VALE LIVING WITH LAKES CENTRE

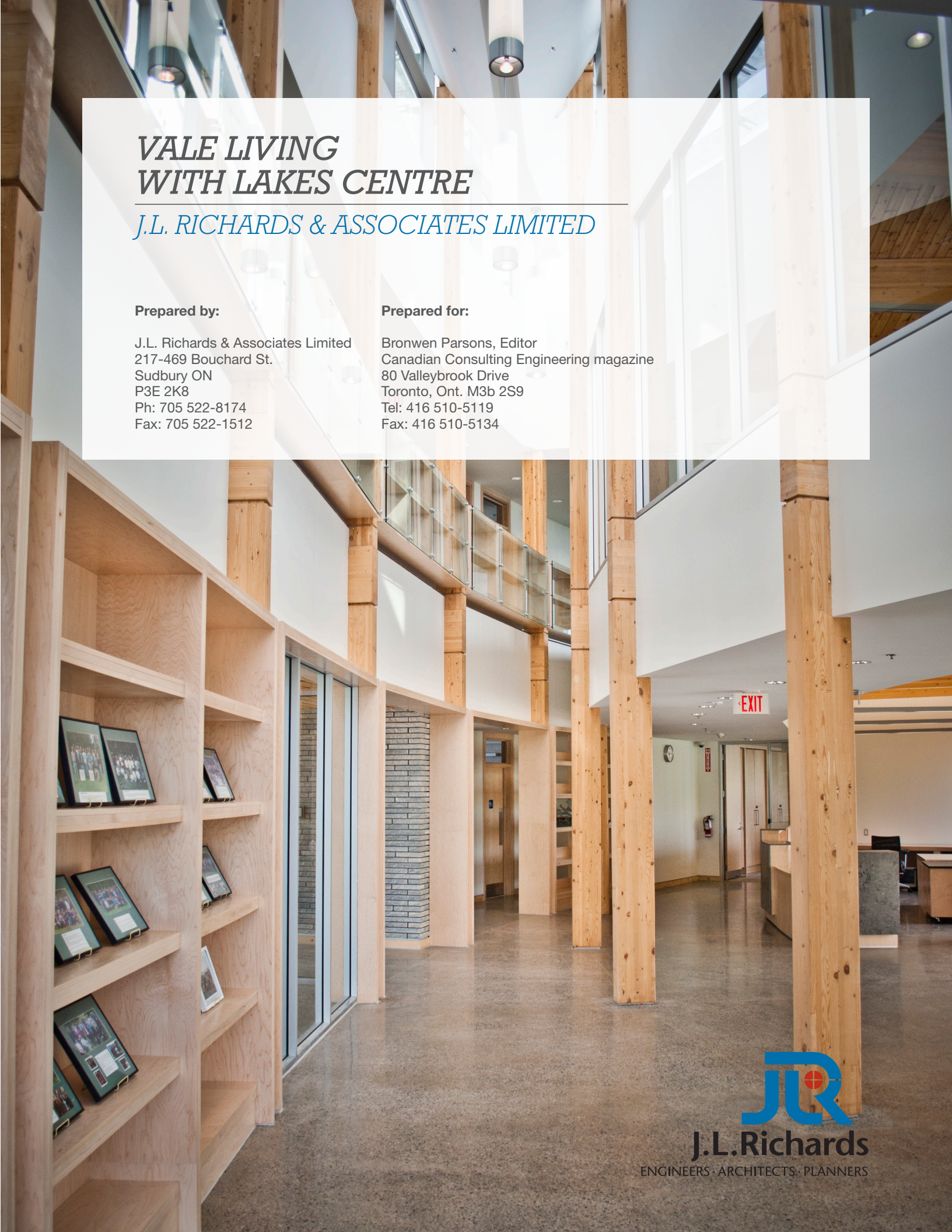
J.L. RICHARDS & ASSOCIATES LIMITED

Prepared by:

J.L. Richards & Associates Limited
217-469 Bouchard St.
Sudbury ON
P3E 2K8
Ph: 705 522-8174
Fax: 705 522-1512

Prepared for:

Bronwen Parsons, Editor
Canadian Consulting Engineering magazine
80 Valleybrook Drive
Toronto, Ont. M3b 2S9
Tel: 416 510-5119
Fax: 416 510-5134



J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

Laurentian University is home to one of the most environmentally sustainable laboratories in North America. The Vale Living With Lakes Centre (LWLC) is a $21M research facility which houses a unique partnership of scientists. The Client's goal to be a world leading sustainable research centre was embraced by the Design Team throughout all phases of the project. To ensure this result, the Design Team worked with the Client to develop a series of rigorous goals for the project. Selected through a quality-based selection process, J.L. Richards & Associates Limited provided prime consulting, engineering, architectural, and project management services for the project. Construction was completed one month ahead of schedule and within the project budget.

The goals for this project were sharply focused on the Client's current needs, as well as the anticipated needs for the long-term financial, operational, and environmental sustainability of the centre. The Client didn't want to just create a Green building, they wanted to create a building that would help them do their work more effectively now and for years to come.

From the very early stages of the project, the Design Team worked with the Client to holistically develop design concepts and to evaluate various technological approaches. There were two mottos that were repeated frequently throughout the project. They were: 1) Good engineering = good architecture, and 2) Nobody is as smart as everybody. The first design meetings were held on the future site of the project and included over 20 people including the entire Design Team, the clients, University personnel, City of Greater Sudbury officials, students, and community members. From these meetings a rigorous set of goals were developed. The project goals established early in the process would go on to become the DNA of the project. They helped guide virtually every design decision as the project moved forward.

With clearly articulated goals set for the project, the Design Team focused on delivering a design that would meet them. A number of technologies were considered early on to establish which systems can deliver the best results both from a performance and a financial perspective. Detailed cost benefit analyses were performed on various systems that ranged from a geo-exchange heating/cooling system, wind turbines, to triple glazed window systems. The systems that performed poorly were rejected. The systems that performed well on a financial, operational, and environmental basis are currently operating within the building today.

The project consists of two separate buildings, the Main Building, a two storey structure housing office, laboratory, teaching, and meeting spaces; and the Watershed Centre, a single storey structure that houses field crew operations, storage, and specialized facilities. The form and layout of the buildings work with the site topography and echo the shoreline of Ramsey Lake. The interior spaces provide a beautiful, healthy, and quiet work environment, offering spectacular views of the Ramsey Lake. Interior spaces are naturally day-lit and are provided with natural ventilation. Meeting and teaching rooms are outfitted with state of the art multi-media equipment allowing for web-based communication.

