

Green airports

A Canadian Perspective

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One Team. Infinite Solutions



Biodiversity



Night sky



Silence

But we are here...



We have challenges



How to respond?



Both:

Sustainable initiatives, and
Reduction in operating costs

Vancouver International
Terminal Building





De facto standard

Commercial buildings /
urban settings

Not all points appropriate

Not all initiatives earn points

Point chasing

Greenhouse gases

Not the be all and end all
of Green...

Winnipeg International Airport

What is “Green”?

Words, words, words ...

The only real definition



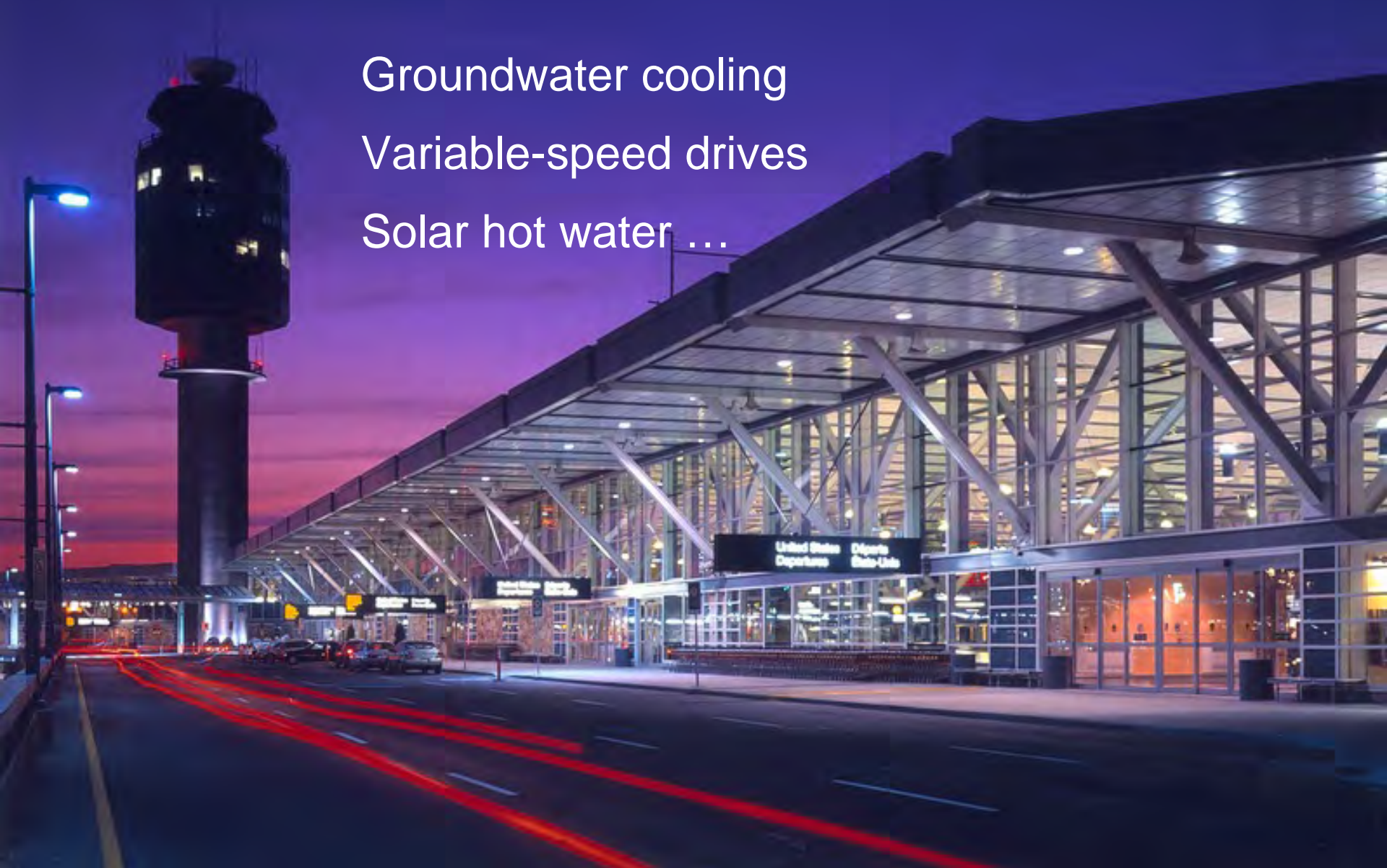
A way of existence
in which humans
(through all their works)
are contributing members
of the world eco system

The State of the Art

What has been done in Canada?

