA (TCA)	sf	21,507	103,859	
1.04	# Levels Below Grade	no	1	2	
1.05	# Towers	no	1	1	
1.06	# Floors Tower	no	5	7	
1.07	# Suites	no	11	39	
1.08	# Parking	no	0	64	
1.09	# Lockers	no	0	64	
1.10	Site Area	sf	9,178	18,558	
2.00	**Below Grade**				
2.01	Total Below Grade Area	sf	3,175	33,229	
2.01.01	Net Parking area	sf	0	29,058	
2.01.02	Service / Mechanical	sf	2,917	765	
2.01.03	Circulation	sf	258	1,372	
2.01.04	Storage / Lockers	sf	0	2,035	
2.02	Stalls	no	0	64	
2.03	No. of levels	no	1	2	
2.04	Gross Parking Area / Stall	sf	-	522	
2.05	Net parking area / Stall	sf	-	451	
2.06	Stalls / Unit	no	0.00	1.62	
2.07	Exterior Wall Area	sf	2,379	8,681	
2.08	Exterior wall / GPA (Below Grade)	ratio	0.75	0.26	
2.09	Excavation Volume	m3	1,168	10,213	
2.10	Excavation/Parking Area ratio (m3/m2)	m3/m2	3.96	3.33	
2.11	Below Grade (GPA) / Total Construction Area(TCA)	ratio	0.15	0.32	
2.12	# Elevator Cabs	no	1	2	
2.13	# Elevator Stops	no	1	9	
3.00	**Above Grade**				
3.01	Total Above Grade Area (GLA)	sf	18,332	70,630	
3.01.01	Residential - High Rise	sf	0	0	
3.01.02	Residential - Low Rise	sf	12,742	56,739	
3.01.03	Retail /Commercial	sf	2,196	2,175	
3.01.04	Amenity	sf	108	942	
3.01.05	Storage / Lockers	sf	0	0	
3.01.06	Service Areas (mechanical/electric	sf	444	2,153	
3.01.07	Circulation	sf	2,842	8,622	
3.02	Net saleable area	sf	14,938	58,913	
3.05	**Suite Breakdown**				
3.05.01	Bachelor / Studio	no	0	1	
3.05.02	1 bedroom	no	3	5	
3.05.03	1 bedroom + Den	no	0	4	
3.05.04	2 bedroom	no	8	15	
3.05.05	2 bedroom + Den / Study	no	0	15	
3.05.06	3 bedroom	no	0	1	
3.05.07	3 bedroom + Den	no	0	0	
3.05.08	4 bedroom + den	no	0	0	
3.05.09	Penthouse	no	0	0	
3.06	No. of units	no	11	39	
3.07	GLA / Unit	sf	0	0	
3.08	2 bedroom / 1 bedroom Ratio		2.67	3.47	
3.12	**Floors**				

Ref.	Item	Unit	Case Study Value	Industry Standard Value	Key Indicators
3.12.02	Typical floor to floor height	lf	9.67	9.00	
3.12.03	Window Area	sf	2,217	11,738	
3.12.04	Exterior wall area	sf	12,734	35,743	
3.12.05	Exterior wall / GLA (Above Grade)		0.69	0.50	
3.12.06	# Elevator Cabs	no	1	2	
3.12.07	# Elevator Stops	no	1	9	
3.13	**Saleable**				
3.13.01	Total Saleable Area	sf	14,938	58,913	
3.13.02	Residential	sf	12,742	56,739	
3.13.03	Retail/Commercial	sf	2,196	2,175	
3.14	**Statistical Efficiency Ratios**			**0.00**	
3.15	Building Efficiency (Net Saleable / GLA)	ratio	0.81	0.83	
3.16	Typical floor Efficiency (Net Saleable / GLA)	ratio	0.88	0.88	
3.17	Average Selling Area/Unit (Average Unit Size)	sf	1,158	1,455	
3.18	Exterior wall / Net Saleable Area (Above Grade)	ratio	0.85	0.61	
3.19	Window / Ext.wall ratio	ratio	0.17	0.32	
3.22	Retail ratio - (Retail area / GLA)	ratio	0.12	0.06	
3.23	GFA / Unit	sf	1,955	2,660	
3.26	**Construction Ratios**				
3.27	Formwork contact area	m2	7,496	23,320	
3.28	Concrete volume (including Waste)	m3	749	5,016	
3.29	Rebar Weight	kg	61,545	419,297	
3.30	Rebar / Concrete Volume ratio	kg/m3	82.2	82.3	
	Structural Steel	kg	?	0.0	
3.31	Rebar / GLA	kg/m2	3.36	5.85	
3.32	Rebar / GFA	kg/m2	2.86	3.97	
3.33	Formwork / GFA	m2/m3	0.35	0.22	
3.34	Concrete / GFA	m3/m2	0.37	0.52	
3.35	Concrete / GLA	m3/m2	0.44	0.76	
3.36	Structural Steel/GLA	kg	?	?	
3.37	Number of fan coils/heat pump units	no	0	39	
3.38	Fan Coils / unit, heat pumps/unit	no	0.00	1.00	
3.39	Net saleable area per Fan coil	sf	-	1,514	
4.00	**Site**				
4.01	Gross Site Area	acre	0.21	0.42	
4.02	Site Density (UPA)	unit/acre	52.34	94.44	
4.03	Site Area/Unit	sf	834.36	469.79	
5.00	**Construction Cost**				
6.00.01	Below Grade Cost	$	$149,960	$2,110,000	
6.00.03	Above Grade Cost (Incl Site Work)	$	$2,315,630	$6,868,722	
6.01	**Total Cost**	$	**$2,465,590**	**$8,978,722**	
6.02	Cost / Stall	$/Unit	-	$33,168	
6.03	Cost / GLA	$/sf	$134.50	$126.44	
6.04	Cost / GFA	$/sf	$114.64	$86.12	
6.05	Cost / Unit	$/Unit	$224,145	$229,175	
6.06	Cost / Saleable Area	$/sf	$165.05	$151.59	

b3.3 Project Narrative - By Building Element

A1 Sub-Structure

Standard Building
• Conventional foundations with spread footing.
• Open cut excavation

LEED Gold Initiatives:
• Use fly-ash as partial substitute of Portland cement in concrete mix
• Use portion of slag as aggregate for concrete mix.

A2 Structure

Standard Building
• Core-slab floor with concrete block structure and shear walls.
• Steel transfer beams and lintels
• Pre-cast exit stairs

LEED Initiatives:
• 250 Durisol insulated concrete formwork
• Use fly-ash as partial substitute of Portland cement in concrete mix
• Use slag as aggregate for concrete mix.
• Use of rebar with recycled content

A3 Exterior Enclosure

Below Grade
Standard Building
• Cast in place concrete perimeter basement wall.
• Waterproof membrane on protection board

LEED Initiatives:
• Use fly-ash as partial substitute of Portland cement in concrete mix
• Use slag as aggregate for concrete mix.
• Use of rebar with recycled content
• 50mm spray foam insulation under slab on grade

Above Grade
Standard Building
Walls
• Brick veneer with steel framing/concrete block wall back-up.
• Polymer EIFS with 50mm EPS and field applied 3 coat finish with steel framing/concrete block wall back up.
• Vinyl windows with Low-E coating and operable casement type sections
• Insulated hollow metal doors and frames.
Roof
• 4-ply built-up insulated roof finish.
• Terrace pavers in areas.
• Balconies/terraces
• Allowance for roof feature.

LEED Initiatives:
Walls
• Increase thermal performance of wall assemblies including details to minimize thermal bridging
• Provide minimum of R-6 over all structural members
• Increase thermal performance of window assemblies to include fiberglass windows with 19mm thermal break, Cavity space (13mm) to include warm edge spacer, soft coat low-E coating (e=0.05), argon filled, overall U-value 1.94, SHGC 0.39
• Provision for cross ventilation and natural lighting in common areas
• Two doors with vestibule provided at all exterior doors including doors into the parking garage
• Allowance for additional air and water leakage testing of sample units
• Allowance for durable building details and construction methods
• Allowance for Low VOC Materials inside of air barrier
Roof
• Inverted roof fully adhered to structural deck
• Extensive green roof system
• Allowance for additional water leakage testing
• Allowance for durable building details and construction methods
• Allowance for Low VOC materials inside of air barrier
• Increase thermal performance of wall assemblies to overall R-17
• Increase spandrel panel insulation to R-12

B1 Partitions and Doors

Standard Building
• Concrete shear wall, concrete block walls and drywall partitions.
• Fire rated stairwell doors. Solid core suite entry doors.
• Hollow core wood interior doors.
• Hard board sliding closet doors
• Hollow metal doors and solid core wood doors to common areas.

LEED Initiatives:
• Floor sweep and air tight seals around all suite entry doors.
• Recycled content specified for Gypsum board
• Recycled content specified for steel framing
• Allowance for durable building details and construction methods
• Allowance for Low VOC Materials

B2 Finishes

Standard Building
Floors
• Carpet to corridors.
• Carpet and ceramic to amenity areas.
• Engineered hardwood floor to foyer, living, dining, den/kitchen.
• Carpet to bedrooms
• Ceramic floor tiles to washrooms, and showers. Ceramic to laundry & garbage chute.
Ceilings
• Suspended drywall ceiling to kitchen, and bath. Suspended drywall ceiling to Corridors, amenity rooms, lobby to tower.
• Sprayed texture to concrete soffit in suites.
• Allowance for feature ceilings.
Walls
• Paint to drywall and concrete block walls.
• Ceramic tile to tub and shower surrounds in suites.
• Paint finish, contemporary styled baseboards and door casing to suites.

LEED Initiatives:
• Ceramic to common areas including corridors
• Solid wood flooring to suites
• Allowance for durable building details and construction methods
• Allowance for Low VOC Materials
• Materials that have recycled and/or post consumer/industrial content.
• Materials that have been manufactured and/or harvested regionally.

B3 Fittings and Equipment

B31 Fittings and Fixtures

Standard Condo
• Medium quality washroom accessories to bathrooms
• Kitchen cabinets with granite counter tops and vanities with cultured marble counter tops.

LEED Initiatives:
• Allowance for durable building details and construction methods

B32 Equipment

Standard Building
• Garbage compactor and tri-sorter.
• Allowances for suite appliances
• Allowances for window washing roof anchors.

LEED Initiatives:
• Energy Star refrigerator, and cloths washer in suites

B33 Conveying Systems

Standard Building
• 1nos x 5 stop = 5 stop passenger elevator to above grade

LEED Initiatives:
• None

C1 Mechanical

Standard Condo
• Medium quality plumbing fixtures.
• Residential floors to have full standpipe cover-

age.
• Make up air units gas heat & DX cooled
• Vertical 2-pipe fan-coil unit in each suite
• Kitchen and washroom exhaust directly vented.
• Microwave with built-in hood fan (cost included in architectural)
• A gas hot water boiler provides domestic hot water
• Gas fired building heating
• Allowance for common area fancoil unit
• Allowance for water softener

LEED Initiatives:
• Radiant floor heating and utilizing thermal mass effect
• Elimination of suite air conditioning
• Ductless mini-split provides fresh air to each suite
• Medium/high quality plumbing fixtures
• Low-flow lavatory and shower heads

C2 Electrical

Standard Condo
• Medium quality lighting fixtures
• Suite devices are assumed to be standard apartment quality
• Pipe heat tracing is included

EXCLUDED
• Hydro charges
• Communication cables – assumed by local provider
• Suite security system
• In slab heating
• DDC controls on major equipment

LEED Initiatives:
• Occupancy sensors in corridors/stair cases and amenity
• Efficient lighting design in amenity, corridors, suites, and bedrooms

EXCLUDED
• Same as above

D1 Site Development

Standard Building
• Allowances for site development includes unit pavers, concrete paving and soft landscaping, site improvements.
• Allowance made for Mechanical site services.
• Allowance made for Electrical site services.

LEED Initiatives:
• Size parking to meet but not exceed local bylaw requirements
• Reduce site disturbance to vicinity immediately around proposed building footprint and site work completed
• Elimination of irrigation
•Adaptive species landscaping
• Erosion and sedimentation control documentation and implementation

D2 Ancillary Work

• None

b3.4 Project Cost Summary

Construction Cost Item		GFA(M2)	Total Project Excluding LEED $ Budget	$/m2	Total Project Including LEED $ Budget	$/m2	No. Units/ Spaces	$ /Unit	% increase	
Below Grade		295	$149,960	$508	$149,960	$508	1	$150,000	0.0%	
Above Grade - 5 Storey		1,703	$1,933,381	$1,135	$2,114,312	$1,242	11	$192,200	9.4%	Additional requirements of LEED
Site Development		853	$148,299	$174	$151,318	$177	11	$13,800	2.0%	Rainwater harvesting and drip irrigation
Subtotal Construction Costs		1,703	$2,231,640	$1,310	$2,415,590	$1,418	11	$219,600	8.2%	
Design Contingency-Allowance	0.0%	1,703	$0	$0	$0	$0	11	$0	0.0%	
Subtotal - GLA (including Design Allowance)		1,703	$2,231,600	$1,310	$2,415,600	$1,418	11	$219,600	8.2%	
Escalation Contingency	0.0%	1,703	$0	$0	$0	$0	11	$0	0.0%	
Post-contract Construction Contingency	1 sum	1,703	$50,000	$29	$50,000	$29	11	$4,500	0.0%	
Total Construction Costs		**1,703**	**$2,282,000**	**$1,340**	**$2,466,000**	**$1,448**	**11**	**$224,200**	**8.1%**	
Project Soft Costs										
Land (Reality taxes only)		-	Excluded	-	Excluded	-	-	-	-	
Municipal Fees		-	Excluded	-	Excluded	-	-	-	-	
Construction (Excluded above)		-	Excluded	-	Excluded	-	-	-	-	
Design Consultants		-	Excluded	-	Excluded	-	-	-	-	
General and Administrative		-	Excluded	-	Excluded	-	-	-	-	
Furniture Fixtures and Equipment		-	Excluded	-	Excluded	-	-	-	-	
Marketing and Sales		-	Excluded	-	Excluded	-	-	-	-	
Finance		-	Excluded	-	Excluded	-	-	-	-	
Interim Building Operations		-	Excluded	-	Excluded	-	-	-	-	
Government Taxes		-	Excluded	-	Excluded	-	-	-	-	
Development Contingency		-	Excluded	-	Excluded	-	-	-	-	
Total Soft Costs		-	Excluded	-	Excluded	-	-	-	-	
Total Project Budget		**1,703**	**$2,282,000**	$1,340	**$2,466,000**	$1,448	**11**	**$224,200**	8.1%	

Notes
1. See project narrative for description of LEED initiatives
2. Based on September 2005 Budget
3. GST is Excluded.

b3.5 Trade Summary - Total Project

		Total Project Excluding LEED		Total Project Including LEED					
Division		Budget	Cost/ GLA (m2)	Budget	Cost/ GLA (m2)	Cost/ Unit	% of Total	LEED % Increase	Comments
0 Construction Management Fee		$226,690	$133.11	$262,000	$153.85	$23,818	10.62%	15.6%	Documentation and mark-up
1 General Conditions		$45,000	$26.42	$50,000	$29.36	$4,545	2.03%	11.1%	Includes LEED documentation
2 Site Work		$148,299	$87.08	$151,318	$88.85	$13,756	6.14%	2.0%	
3 Concrete		$356,892	$209.57	$356,892	$209.57	$32,445	14.47%	0.0%	
4 Masonry		$228,209	$134.00	$228,209	$134.00	$20,746	9.25%	0.0%	
5 Metals		$78,408	$46.04	$95,308	$55.96	$8,664	3.86%	21.6%	Solar shading canopy at ground floor
6 Carpentry		$135,000	$79.27	$135,000	$79.27	$12,273	5.47%	0.0%	
7 Thermal and Moisture Protection		$154,021	$90.44	$269,542	$158.27	$24,504	10.93%	75.0%	Increased thermal performance and durability
8 Doors & Windows		$79,640	$46.76	$90,460	$53.12	$8,224	3.67%	13.6%	Increased thermal performance glazing
9 Finishes		$260,500	$152.97	$260,500	$152.97	$23,682	10.56%	0.0%	
10 Specialties		$38,810	$22.79	$39,310	$23.08	$3,574	1.59%	1.3%	
11 Equipment		$37,000	$21.73	$42,500	$24.96	$3,864	1.72%	14.9%	Energy Star appliances
12 Furnishings		$0	$0.00	$0	$0.00	$0	0.00%	0.0%	
13 Special Construction		$0	$0.00	$0	$0.00	$0	0.00%	0.0%	
14 Conveying Systems		$83,050	$48.77	$83,050	$48.77	$7,550	3.37%	0.0%	
15 Mechanical		$276,921	$162.61	$265,000	$155.61	$24,091	10.75%	-4.3%	Elimination of suite air conditioning
16 Electrical		$83,200	$48.85	$86,500	$50.79	$7,864	3.51%	4.0%	Occupancy sensors on light fixtures
Subtotal (Excl. Contingencies)		$2,232,000	$1,310.42	$2,416,000	$1,418.43	$219,599	97.97%	8.2%	
Design Contingency (Excl.)	0.0 %	$0	$0.00	$0	$0.00	$0	0.00%	0.0%	
Escalation Contingency (Excl)	0.0 %	$0	$0.00	$0	$0.00	$0	0.00%	0.0%	
Post Contract Contingency	1 sum	$50,000	$29.36	$50,000	$29.36	$4,545	2.03%	0.0%	
Subtotal		$2,282,000	$1,339.78	$2,466,000	$1,447.79	$224,145	100.00%	8.1%	
GST (Excluded)		$0	$0.00	$0	$0.00	$0	0.00%	0.0%	
Total Project Construction Cost		**$2,282,000**	**$1,339.78**	**$2,466,000**	**$1,447.79**	**$224,145**	100.00%	8.1%	

b3.6 LEED Incremental Costing - Total Project

Total Gross Floor Area 1,703 m2
suites 11 no

	LEED prerequisite/credit	Targeted	Pending	Not Pursued	cost factor description	quantity	unit rate	sub total	total	cost/m2 total gfa	comments	Division impact
							Incremental from Standard Building to LEED					
Sustainable Sites	**SSp1 Erosion & Sedimentation Control -** Control erosion to reduce negative impacts on water and air quality.	Y			None	0 m2	$0.00	$0	$0	$0.00 $0.00	Included in Base - Municipal Requirement, Good practice	2000
	SSc1 Site Selection - Avoid development of inappropriate sites and reduce the environmental impact from the location of a building on a site.	1			None	0 m2	$0.00	$0	$0	$0.00 $0.00	Minimal cost impact - additional documentation included in General requirements.	1000
	SSc2 Development Density - Channel development to urban areas with existing infrastructure, protect green fields and preserve habitat and natural resources.	1			None	0 m2	$0.00	$0	$0	$0.00	Included in Base - site location meets requirements - documentation included in General Requirements	1000
	SSc3 Brownfield Redevelopment - Rehabilitate damaged sites where development is complicated by real or perceived environmental contamination, reducing pressure on undeveloped land.			1	Not Pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED	1000
	SSc4.1 Alternative Transportation: Public Transportation Access - Reduce pollution and land development impacts from automobile use.	1			None	0 m2	$0.00	$0	$0	$0.00 $0.00	Minimal cost impact - additional documentation included in General requirements.	1000
	SSc4.2 Alternative Transportation: Bicycle Storage & Changing Rooms - Reduce pollution and land development impacts from automobile use.	1			None	0 no	$0.00	$0	$0	$0.00 $0.00	Bike racks included in base	10000
	SSc4.3 Alternative Transportation: Alternative Fuel Refueling Stations - Reduce pollution and land development impacts from automobile use.			1	Not Pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED	n/a
	SSc4.4 Alternative Transportation: Parking Capacity - Reduce pollution and land development impacts from single occupancy vehicle use.	1			Additional signage	1 sum	$500.00	$500	$500	$0.29 $0.29	Current parking capacity meets requirements. Additional signage and documentation for LEED	10000
	SSc5.1 Reduced Site Disturbance: Protect or restore open space - Conserve existing natural areas and restore damaged areas to provide habitat and promote biodiversity.	1			None	0 m2	$0.00	$0	$0	$0.00 $0.00	Downtown infill project on previously developed site	n/a
	SSc5.2 Reduced Site Disturbance: Development Footprint - Conserve existing natural areas and restore damaged areas to provide habitat and promote biodiversity.			1	Not Pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED	n/a
	SSc6.1 Storm water Management: Rate And Quantity - Limit disruption and pollution of natural water flows by managing storm water runoff.	1			Documentation and report Green roof	0 sum 0 m2	$0.00 $0.00	$0 $0	$0	$0.00 $0.00 $0.00	Included in General requirements Included in SSc7.2	1000 15000
	SSc6.2 Storm water Management, Treatment - Limit disruption of natural water flows by eliminating storm water runoff, increasing on-site infiltration and eliminating contaminants.			1	Not Pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED	2000, 15000
	SSc7.1 Landscape & Exterior Design to Reduce Heat Island Effect: Non-Roof - Reduce heat islands to minimize impact on microclimate and human and wildlife habitat.	1			Under building parking	0 m2	$0.00	$0	$0	$0.00 $0.00	Included in base	2000
	SSc7.2 Landscape & Exterior Design to Reduce Heat Islands: Roof - Reduce heat islands to minimize impact on microclimate and human and wildlife habitat.	1			Inverted roof fully adhered Extensive green roof soil Extensive green roof system	293 m2 293 m2 293 m2	$30.00 $17.06 $27.37	$8,790 $5,000 $8,019	$21,809	$4.71 $5.16 $2.94 $4.71	Base assumes built-up ashphalt Assume no structural premium for additional dead load	2, 7100
	SSc8 Light Pollution Reduction - Eliminate light trespass from the building and site, improve night sky access and reduce development impact on nocturnal environments.			1	Not Pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED	16000
	9											
Water Efficiency	**WEc1.1 Water Efficient Landscaping:** Reduce by 50% - Limit or eliminate the use of potable water for landscape irrigation.	1			Documentation and report Savings from typ. Irrigation system	0 sum 1 sum	$0.00 -$10,000.00	$0 -$10,000	-$10,000	-$5.87 $0.00 ($5.87)	Related to SSc6.1 Included in General requirements No Irrigation at grade or on green roof included	2000 15000
	WEc1.2 Water Efficient Landscaping: No potable use or no Irrigation - Limit or eliminate the use of potable water for landscape irrigation.	1			Included in WEc1.1	0 m2	$0.00	$0	$0	$0.00 $0.00		1000
	WEc2 Innovative Wastewater Technologies - Reduce generation of wastewater and potable water demand, while increasing the local aquifer recharge.			1	Not Pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED	2000, 15000
	WEc3.1 Water Use Reduction: 20% - Maximize water efficiency within buildings to reduce the burden on municipal water supply and wastewater systems.	1			Low flow showers and facets	0 m2	$0.00	$0	$0	$0.00 $0.00	Minimal cost impact	15000
	WEc3.2 Water Use Reduction: 30% - Maximize water efficiency within buildings to reduce the burden on municipal water supply and wastewater systems.			1	Not Pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED	15000
	3											
	EAp1 Fundamental Commissioning - Verify and ensure that fundamental building elements and systems are designed, installed and calibrated to operate as intended.	Y			Engage a commissioning authority	1 sum	$0.00	$0	$0	$0.00 $0.00	Related to EAc3	1000
	EAp2 Minimum Energy Performance - Establish the minimum level of energy efficiency for the base building and systems.	Y			Included in EAc1.1	0 m2	$0.00	$0	$0	$0.00 $0.00	See EAc1.1	misc
	EAp3 CFC Reduction and Elimination of Halons - Reduce ozone depletion.	Y			None	0 m2	$0.00	$0	$0	$0.00 $0.00	Standard for new building equipment	15000
	EAc1.1 Optimize Energy Performance: 20% - Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associate with excessive energy use.	2			Interior Lighting Building Envelope HVAC Systems Plant Equipment & DHW	1 sum 1 sum 1 sum 1 sum	$3,300.00 $113,859.00 -$11,921.00 $0.00	$3,300 $113,859 -$11,921 $0	$105,238	$61.80 $1.94 $66.86 ($7.00) $0.00	See Scenarios for detail	16000 misc 15000 15000
	EAc1.2 Optimize Energy Performance: 30% - Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associate with excessive energy use.	2			Included in EAc1.1	0 m2	$0.00	$0	$0	$0.00 $0.00	See EAc1.1	-
sphere	**EAc1.3 Optimize Energy Performance:** 40% - Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associate with excessive energy use.	2			Included in EAc1.1	0 m2	$0.00	$0	$0	$0.00 $0.00	See EAc1.1	-

Total Gross Floor Area 1,703 m2
suites 11 no

	LEED prerequisite/credit	Targeted	Pending	Not Pursued	cost factor description	quantity	unit rate	sub total	total	cost/m2 total gfa	comments	Division impact
							Incremental from Standard Building to LEED					
Energy & Atmo	**EAc1.4 Optimize Energy Performance:** 50% - Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associate with excessive energy use.	2			Included in EAc1.1	0 m2	$0.00	$0	$0	$0.00 $0.00	See EAc1.1	-
	EAc1.5 Optimize Energy Performance: 60% - Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associate with excessive energy use.			2	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED	-
	EAc2.1 Renewable Energy: 5% - Encourage and recognize increasing levels of on-site renewable energy self-supply in order to reduce environmental impacts associated with fossil fuel energy use.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED	-
	EAc2.2 Renewable Energy: 10% - Encourage and recognize increasing levels of on-site renewable energy self-supply in order to reduce environmental impacts associated with fossil fuel energy use.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED	16000
	EAc2.3 Renewable Energy: 20% - Encourage and recognize increasing levels of on-site renewable energy self-supply in order to reduce environmental impacts associated with fossil fuel energy use.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED	16000
	EAc3 Best Practice Commissioning - Verify and ensure that the entire building is designed, constructed and calibrated to operate as intended.	1			Engage a independent commissioning authority	1 sum	$15,000.00	$15,000	$15,000	$8.81 $8.81	Related to EAp1	1000
	EAc4 Ozone Protection: Elimination of HCFCs - Reduce ozone depletion and support early compliance with the Montreal Protocol.	1			None	0 m2	$0.00	$0	$0	$0.00 $0.00	Standard for system specified	15000
	EAc5 Measurement & Verification - Provide for the ongoing accountability and optimization of building energy and water consumption performance over time.			1	Not pursued	1 sum	$0.00	$0	$0	$0.00 $0.00	EXCLUDED	15000
	EAc6 Green Power - Encourage the development and use of grid-source, renewable energy technologies on a net zero pollution basis.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED	n/a
	10											
Materials & Resources	**MRp1 Storage & Collection of Recyclables -** Facilitate the reduction of waste generated by building occupants that is hauled to and disposed of in landfills.	Y			Permanent recycling area in the building	0 m2	$0.00	$0	$0	$0.00 $0.00	Minimal cost impact - assume no increase in area	misc
	MRc1.1 Building Reuse: Maintain 75% of Existing Walls, Floors, and Roof - Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED	misc
	MRc1.2 Building Reuse: Maintain 95% of Existing Walls, Floors and Roof - Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED	misc
	MRc1.3 Building Reuse: Maintain 50% of Interior Non-Structural Elements - Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED	misc
	MRc2.1 Construction Waste Diversion: Divert 50% From Landfill - Divert construction, demolition and land clearing debris from landfill disposal. Redirect recyclable recovered resources back to the manufacturing process. Redirect reusable materials to appropriate sites.	1			Additional lifting and dumpster rental fees Documentation and sorting of Wood, Masonry Metal, and GWB	0 sum 1 sum	$0.00 $5,000.00	$0 $5,000	$5,000	$2.94 $0.00 $2.94	Additional costs assumed to be absorbed by reduced tipping fees for recyclable materials Photographs and LEED standard documents	1000
	MRc2.2 Construction Waste Diversion: Divert 75% from Landfill - Divert construction, demolition and land clearing debris from landfill disposal. Redirect recyclable recovered resources back to the manufacturing process. Redirect reusable materials to appropriate sites.	1			Included in MRc2.1	0 m2	$0.00	$0	$0	$0.00 $0.00	See MRc2.1	1000
	MRc3.1 Resource Reuse: 5% - Reuse building materials and products in order to reduce demand for virgin materials and to reduce waste, thereby reducing impacts associated with the extraction and processing of virgin resources.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED	misc
	MRc3.2 Resource Reuse: 10% - Reuse building materials and products in order to reduce demand for virgin materials and to reduce waste, thereby reducing impacts associated with the extraction and processing of virgin resources.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED	misc
	MRc4.1 Recycled Content : 7.5% (Post-Consumer + 1/2 Post-Industrial) - Increase demand for building products that incorporate recycled content materials, therefore reducing impacts resulting from extraction and processing of new virgin materials and by-passing energy and green house gas-intensive industrial and manufacturing processes.	1			Durisol blocks with recylced wood content Specification of high recycled content materials such as asphalt GWB steel and Brick Documentation and report	0 m2 0 m2 0 sum	$0.00 $0.00 $0.00	$0 $0 $0	$0	$0.00 $0.00 $0.00 $0.00	Minimal cost impact Minimal cost impact, T.I. costs excluded from estimate Included in General requirements	misc misc 1000
	MRc4.2 Recycled Content: 15% (Post-Consumer + 1/2 Post-Industrial - Increase demand for building products that incorporate recycled content materials, therefore reducing impacts resulting from extraction and processing of new virgin materials and by-passing energy and green house gas-intensive industrial and manufacturing processes.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	EXCLUDED	-
	MRc5.1 Regional Material: 10% Extracted and Manufactured Regionally - Increase demand for building materials and products that are extracted and manufactured within the region, thereby supporting the use of indigenous resources and reducing the environmental impacts resulting from transportation.	1			None	0 m2	$0.00	$0	$0	$0.00 $0.00	Minimal cost impact - proximity to industry	misc
	MRc5.2 Regional Materials: 20% Extracted and Manufactured Regionally - Increase demand for			1					$0	$0.00	EXCLUDED	

