White Rock Operations Building

A Case Study

For ARCH 684
Prof. Terri Meyer Boake

By Vincent Plouffe
December 2003

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White Rock, British Columbia

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Architect:	Busby & Associates Architects, Vancouver
Contractor:	KDS Construction
Engineering:	Flagel Engineering
Completed:	Summer 2003
Project Cost:	$1.34 million
Project Size:	661m^2 facility. (~6500 s.f.)
LEED Score:	Gold (44 / 69, registered)

Building entrance

The Greater Vancouver area has, for many years now, been promoting sustainable design in new construction as part of its policies, offering incentives and support for new developments and initiatives which choose to utilize the available technologies. A number of architectural firms in the area have become widely known as leaders in green design, and Busby & Associates Architects, based in Vancouver, are amongst them. The City of White Rock, located just south of Vancouver, has taken on the same challenge and has included in its policies a mandate which emphasizes the following design features for new buildings: improved air quality, enhanced liveability, renewable energy, energy conservation, water management, and solid waste reduction. All of these combine to make the LEED standard for sustainable design a perfect measure by which to determine desirable targets and goals towards which any new projects might strive. In the case of the new White Rock Operations Building, they achieved it with flying colours. For a capital cost increase of 8%, the project succeeded in reducing energy costs by 40%, allowing for amortization in 11 years.[1]

This case study will review the building from the perspective of the Green Building Rating System For New Construction and Major Renovation, otherwise known as LEED-NC (v2.1). This code, which stands for Leadership in Energy and Environmental Design, was established by the United States Green Building Council, and has been promoted over the last few years as a new standard and system of qualification for environmental design in architecture. The recently formed Canadian Green Building Council has been working to adapt the U.S. standard for usage in Canadian climates and building practice. For the purposes of this study, however, the U.S. standard will be used. The White Rock Operations Building is already certified by LEED, and is the first building in Canada to receive a gold rating. A gold rating is a score of thirty-nine to fifty-one out of a possible sixty-nine, with platinum rating covering the highest achievable level of the scale.

Sustainable Sites

Previously the site of an old sewage treatment plant, the building itself consists of two major components. The north building is two-storeys, and was built over the basement of the office component of the

[1] "Leading by Example"

old treatment plant. It now houses low-occupancy departmental elements such as field crew facilities, change rooms, a first aid room, lunch and meeting rooms. The south building is a single storey office component, and a deck and garden located on the roof. It re-uses the buried tank walls of the old sanitation plant as a foundation. The use of this abandoned treatment plant proved ideal to both the needs of the city and the intended goal of LEED certification, as LEED favours the re-development of old urban sites or previous building sites as part of its rating system. While the new operations building satisfied the requirements of re-use, however, the location was still considered to be too extra-urban to warrant earning the urban redevelopment credit, probably because of its small size and resulting low density. Similarly, that the building did not receive credit for redevelopment of a brownfield site seems highly unusual. Its previous use as a sewage treatment plant would seem to indicate that issues of site contamination would be a problem. Given that special effort was made to accommodate extensive, specialized landscaping to manage and filter water runoff, and soil infiltration, it would seem logical that some soil remediation might also have taken place. For reasons unknown, however, that particular credit was never granted to the project during its evaluation.

Wood Trellises and shading devices

The new building takes advantage of readily available alternative transportation methods, earning all of the related credits save that reserved for the use of alternative fuels. No credits were awarded for reduced site disturbance, however, either because of its previous incarnation as a treatment plant, or because it proved impossible to exceed the zoning green-space requirements by the necessary 25%.

In order to increase the efficiency of storm water management, on site, 376m^2 of asphalt paving was replaced by landscaping, and the remaining parking surface is composed of gravel to allow for rainwater infiltration.[2] Surprisingly enough, despite its previous incarnation, no special steps were taken to treat any of the water runoff from the site, though the landscaping was selected to minimize requirements of potable water use for maintenance.

Water Efficiency

Water management and efficiency is one of the primary areas of focus in the design of the new building. The desired goal was to reduce total site water use by 90%, and building water use by over 20%.[3] Site landscaping was carefully scrutinized to ensure that the selected plants would receive proper irrigation from any storm water runoff, and allow for maximum water infiltration. Special steps were also taken to ensure that runoff stemming from the construction process would not contaminate the local watershed.