The Client was very concerned that the development of the project, both during construction and after, would not adversely effect the overall health of the lake and watershed. To address this concern, storm water management for the site is carefully considered and managed. Storm water on the site hits one of three surfaces; natural landscape, green roofs, or parking areas. The green roofs act as a sponge to slow storm water down, providing an initial level of polishing as it filters through the growing medium. The water is then diverted to two bio-swales within the parking area where a second level of polishing occurs through carefully selected plant species. The storm water is then deposited into a pond where it is held so that any particles can be allowed to settle. The pond acts as a cistern, storing water so that it can be pumped back into the building to be used to flush toilets or clean equipment and gear. Any overflow from the pond is outlet into a natural wetland that was protected during construction to receive a final level of polishing. Likewise, storm water that lands on the parking area is filtered through a permeable paving surface where, through filtration and a series of sub-drains, it is slowed and directed to the bio-swales or the pond. Finally, storm water that lands on the hillside beyond the Watershed Centre is directed towards the bio-swales or the pond. Prior to construction, a team of ecologists measured water conditions on the site to establish a baseline by which to measure the completed project against. The verification for post construction conditions is expected to be completed next summer, and all indications are that the system works as per the design intent. The water leaving the site is as clean or cleaner than pre-project conditions.

Often structural building systems minimally contribute towards sustainability because much of structural design is governed by codes and life safety principles. However, the selection of materials used within the structural system can contribute towards the sustainability of a project. Partly for this reason, wood was selected as the structural system for the project. No other structural system is produced using natural energy sources (i.e. sun, rain water, and nutrients from soil). In addition, wood offers tremendous carbon storage, minimizing the carbon footprint of the building. At the time of design, in 2006, eastern species of glue-laminated FSC timber material and Forest Stewardship Council (FSC) wood decking were difficult to source. Together with Woodworks! and local

mills, the Design Team developed supply sources that could produce the products from locally harvested materials. As a result, the FSC glue-laminated Jack Pine timber frame for the project was harvested in the Chapleau area, and produced in Northern Quebec. The FSC Red Pine wood decking within both buildings was harvested in the Chapleau area and produced in Thessalon. The Eastern White Cedar cladding on the exterior of the building was harvested and produced on Manitoulin Island. The use of wood throughout the project not only provides a beautiful interior space, it also reflects the spirit and sustains the economy of Northern Ontario.

In addition to the above, the design of the structural system minimized the use of steel in connections. The column to beam connections were achieved by embedding rebar within pre-drilled holes, forming a simple pin connection. Some plate and knife connections were required, but in each case the structural design aimed at minimizing the use of steel. The lateral loads of the main building are managed by wood clad shear walls in the short direction and a structural panelized system in the long direction. The structural Design Team developed a panelized system which was constructed on the ground while the framing of the building was installed. Once the framing was in place, the panels were flown up and bolted in place to steel connections at each column. This system was an extremely quick way to construct the building and was a significant factor in the project finishing one month ahead of schedule.

The energy target for the project came directly from the Client's belief that their organization should spend less on operating their building, so that they can maximize their hard fought research dollars on actual science. The Client calculated how much energy their former facility used (approximately $42,000 per year) and told the Design Team, that if the new facility could not operate using the same amount of energy, then they did not want the new buildings. The first part of meeting this goal was the design of a geo-exchange system that provided both heating and cooling for the building. A field of 40 wells drilled 350 feet within the bedrock form the heart of the system. The geo-exchange field feeds three heat exchangers that in turn feed manifolds for in-floor heating throughout both buildings. In addition, auxiliary VAV units provide top-up heating in extreme cold periods, and provide cooling in the summer. The ventilation system is equipped with an extremely efficient heat recovery system located on the second floor of the main building. The exterior skin of the buildings is comprised of a high performance building envelope. Horizontal exterior shading devices on the South façade make use of passive solar heat gain in the winter months and passive cooling in the summer moths. By using a holistic approach to building design, the two buildings are highly efficient and minimize the energy consumption so that the Client can focus their research dollars on science.

The roofs of both buildings are covered with a living roof system. The green roof provides additional insulation to the rooftop, protects the roofing membrane from the elements, and absorbs storm water on the rooftop. A unique result of the industrially damaged landscape in the Sudbury area is that wild blueberries thrive in the acidified soil. Naturally, the local species of wild blueberry was an immediate choice as the plant to cover the roofs of both buildings. The plants thrive in shallow soil, are drought tolerant, and are a local species. The Design Team developed a custom design for the roof top growing medium that would allow these plants to thrive. The plants were grown in greenhouses from clippings taken from plants found on the site. This will be Sudbury's first extensive green roof and it will be the only blueberry green roof in the world (to our knowledge).

It is difficult to discuss any one system within the Vale Living With Lakes Centre. As soon as you begin to discuss one system, it leads to a half dozen other systems that help contribute to the overall success of the design. The design carefully integrates all systems so that they work together, rather than independently. This level of complexity could only be achieved through an integrated design process. Working with all disciplines at the table allowed for cross fertilization of design principles so that in the end, the project is holistic.

The Client wanted to cast the net far and wide when it came to community input and consultation for the project. The Client themselves formed a "Core Review Team" who would direct the project design. This team included principals from the Cooperative Freshwater Ecology Unit, Laurentian University (LU) professors, members of the board of governors of LU, LU operations staff, City of Greater Sudbury Staff, LU Students, and members of the community. In addition, the project team made a number of presentations to the community ranging from open public forums held at City Hall, to presentations to the Mayor and City Council. The Design Team worked with all interest groups to develop a project that the entire community could be proud of.

