

Appendix B. Case Studies

Case Study 1: Clarington Technology Park (Bowmanville, Ontario)

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Case Study 10 – Low Impact Development: Honda Canada Campus (Markham, Ontario)

Additional Resources and Information:

- Community Investment Toolkit, Metro Portland, <http://www.oregonmetro.gov/index.cfm/go/by.web/id=28446>
- East Ontario Wood Centre & Eco-Industrial Park, <http://www.woodcentre.ca/>
- Canadian GeoExchange Coalition, <http://www.geoexchange.ca>

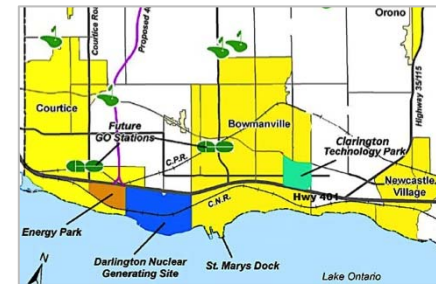
Case Study 1

Clarington Technology Business Park

Bowmanville, ON

Key Facts

- **Site Size:** 352 acres greenfield site.
- **Location:** located in the Town of Bowmanville, immediately north of Highway 401. Highway 2 forms the area's northern boundary. Less than one hour from Toronto airport.
- **Land Use:** Zoned M1 (Light Industrial), M2 (General Industrial) and Agricultural (A-22) under current land use designations. The Secondary Plan will provide amendments to create consistency between Clarington Official Plan and the zoning y-law for this area.



Green Features

- **Flexible Land Use Framework** which is based upon an open space network and road system.
- **Sustainable Design Guidelines** encourage LEED standards and promote best practices in green development:
 - ▶ Compact Development
 - ▶ A Mix of Land Use
 - ▶ Transit Use
 - ▶ Promotion of Walking and Cycling
 - ▶ Natural Habitat Preservation and Restoration
 - ▶ Alternative Energy Sources
 - ▶ Green Buildings
 - ▶ Energy and Water Efficiencies
 - ▶ Waste Management
 - ▶ Innovation Stormwater Management



Concept Site Layout for Mixed Use Corridor



Concept Site Layout for Prestige Employment



Clarington Concept Plan

What are the ideas for Caledon?

- ▶ **Diversity:** A range of business uses to be accommodated. Streets will be designed for a variety of transportation modes, including automobiles, trucks, cycling, walking and public transit.
- ▶ **Mixed Use Corridors** allow uses such as business offices, day nurseries, fitness centers, banks and restaurants to be established at a high profile location along major roads for the needs of businesses and employees within park.
- ▶ **Higher Density Land Uses and Taller Building** at intersections of arterial roads.
- ▶ **Development Charge Incentives** are reduced by 50% for LEED certified buildings and 100% for research facilities to encourage the establishment of target industries.
- ▶ Encourage **Shared Driveway, Parking/Service Lands and Access Driveway Entrances.**
- ▶ **Passive Solar Landscaping** by locating and selecting plants to provide climate protection for buildings and employees, for example, using deciduous trees planted on south sides of buildings and periphery of parking lots to reduce and redirect sun exposure in summer.
- ▶ Encourage **Consolidated and Shared Utility Trenches** for ease of access and maintenance.
- ▶ Require that development applications include a **Sustainability Plan** which consider techniques, such as rainwater capture, vegetated swales, porous surfaces for pathways and parking lots, green roofs, greywater reuse, renewable energy and cogeneration.
- ▶ Establish a **Network of Connected Open Space**, which includes stormwater pond, trail system, re-established creek system, with highlighting the stormwater ponds as focal points.



Case Study 2

Boxwood Business Park

Cambridge, ON

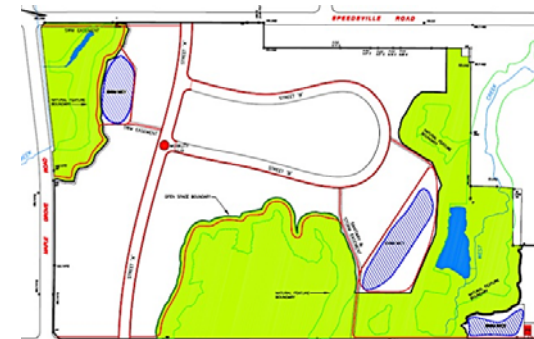
Key Facts

- **Site Size:** 220 acres city-owned greenfield site with more than 30 acres designated as open space. The site is subdivided into lots ranging from 1 to 20 acres.
- **Location:** Located within City of Cambridge, just east of the Toyota Motor assembly plant and accessible from Highway 401, 24, 8 and 7.
- **Land Use:** Current used as open space and agricultural, will be zoned M3 for general industrial use.