Vancouver Intl Airport

Groundwater cooling
Variable-speed drives
Solar hot water ...



YVR - Renewable Energy



800 gallons / day...

100% of dom. HW

1/3 of total demand

Boilers off in summer

Tenants: free hot water

\$90,000/year saving

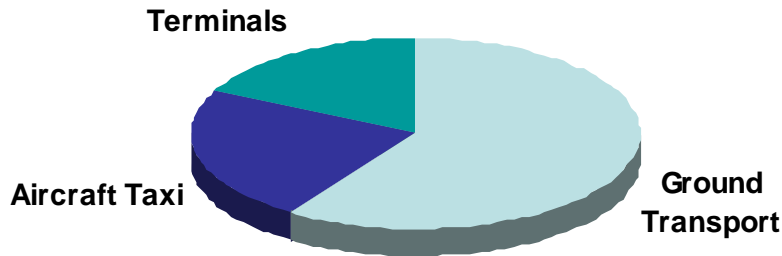
YVR - Ground Transportation



3.8% of Sea Island
emissions

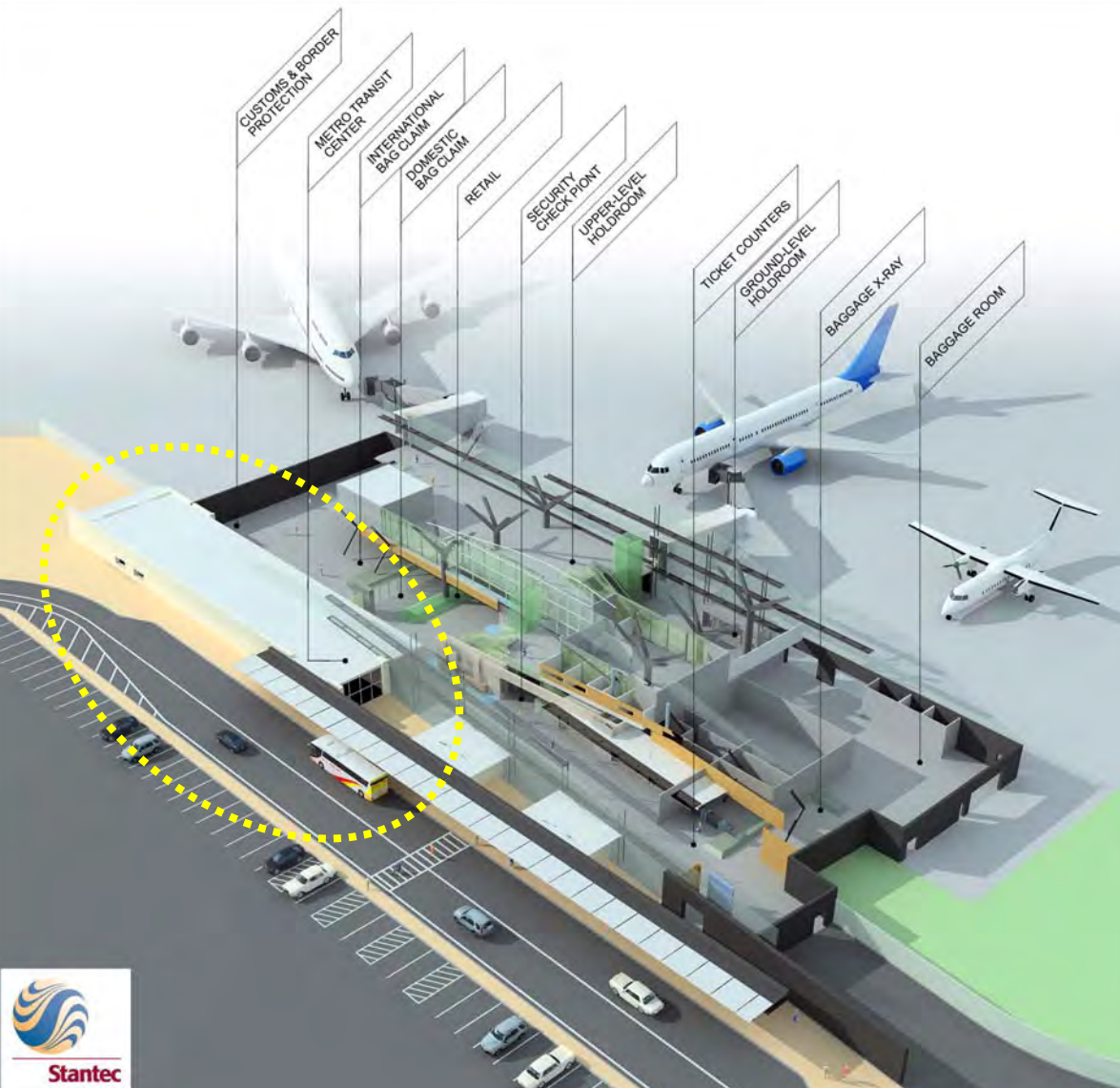
Taxi incentive program

Canada Line...



Manchester Airport GHG emissions

Niagra - Intermodality



Doesn't have to
be expensive

Municipal bus
station

Winnipeg International Airport

An aerial architectural rendering of the Winnipeg International Airport. The image shows a large, modern terminal building with a curved, white roof and a glass facade. To the left of the terminal is a large, multi-level parking lot filled with cars. To the right of the terminal is a wide tarmac area with several commercial airplanes parked at gates. The airport is surrounded by green grass and a clear blue sky with some clouds. The overall scene is a detailed and realistic representation of the airport's design.

LEED-registered
(targeting *Certified*)

Winnipeg - GHG Calculation



In an extreme climate...

Area m2	kwh/m2/yr	GJ/m2/yr	GHW/yr	GHG tonnes/yr
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Existing Terminal	41,500	397	1.43	16.48	3,361