Total Gross Floor Area 1,703 m2
suites 11 no

	LEED prerequisite/credit	Targeted	Pending	Not Pursued	cost factor description	quantity	unit rate	sub total	total	cost/m2 total gfa	comments	Division impact
							Incremental from Standard Building to LEED					
	building materials and products that are extracted and manufactured within the region, thereby supporting the use of indigenous resources and reducing the environmental impacts resulting from transportation.				Not pursued	0 m2	$0.00	$0		$0.00		misc
	MRc6 Rapidly Renewable Materials - Reduce the use and depletion of finite raw materials and long-cycle renewable materials by replacing them with rapidly renewable materials.			1					$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		misc
	MRc7 Certified Wood - Encourage environmentally responsible forest management.			1					$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		6000
	MRc8 Durable Building - Minimize materials use and construction waste over a building's life resulting from premature failure of the building and its constituent components and assemblies.	1							$20,042	$11.77		
					Rain screen stucco in lieu of EIFS	654 m2	$23.00	$15,042		$8.83	Additional insulation included in EAc1	7000
					Flashing and joint details	1 sum	$5,000.00	$5,000		$2.94	Order of magnitude	7000
					Mechanical Systems	0 m2	$0.00	$0		$0.00	No premium cost, however awknowledged	15000
					Durable finish details	0 m2	$0.00	$0		$0.00	Included in base - considered standard apartment spec	9000
Indoor Environmental Quality	5											
	EQp1 Minimum IAQ Performance - Establish minimum indoor air quality (IAQ) performance to enhance indoor air quality in buildings, thus contributing to the comfort and well-being of the occupants.	Y							$0	$0.00	Minimal cost impact - Standard building specification	
					None	0 m2	$0.00	$0		$0.00		15000, misc
	EQp2 Environmental Tobacco Smoke (ETS) Control - Prevent or minimize exposure of building occupants, indoor surfaces, and systems to Environmental Tobacco Smoke (ETS).	Y							$2,650	$1.56		
					Suite weather-stripping	11 no	$50.00	$550		$0.32	Weather stripping and floor sweep for residential units	
					Blower door testing of sample units	3 no	$700.00	$2,100		$1.23	Sampling of units	15000, misc
	EQc1 Carbon Dioxide (CO2) Monitoring - Provide capacity for indoor air quality (IAQ) monitoring to help sustain long-term occupant comfort and well-being.			1					$0	$0.00	EXCLUDED	
					Not Pursued	0 m2	$0.00	$0		$0.00		15000
	EQc2 Increase Ventilation Effectiveness: Provide for effective delivery and mixing of supply air to support the safety, comfort and well-being of building occupants.		1						$0	$0.00	Credit achievement pending approch to mechanical systems	
					Need information - layout and distribution diagrams	0 m2	$0.00	$0		$0.00		15000
	EQc3.1 Construction IAQ Management Plan: During Construction - Prevent indoor air quality problems resulting from the construction/renovation process in order to help sustain the comfort and well-being of construction workers and building occupants.	1							$7,500	$4.40		
					Photograph documentation.	1 sum	$500.00	$500		$0.29		1000
					Completion of standardized schedules.	1 sum	$2,000.00	$2,000		$1.17		1000
					Allowance for misc implications	1 sum	$5,000.00	$5,000		$2.94		1000
	EQc3.2 Construction IAQ Management Plan: Testing Before Occupancy - Minimize indoor air quality problems resulting from the construction/renovation process in order to help sustain the			1					$0	$0.00	EXCLUDED	
					Not Pursued	0 sum	$0.00	$0		$0.00		1000
	EQc4.1 Low-Emitting Materials: Adhesives & Sealants - Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.	1							$0	$0.00	Minimal cost impact - Specification of Low VOC materials	
					None	0 m2	$0.00	$0		$0.00		7920
	EQc4.2 Low-Emitting Materials: Paints & Coatings - Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being	1							$0	$0.00		
					Low VOC Paints	0 m2	$0.00	$0		$0.00	Minimal cost impact	9900
	EQc4.3 Low-Emitting Materials: Carpet - Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.	1							$0	$0.00		
					Low VOC carpet	1703 m2	$0.00	$0		$0.00	Minimal cost impact	9685
	EQc4.4 Low-Emitting Materials: Composite Wood & Laminates - Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.		1						$0	$0.00	EXCLUDED	
					Not Pursued	0 m2	$0.00	$0		$0.00		6400
	EQc5 Indoor Chemical & Pollutant Source Control - Minimize exposure of building occupants to potentially hazardous particulates, biological contaminants and chemical pollutants that adversely impact air and water quality.	1							$7,000	$4.11		
					Completion of standardized schedules.	2 no	$500.00	$1,000		$0.59		
					Testing of sample suites	3 no	$2,000.00	$6,000		$3.52		15000
	EQc6.1 Controllability of Systems: Perimeter Spaces - Provide a high level of thermal, ventilation and lighting system control by individual occupants or specific groups in multi-occupant spaces to promote the productivity, comfort and well-being of building occupants.	1							$0	$0.00		
					None	0 m2	$0.00	$0		$0.00	Operable windows included in base - additional costs for documentation included in General Requirements	8520
	EQc6.2 Controllability of Systems: Non-Perimeter Spaces - Provide a high level of thermal, ventilation and lighting system control by individual occupants or specific groups in multi-occupant spaces to promote the productivity, comfort and well-being of building occupants.			1					$0	$0.00	EXCLUDED	
					Not Pursued	0 m2	$0.00	$0		$0.00		15000
	EQc7.1 Thermal Comfort: Compliance - Provide a thermally comfortable environment that supports the productivity and well-being of building occupants.	1							$0	$0.00	Minimal cost impact - Standard specification	
					None	0 m2	$0.00	$0		$0.00		15000
	EQc7.2 Thermal Comfort: Monitoring - Provide a thermally comfortable environment that supports the productivity and well-being of building occupants.			1					$0	$0.00	EXCLUDED	
					Not Pursued	0 no	$0.00	$0		$0.00		15000
	EQc8.1 Daylight and Views: Daylight 75% of Spaces - Provide for the building occupants a connection between indoor spaces and the outdoors through the introduction of daylight and views into the regularly occupied area of the building.	1							$0	$0.00	Included in base	
					None	0 m2	$0.00	$0		$0.00	Solar louvres carried in EAc1	n/a
	EQc8.2 Daylight and Views: Daylight 90% of Spaces - Provide for the building occupants a connection between indoor spaces and the outdoors through the introduction of daylight and views into the regularly occupied area of the building.	1							$0	$0.00	Included in base	
					None	0 m2	$0.00	$0		$0.00		n/a
	9											
	IDc1.1 Innovation in Design: Exceptional performance ventilation and a/c system	1							$0	$0.00		

Total Gross Floor Area	1,703 m2
suites	11 no

	LEED prerequisite/credit	Targeted	Pending	Not Pursued	cost factor description	quantity	unit rate	sub total	total	cost/m2 total gfa	comments	Division impact
					Incremental from Standard Building to LEED							
Innovation & Design Process					Innovative passive ventilation and near elimination of air conditioning system for MURB demonstrates leadership	1703 m2	$0.00	$0		$0.00	Included in EAc1	10900
	IDc1.2 Innovation in Design: Energy star appliances	1							$5,500	$3.23	Includes, fridge, stove, dishwasher	
					Energy star appliances	11 no	$500.00	$5,500		$3.23		n/a
	IDc1.2 Innovation in Design: Exceptional performance in durable building credit	1							$0	$0.00	See MRCc8	
					Included in MRc8	0 m2	$0.00	$0		$0.00		n/a
	IDc1.4 Innovation in Design: Specific Title			1					$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		-
	IDc2 LEED® Accredited Professional:	1							$3,710	$2.18		
					LEED® Consulting - EXCLUDED	1 sum	$0.00	$0		$0.00		1000
					LEED® Registration	1 sum	$1,060.00	$1,060		$0.62		1000
					LEED® Certification	1 sum	$2,650.00	$2,650		$1.56		1000
	NET COST (Including Site)	40	2	28					$183,949	$108.01		
	General Requirements & Fees								$0			
	General requirements on additional cost (Excluded)							$0				
	Construction Management Fees (Excluded)							$0				
	Design Fees (Excluded)							$0				
	TOTAL ESTIMATE (Excluding Contingencies)								$183,949	$108.01		
	Allowances								$0			
	Design Allowances (Excluded)							$0				
	Escalation Allowances (Excluded)							$0				
	Construction Allowances (Excluded)							$0				
	TOTAL ESTIMATE (Including Allowances)								$183,949	$108.01		

GFA:	1,703	$108.01	/m2
GFA:	18,331	$10.03	/sf
Suites	11	$16,722.67	/suite
Points	40	$4,599	/credit

b2.7 EAc1 - Optimize Energy Performance Strategies

Total Gross Floor Area 1,703
suites 11

	Scenario	Quantity	Unit Rate	Sub-Total	$ Budget	Comments
Interior Lighting	1. Efficient Lighting Design				$0	Included in base
	Reduce installed lighting power to meet ASHRAE 90.1-2004 Use fluorescent (T8 and/or T5 with electronic ballasts), 4-pin compact fluorescent, LED and HID fixtures to avoid high lighting power densities. Eliminate halogen, incandescent and mercury vapour fixtures.	0 m2	$0.00	$0		
	2. Occupancy sensors for lighting				$3,300	
	Provide occupancy sensors to control lighting in the building (e.g. exit stairwells, amenity areas, parking garage storage rooms, utility rooms and maintenance closets).	30 no	$110.00	$3,300		
	Total Interior Lighting				$3,300	
Building Envelope	1. Increase thermal performance of stucco cladding				$3,924	
	Upgrade R-Value from R12 to R20 by using spray applied polyurethane in place of 3" mineral fibre included in base.	654 m2	$6.00	$3,924		
	2. Increase thermal performance of exterior masonry wall assemblies				$3,180	
	Upgrade effective R-value (i.e. including effects of thermal bridging) from R-12 to R-20 by adding using spray applied polyurethane in place of 3" mineral fibre included in base.	530 m2	$6.00	$3,180		
	3. Reduce thermal bridging through balcony connection.				$75,000	
	Reduce effects of thermal bridging through the use of shelf angle supports in lieu of conventional cantielivered CIP balcony detial	15 no	$5,000.00	$75,000		Order of Magnitude additional cost including material and laybour related to balcony detail
	4. Increase thermal performance of roof assembly				$3,550	
	Upgrade effective R-value of roof assembly to R-26 by adding 25mm of polyisocyanurate. Assumed base design Is R-20	355 m2	$10.00	$3,550		
	5. Increase thermal Performance of Exposed Floor Assemblies				$1,035	
	Design exposed floor assemblies with a minimum effective R-value of R-15 by using spray applied polyurethane in place of pin cushion mineral wool batt.	69 m2	$15.00	$1,035		
	6. Upgrade Window Performance				$10,270	
	Specify windows with increased thermal performance including fiberglass frames	158 m2	$65.00	$10,270		Base assumes vinyl double glazing with low E coating and 3/8" thermal break
	7. Solar shades over ground floor windows				$16,900	
	Provide solar shading for ground floor windows on South and West facades	26 m2	$650.00	$16,900		Related to EQc8
	Total Building Envelope				$113,859	
HVAC Systems	1. Reduction in Building Heating Equipment Costs				$0	
	Order of Magnitude calculation of typical forced air heating vs radiant floor heating with passive mini-split ventilation	1703 m2	$0.00	$0		Base assumes 2 pipe fancoil with central boiler - Minimal cost impact with either approach
	2. Reduction in Building Cooling Equipment Costs				-$11,921	
	Order of Magnitude credit for mechanical cooling system	1703 m2	-$7.00	-$11,921		Base assumes 2 pipe fan coil with central chiller plant
	Total HVAC Systems				-$11,921	
Net Cost Excluding General Requirements and Allowances					$105,238	

1,703 m2	$61.80
18,331 sf	$5.74
11 suites	$9,567.09

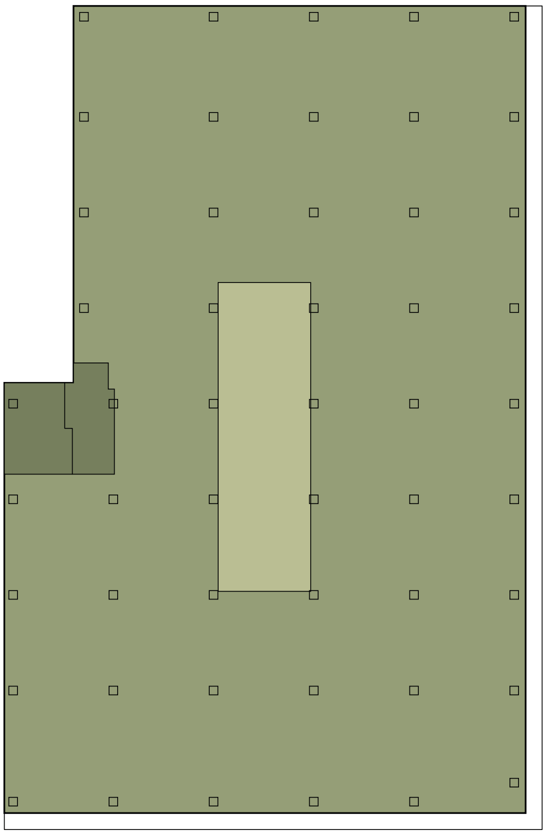
Ref.	Design Criteria/Characteristics		MNECB Reference Building		b3 - Multi-unit Residential Case Study		Key Indicators
1.00	**Construction Cost Summary**						
1.01	Building Area (GLA)		1,703	m2	1,703	m2	
1.02	Number of Suites		11	no	11	no	
1.03	Total Construction Hard Costs (Excl. LEED)		$2,282,000	$1,339.99 /m2	$2,282,000	$1,339.99 /m2	
1.04	Total LEED Incremental Construction Cost		$0	$0.00 /m2	$184,000	$108.04 /m2	
1.05	Total Construction Hard Costs (Incl. LEED)		$2,282,000	$1,339.99 /m2	$2,466,000	$1,448.03 /m2	
1.06	Total Project Soft Costs		Excluded	- /m2	Excluded	- /m2	
1.07	**Total Project Budget**		$2,282,000	$1,339.99 /m2	$2,466,000	$1,448.03 /m2	
2.00	**Building Environmental Performance**						
2.01	Energy Use per year	KWh/a	425,750	250.0 /m2	178,815	105.0 /m2	
2.02	Energy Cost per year (Note 2)	$	$26,104	$15.33 /m2	$11,977	$7.03 /m2	
2.03	Percent of MNECB baseline		100.0%		54.1%		
2.04	Water Use per year	m3	3,525	2.070 m3/m2	3,525	2.070 m3/m2	
2.05	Water Cost per year (@ $1.20/m3)	$	$4,230	$2.48 /m2	$4,230	$2.48 /m2	
2.06	Percent water reduction		0%		0%		
2.07	Greenhouse Gas reduction	Tonnes CO2/a	-		-		
2.08		Tonnes CO2/a/unit	-		-		
3.00	**Value of Increased Site Density Permitted by Municipality**						
3.01	Number of suites permitted by zoning	no	11		12		
3.02	Increase in site density beyond zoning	%	0.0%		5.0%		
3.03	Developer revenue	$	$275,000	$25,000 /suite	$288,750	$25,000 /suite	
3.04	Increased deveoper revenue	$	$0	$0.00 /m2	$13,750	$8.07 /m2	
3.05	Increased building value (% of Capital)	%	0%		0.6%		
3.06	Payback on LEED Cost Increment	Years	0.0		13.4		
4.00	**Value of Reduced time in Gaining Project Approvals**						
4.01	Duration of Permiting and Approvals	Months	12		9		
4.02	Carrying costs of pre-construction	$/Month	$4,400	$400 /suite	$4,400	$400 /suite	
4.03	Estimated carrying cost pre-construction	$	$52,800	$31.00 /m2	$39,600	$23.25 /m2	
4.04	Savings from Schedule Advantage	$	$0	$0.00 /m2	$13,200	$7.75 /m2	
4.05	Increased building value (% of Capital)	%	0%		0.5%		
4.06	Payback on LEED Cost Increment	Years	0.0		13.9		
5.00	**Value of Sales Premium (Note 1)**						
5.01	Sales Revenue (GSA = 85% of GLA)	$	$506,643	$350.00 /m2 (GSA)	$531,975	$367.50 /m2 (GSA)	
5.02	Sales Revenue Premium	%	0.0%		5.0%		
5.03	Additional Sales Revenue	$	$0	$0.00 /m2 (GSA)	$25,332	$17.50 /m2 (GSA)	
5.06	Increased building value (% of Capital)	%	0%		1.0%		
5.07	Payback on LEED Cost Increment	Years	0.0		7.3		
6.00	**Value of Increased Sales Velocity**						
6.01	Duration of Pre-Construction Sales	Months	5		3		
6.02	Carrying costs during pre-sales	$/Month	$8,250	$750 /suite	$8,250	$750 /suite	
6.03	Estimated carrying cost pre-const. sales	$	$41,250	$24.22 /m2	$24,750	$14.53 /m2	
6.04	Savings from Schedule Advantage	$	$0	$0.00 /m2	$16,500	$9.69 /m2	
6.05	Increased building value (% of Capital)	%	0%		0.7%		
6.06	Payback on LEED Cost Increment	Years	0.0		11.2		
7.00	**Value of Reduced Condominium Fees (Note 2, 3)**						
7.01	Condo fees (GSA = 85% of GLA)	$/Month	$7,961.53	$5.50 /m2	$7,237.75	$5.00 /m2	
7.02	Condo fees	$/Year	$95,538	$8,685 /suite	$86,853	$7,896 /suite	
7.03	Savings available for debt service	$/Month	$0	$0.00 /suite	$724	$65.80 /suite	
7.04	Value of reduced condo fee in qualifying for additional mortgage	$	$0	$0.00 /m2	$44,000	$4,000 /suite	
7.05	Building premium on condo fee savings	$	$0	$0.00 /m2	$44,000	$25.84 /m2	
7.06	Increased building value (% of Capital)	%	0%		1.8%		
7.07	Payback on LEED Cost Increment	Years	0.0		4.2		
8.00	**Total Increase in Building Value**						
8.01	Increase in buliding value (sum 3 to 7)	$	$0	$0.00 /m2	$112,782	$66.23 /m2	
8.02	Increased building value (% of Capital)	%	0%		4.6%		
8.03	Payback on LEED Cost Increment	Years	0.0		1.6		

1. Sales revenue based on similar building sales information provided by Altus Helyar Valuation Consulting
2. Condo fees based on Altus Helyar Cost Consulting data
3. Mortgage qualification figures by Invis Financial on-line calculator

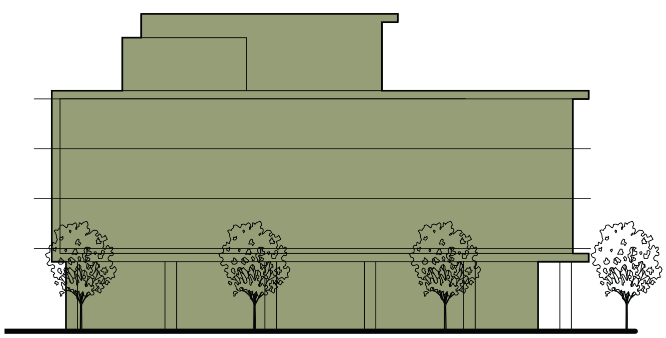
Appendix C

Commercial Buildings Case Study Analysis Back-up

c1.1 Project Diagrams and Overview



Typical Floor Plan Diagram



Building Elevation Diagram

Ref.	Design Criteria/Characteristics - Commercial Building		c1 Commercial Case Study	Key Indicators
1.00	**Project Statistics**			
1.01	Location		Halifax, Nova Scotia	
1.02	Gross Floor Area (m2 GFA)		15,775	
1.03	Stories		3	
2.00	**Construction Cost Estimate**			
2.01	Office building (excl. tenant impr		$21,441,699	
2.02	Site Development		$2,090,080	
2.03	**Subtotal Excluding Contingencies**		**$23,532,000**	
2.04	Design Contingency/Allowance		$1,177,000	
2.05	Escalation Contingency		$0	
2.06	Post Contract		$1,177,000	
2.07	Tenant Improvements Allowance		-	
2.08	**Total Construction Cost (Excl. GST)**		**$25,886,000**	
2.09		**$/m2 (GLA)**	**$1,641**	
3.00	**Estimated LEED Cost Increment (Included above)**			
3.01	$ Budget		$2,673,000	
3.02	$/m2		$169	
3.03	$/credit		$63,643	
3.04	**% increase**		11.5%	
4.00	**Exterior Enclosure (Overall System)**			
4.01	Wall R-Value		R-17	
4.02	Roof R-Value		R-26	
4.03	Floor R-Value		R-15	
4.04	Glazing U-factor / SHGC / visible light trans.		2.16/0.55/0.65	
4.05	Amount of glazing (% of building skin area)		40%	
5.00	**Building Environmental Performance**			
5.01	Energy Intensity (Base/LEED)	KWh/m2/a	-	
5.02	Percent of MNECB baseline		40% MNECB	
5.03	Water use (Base/LEED)	L/m2/a		
5.04	Percent water reduction		30%	
5.05	Greenhouse Gas reduction	tonnes CO2/a	-	
5.06		tonnes CO2/a/m2	-	

c1.2 Design Efficiency Statistics

Ref.	Item	Unit	Case Study Value	Industry Standard Value
1.00	**Project Totals**			
1.01	Below Grade Area (GPA)	sf	0	0
1.02	GLA	sf	161,459	149,648
1.03	GFA (TCA)	sf	161,459	149,648
1.04	# Levels Below Grade	no	0	0
1.06	# Floors	no	4	5
1.07	# Units	no	1	1
1.08	# Parking (underground)	no	0	0
1.10	Site Area	sf	297,000	200,385
2.00	**Below Grade (Including CHP Shell Space)**			
2.01	Total Area Parking	sf	0	0
2.01.01	Net Parking Area (incl. Circulation)	sf	0	0
2.01.02	Service / Mechanical	sf	0	0
2.01.03	Storage	sf	0	0
2.01.04	Amenity	sf	0	0
2.02	Stalls	no	0	0
2.03	No. of levels	no	0	0
2.04	Gross Parking Area / Stall	sf	n/a	n/a
2.05	Net parking area / Stall	sf	n/a	n/a
2.06	Stalls / Unit	no	0.00	0.00
2.07	Exterior Wall Area	sf	0	0
2.08	Exterior wall / GPA (Below Grade)	ratio	n/a	n/a
2.09	Excavation Volume	m3	n/a	519
2.10	Excavation/Parking Area ratio (M3/M2)	m3/m2	n/a	n/a
2.11	Below Grade (GPA) / Total Construction Area(TCA)	ratio	0.00	0.00
2.12	# Elevator Cabs	no	0	0
2.13	# Elevator Stops	no	0	0
3.00	**Above Grade**			
3.01	Total Above Grade Area (GLA)	sf	161,459	149,648
3.01.01	Commercial Office	sf	132,773	118,928
3.01.03	Commercial Retail	sf	0	3,452
3.01.04	Amenity	sf	0	2,095
3.01.05	Loading/Storage	sf	807	1,830
3.01.06	Service Areas (mechanical/electrica	sf	9,020	10,305
3.01.07	Circulation	sf	18,858	13,039
3.02	Net saleable area	sf	132,773	118,928
3.06	No. of units	no	1	1
3.07	GLA / Unit	sf	132,773	85,735
3.12	**Floors**			
3.12.01	No. of Floors - Tower 1 / Tower 2	no	4	5
3.12.02	Typical floor to floor height	lf	14.12	13.24
3.12.03	Window Area	sf	31,916	32,070
3.12.04	Exterior wall area	sf	59,612	55,500
3.12.05	Exterior wall / GLA (Above Grade)		0.37	0.37
3.12.06	# Elevator Cabs	no	3	3
3.12.07	# Elevator Stops	no	9	13
3.13	**Saleable**			
3.13.01	Total Saleable Area	sf	132,773	118,928

Ref.	Item	Unit	Case Study Value	Industry Standard Value
3.13.02	Commercial Office	sf	132,773	118,928
3.13.03	Commercial Retail	sf	0	0
3.14	**Statistical Efficiency Ratios**			
3.15	Building Efficiency (Net Saleable / GLA)	ratio	0.82	0.79
3.16	Typical floor Efficiency (Net Saleable / GLA)	ratio	0.89	0.89
3.17	Average Selling Area/Unit (Average Unit Size)	sf	132,773	85,735
3.18	Exterior wall / Net Saleable Area (Above Grade)	ratio	0.45	0.48
3.19	Window / Ext.wall ratio	ratio	0.54	0.58
3.22	Retail ratio - (Retail area / GLA)	ratio	0.00	-
3.23	GFA / Unit	sf	161,459	109,284
3.26	**Construction Ratios**			
3.27	Formwork contact area	m2	24,180	23,810
3.28	Concrete volume (including Waste)	m3	6,566	6,099
3.29	Rebar Weight	kg	650,000	646,294
3.30	Rebar / Concrete Volume ratio	kg/m3	99.0	106.2
3.31	Structural Steel - Total Weight	kg	-	-
3.32	Rebar / GLA	kg/m2	4.03	4.33
3.33	Rebar / GFA	kg/m2	4.03	4.33
3.34	Formwork / GFA	m2/m3	1.61	1.70
3.35	Concrete / GFA	m3/m2	0.44	0.44
3.36	Concrete / GLA	m3/m2	0.44	0.44
3.37	Structural Steel/GLA	kg/m2	-	-
4.00	**Site**			
4.01	Gross Site Area	acre	6.80	4.59
4.02	Site Density (UPA)	unit/acre	0.15	0.59
4.03	Site Area/Unit	sf	297,000.00	126,134.67
5.00	**Construction Cost (Including LEED)**			
6.00.01	Below Grade Cost	$	n/a	$0
6.00.02	Above Grade Cost (Incl Site Work)	$	$25,886,000	$23,407,333
6.01	**Total Cost**	$	**$25,886,000**	**$23,407,333**
6.02	Cost / Stall	$/Unit	-	$0.00
6.03	Cost / GLA	$/sf	$160.33	$156.55
6.04	Cost / GFA	$/sf	$160.33	$156.55
6.05	Cost / Unit	$/Unit	$25,886,000	$16,935,833
6.06	Cost / Saleable Area	$/sf	$194.96	$199.20

c1.3 Project Narrative

A1 Sub-Structure

• Conventional concrete pad foundations and spread footings

Potential LEED Gold Initiatives:
• Use fly-ash as partial substitute of Portland cement in concrete mix
• Use slag as aggregate for concrete mix.
• Use of rebar with recycled content

A2 Structure

• Structural concrete slab on grade.
• Concrete structure on 8.0m – 8.5m grid
• Reinforced concrete suspended slabs and roof
• Steel exit stairs ground floor to roof.

Potential LEED Gold Initiatives:
• Use fly-ash as partial substitute of Portland cement in concrete mix
• Use slag as aggregate for concrete mix.
• Use of rebar with recycled content

A3 Exterior Enclosure

Walls
• 15% architectural brick veneer ($800/1000, 5-bricks/sf) wall with drywall / concrete wall back up (R-12).
• 25% pre-finished metal clad wall with drywall/ concrete wall back up (R-12).
• 60% exterior wall area strip windows with vision glazing including double glazing and Low-E coating overall (U-Value 2.9)
• Insulated hollow metal doors and frames.

Roof
• Built-up insulated roof finish (R-21)

Potential LEED Initiatives:
Walls
• Increase thermal performance of wall assemblies to R17 including details to minimize thermal bridging
• Provide minimum of R-6 over all structural members passing through envelope
• Increase thermal performance of window assemblies to include 19mm thermal break, soft coat low-E coating, and warm edge spacers (U-Value 2.16)
• Provide awning type operable window units in window wall assembly
• Reduce amount of vision glazing to 35% with 5% translucent transom for aggregate of 40% of exterior wall area. Provide pre-finished metal cladding assembly for additional 20% of wall area
• Recycled content specified for steel framing
• Two doors with vestibule provided at all exterior doors
• Allowance for additional air and water leakage testing of sample units
• Allowance for durable building details and construction methods
• Allowance for Low VOC Materials inside of air barrier

Roof
• Inverted roof fully adhered to structural deck
• Allowance for additional water and air leakage testing
• Allowance for durable building details and construction methods
• Allowance for low VOC materials inside of air barrier

Projections
• Allowance for shading devices on the south façade

B1 Partitions and Doors

Base Building
• Concrete shear wall, concrete block walls and drywall partitions around washrooms, common areas and service spaces
• Fire rated stairwell doors.
• Hollow metal doors to washrooms, common areas and service spaces.

Potential LEED Gold Initiatives:
• Recycled content specified for Gypsum board
• Recycled content specified for steel framing
• Allowance for durable building details and

construction methods
• Allowance for Low VOC Materials

Tenant Improvements
• Drywall partitions to offices and boardrooms
• Glass partitions
• Solid core wood doors

Potential LEED Initiatives:
• Recycled content specified for Gypsum board
• Recycled content specified for steel framing
• Durable building details and construction methods
• Low VOC Materials

B2 Finishes

Base Building
Floors
• Ceramic tile to washrooms
• Stone to ground floor main entrance/circulation
• Epoxy floor paint to service areas and exit stairs
• Unfinished to office and elevator lobby areas

Ceilings
• Suspended drywall ceiling to Elevator Lobby ground floor main entrance, & circulation areas and washrooms
• ACT Ceilings to office areas
• Paint to structure in service spaces

Walls
• Ceramic wall tiles to washrooms
• Paint to other areas
Estimate excludes all costs for tenant improvements including private offices, boardrooms, kitchenettes, demising walls etc.

• Potential LEED Initiatives:
• Reduction in amount of ceiling finishes in office areas – 60% exposed concrete 20% ACT 20% drywall.
• Allowance for durable building details and construction methods
• Allowance for Low VOC Materials
• Materials that have recycled and/or post consumer/industrial content.
• Materials that have been manufactured and/or harvested regionally.

Tenant Improvements
Floors
• Carpet to Office areas.

Ceilings
• Drywall bulkheads and feature ceiling in tenant spaces
• Sprayed texture to concrete soffit in suites.

Walls
• Paint to drywall and concrete block walls.
• Vinyl wall covering to corridors.
• Ceramic tile to tub and shower surrounds in suites.
• Rubber/carpet baseboards, and paint to door casing.

Potential LEED Initiatives:
• Greenseal rated carpet to office areas with engineered wood and linoleum accents in high traffic areas
• Minimal ceiling finishes in office area
• Reduced level of finish generally in office areas
• Durable building details and construction methods
• Low VOC Materials
• Materials that have recycled and/or post consumer/industrial content.
• Materials that have been manufactured and/or harvested regionally.