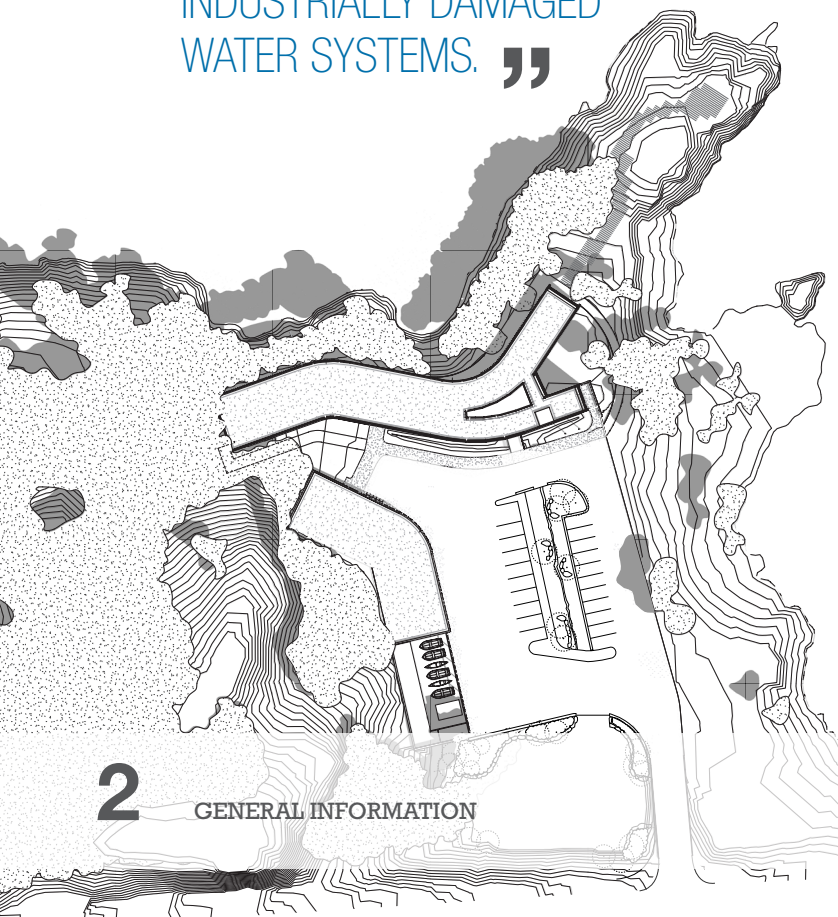
Despite it being a research facility, the building was designed to fit within the landscape, and to be a place the community would be proud of. The form of the building was carefully designed so that it was worthy enough to sit on the shores of Ramsey Lake. The building is purposely designed to be about the lake. To date, the client has been overwhelmed with requests for building tours, with well over 2,000 visitors over the past six months. The Vale Living With Lakes Centre has now become a resource for the public to learn about green building systems and design. The project serves as a benchmark for sustainable design, laboratory facility design and building design within Northern Ontario.

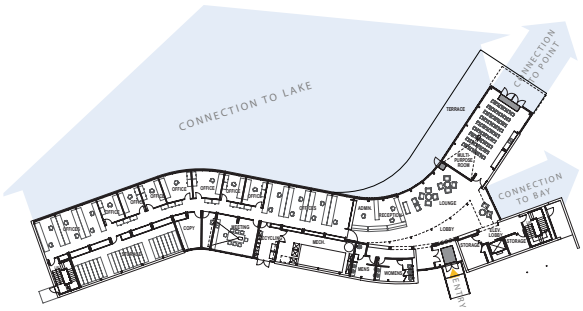
GENERAL INFORMATION

A UNIQUE CLIENT

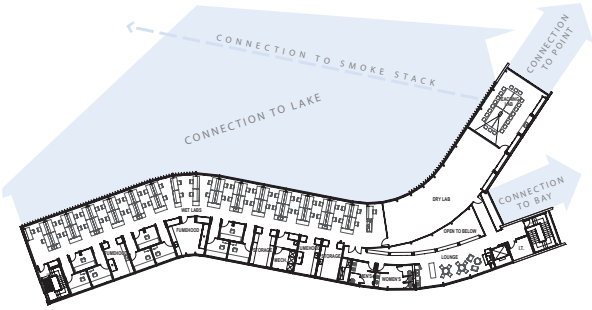
Laurentian University is home to one of the most environmentally sustainable laboratory buildings in the world, the Vale Living With Lakes Centre (LLC). This graceful building on the shores of Ramsey Lake houses a unique client. The users within the building form an organization called the Cooperative Freshwater Ecology Unit (Co-op Unit). There is no other organization of its kind in the world. It is a group of biologists from Laurentian University, the Ontario Ministry of Natural Resources, and the Ontario Ministry of the Environment. The group studies and monitors local watersheds with particular expertise in industrially damaged water systems. The Co-op Unit has become a world renowned scientific organization. It is through their vision, commitment, and desire to 'walk the walk' that the Vale Living With Lakes Centre has become the beautiful, functional, and engaging place that it is.

> "THE CLIENT STUDIES AND MONITORS LOCAL WATERSHEDS WITH PARTICULAR EXPERTISE IN INDUSTRIALLY DAMAGED WATER SYSTEMS."





GROUND FLOOR PLAN



SECOND FLOOR PLAN

A WATERSHED SITE

Laurentian University is situated on a 735 acres, bounding 5 lakes, that is mostly comprised of boreal shield landscape. The developed portion that forms the main campus sits almost entirely within a watershed that drains to two outlets into Ramsey Lake. The Co-op Unit, following their own mantra "Healthy land makes for healthy lakes", considered the entire Laurentian University watershed as their site with the Lakes Centre as a guardian of that watershed. As such, the development had to respect the watershed within which it sits, and contribute positively towards it.

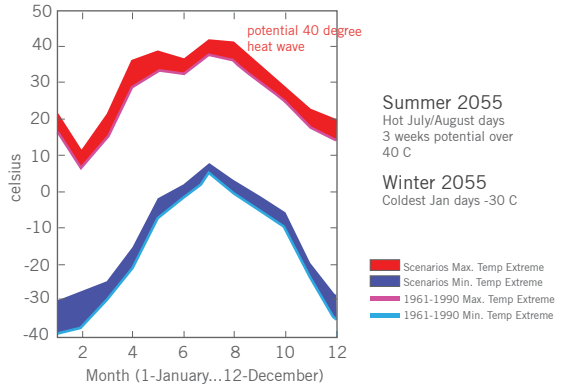
The Vale Living With Lakes Centre occupies a small area of previously developed land on the shores of Ramsey Lake. The existing site contained an old cottage, some industrial waste material (slag), an old sewage system, and remnants from previous structures along the shoreline. Ramsey Lake is the "largest freshwater lake found within a city" in the world and is the source of most of the city of Sudbury's drinking water. The small peninsula on the site contains a geological feature known as the Creighton Fault, which can be followed 1.8 km away to the west end of the lake within the ramp area of Science North. The peninsula is a much loved angling spot used by the community where walleye and bass can be caught from shore. The former Inco (now Vale) Superstack looms large to the west, a reminder of both the past environmental damage caused by industrial activity and the great strides made since to minimize environmental impacts of mining.

Related scientists within the university measured pre-project flora, fauna, water courses, flow rates, and water quality throughout the entire watershed. They established a baseline pre-development condition by which to use as a metric after project completion.