Key Features

- Ensure the protection of the woodlots and creek valleys, also incorporate buffers to protect these sensitive areas.
- Trail and bike paths, transit access to promote environmental friendly transportation.
- Street layout design with southern exposure to facilitate alternative energy options for landowners.
- Encourage on-site measures that enhance infiltration, or re-use stormwater for non-potable plumbing requirements or for irrigation.



Boxwood Preferred Concept Plan

What are the ideas for Caledon?

- ▶ Boxwood is expected to attract industrial and commercial uses. Targeted sectors are Advanced Manufacturing with a focus on technology and food sectors, Life Sciences including health services and medical devices, small firms in the Knowledge-Based businesses, and Environmental Design including green technologies and built environment.
- ▶ The most significant portions of development constraints for this site include two creek corridors run through the site and a large wetland. These lands are dedicated to open space or to be maintained for ecological value, instead of developing into high-impact uses.



Boxwood Subdivision includes two creek corridors and a wetland patch.

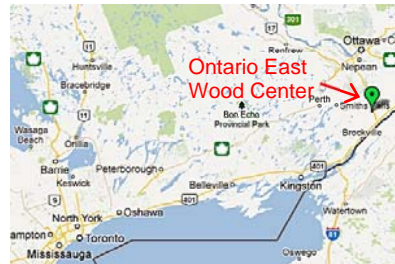
Case Study 3

Ontario East Wood Centre & EIP

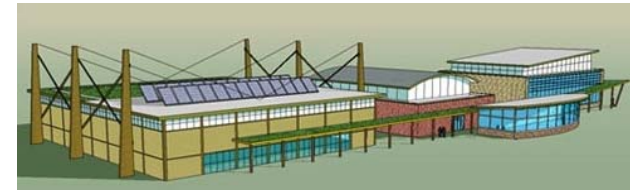
Edwardsburg/Cardinal, ON

Key Facts

- The Ontario East Wood Centre & Eco-Industrial Park runs north from County Road 2 within the 400-acre Edwardsburgh/Cardinal Industrial Park, adjacent to the Port of Prescott. The site has been designed to encourage a forest and biomass innovation cluster of industrial, business and demonstration projects in an environment supportive of a low carbon economy in Eastern Ontario.



More Information:
<http://www.woodcentre.ca/>



Wood Science Innovation Centre Concept Elevation

Green Features

- The underlying concept and core research theme for this development is that energy should be conserved and converted. Optimizing energy flows between participants will help reduce environmental impacts and costs, and enhance the site for workers and visitors. By-product synergies are also promoted.
- EIP Design Principles:
 - ▶ Resource conservation: e.g. by integrating passive energy conservation with energy systems
 - ▶ Renewable technologies: increase use of renewable materials and energy technologies
 - ▶ Demand management: reduce demand for materials and energy
 - ▶ Light and sound pollution: use of healthy/natural light and sound conditions
 - ▶ Health for project workers and users: promote healthy interiors and exteriors
 - ▶ Offset opportunities: minimize the effects of environmental burdens
- The planned Wood Science Innovation Centre will be designed to optimize energy use. Built-in energy and resource harvesting systems will be used to help industry participants match plant configurations with outputs. Other design concept include structural mass and in-floor radiant energy systems; advanced glazing systems, translucent insulation and exterior shading systems which can help control day lighting; and increased thermal resistance and sealing of the envelope that can decrease energy use.



Ontario East Wood Centre & EIP Concept Site Plan

Case Study 4

TaigaNova Eco-Industrial Park

Fort McMurray, AB

Key Facts

- **Site Size:** 131 acres greenfield site, subdivided into 26 lots. Lots range in size 0.83 acres to 5.52 acres.
- **Location:** located 7 km north of Fort McMurray's town centre on the east side of Highway 63, which connects the site to the major oil sands operations and the City of Edmonton.
- **Land Use:** Zoned C4 (Highway Commercial District) and BI (Business Industrial District).