The building itself collects rainwater, which is stored and used as a grey water supply for toilets, irrigation and washing vehicles on-site. Waterless urinals and low-flow faucets help control interior water use. Additional runoff from nearby city streets is also directed into the tanks, which provide a thermal mass that can be used to facilitate the heating and cooling of the building. The partial green roof on the south building serves a similar purpose, while also providing insulation. It serves as a component in the overall site water management system.[4]

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[2] ibid, Canadian Green Building Council
[3] Infrastructure News, Fall 2003
[4] "Leading by Example"

All of these efforts combine to earn the building a full five out of five possible points in the area of Water Efficiency, with regards to LEED criteria. This deceptively small category actually plays a considerable secondary roll throughout other sections of the standard, making careful water management a far more important factor in the overall score and achievement level of any project than might at first be apparent. In the case of this particular project, the invested effort would prove to be well worth it.

Photovoltaic Systems supply enough energy to heat the building 6-8 months out of the year.

Energy & Atmosphere

The largest of all six categories in the LEED standard, it boasts an available seventeen points out of a total possible sixty-nine. Energy cost savings are one of the oldest areas of sustainable design, and play a major part in the crucial decisions made about how and when to invest in sustainable design. In many cases, the result is an increased capital cost, with benefits reaped later in lower operating costs. In this particular case, the original investment increase was 8%, and the energy costs were reduced by over 40%. The original design strategy called for a reduced energy consumption of over 55% beyond that established by ASHRAE 90.1.[5] LEED offers up to ten points for energy optimization, depending on the level of efficiency achieved. The White Rock Operations Building scored an impressive eight.

Heating and cooling costs are minimized by the use of collected storm water and the green roof which both provide thermal mass. Low-energy heat pumps are also used to provide effective cost savings, though a gas-heating tank serves as a backup.

White Rock is located in one of the sunniest areas of Lowland British Columbia, and the project designers were quick to take advantage of it. Photovoltaic systems at the site are capable of generating over 5% of the power requirements of the building, and provide an annual cost savings of almost five thousand dollars. The system is monitored locally, by

[5] Project Summary, Busby & Associates Architects

remote control devices, and provides sufficient power to satisfy the building's heating demands six to eight months out of the year.[6]

Monitoring systems also control lighting throughout low-use areas of the building, minimizing energy use during periods of low activity. Even low-wattage signage and security lights were used in the effort to minimize consumption. The building's small size, and extensive glazing along the south face make efficient use of daylighting, while shading devices, large roof overhangs, and high-efficiency glass control summer sun penetration. The north face of the building, as well as non-view areas, have minimal openings and are otherwise covered by landscaping.[7]

Most of the building's LEED score in this section stems from energy optimization, though additional credits are obtained for the local generation of renewable energy, the complete absence of CFC and other materials harmful to the ozone, as well as investments in green power.

Materials & Resources

Despite the re-use of the basement and old storage tanks from the old sewage treatment plant in the new facility, the building still did not earn any credit for building re-use, which requires a minimum maintenance of at least 75% of the original building shell. Significant effort was made to minimize the impact of waste generated by the construction process, and in the recycling of building materials. 99% of the materials at the site were recycled, which avoided a half-million tons of landfill. Additional recycled materials used included: heavy timbers, wood decking, and insulation.[8]

The project did not receive creditation for the use of rapidly renewable resources, including certified wood products, but did meet the requirements for the re-use of 5% post-consumer products, including post-industrial recycled products. All materials for the projects were manufactured within 500km of the site.

Indoor Environment Quality

This category in the LEED standard offers the second largest number of points overall, with fifteen available, compared to the possible seventeen from Energy & Atmosphere. This project made extensive use of low-emission materials, including 40% content fly-ash concrete and water-based, non-toxic adhesives. The interior control systems, combined with exterior sun control devices (sunshades, overhangs, wall trellises, and deciduous trees in landscaping) to maximize environmental quality. Lighting systems combined general area lighting with independent, operator controlled station lighting and ventilation for greater versatility and comfort. Operable windows are present at all workstations, and interior glazing combined with the small building size to allow for maximized daylight penetration.[9]

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[6] Infrastructure News, Fall 2003; Project Summary, SPS Energy Solutions; Project Summary, Busby & Associates Architects

[7] "Leading by Example"

[8] ibid.