Model National Energy Code	51,500	332	1.19	17.10	3,488
New Terminal Design	51,500	183	0.66	9.42	1,923
New Terminal Anticipated Actual	51,500	238	0.86	12.26	2,500

Annual GHG reduction comparing new terminal to existing terminal

-861

Annual GHG reduction comparing new terminal to Model National Energy Code

-988

Annual GHG reduction comparing new terminal to existing terminal, corrected for area

-1,068

Winnipeg - Wish list



- Boiler Flue – Heat Reclaim
- Boilers – High Efficiency
- Vestibules – Revolving Doors
- Geothermal Heat Pumps
- Green Roof
- Grey Water Recovery
- Heat Recovery – High Efficiency
- Heat Recovery – Super Efficiency
- Heat Recovery – Electrical Room
- High Efficiency Chillers
- Ground Effect Air Intakes
- Low Pressure Drop Piping/Ductwork
- Low Pressure Fan Systems
- Radiant Heating / Cooling
- Solar Wall
- Living Wall
- Wind Power
- High Efficiency Lighting
- Day-Lighting Controls
- Harvest Daylight / Light Shelves
- Photo-voltaics / Solar Collectors
- Super Building Insulation
- Triple Glazed Windows
- Regional Materials / Low Emitting
- LEED Certification
- CBIP Application
- Energy Rebate Program
- Indigenous Landscaping
- Construction Waste Management
- Recycled Content
- Rapidly Renewable Material
- Certified Wood
- Commissioning
- Displacement Ventilation
- Indoor Air Quality
- Water Use Reduction