Green Features

- **New land use by-law amendments require businesses to:**
 - Make buildings that will be at least 25% more efficient than Model National Energy Code
 - Provide preferred parking for car-pool or low emissions vehicles
 - Reduce environmental impacts during construction
 - Consider strategies to reduce resource use, reduce waste generation and increase land use efficiency
 - Consider by-product synergy
- **Storm water management pond** is designed as both an amenity and habitat.
- **Pedestrian connectivity** allowing people to easily walk or bicycle between businesses and to amenity areas.
- **Narrowed Internal Roads** to reduce asphalt use.



ACFN Business Group LEED Gold Building



Bicycle Rack and Permeable Parking Pad



TaigaNova Concept Site Plan

What are the ideas for Caledon?

- ▶ **Use by-law** to allow for a variety of light industrial, manufacturing, R&D, recycling and commercial uses, include hotel, health service and childcare facility.
- ▶ **Variety of Lot Sizes** to accommodate different land uses.
- ▶ Adopt **Low Impact Design** responding to natural drainage patterns.
- ▶ **Low Maintenance Landscaping:** choose native and drought-tolerant species that reduce the need for maintenance, pesticide use and irrigation.
- ▶ **Preferential** Parking for car-pool, hybrid, electric vehicles or the most fuel-efficient model.
- ▶ Required Building Energy Performance Report sets the standard for **Energy Efficient Building**.
- ▶ **Minimize Light Pollution** by using fixtures that provide absolute cut-off.
- ▶ Safe and Clearly marked **Pedestrian and Bicycle Pathways** that are separated from heavy traffic and connecting to green space can encourage the use of outdoor amenity.
- ▶ Encourage **By-product Synergy through** collecting inputs, outputs and needed resource information from businesses within the park.
- ▶ **Green Power Purchase:** some businesses have considered buying green power for at least 10% of their electricity requirements.
- ▶ Explore opportunities that were considered to **Reduce Resources Needs and Waste Generation**, such as recovering waste heat and water, recycling / reusing stormwater.
- ▶ **District Energy System ready:** consider coordinating heating/cooling between building cluster. All the developments need to use hydronic-compatible heating system.



Case Study 5

Innovista Eco-Industrial Park

Key Facts

- **Site Size:** 108 acres greenfield site, with 32 acres of parks and ecological reserves. The site will be developed in three phases, the first phase contains 10 lots range in size 2 acres to 7 acres.
- **Location:** located on Highway 16 at the eastern entrance to Hinton, Alberta. It's the gateway to the east of City of Edmonton and west of Jasper National Park.
- **Land Use:** Zoned M-E1 (Eco-Industrial District).

Hinton, AB



Green Features

- **First-of-its-kind Zoning:** Land Use Bylaw was amended to create an Eco-Industrial District, which includes new uses, provisions for future district energy connection, encourages green roofs, and reduces development setbacks.
- **Business Advantage:** The site layout was designed to facilitate by-product. Easements, both underground and at the back of each lot, allow for the transfer of resources between facilities.
- **Small-Bore Sewer (SBS) System:** Innovative infrastructure provides biological pre-treatment at each site to reduce the amount of wastewater sent to a central WWTP.
- **Green Building:** Lot owners are encouraged through the Design Guidelines to implement green building strategies, with potential cost and resource savings in construction materials, technologies and operations.



Innovista Concept Site Plan



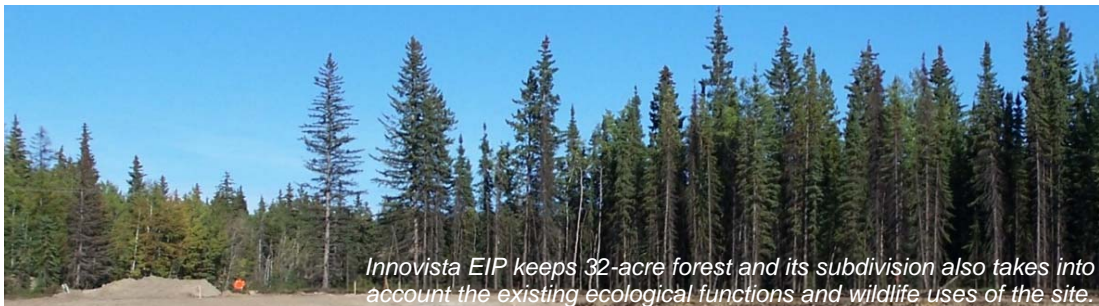
Entry Signage



Hinton Infrastructure Services Building is designed to achieve LEED Silver standard

What are the ideas for Caledon?