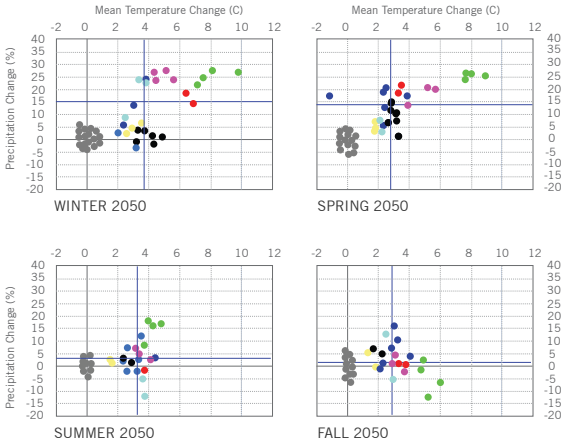
A BUILDING THAT CAN ACCOMMODATE CHANGE

The project had to accommodate a number of prescribed uses that are not uncommon to a water ecology laboratory facility. However, the Vale Living With Lakes Centre had to accommodate one important programmatic requirement above all: change. The interior spaces needed to be flexible and functional. They needed to be able to grow and shrink in the same way research budgets and related staffing and student numbers grow and shrink from year to year. In addition, the building design had to accommodate climate change. The Design Team was provided with climate models projecting altered conditions due to climate change to 2050. No building, to our knowledge, has been asked to accommodate this type of change.

Sudbury in a 2050 Climate



Extreme Temperature Range
2040 - 2069 Sudbury, Ontario



The coloured dots represent various climate model predictions of global warming in Sudbury

INNOVATIVE CONSULTING ENGINEERING PROCESS

TRULY COLLABORATIVE EFFORT

From the very early stages of the project, the Design Team worked holistically with the client to develop design concepts and to evaluate various technological approaches. There were two mottos that were repeated frequently throughout the project. They were:

1) GOOD ENGINEERING = GOOD ARCHITECTURE, AND
2) NOBODY IS AS SMART AS EVERYBODY.

The entire Design Team, including all engineering disciplines, attended all design meetings with the client. All members of the Design Team met on a weekly basis. All members of the Design Team developed the conceptual design of the project together so that all opinions and ideas were considered. Because of this inclusive design approach, the Vale Living With Lakes Centre has become a benchmark from which to measure engineering design and a source of pride within the community.

> "THE DESIGN TEAM WORKED HOLISTICALLY WITH THE CLIENT TO DEVELOP DESIGN CONCEPTS AND TO EVALUATE VARIOUS TECHNOLOGICAL APPROACHES."

WORKING WITH A DEDICATED CLIENT

The Co-Op Unit developed a group of stakeholder representatives that became known as the Core Review Team. The purpose of the Core Review Team was to actively participate in the design process, bringing a variety of stakeholder opinions to the table. The Core Review Team included primary researchers from the Co-op Unit, Laurentian University Biologists & Hydrologists, Laurentian University Physical Plant and Planning staff, a member of Laurentian University's board of directors, student representation, and the Chief Planner of the City of Greater Sudbury. The Core Review Team became our client.

The Staff of the Vale Living With Lakes Centre

RIGOROUS PROJECT GOALS

Through a series of design meetings with both the Design Team and the Core Review Team, a set of rigorous goals were established for the project. These goals became the DNA of the project and they helped guide virtually every design decision as the project moved forward. The project goals were as follows:

> “THE PROJECT GOALS BECAME THE DNA OF THE PROJECT AND THEY HELPED GUIDE VIRTUALLY EVERY DESIGN DECISION AS THE PROJECT MOVED FORWARD.”

1. Restore

1. The building itself will be a working lab rather than a showcase of environmental technologies.
2. The building will show rehabilitation of mining and industrial lands.
3. There will be education and outreach programs.

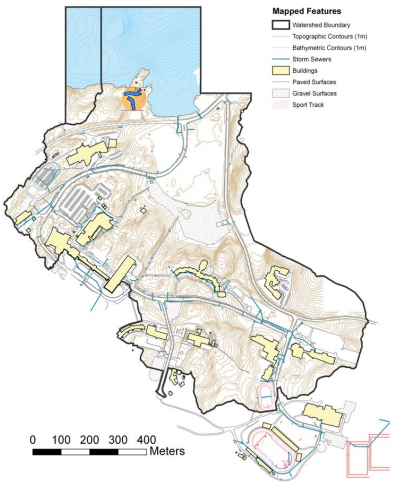
2. Reduce

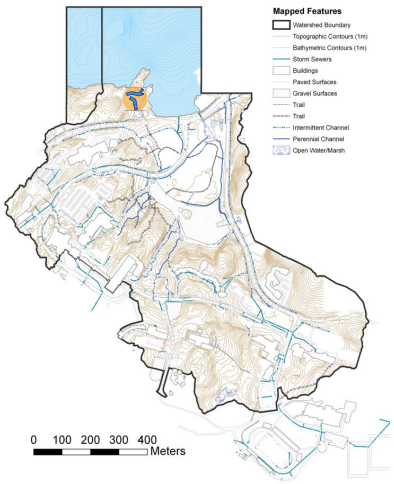
1. Reduce cost of operation and generate scholarship funding from energy savings. The annual operating budget will be less than $42,000.
2. Minimize our ecological footprint and assist in rehabilitation of Sudbury, including health of people and fauna.
3. Air and water pollutants coming from the site will be zero, with monitored proof.
4. Achieve Platinum level LEED certification.

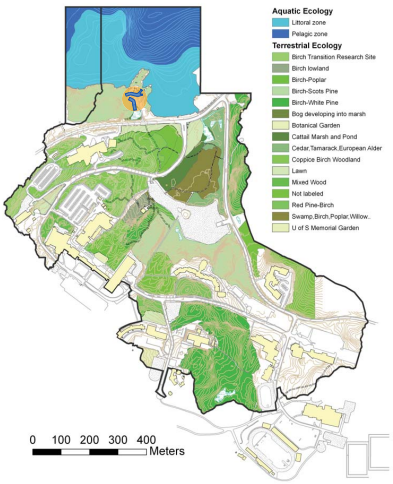
3. Renew

1. There will be focus on recruiting the best future staff and faculty.
2. There will be a focus on retaining the best equipment and technologies.
3. There will be a focus on expanding the foci of the LWLC to include health and engineering.
4. The LWLC will support the Northern Ontario wood industry.