[9] ibid.

Innovation & Design Process

This final category allows for the disbursal of up to four points for design innovations not otherwise covered by the LEED certification process, and one additional point if a principal designer has completed a LEED professional exam – for which Busby & Associates Architects did qualify. Two additional points were granted in this particular case: the first for exemplary reduction in water use, and the second for exemplary performance in 98% CWM.

The new operations building ties into strategic plans outlined by the Greater Vancouver Task Group – a part of the Strategic Region Initiative organized over the last two years. The first point in the plan calls for a closer tie between infrastructure and new construction. What better example than a new, green, operations center?[10]

Conclusions

The White Rock Operations Building is certainly a major achievement in sustainable design. Scoring an impressive forty-four out of a possible sixty-nine points in the LEED standard, it became the first building in Canada to earn a gold rating from the Green Building Council. While the building itself is certainly an examplar of sustainable design considerations, several additional points are worth mentioning. The first is that this is a building of relatively small size, which minimize the risks sometimes associated with investing in green technologies, which still occasionally surface despite growing success and dependability of the systems involved. While a gold rating at any scale is nothing to scoff at, a moment must be taken to consider whether or not the same level of success might have been achieved for the same proportional costs if the building had been five time, ten times, or even twenty times the size of this one. While the list of sustainable design projects are growing, it is important to note that the vast majority of these projects tend to involve buildings of a smaller scale. With that in mind, an investigation of the affects of variable project size and scale on the difficulties of meeting LEED criteria might be worthwhile to determine if the standard can be fairly and appropriate applied to all projects, equally, regardless of scale.

Main building entrance, Close-up view.

The second point which bears consideration is that the White Rock Operations Building seems to have found and exploited some of the weaknesses in the standard, most especially the underestimated impact of water management in its secondary benefits. In contrast, however, some of the more significant components of the project, such as the extensive re-use of a pre-existing structure for foundations, went unrecognized as the project did not happen to meet the specific requirements outlined by the standard. While the underlying decisions are certainly consistent with the spirit and intentions of sustainable design, care must be taken to ensure that the term does not become constrained by the technicalities and requirements of a code which may not apply universally for the best possible results. LEED is a valuable tool for the promotion of green building, and is certainly worth aspiring to, but its dictates and boundaries cannot be considered as the final word on what is green, and what is not.

[10] ibid.

LEED
LEADERSHIP IN ENERGY & ENVIRONMENTAL DESIGN

Green Operations Building, LEED Project # 0225
LEED Version 2 Certification Level: GOLD
July 28, 2003

44 Points Achieved — Possible Points: **69**

Certified 26 to 32 points Silver 33 to 38 points Gold 39 to 51 points Platinum 52 or more points

8 Sustainable Sites — Possible Points: 14

Y			
Y	Prereq 1	**Erosion & Sedimentation Control**	
1	Credit 1	**Site Selection**	1
	Credit 2	**Urban Redevelopment**	1
	Credit 3	**Brownfield Redevelopment**	1
1	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
1	Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
	Credit 4.3	**Alternative Transportation**, Alternative Fuel Refueling Stations	1
1	Credit 4.4	**Alternative Transportation**, Parking Capacity	1
	Credit 5.1	**Reduced Site Disturbance**, Protect or Restore Open Space	1
	Credit 5.2	**Reduced Site Disturbance**, Development Footprint	1
1	Credit 6.1	**Stormwater Management**, Rate and Quantity	1
	Credit 6.2	**Stormwater Management**, Treatment	1
1	Credit 7.1	**Landscape & Exterior Design to Reduce Heat Islands**, Non-Roof	1
1	Credit 7.2	**Landscape & Exterior Design to Reduce Heat Islands**, Roof	1
1	Credit 8	**Light Pollution Reduction**	1

5 Water Efficiency — Possible Points: 5

Y			
1	Credit 1.1	**Water Efficient Landscaping**, Reduce by 50%	1
1	Credit 1.2	**Water Efficient Landscaping**, No Potable Use or No Irrigation	1
1	Credit 2	**Innovative Wastewater Technologies**	1
1	Credit 3.1	**Water Use Reduction**, 20% Reduction	1
1	Credit 3.2	**Water Use Reduction**, 30% Reduction	1