B3 Fittings & Equipment

B31 Fittings and Fixtures
• Steel rail/balustrade to exit stairs
• Mill work – FF&E budget for washrooms and service spaces
• Stone washroom vanities to washrooms
• General mill work - Allowance - $10,000
• Stainless steel washroom accessories
• Foot grilles - $5000
• Interior signage base building - Allowance - $5000
• Roll shade window blinds EXCLUDED from

estimate

Potential LEED Initiatives:
• Green Building education signage and kiosk allowance
• Low VOC millwork
• Allowance for durable building details and construction methods

B32 Equipment

Standard Commercial Office Building
• General Equipment – see FF&E Budget
• Recycling/waste equipment - Allowance $15,000
• Window washing anchors - Allowance - $20,000
• Loading dock levelers & equipment - Allowance - $12,000

Potential LEED Initiatives:
• None

B33 Conveying Systems

• 3 no 3 stop passenger elevators (GF-3F)

Potential LEED Initiatives:
• None

C1 Mechanical

Plumbing & Drainage
• Commercial quality plumbing fixtures with hand free electronic operator
• Plumbing services up to and including fixtures
• Allowance for capped connection for future.
• Remote hot water tank by tenant
• Domestic booster pump

Fire Protection
• Sprinkler and fire stand pipe through out the building

HVAC
• Individual floor compartmental air handling units
• Air cooled chiller provides chilled water
• All units have humidifiers.
• Terminal units, diffusers and grilles.
• Make-up air units
• Gas hot water boilers provides hot water to heating elements

Controls
• DDC systems and VFD

Potential Gold Initiatives
• Domestic hot water condensing boilers
• Low-flow flush valve WC's waterless urinals and electronic faucets
• Water metering for office spaces
• Fire pump and jockey pump
• Light hazard sprinkler and standpipe system throughout
• High efficient air cooled chillers provide chilled water to air handling units
• Free cooling heat exchanger
• High efficiency boilers provide hot water to heating elements
• Heat recovery air handling units provide conditioned air
• Air distribution through galvanized steel ductwork and terminal units
• DDC control system on all major equipment balancing dampers, terminal units and perimeter radiation
• Variable speed drives on all fans, pumps, motors, etc…

C2 Electrical

• Feeder cables are assumed to be standard offices
• Pipe tracing included as required
• Office is shell space-Tenant fit out not included
• Office general lighting included.
• Communication zone box/conduits are included.
• Zone power box and conduits are include
• Hydro charges excluded
• Building power supply primary cable assumed by Hydro
• Office receptacle to partitions Tenant improvement works
• Communication cabling –office –Tenant Fit

out
• HV Sub station assumed by local power company
• Ceiling tray in office space not included
• Fire alarm system included
• Security system included for base building only

Potential LEED Initiatives:
• Medium/High quality lighting fixtures
• Perimeter lighting photo control
• Occupancy sensors in corridors/stair cases and common areas
• Efficient lighting design
• Daylight sensors for lighting in common, and tenant areas

D1 Site Development

• Allowances for site development includes unit pavers, concrete paving and soft landscaping, site improvements.
• Allowance made for Mechanical site services.
• Storm water detention pond EXCLUDED
• Allowance made for Electrical site services

Potential LEED Initiatives:
• Erosion and sedimentation control documentation and implementation
• Size parking to meet but not exceed local bylaw requirements
• Reduce site disturbance to vicinity immediately around proposed building footprint and site work
• Pervious pavers to drive aisles in parking areas
• Allowance for additional tree plantings to reduce heat island effect
• Specify adaptive species landscaping
• Irrigation system deleted
• Limit the amount of light trespass from the site and limit up lighting to enhance night sky and nocturnal environs
• Perimeter lighting photo control

D2 Ancillary Work
• None

c1.4 Project Cost Summary

Construction Cost Item		GFA(M2)	Total Project Excluding LEED $ Budget	Total Project Excluding LEED $/m2	Total Project Including LEED $ Budget	Total Project Including LEED $/m2	% Increase	Key incremental cost factors
Office Building - 4 Storey		15,000	$19,492,450	$1,299	$21,441,699	$1,429	10.0%	Additional Requirements of LEED
Site Development		6,140	$1,609,050	$262	$2,090,080	$340	29.9%	Additional Requirements of LEED
Subtotal Construction Costs		15,000	$21,102,000	$1,407	23,532,000	$1,569	11.5%	
Design Contingency-Allowance	5.0%	15,000	$1,055,000	$70	$1,177,000	$78	11.6%	
Subtotal - GLA (including Design Allowance)		15,000	$22,157,000	$1,477	$24,709,000	$1,647	11.5%	
Escalation Contingency	0.0%	15,000	$0	$0	$0	$0	0.0%	
Post-contract Construction Contingency	5.0%	15,000	$1,055,000	$70	$1,177,000	$78	11.6%	
Total Construction Costs		**15,000**	**$23,212,000**	**$1,547**	**$25,886,000**	**$1,726**	**11.5%**	
Project Soft Costs								
Land (Reality taxes only)		15,000	$70,000	$5	$70,000	$5	0.0%	
Municipal Fees		15,000	$124,000	$8	$124,000	$8	0.0%	
Construction (Excluded above)		15,000	$6,517,000	$434	$6,547,000	$436	0.5%	
Design Consultants		15,000	$904,000	$60	$968,000	$65	7.1%	Allowance for LEED consulting
General and Administrative		15,000	$905,000	$60	$995,000	$66	9.9%	Allowance for LEED documentation
Furniture Fixtures and Equipment		-	Excluded	-	Excluded	-	-	
Marketing and Sales		-	Excluded	-	Excluded	-		
Finance		15,000	$1,587,000	$106	$1,587,000	$106	0.0%	
Interim Building Operations		-	Excluded	-	Excluded	-		
Government Taxes		-	Excluded	-	Excluded	-		
Development Contingency		15,000	$331,000	$22	$334,000	$22	0.9%	Contingency for incremental LEED cost
Total Soft Costs		15,000	**$10,438,000**	$696	**$10,625,000**	$708	1.8%	
Total Project Budget		**15,000**	**$33,650,000**	$2,243	**$36,511,000**	$2,434	8.5%	

Notes

1. Utility Connection Charges are Excluded.
2. Priced at 3rd qtr of 2006 rates.
3. GST is Excluded.

c1.5 Elemental Cost Summary - Total Project

Gross Livable Area (GLA): 15,000 m2

Element		Total Project Excluding LEED: Elemental Amount	Cost/m2	Total	%	Total Project Including LEED: Elemental Amount	Cost/m2	Total	%	LEED % Increase	Key incremental cost factors
A SHELL											
A1 SUBSTRUCTURE			$35.82				$35.82				
A11 Foundation		$527,279	$35.15			$527,279	$35.15				
A12 Basement Excavation		$10,000	$0.67	$537,279	2.3%	$10,000	$0.67	$537,279	2.1%	0.0%	
A2 STRUCTURE			$282.47				$284.14				
A21 Lowest Floor Construction		$180,674	$12.04			$180,674	$12.04				
A22 Upper Floor Construction		$2,709,363	$180.62			$2,734,363	$182.29				
A23 Roof Construction		$1,347,029	$89.80	$4,237,066	18.3%	$1,347,029	$89.80	$4,262,066	16.5%	0.6%	
A3 EXTERIOR ENCLOSURE			$250.20				$280.95				
A31 Walls Below Grade		$0	$0.00			$0	$0.00				
A32 Walls Above Grade		$2,686,905	$179.13			$3,018,138	$201.21				Increased thermal performance
A33 Windows & Entrance		$126,050	$8.40			$126,050	$8.40				Increased thermal performance of glazing
A34 Roof Covering		$650,000	$43.33			$790,000	$52.67				
A35 Projections		$290,000	$19.33	$3,752,955	16.2%	$280,000	$18.67	$4,214,188	16.3%	12.3%	
B INTERIORS											
B1 PARTITIONS & DOORS			$45.21				$46.87				
B11 Partitions		$647,520	$43.17			$672,520	$44.83				Additional partitioning for vestibuels at all entrances
B12 Doors		$30,600	$2.04	$678,120	2.9%	$30,600	$2.04	$703,120	2.7%	3.7%	Additional doors for vestibuels at all entrances
B2 FINISHES			$39.20				$43.40				
B21 Floor Finishes		$105,760	$7.05			$156,800	$10.45				Low VOC specification
B22 Ceiling Finishes		$390,325	$26.02			$391,875	$26.13				Low VOC specification
B23 Wall Finishes		$91,933	$6.13	$588,018	2.5%	$102,271	$6.82	$650,946	2.5%	10.7%	Low VOC specification
B3 FITTING & EQUIPMENT			$37.91				$40.48				
B31 Fitting & Fixtures		$238,650	$15.91			$273,650	$18.24				Green building education kiosk
B32 Equipment		$30,000	$2.00			$33,600	$2.24				Increased durability
B33 Conveying Systems		$300,000	$20.00	$568,650	2.4%	$300,000	$20.00	$607,250	2.3%	6.8%	
C SERVICES											
C1 MECHANICAL			$323.00				$370.00				
C11 Plumbing & Drainage		$525,000	$35.00			$750,000	$50.00				Low flow plumbing fixtures
C21 Fire Protection		$375,000	$25.00			$375,000	$25.00				
C13 HVAC		$3,570,000	$238.00			$3,975,000	$265.00				Energy saving equipment
C14 Controls		$375,000	$25.00	$4,845,000	20.9%	$450,000	$30.00	$5,550,000	21.4%	14.6%	DDC controls for all major equipment
C2 ELECTRICAL			$164.82				$179.53				
C21 Service & distribution		$727,574	$48.50			$727,574	$48.50				
C22 Lighting, Devices & Heating		$512,751	$34.18			$713,361	$47.56				Energy saving fixtures
C23 Systems & Ancillaries		$1,232,049	$82.14	$2,472,374	10.7%	$1,252,049	$83.47	$2,692,984	10.4%	8.9%	
NET BUILDING COST (Excluding Site)			$1,178.63	$17,679,462	76.2%		$1,281.19	$19,217,833	74.2%	8.7%	
D SITE											
D1 SITE WORK			$100.25				$132.32				
D11 Site Development		$1,100,000	$73.33			$1,596,030	$106.40				Rainwater harvesting system for irrigation
D12 Mechanical Site Services		$300,000	$20.00			$285,000	$19.00				Drip irrigation in lieu of standard sprinklers
D13 Electrical Site Services		$103,720	$6.91	$1,503,720	6.5%	$103,720	$6.91	$1,984,750	7.7%	32.0%	
D2 ANCILLARY WORK			$0.00				$0.00				
D21 Demolition		$0	$0.00			$0	$0.00				
D22 Alterations		$0	$0.00	$0	0.0%	$0	$0.00	$0	0.0%	0.0%	
NET BUILDING COST (Including Site)			$1,278.88	$19,183,182	82.6%		$1,413.51	$21,202,583	81.9%	10.5%	
Z MARKUPS											
Z1 GENERAL REQUIREMENTS	10.0%		$127.89				$155.28				
Z11 General Requirements	7.0%	$1,342,800	$89.52			$1,643,824	$109.59				
Z12 Fee	3.0%	$575,500	$38.37	$1,918,300	8.3%	$685,400	$45.69	$2,329,224	9.0%	21.4%	LEED documentation costs
TOTAL CONSTRUCTION ESTIMATE (Excluding Contingencies)			$1,406.77	$21,101,482	90.9%		$1,568.79	$23,531,807	90.9%	11.5%	
Z2 CONTINGENCIES	10.0%		$140.68				$156.88				
Z21 Design Contingency	5.0%	$1,055,100	$70.34			$1,176,600	$78.44				
Z22 Escalation Contingency	0.0%	$0	$0.00			$0	$0.00				
Z23 Construction Contingency	5.0%	$1,055,100	$70.34	$2,110,200	9.1%	$1,176,600	$78.44	$2,353,200	9.1%	11.5%	
GOOD & SERVICES TAX	0%	$0	$0.00	$0	0.0%	$0	$0.00	$0	0.0%	0.0%	
TOTAL CONSTRUCTION ESTIMATE (Including Allowances)			$1,547.45	$23,212,000	100.0%		$1,725.67	$25,885,000	100.0%	11.5%	

		Excluding LEED Cost/m2	Including LEED Cost/m2	
GFA :	15,000 m2	$1,547.47	$1,725.67	11.5%
GFA :	161,459 sf	$143.76	$160.32	11.5%

c1.6 Trade Summary - Total Project

	Division		Total Project Excluding LEED		Total Project Including LEED			LEED %	
			Budget	Cost/ GLA (m2)	Budget	Cost/ GLA (m2)	% of Total	Increase	Key incremental cost factors
0	Construction Management Fee	3.0%	$575,495	$38.37	$685,392	$45.69	2.6%	0.0%	
1	General Conditions	7.0%	$1,342,823	$89.52	$1,643,805	$109.59	6.4%	22.4%	Includes LEED documentation
2	Site Work		$1,609,050	$107.27	$2,090,080	$139.34	8.1%	29.9%	Stormwater management and drip irrigation
3	Concrete		$5,288,802	$352.59	$5,313,802	$354.25	20.5%	0.5%	
4	Masonry		$147,120	$9.81	$147,120	$9.81	0.6%	0.0%	
5	Metals		$71,180	$4.75	$74,780	$4.99	0.3%	5.1%	
6	Carpentry		$103,000	$6.87	$123,000	$8.20	0.5%	19.4%	Low VOC millwork
7	Thermal and Moisture Protection		$1,238,300	$82.55	$1,712,678	$114.18	6.6%	38.3%	Increase thermal performance of envelope
									Reduction of 20% in glazing area
8	Doors & Windows		$2,078,250	$138.55	$1,955,105	$130.34	7.6%	-5.9%	Increase in thermal performance
9	Finishes		$819,056	$54.60	$856,984	$57.13	3.3%	4.6%	Low VOC specification
									Green building education kiosk
10	Specialties		$181,050	$12.07	$356,050	$23.74	1.4%	96.7%	Durable building details
11	Equipment		$30,000	$2.00	$30,000	$2.00	0.1%	0.0%	
12	Furnishings		$0	$0.00	$0	$0.00	0.0%	0.0%	
13	Special Construction		$0	$0.00	$0	$0.00	0.0%	0.0%	
14	Conveying Systems		$300,000	$20.00	$300,000	$20.00	1.2%	0.0%	
15	Mechanical		$4,845,000	$323.00	$5,550,000	$370.00	21.4%	14.6%	Increased energy efficiency
16	Electrical		$2,472,374	$164.82	$2,692,984	$179.53	10.4%	8.9%	Increased energy efficiency
Subtotal			$21,102,000	$1,406.77	$23,532,000	$1,568.79	90.9%	11.5%	
	Design Contingency	5.0%	$1,055,000	$70.33	$1,177,000	$78.47	4.5%	11.6%	
	Escalation Contingency	0.0%	$0	$0.00	$0	$0.00	0.0%	0.0%	
	Post Contract Contingency	5.0%	$1,055,000	$70.33	$1,177,000	$78.47	4.5%	11.6%	
Subtotal			$23,212,000	$1,547.43	$25,886,000	$1,725.72	100.0%	11.5%	
	GST (Excluded)		$0	$0.00	$0	$0.00	0.0%	0.0%	
Total Project Construction Cost			**$23,212,000**	**$1,547.43**	**$25,886,000**	**$1,725.72**	**100.0%**	11.5%	

c1.7 LEEED Incremental Costing - Total Project

Total Gross Floor Area 15,000 m2

	LEED prerequisite/credit	LEED points Y	?	N	cost factor description	Quantity	Incremental from Standard Office to LEED: unit rate	sub total	total	cost/m2 total gfa	Division Impact	Comments
Sustainable Sites	**SSp1 Erosion & Sedimentation Control -** Control erosion to reduce negative impacts on water and air quality.	Y			None	0 m2	$0.00	$0	$0	$0.00 / $0.00	2000	Included in Base - Municipal Requirement
	SSc1 Site Selection - Avoid development of inappropriate sites and reduce the environmental impact from the location of a building on a site.	1			None	0 m2	$0.00	$0	$0	$0.00 / $0.00	n/a	Both sites meet requirements for this credit
	SSc2 Development Density - Channel development to urban areas with existing infrastructure, protect green fields and preserve habitat and natural resources.			1	Not Pursued	0 m2	$0.00	$0	$0	$0.00	n/a	EXCLUDED
	SSc3 Brownfield Redevelopment - Rehabilitate damaged sites where development is complicated by real or perceived environmental contamination, reducing pressure on undeveloped land.			1	Not Pursued	0 m2	$0.00	$0	$0	$0.00 / $0.00	2000	EXCLUDED
	SSc4.1 Alternative Transportation: Public Transportation Access - Reduce pollution and land development impacts from automobile use.			1	Not Pursued	0 m2	$0.00	$0	$0	$0.00 / $0.00	n/a	EXCLUDED
	SSc4.2 Alternative Transportation: Bicycle Storage & Changing Rooms - Reduce pollution and land development impacts from automobile use.	1							$6,000	$0.40		
					Change rooms and showering facilities	2 no	$1,200.00	$2,400		$0.16	misc	Assume no increase to building area and locate washrooms allowance for additional pumbing c
					Bicycle racks for 5% of building	30 no	$120.00	$3,600		$0.24	5000	Based on building occupancy of 600 people
	SSc4.3 Alternative Transportation: Alternative Fuel Refueling Stations - Reduce pollution and land development impacts from automobile use.			1	Not Pursued	0 m2	$0.00	$0	$0	$0.00 / $0.00	n/a	EXCLUDED
	SSc4.4 Alternative Transportation: Parking Capacity - Reduce pollution and land development impacts from single occupancy vehicle use.	1			None	0 m2	$0.00	$0	$0	$0.00 / $0.00	n/a	Pending - Client requirement for 350 spaces m municipal requirements for parking capacity.
	SSc5.1 Reduced Site Disturbance: Protect or restore open space - Conserve existing natural areas and restore damaged areas to provide habitat and promote biodiversity.	1			Conserve existing natural areas and restore damaged areas to provide habitat and promote biodiversity	0 m2	$0.00	$0	$0	$0.00 / $0.00	2000	Minimal cost impact - additional site coordinati documentation included in General requiremen design, location and landscaping implications
	SSc5.2 Reduced Site Disturbance: Development Footprint - Conserve existing natural areas and restore damaged areas to provide habitat and promote biodiversity.		1		Not Pursued	0 m2	$0.00	$0	$0	$0.00 / $0.00	n/a	EXCLUDED
	SSc6.1 Storm water Management: Rate And Quantity - Limit disruption and pollution of natural water flows by managing storm water runoff.	1			Specification of pervious pavement materials	14045 m2	$34.00	$477,530	$477,530	$31.84 / $31.84	2000	Assume pervious pavement used in drive isles a only
	SSc6.2 Storm water Management, Treatment - Limit disruption of natural water flows by eliminating storm water runoff, increasing on-site infiltration and eliminating contaminants.		1		Not Pursued	0 m2	$0.00	$0	$0	$0.00 / $0.00	2000, 13000	EXCLUDED
	SSc7.1 Landscape & Exterior Design to Reduce Heat Island Effect: Non-Roof - Reduce heat islands to minimize impact on microclimate and human and wildlife habitat.	1			Landscaping to provide shading to impervious surfaces	7400 m2	$2.50	$18,500	$18,500	$1.23 / $1.23	2000	Related to SSc6.1
	SSc7.2 Landscape & Exterior Design to Reduce Heat Islands: Roof - Reduce heat islands to minimize impact on microclimate and human and wildlife habitat.		1		Not Pursued	0 m2	$0.00	$0	$0	$0.00 / $0.00	2, 7100	EXCLUDED
	SSc8 Light Pollution Reduction - Eliminate light trespass from the building and site, improve night sky access and reduce development impact on nocturnal environments.	1			Documentation and additional design to meet credit requirements	1 sum	$10,000.00	$10,000	$10,000	$0.67 / $0.67	1000, 16000	
Water Efficiency	**WEc1.1 Water Efficient Landscaping:** Reduce by 50% - Limit or eliminate the use of potable water for landscape irrigation.	1			Included in WEc1.2	1 no	$0.00	$0	$0	$0.00 / $0.00	2000, 15000	See WEc1.2
	WEc1.2 Water Efficient Landscaping: No potable use or no Irrigation - Limit or eliminate the use of potable water for landscape irrigation.	1			Savings from typ. Irrigation system	1 no	-$15,000.00	-$15,000	-$15,000	-$1.00 / ($1.00)	2000, 15000	
	WEc2 Innovative Wastewater Technologies - Reduce generation of wastewater and potable water demand, while increasing the local aquifer recharge.			1	Not Pursued	0 m2	$0.00	$0	$0	$0.00 / $0.00	15000	EXCLUDED
	WEc3.1 Water Use Reduction: 20% - Maximize water efficiency within buildings to reduce the burden on municipal water supply and wastewater systems.	1							$6,330	$0.42		
					Automatic controls for ultra-low flow faucets (1.9 LPM)	36 no	$0.00	$0		$0.00	15000	Minimal cost impact
					Waterless urinals	3 no	-$290.00	-$870		($0.06)	15000	No allowance for plumbing rough-in

Total Gross Floor Area 15,000 m2

	LEED prerequisite/credit	LEED points Y	?	N	cost factor description	Quantity	Incremental from Standard Office to LEED: unit rate	sub total	total	cost/m2 total gfa	Division Impact	Comments
					Dual-flush valve water closets (4.2/6.0 LPF)	36 no	$200.00	$7,200		$0.48	15000	Based on sloan flush valve
	WEc3.2 Water Use Reduction: 30% - Maximize water efficiency within buildings to reduce the burden on municipal water supply and wastewater systems.	1							$61,500	$4.10		Related to WEc3.1
					45m3 cistern	1 no	$30,000.00	$30,000		$2.00	15000	
					Additional piping for non potable water	15000 m2	$2.10	$31,500		$2.10	15000	
Energy & Atmosphere	**EAp1 Fundamental Commissioning -** Verify and ensure that fundamental building elements and systems are designed, installed and calibrated to operate as intended.	Y							$30,000	$2.00		
					Engage a independent commissioning authority	1 sum	$15,000.00	$30,000		$2.00	1000	
	EAp2 Minimum Energy Performance - Establish the minimum level of energy efficiency for the base building and systems.	Y							$0	$0.00		See EAc1.1
					Included in EAc1.1	2450 m2	$0.00	$0		$0.00	misc	
	EAp3 CFC Reduction and Elimination of Halons - Reduce ozone depletion.	Y							$0	$0.00		Standard for new office building equipment
					None	0 m2	$0.00	$0		$0.00	15000	
	EAc1.1 Optimize Energy Performance: 20% - Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associate with excessive energy use.	2							$741,513	$49.43		See Scenarios for detail
					Interior Lighting	1 sum	$96,510.00	$96,510		$6.43	16000	
					Building Envelope	1 sum	$76,003.00	$76,003		$5.07	misc	
					HVAC Systems	1 sum	$569,000.00	$569,000		$37.93	15000	
	EAc1.2 Optimize Energy Performance: 30% - Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associate with excessive energy use.	2							$0	$0.00		See EAc1.1
					Included in EAc1.1	0 m2	$0.00	$0		$0.00	-	
	EAc1.3 Optimize Energy Performance: 40% - Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associate with excessive energy use.	2							$0	$0.00		See EAc1.1
					Included in EAc1.1	0 m2	$0.00	$0		$0.00	-	
	EAc1.4 Optimize Energy Performance: 50% - Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associate with excessive energy use.		1	1					$0	$0.00		See EAc1.1
					Included in EAc1.1	0 m2	$0.00	$0		$0.00	-	
	EAc1.5 Optimize Energy Performance: 60% - Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associate with excessive energy use.			2					$0	$0.00		EXCLUDED
					Not pursued	0 m2	$0.00	$0		$0.00	-	
	EAc2.1 Renewable Energy: 5% - Encourage and recognize increasing levels of on-site renewable energy self-supply in order to reduce environmental impacts associated with fossil fuel energy use.			1					$0	$0.00		EXCLUDED
					Not pursued	0 m2	$0.00	$0		$0.00	16000	
	EAc2.2 Renewable Energy: 10% - Encourage and recognize increasing levels of on-site renewable energy self-supply in order to reduce environmental impacts associated with fossil fuel energy use.			1					$0	$0.00		EXCLUDED
					Not pursued	0 m2	$0.00	$0		$0.00	16000	
	EAc2.3 Renewable Energy: 20% - Encourage and recognize increasing levels of on-site renewable energy self-supply in order to reduce environmental impacts associated with fossil fuel energy use.			1					$0	$0.00		EXCLUDED
					Not pursued	0 m2	$0.00	$0		$0.00	16000	
	EAc3 Best Practice Commissioning - Verify and ensure that the entire building is designed, constructed and calibrated to operate as intended.	1							$25,000	$1.67		
					Engage a independent commissioning authority	1 sum	$25,000.00	$25,000		$1.67	1000	
	EAc4 Ozone Protection: Elimination of HCFCs - Reduce ozone depletion and support early compliance with the Montreal Protocol.	1							$10,000	$0.67		
					Specification of no HCFC HVAC& R equipment	1 sum	$10,000.00	$10,000		$0.67	15000	
	EAc5 Measurement & Verification - Provide for the ongoing accountability and optimization of building energy and water consumption performance over time.	1							$45,000	$3.00		
					Lighting systems and controls	1 sum	$10,000.00	$10,000		$0.67	1000, 16000	Allowance for monitoring system
					Constant and variable motor loads	0 m2	$0.00	$0		$0.00	1000, 16000	Included in base
					Variable frequency drive (VFD) operation	0 m2	$0.00	$0		$0.00	1000, 15000	
					Chiller efficiency at variable loads (kW/ton)	0 m2	$0.00	$0		$0.00	1000, 15000	
					Air and water economizer and heat recovery cycles.	0 m2	$0.00	$0		$0.00	1000, 15000	
					Air distribution static pressures /ventilation air volumes.	0 m2	$0.00	$0		$0.00	1000, 15000	Included in base
					Boiler efficiencies (can be on an annual basis)	1 sum	$10,000.00	$10,000		$0.67	1000, 15000	Allowance for monitoring system

Total Gross Floor Area 15,000 m2

	LEED prerequisite/credit	LEED points Y	?	N	cost factor description	Quantity	Incremental from Standard Office to LEED: unit rate	sub total	total	cost/m2 total gfa	Division Impact	Comments
					Costs includes meters for all major base building systems and 1-Year analysis to compare actual performance to anticipated performance.	1 sum	$25,000.00	$25,000		$1.67	1000, 15000	
	EAc6 Green Power - Encourage the development and use of grid-source, renewable energy technologies on a net zero pollution basis.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	n/a	EXCLUDED
Materials & Resources												
	MRp1 Storage & Collection of Recyclables - Facilitate the reduction of waste generated by building occupants that is hauled to and disposed of in landfills.	Y			Permanent recycling area in the building	0 m2	$0.00	$0	$0	$0.00 $0.00	misc	Minimal cost impact - assume no increase in
	MRc1.1 Building Reuse: Maintain 75% of Existing Walls, Floors, and Roof - Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	misc	EXCLUDED
	MRc1.2 Building Reuse: Maintain 95% of Existing Walls, Floors and Roof - Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	misc	EXCLUDED
	MRc1.3 Building Reuse: Maintain 50% of Interior Non-Structural Elements - Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	misc	EXCLUDED
	MRc2.1 Construction Waste Diversion: Divert 50% From Landfill - Divert construction, demolition and land clearing debris from landfill disposal. Redirect recyclable recovered resources back to the manufacturing process. Redirect reusable materials to appropriate sites.	1			Included in MRc2.2	0 m2	$0.00	$0	$0	$0.00 $0.00	1000	See MRc2.2
	MRc2.2 Construction Waste Diversion: Divert 75% from Landfill - Divert construction, demolition and land clearing debris from landfill disposal. Redirect recyclable recovered resources back to the manufacturing process. Redirect reusable materials to appropriate sites.	1			Documentation and sorting of Wood, Plastic, Glass, Metal, Gypsum waste	1 sum	$10,000.00	$10,000	$10,000	$0.67 $0.67	1000	
	MRc3.1 Resource Reuse: 5% - Reuse building materials and products in order to reduce demand for virgin materials and to reduce waste, thereby reducing impacts associated with the extraction and processing of virgin resources.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	misc	EXCLUDED
	MRc3.2 Resource Reuse: 10% - Reuse building materials and products in order to reduce demand for virgin materials and to reduce waste, thereby reducing impacts associated with the extraction and processing of virgin resources.			1	Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	misc	EXCLUDED
	MRc4.1 Recycled Content : 7.5% (Post-Consumer + 1/2 Post-Industrial) - Increase demand for building products that incorporate recycled content materials, therefore reducing impacts resulting from extraction and processing of new virgin materials and by-passing energy and green house gas-intensive industrial and manufacturing processes.	1			25% slag or fly-ash	0 m2	$0.00	$0	$0	$0.00 $0.00	misc	Subject to weather and schedule constraints. savings assumed to be offset by accelorator a Documentation costs allowed for in IDc2. Minimal cost impact, T.I. costs excluded fr
					Misc. materials and finishes	0 m2	$0.00	$0		$0.00	misc	
	MRc4.2 Recycled Content: 15% (Post-Consumer + 1/2 Post-Industrial - Increase demand for building products that incorporate recycled content materials, therefore reducing impacts resulting from extraction and processing of new virgin materials and by-passing energy and green house gas-intensive industrial and manufacturing processes.		1		Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	misc	EXCLUDED
	MRc5.1 Regional Material: 10% Extracted and Manufactured Regionally - Increase demand for building materials and products that are extracted and manufactured within the region, thereby supporting the use of indigenous resources and reducing the environmental impacts resulting from transportation.	1			None	0 m2	$0.00	$0	$0	$0.00 $0.00	misc	Minimal cost impact - proximity to industry
	MRc5.2 Regional Materials: 20% Extracted and Manufactured Regionally - Increase demand for building materials and products that are extracted and manufactured within the region, thereby supporting the use of indigenous resources and reducing the environmental impacts resulting from transportation.		1		Not pursued	0 m2	$0.00	$0	$0	$0.00 $0.00	misc	EXCLUDED