Understanding Ecological Systems:
The Laurentian University Watershed







ENGAGING WITH THE COMMUNITY

Throughout the consultation process, the Design Team engaged the community through a number of public information sessions. These included presentations at the University, and to City Council, as well as open houses at the University and City Hall. In addition to these, presentations were made to the Ontario Ministry of the Environment, Laurentian University Board of Governors, and at the Co-op Annual General Meeting. These presentations were a means by which important feedback and input was provided to help shape the final design of the building.

> "THESE PRESENTATIONS WERE A MEANS BY WHICH IMPORTANT FEEDBACK AND INPUT WAS PROVIDED TO HELP SHAPE THE FINAL DESIGN OF THE BUILDING."

INVESTIGATION OF ALTERNATIVE SOLUTIONS

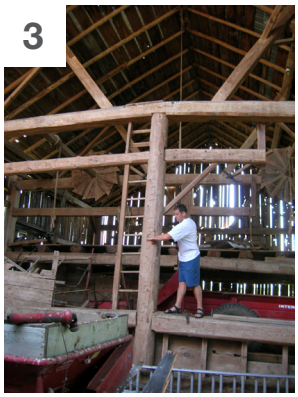
Early on in the development of the project, a number of steps were taken in the hopes of educating the Core Review Team and exploring alternative solutions that could be utilized within the Vale Living With Lakes Centre. The Design Team and the Core Review Team began this process by traveling to Vancouver to conduct a Green Building Tour. At the time, the highest concentration of sustainable building designs could be found in the lower mainland of British Columbia. This destination provided the biggest "bang for our buck". While on the tour, the Core Review Team was able to see first hand what sustainable building strategies were being employed and the Design Team was there to both learn and provide technical explanations where needed.

Later in the design process, alternative sources of wood were explored. These ranged from investigating blown-down barn structures to blown-down old growth white pine trees which were caused by a massive weather system on nearby Manitoulin Island. The final design of the building allowed for the use of alternative wood sources should they be available at the time of construction.

1. Wind Blow-Down White Pine
2. Red Pine Source Material
3. Reviewing wind Damaged Barn
4. Green Building Tour
5. Wind Damaged Barn

1


2


3


4


5


PROJECT SOLUTIONS

HOLISTIC BUILDING DESIGN

The Vale Living With Lakes Centre is designed with a 'whole' building concept so that all systems are interconnected with each other. One cannot discuss the mechanical heating and cooling system without also discussing the passive solar heat gain strategies, the building orientation, the green roofs, the stormwater management, and the parking areas. As in nature, all systems are intricately connected, so too is the Vale Living With Lakes Centre.

> "AS IN NATURE, ALL SYSTEMS ARE INTRICATELY CONNECTED, SO TOO IS THE VALE LIVING WITH LAKES CENTRE."

GROUND BREAKING CIVIL ENGINEERING

The building deliberately echoes the shoreline of Ramsey Lake, conceptually defined by the lake. As a guardian of the Laurtentian University watershed which flows into Ramsey Lake, the development could only contribute positively to the health of the Ramsey Lake Watershed. To address this concern, storm water management for the site was carefully considered and designed. Storm water lands on one of three surfaces; natural landscape, green roofs, or parking areas. The green roofs act as a sponge and slow storm water down and provide an initial level of polishing as it filters through the growing medium. The water is then diverted to two bio-swales within the parking area where a second level of polishing occurs through carefully selected plant species. The storm water is then deposited into a pond where it is held so that any solids can be allowed to settle. The pond acts as a cistern, storing water so that it can be pumped back into the building to be used to flush toilets or clean equipment and gear. Any overflow from the pond is outlet into a natural wetland that was protected during construction to receive a final level of polishing. Likewise, stormwater that lands on the parking area is filtered through a permeable paving surface where through filtration and a series of sub-drains, it is slowed and directed to the bio-swales or the pond. Finally, storm water that lands on the hillside beyond the Watershed Centre is directed towards the bio-swales or the pond. The net result is all stormwater is treated for both quantity and quality on site and 100% of storm water is diverted from municipal systems. In addition, stormwater leaving the site is as clean or cleaner than if the project had not existed.

Prior to construction, a team of ecologists measured water conditions on the site to establish a baseline by which to measure the completed project against. The verification for post construction conditions is expected to be completed this summer, and all indications are that the system functions as per the design intent.

During construction, blast rock taken from the site was processed and recycled. The re-purposed material was used as engineered backfill throughout the development. This reduced the need for virgin quarried product by approximately 75%. Existing contaminated industrial waste material (slag) found on site was removed and placed within the development in order to neutralize it to prevent further leaching into the watershed.

1


2


3


1. Pond During Construction
2. Permeable Pavers Being Installed
3. Silt Mitigation and Disturbance Boundary During Construction

PROJECT SOLUTIONS

INNOVATIVE STRUCTURAL ENGINEERING

The decision to use a wood structure for the project was made early on in the consulting process. Wood is the only structural building material that grows and the unfinished wood structure provides a beautiful working environment for the building users. The glue-laminated columns and beams are made from Forestry Stewardship Council (FSC) jack pine harvested 250 km north-west of the site. The FSC red pine structural decking was harvested 240 km north-west of the site and processed 200 km south-west of the site. It was important to use locally available forest products and producers to both minimize carbon generated from transportation as well as support a struggling local wood economy.

One important factor in the Design Team's decision to use wood throughout the project was the extremely low carbon footprint inherent in wood. The total volume of solid wood used was 526 cubic metres. This translates to 434 metric tonnes of carbon dioxide sequestered. In addition, the project avoided another 912 metric tonnes of carbon dioxide (the amount of carbon dioxide generated by using typical steel and concrete structures). The amount of carbon dioxide sequestered and avoided is equivalent to removing 275 cars off the highway for a year.

One has to look closely at the details of the wood structural system in order to find innovation and creativity. Steel is minimized at all wood to wood connections and a simple pin connection is used. Beams arrived at the site with steel pins installed and held in place with an epoxy glue. The columns arrived with pre-drilled holes to accept the steel pins and were connected on site using epoxy glue. This connection detail reduced the amount of steel in these locations by approximately 90%. It also proved to be a very quick installation method, contributing to a reduction in schedule.

The main building is very long and built without perimeter beams in the east-west direction. In order to stiffen the structure in the long direction, the structural Design Team created a structural panel system. Structural panels were constructed on the ground while the main structure was being erected. The panels both acted as stiffening elements and formed the exterior building envelope. Each panel used a steel connection detail at each corner that transferred loads in the long direction to the columns. The panels were swung up and fastened in place. This system was remarkably fast to install and contributed significantly to the reduction in construction schedule.