 **Not Implemented**

 **Implemented**

Winnipeg - Features



Radiant flooring at departures level

Boiler efficiency at 95%

Energy model at 45% reduction in use

Heat recovery from retail tenants

Daylighting, + 75% of Public Space

Indoor air monitoring for CO2 and VOC's

Acoustic Treatment at ceilings and walls from
recycled sources

Recycled air filtration

Winnipeg Airport Parkade - LED Lighting



An architectural rendering of the Lynden Pindling International Airport terminal in Nassau, Bahamas, shown at night. The terminal is a long, modern building with a white facade and a series of illuminated glass wings. The interior lights are on, and the building is surrounded by a tarmac with several aircraft parked at gates. The sky is dark, and the overall scene is lit with a warm, golden glow from the building's lights.

Lynden Pindling Int., Nassau, Bahamas

Nassau - Features



Large overhangs

No Curtainwall

50% Glazing to Wall ratio



Edmonton International Airport

Edmonton, Alberta

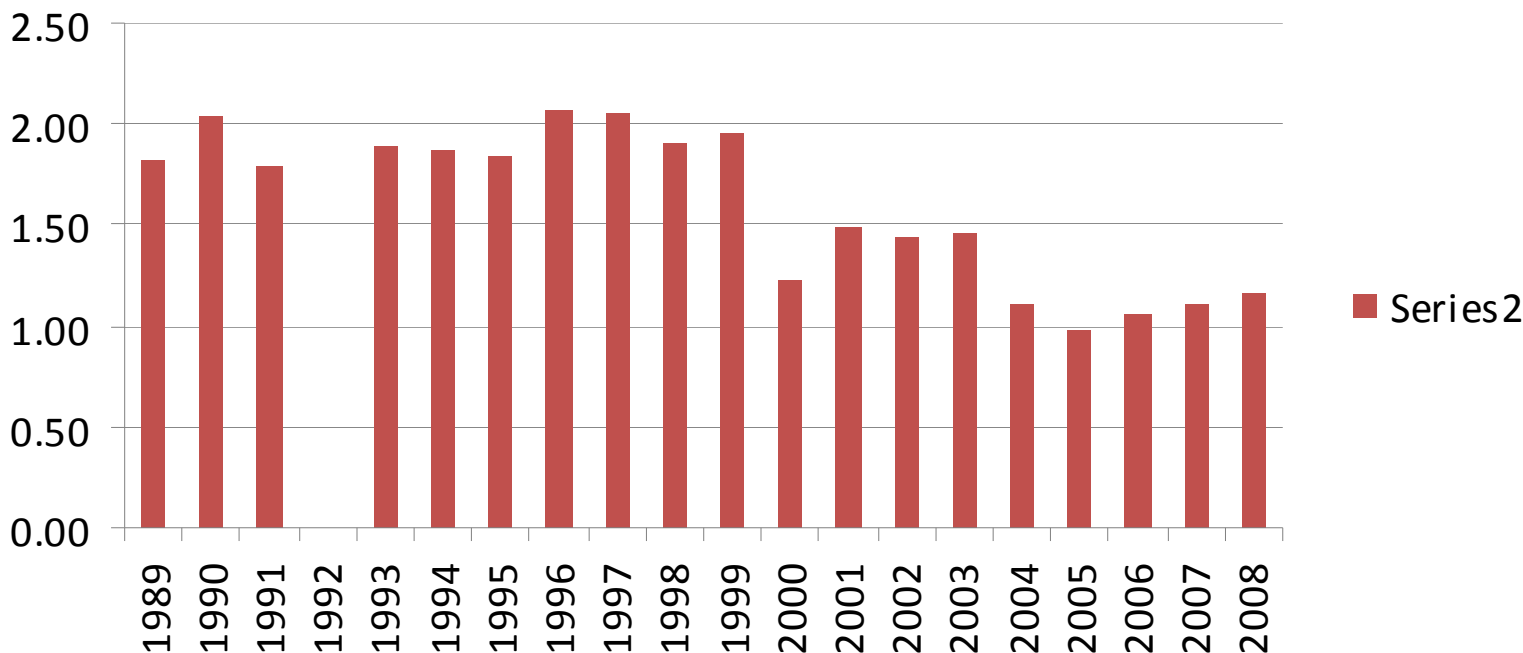


LEED-registered, targeting: *Certified*

EIA Building Heating



CUP/ATB heating performance GJ/m²/yr



Gas Usage 1996 ~2 GJ/m²

Gas Usage 2006 ~1 GJ/m²

EIA Carbon Footprint



EIA Carbon Emissions - Tonnes CO₂

Gas
15%



Electricity
85%

■ Electricity

■ Gas

Electricity 85%

- 30.9 GWH
- 28,718 tonnes of CO₂e

Gas 15%

- 25.9 GWH
- 4,923 tonnes of CO₂e

Total

33,641 tonnes of CO₂e

(Based on 2006 Data
Not all Site Issues Included)



LEED Canada-NC 1.0 Project Scorecard

31-Jul-09

Edmonton Airport - Air Terminal Building Expansion 2012
Edmonton, Alberta

Sustainable Sites					Possible Points: 14
Y	P	?	N		
1				Credit 1: Erosion & Sedimentation Control	1
				Credit 2: Site Selection	1
				Credit 3: Development Density	1
				Credit 4: Redevelopment of Contaminated Site	1
				Credit 5: Alternative Transportation: Public Transportation Access	1
				Credit 6: Alternative Transportation: Bicycle Storage & Changing Rooms	1