Total Gross Floor Area 15,000 m2

	LEED prerequisite/credit	LEED points Y	?	N	cost factor description	Quantity	Incremental from Standard Office to LEED: unit rate	sub total	total	cost/m2 total gfa	Division Impact	Comments
	MRc6 Rapidly Renewable Materials - Reduce the use and depletion of finite raw materials and long-cycle renewable materials by replacing them with rapidly renewable materials.			1					$0	$0.00		EXCLUDED
					Not pursued	0 m2	$0.00	$0		$0.00	misc	
	MRc7 Certified Wood - Encourage environmentally responsible forest management.			1					$0	$0.00		EXCLUDED
					Not pursued	0 m2	$0.00	$0		$0.00	6000	
	MRc8 Durable Building - Minimize materials use and construction waste over a building's life resulting from premature failure of the building and its constituent components and assemblies.	1							$210,000	$14.00		
					Allowance for detailing beyond standard practice consistent with durable building principles	1 sum	$200,000.00	$200,000		$13.33	misc	
					Develop and implement a Building Durability Plan in accordance with the principles of CSA S478-95 (R2001)	1 sum	$10,000.00	$10,000		$0.67	1000	
Indoor Environmental Quality												
	EQp1 Minimum IAQ Performance - Establish minimum indoor air quality (IAQ) performance to enhance indoor air quality in buildings, thus contributing to the comfort and well-being of the occupants.	Y							$0	$0.00		Minimal cost impact - Standard commercial sp
					None	0 m2	$0.00	$0		$0.00	15000, misc	
	EQp2 Environmental Tobacco Smoke (ETS) Control - Prevent or minimize exposure of building occupants, indoor surfaces, and systems to Environmental Tobacco Smoke (ETS).	Y							$0	$0.00		Minimal cost impact - Non-smoking building
					None	0 m2	$0.00	$0		$0.00	15000, misc	
	EQc1 Carbon Dioxide (CO2) Monitoring - Provide capacity for indoor air quality (IAQ) monitoring to help sustain long-term occupant comfort and well-being.	1							$6,000	$0.40		
					CO2 controls for ventilation	1 sum	$6,000.00	$6,000		$0.40	15000	
	EQc2 Increase Ventilation Effectiveness: Provide for effective delivery and mixing of supply air to support the safety, comfort and well-being of building occupants.	1							$0	$0.00		Minimal cost impact - Standard commercial sp
					None	0 m2	$0.00	$0		$0.00	15000	
	EQc3.1 Construction IAQ Management Plan: During Construction - Prevent indoor air quality problems resulting from the construction/renovation process in order to help sustain the comfort and well-being of construction workers and building occupants.	1							$12,500	$0.83		
					Photograph documentation.	1 sum	$500.00	$500		$0.03	1000	
					Completion of standardized schedules.	1 sum	$2,000.00	$2,000		$0.13	1000	
					Allowance for misc implications	1 sum	$10,000.00	$10,000		$0.67	1000	
	EQc3.2 Construction IAQ Management Plan: Testing Before Occupancy - Minimize indoor air quality problems resulting from the construction/renovation process in order to help sustain the comfort and well-being of construction workers and building occupants.	1							$10,000	$0.67		
					Includes testing for; particulate matter (PM10), formaldehyde, total volatile organic compounds, carbon monoxide, 4-phenycyclohexane (4pc)	1 sum	$10,000.00	$10,000		$0.67	1000	
	EQc4.1 Low-Emitting Materials: Adhesives & Sealants - Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.	1							$0	$0.00		Minimal cost impact - Standard commercial sp
					None	0 m2	$0.00	$0		$0.00	7920	
	EQc4.2 Low-Emitting Materials: Paints & Coatings - Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.	1							$12,928	$0.86		Low VOC Specification
					Low VOC spec - core and shell	12928 m2	$1.00	$12,928		$0.86	9900	
					Low VOC spec - T.I. spaces EXCLUDED	35100 m2	$0.00	$0		$0.00	9900	Associated costs are assumed to be included i
	EQc4.3 Low-Emitting Materials: Carpet - Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.	1							$0	$0.00		Low VOC Specification
					Green seal carpet - T.I. spaces EXCLUDED	11475 m2	$0.00	$0		$0.00	9685	Associated costs are assumed to be included i
	EQc4.4 Low-Emitting Materials: Composite Wood & Laminates - Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.	1							$20,000	$1.33		Low VOC Specification - excluding workstatior
					Low VOC millwork - Core and shell	1 sum	$20,000.00	$20,000		$1.33	6400	Washrooms and misc millwork in common are
					Low VOC millwork - T.I. spaces EXCLUDED	1 sum	$0.00	$0				Associated costs are assumed to be included i
	EQc5 Indoor Chemical & Pollutant Source Control - Minimize exposure of building occupants to potentially hazardous particulates, biological contaminants and chemical pollutants that adversely impact air and water quality.	1							$0	$0.00		
					MERV 13 filters in all air-handling equipment	0 no	$0.00	$0		$0.00	15000	Minimal cost impact - Standard commercial sp
					Separately exhausted photocopy	0 no	$0.00	$0		$0.00	15000	Minimal cost impact - Standard commercial sp
	EQc6.1 Controllability of Systems: Perimeter Spaces - Provide a high level of thermal, ventilation and lighting system control by individual occupants or specific groups in multi-occupant spaces to promote the productivity, comfort	1							$229,100	$15.27		
					Provide a minimum of one operable window per 18.5 m2 (200 ft2) within							

Total Gross Floor Area 15,000 m2

	LEED prerequisite/credit	LEED points Y	?	N	cost factor description	Quantity	Incremental from Standard Office to LEED: unit rate	sub total	total	cost/m2 total gfa	Division Impact	Comments
					Provide a minimum of one lighting zone per 18.5 m2 (200 ft2) within 5 m (15 ft) of perimeter wall.	347 no	$300.00	$104,100		$6.94	16000	
	EQc6.2 Controllability of Systems: Non-Perimeter Spaces - Provide a high level of thermal, ventilation and lighting system control by individual occupants or specific groups in multi-occupant spaces to promote the productivity, comfort and well-being of building occupants.			1					$0	$0.00		EXCLUDED
					Not Pursued	0 m2	$0.00	$0		$0.00	15000	
	EQc7.1 Thermal Comfort: Compliance - Provide a thermally comfortable environment that supports the productivity and well-being of building occupants.	1							$0	$0.00		Minimal cost impact - Standard commercial sp
					None	0 m2	$0.00	$0		$0.00	15000	
	EQc7.2 Thermal Comfort: Monitoring - Provide a thermally comfortable environment that supports the productivity and well-being of building occupants.	1							$15,000	$1.00		
					Include expanded points on the BAS to monitor and control humidity in all regularly occupied spaces.	1 sum	$15,000.00	$15,000		$1.00	15000	
	EQc8.1 Daylight and Views: Daylight 75% of Spaces - Provide for the building occupants a connection between indoor spaces and the outdoors through the introduction of daylight and views into the regularly occupied area of the building.	1							$160,000	$10.67		
					Provide a minimum daylight factor of 2%, or at least 250 Lux (25 foot-candles), in 75% of spaces for critical visual tasks.	0 m2	$0.00	$0		$0.00	n/a	Minimal cost impact - Pending final layout of c orientation, and building layout considered ba: Daylight modeling included in IDc2
					Allowance for solar shading devices to south façade glazing.	1 sum	$160,000.00	$160,000		$10.67	n/a	Cost implications in T.I. areas assumed to be i allowance
	EQc8.2 Daylight and Views: Daylight 90% of Spaces - Provide for the building occupants a connection between indoor spaces and the outdoors through the introduction of daylight and views into the regularly occupied area of the building.	1							$0	$0.00		Minimal cost impact - Pending final layout of c
					None	0 m2	$0.00	$0		$0.00	n/a	Cost implications in T.I. areas assumed to be i allowance
Innovation & Design Process	**IDc1.1 Innovation in Design:** Green Building Education	1							$15,000	$1.00		
					Instate a public education program that includes; An interactive kiosk/display describing LEED features; Distributed signage highlighting building LEED features; A case study or design manual about LEED features	1 sum	$15,000.00	$15,000		$1.00	10900	
	IDc1.2 Innovation in Design: Green house keeping	1							$0	$0.00		Documentation requirements included in IDc2
					Green house keeping program	1 sum	$0.00	$0		$0.00	n/a	Potential operational cost implications exclude
	IDc1.3 Innovation in Design: Specific Title			1					$0	$0.00		EXCLUDED
					Not pursued	0 m2	$0.00	$0		$0.00	-	
	IDc1.4 Innovation in Design: Specific Title			1					$0	$0.00		EXCLUDED
					Not pursued	0 m2	$0.00	$0		$0.00	-	
	IDc2 LEED® Accredited Professional:	1							$92,124	$6.00		
					LEED® Consulting	1 sum	$80,000.00	$80,000		$5.33	1000	
					LEED® Registration	1 sum	$2,054.00	$2,054			1000	
					LEED® Certification	1 sum	$10,070.00	$10,070		$0.67	1000	
	NET COST (Including Site)	42	6	22					$2,209,000	$147.27		
	General Requirements & Fees								$220,900			
	General requirements on additional cost (7.0%)							$154,630				
	Construction Management Fees (3%)							$66,270				
	Design Fees **(Excluded)**							$0				
	TOTAL ESTIMATE (Excluding Contingencies)								$2,430,000	$162.00		
	Allowances								$243,000			
	Design Allowances (5%)							$121,500				
	Escalation Allowances **(Excluded)**							$0				
	Construction Allowances (5%)							$121,500				
	TOTAL ESTIMATE (Including Allowances)								$2,673,000	$178.20		

GFA:	15000	**$178.20**	/m2
GFA:	161,459	**$16.56**	/sf
Points	42	**$63,643**	/credit

c1.8 EAc1 Optimize Energy Performance Strategies

Total Gross Floor Area 15,000

	Scenario Description	Quantity	Unit Rate	Sub-Total	LEED Premium from Typical Office building	cost/m2 total gfa	Division impact	Comments
Interior Lighting	1. Efficient Lighting Design				$0	$0.00		
	Reduce installed lighting power in corridors and common areas on ground floor to meet ASHRAE 90.1-2004	0 m2	$0.00	$0		$0.00	16000	Savings in reduction in number of fixtures assumed to be absorbed by additional design costs
	2. Efficient Lighting design in general office				$74,010	$4.93		
	Install high efficiency compact fluorescent fixtures in office areas	2467 no	$30.00	$74,010		$4.93	16000	
	3. Occupancy sensors for lighting				$12,500	$0.83		
	Installed in stairwells, utility rooms, and general office area	50 no	$250.00	$12,500		$0.83	16000	
	4. Daylight sensors for lighting				$10,000	$0.67		
	Installed in general office area	40 no	$250.00	$10,000		$0.67	16000	
	Total Interior Lighting (measures 1 - 4)				$96,510			
Building Envelope	5. Increase roof insulation				$90,000	$6.00		
	Increase from R-21 to R-25 (replace extruded polystyrene with polyisocyanurate)	5000 m2	$18.00	$90,000		$6.00	8000	
	6. Upgrade window glazing				$76,650	$5.11		
	Upgrade to soft coat low-e (e=0.05) and add warm-edge spacers. U-value = 2.16 W/m2-C	2190 m2	$35.00	$76,650		$5.11	8520	Based on 40% of wall area
	7. Reduce window-to-wall ratio to 40%				-$103,775	-$6.92		
	Replace vision wall with spandrel/solid wall assembly	1 sum	-$103,775.00	-$103,775		($6.92)	misc	Savings related to substituting wall assembly for 20% of glazing area
	8. Increase wall insulation				$13,128	$0.88		
	Increase from R-12 to R-17 (add 25mm XPS)	2188 m2	$6.00	$13,128		$0.88	8000	Based on 40% of wall area
	Total Building Envelope (measure 5-8)				$76,003			
HVAC Systems	9. Energy recovery ventilator				$200,000	$13.33		
	Enthalpy wheel (75% effective) in central make-up air unit serving office spaces	2 no	$100,000.00	$200,000		$13.33	15000	
	10. Condensing Boiler				$54,000	$3.60		
	Fully-modulating burner + efficiency = 85%	2 no	$27,000.00	$54,000		$3.60	15000	
	11. Increase pumping efficiency				$55,000	$3.67		
	Combined impeller/motor efficiency - 70%	1 sum	$55,000.00	$55,000		$3.67	15000	
	12. Upgrade overall fan efficiency				$200,000	$13.33		
	Central supply and exhaust fans - 57%	2 no	$100,000.00	$200,000		$13.33	15000	
	13. Condensing water heater				$60,000	$4.00		
	Increase water heater efficiency to 93%	3 no	$20,000.00	$60,000		$4.00	15000	
	14. CO2 controlled ventilation				-	-		Included in EQc1
	Use CO2 sensors to control ventilation	-	-	-		-		
	15. Low-flow fixtures				-	-		Included in WEc3.1
	Shower heads 5.7 L/min.	-	-	-		-		
	Lavatory faucets 1.9 L/min.	-	-	-		-		
	Total HVAC Systems (measures 9-13)				$569,000			
	NET COST EXCLUDING GENERAL REQUIREMENTS AND ALLOWANCES				$741,513			
			15,000 m2		$49.43			
			161,459 sf		$4.59			

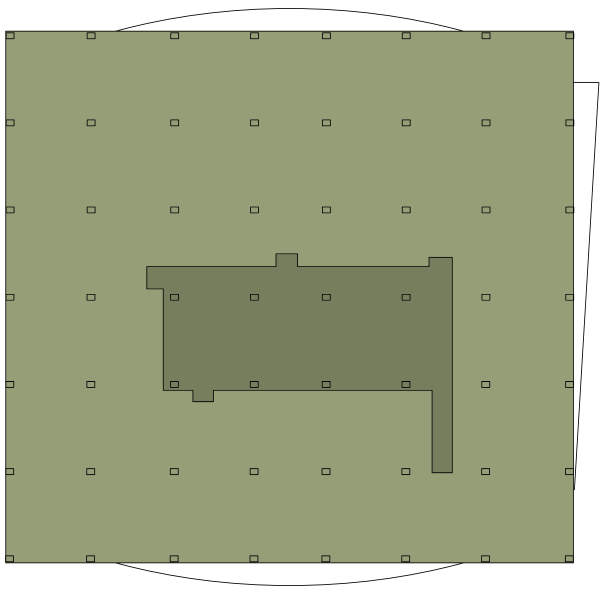
c1.9 Building Value Assessment

Ref.	Design Criteria/Characteristics		MNECB Reference Building		c1 - Commercial Building Case Study		Key Indicators
1.00	**Construction Cost Summary**						
1.01	Building Area (GLA)		15,000	m2	15,000	m2	
1.03	Total Construction Hard Costs (Excl. LEED)		$23,212,000	$1,547.47 /m2	$23,212,000	$1,547.47 /m2	
1.04	Total LEED Incremental Construction Cost		$0	$0.00 /m2	$2,674,000	$178.27 /m2	
1.05	Total Construction Hard Costs (Incl. LEED)		$23,212,000	$1,547.47 /m2	$25,886,000	$1,725.73 /m2	
1.06	Total Project Soft Costs		Excluded	- /m2	Excluded	- /m2	
1.07	**Total Project Budget**		$23,212,000	$1,547.47 /m2	$25,886,000	$1,725.73 /m2	
2.00	**Building Environmental Performance (Note 1)**						
2.01	Energy Use per year	KWh/a	3,594,000	239.6 /m2	2,203,500	146.9 /m2	
2.02	Energy Cost per year	$	$246,156	$16.41 /m2	$159,961	$10.66 /m2	
2.03	Percent of MNECB baseline		100.0%		35.0%		
2.04	Water Use per year	m3	31,050	2.070 m3/m2	21,735	1.449 m3/m2	
2.05	Water Cost per year (@ $1.20/m3)	$	$37,260	$2.48 /m2	$26,082	$1.74 /m2	
2.06	Percent water reduction		0%		30%		
2.07	Greenhouse Gas reduction	Tonnes CO2/a	0.0		440.9		
3.00	**Value of Energy Savings (Note 1)**						
3.01	Annual Energy Cost	$/a	$246,156	$16.41 /m2	$159,961	$10.66 /m2	
3.02	Energy use reduction	%	0.0%		35.0%		
3.03	Energy savings per year	$	$0	$0.00 /m2	$86,195	$5.75 /m2	
3.04	Cap rate	%	8%		8%		
3.05	Increased building value	$	$0	$0 /m2	$1,077,438	$71.83 /m2	
3.06	Increased building value (% of Capital)	%	0%		4.2%		
3.07	Payback on LEED Cost Increment	Years	0.0		2.5		
4.00	**Value of Water Savings (Note 2)**						
4.01	Annual Water Cost	$/a	$37,260	2.48 /m2	$26,082	1.74 /m2	
4.02	Water use reduction	%	0.0%		30%		
4.03	Water savings per year	$	$0	$0.00 /m2	$11,178	$0.75 /m2	
4.04	Cap rate	%	8%		8%		
4.05	Increased building value	$	$0	$0 /m2	$139,725	$9.31 /m2	
4.06	Increased building value (% of Capital)	%	0%		0.5%		
4.07	Payback on LEED Cost Increment	Years	0.0		19.1		
5.00	**Value of Rent Premium (Note 3)**						
5.01	Rental Income (GSA = 88% of GLA)	$	$3,960,000	$300.00 /m2	$4,158,000	$315.00 /m2	
5.02	Lease Revenue Premium	%	0.0%		5.0%		
5.03	Additional Sales Revenue	$	$0	$0.00 /m2	$198,000	$15.00 /m2	
5.04	Cap rate	%	8%		8%		
5.05	Increased building value	$	$0	$0 /m2	$2,475,000	$165.00 /m2	
5.06	Increased building value (% of Capital)	%	0%		9.6%		
5.07	Payback on LEED Cost Increment	Years	0.0		1.1		
6.00	**Value of Occupancy Premium**						
6.01	Occupancy Assumed	%	90%		92%		
6.02	Annual Rent (GSA = 88% of GLA)	$	$3,960,000	$300.00 /m2(GSA)	$3,960,000	$300.00 /m2(GSA)	
6.03	Annual Occupancy Premium	$	$0	$0.00 /m2(GSA)	$79,200	$5.28 /m2(GSA)	
6.05	Increased building value	$	$0	$0 /m2	$79,200	$5.28 /m2	
6.06	Increased building value (% of Capital)	%	0%		0.3%		
6.07	Payback on LEED Cost Increment	Years	0.0		33.8		
7.00	**Residual Value Premium**						
7.01	Total Project budget (incl LEED)	$	$23,212,000	$1,547.47 /m2	$25,886,000	$1,725.73 /m2	
7.02	Rent Premium (5%)	$/a	$0	$0.00 /m2(GSA)	$198,000	$15.00 /m2(GSA)	
7.03	Net Rent (GSA = 88% of GLA)	$/a	$3,960,000	$300.00 /m2(GSA)	$4,158,000	$315.00 /m2(GSA)	
7.04	Building Value (assume cap rate of 8% for standard and 7.75% for LEED)	$	$49,500,000	$3,300.00 /m2	$53,651,613	$3,576.77 /m2	
7.05	Increased building value	$	$0	$0 /m2	$4,151,613	$276.77 /m2	
7.06	Increased building value (% of Capital)	%	0%		16.0%		
7.07	Payback on LEED Cost Increment	Years	0.0		0.6		
8.00	**Total Increase in Building Value**						
8.01	Increase in buliding value (sum 3 to 7)	$	$0	$0.00 /m2	$4,317,008	$287.80 /m2	
8.02	Increased building value (% of Capital)	%	0%		16.7%		
8.03	Payback on LEED Cost Increment	Years	0.0		0.6		

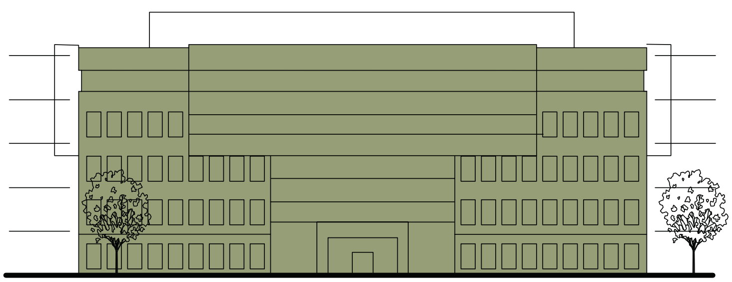
Notes

1. Energy performance based on similar building consumption trends
2. Water consumption based on similar building consumption trends
3. Rental income based on similar building revenues provided by Altus Helyar Valuation Consulting

c2.1 Project Diagrams and Overview



Typical Floor Plan Diagram



Building Elevation Diagram

Ref.	Design Criteria/Characteristics - Commercial Building	c2 Commercial Case Study	Key Indicators
1.00	**Project Statistics**		
1.01	Location	Markham, Ontario	
1.02	Gross Floor Area (m2 GFA)	14,454	
1.03	Stories	6	
2.00	**Construction Cost Estimate**		
2.01	Office building (excl. tenant impr	$19,819,621	
2.02	Site Development	$1,286,274	
2.03	**Subtotal Excluding Contingencies**	**$21,106,000**	
2.04	Design Contingency/Allowance	$1,055,000	
2.05	Escalation Contingency	$0	
2.06	Post Contract	$1,055,000	
2.07	Tenant Improvements Allowance	-	
2.08	**Total Construction Cost (Excl. GST)**	**$23,216,000**	
2.09	**$/m2 (GLA)**	**$1,606**	
3.00	**Estimated LEED Cost Increment (Included above)**		
3.01	$ Budget	$1,636,000	
3.02	$/m2	$113	
3.03	$/credit	$41,949	
3.04	**% increase**	7.6%	
4.00	**Exterior Enclosure (Overall System)**		
4.01	Wall R-Value	R-17	
4.02	Roof R-Value	R-26	
4.03	Floor R-Value	R-15	
4.04	Glazing U-factor / SHGC / visible light trans.	1.66/0.43/0.60	
4.05	Amount of glazing (% of building skin area)	58%	
5.00	**Building Environmental Performance**		
5.01	Energy Intensity (Base/LEED) KWh/m2/a	260/149	
5.02	Percent of MNECB baseline	53.5% MNECB	
5.03	Water use (Base/LEED) L/m2/a		
5.04	Percent water reduction	30%	
5.05	Greenhouse Gas reduction tonnes CO2/a	440.9	
5.06	tonnes CO2/a/m2	0.031	

c2.2 Design Efficiency Statistics

Ref.	Item	Unit	Case Study Value	Industry Standard Value	Key Indicators
1.00	**Project Totals**				
1.01	Below Grade Area (GPA)	sf	0	0	
1.02	GLA	sf	155,581	149,648	
1.03	GFA (TCA)	sf	155,581	149,648	
1.04	# Levels Below Grade	no	0	0	
1.06	# Floors (Excluding MPH)	no	5	5	
1.07	# Units	no	1	1	
1.08	# Parking (underground)	no	0	0	
1.10	Site Area	sf	261,000	200,385	
2.00	**Below Grade (Including CHP Shell Space)**				
2.01	Total Area Parking	sf	0	0	
2.01.01	Net Parking Area (incl. Circulation)	sf	0	0	
2.01.02	Service / Mechanical	sf	0	0	
2.01.03	Storage	sf	0	0	
2.01.04	Amenity	sf	0	0	
2.02	Stalls	no	0	0	
2.03	No. of levels	no	0	0	
2.04	Gross Parking Area / Stall	sf	n/a	n/a	
2.05	Net parking area / Stall	sf	n/a	n/a	
2.06	Stalls / Unit	no	0.00	0.00	
2.07	Exterior Wall Area	sf	0	0	
2.08	Exterior wall / GPA (Below Grade)	ratio	n/a	n/a	
2.09	Excavation Volume	m3	n/a	519	
2.10	Excavation/Parking Area ratio (M3/M2)	m3/m2	n/a	n/a	
2.11	Below Grade (GPA) / Total Construction Area(TCA)	ratio	0.00	0.00	
2.12	# Elevator Cabs	no	0	0	
2.13	# Elevator Stops	no	0	0	
3.00	**Above Grade**				
3.01	Total Above Grade Area (GLA)	sf	155,581	149,648	
3.01.01	Commercial Office	sf	129,393	118,928	
3.01.03	Commercial Retail	sf	0	3,452	
3.01.04	Amenity/Washroom	sf	3,444	2,095	
3.01.05	Loading/Storage	sf	4,682	1,830	
3.01.06	Service Areas (mechanical/electric	sf	7,029	10,305	
3.01.07	Circulation	sf	11,033	13,039	
3.02	Net saleable area	sf	129,393	118,928	
3.06	No. of units	no	1	1	
3.07	GLA / Unit	sf	129,393	85,735	
3.12	**Floors**				
3.12.01	No. of Floors - Tower 1 / Tower 2	no	5	5	
3.12.02	Typical floor to floor height	lf	13.78	13.24	
3.12.03	Window Area	sf	29,946	32,070	
3.12.04	Exterior wall area	sf	51,905	55,500	
3.12.05	Exterior wall / GLA (Above Grade)		0.33	0.37	
3.12.06	# Elevator Cabs	no	3	3	
3.12.07	# Elevator Stops	no	15	13	

Ref.	Item	Unit	Case Study Value	Industry Standard Value	Key Indicators
3.13	**Saleable**				
3.13.01	Total Saleable Area	sf	129,393	118,928	
3.13.02	Commercial Office	sf	129,393	118,928	
3.13.03	Commercial Retail	sf	0	0	
3.14	**Statistical Efficiency Ratios**				
3.15	Building Efficiency (Net Saleable / GLA)	ratio	0.83	0.79	
3.16	Typical floor Efficiency (Net Saleable / GLA)	ratio	0.89	0.89	
3.17	Average Selling Area/Unit (Average Unit Size)	sf	129,393	85,735	
3.18	Exterior wall / Net Saleable Area (Above Grade)	ratio	0.40	0.48	
3.19	Window / Ext.wall ratio	ratio	0.58	0.58	
3.22	Retail ratio - (Retail area / GLA)	ratio	0.00	-	
3.23	GFA / Unit	sf	155,581	109,284	
3.26	**Construction Ratios**				
3.27	Formwork contact area	m2	29,606	23,810	
3.28	Concrete volume (including Waste)	m3	6,379	6,099	
3.29	Rebar Weight	kg	700,053	646,294	
3.30	Rebar / Concrete Volume ratio	kg/m3	109.7	106.2	
3.31	Structural Steel - Total Weight	kg	-	-	
3.32	Rebar / GLA	kg/m2	4.50	4.33	
3.33	Rebar / GFA	kg/m2	4.50	4.33	
3.34	Formwork / GFA	m2/m3	2.05	1.70	
3.35	Concrete / GFA	m3/m2	0.44	0.44	
3.36	Concrete / GLA	m3/m2	0.44	0.44	
3.37	Structural Steel/GLA	kg/m2	-	-	
4.00	**Site**				
4.01	Gross Site Area	acre	5.98	4.59	
4.02	Site Density (UPA)	unit/acre	0.17	0.59	
4.03	Site Area/Unit	sf	261,000.00	126,134.67	
5.00	**Construction Cost (Including LEED)**				
6.00.01	Below Grade Cost	$	n/a	$0	
6.00.02	Above Grade Cost (Incl Site Work)	$	$23,216,000	$23,407,333	
6.01	**Total Cost**	**$**	**$23,216,000**	**$23,407,333**	
6.02	Cost / Stall	$/Unit	-	$0.00	
6.03	Cost / GLA	$/sf	$149.22	$156.55	
6.04	Cost / GFA	$/sf	$149.22	$156.55	
6.05	Cost / Unit	$/Unit	$23,216,000	$16,935,833	
6.06	Cost / Saleable Area	$/sf	$179.42	$199.20	

A1 Sub-Structure

• Conventional concrete pad foundations and spread footings

Potential LEED Initiatives:
• Use fly-ash as partial substitute of Portland cement in concrete mix
• Use slag as aggregate for concrete mix.
• Use of rebar with recycled content

A2 Structure

• Structural concrete slab-on-grade.
• Concrete structure on 8.0m – 8.5m grid
• Reinforced concrete suspended slabs and roof
• Steel exit stairs ground floor to roof.

Potential LEED Initiatives:
• Use fly-ash as partial substitute of Portland cement in concrete mix
• Use slag as aggregate for concrete mix.
• Use of rebar with recycled content

A3 Exterior Enclosure

Walls
• Architectural brick veneer wall with drywall / concrete wall back up (R-12).
• Pre-finished metal clad wall with drywall/concrete wall back up (R-12).
• Strip windows with vision glazing including double glazing and Low-E coating overall (U-Value 2.9)
• Insulated hollow metal doors and frames.

Roof
• Built-up insulated roof finish (R-21)

Potential LEED Initiatives:
Walls
• Increase thermal performance of wall assemblies to R17 including details to minimize thermal bridging
• Provide minimum of R-6 over all structural members passing through envelope
• Increase thermal performance of window assemblies to include 19mm thermal break, soft coat low-E coating, and warm edge spacers (U-Value 2.16)
• Provide awning type operable window units in window wall assembly
• Recycled content specified for steel framing
• Two doors with vestibule provided at all exterior doors
• Allowance for additional air and water leakage testing of sample units
• Allowance for Low VOC Materials inside of air barrier

Roof
• Inverted roof fully adhered to structural deck
• Allowance for additional water and air leakage testing
• Allowance for low VOC materials inside of air barrier

B1 Partitions and Doors

Base Building
• Concrete shear wall, concrete block walls and drywall partitions around washrooms, common areas and service spaces
• Fire rated stairwell doors.
• Hollow metal doors to washrooms, common areas and service spaces.

Potential LEED Initiatives:
• Recycled content specified for Gypsum board
• Recycled content specified for steel framing
• Allowance for durable building details and construction methods
• Allowance for Low VOC Materials

Tenant Improvements
• Drywall partitions to offices and boardrooms
• Glass partitions

Potential LEED Initiatives:
• Recycled content specified for Gypsum board
• Recycled content specified for steel framing
• Low VOC Materials

B2 Finishes

Base Building

Floors

- Ceramic tile to washrooms
- Stone to ground floor main entrance/circulation
- Epoxy floor paint to service areas and exit stairs
- Unfinished to office and elevator lobby areas

Ceilings

- Suspended drywall ceiling to Elevator Lobby ground floor main entrance, & circulation areas and washrooms
- ACT Ceilings to office areas
- Paint to structure in service spaces

Walls

- Ceramic wall tiles to washrooms
- Paint to other areas

Estimate excludes all costs for tenant improvements including private offices, boardrooms, kitchenettes, demising walls etc.