1

2

1. Panels Being Constructed
2.Wood Structure Under Construction

> "THIS SYSTEM WAS REMARKABLY FAST TO INSTALL AND CONTRIBUTED SIGNIFICANTLY TO THE REDUCTION IN CONSTRUCTION SCHEDULE."

In making material choices we looked for local and natural products within 500-600 km of the site, to reduce the buidling's carbon footprint.

HIGH PERFORMANCE MECHANICAL ENGINEERING

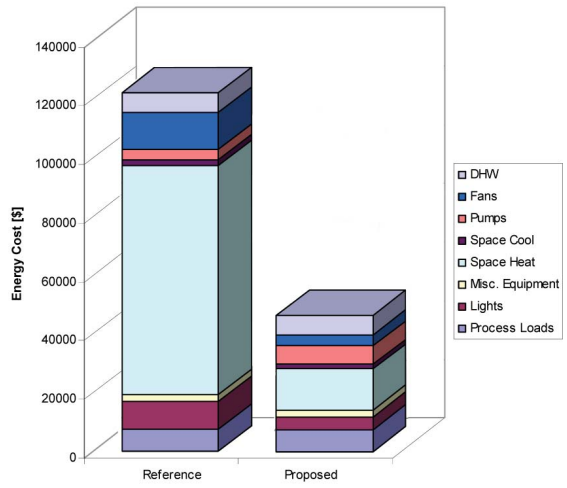
Early in the consulting process, the client set a very rigorous energy target for the project. The first step in meeting this goal was the design of a geo exchange system (geo thermal system) that provides both heating and cooling for the building. A field of 40 wells drilled 350 feet within the bedrock below the parking area form the heart of the system. The geo exchange field feeds three heat exchangers that in turn feed manifolds regulating in-floor heating throughout both buildings. In addition, auxiliary VAV units provide top up heating in extreme winter time periods and cooling in the summer. The low pressure ventilation system is equipped with a heat recovery system located on the second floor of the main building. The geo exchange system is recharged in the shoulder seasons through a fluid cooler unit located on the roof. This takes ambient, warm, outside air and transfers it into the ground to offset the higher heating loads experienced in Northern Ontario. The exterior skin of the buildings is comprised of a high performance building envelope. Horizontal exterior shading devices on the south façade make use of passive solar heat gain in the winter months and passive cooling in the summer months. By using a holistic approach to building design, the two buildings achieve a 77% reduction in energy use (compared to the MNECB model building) or a 35% reduction in energy compared to a high efficiency natural gas system.

The building is outfitted with a sophisticated building automation system (BAS). Sensors and meters are located throughout the building to ensure the indoor air quality is excellent and human comfort is high. All utilities are metered and tracked. The BAS and metered data are fed to an energy information platform. This is an interactive display and tracking system that provides real time feedback on the energy/utility use of the project. The interface for the system is a 42” touch screen display located at the main entrance of the building. Users and visitors can access real time information that shows how the building is performing.

The stormwater management system includes a pond that doubles as a cistern. Water is collected and stored to be recycled as grey water. Grey water is used to flush toilets in the buildings, for irrigation of the green roofs, and to wash down field equipment to prevent invasive species from transferring from lake to lake. The grey water recycling system has reduced potable water use by over 75%.

> “BY USING A HOLISTIC APPROACH TO BUILDING DESIGN, THE TWO BUILDINGS ACHIEVE A 77% REDUCTION IN ENERGY USE...”

Energy Performance



EXCELLENCE IN ENERGY:
77% Reduction = $75,000 annual savings

CREATIVE ELECTRICAL ENGINEERING

The building is 90% day-lit, meaning that 95% of indoor spaces have sufficient natural light during average daytime conditions. In order to further reduce electrical loads, the lighting system throughout the building was designed with high efficiency fixtures. In all office and lab spaces, a sophisticated daylight harvesting system was installed. Through a combination of light level sensors and occupancy sensors, lights are dimmed from 0% to 100% so that lighting is only provided where and when it is needed. The net result is a 70% reduction on electricity use for space lighting.

> "THE BUILDING IS ACTIVELY HELPING TO NEUTRALIZE THE ACIDIC WATERSHED OF WHICH IT IS A PART. POETICALLY SPEAKING, THE BUILDING IS HELPING TO HEAL THE LANDSCAPE OF ITS INDUSTRIALLY DAMAGED HERITAGE."

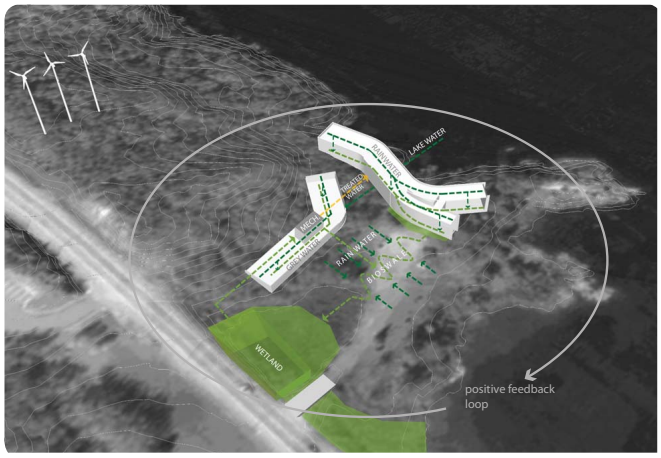
Daylighting Vale Living With Lakes Centre

ENVIRONMENTAL STRATEGIES

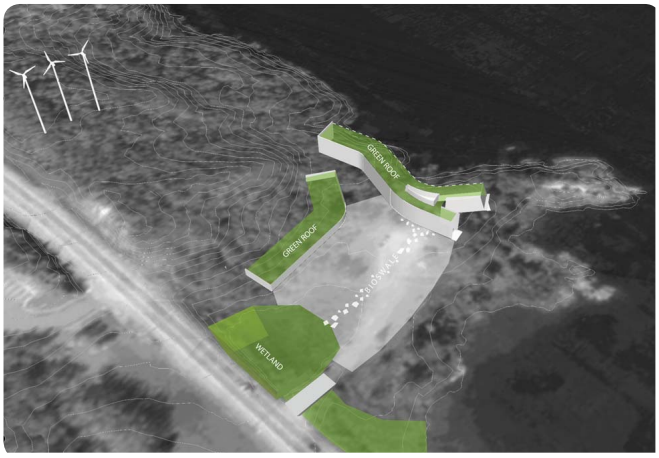
The Vale Living With Lakes Centre makes use of many environmental strategies, most of which are intertwined with one another. Systems and approaches such as the geo exchange heating and cooling system, passive solar heat gain, passive cooling, exclusive use of FSC wood products, sourcing local materials, grey water recycling, excellent indoor air quality, daylight harvesting, construction waste diversion, solar domestic hot water heating, and the use of green roofs are not unique to this project, but contribute significantly towards the Core Review Team's goals, one of which being the achievement of a LEED Platinum designation. There are three additional environmental strategies that are very unique to this project and cannot be scored within a rating system.