- ▶ **Designated Zone for Eco-Industrial Uses** (M-EI zone) will allow for the industrial development that will demonstrate innovation and high level of environmental and economic performance.
- ▶ Utilize **Green Infrastructure**, with the long-term goal of self-sufficiency with respect to energy, water, and waste management.
- ▶ **Innovation Sewer Treatment Systems** such as Small Bore Sewer System (SBS) that uses small diameter pipes to collect pre-treated wastewater from each lot and reduces effluent volume reaching municipal system.
- ▶ Require businesses to identify **By-product Synergy and Resource Sharing** opportunities in the pre-development planning stage.
- ▶ **Attractive Connections** between buildings and trail system to encourage walking and cycling.
- ▶ **Continuity of Landscaped Areas** with adjacent lots, stormwater ponds and natural features.
- ▶ **Share Driveway and/or Parking Facilities** where possible.
- ▶ **Reduced Roadways Width** can lead to less material use compared to traditional industrial parks, also limit the traffic speed within park.
- ▶ Require at least 40% **Permeable Surface** for every lot through the use of landscaping, green roofs and porous pavement.
- ▶ Produce **On-site Energy from Renewable Sources or via Co-generation**.
- ▶ Orient and mass building to maximize opportunities for **Passive Solar Heating and Cooling, Natural Lighting and Ventilation**.
- ▶ Consider systems to use **Non-potable Water Sources** where appropriate in industrial processes, wetland flow stabilization and irrigation.



Case Study 6



Portland, OR

Key Facts

- Metro serves more than 1.5 million residents in Clackamas, Multnomah and Washington counties and the 25 cities in the Portland region.
- The Metro Council is forging new strategies and innovative partnerships to build vibrant communities, promote economic growth and save wildlife habitat.

Key Features

Community Investment Toolkit is a tool for local governments, nonprofits, developers & community leaders to understand best practices for creating/enhancing vibrant employment & industrial lands. The Community Investment Toolkit focuses on three topics:

- ▶ Financial incentives
- ▶ Urban design and local zoning and building codes
- ▶ Economically and ecologically sustainable employment and industrial development



What are the ideas for Caledon?

- ▶ **High-performance Infrastructure** – Tools emphasize the value of innovative infrastructure projects that take a systems approach and mimic natural ecosystems to reduce life cycle environmental and financial costs.
- ▶ **Code Changes & Planning Tools** – Best practices for innovative design & development codes and planning that support 21st century design, ie. using LEED-ND as a guide for local codes.
- ▶ **Revitalization of Employment Lands** – Local governments can promote redevelopment through engaging stakeholders, PPPs, securing funding, preparing site-readiness analyses, and in some cases creative legal and intergovernmental agreements.
- ▶ **Economic Development Partnerships** – collaboration with local economic development partners in implementing the tools. Metro will support knowledge sharing by documenting experiences in detailed case studies.



Port of Portland Headquarters includes a living machine and solar panels.

Download Toolkit:
http://library.oregonmetro.gov/files//eco-efficient_toolkit.pdf

Case Study 7 – Green Roof

Walmart Supercentre

Port Coquitlam, BC

Key Facts

- Green Roof Size: 151,300 square foot and connect to a landscaped bio-swale
- Location: Fremont Village Shopping Centre, Port Coquitlam, BC
- Construction Cost: \$ 1 million
- Completion Year: 2011
- Applicable Bylaw: Port Coquitlam 2006 bylaw – requires all buildings over 5,000 square metres (53,821 square feet) to use green technology to reduce heat island effect of large buildings.