- Potential LEED Initiatives:
- Reduction in amount of ceiling finishes in office areas – 60% exposed concrete 20% ACT 20% drywall.
- Allowance for durable building details and construction methods
- Allowance for Low VOC Materials
- Materials that have recycled and/or post consumer/industrial content.
- Materials that have been manufactured and/or harvested regionally.

Tenant Improvements

Floors

- Carpet to Office areas.

Ceilings

- Drywall bulkheads and feature ceiling in tenant spaces
- Sprayed texture to concrete soffit in suites.

Walls

- Paint to drywall and concrete block walls.
- Vinyl wall covering to corridors.
- Ceramic tile to tub and shower surrounds in suites.
- Rubber/carpet baseboards, and paint to door casing.

Potential LEED Initiatives:

- Greenseal rated carpet to office areas with engineered wood and linoleum accents in high traffic areas
- Minimal ceiling finishes in office area
- Reduced level of finish generally in office areas
- Low VOC Materials
- Materials that have recycled and/or post consumer/industrial content.
- Materials that have been manufactured and/or harvested regionally.

B3 Fittings & Equipment

B31 Fittings and Fixtures

- Steel rail/balustrade to exit stairs
- Millwork – FF&E budget for washrooms and service spaces
- Stone washroom vanities to washrooms
- General mill work - Allowance
- Stainless steel washroom accessories
- Foot grilles
- Interior signage-base building - Allowance
- Roll shade window blinds EXCLUDED from estimate

Potential LEED Initiatives:

- Green Building education signage and kiosk allowance
- Low VOC millwork
- Allowance for durable building details and construction methods

B32 Equipment

Standard Commercial Office Building

- General Equipment – see FF&E Budget
- Recycling/waste equipment - Allowance
- Window washing anchors - Allowance
- Loading dock levelers & equipment - Allowance

Potential LEED Initiatives:

- None

B33 Conveying Systems

• 3 no 5 stop passenger elevators (GF-5F)

Potential LEED Initiatives:
• None

C1 Mechanical

C11 Plumbing & Drainage
• Commercial quality plumbing fixtures with hand free electronic operator
• Plumbing services up to and including fixtures
• Remote hot water tank by tenant
• Domestic booster pump

C12 Fire Protection
• Sprinkler and fire stand pipe through out the building

C13 HVAC
• Individual floor compartmental air handling units
• Air cooled chiller provides chilled water
• All units have humidifiers.
• Terminal units, diffusers and grilles.
• Make-up air units
• Gas hot water boilers provides hot water to heating elements

C14 Controls
• DDC systems and VFD

Potential LEED Initiatives
• Domestic hot water condensing boilers
• Low-flow flush valve WC's waterless urinals and electronic faucets
• Rainwater harvesting for sewage conveyance
• Water metering for office spaces
• High efficient air cooled chillers provide chilled water to air handling units
• Free cooling heat exchanger
• High efficiency boilers provide hot water to heating elements
• Heat recovery air handling units provide conditioned air
• DDC control system on all major equipment balancing dampers, terminal units and perimeter radiation
• Variable speed drives on all fans, pumps, motors, etc…

C2 Electrical

• Feeder cables are assumed to be standard offices
• Pipe tracing included as required
• Office is shell space-Tenant fit out not included
• Office general lighting included.
• Communication zone box/conduits are included.
• Zone power box and conduits are include
• Hydro charges excluded
• Building power supply primary cable assumed by Hydro
• Office receptacle to partitions Tenant improvement works
• Communication cabling –office –Tenant Fit out
• HV Substation assumed by local power company
• Ceiling tray in office space not included
• Fire alarm system included
• Security system included for base building only

Potential Initiatives:
• Medium/High quality lighting fixtures
• Perimeter lighting photo control
• Occupancy sensors in corridors/stair cases and common areas
• Efficient lighting design
• Daylight sensors for lighting in common, and tenant areas

D1 Site Development

• Allowances for site development includes unit pavers, concrete paving and soft landscaping, site improvements.
• Allowance made for mechanical site services.
• Storm water detention pond EXCLUDED
• Allowance made for electrical site services

Potential LEED Initiatives:
• Erosion and sedimentation control documentation and implementation
• Size parking to meet but not exceed local bylaw requirements
• Reduce site disturbance to vicinity immediately around proposed building footprint and site work
• Pervious pavers to drive aisles in parking areas
• Specify adaptive species landscaping
• Irrigation system deleted
• Limit the amount of light trespass from the site and limit up lighting to enhance night sky and nocturnal environs
• Perimeter lighting photo control

D2 Ancillary Work
• None

c2.4 Project Cost Summary

Construction Cost Item		GFA(M2)	Total Project Excluding LEED $ Budget	Total Project Excluding LEED $/m2	Total Project Including LEED $ Budget	Total Project Including LEED $/m2	% Increase	Key incremental cost factors
Office Building - 5 Storey		14,454	$18,649,979	$1,290	$19,819,621	$1,371	6.3%	Additional requirements of LEED
Site Development		21,670	$968,517	$45	$1,286,274	$59	32.8%	Additional requirements of LEED
Subtotal Construction Costs		14,454	$19,618,000	$1,357	21,106,000	$1,460	7.6%	
Design Contingency-Allowance	5.0%	14,454	$981,000	$68	$1,055,000	$73	7.5%	Contingency on incremental cost
Subtotal - GLA (including Design Allowance)		14,454	$20,599,000	$1,425	$22,161,000	$1,533	7.6%	
Escalation Contingency	0.0%	14,454	$0	$0	$0	$0	0.0%	
Post-contract Construction Contingency	5.0%	14,454	$981,000	$68	$1,055,000	$73	7.5%	Contingency on incremental cost
Total Construction Costs		**14,454**	**$21,580,000**	**$1,493**	**$23,216,000**	**$1,606**	**7.6%**	
Project Soft Costs								
Land (Reality taxes only)		-	Excluded	-	Excluded	-	-	
Municipal Fees		-	Excluded	-	Excluded	-	-	
Construction (Excluded above)		-	Excluded	-	Excluded	-	-	
Design Consultants		-	Excluded	-	Excluded	-	-	
General and Administrative		-	Excluded	-	Excluded	-	-	
Furniture Fixtures and Equipment		-	Excluded	-	Excluded	-	-	
Marketing and Sales		-	Excluded	-	Excluded	-	-	
Finance		-	Excluded	-	Excluded	-	-	
Interim Building Operations		-	Excluded	-	Excluded	-	-	
Government Taxes		-	Excluded	-	Excluded	-	-	
Development Contingency		-	Excluded	-	Excluded	-	-	
Total Soft Costs		-	Excluded	-	Excluded	-	-	
Total Project Budget		**14,454**	**$21,580,000**	$1,493	**$23,216,000**	$1,606	7.6%	

Notes

1. Utility Connection Charges are Excluded.
2. Priced at 3rd qtr of 2006 rates.
3. GST is Excluded.
4. Excludeds LEED consultant costs

c2.5 Elemental Cost Summary - Total Project

Gross Livable Area (GLA): 15,000 m2

Element		Total Project Excluding LEED: Elemental Amount	Cost/m2	Total	%	Total Project Including LEED: Elemental Amount	Cost/sf	Total	%	LEED % Increase	Key incremental cost factors
A SHELL											
A1 SUBSTRUCTURE			$39.37				$39.37				
A11 Foundation		$482,103	$33.35			$482,103	$33.35				
A12 Basement Excavation		$86,927	$6.01	$569,030	2.6%	$86,927	$6.01	$569,030	2.5%	0.0%	
A2 STRUCTURE			$309.07				$309.07				
A21 Lowest Floor Construction		$109,427	$7.57			$109,427	$7.57				
A22 Upper Floor Construction		$3,530,995	$244.29			$3,530,995	$244.29				
A23 Roof Construction		$826,825	$57.20	$4,467,247	20.7%	$826,825	$57.20	$4,467,247	19.2%	0.0%	
A3 EXTERIOR ENCLOSURE			$273.55				$286.20				
A31 Walls Below Grade		$51,820	$3.59			$51,820	$3.59				
A32 Walls Above Grade		$951,788	$65.85			$965,654	$66.81				Increased thermal performance
A33 Windows & Entrance		$1,840,910	$127.36			$1,964,215	$135.89				Increased thermal performance
A34 Roof Covering		$395,125	$27.34			$440,800	$30.50				Increased thermal performance
A35 Projections		$714,217	$49.41	$3,953,860	18.3%	$714,217	$49.41	$4,136,706	17.8%	4.6%	
B INTERIORS											
B1 PARTITIONS & DOORS			$96.58				$96.58				
B11 Partitions		$1,288,737	$89.16			$1,288,737	$89.16				
B12 Doors		$107,250	$7.42	$1,395,987	6.5%	$107,250	$7.42	$1,395,987	6.0%	0.0%	
B2 FINISHES			$65.11				$66.17				
B21 Floor Finishes		$119,660	$8.28			$119,660	$8.28				
B22 Ceiling Finishes		$619,440	$42.86			$619,440	$42.86				
B23 Wall Finishes		$202,065	$13.98	$941,165	4.4%	$217,331	$15.04	$956,431	4.1%	1.6%	Low VOC finishes
B3 FITTING & EQUIPMENT			$71.05				$73.68				
B31 Fitting & Fixtures		$269,490	$18.64			$272,490	$18.85				
B32 Equipment		$82,500	$5.71			$117,500	$8.13				Green building informatio kiosk
B33 Conveying Systems		$675,000	$46.70	$1,026,990	4.8%	$675,000	$46.70	$1,064,990	4.6%	3.7%	
C SERVICES											
C1 MECHANICAL			$235.81				$282.39				
C11 Plumbing & Drainage		$382,900	$26.49			$393,025	$27.19				Rainwater for sewage conveyance
C21 Fire Protection		$345,215	$23.88			$345,215	$23.88				
C13 HVAC		$2,333,100	$161.42			$2,961,150	$204.87				Energy saving equipment
C14 Controls		$347,250	$24.02	$3,408,465	15.8%	$382,250	$26.45	$4,081,640	17.6%	19.8%	DDC on major equipment
C2 ELECTRICAL			$80.22				$86.58				
C21 Service & distribution		$525,015	$36.32			$525,015	$36.32				
C22 Lighting, Devices & Heating		$519,993	$35.98			$601,993	$41.65				Motion and photo sensors on lighting fixtures
C23 Systems & Ancillaries		$114,427	$7.92	$1,159,435	5.4%	$124,427	$8.61	$1,251,435	5.4%	7.9%	
NET BUILDING COST (Excluding Site)			$1,170.76	$16,922,179	78.4%		$1,240.04	$17,923,466	77.2%	5.9%	
D SITE											
D1 SITE WORK			$40.55				$80.74				
D11 Site Development		$728,887	$33.64			$994,644	$68.81				Pervious pavement in parking area
D12 Mechanical Site Services		$67,500	$3.11			$82,500	$5.71				Cistern and equipment for rainwater harvesting
D13 Electrical Site Services		$82,430	$3.80	$878,817	4.1%	$89,930	$6.22	$1,167,074	5.0%	32.8%	
D2 ANCILLARY WORK			$0.00				$0.00				
D21 Demolition		$0	$0.00			$0	$0.00				
D22 Alterations		$0	$0.00	$0	0.0%	$0	$0.00	$0	0.0%	0.0%	
NET BUILDING COST (Including Site)			$1,211.32	$17,800,996	82.5%		$1,320.78	$19,090,540	82.2%	7.2%	
Z MARKUPS											
Z1 GENERAL REQUIREMENTS	10.0%		$123.68				$139.43				
Z11 General Requirements	7.0%	$1,246,100	$84.79			$1,400,555	$96.90				Includes LEED documentation costs (Excl. consulting)
Z12 Fee	3.0%	$571,400	$38.88	$1,817,500	8.4%	$614,700	$42.53	$2,015,255	8.7%	10.9%	Additional fee on incremental cost
TOTAL CONSTRUCTION ESTIMATE (Excluding Contingencies)			$1,334.99	$19,618,496	90.9%		$1,460.20	$21,105,795	90.9%	7.6%	
Z2 CONTINGENCIES	10.0%		$133.50				$146.02				
Z21 Design Contingency	5.0%	$980,900	$66.75			$1,055,300	$73.01				
Z22 Escalation Contingency	0.0%	$0	$0.00			$0	$0.00				
Z23 Construction Contingency	5.0%	$980,900	$66.75	$1,961,800	9.1%	$1,055,300	$73.01	$2,110,600	9.1%	7.6%	
GOOD & SERVICES TAX	0%	$0	$0.00	$0	0.0%	$0	$0.00	$0	0.0%	0.0%	
TOTAL CONSTRUCTION ESTIMATE (Including Allowances)			$1,468.49	$21,580,300	100.0%		$1,606.23	$23,216,395	100.0%	7.6%	

		Cost/m2	Cost/m2	
GFA :	14,454 m2	$1,493.03	$1,606.23	7.6%
GFA :	155,582 sf	$138.71	$149.22	7.6%

c2.6 Trade Summary - Total Project

Division		Total Project Excluding LEED		Total Project Including LEED				
		Budget	Cost/ GLA (m2)	Budget	Cost/ GLA (m2)	% of Total	LEED % Increase	Key incremental cost factors
0 Construction Management Fee		$571,412	$39.53	$611,981	$42.34	2.6%	0.0%	Additional fee on incremental cost
1 General Conditions		$1,246,070	$86.21	$1,412,486	$97.72	6.1%	13.4%	Includes LEED documentation
2 Site Work		$1,102,457	$76.27	$1,337,539	$92.54	5.8%	21.3%	Porous pavement to parking area
3 Concrete		$6,121,663	$423.53	$6,121,663	$423.53	26.4%	0.0%	
4 Masonry		$333,179	$23.05	$333,179	$23.05	1.4%	0.0%	
5 Metals		$165,735	$11.47	$165,735	$11.47	0.7%	0.0%	
6 Carpentry		$117,100	$8.10	$137,100	$9.49	0.6%	17.1%	Low VOC millwork
7 Thermal and Moisture Protection		$1,038,541	$71.85	$1,143,757	$79.13	4.9%	10.1%	Increase thermal performance
8 Doors & Windows		$2,030,875	$140.51	$2,154,180	$149.04	9.3%	6.1%	Increase thermal performance of glazing area
9 Finishes		$1,455,796	$100.72	$1,471,062	$101.78	6.3%	1.0%	Low VOC finishes
10 Specialties		$105,250	$7.28	$123,250	$8.53	0.5%	17.1%	Green building information kiosk
11 Equipment		$82,500	$5.71	$82,500	$5.71	0.4%	0.0%	
12 Furnishings		$5,000	$0.35	$5,000	$0.35	0.0%	0.0%	
13 Special Construction		$0	$0.00	$0	$0.00	0.0%	0.0%	
14 Conveying Systems		$675,000	$46.70	$675,000	$46.70	2.9%	0.0%	
15 Mechanical		$3,408,465	$235.81	$4,080,140	$282.28	17.6%	19.7%	Increased mechanical equipment costs
16 Electrical		$1,159,435	$80.22	$1,251,435	$86.58	5.4%	7.9%	
Subtotal		$19,618,000	$1,357.30	$21,106,000	$1,460.22	90.9%	7.6%	
Design Contingency	5.0%	$981,000	$67.87	$1,055,000	$72.99	4.5%	7.5%	
Escalation Contingency	0.0%	$0	$0.00	$0	$0.00	0.0%	0.0%	
Post Contract Contingency	5.0%	$981,000	$67.87	$1,055,000	$72.99	4.5%	7.5%	
Subtotal		$21,580,000	$1,493.05	$23,216,000	$1,606.20	100.0%	7.6%	
GST (Excluded)		$0	$0.00	$0	$0.00	0.0%	0.0%	
Total Project Construction Cost		**$21,580,000**	**$1,493.05**	**$23,216,000**	**$1,606.20**	**100.0%**	7.6%	

c2.7 LEED Incremental Costing - Total Project

Total Gross Floor Area 14,454 m2

	LEED prerequisite/credit	Targeted	Pending	Not Pursued	cost factor description	quantity	unit rate (Incremental from Standard Office to LEED)	sub total	total	cost/m2 total gfa	comments	Division impact
Sustainable Sites	**SSp1 Erosion & Sedimentation Control -** Control erosion to reduce negative impacts on water and air quality.	Y							$0	**$0.00**	Included in Base - Municipal Requirement, Good practice	
					None	0 m2	$0.00	$0		$0.00		2000
	SSc1 Site Selection - Avoid development of inappropriate sites and reduce the environmental impact from the location of a building on a site.	1							$0	**$0.00**	Minimal cost impact - additional documentation included in General requirements.	
					None	0 m2	$0.00	$0		$0.00		1000
	SSc2 Development Density - Channel development to urban areas with existing infrastructure, protect green fields and preserve habitat and natural resources.			1					$0	**$0.00**	EXCLUDED	
					Not Pursued	0 m2	$0.00	$0				n/a
	SSc3 Brownfield Redevelopment - Rehabilitate damaged sites where development is complicated by real or perceived environmental contamination, reducing pressure on undeveloped land.			1					$0	**$0.00**	EXCLUDED	
					Not Pursued	0 m2	$0.00	$0		$0.00		n/a
	SSc4.1 Alternative Transportation: Public Transportation Access - Reduce pollution and land development impacts from automobile use.	1							$0	**$0.00**	Minimal cost impact - additional documentation included in General requirements.	
					None	0 m2	$0.00	$0		$0.00		1000
	SSc4.2 Alternative Transportation: Bicycle Storage & Changing Rooms - Reduce pollution and land development impacts from automobile use.			1					$0	**$0.00**	EXCLUDED	
					Not Pursued	0 m2	$0.00	$0		$0.00		n/a
	SSc4.3 Alternative Transportation: Alternative Fuel Refueling Stations - Reduce pollution and land development impacts from automobile use.			1					$0	**$0.00**	EXCLUDED	
					Not Pursued	0 m2	$0.00	$0		$0.00		n/a
	SSc4.4 Alternative Transportation: Parking Capacity - Reduce pollution and land development impacts from single occupancy vehicle use.	1							$3,000	**$0.21**	Current parking capacity meets requirements. Additional signage and documentation for LEED	
					Additional signage	1 sum	$3,000.00	$3,000		$0.21		n/a
	SSc5.1 Reduced Site Disturbance: Protect or restore open space - Conserve existing natural areas and restore damaged areas to provide habitat and promote biodiversity.			1					$0	**$0.00**	EXCLUDED	
					Not Pursued	0 m2	$0.00	$0		$0.00		2000
	SSc5.2 Reduced Site Disturbance: Development Footprint - Conserve existing natural areas and restore damaged areas to provide habitat and promote biodiversity.	1							$0	**$0.00**	Included in Base - Landscaped area and bio retention pond meet req'ts for open space dedication	
					None	0 m2	$0.00	$0		$0.00		n/a
	SSc6.1 Storm water Management: Rate And Quantity - Limit disruption and pollution of natural water flows by managing storm water runoff.		1						$0	**$0.00**	Pending - existing SWM controls and WEc2	
					Documentation and report	0 sum	$0.00	$0		$0.00	Included in General requirements	1000
					SWM Cistern and controls	0 sum	$0.00	$0		$0.00	Included in WEc2	2000
	SSc6.2 Storm water Management, Treatment - Limit disruption of natural water flows by eliminating storm water runoff, increasing on-site infiltration and eliminating contaminants.	1							$0	**$0.00**		
					Documentation and report	0 sum	$0.00	$0		$0.00	Included in General requirements	1000
					None	0 m2	$0.00	$0		$0.00	Pending - Included in Base - Civil consultant to confirm that existing measures meet removal rate requirements	2000
	SSc7.1 Landscape & Exterior Design to Reduce Heat Island Effect: Non-Roof - Reduce heat islands to minimize impact on microclimate and human and wildlife habitat.	1							$220,082	**$15.23**	No pervious pavement carried in base estimate	
					Porous paving to 50% of hard surface area	6473 m2	$34.00	$220,082		$15.23		2000
	SSc7.2 Landscape & Exterior Design to Reduce Heat Islands: Roof - Reduce heat islands to minimize impact on microclimate and human and wildlife habitat.	1							$45,675	**$3.16**	Built-up asphalt roof carried in base	
					Lexcan Hi-Tuff TPO roofing	3045 m2	$15.00	$45,675		$3.16		2, 7100
	SSc8 Light Pollution Reduction - Eliminate light trespass from the building and site, improve night sky access and reduce development impact on nocturnal environments.	1							$7,500	**$0.52**		
					Documentation and additional design to meet credit requirements	1 sum	$7,500.00	$7,500		$0.52		1000, 16000
Water Efficiency	**WEc1.1 Water Efficient Landscaping:** Reduce by 50% - Limit or eliminate the use of potable water for landscape irrigation.	1							$0	**$0.00**	See W#c1.2	
					Documentation and report	0 sum	$0.00	$0		$0.00	Included in General requirements	
					Savings from typ. Irrigation system	1 no	$0.00	$0		$0.00	No irrigation provided in base	2000, 15000
	WEc1.2 Water Efficient Landscaping: No potable use or no Irrigation - Limit or eliminate the use of potable water for landscape irrigation.		1						$0	**$0.00**		
					Included in WEc1.1	0 m2	$0.00	$0		$0.00	Pending results of WEc1.1 modeling	1000
	WEc2 Innovative Wastewater Technologies - Reduce generation of wastewater and potable water demand, while increasing the local aquifer recharge.	1							$55,000	**$3.81**		
					Precast 15m2 cistern	1 sum	$15,000.00	$15,000		$1.04		2000
					Additional piping for non potable	1 sum	$40,000.00	$40,000		$2.77		15000
	WEc3.1 Water Use Reduction: 20% - Maximize water efficiency within buildings to reduce the burden on municipal water supply and wastewater systems.	1							-$29,875	**-$2.07**		
					Dual-flush w/c: 3/6 LPF	35 no	-$725.00	-$25,375		($1.76)	Manual dual flush valve in place of auto	15000
					Urinals: 1.9 LPF	15 no	-$300.00	-$4,500		($0.31)	Manual dual flush valve in place of auto	15000
					Auto lavatory faucet: 1.9 L/min.	30 no	$0.00	$0		$0.00	Included in base	15000
					Kitchen faucet: 1.9 L/min.	0 no	$0.00	$0		$0.00	FF&E excluded from estimate	15000
					Showerhead: 6.8L/min.	0 no	$0.00	$0		$0.00	Not pursued	15000
	WEc3.2 Water Use Reduction: 30% - Maximize water efficiency within buildings to reduce the burden on municipal water supply and wastewater systems.	1							$0	**$0.00**	See WEc3.1	
					Included in WEc3.1	0 m2	$0.00	$0		$0.00		15000
	EAp1 Fundamental Commissioning - Verify and ensure that fundamental building elements and systems are designed, installed and calibrated to operate as intended.	Y							$15,000	**$1.04**		
					Engage a independent commissioning authority	1 sum	$15,000.00	$15,000		$1.04		1000
	EAp2 Minimum Energy Performance - Establish the minimum level of energy efficiency for the base building and systems.	Y							$0	**$0.00**	See EAc1.1	
					Included in EAc1.1	2450 m2	$0.00	$0		$0.00		misc
	EAp3 CFC Reduction and Elimination of Halons - Reduce ozone depletion.	Y							$0	**$0.00**	Standard for new office building equipment	
					None	0 m2	$0.00	$0		$0.00		15000
	EAc1.1 Optimize Energy Performance: 20% - Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associate with excessive energy use.	2							$863,396	**$57.38**	See Scenarios for detail	
					Interior Lighting	1 sum	$82,000.00	$82,000		$5.67		16000
					Building Envelope	1 sum	$182,846.00	$182,846		$12.65		misc
					HVAC Systems	1 sum	$564,550.00	$564,550		$39.06		15000
					Plant Equipment & DHW	1 sum	$34,000.00	$34,000		$2.35		15000
	EAc1.2 Optimize Energy Performance: 30% - Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associate with excessive energy use.	2							$0	**$0.00**	See EAc1.1	
					Included in EAc1.1	0 m2	$0.00	$0		$0.00		-
	EAc1.3 Optimize Energy Performance: 40% - Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associate with excessive energy use.	1	1						$0	**$0.00**	See EAc1.1	
					Included in EAc1.1	0 m2	$0.00	$0		$0.00		-

							Total Gross Floor Area		14,454 m2			
							Incremental from Standard Office to LEED					
	LEED prerequisite/credit	Targeted	Pending	Not Pursued	cost factor description	quantity	unit rate	sub total	total	cost/m2 total gfa	comments	Division impact
Energy & Atmosphere	**EAc1.4 Optimize Energy Performance:** 50% - Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associate with excessive energy use.		2						$0	$0.00	See EAc1.1	
					Included in EAc1.1 - pending final energy modeling results	0 m2	$0.00	$0		$0.00		-
	EAc1.5 Optimize Energy Performance: 60% - Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associate with excessive energy use.			2					$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		-
	EAc2.1 Renewable Energy: 5% - Encourage and recognize increasing levels of on-site renewable energy self-supply in order to reduce environmental impacts associated with fossil fuel energy use.			1					$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		16000
	EAc2.2 Renewable Energy: 10% - Encourage and recognize increasing levels of on-site renewable energy self-supply in order to reduce environmental impacts associated with fossil fuel energy use.			1					$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		16000
	EAc2.3 Renewable Energy: 20% - Encourage and recognize increasing levels of on-site renewable energy self-supply in order to reduce environmental impacts associated with fossil fuel energy use.			1					$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		16000
	EAc3 Best Practice Commissioning - Verify and ensure that the entire building is designed, constructed and calibrated to operate as intended.		1						$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		1000
	EAc4 Ozone Protection: Elimination of HCFCs - Reduce ozone depletion and support early compliance with the Montreal Protocol.			1					$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		15000
	EAc5 Measurement & Verification - Provide for the ongoing accountability and optimization of building energy and water consumption performance over time.	1							$45,000	$3.11		
					Lighting systems and controls	1 sum	$10,000.00	$10,000		$0.69	Allowance for monitoring system	1000, 16000
					Constant and variable motor loads	0 m2	$0.00	$0		$0.00	Included in base	1000, 16000
					Variable frequency drive (VFD) operation	0 m2	$0.00	$0		$0.00		1000, 15000
					Chiller efficiency at variable loads (kW/ton)	0 m2	$0.00	$0		$0.00		1000, 15000
					Air and water economizer and heat recovery cycles.	0 m2	$0.00	$0		$0.00		1000, 15000
					Air distribution static pressures /ventilation air volumes.	0 m2	$0.00	$0		$0.00	Included in base	1000, 15000
					Boiler efficiencies (can be on an annual basis)	1 sum	$10,000.00	$10,000		$0.69	Allowance for monitoring system	1000, 15000
					Costs includes meters for all major base building systems and 1-Year analysis to compare actual performance to anticipated performance	1 sum	$25,000.00	$25,000		$1.73		1000, 15000
	EAc6 Green Power - Encourage the development and use of grid-source, renewable energy technologies on a net zero pollution basis.			1					$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		n/a
Materials & Resources	**MRp1 Storage & Collection of Recyclables -** Facilitate the reduction of waste generated by building occupants that is hauled to and disposed of in landfills.	Y							$0	$0.00	Minimal cost impact - assume no increase in area	
					Permanent recycling area in the building	0 m2	$0.00	$0		$0.00		misc
	MRc1.1 Building Reuse: Maintain 75% of Existing Walls, Floors, and Roof - Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.			1					$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		misc
	MRc1.2 Building Reuse: Maintain 95% of Existing Walls, Floors and Roof - Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.			1					$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		misc
	MRc1.3 Building Reuse: Maintain 50% of Interior Non-Structural Elements - Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.			1					$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		misc
	MRc2.1 Construction Waste Diversion: Divert 50% From Landfill - Divert construction, demolition and land clearing debris from landfill disposal. Redirect recyclable recovered resources back to the manufacturing process. Redirect reusable materials to appropriate sites.	1							$0	$0.00	See MRc2.2	
					Included in MRc2.2	0 m2	$0.00	$0		$0.00		1000
	MRc2.2 Construction Waste Diversion: Divert 75% from Landfill - Divert construction, demolition and land clearing debris from landfill disposal. Redirect recyclable recovered resources back to the manufacturing process. Redirect reusable materials to appropriate sites.	1							$10,000	$0.69		
					Additional lifting and dumpster rental fees	0 sum	$0.00	$0		$0.00	Additional costs assumed to be absorbed by reduced tipping fees for recyleable materials	1000
					Documentation and sorting of Wood, Masonry Metal, and GWB	1 sum	$10,000.00	$10,000		$0.69		1000
	MRc3.1 Resource Reuse: 5% - Reuse building materials and products in order to reduce demand for virgin materials and to reduce waste, thereby reducing impacts associated with the extraction and processing of virgin resources.			1					$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		misc
	MRc3.2 Resource Reuse: 10% - Reuse building materials and products in order to reduce demand for virgin materials and to reduce waste, thereby reducing impacts associated with the extraction and processing of virgin resources.			1					$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		misc
	MRc4.1 Recycled Content : 7.5% (Post-Consumer + 1/2 Post-Industrial) - Increase demand for building products that incorporate recycled content materials, therefore reducing impacts resulting from extraction and processing of new virgin materials and by-passing energy and green house gas-intensive industrial and manufacturing processes.	1							$0	$0.00	Subject to weather and schedule constraints. Material cost savings assumed to be offset by accelorator admixtures.	
					25% slag or fly-ash	0 m2	$0.00	$0		$0.00	Documentation costs allowed for in IDc2.	misc
					Specification of high recycled content materials such as asphalt GWB steel and ACT	0 m2	$0.00	$0		$0.00		misc
					Misc. materials and finishes	0 m2	$0.00	$0		$0.00	Minimal cost impact, T.I. costs excluded from estimate	misc