				Credit 7: Alternative Transportation: Alternative Fuel Refueling Stations	1
				Credit 8: Alternative Transportation: Parking Capacity	1
				Credit 9: Reduced Site Disturbance: Protect or Restore Open Space	1
				Credit 10: Reduced Site Disturbance: Development Footprint	1
				Credit 11: Stormwater Management: Rate and Quantity	1
				Credit 12: Stormwater Management: Treatment	1
				Credit 13: Heat Island Effect: Non-Roof	1
				Credit 14: Heat Island Effect: Roof	1
				Credit 15: Light Pollution Reduction	1

Water Efficiency					Possible Points: 12
Y	P	?	N		
				Credit 1: Water Efficient Landscaping: Reduce by 50%	1
				Credit 2: Water Efficient Landscaping: No Potable Use or No Irrigation	1
				Credit 3: Innovative Wastewater Technologies	1
				Credit 4: Water Use Reduction: 20% Reduction	1
				Credit 5: Water Use Reduction: 30% Reduction	1

Energy & Atmosphere					Possible Points: 25
Y	P	?	N		
1				Prerequisite 1: Fundamental Building Systems Commissioning	1
1				Prerequisite 2: Minimum Energy Performance	1
1				Prerequisite 3: HVAC&R System Energy Performance	1
2				Credit 1.1: Optimize Energy Performance: 50% New / 30% Existing	2
2				Credit 1.2: Optimize Energy Performance: 50% New / 30% Existing	2
1	1			Credit 1.3: Optimize Energy Performance: 50% New / 30% Existing	1
2				Credit 1.4: Optimize Energy Performance: 50% New / 30% Existing	2
2				Credit 1.5: Optimize Energy Performance: 50% New / 30% Existing	2
1				Credit 2.1: Renewable Energy: 5%	1
1				Credit 2.2: Renewable Energy: 10%	1
1				Credit 2.3: Renewable Energy: 20%	1
1				Credit 3: Best Practice Commissioning	1
1				Credit 4: Elimination of HCFCs and Halons	1
1				Credit 5: Measurement & Verification	1
1				Credit 6: Green Power	1

Note:
P = Pursuing credit but still vulnerable due to cost, product availability, unanticipated construction issues, etc.
? = Unsure if project can achieve, further review / calculations / research is ongoing.