11 Energy & Atmosphere — Possible Points: 17

Y			
Y	Prereq 1	**Fundamental Building Systems Commissioning**	
Y	Prereq 2	**Minimum Energy Performance**	
Y	Prereq 3	**CFC Reduction in HVAC&R Equipment**	
2	Credit 1.1	**Optimize Energy Performance**, 20% New / 10% Existing	2
2	Credit 1.2	**Optimize Energy Performance**, 30% New / 20% Existing	2
2	Credit 1.3	**Optimize Energy Performance**, 40% New / 30% Existing	2
2	Credit 1.4	**Optimize Energy Performance**, 50% New / 40% Existing	2
	Credit 1.5	**Optimize Energy Performance**, 60% New / 50% Existing	2
1	Credit 2.1	**Renewable Energy**, 5%	1
	Credit 2.2	**Renewable Energy**, 10%	1
	Credit 2.3	**Renewable Energy**, 20%	1
	Credit 3	**Additional Commissioning**	1
1	Credit 4	**Ozone Depletion**	1
	Credit 5	**Measurement & Verification**	1
1	Credit 6	**Green Power**	1

6 Materials & Resources — Possible Points: 13

Y			
Y	Prereq 1	**Storage & Collection of Recyclables**	
	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 & 50% Non-Shell	1
1	Credit 2.1	**Construction Waste Management**, Divert 50%	1
1	Credit 2.2	**Construction Waste Management**, Divert 75%	1
1	Credit 3.1	**Resource Reuse**, Specify 5%	1
	Credit 3.2	**Resource Reuse**, Specify 10%	1
1	Credit 4.1	**Recycled Content**	1
	Credit 4.2	**Recycled Content**	1
1	Credit 5.1	**Local/Regional Materials**, 20% Manufactured Locally	1
1	Credit 5.2	**Local/Regional Materials**, of 20% Above, 50% Harvested Locally	1
	Credit 6	**Rapidly Renewable Materials**	1
	Credit 7	**Certified Wood**	1

11 Indoor Environmental Quality — Possible Points: 15

Y			
Y	Prereq 1	**Minimum IAQ Performance**	
Y	Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	
1	Credit 1	**Carbon Dioxide** (CO_2) **Monitoring**	1
	Credit 2	**Increase Ventilation Effectiveness**	1
	Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
1	Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1	Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
1	Credit 4.2	**Low-Emitting Materials**, Paints	1
1	Credit 4.3	**Low-Emitting Materials**, Carpet	1
1	Credit 4.4	**Low-Emitting Materials**, Composite Wood	1
1	Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1	Credit 6.1	**Controllability of Systems**, Perimeter	1
	Credit 6.2	**Controllability of Systems**, Non-Perimeter	1
1	Credit 7.1	**Thermal Comfort**, Comply with ASHRAE 55-1992	1
	Credit 7.2	**Thermal Comfort**, Permanent Monitoring System	1
1	Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
1	Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

3 Innovation & Design Process — Possible Points: 5

Y			
1	Credit 1.1	**Innovation in Design**: Exemplary Performance in 98% CWM	1
1	Credit 1.2	**Innovation in Design**: Exemplary Reduction of Water Use	1
	Credit 1.3	**Innovation in Design**:	1
	Credit 1.4	**Innovation in Design**:	1
1	Credit 2	**LEED™ Accredited Professional**	1

References:

1. “Leading by Example”, City of White Rock Policy Document
   http://www.sustainability.ca
2. “A Strategic Framework for Green Building in Greater Vancouver”,
   SRI Phase 2, Green Building Task Group
   http://www.gvrd.bc.ca/sustainability/SRI-Issue GroupReports/reports/
3. Infrastructure News, Fall 2003
   http://cse.gov.bc.ca/ProgramsAndServices/Canada-BCInfrstructureProgram/
4. Project Summary, SPS Energy Solutions
   http://www.spsenergy.com
5. Project Summary, Busby & Associates Architects
   http://www.busby.ca/0118WhiteRock/index.htm
6. Canadian Green Building Council
   http://www.cagbc.org
7. Ann White, “Interview with Alex Zimmerman”, Commercial Real Estate News, August 25, 2003.
   http://www.commercialrealestatenews.ca/interviews/AlexZimmerman/
8. United States Green Building Council
   http://www.usgbc.org

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