Total Gross Floor Area 14,454 m2

	LEED prerequisite/credit	Targeted	Pending	Not Pursued	cost factor description	quantity	Incremental from Standard Office to LEED: unit rate	sub total	total	cost/m2 total gfa	comments	Division impact
					Documentation and report	0 sum	$0.00	$0		$0.00	Included in General requirements	1000
	MRc4.2 Recycled Content: 15% (Post-Consumer + 1/2 Post-Industrial - Increase demand for building products that incorporate recycled content materials, therefore reducing impacts resulting from extraction and processing of new virgin materials and by-passing energy and green house gas-intensive industrial and manufacturing processes.		1		Not pursued	0 m2	$0.00	$0	$0	**$0.00** $0.00	EXCLUDED	misc
	MRc5.1 Regional Material: 10% Extracted and Manufactured Regionally - Increase demand for building materials and products that are extracted and manufactured within the region, thereby supporting the use of indigenous resources and reducing the environmental impacts resulting from transportation.	1			None	0 m2	$0.00	$0	$0	**$0.00** $0.00	Minimal cost impact - proximity to industry	misc
	MRc5.2 Regional Materials: 20% Extracted and Manufactured Regionally - Increase demand for building materials and products that are extracted and manufactured within the region, thereby supporting the use of indigenous resources and reducing the environmental impacts resulting from transportation.		1		Not pursued	0 m2	$0.00	$0	$0	**$0.00** $0.00	EXCLUDED	misc
	MRc6 Rapidly Renewable Materials - Reduce the use and depletion of finite raw materials and long-cycle renewable materials by replacing them with rapidly renewable materials.			1	Not pursued	0 m2	$0.00	$0	$0	**$0.00** $0.00	EXCLUDED	misc
	MRc7 Certified Wood - Encourage environmentally responsible forest management.		1		Not pursued	0 m2	$0.00	$0	$0	**$0.00** $0.00	EXCLUDED	6000
	MRc8 Durable Building - Minimize materials use and construction waste over a building's life resulting from premature failure of the building and its constituent components and assemblies.			1	Not pursued	0 m2	$0.00	$0	$0	**$0.00** $0.00	EXCLUDED	misc
Indoor Environmental Quality	**EQp1 Minimum IAQ Performance -** Establish minimum indoor air quality (IAQ) performance to enhance indoor air quality in buildings, thus contributing to the comfort and well-being of the occupants.	Y			None	0 m2	$0.00	$0	$0	**$0.00** $0.00	Minimal cost impact - Standard commercial specification	15000, misc
	EQp2 Environmental Tobacco Smoke (ETS) Control - Prevent or minimize exposure of building occupants, indoor surfaces, and systems to Environmental Tobacco Smoke (ETS).	Y			None	0 m2	$0.00	$0	$0	**$0.00** $0.00	Minimal cost impact - Non-smoking building	15000, misc
	EQc1 Carbon Dioxide (CO2) Monitoring - Provide capacity for indoor air quality (IAQ) monitoring to help sustain long-term occupant comfort and well-being.	1			CO2 controls for ventilation	10 no	$400.00	$4,000	$4,000	**$0.28** $0.28	Related to HVAC Systems Scenario #4	15000
	EQc2 Increase Ventilation Effectiveness: Provide for effective delivery and mixing of supply air to support the safety, comfort and well-being of building occupants.	1			Testing on site	1 sum	$5,000.00	$5,000	$5,000	**$0.35** $0.35	Minimal cost impact - Standard commercial specification	15000
	EQc3.1 Construction IAQ Management Plan: During Construction - Prevent indoor air quality problems resulting from the construction/renovation process in order to help sustain the comfort and well-being of construction workers and building occupants.	1			Photograph documentation. Completion of standardized schedules. Allowance for misc implications	1 sum 1 sum 1 sum	$500.00 $2,000.00 $10,000.00	$500 $2,000 $10,000	$12,500	**$0.86** $0.03 $0.14 $0.69		1000 1000 1000
	EQc3.2 Construction IAQ Management Plan: Testing Before Occupancy - Minimize indoor air quality problems resulting from the construction/renovation process in order to help sustain the comfort and well-being of construction workers and building occupants.	1			Includes testing for; particulate matter (PM10), formaldehyde, total volatile organic compounds, carbon monoxide, 4-phenycyclohexane (4pc)	1 sum	$10,000.00	$10,000	$10,000	**$0.69** $0.69		1000
	EQc4.1 Low-Emitting Materials: Adhesives & Sealants - Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.	1			None	0 m2	$0.00	$0	$0	**$0.00** $0.00	Minimal cost impact - Standard commercial specification	7920
	EQc4.2 Low-Emitting Materials: Paints & Coatings - Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.	1			Low VOC spec - core and shell Low VOC spec - T.I. spaces EXCLUDED	15266 m2 0 m2	$1.00 $0.00	$15,266 $0	$15,266	**$1.06** $1.06 $0.00	Low VOC Specification T.I. Excluded from estimate	9900 9900
	EQc4.3 Low-Emitting Materials: Carpet - Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.	1			Green seal carpet - T.I. spaces EXCLUDED	0 m2	$0.00	$0	$0	**$0.00** $0.00	Low VOC Specification T.I. Excluded from estimate	9685
	EQc4.4 Low-Emitting Materials: Composite Wood & Laminates - Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.	1			Low VOC millwork - Core and shell Low VOC millwork - T.I. spaces EXCLUDED	1 sum 1 sum	$20,000.00 $0.00	$20,000 $0	$20,000	**$1.38** $1.38	Low VOC Specification - excluding workstations Washrooms and misc millwork in common areas T.I. Excluded from estimate	6400
	EQc5 Indoor Chemical & Pollutant Source Control - Minimize exposure of building occupants to potentially hazardous particulates, biological contaminants and chemical pollutants that adversely impact air and water quality.	1			MERV 13 filters in all air-handling equipment Separately exhausted photocopy	2 no 5 no	$2,000.00 $4,000.00	$4,000 $20,000	$24,000	**$1.66** $0.28 $1.38	Allowance for premium filters in AHU Allow for direct exhaust to exterior through roof	15000 15000
	EQc6.1 Controllability of Systems: Perimeter Spaces - Provide a high level of thermal, ventilation and lighting system control by individual occupants or specific groups in multi-occupant spaces to promote the productivity, comfort and well-being of building occupants.			1	Not Pursued	0 m2	$0.00	$0	$0	**$0.00** $0.00	EXCLUDED	8520
	EQc6.2 Controllability of Systems: Non-Perimeter Spaces - Provide a high level of thermal, ventilation and lighting system control by individual occupants or specific groups in multi-occupant spaces to promote the productivity, comfort and well-being of building occupants.			1	Not Pursued	0 m2	$0.00	$0	$0	**$0.00** $0.00	EXCLUDED	15000
	EQc7.1 Thermal Comfort: Compliance - Provide a thermally comfortable environment that supports the productivity and well-being of building occupants.	1			None	0 m2	$0.00	$0	$0	**$0.00** $0.00	Minimal cost impact - Standard commercial specification	15000
	EQc7.2 Thermal Comfort: Monitoring - Provide a thermally comfortable environment that supports the productivity and well-being of building occupants.			1	Not Pursued	0 sum	$0.00	$0	$0	**$0.00** $0.00	EXCLUDED	15000

Total Gross Floor Area 14,454 m2

	LEED prerequisite/credit	Targeted	Pending	Not Pursued	cost factor description	quantity	unit rate (Incremental from Standard Office to LEED)	sub total	total	cost/m2 total gfa	comments	Division impact
	EQc8.1 Daylight and Views: Daylight 75% of Spaces - Provide for the building occupants a connection between indoor spaces and the outdoors through the introduction of daylight and views into the regularly occupied area of the building.	1			None	0 m2	$0.00	$0	$0	$0.00 $0.00	Minimal cost impact - Pending final layout of office. Window orientation, and building layout considered base building. Daylight modeling included in IDc2	n/a
	EQc8.2 Daylight and Views: Daylight 90% of Spaces - Provide for the building occupants a connection between indoor spaces and the outdoors through the introduction of daylight and views into the regularly occupied area of the building.	1			None	0 m2	$0.00	$0	$0	$0.00 $0.00	Minimal cost impact - Pending final layout of office Cost implications in T.I. areas assumed to be carried by tenant	n/a
Innovation & Design Process	**IDc1.1 Innovation in Design:** Green Building Education	1			Instate a public education program that includes; An interactive kiosk/display describing LEED features; Distributed signage highlighting building LEED features; A case study or design manual about LEED features	1 sum	$15,000.00	$15,000	$15,000	$1.04 $1.04		10900
Innovation & Design Process	**IDc1.2 Innovation in Design:** Low-Emitting Funiture Systems - Specify GREENGUARD Certifiedc systems furniture and seating products; potential suppliers include: Teknion, Herman Miller, Knoll etc.	1			None	0 m2	$0.00	$0	$0	$0.00 $0.00	Cost implications in T.I. areas assumed to be carried by tenant	n/a
Innovation & Design Process	**IDc1.2 Innovation in Design:** Green house keeping	1			Green house keeping program	0 m2	$0.00	$0	$0	$0.00 $0.00	Documentation requirements included in IDc2 Potential operational cost implications excluded	n/a
Innovation & Design Process	**IDc1.4 Innovation in Design:** Water Efficiency Exceptional Performance - Reduce usage of potable water for sweage conveyance by 100%, OR reduce potable water use by 40% relative to the baseline calculated for the building (not including irrigation).	1			Included in WEc3.1	0 m2	$0.00	$0	$0	$0.00 $0.00	See WEc3.1	-
Innovation & Design Process	**IDc2 LEED® Accredited Professional:**	1							$11,755	$0.81		
					LEED® Consulting - EXCLUDED	1 sum	$0.00	$0		$0.00		1000
					LEED® Registration	1 sum	$2,010.00	$2,010		$0.14		1000
					LEED® Certification	1 sum	$9,745.00	$9,745		$0.67		1000
	NET COST (Including Site)	39	9	22					$1,352,299	$93.56		
	General Requirements & Fees								$135,230			
	General requirements on additional cost (7.0%)							$94,661				
	Construction Management Fees (3%)							$40,569				
	Design Fees **(Excluded)**							$0				
	TOTAL ESTIMATE (Excluding Contingencies)								$1,487,529	$102.91		
	Allowances								$148,753			
	Design Allowances (5%)							$74,376				
	Escalation Allowances **(Excluded)**							$0				
	Construction Allowances (5%)							$74,376				
	TOTAL ESTIMATE (Including Allowances)								$1,636,282	$113.21		

GFA:	14454	**$113.21**	/m2
GFA:	155,582	**$10.52**	/sf
Points	39	**$41,956**	/credit

c2.8 EAc1 Optimize Energy Performance Strategies

GFA (m2) 14454

	Scenario - Per Enermodal Engineering Ltd.	Quantity	Unit Rate	Sub-Total	LEED Premium from Typical Office building	Comments
Interior Lighting	1. Efficient Lighting Design				$0	Included in base
	Reduce installed lighting power to meet ASHRAE 90.1-2004 Use fluorescent (T8 and/or T5 with electronic ballasts), 4-pin compact fluorescent, LED and HID fixtures to avoid high lighting power densities. Eliminate halogen, incandescent and mercury vapour fixtures.	0 m2	$0.00	$0		
	2. Occupancy sensors for lighting				$30,000	
	Provide occupancy sensors to control lighting in the building (e.g. offices, meeting rooms, training rooms, washrooms, storage rooms, utility rooms and mainenance closets). Exceptions may included recption areas, areas where safety may be a concern and areas prohibited under the Ontario Building Code	150 no	$200.00	$30,000		
	3. Daylighting sensors for lighting				$52,000	
	Install daylight sensors with continuous dimming control on perimeter circuits in open office areas, lunch room, HPS training rooms, etc	80 no	$650.00	$52,000		
	Total Interior Lighting (measures 1 - 3)				$82,000	
Building Envelope	1. Increase thermal Performance of Spandrel Panel				$5,850	
	Increase spandrel R-Value from R6 to R12 by adding 25mm of extruded polystyrene or spray applied polyurethane to interior surface of metal back pan. Alternatively, add 50mm of rigid mineral fibre or rigid fibreglass	975 m2	$6.00	$5,850		Assume spandrel area 35% of curtain wall
	2. Increase thermal Performance of Exterior Wall Assemblies				$13,866	
	Upgrade effective R-value (i.e. including effects of thermal bridging) of W1 from R-12 to R-17 by adding 25mm of extruded polystyrene outborad or fthe dens glass gold sheathing	2311 m2	$6.00	$13,866		Excludes MPH wall area
	3. Increase thermal performance of roof assembly				$45,675	
	Upgrade effective R-value of roof assembly to R-26 by adding 25mm of polyisocyanurate. Assumed base design Is R-20	3045 m2	$15.00	$45,675		
	4. Increase thermal Performance of Exposed Floor Assemblies				$0	No exposed floor assembly
	Design exposed floor assemblies with a minimum effective R-value of R-15	0 m2	$0.00	$0		
	5. Upgrade Window Performance				$117,455	
	Specify windows with the following thermal performance in accordance with CSA-A440.2: Curtain Wall: U = 1.66 W/m2C, SHGC = 0.43 Fixed: U = 1.97 W/m2C, SHGC = 0.39 Note: Cavity space (13mm) to include insulating non-metal spacer and argon fill. Frames to include 19mm thermal break. Glazing to include soft coat low-e coating.	1807 m2	$65.00	$117,455		Base assumes double glazing with low E coating and 3/8" thermal break
	Total Building Envelope (measure 5)				$182,846	
ems	1. Outdoor Air Reset				$14,000	
	Control the supply air temperature using outdoor air reset.	2 no	$5,000.00	$10,000		
		2 no	$2,000.00	$4,000		Additional filters for outdoor air
	2. Energy Recovery Ventilator in VAV systems				$230,000	
	Add enthalpy wheel (75% effective) to serve all ventilation air. Note: this measure must be implemented with measure #1 (Outdoor Air Reset) to maximize energy recovery savings.	92000 cfm	$2.50	$230,000		
	3. High efficiency RTU				$276,000	

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	Scenario - Per Enermodal Engineering Ltd.	Quantity	Unit Rate	Sub-Total	LEED Premium from Typical Office building	Comments
HVAC Syst	Upgrade from standard efficiency to a high efficiency roof top unit with an EER = 11. Note: This measure will only apply if DX coooling is used in roof top units. Energy savings will be maximiszed with the use of a central chiller (see measure 4.5)	92000 cfm	$3.00	$276,000		
	4. Demand Control Ventilation				$10,000	
	Use CO2 sensors to control ventilation air. Provide one sensor per air handeling unit and in high occupant load areas (e.g. offices, meeting rooms, etc.)	10 no	$1,000.00	$10,000		
	5. Upgrade Fan Efficiency in VAV Systems				$34,550	
	Specify supply fans 55% efficiency	127 no	$250.00	$31,750		
	Specify central exhaust fans: 35% efficiency	8 no	$350.00	$2,800		
	Total HVAC Systems (measures 7a, 7c, & 8)				$564,550	
Plant Equipment & DHW	1. Modulating Boiler				$0	
	Add fully-modulating burner to the boiler to standard efficiency boiler.	0 m2	$0.00	$0		Central Heating and District Hot Water system EXCLUDED from estimate
	2. Condensing Boiler				$0	
	Upgrade from standard efficiency boiler to condensing boiler (efficiency = 93%)	0 m2	$0.00	$0		Central Heating and District Hot Water system EXCLUDED from estimate
	3. VSD on Pumps				$17,000	
	Add variable speed drives on all heating pumps.	2 m2	$8,500.00	$17,000		
	4. Increase Pumping Efficiency				$12,000	
	Increased combined impeller/motor efficiency to 70% for all heating pumps.	4 no	$3,000.00	$12,000		
	5. High Efficiency Water Cooled Chiller				$0	
	Upgrade water cooled chiller to a high efficiency model with a COP = 7.0 Note: This measure will only apply if a central chiller system is used as opposed to high efficiency DX coooling roof top units (see measure 3.2). This measure assumes a standard efficiency water cooled chiller is part of the base design	0 m2	$0.00	$0		Central Heating and District Hot Water system EXCLUDED from estimate
	6. VSD on Cooling Tower Pump				$5,000	
	Add variable speed drive to cooling tower pump.	1 sum	$5,000.00	$5,000		
	7. Low-Flow Fixtures				$0	
	Upgrade to lavatory faucets with a flow rate of 1.9L/min. @552KPa (0.5 gpm@80psi).	0 m2	$0.00	$0		Included in WEc3.1
	Total Plant Equipment & DHW (10, 11, & 13)				$34,000	
	NET COST EXCLUDING GENERAL REQUIREMENTS AND ALLOWANCES				$863,396	
			14,454 m2		$59.73	
			155,582 sf		$5.55	

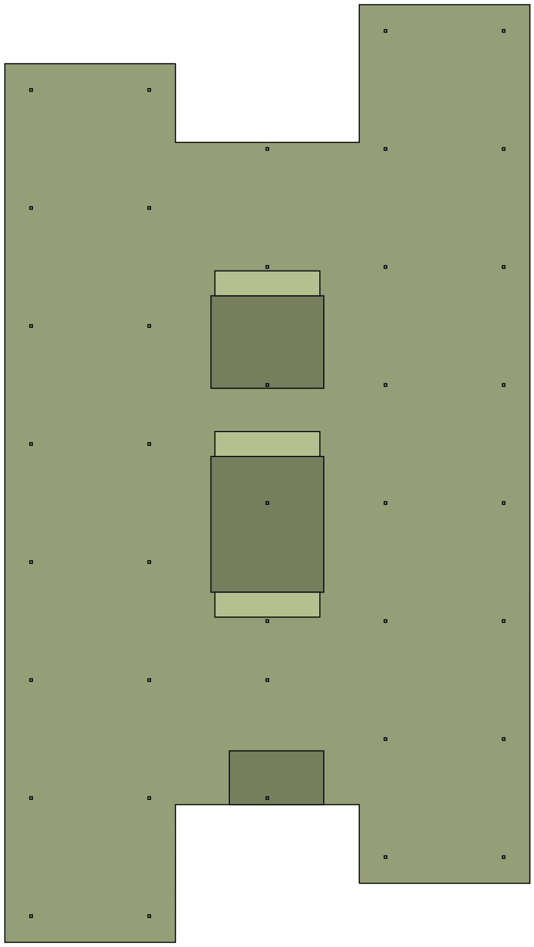
c2.9 Building Value Assessment

Ref.	Design Criteria/Characteristics		MNECB Reference Building		c2 - Commercial Building Case Study		Key Indicators
1.00	**Construction Cost Summary**						
1.01	Building Area (GLA)		14,454	m2	14,454	m2	
1.03	Total Construction Hard Costs (Excl. LEED)		$21,580,000	$1,493.01 /m2	$21,580,000	$1,493.01 /m2	
1.04	Total LEED Incremental Construction Cost		$0	$0.00 /m2	$1,636,000	$113.19 /m2	
1.05	Total Construction Hard Costs (Incl. LEED)		$21,580,000	$1,493.01 /m2	$23,216,000	$1,606.20 /m2	
1.06	Total Project Soft Costs		Excluded	- /m2	Excluded	- /m2	
1.07	**Total Project Budget**		$21,580,000	$1,493.01 /m2	$23,216,000	$1,606.20 /m2	
2.00	**Building Environmental Performance (Note 1)**						
2.01	Energy Use per year	KWh/a	3,758,040	260.0 /m2	2,153,646	149.0 /m2	
2.02	Energy Cost per year	$	$274,416	$18.99 /m2	$165,746	$11.47 /m2	
2.03	Percent of MNECB baseline		100.0%		53.5%		
2.04	Water Use per year	m3	29,920	2.070 m3/m2	20,944	1.449 m3/m2	
2.05	Water Cost per year (@ $1.20/m3)	$	$35,904	$2.48 /m2	$25,133	$1.74 /m2	
2.06	Percent water reduction		0%		30%		
2.07	Greenhouse Gas reduction	Tonnes CO2/a	0.0		440.9		
3.00	**Value of Energy Savings (Note 1)**						
3.01	Annual Energy Cost	$/a	$274,416	$18.99 /m2	$165,746	$11.47 /m2	
3.02	Energy use reduction	%	0.0%		53.5%		
3.03	Energy savings per year	$	$0	$0.00 /m2	$108,670	$7.52 /m2	
3.04	Cap rate	%	8%		8%		
3.05	Increased building value	$	$0	$0 /m2	$1,358,375	$93.98 /m2	
3.06	Increased building value (% of Capital)	%	0%		5.9%		
3.07	Payback on LEED Cost Increment	Years	0.0		1.2		
4.00	**Value of Water Savings (Note 2)**						
4.01	Annual Water Cost	$/a	$35,904	2.48 /m2	$25,133	1.74 /m2	
4.02	Water use reduction	%	0.0%		30%		
4.03	Water savings per year	$	$0	$0.00 /m2	$10,771	$0.75 /m2	
4.04	Cap rate	%	8%		8%		
4.05	Increased building value	$	$0	$0 /m2	$134,639	$9.32 /m2	
4.06	Increased building value (% of Capital)	%	0%		0.6%		
4.07	Payback on LEED Cost Increment	Years	0.0		12.2		
5.00	**Value of Rent Premium (Note 3)**						
5.01	Rental Income (GSA = 88% of GLA)	$	$3,815,856	$300.00 /m2	$4,006,649	$315.00 /m2	
5.02	Lease Revenue Premium	%	0.0%		5.0%		
5.03	Additional Sales Revenue	$	$0	$0.00 /m2	$190,793	$15.00 /m2	
5.04	Cap rate	%	8%		8%		
5.05	Increased building value	$	$0	$0 /m2	$2,384,910	$165.00 /m2	
5.06	Increased building value (% of Capital)	%	0%		10.3%		
5.07	Payback on LEED Cost Increment	Years	0.0		0.7		
6.00	**Value of Occupancy Premium**						
6.01	Occupancy Assumed	%	90%		92%		
6.02	Annual Rent (GSA = 88% of GLA)	$	$3,815,856	$300.00 /m2(GSA)	$3,815,856	$300.00 /m2(GSA)	
6.03	Annual Occupancy Premium	$	$0	$0.00 /m2(GSA)	$76,317	$5.28 /m2(GSA)	
6.05	Increased building value	$	$0	$0 /m2	$76,317	$5.28 /m2	
6.06	Increased building value (% of Capital)	%	0%		0.3%		
6.07	Payback on LEED Cost Increment	Years	0.0		21.4		
7.00	**Residual Value Premium**						
7.01	Total Project budget (incl LEED)	$	$21,580,000	$1,493.01 /m2	$23,216,000	$1,606.20 /m2	
7.02	Rent Premium (5%)	$/a	$0	$0.00 /m2(GSA)	$190,793	$15.00 /m2(GSA)	
7.03	Net Rent (GSA = 88% of GLA)	$/a	$3,815,856	$300.00 /m2(GSA)	$4,006,649	$315.00 /m2(GSA)	
7.04	Building Value (assume cap rate of 8% for standard and 7.75% for LEED)	$	$47,698,200	$3,300.00 /m2	$51,698,694	$3,576.77 /m2	
7.05	Increased building value	$	$0	$0 /m2	$4,000,494	$276.77 /m2	
7.06	Increased building value (% of Capital)	%	0%		17.2%		
7.07	Payback on LEED Cost Increment	Years	0.0		0.4		
8.00	**Total Increase in Building Value**						
8.01	Increase in buliding value (sum 3 to 7)	$	$0	$0.00 /m2	$5,569,825	$385.35 /m2	
8.02	Increased building value (% of Capital)	%	0%		24.0%		
8.03	Payback on LEED Cost Increment	Years	0.0		0.3		

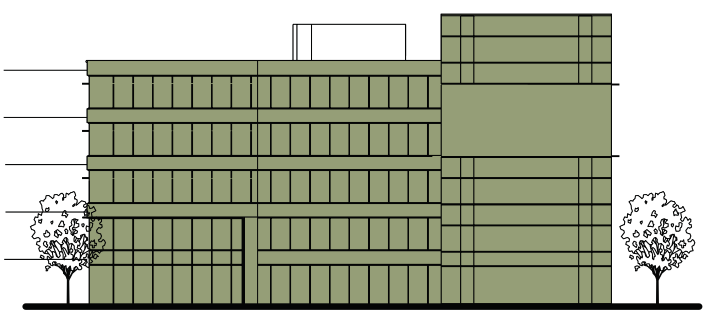
Notes

1. Energy performance figures provided by Enermodal Engineering Ltd.
2. Water consumption based on similar building consumption trends
3. Rental income based on similar building revenues provided by Altus Helyar Valuation Consulting

c3.1 Project Diagrams and Overview



Typical Floor Plan Diagram



Building Elevation Diagram

Ref.	Design Criteria/Characteristics - Commercial Building		c3 Commercial Case Study	Key Indicators
1.00	**Project Statistics**			
1.01	Location		Markham, Ontario	
1.02	Gross Floor Area (m2 GFA)		12,254	
1.03	Stories		5	
2.00	**Construction Cost Estimate**			
2.01	Office building (excl. tenant impr		$18,858,151	
2.02	Site Development		$678,849	
2.03	**Subtotal Excluding Contingencies**		**$19,537,000**	
2.04	Design Contingency/Allowance		$586,000	
2.05	Escalation Contingency		$0	
2.06	Post Contract		$977,000	
2.07	Tenant Improvements Allowance		-	
2.08	**Total Construction Cost (Excl. GST)**		**$21,100,000**	
2.09		**$/m2 (GLA)**	**$1,722**	
3.00	**Estimated LEED Cost Increment (Included above)**			
3.01	$ Budget		$1,554,000	
3.02	$/m2		$127	
3.03	$/credit		$48,563	
3.04	**% increase**		8.0%	
4.00	**Exterior Enclosure (Overall System)**			
4.01	Wall R-Value		R-20	
4.02	Roof R-Value		R-26	
4.03	Floor R-Value		R-15	
4.04	Glazing U-factor / SHGC / visible light trans.		1.66/0.43/0.60	
4.05	Amount of glazing (% of building skin area)		62%	
5.00	**Building Environmental Performance**			
5.01	Energy Intensity (Base/LEED)	KWh/m2/a	219.1/144.7	
5.02	Percent of MNECB baseline		38.6% MNECB	
5.03	Water use (Base/LEED)	L/m2/a		
5.04	Percent water reduction		30%	
5.05	Greenhouse Gas reduction	tonnes CO2/a	-	
5.06		tonnes CO2/a/m2	-	

c3.2 Design Efficiency Statistics

Ref.	Item	Unit	Case Study Value	Industry Standard Value	Key Indicators
1.00	**Project Totals**				
1.01	Below Grade Area (GPA)	sf	0	0	
1.02	GLA	sf	131,905	149,648	
1.03	GFA (TCA)	sf	131,905	149,648	
1.04	# Levels Below Grade	no	0	0	
1.06	# Floors (Excluding MPH)	no	5	5	
1.07	# Units	no	1	1	
1.08	# Parking (underground)	no	0	0	
1.10	Site Area	sf	43,154	200,385	
2.00	**Below Grade (Including CHP Shell Space)**				
2.01	Total Area Parking	sf	0	0	
2.01.01	Net Parking Area (incl. Circulation)	sf	0	0	
2.01.02	Service / Mechanical	sf	0	0	
2.01.03	Storage	sf	0	0	
2.01.04	Amenity	sf	0	0	
2.02	Stalls	no	0	0	
2.03	No. of levels	no	0	0	
2.04	Gross Parking Area / Stall	sf	n/a	n/a	
2.05	Net parking area / Stall	sf	n/a	n/a	
2.06	Stalls / Unit	no	0.00	0.00	
2.07	Exterior Wall Area	sf	0	0	
2.08	Exterior wall / GPA (Below Grade)	ratio	n/a	n/a	
2.09	Excavation Volume	m3	1,558	519	
2.10	Excavation/Parking Area ratio (M3/M2)	m3/m2	n/a	n/a	
2.11	Below Grade (GPA) / Total Construction Area(TCA)	ratio	0.00	0.00	
2.12	# Elevator Cabs	no	0	0	
2.13	# Elevator Stops	no	0	0	
3.00	**Above Grade**				
3.01	Total Above Grade Area (GLA)	sf	131,905	149,648	
3.01.01	Commercial Office	sf	94,618	118,928	
3.01.03	Cafeteria/kitchen	sf	10,355	3,452	
3.01.04	Amenity/Washroom	sf	2,842	2,095	
3.01.05	Loading/Storage	sf	0	1,830	
3.01.06	Service Areas (mechanical/electric	sf	14,865	10,305	
3.01.07	Circulation	sf	9,225	13,039	
3.02	Net saleable area	sf	94,618	118,928	
3.06	No. of units	no	1	1	
3.07	GLA / Unit	sf	94,618	85,735	
3.12	**Floors**				
3.12.01	No. of Floors - Tower 1 / Tower 2	no	5	5	
3.12.02	Typical floor to floor height	lf	11.81	13.24	
3.12.03	Window Area	sf	34,348	32,070	
3.12.04	Exterior wall area	sf	54,984	55,500	
3.12.05	Exterior wall / GLA (Above Grade)		0.42	0.37	
3.12.06	# Elevator Cabs	no	3	3	
3.12.07	# Elevator Stops	no	15	13	

Ref.	Item	Unit	Case Study Value	Industry Standard Value	Key Indicators
3.13	**Saleable**				
3.13.01	Total Saleable Area	sf	94,618	118,928	
3.13.02	Commercial Office	sf	94,618	118,928	
3.13.03	Commercial Retail	sf	0	0	
3.14	**Statistical Efficiency Ratios**				
3.15	Building Efficiency (Net Saleable / GLA)	ratio	0.72	0.79	
3.16	Typical floor Efficiency (Net Saleable / GLA)	ratio	0.89	0.89	
3.17	Average Selling Area/Unit (Average Unit Size)	sf	94,618	85,735	
3.18	Exterior wall / Net Saleable Area (Above Grade)	ratio	0.58	0.48	
3.19	Window / Ext.wall ratio	ratio	0.62	0.58	
3.22	Retail ratio - (Retail area / GLA)	ratio	0.08	-	
3.23	GFA / Unit	sf	131,905	109,284	
3.26	**Construction Ratios**				
3.27	Formwork contact area	m2	17,644	23,810	
3.28	Concrete volume (including Waste)	m3	5,353	6,099	
3.29	Rebar Weight	kg	588,830	646,294	
3.30	Rebar / Concrete Volume ratio	kg/m3	110.0	106.2	
3.31	Structural Steel - Total Weight	kg	58,000	-	
3.32	Rebar / GLA	kg/m2	4.46	4.33	
3.33	Rebar / GFA	kg/m2	4.46	4.33	
3.34	Formwork / GFA	m2/m3	1.44	1.70	
3.35	Concrete / GFA	m3/m2	0.44	0.44	
3.36	Concrete / GLA	m3/m2	0.44	0.44	
3.37	Structural Steel/GLA	kg/m2	4.73	-	
4.00	**Site**				
4.01	Gross Site Area	acre	0.99	4.59	
4.02	Site Density (UPA)	unit/acre	1.01	0.59	
4.03	Site Area/Unit	sf	43,154.00	126,134.67	
5.00	**Construction Cost (Including LEED)**				
6.00.01	Below Grade Cost	$	n/a	$0	
6.00.02	Above Grade Cost (Incl Site Work)	$	$21,120,000	$23,407,333	
6.01	**Total Cost**	**$**	**$21,120,000**	**$23,407,333**	
6.02	Cost / Stall	$/Unit	-	$0.00	
6.03	Cost / GLA	$/sf	$160.12	$156.55	
6.04	Cost / GFA	$/sf	$160.12	$156.55	
6.05	Cost / Unit	$/Unit	$21,120,000	$16,935,833	
6.06	Cost / Saleable Area	$/sf	$223.21	$199.20	

c3.3 Project Narrative

A1 Sub-Structure

• Conventional concrete pad foundations and spread footings

Potential LEED Initiatives:
• Use fly-ash as partial substitute of Portland cement in concrete mix
• Use slag as aggregate for concrete mix.
• Use of rebar with recycled content

A2 Structure

• Structural concrete slab-on-grade.
• Concrete structure on 8.0m – 9.0m grid
• Reinforced concrete suspended slabs and roof
• Structural steel to mechanical penthouse
• Steel exit stairs ground floor to roof.