Total Project Score					Possible Points: 70
29	8	8	25		

Materials & Resources					Possible Points: 14
Y	P	?	N		
1				Credit 1: Storage & Collection of Recyclables	1
				Credit 1.1: Building Reuse: Maintain 75% of Existing Shell	1
				Credit 1.2: Building Reuse: Maintain 100% of Existing Shell	1
				Credit 1.3: Building Reuse: Maintain 100% Shell, 75% Non-Shell	1
				Credit 2: Construction Waste Management: 75%	1
				Credit 2.1: Construction Waste Management: 75%	1
				Credit 2.2: Construction Waste Management: 75%	1
				Credit 3: Resource Reuse: Specify	1
				Credit 3.1: Resource Reuse: Specify	1
				Credit 3.2: Resource Reuse: Specify	1
				Credit 4: Recycled Content: 7.5% (consumer + 1/2 industrial)	1
				Credit 4.1: Recycled Content: 7.5% (consumer + 1/2 industrial)	1
				Credit 5: Regional Materials: 20% Extrajurisdictional	1
				Credit 5.1: Regional Materials: 20% Extrajurisdictional	1
				Credit 5.2: Regional Materials: 20% Extrajurisdictional	1
				Credit 6: Recycled Wood	1
				Credit 7: Recycled Wood	1

Indoor Environmental Quality					Possible Points: 12
Y	P	?	N		
1				Credit 1: Minimum IAQ Performance	1
1				Credit 2: Environmental Tobacco Smoke (ETS) Control	1
1				Credit 3: Carbon Dioxide (CO2) Monitoring	1
1				Credit 4: Increase Ventilation Effectiveness	1
1				Credit 5: Construction IAQ Management Plan: During Construction	1
1				Credit 6: Construction IAQ Management Plan: Before Occupancy	1
1				Credit 7: Low-Emitting Materials: Adhesives & Sealants	1
1				Credit 8: Low-Emitting Materials: Paints	1
1				Credit 9: Low-Emitting Materials: Carpet	1
1				Credit 10: Low-Emitting Materials: Composite Wood	1
1				Credit 11: Indoor Chemical & Pollutant Source Control	1
1				Credit 12: Controllability of Systems: Perimeter	1
1				Credit 13: Controllability of Systems: Non-Perimeter	1
1				Credit 14: Thermal Comfort: Comply with ASHRAE 55-1992	1
1				Credit 15: Thermal Comfort: Permanent Monitoring System	1
1				Credit 16: Daylight & Views: Daylight 75% of Spaces	1
1				Credit 17: Daylight & Views: Views for 90% of Spaces	1

Innovation & Design Process					Possible Points: 8
Y	P	?	N		
1				Credit 1.1: Innovation in Design: Living Wall	1
1				Credit 1.2: Innovation in Design: Educational Program	1
1				Credit 1.3: Innovation in Design: Educator Survey - Post Occupancy Evaluation	1
1				Credit 1.4: Innovation in Design: Low Mercury Lighting	1
1				Credit 1.5: Innovation in Design: Green Cleaning Program	1
1				Credit 1.6: Innovation in Design: Water Use Reduction 40%	1
1				Credit 1.7: Innovation in Design: Construction Waste Management 95%	1
1				Credit 1.8: LEED Accredited Professional	1

EIA - Water conservation



Storm water runoff
Storm water treatment

30% water use reduction
Grey water usage

EIA – Energy (at -40 degrees)



30% Reduction compared to reference building

Super insulation

High performance, triple glazing

Lighting

Heat recovery

Indoor Air Bio-filtration



How do you get to Green?

Some suggestions

Measure

Needs / Opportunities

Goals

Guidelines

Lead

An aerial photograph of a modern airport runway and taxiway system. The runway is a long, straight, dark grey strip running vertically through the center of the image. It is flanked by wide, green grassy areas. To the left of the runway, there is a series of circular and oval-shaped taxiways or parking areas. The surrounding landscape is a patchwork of green and brown fields, with some small buildings and roads visible in the distance. The overall impression is of a well-planned, integrated infrastructure project.

Living airports...

The future

Rian Burger
Stantec