One of the members of the Core Review Team is a climate change expert. During design meetings, there was a lot of discussion regarding climate change and how it may affect the project in the future. Eventually, the goal was set that the building would be designed so that it could easily accommodate climate change and the projected environmental conditions in 2050. A climate change model was supplied to the Design Team and analysis was conducted to ensure that the building could function within the modeled conditions for 2050. To our knowledge, no other building in the world has been designed for climate change.

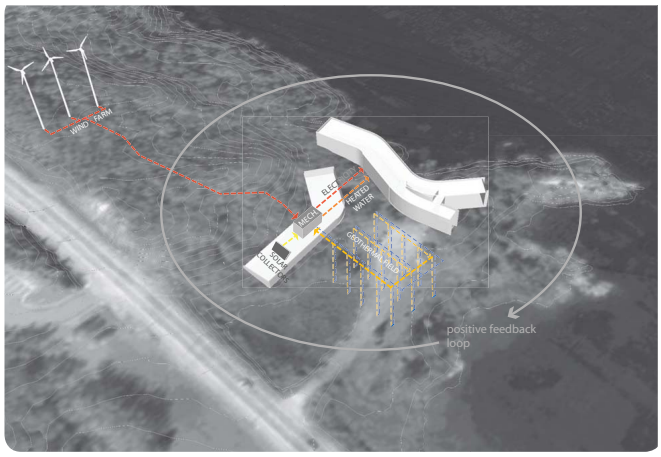
Most building sites begin and end at a property line. The second unique environmental strategy employed by the Vale Living With Lakes Centre was guided by the concept that the



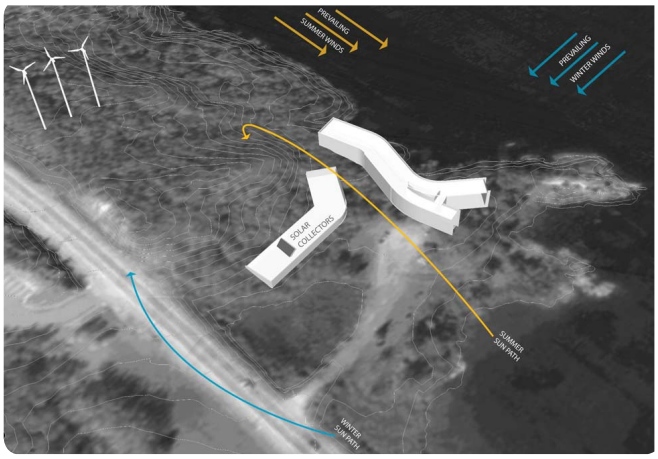
Stormwater Cleaning



Reduced Energy



Healing the Watershed

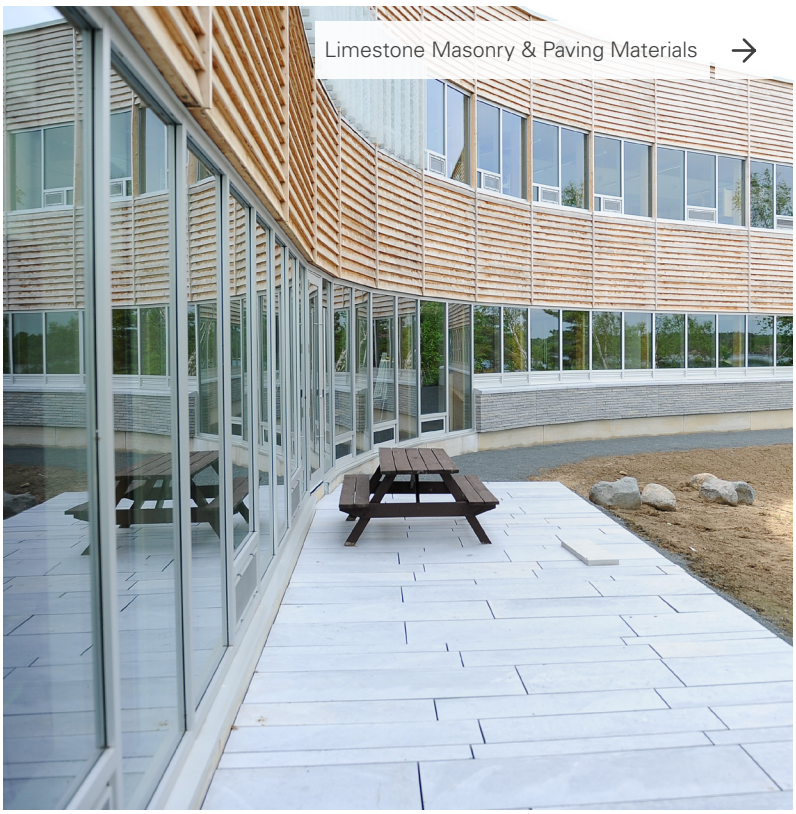


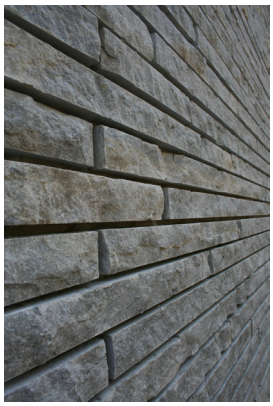
Renewable Energy

ENVIRONMENTAL STRATEGIES CONTINUED

site is part of a much larger watershed and that development contributes to the watershed either positively or negatively. Early on in the consulting process the Core Review Team set the goal that the project would have a positive contribution to the watershed within which is sits. This is a drastically different approach to engineering design and a radically different concept of land use. In order to provide a baseline record for the Laurentian University watershed, the Core Review Team tasked a related group of scientists, hydrologists, and students to measure the pre-project flora, fauna, watercourses, flow rates, and water quality throughout the entire watershed. The idea was that they could compare the baseline information gathered before the project with the measurements after the project has been completed and ensure that the Design Team attained their project goal. The post completion testing is currently underway and all indications are that the goal of contributing positively towards the watershed has been met. To our knowledge, no other project has included the watershed within which it sits as an extension of its site and no other project has been measured as rigorously with respect to watershed health.