Potential LEED Initiatives:
• Use fly-ash as partial substitute of Portland cement in concrete mix
• Use slag as aggregate for concrete mix.
• Use of rebar and steel structure with recycled content

A3 Exterior Enclosure

Walls
• Composite wood panels with drywall / concrete wall back up (R-12).
• Pre-finished metal cladding to MPH wall with drywall/concrete wall back up (R-12).
• Curtain wall with vision glazing including double glazing and Low-E coating overall (U-Value 2.9)
• Insulated hollow metal doors and frames.

Roof
• Built-up insulated roof finish (R-20)

Potential LEED Initiatives:
Walls
• Increase thermal performance of wall assemblies to R17 including details to minimize thermal bridging
• Provide minimum of R-6 over all structural members passing through envelope
• Increase thermal performance of window assemblies to include 19mm thermal break, soft coat low-E coating, and warm edge spacers (U-Value 2.16)
• Provide awning type operable window units in curtain wall assembly
• Recycled content specified for steel framing
• Two doors with vestibule provided at all exterior doors
• Allowance for additional air and water leakage testing of sample units
• Allowance for Low VOC materials inside of air barrier

Roof
• Inverted roof fully adhered to structural deck (R-26)
• Allowance for additional water and air leakage testing
• Allowance for low VOC materials inside of air barrier

Projections
• Solar shading devices on South and portions of East and West facades

B1 Partitions and Doors

Base Building
• Concrete shear wall, concrete block walls and drywall partitions around washrooms, common areas and service spaces
• Fire rated stairwell doors.
• Hollow metal doors to washrooms, common areas and service spaces.

Potential LEED Initiatives:
• Recycled content specified for gypsum board
• Recycled content specified for steel framing
• Allowance for durable building details and construction methods
• Allowance for low VOC materials

Tenant Improvements
• Excluded

B2 Finishes

Base Building

Floors
- Stone to ground floor main entrance/circulation
- Stone to washrooms
- Epoxy floor paint to service areas and exit stairs
- Sealer to floors in tenant areas, kitchen and cafeteria
- Unfinished to office and elevator lobby areas

Ceilings
- Suspended drywall ceiling to Elevator Lobby ground floor main entrance, & circulation areas and washrooms
- ACT ceilings to office areas (tiles not installed)
- Paint to structure in service spaces

Walls
- Ceramic wall tiles to washrooms
- Stone to ground floor elevator lobbies
- Paint to other areas

Estimate excludes all costs for tenant improvements including private offices, boardrooms, kitchenettes, demising walls etc.

Potential LEED Initiatives:
- Reduction in amount of ceiling finishes in office areas – 60% exposed concrete 20% ACT 20% drywall.
- Allowance for durable building details and construction methods
- Allowance for Low VOC Materials
- Materials that have recycled and/or post consumer/industrial content.
- Materials that have been manufactured and/or harvested regionally.

Tenant Improvements (Excluded from Budget)

Floors
- Carpet to Office areas.

Ceilings
- Drywall bulkheads and feature ceiling in tenant spaces
- Sprayed texture to concrete soffit in suites.

Walls
- Paint to drywall and concrete block walls.
- Vinyl wall covering to corridors.
- Ceramic tile to tub and shower surrounds in suites.
- Rubber/carpet baseboards, and paint to door casing.

Potential LEED Initiatives:
- Greenseal rated carpet to office areas with engineered wood and linoleum accents in high traffic areas
- Minimal ceiling finishes in office areas
- Reduced level of finish generally in office areas
- Low VOC Materials
- Materials that have recycled and/or post consumer/industrial content.
- Materials that have been manufactured and/or harvested regionally.

B3 Fittings & Equipment

B31 Fittings and Fixtures
- Steel rail/balustrade to exit stairs
- Millwork – FF&E budget for washrooms and service spaces
- Stone washroom vanities to washrooms
- General mill work - Allowance
- Stainless steel washroom accessories
- Foot grilles
- Interior signage-base building - Allowance

Potential LEED Initiatives:
- Green Building education signage and kiosk allowance
- Low VOC millwork

B32 Equipment
- General Equipment – see FF&E Budget
- Recycling/waste equipment - Allowance
- Window washing anchors - Allowance
- Loading dock levelers & equipment - Allowance

Potential LEED Initiatives:
- None

B33 Conveying Systems

• 3 no 5 stop passenger elevators (GF-5F)

Potential LEED Initiatives:
• None

C1 Mechanical

C11 Plumbing & Drainage
• Commercial quality plumbing fixtures with hand free electronic operator
• Plumbing services up to and including fixtures
• Individual floor hot water tank
• Allowance for perimeter radiation and VAV
• Domestic booster pump
• Allowance for ground floor cafe area air handling unit
• Allowance for ground floor kitchen ecology unit
• Allowance for sanitary, storm and elevator sump pumps
• Allowance for grease interceptors
• Allowance for cafe kitchen rough-ins

C12 Fire Protection
• Sprinkler and fire stand pipe through out the building

C13 HVAC
• Individual floor compartmental air handling units
• Air cooled chiller provides chilled water
• All units have humidifiers.
• Terminal units, diffusers and grilles.
• Make-up air units
• Gas hot water boilers provides hot water to heating elements

C14 Controls
• DDC systems and VFD
• Allowance for building automation controls and monitoring system
• Allowance for emergency generator fuel oil and exhaust system

Potential LEED Initiatives
• Low-flow flush valve WC's waterless urinals and electronic faucets
• Rainwater harvesting for site irrigation
• Free cooling heat exchanger
• High efficiency boilers provide hot water to heating elements
• Heat recovery air handling units provide conditioned air
• DDC control system on all major equipment balancing dampers, terminal units and perimeter radiation
• Variable speed drives on all fans, pumps, motors, etc
• CO2 demand controls

Exclusions
• Permits & Fees etc.
• Snow melting system

C2 Electrical

• Feeder cables are assumed to be standard offices
• Pipe tracing included as required
• Office is shell space-Tenant fit out not included
• Office general lighting included.
• Communication zone box/conduits are included.
• Zone power box and conduits are included
• Fire alarm system included
• Security system included for base building only

Potential LEED Initiatives:
• Medium/High quality lighting fixtures
• Perimeter lighting photo control
• Occupancy sensors in corridors/stair cases and common areas
• Efficient lighting design
• Daylight sensors for lighting in common, and tenant areas

Exclusions
• HV Substation assumed by local power company
• Building power supply primary cable assumed

by Hydro
• Ceiling tray in office space
• Office receptacle to partitions
• Communication cabling
• Hydro charges excluded

D1 Site Development

• Allowances for site development includes unit pavers, concrete paving and soft landscaping, site improvements.
• Allowance made for mechanical site services.
• Storm water detention pond EXCLUDED
• Allowance made for electrical site services

Potential LEED Initiatives:
• Erosion and sedimentation control documentation and implementation
• Reduce site disturbance to vicinity immediately around proposed building footprint and site work
• Specify adaptive species landscaping
• Rainwater harvesting system including cistern, filtration and pumps tied to site irrigation
• Limit the amount of light trespass from the site and limit up lighting to enhance night sky and nocturnal environs
• Perimeter lighting photo control

D2 Ancillary Work
• None

c3.4 Project Cost Summary

			Total Project Excluding LEED		Total Project Including LEED			Key incremental cost factors
Construction Cost Item		**GFA(M2)**	**$ Budget**	**$/m2**	**$ Budget**	**$/m2**	**% Increase**	
Office Building - 5 Storey		12,254	$17,703,000	$1,445	$18,858,151	$1,539	6.5%	Additional requirements of LEED
Below Grade Parking		0	n/a	n/a	n/a	n/a	n/a	No underground parking provided
Site Development		4,009	$395,000	$99	$678,849	$169	71.9%	Additional requirements of LEED
Subtotal Construction Costs		12,254	$18,098,000	$1,477	19,537,000	$1,594	8.0%	
Design Contingency-Allowance	3.0%	12,254	$543,000	$44	$586,000	$48	7.9%	
Subtotal - GLA (including Design Allowance)		12,254	$18,641,000	$1,521	$20,123,000	$1,642	8.0%	
Escalation Contingency	0.0%	12,254	$0	$0	$0	$0	0.0%	
Post-contract Construction Contingency	5.0%	12,254	$905,000	$74	$977,000	$80	8.0%	
Total Construction Costs		**12,254**	**$19,546,000**	**$1,595**	**$21,100,000**	**$1,722**	**8.0%**	
Project Soft Costs								
Land (Reality taxes only)		-	Excluded	-	Excluded	-	-	
Municipal Fees		-	Excluded	-	Excluded	-	-	
Construction (Excluded above)		-	Excluded	-	Excluded	-	-	
Design Consultants		-	Excluded	-	Excluded	-	-	
General and Administrative		-	Excluded	-	Excluded	-	-	
Furniture Fixtures and Equipment		-	Excluded	-	Excluded	-	-	
Marketing and Sales		-	Excluded	-	Excluded	-	-	
Finance		-	Excluded	-	Excluded	-	-	
Interim Building Operations		-	Excluded	-	Excluded	-	-	
Government Taxes		-	Excluded	-	Excluded	-	-	
Development Contingency		-	Excluded	-	Excluded	-	-	
Total Soft Costs		-	Excluded	-	Excluded	-	-	
Total Project Budget		**12,254**	**$19,546,000**	$1,595	**$21,100,000**	$1,722	8.0%	

Notes

1. Utility connection charges are Excluded.
2. Priced at 3rd quarter of 2006 rates.
3. GST is Excluded.
4. Excludes LEED consultant costs
5. Excludes tenant improvements

c3.5 Elemental Cost Summary - Total Project

Gross Livable Area (GLA): 12,254 m2

Element		Total Project Excluding LEED: Elemental Amount	Cost/m2	Total	%	Total Project Including LEED: Elemental Amount	Cost/sf	Total	%	LEED % Increase	Key incremental cost factors
A SHELL											
A1 SUBSTRUCTURE			$38.30				$38.30				
A11 Foundation		$450,500	$36.76			$450,500	$36.76				
A12 Basement Excavation		$18,800	$1.53	$469,300	2.4%	$18,800	$1.53	$469,300	2.2%	0.0%	
A2 STRUCTURE			$268.58				$268.58				
A21 Lowest Floor Construction		$111,900	$9.13			$111,900	$9.13				
A22 Upper Floor Construction		$2,651,600	$216.39			$2,651,600	$216.39				
A23 Roof Construction		$527,700	$43.06	$3,291,200	16.8%	$527,700	$43.06	$3,291,200	15.6%	0.0%	
A3 EXTERIOR ENCLOSURE			$313.03				$355.53				
A31 Walls Below Grade		$0	$0.00			$0	$0.00				
A32 Walls Above Grade		$869,800	$70.98			$874,762	$71.39				Increased thermal performance
A33 Windows & Entrance		$2,255,900	$184.09			$2,422,800	$197.72				Increased thermal performance
A34 Roof Covering		$370,500	$30.24			$539,349	$44.01				Increased thermal performance
A35 Projections		$339,700	$27.72	$3,835,900	19.6%	$519,700	$42.41	$4,356,611	20.6%	13.6%	Solar shading devices
B INTERIORS											
B1 PARTITIONS & DOORS			$65.91				$65.91				
B11 Partitions		$793,500	$64.75			$793,500	$64.75				
B12 Doors		$14,100	$1.15	$807,600	4.1%	$14,100	$1.15	$807,600	3.8%	0.0%	
B2 FINISHES			$52.54				$52.54				
B21 Floor Finishes		$188,800	$15.41			$188,800	$15.41				
B22 Ceiling Finishes		$386,100	$31.51			$386,100	$31.51				
B23 Wall Finishes		$68,900	$5.62	$643,800	3.3%	$68,900	$5.62	$643,800	3.1%	0.0%	
B3 FITTING & EQUIPMENT			$87.67				$90.84				
B31 Fitting & Fixtures		$344,300	$28.10			$346,700	$28.29				
B32 Equipment		$45,000	$3.67			$81,500	$6.65				Green building information kiosk
B33 Conveying Systems		$685,000	$55.90	$1,074,300	5.5%	$685,000	$55.90	$1,113,200	5.3%	3.6%	
C SERVICES											
C1 MECHANICAL			$277.89				$320.72				
C11 Plumbing & Drainage		$360,000	$29.38			$370,000	$30.19				Rainwater for sewage conveyance
C21 Fire Protection		$304,200	$24.82			$304,200	$24.82				
C13 HVAC		$2,362,300	$192.78			$2,853,175	$232.84				Energy saving equipment
C14 Controls		$378,800	$30.91	$3,405,300	17.4%	$402,693	$32.86	$3,930,068	18.6%	15.4%	DDC on major equipment
C2 ELECTRICAL			$204.46				$207.43				
C21 Service & distribution		$806,300	$65.80			$806,300	$65.80				
C22 Lighting, Devices & Heating		$1,325,300	$108.15			$1,361,590	$111.11				Motion and photo sensors on lighting fixtures
C23 Systems & Ancillaries		$373,900	$30.51	$2,505,500	12.8%	$373,900	$30.51	$2,541,790	12.0%	1.4%	
NET BUILDING COST (Excluding Site)			$1,308.38	$16,032,900	82.0%		$1,399.83	$17,154,000	81.3%	7.0%	
D SITE											
D1 SITE WORK			$31.68				$42.70				
D11 Site Development		$248,100	$20.25			$353,100	$28.82				Drip irrigation
D12 Mechanical Site Services		$67,500	$5.51			$97,500	$7.96				Cistern and equipment for rainwater harvesting
D13 Electrical Site Services		$72,600	$5.92	$388,200	2.0%	$72,600	$5.92	$523,200	2.5%	34.8%	
D2 ANCILLARY WORK			$0.00				$4.07				
D21 Demolition		$0	$0.00			$0	$4.07				
D22 Alterations		$0	$0.00	$0	0.0%	$0	$0.00	$0	0.0%	0.0%	
NET BUILDING COST (Including Site)			$1,340.06	$16,421,100	84.0%		$1,446.60	$17,727,000	84.0%	8.0%	
Z MARKUPS											
Z1 GENERAL REQUIREMENTS	10.0%		$136.82				$147.70				
Z11 General Requirements	7.0%	$1,149,500	$93.81			$1,290,775	$101.26				Includes LEED documentation costs (Excl. consulting)
Z12 Fee	3.0%	$527,100	$43.01	$1,676,600	8.6%	$569,000	$46.43	$1,809,900	8.6%	8.0%	Additional fee on incremental cost
TOTAL CONSTRUCTION ESTIMATE (Excluding Contingencies)			$1,476.88	$18,097,700	92.6%		$1,594.30	$19,537,000	92.6%	8.0%	
Z2 CONTINGENCIES	10.0%		$118.15				$127.55				
Z21 Design Contingency	5.0%	$542,900	$44.30			$586,100	$47.83				
Z22 Escalation Contingency	0.0%	$0	$0.00			$0	$0.00				
Z23 Construction Contingency	5.0%	$904,900	$73.85	$1,447,800	7.4%	$976,900	$79.72	$1,563,000	7.4%	8.0%	
GOOD & SERVICES TAX	0%	$0	$0.00	$0	0.0%	$0	$0.00	$0	0.0%	0.0%	
TOTAL CONSTRUCTION ESTIMATE (Including Allowances)			$1,595.03	$19,546,000	100.0%		$1,721.85	$21,100,000	100.0%	8.0%	

		Excluding LEED Cost/m2	Including LEED Cost/m2	
GFA :	12,254 m2	$1,595.07	$1,721.89	8.0%
GFA :	131,901 sf	$148.19	$159.97	8.0%

c3.6 Trade Summary - Total Project

Division			Total Project Excluding LEED		Total Project Including LEED				
			Budget	Cost/ GLA (m2)	Budget	Cost/ GLA (m2)	% of Total	LEED % Increase	Key incremental cost factors
0	Construction Management Fee		$527,115	$43.02	$560,660	$45.75	2.7%	6.4%	Additional fee on incremental cost
1	General Conditions		$1,149,473	$93.80	$1,305,713	$106.55	6.2%	13.6%	Includes LEED documentation
2	Site Work		$497,828	$40.63	$781,677	$63.79	3.7%	57.0%	Green roof and rainwater harvesting
3	Concrete		$3,932,771	$320.94	$3,932,771	$320.94	18.6%	0.0%	
4	Masonry		$193,225	$15.77	$193,225	$15.77	0.9%	0.0%	
5	Metals		$310,245	$25.32	$492,645	$40.20	2.3%	58.8%	Solar shading device, bike racks
6	Carpentry		$507,870	$41.45	$507,870	$41.45	2.4%	0.0%	
7	Thermal and Moisture Protection		$696,210	$56.81	$701,172	$57.22	3.3%	0.7%	Increase thermal performance
8	Doors & Windows		$2,664,872	$217.47	$2,831,772	$231.09	13.4%	6.3%	Increase thermal performance of glazing area
9	Finishes		$892,468	$72.83	$892,468	$72.83	4.2%	0.0%	Low VOC finishes
10	Specialties		$49,750	$4.06	$49,750	$4.06	0.2%	0.0%	
11	Equipment		$45,000	$3.67	$81,500	$6.65	0.4%	81.1%	Green building information kiosk
12	Furnishings		$5,000	$0.41	$5,000	$0.41	0.0%	0.0%	
13	Special Construction		$30,000	$2.45	$30,000	$2.45	0.1%	0.0%	
14	Conveying Systems		$685,000	$55.90	$685,000	$55.90	3.2%	0.0%	
15	Mechanical		$3,405,255	$277.89	$3,926,130	$320.40	18.6%	15.3%	Increased mechanical equipment costs
16	Electrical		$2,505,545	$204.47	$2,559,335	$208.86	12.1%	2.1%	Occupancy and daylight sensors
Subtotal			$18,098,000	$1,476.88	$19,537,000	$1,594.31	92.6%	8.0%	
	Design Contingency	3.0%	$543,000	$44.31	$586,000	$47.82	2.8%	7.9%	
	Escalation Contingency	0.0%	$0	$0.00	$0	$0.00	0.0%	0.0%	
	Post Contract Contingency	5.0%	$905,000	$73.85	$977,000	$79.73	4.6%	8.0%	
Subtotal			$19,546,000	$1,595.04	$21,100,000	$1,721.86	100.0%	8.0%	
	GST (Excluded)		$0	$0.00	$0	$0.00	0.0%	0.0%	
Total Project Construction Cost			**$19,546,000**	**$1,595.04**	**$21,100,000**	**$1,721.86**	**100.0%**	8.0%	

c3.7 LEED Incremental Costing - Total Project

GLA 12,254 m2

	LEED prerequisite/credit	Targeted	Pending	Not Pursued	cost factor description	quantity	unit rate	sub total	total	cost/m2 total gfa	comments	division impact
							Incremental from Standard Office to LEED					
Sustainable Sites	**SSp1 Erosion & Sedimentation Control -** Control erosion to reduce negative impacts on water and air quality.	Y							$0	$0.00	Included in Base - Municipal Requirement, Good practice	
					None	0 m2	$0.00	$0		$0.00		2000
	SSc1 Site Selection - Avoid development of inappropriate sites and reduce the environmental impact from the location of a building on a site.	1							$0	$0.00	Minimal cost impact - additional documentation included in	
					None	0 m2	$0.00	$0		$0.00	General requirements.	1000
	SSc2 Development Density - Channel development to urban areas with existing infrastructure, protect green fields and preserve habitat and natural resources.			1					$0	$0.00	EXCLUDED	
					Not Pursued	0 m2	$0.00	$0				1000
	SSc3 Brownfield Redevelopment - Rehabilitate damaged sites where development is complicated by real or perceived environmental contamination, reducing pressure on undeveloped land.			1					$0	$0.00	EXCLUDED	
					Not Pursued	0 m2	$0.00	$0		$0.00		-
	SSc4.1 Alternative Transportation: Public Transportation Access - Reduce pollution and land development impacts from automobile use.	1							$0	$0.00	Minimal cost impact - additional documentation included in	
					None	0 m2	$0.00	$0		$0.00	General requirements.	1000
	SSc4.2 Alternative Transportation: Bicycle Storage & Changing Rooms - Reduce pollution and land development impacts from automobile use.	1							$12,400	$0.20	No bike racks or showers assumed in base design	
					Shower facilities	4 no	$2,500.00	$10,000		$0.82	Assume showers located adjacent to washroom area	15000
					Bike racks	30 no	$80.00	$2,400		$0.20	Assume 530 employees	10000
	SSc4.3 Alternative Transportation: Alternative Fuel Refueling Stations - Reduce pollution and land development impacts from automobile use.			1					$0	$0.00	EXCLUDED	
					Not Pursued	0 m2	$0.00	$0		$0.00		-
	SSc4.4 Alternative Transportation: Parking Capacity - Reduce pollution and land development impacts from single occupancy vehicle use.		1						$0	$0.00	Pending finalized master plan max allowable to achieve	
					None	0 m2	$0.00	$0		$0.00	point is 256 based on current building design	1000
	SSc5.1 Reduced Site Disturbance: Protect or restore open space - Conserve existing natural areas and restore damaged areas to provide habitat and promote biodiversity.			1					$0	$0.00	EXCLUDED	
					Not Pursued	0 m2	$0.00	$0		$0.00		-
	SSc5.2 Reduced Site Disturbance: Development Footprint - Conserve existing natural areas and restore damaged areas to provide habitat and promote biodiversity.			1					$0	$0.00	EXCLUDED	
					Not Pursued	0 m2	$0.00	$0		$0.00		-
	SSc6.1 Storm water Management: Rate And Quantity - Limit disruption and pollution of natural water flows by managing storm water runoff.			1					$0	$0.00	EXCLUDED	
						0 sum	$0.00	$0		$0.00		1000
	SSc6.2 Storm water Management, Treatment - Limit disruption of natural water flows by eliminating storm water runoff, increasing on-site infiltration and eliminating contaminants.	1							$0	$0.00	Off site SWM pond included in base	
					Storm water management pond	0 m2	$0.00	$0		$0.00		2000
	SSc7.1 Landscape & Exterior Design to Reduce Heat Island Effect: Non-Roof - Reduce heat islands to minimize impact on microclimate and human and wildlife habitat.	1							$0	$0.00	50% U/G parking included in base	
					None	0 m2	$0.00	$0		$0.00		2000
	SSc7.2 Landscape & Exterior Design to Reduce Heat Islands: Roof - Reduce heat islands to minimize impact on microclimate and human and wildlife habitat.	1							$223,848	$18.27	Built-up asphalt roof carried in base	
					Extensive green roof 25%	584 m2	$235.00	$137,299		$11.20	extensive roof system	2000
					Option 2 - 60m3 Cistern	1 sum	$55,000.00	$55,000		$4.49	Includes particulate filtration, pumps and piping to irrigation beyond cistern carried in WEc1.2 (option 1)	2000
					High albedo roof membrane 75%	1753 m2	$18.00	$31,550		$2.57		2000
	SSc8 Light Pollution Reduction - Eliminate light trespass from the building and site, improve night sky access and reduce development impact on nocturnal environments.	1							$7,500	$0.61		
					Documentation and additional design to meet credit requirements	1 sum	$7,500.00	$7,500		$0.61		1000, 16000
		7										
Water Efficiency	**WEc1.1 Water Efficient Landscaping:** Reduce by 50% - Limit or eliminate the use of potable water for landscape irrigation.	1							$20,000	$1.63		
					Drip irrigation and native species landscaping	1 sum	$20,000.00	$20,000		$1.63		2000
	WEc1.2 Water Efficient Landscaping: No potable use or no Irrigation - Limit or eliminate the use of potable water for landscape irrigation.	1							$60,000	$4.90		
					Option 1 - 20m3 cistern	1 sum	$30,000.00	$30,000		$2.45	For Street level planting irrigation	2000
					Pumps filtration piping	1 sum	$30,000.00	$30,000		$2.45		16000
					Option 2 - 60m3 Cistern	0 m2	$0.00	$0		$0.00	Included in SSc7.2	2000
	WEc2 Innovative Wastewater Technologies - Reduce generation of wastewater and potable water demand, while increasing the local aquifer recharge.			1					$0	$0.00	EXCLUDED	
					Not Pursued	0 m2	$0.00	$0		$0.00	Assume that Option 2 is pursued	-
	WEc3.1 Water Use Reduction: 20% - Maximize water efficiency within buildings to reduce the burden on municipal water supply and wastewater systems.	1							$0	$0.00	Included in Base	
					Low-flush toilets: 4.8 LPF	0 no	$0.00	$0		$0.00	Sloan flush Valve	15000
					Urinals: 1.9 LPF	0 no	$0.00	$0		$0.00	American Standard - Innsbrook selectronic	15000
					Flow restrictors for lavatories and kitchenette sink (1.9L/Min)	0 no	$0.00	$0		$0.00		15000
					Showerhead: 5.7L/min.	0 no	$0.00	$0		$0.00	Manufactured by Euro - Model # EU150	15000
	WEc3.2 Water Use Reduction: 30% - Maximize water efficiency within buildings to reduce the burden on municipal water supply and wastewater systems.	1							$0	$0.00	See WEc3.1	
					Included in WEc3.1	0 m2	$0.00	$0		$0.00		-
		4										
	EAp1 Fundamental Commissioning - Verify and ensure that fundamental building elements and systems are designed, installed and calibrated to operate as intended.	Y							$0	$0.00		
					Engage a commissioning authority	0 m2	$0.00	$0		$0.00	Included in EAc3	1000
	EAp2 Minimum Energy Performance - Establish the minimum level of energy efficiency for the base building and systems.	Y							$0	$0.00	See EAc1.1	
					Included in EAc1.1	0 m2	$0.00	$0		$0.00		misc
	EAp3 CFC Reduction and Elimination of Halons - Reduce ozone depletion.	Y							$0	$0.00	Markham District Energy Plant refrigeration equipment use	
					None	0 m2	$0.00	$0		$0.00	HFC refrigerants	15000
	EAc1.1 Optimize Energy Performance: 20% - Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associate with excessive energy use.	2							$490,402	$40.02	See Scenarios for detail	
					Interior Lighting	1 sum	$36,290.00	$36,290		$2.96		16000
					Building Envelope	1 sum	$171,862.40	$171,862		$14.03		misc
					HVAC Systems	1 sum	$282,250.00	$282,250		$23.03		15000

GLA 12,254 m2

	LEED prerequisite/credit	Targeted	Pending	Not Pursued	cost factor description	quantity	unit rate (Incremental from Standard Office to LEED)	sub total	total	cost/m2 total gfa	comments	division impact
Energy & Atmosphere					Plant Equipment & DHW	1 sum	$0.00	$0		$0.00		15000
	EAc1.2 Optimize Energy Performance: 30% - Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associated with excessive energy use.	1	1						$0	$0.00	See EAc1.1	
					Included in EAc1.1	0 m2	$0.00	$0		$0.00		-
	EAc1.3 Optimize Energy Performance: 40% - Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associate with excessive energy use.		1	1					$0	$0.00	See EAc1.1	
					Included in EAc1.1	0 m2	$0.00	$0		$0.00		-
	EAc1.4 Optimize Energy Performance: 50% - Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associate with excessive energy use.			2					$0	$0.00	EXCLUDED	
					Not Pursued	0 m2	$0.00	$0		$0.00		-
	EAc1.5 Optimize Energy Performance: 60% - Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associate with excessive energy use.			2					$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		-
	EAc2.1 Renewable Energy: 5% - Encourage and recognize increasing levels of on-site renewable energy self-supply in order to reduce environmental impacts associated with fossil fuel energy use.			1					$0	$0.00	EXCLUDED	
					Not Pursued	0 m2	$0.00	$0		$0.00		-
	EAc2.2 Renewable Energy: 10% - Encourage and recognize increasing levels of on-site renewable energy self-supply in order to reduce environmental impacts associated with fossil fuel energy use.			1					$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		-
	EAc2.3 Renewable Energy: 20% - Encourage and recognize increasing levels of on-site renewable energy self-supply in order to reduce environmental impacts associated with fossil fuel energy use.			1					$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		-
	EAc3 Best Practice Commissioning - Verify and ensure that the entire building is designed, constructed and calibrated to operate as intended.	1							$12,000	$0.98	Related to EAp1	
					Additional Commissioning	1 sum	$12,000.00	$12,000		$0.98		1000
	EAc4 Ozone Protection: Elimination of HCFCs - Reduce ozone depletion and support early compliance with the Montreal Protocol.	1							$0	$0.00	Included in base - (due to Markham District Energy Refrigerant charges)	
					None	0 m2	$0.00	$0		$0.00		15000
	EAc5 Measurement & Verification - Provide for the ongoing accountability and optimization of building energy and water consumption performance over time.	1							$10,000	$0.82	Cost includes meters for all major base building systems	
					Metering equipment for electrical	1 sum	$10,000.00	$10,000		$0.82		16000
					Metering equipment for HVAC	1 sum	$0.00	$0		$0.00		15000
					Air distribution static pressures/ventilation air volumes	0 sum	$0.00	$0		$0.00	Included in base - Standard BAS requirement	15000
					Boiler efficiencies	0 sum	$0.00	$0		$0.00	CHP Equipment EXCLUDED from estimate	15000
	EAc6 Green Power - Encourage the development and use of grid-source, renewable energy technologies on a net zero pollution basis.			1					$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		-
	6											
Materials & Resources	**MRp1 Storage & Collection of Recyclables -** Facilitate the reduction of waste generated by building occupants that is hauled to and disposed of in landfills.	Y							$0	$0.00	Assume no additional building area	
					Permanent recycling area in the building	0 m2	$0.00	$0		$0.00		misc
	MRc1.1 Building Reuse: Maintain 75% of Existing Walls, Floors, and Roof - Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.			1					$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		-
	MRc1.2 Building Reuse: Maintain 95% of Existing Walls, Floors and Roof - Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.			1					$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		-
	MRc1.3 Building Reuse: Maintain 50% of Interior Non-Structural Elements - Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.			1					$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		-
	MRc2.1 Construction Waste Diversion: Divert 50% From Landfill - Divert construction, demolition and land clearing debris from landfill disposal. Redirect recyclable recovered resources back to the manufacturing process. Redirect reusable materials to appropriate sites.	1							$5,000	$0.41		
					Additional lifting and dumpster rental fees	0 sum	$0.00	$0		$0.00	Additional costs assumed to be absorbed by reduced tipping fees for recyclable materials	
					Documentation and sorting of Wood, Masonry Metal, and GWB	1 sum	$5,000.00	$5,000		$0.41	Photographs and LEED standard documents	1000
	MRc2.2 Construction Waste Diversion: Divert 75% from Landfill - Divert construction, demolition and land clearing debris from landfill disposal. Redirect recyclable recovered resources back to the manufacturing process. Redirect reusable materials to appropriate sites.		1						$0	$0.00	See MRc2.1	
					Included in MRc2.1	0 m2	$0.00	$0		$0.00		1000
	MRc3.1 Resource Reuse: 5% - Reuse building materials and products in order to reduce demand for virgin materials and to reduce waste, thereby reducing impacts associated with the extraction and processing of virgin resources.			1					$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		-
	MRc3.2 Resource Reuse: 10% - Reuse building materials and products in order to reduce demand for virgin materials and to reduce waste, thereby reducing impacts associated with the extraction and processing of virgin resources.			1					$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		-
	MRc4.1 Recycled Content : 7.5% (Post-Consumer + 1/2 Post-Industrial) - Increase demand for building products that incorporate recycled content materials, therefore reducing impacts resulting from extraction and processing of new virgin materials and by-passing energy and green house gas-intensive industrial and manufacturing processes.	1							$0	$0.00	Subject to weather and schedule constraints. Material cost savings assumed to be offset by accelerator admixtures.	
					25% slag or fly-ash	0 m2	$0.00	$0		$0.00	Documentation costs allowed for in IDc2. Minimal cost impact	misc
					Specification of high recycled content materials such as asphalt GWB steel and Brick	0 m2	$0.00	$0		$0.00		misc