Green Roof Policy

- Port Coquitlam became the first municipality in Canada to mandate green roofs on large commercial buildings in 2006. The city also fast-tracks applications with green building technologies provided.
- Main purpose of the policy is to obtain environmental benefits, including:
 - ▶ Reducing storm water run-off
 - ▶ Improving building thermal performance and energy consumption
 - ▶ Reducing the urban heat island effect
- Other municipalities have green roof policy / bylaw
 - ▶ City of Toronto, Ontario – Green Roof Bylaw (May 2009) applies to new industrial development greater than 2,000 m² as of April 30, 2012. The coverage requirement is either covering the lesser of 10 per cent of available roof space or 2,000 m². (<http://www.toronto.ca/greenroofs>)
 - ▶ City of Richmond, British Columbia – Bylaw #8385 (October 2008) applies to new industrial or office development greater than 2,000 m². These buildings would need a minimum of 100 green points, which could be achieved through the development of a green roof, meeting a LEED Silver standard, or using the roof for parking and landscaping the grounds. (<http://www.richmond.ca/cityhall/bylaws/chapter.htm>)



A green roof being planted on a Walmart Supercentre in Port Coquitlam, BC. (Credit: Onni Group)



Toronto Transit Commission's subway system – Eglinton West station boasts a 790 m² green roof. (Credit: Gardens in the Sky)

Case Study 8 – Green Warehouse

Testa Produce Inc.

Chicago, IL

Key Facts

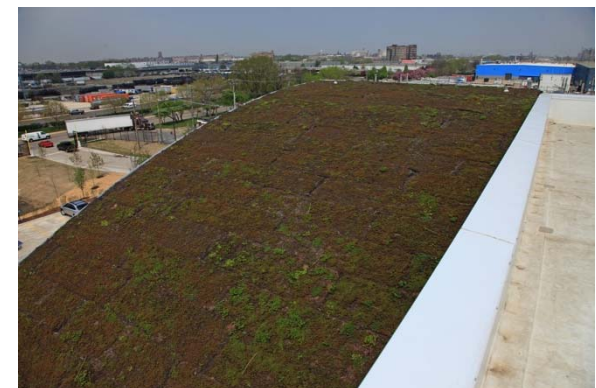
- Facility Size: 91,000 square foot on a 571,928 square feet site
- Facility Type: Refrigerated storage facility
- Location: Back of the Yards industrial area, Chicago, IL
- Completion Year: 2011
- Construction Cost: \$ 24 million US dollars
- Green Building Rating: LEED Platinum certified

Green Features

- **On-site Renewable Energy System**
 - ▶ Wind Turbine generates 880,000 kWh of energy, roughly 30% of the building's power needs
 - ▶ 108 Solar Panels installed at parking lot supply electric car charging station
 - ▶ Solar Hot Water System located on the roof produces 100% of the building's non-potable hot water
- **Reduce Heat Island Effect**
 - ▶ 45,650 square feet Vegetated Roof collects rainwater for non-potable uses, such as flushing toilets.
 - ▶ White concrete surface pavement instead of blacktop asphalt
 - ▶ Green screens at the front of building
- **Stormwater Management**
 - ▶ Retention Pond is connected to the building for water utilization
 - ▶ Bio swale system borders the building to encourage rainwater infiltration
 - ▶ Permeable Pavers lining the walkway and parking lot
 - ▶ Rainwater Harvesting Cistern stores the internally filtered rainwater collected from green roof



A wind turbine and solar panels are mounted in the Testa Produce's refrigerated storage facility in Chicago. (Credit: Nick Przybyciel/MEDILL)



Vegetated roof slopes at the front to create a unique green identity for the building. (Credit: Testa Produce Inc.)

Green Features (Continued)