The area around Sudbury is widely recognized as one of the most devastating industrially damaged landscapes in the world. At one point in the 1960's the Inco Superstack was the single largest point source of pollution in the world. This is an unpleasant heritage, but counter intuitively, it has resulted in some remarkable environmental achievements. A number of members of the Core Review Team were responsible for the science and implementation of the world's largest re-greening effort. In addition, some of these same scientists developed techniques in neutralizing acid damaged lakes and watersheds so that plant and fish species could return to the area. These techniques included adding lime to the damaged waterbody to first neutralize the acidic water. Once the pH was brought to a natural level, plant species re-established and soon fish species were re-introduced or migrated back into previously inhospitable habitat. Learning from these techniques, the Vale Living With Lakes Centre makes use of limestone on the façade of the building and throughout the development. As rainwater hits the limestone surfaces, it pulls off tiny particles with it. These lime particles find their way slowly into the greater watershed. In a small way, the building is actively helping to neutralize the acidic watershed of which it is a part. Poetically speaking, the building is helping to heal the landscape of its industrially damaged heritage. To our knowledge, no other building in the world helps to heal the landscape within which it is located.





PROJECT SOLUTIONS

SOCIAL RIPPLES

The Vale Living With Lakes Centre has irreversibly affected the City of Greater Sudbury in many ways. The construction of the project as well as sourcing of local materials and labour not only brought hundreds of jobs to the community, but it also built value added expertise within the participating companies. In addition, it has become an example of what sustainable building design can accomplish. The users of the building have already conducted tours to over a thousand visitors to the Lakes Centre. Each visitor experiences a positive example of environmental strategies such as natural shorelines, sustainable building products, and the concept of a healthy watershed. The building has become a point of pride within the city and a counterpoint to the region's industrial heritage.

The orientation of the building and site deliberately maintains access to the peninsula to the north-east. Anglers can be seen fishing on most evenings through the summer months catching fish, just as in previous years when the project had not yet been built. They can also take advantage of the expert knowledge nearby and approach field crew, students, and staff to ask questions or learn about the watershed and the fish species that dwell within it.

ECONOMIC EFFECTS

The energy target for the project came directly from the Client's belief that their organization should spend less on operating their building, so that they can maximize their hard won research dollars on actual science. The Client calculated how much energy their former facility used (approximately $42,000 per year) and told the Design Team, that if the new facility could not operate using the same amount of energy, then they did not want the new buildings. This target governed all discussions regarding energy efficiency within the project. In order to meet this target, the project had to realize a 77% reduction in energy use compared to the model building. This target far exceeds those set within the LEED rating system.

The Core Review Team also recognized that recruitment and retention of students and staff was vital to the long term feasibility of the Vale Living With Lakes Centre. The organization knew that they could not afford to entice top students with economic incentives, however they could offer students and staff something that no other facility could offer. The Centre could offer students a work environment where every working space, whether it is a lab or a workstation, has a spectacular view to a pristine northern Ontario lake. They could offer the opportunity for students and staff to work in a building that is environmentally sustainable and contributes positively to the watershed. These economic factors are hard to quantify, however the increase in graduate student applications received in the last six months has been approximately 50% compared to pervious years.

> "THE INCREASE IN GRADUATE STUDENT APPLICATIONS RECEIVED IN THE LAST SIX MONTHS HAS BEEN APPROXIMATELY 50% COMPARED TO PERVIOUS YEARS."

BUDGET

The total project budget for the Vale Living With Lakes Centre is $21M. The construction value for the project was $15.6M. The project was constructed under the established budget. In addition, total non-owner directed change orders (i.e. does not include wish list items or added items) is 3.0% of construction value. This is well below industry expectations for new construction.

The project cost per square foot sits within a typical building cost for laboratory buildings (Handscombe benchmark). All premium cost items such as the geothermal heating & cooling system underwent a detailed cost benefit analysis so that the Core Review Team could make educated decisions. Payback periods were reviewed and factored into all decisions. Many strategies were eliminated early on because their payback period was excessive or unattainable. By placing all pertinent budget information in the hands of the client, decisions could be made with confidence.

SCHEDULE

The construction of the project began in June of 2009. The original construction schedule was 16 months long with a completion date of March 1, 2011. The project was completed one month ahead of schedule. Working with the Contractor to analyze the improved construction schedule, the Contractor attributed the speed of construction with three factors:

1. The simple steel pin details at the wood to wood connections were extremely quick and easy to install;
2. The panelized building envelope/structural panels were very quick to install and achieved a high level of quality control because they were fabricated on the ground; and
3. The contract documents were complete and did not cause delay in the field.

> "THE PROJECT WAS COMPLETED ONE MONTH AHEAD OF SCHEDULE."

IMPACTS ON THE PROFESSION

A NEW HIGH WATER MARK

The Vale Living With Lakes Centre has set a high standard for building design by which all future sustainable building projects will be judged. The Design Team's engineering innovation has resulted in a number of unprecedented strategies that transform the building from a static structure to an active element that contributes positively to the ecosystem that surrounds it. Stormwater leaving the site is cleaner than if the project had not been constructed and contains particles that will help reverse the damage caused by 100 years of industrial activity. This concept of building something which will continually improve the site fundamentally changes the relationship between the built environment and natural environment.

PRIDE OF THE COMMUNITY

From the moment the final design was presented to the public, the Vale Living With Lakes Centre has been embraced and celebrated within the community. Without exception, the building has received positive attention with well over 1000 visitors visiting and touring the site in the 12 months it has been occupied. The building's public spaces are booked regularly for both public and private events which range from art exhibitions to private receptions, and from public announcements to industry conferences. Not only does the project contribute positively to Sudbury's natural environment, but it also contributes to the social environment, where the Vale Living With Lakes Centre has become a source of pride within the community.

> "MOST BUILDINGS NEVER MEET ONE'S EXPECTATIONS. THIS PROJECT NOT ONLY MEETS THE EXPECTATION, IT SURPASSES IT. YOU SHOULD BE VERY PROUD OF WHAT YOU HAVE DONE."

THE COMPLETED PROJECT

The Design Team and the Core Review Team for the Vale Living With Lakes Centre can quite confidently say that all goals set for the project have either been met or are nearing completion (i.e. LEED Platinum designation). This is no small accomplishment. Perhaps the best expression of the success of the project was made by a member of the Core Review Team, Dr. David Pearson, when he said:

Most buildings never meet one's expectations. This project not only meets the expectation, it surpasses it. You should be very proud of what you have done.


EXIT