GLA 12,254 m2

	LEED prerequisite/credit	Targeted	Pending	Not Pursued	cost factor description	quantity	unit rate (Incremental from Standard Office to LEED)	sub total	total	cost/m2 total gfa	comments	division impact
					Misc. materials and finishes	0 m2	$0.00	$0		$0.00	Minimal cost impact	misc
					Documentation and report	0 m2	$0.00	$0		$0.00	Included in General requirements	1000
	MRc4.2 Recycled Content: 15% (Post-Consumer + 1/2 Post-Industrial - Increase demand for building products that incorporate recycled content materials, therefore reducing impacts resulting from extraction and processing of new virgin materials and by-passing energy and green house gas-intensive industrial and manufacturing processes.		1						$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		-
	MRc5.1 Regional Material: 10% Extracted and Manufactured Regionally - Increase demand for building materials and products that are extracted and manufactured within the region, thereby supporting the use of indigenous resources and reducing the environmental impacts resulting from transportation.	1							$0	$0.00	Minimal cost impact - proximity to industry	
					None	0 m2	$0.00	$0		$0.00		misc
	MRc5.2 Regional Materials: 20% Extracted and Manufactured Regionally - Increase demand for building materials and products that are extracted and manufactured within the region, thereby supporting the use of indigenous resources and reducing the environmental impacts resulting from transportation.		1						$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		misc
	MRc6 Rapidly Renewable Materials - Reduce the use and depletion of finite raw materials and long-cycle renewable materials by replacing them with rapidly renewable materials.			1					$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		misc
	MRc7 Certified Wood - Encourage environmentally responsible forest management.		1						$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		6000
	MRc8 Durable Building - Minimize materials use and construction waste over a building's life resulting from premature failure of the building and its constituent components and assemblies.		1						$0	$0.00	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		misc
Indoor Environmental Quality	3											
	EQp1 Minimum IAQ Performance - Establish minimum indoor air quality (IAQ) performance to enhance indoor air quality in buildings, thus contributing to the comfort and well-being of the occupants.	Y							$0	$0.00	Minimal cost impact - Standard commercial specification	
					None	0 m2	$0.00	$0		$0.00		15000, misc
	EQp2 Environmental Tobacco Smoke (ETS) Control - Prevent or minimize exposure of building occupants, indoor surfaces, and systems to Environmental Tobacco Smoke (ETS).	Y							$16,100	$1.31	Minimal cost impact - Non-smoking building	
					Documentation and report	0 no	$50.00	$0		$0.00	Included in General Requirements	
					Testing of sample units	23 no	$700.00	$16,100		$1.31		15000, 1000
	EQc1 Carbon Dioxide (CO2) Monitoring - Provide capacity for indoor air quality (IAQ) monitoring to help sustain long-term occupant comfort and well-being.	1							$23,893	$1.95		
					Install CO sensors at combustion equipment	0 no	$0.00	$0		$0.00	Assume no combustion equipment - CHP costs excluded	
					Indoor air quality monitors	25 no	$955.72	$23,893		$1.95		1000
	EQc2 Increase Ventilation Effectiveness: Provide for effective delivery and mixing of supply air to support the safety, comfort and well-being of building occupants.		1						$0	$0.00	EXCLUDED	
					Not Pursued	0 m2	$0.00	$0		$0.00		15000
	EQc3.1 Construction IAQ Management Plan: During Construction - Prevent indoor air quality problems resulting from the construction/renovation process in order to help sustain the comfort and well-being of construction workers and building occupants.	1							$10,000	$0.82		
					Photograph documentation.	1 sum	$500.00	$500		$0.04		1000
					Completion of standardized schedules.	1 sum	$2,000.00	$2,000		$0.16		1000
					Allowance for misc implications	1 sum	$7,500.00	$7,500		$0.61		1000
	EQc3.2 Construction IAQ Management Plan: Testing Before Occupancy - Minimize indoor air quality problems resulting from the construction/renovation process in order to help sustain the		1						$0	$0.00		
					Not pursued	0 m2	$600.00	$0		$0.00	EXCLUDED	1000
	EQc4.1 Low-Emitting Materials: Adhesives & Sealants - Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.	1							$0	$0.00	Minimal cost impact - Specification of Low VOC materials	
					None	0 m2	$0.00	$0		$0.00		7920
	EQc4.2 Low-Emitting Materials: Paints & Coatings - Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.	1							$0	$0.00	Low VOC Specification	
					Low VOC spec - tenant areas	0 m2	$0.00	$0		$0.00	TI excluded from estimate	1000
					Low VOC spec - common areas	0 m2	$0.00	$0		$0.00	Minimal cost impact - Specification of Low VOC paint	9900
	EQc4.3 Low-Emitting Materials: Carpet - Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.	1							$0	$0.00		
					Green seal carpet - tenant areas	0 m2	$0.00	$0		$0.00	TI excluded from estimate	
					Green seal carpet - common areas	0 m2	$0.00	$0		$0.00	No carpet specified for common areas	9685
	EQc4.4 Low-Emitting Materials: Composite Wood & Laminates - Reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.			1					$0	$0.00	EXCLUDED	
					Not Pursued	0 m2	$0.00	$0		$0.00		6400
	EQc5 Indoor Chemical & Pollutant Source Control - Minimize exposure of building occupants to potentially hazardous particulates, biological contaminants and chemical pollutants that adversely impact air and water quality.			1					$0	$0.00	EXCLUDED	
					Not Pursued	0 m2	$0.00	$0		$0.00		15000
	EQc6.1 Controllability of Systems: Perimeter Spaces - Provide a high level of thermal, ventilation and lighting system control by individual occupants or specific groups in multi-occupant spaces to promote the productivity, comfort and well-being of building occupants.	1							$0	$0.00		
					None	0 m2	$0.00	$0		$0.00	Operable windows included in base - additional costs for documentation included in General Requirements	8520
	EQc6.2 Controllability of Systems: Non-Perimeter Spaces - Provide a high level of thermal, ventilation and lighting system control by individual occupants or specific groups in multi-occupant spaces to promote the productivity, comfort and well-being of building occupants.		1						$0	$0.00	EXCLUDED	
					Not Pursued	0 m2	$0.00	$0		$0.00		15000
	EQc7.1 Thermal Comfort: Compliance - Provide a thermally comfortable environment that supports the productivity and well-being of building occupants.	1							$0	$0.00	Minimal cost impact - Standard specification	
					None	0 m2	$0.00	$0		$0.00		15000
	EQc7.2 Thermal Comfort: Monitoring - Provide a thermally comfortable environment that		1						$0	$0.00	EXCLUDED	

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	LEED prerequisite/credit	Targeted	Pending	Not Pursued	cost factor description	quantity	unit rate (Incremental from Standard Office to LEED)	sub total	total	cost/m2 total gfa	comments	division impact
	supports the productivity and well-being of building occupants.				Not pursued	0 m2	$0.00	$0		$0.00		15000
	EQc8.1 Daylight and Views: Daylight 75% of Spaces - Provide for the building occupants a connection between indoor spaces and the outdoors through the introduction of daylight and views into the regularly occupied area of the building.	1							$180,000	**$0.00**	Minimal cost impact - Pending final office area layout. Window orientation, and building layout considered base building. Related to EAc1. Daylight modeling included in IDc2	
					Light shelves	450 m	$400.00	$180,000		$14.69		
					None	0 m2	$0.00	$0		$0.00		n/a
	EQc8.2 Daylight and Views: Daylight 90% of Spaces - Provide for the building occupants a connection between indoor spaces and the outdoors through the introduction of daylight and views into the regularly occupied area of the building.	1							$0	**$0.00**	Minimal cost impact - Pending final unit layout	
					None	0 m2	$0.00	$0		$0.00		n/a
Innovation & Design Process	9											
	IDc1.1 Innovation in Design: Exceptional performance water use	1							$0	**$0.00**	Included in WEc3	
					Over 40% water use reduction anticipated based on the water fixtures proposed by Rybka - current water use reduction anticipated to be 47%	0 m2	$0.00	$0		$0.00		
	IDc1.2 Innovation in Design: Green building education	1							$36,500	**$2.98**		
					Instate public education program that includes; An interactive kiosk/display describing LEED features; Distributed signage highlighting building LEED features; A case study or design manual about LEED features	1 sum	$36,500.00	$36,500		$2.98	Minimal cost impact anticipated - pending construction specification details	n/a
	IDc1.2 Innovation in Design: Specific Title		1						$0	**$0.00**	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		n/a
	IDc1.4 Innovation in Design: Specific Title		1						$0	**$0.00**	EXCLUDED	
					Not pursued	0 m2	$0.00	$0		$0.00		-
	IDc2 LEED® Accredited Professional:	1							$10,275	**$0.84**		
					LEED® Consulting - EXCLUDED	1 sum	$0.00	$0		$0.00	EXCLUDED	1000
					LEED® Registration	1 sum	$1,835.00	$1,835		$0.15		1000
					LEED® Certification	1 sum	$8,440.00	$8,440		$0.69		1000
	Miscellaneous Implications of District Heating and Cooling system in LEED option								$208,625	**$17.03**		
					Miscellaneous Architectural	1 sum	$0.00	$0		$0.00		misc
					Miscellaneous Mechanical	1 sum	$208,625.00	$208,625		$17.03		15000
					Miscellaneous Electrical	1 sum	$0.00	$0		$0.00		16000
	NET COST (Including Site)	32	14	24					$1,327,000	$108.29		
	<u>General Requirements & Fees</u>								$111,817			
	General requirements on additional cost (7.0%)							$78,272				
	Construction Management Fees (3.0%)							$33,545				
	Design Fees							$0				
	TOTAL ESTIMATE (Excluding Contingencies)								$1,439,000	$117.43		
	<u>Allowances</u>								$98,399			
	Design Allowances (5%)							$36,900				
	Escalation Allowances **(Excluded)**							$0				
	Construction Allowances (5%)							$61,499				
	TOTAL ESTIMATE (Including Allowances)								$1,537,000	$125.43		

GFA:	12,254	**$125.43**	/m2	/m2
GFA:	131,901	**$11.65**	/sf	/sf
Points	32	**$48,031**	/credit	/credit

c3.8 EAc1 Optimize Energy Performance Strategies

GLA 12,254

	Scenario	Quantity	Unit Rate	Sub-Total	TOTAL LEED PREMIUM	Comments
Interior Lighting	1. Efficient Lighting Design in Amenity and Corridor				$0	Included in base
	Reduce installed lighting power to meet ASHRAE 90.1-2004 Use fluorescent (T8 and/or T5 with electronic ballasts), 4-pin compact fluorescent, LED and HID fixtures to avoid high lighting power densities. Eliminate halogen, incandescent and mercury vapour fixtures in common areas	0 m2	$0.00	$0		
	2. Occupancy sensors for lighting				$14,050	
	Installed in offices, washrooms and mechanical/electrical rooms	59 no	$238	$14,050		Assumes minimum zone controls in open office layout
	3a. Daylighting Sensors For Lighting				$0	Not Pursued
	Fully modulating daylight sensors installed in peripheral zones	40	$0.00	$0		
	3b. Daylighting Sensors For Lighting				$22,240	
	Multi-stepped dimming control installed in peripheral zones.	40 no	$556.00	$22,240		
	Total Interior Lighting				$36,290	
Building Envelope	4. Increase thermal Performance of Exterior Wall Assemblies				$4,962	Excludes MPH wall area
	Increase wall insulation from R12 to R17 by adding 25mm of polystyrene	827 m2	$6.00	$4,962		
	5. Increase thermal Performance of Spandrel Panel				$6,602	
	Increase R-value from R-6 to R-11 by adding a continuous layer of 25mm of polystyrene behind spandrel mullions.	1100 m2	$6.00	$6,602		Assume 30% of window area
	6. Increase thermal performance of roof assembly				-	Not Pursued
	Upgrade effective R-value of roof assembly to R-26 by adding 25mm of polyisocyanurate. Assumed base design Is R-20	-	-	-		
	7a. Window Glazing				$141,218	Enermodal to confirm overall glazing U-value
	Add argon and warm-edge spacers	2568 m2	$55.00	$141,218		
	7b. Window Glazing: Triple Glazed				$0	Not Pursued
	Add layer of glazing with one layer low-e (soft coat), two argon cavities, and warm edge spacers.	0 m2	$0.00	$0		
	8. Improved Curtain wall framing				$19,080	Cost for thermal break in framing only
	Increase thermal break from 13mm to 19mm on all curtain and spandrel	1908 m2	$10.00	$19,080		
	9. Green Roof				$0	Included in SSc7.2
	Use a green roof on 25% of the roof area (R-22)	0 m2	$0.00	$0		
	Total Building Envelope				$171,862	
HVAC Systems	10. OA Reset + Economizer				$204,450	
	Use outdoor air reset control with differential enthalpy economizer.	1 sum	$204,450.00	$204,450		
	11. Set VAV Minimums to 20%				$47,800	
	Set VAV minimums to 20% of the maximum flow rate for all zones	1 sum	$47,800.00	$47,800		
	12. Upgrade fan efficiency				-	Not Pursued
	Increase fan efficiencies to 55% for supply fans and 35% for central return fans	-	-	-		
	13 Demand Control Ventilation				$30,000	
	CO2 Monitoring and control for variable occupancy spaces.	1 sum	$30,000.00	$30,000		
	Total HVAC Systems				$282,250	
Plant Equipment & D	14. Increase pumping efficiency				-	Not Pursued
	Combined impeller/motor efficiency - 75%	-	-	-		
	15. Low-flow fixtures				-	Included in WEc3.1
	Shower heads 5.7 L/min.	-	-	-		
	Lavatory faucets 1.9 L/min.	-	-	-		
	Total Plant Equipment & DHW				$0	
	NET COST EXCLUDING GENERAL REQUIREMENTS AND ALLOWANCES				$490,402	
			12,254 m2		$40.02	
			131,901 sf		$3.72	

Ref.	Design Criteria/Characteristics		MNECB Reference Building		c3 - Commercial Building Case Study		Key Indicators
1.00	**Construction Cost Summary**						
1.01	Building Area (GLA)		12,254	m2	12,254	m2	
1.03	Total Construction Hard Costs (Excl. LEED)		$19,546,000	$1,595.07 /m2	$19,546,000	$1,595.07 /m2	
1.04	Total LEED Incremental Construction Cost		$0	$0.00 /m2	$1,554,000	$126.82 /m2	
1.05	Total Construction Hard Costs (Incl. LEED)		$19,546,000	$1,595.07 /m2	$21,100,000	$1,721.89 /m2	
1.06	Total Project Soft Costs		Excluded	- /m2	Excluded	- /m2	
1.07	**Total Project Budget**		$19,546,000	$1,595.07 /m2	$21,100,000	$1,721.89 /m2	
2.00	**Building Environmental Performance (Note 1)**						
2.01	Energy Use per year	KWh/a	2,684,851	219.1 /m2	1,773,154	144.7 /m2	
2.02	Energy Cost per year	$	$217,895	$17.78 /m2	$154,176	$12.58 /m2	
2.03	Percent of MNECB baseline		100.0%		38.6%		
2.04	Water Use per year	m3	25,366	2.070 m3/m2	17,756	1.449 m3/m2	
2.05	Water Cost per year (@ $1.20/m3)	$	$30,439	$2.48 /m2	$21,307	$1.74 /m2	
2.06	Percent water reduction		0%		30%		
2.07	Greenhouse Gas reduction	Tonnes CO2/a	-		-		
3.00	**Value of Energy Savings (Note 1)**						
3.01	Annual Energy Cost	$/a	$217,895	$17.78 /m2	$154,176	$12.58 /m2	
3.02	Energy use reduction	%	0.0%		38.6%		
3.03	Energy savings per year	$	$0	$0.00 /m2	$63,719	$5.20 /m2	
3.04	Cap rate	%	8%		8%		
3.05	Increased building value	$	$0	$0 /m2	$796,488	$65.00 /m2	
3.06	Increased building value (% of Capital)	%	0%		3.8%		
3.07	Payback on LEED Cost Increment	Years	0.0		2.0		
4.00	**Value of Water Savings (Note 2)**						
4.01	Annual Water Cost	$/a	$30,439	2.48 /m2	$21,307	1.74 /m2	
4.02	Water use reduction	%	0.0%		30%		
4.03	Water savings per year	$	$0	$0.00 /m2	$9,132	$0.75 /m2	
4.04	Cap rate	%	8%		8%		
4.05	Increased building value	$	$0	$0 /m2	$114,146	$9.31 /m2	
4.06	Increased building value (% of Capital)	%	0%		0.5%		
4.07	Payback on LEED Cost Increment	Years	0.0		13.6		
5.00	**Value of Rent Premium (Note 3)**						
5.01	Rental Income (GSA = 88% of GLA)	$	$3,235,056	$300.00 /m2	$3,396,809	$315.00 /m2	
5.02	Lease Revenue Premium	%	0.0%		5.0%		
5.03	Additional Sales Revenue	$	$0	$0.00 /m2	$161,753	$15.00 /m2	
5.04	Cap rate	%	8%		8%		
5.05	Increased building value	$	$0	$0 /m2	$2,021,910	$165.00 /m2	
5.06	Increased building value (% of Capital)	%	0%		9.6%		
5.07	Payback on LEED Cost Increment	Years	0.0		0.8		
6.00	**Value of Occupancy Premium**						
6.01	Occupancy Assumed	%	90%		92%		
6.02	Annual Rent (GSA = 88% of GLA)	$	$3,235,056	$300.00 /m2(GSA)	$3,235,056	$300.00 /m2(GSA)	
6.03	Annual Occupancy Premium	$	$0	$0.00 /m2(GSA)	$64,701	$5.28 /m2(GSA)	
6.05	Increased building value	$	$0	$0 /m2	$64,701	$5.28 /m2	
6.06	Increased building value (% of Capital)	%	0%		0.3%		
6.07	Payback on LEED Cost Increment	Years	0.0		24.0		
7.00	**Residual Value Premium**						
7.01	Total Project budget (incl LEED)	$	$19,546,000	$1,595.07 /m2	$21,100,000	$1,721.89 /m2	
7.02	Rent Premium (5%)	$/a	$0	$0.00 /m2(GSA)	$161,753	$15.00 /m2(GSA)	
7.03	Net Rent (GSA = 88% of GLA)	$/a	$3,235,056	$300.00 /m2(GSA)	$3,396,809	$315.00 /m2(GSA)	
7.04	Building Value (assume cap rate of 8% for standard and 7.75% for LEED)	$	$40,438,200	$3,300.00 /m2	$43,829,791	$3,576.77 /m2	
7.05	Increased building value	$	$0	$0 /m2	$3,391,591	$276.77 /m2	
7.06	Increased building value (% of Capital)	%	0%		16.1%		
7.07	Payback on LEED Cost Increment	Years	0.0		0.5		
8.00	**Total Increase in Building Value**						
8.01	Increase in buliding value (sum 3 to 7)	$	$0	$0.00 /m2	$6,388,836	$521.37 /m2	
8.02	Increased building value (% of Capital)	%	0%		30.3%		
8.03	Payback on LEED Cost Increment	Years	0.0		0.2		

Notes

1. Energy performance figures provided by Enermodal Engineering Ltd.
2. Water consumption based on similar building consumption trends
3. Rental income based on similar building revenues provided by Altus Helyar Valuation Consulting

Glossary of Terms

Cap (Capitalization) Rate:

A Cap rate is a measure of the ratio between the net income produced by an asset and its capital cost. The rate is calculated in a simple fashion as follows:

Net Income/Capitalization Cost = Cap Rate

Carbon Dioxide (CO_2):

A compound of carbon and oxygen formed whenever carbon is burned. Carbon dioxide is a colourless gas that absorbs infrared radiation, mostly at wavelengths between 12 and 18 microns. It behaves as a one-way filter, allowing incoming, visible light to pass through in one direction, while preventing outgoing infrared radiation from passing in the opposite direction. The one-way filtering effect of carbon dioxide causes an excess of the infrared radiation to be trapped in the atmosphere; thus it acts as a "greenhouse" and has the potential to increase the surface temperature of the planet.

Energy Intensity:

The amount of energy used per unit of activity. Examples of activity measures in this report are households, floor space, passenger-kilometres, tonne-kilometres, physical units of production and constant dollar value of gross domestic product.

Energy Star Rating System:

A United States government program to promote energy efficient consumer products. It is well known for its logo appearing on many computer products and peripherals.

Commercial Building Incentive Programme (CBIP)

The Commercial Building Incentive Program (CBIP) is a Natural Resources Canada program that encourages the design and construction of energy-efficient buildings. To qualify, buildings must be designed to use 25% less energy than a similar building designed to the Model National Energy Code of Buildings (MNECB). The MNECB is standard design practice in most of Canada. A detailed energy simulation (using the EE4 software) must be performed to show that the 25% energy savings target is met. The incentive is available for new buildings and additions and extensive renovations of existing buildings.

Greenhouse Gas (GHG):

A greenhouse gas absorbs and radiates heat in the lower atmosphere that otherwise would be lost in space. The greenhouse effect is essential for life on this planet, since it keeps average global temperatures high enough to support plant and animal growth. The main greenhouse gases are carbon dioxide (CO_2), methane (CH4), chlorofluorocarbons (CFCs) and nitrous oxide (N_2O). By far the most abundant greenhouse gas is CO_2, accounting for about 70 percent of total greenhouse gas emissions (see Carbon Dioxide).

Gross Domestic Product (GDP):

The total value of goods and services produced within Canada during a given year. Also referred to as annual economic output or, more simply, output. To avoid counting the same output more than once, GDP includes only final goods and services – not those that are used to make another product. GDP figures are reported in constant 1997 dollars.

Gross Floor Area (GFA):

The floor area measured to the outside face of exterior enclosing walls of the building under consideration, inclusive of vent shafts and courts, without deduction for corridors, stairways, closets, the thickness of interior walls, columns or other features. The floor area of a building, or portion thereof, not provided with surrounding exterior walls shall be the usable area under the horizontal projection of the roof or floor above. The gross floor area does not include interior courts.

Gross Livable Area (GLA):

Finished, above-grade residential space, measured to the outside face of exterior enclosing walls. Also referred to as Residential Living Area.

Gross Salable Area (GSA):

The floor area available for the exclusive use of a retail tenant measured to the outside face of exterior walls and the center line of demising walls separating tenants. It includes basements and mezzanines.

Leadership in Energy and Environmental Design (LEED):

The LEED™ (Leadership in Energy and Environmental Design) green building rating system was originally developed by the U.S. Green Building Council (USGBC) to provide a recognized standard for the construction industry to assess the environmental sustainability of building designs. Canadian Green Building Council (CaGBC) has since adapted the USGBC LEED™ rating system to the specific concerns and requirements of buildings in Canada.

Secondary Energy:

Energy used by final consumers for residential, agricultural, commercial industrial and transportation purposes.

Annotated bibliography

Chapter 1 - Introduction

HM Treasury. (2006, October 30). Stern Review: The Economics of Climate Change: (ISBN number: 0-521-70080-9). Cambridge University Press.

This text provided an in-depth analysis of the urgent need for global action to stem the rising economic cost of environmental inaction. The report was commissioned by the British Treasury chief Gordon Brown; however, it appeals to all industrialized countries to take immediate action to address climate change. Key recommendations of the report include:

- Greenhouse Gases: Emissions in the atmosphere must be limited to between 450 and 550 parts per million of carbon dioxide. The current level is 430 parts per million. At the start of the industrial revolution in the 18th century, the carbon dioxide levels were at 280 parts per million.

- Deforestation: The loss of forests globally contributes more to carbon dioxide levels in the atmosphere than the transport sector each year. Studies to determine the best way to reduce deforestation must begin soon.

- International aid: Climate change must be integrated into development policy. Rich countries must increase support for poor countries' development.

- Recommendations: To effectively counteract climate change the report suggests a common global price for carbon be created through taxation, emissions trading and regulation. It also suggests that government policies encourage the development of highly efficient products; and says funding for low-carbon technologies must increase fivefold.

Flannery, Tim. The Weather Makers. Australia: Harper Collins Publishers Ltd., 2005.

This text provides a comprehensive assessment of the impact of humans on the environment, using the most current information available to dispel any question that the current climate crisis is being caused by the combustion of fossil fuels and other human activity.

Globe and Mail Newspaper - Various articles

Current newspaper articles provide insight into what the media is relaying to the public from the constant stream of reports being published on topics related to climate change. Over the course of writing this thesis, the environment has become a regular headline on national newspapers, bringing awareness of the issues into the spotlight of the general public.

Chapter 2 - The Environmental Impact of Architecture

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The statistics demonstrating the correlation between buildings and GHG emissions and the key role of buildings in a truly sustainable society were compiled from data available on the Natural Resources of Canada website,

Hawken, Paul, and Amory Lovins, and L. Hunter Lovins. Natural Capitalism: Creating the Next Industrial Revolution. New York: Back Bay Books/Little, Brown and Company, 1999.

From an economic standpoint *Natural Capitalism* by Paul Hawken and Amory Lovins, and *The Ecology of Commerce* by Paul Hawken, provide compelling cases for embracing the problem solving skills of business to solve environmental issues. These accounts are written from the perspective of environmental consultants who are primarily involved in working with the industrial sector to reduce environmental impact while maintaining economic prosperity. The lessons they present can be applied to some degree to the building industry where similar constraints and opportunities exist.

McDonough, William, and Michael Braungart. Cradle to Cradle: Remaking the Way we Make Things. New York: North Point Press, 2002.

This text explores how products and buildings can be designed to maximize there useful life without adding more toxic waste to the environment. This text also addresses issues in sustainable design related to creating a healthy indoor environment and minimizing the impact of building construction on the environment.

Globe and Mail Newspaper - Various articles

Newspaper articles provide an overview of current coverage of the issues related to climate change, especially those covering the Federal governments evolving stance on major issues around ratifying Kyoto.

Chapter 3 - Internal Factors Effecting Cost and Success of Sustainable Design

The primary source of data for this section was Altus Helyar Cost Consulting, where I was employed prior to and during the course of writing this thesis. As noted in the Acknowledgments section of the thesis, access to this information and to the knowledge of my colleagues, especially my advisor Ken Warkentin, was invaluable in completing the case study section of the thesis. The office is a member of the Canadian Green Building Council, has 12 LEED-Accredited Professionals, and is a recognized leader in its industry for providing professional costing advice on environmental buildings across Canada. The office regularly performs cost analysis on buildings seeking LEED certification. The selected case study buildings are a sampling that best represents the potential of sustainable design in buildings commissioned by developers.

Yudelson, Jerry. Developing Green: Strategies for Success. Herndon: National Association of Industrial and Office Properties (NAIOP), 2006.

This text provides an overview of the implications of "Green Development" from the perspective of the development community and construction industry.

Globe and Mail Newspaper - Various articles

Newspaper articles on the growing issues around poor urban planning and a legacy of suburban development are especially relevant to the Neighbourhood Design section of the case study research. A four-part series in entitled *"The Suburbs"*, which was featured in the Globe and Mail in July 2006, details the social issues in suburban communities across Canada.

Chapter 4 - External Factors Effecting Cost and Success of Sustainable Design

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The breakdown of property tax revenue and city expenditure information was compiled from this report. This information was used to support the case for more sustainable development patterns in order to address the budget shortfall facing major Canadian cities.

Yudelson, Jerry. Developing Green: Strategies for Success. Herndon: National Association of Industrial and Office Properties (NAIOP), 2006.

This text provides an overview of the implications of "Green Development" from the perspective of the development community and construction industry.

Chapter 5 - Foundations for Transforming the Market

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The architecture thesis written by Alex Lukachko, *A Culture of Environmentalism,* proposes that in order to realize significant positive change at a pubic level there needs to be a fundamental shift from the current paradigm to one where our society incorporates a different sense of the value of nature. In his thesis, Lukachko argues that relying solely on economic measures does not account for all of the measures inherent in a sustainable society. As this thesis focuses primarily on economic measures, it is important to maintain reference to the larger context of the sustainable design.

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