- **Green Building Materials / products**
 - ▶ Certified green cleaning and pest control products
 - ▶ Low-VOC paints and adhesives
 - ▶ 31% of the building is constructed with recycled materials
- **High Efficient Lighting**
 - ▶ Illuminate entire office area, freezer and all outdoor space by using 100% LED lighting
 - ▶ Warehouse coolers and dock areas contain energy efficient T5 lighting fixtures
 - ▶ Entire facility equipped with motion sensor lighting
 - ▶ Solar tracking and standard skylights add natural lighting throughout offices and in the stairwell
- **Green Distribution – Reduce Carbon Emissions**
 - ▶ Eco-Friendly Refrigeration System
 - ▶ Two Electric Delivery Trucks run 100% on electricity, all the other trucks run on bio diesel fuel
 - ▶ Walkie Rider Material Moving Machines are powered by Methanol Fuel Cells in lieu of battery charging systems
 - ▶ All company cars are Hybrid vehicles and there are designated preferred parking spaces for low-emitting vehicles
- **Waste Management**
 - ▶ 85% construction waste was diverted from landfill
 - ▶ 95% recycling capacity for paper, plastic and cardboard
 - ▶ Use reusable Vinyl Mesh Pallet Wrap to eliminate plastic waste
 - ▶ Hand dryers are used in the washrooms to eliminate paper towel consumption and waste

(More Information: <http://www.testaproduce.com/green.cfm>)



Solar-powered electrical car charging station and Electric Delivery Trucks. (Credit: Testa Produce Inc.)



Methanol Fuel Cell-powered moving machines. (Credit: Testa Produce Inc.)



Reusable vinyl wrap is an alternative to plastic film. (Credit: Pallet Wrapz Inc.)

Case Study 9 – Geoexchange

Challenger Motor Freight

Cambridge, ON

Key Facts

- Building Size: 55,000 square feet
- Facility Type: Operations & Maintenance Facility
- Geo-exchange system: 119 ton 0.75" Horizontal closed ground loop
- Entire heating and cooling load is met by 45 ceiling hung heat-pumps
- Area of loop field: 2.7 acres (under a 200' by 500' parking lot)
- Reduce gas consumption to zero and save \$125,000 a year on operation cost

Other Industrial Applications

- **Walmart Supercentre, Burlington ON**
 - ▶ Use horizontal loop beneath parking lot to supply heating and cooling needs. Energy saving is about 57% compared to those Walmart store constructed without geexchange system
 - ▶ Incorporate SpiderPlow technology to lay 15 kilometres of pipe in six days and reduce construction cost by 70%. (<http://www.canadianconsultingengineer.com/news/walmart-burlington/1000346560/>)
- **Lange Transportation and Storage Ltd., Mississauga ON**
 - ▶ Use vertical loop system to retrofit the building's HVAC system and to heat and cool the entire 70,000 square feet office and warehouse. This retrofit results in at least \$67,000 natural gas saving annually.
 - ▶ Payback period is about 8-9 years. (<http://www.langeshow.com/green.htm>)
- **WestJet Head office, Calgary AB,**
 - ▶ The geexchange system provides heating and cooling for the 315,000 square feet building, and it has reduced energy consumption by 35% and decreased WestJet's greenhouse gas footprint by 1,250 tonnes per year
 - ▶ Embedding Geothermal piles into building's structural piles while constructing the building saves time and drilling cost. (<http://www.dcnonl.com/article/id47368/--westjetsquos-calgary-campus-awarded-lead-gold>)



Horizontal loop system. (Credit: Northern



Case Study 10 – Low Impact Development

Honda Canada Campus

Markham, ON



Key Facts

- **Size:** Campus contains three building within the 52 acres site
 - ▶ Four-storey, 138,000 square foot headquarter building
 - ▶ 85,000 square feet technical centre for research and development
 - ▶ 226,000 square feet parts distribution centre with 14-bay shipping receiving facility
 - ▶ 910-car parking lot
- **Location:** Along Highway 404 in Markham's West Development District
- **Green Building Rating:** Headquarter building is LEED Gold certified

Green Features

- **Passive Design** - North-south building orientation to maximize daylight and energy performance
- **Reduce Heat Island Effect** by the use of heat-reflective white-roof
- **Raised floor system** allows more efficient heat distribution
- **Lighting sensor system** automatically adjusts according to how much natural light is already present in the building. It also turns off if no one is working on the floor
- **Stormwater Management**
 - ▶ Rainwater is collected and stored for use in the irrigation system
 - ▶ Rain water from parking lots is drained through bio filters before being released to public sewer systems
 - ▶ Permeable Pavers the walkway and parking lot

(More Information: <http://www.honda.ca/environment>)



Photo (Left to Right): Underground rainwater harvesting tank; permeable pavement at parking lot; natural drainage; biofilter inlet; permeable pavement in Forecourt roundabout (Credit: Schollen & Company Inc.)