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CONTENTS

Message from the Executive Director
Canada at 150: The important role aggregate played in the construction of Ontario's public buildings from Kingston to Ottawa
Opening young minds: Envirothon helps raise student awareness of aggregates with a new module dedicated to the topic
The future of aggregate technology (is here):Experts turn to drones for better and safer aerial siteimaging and stockpile managementBy Matthew Bradford
Building a great career: CBM Aggregates' Ryan Held sets hissights on a successful career in aggregates22
A helping hand: TOARC's Danielle Solondz enjoys her role in helping landowners rehabilitate their land
Road building 101: Ever wonder what's involved in building a road?Hint: aggregates are used at every stage28By Matthew Bradford
Rock solid: How a 19th-century gravel pit became a\$20-million tourist attraction at the Royal Botanical Gardensin BurlingtonBy Sarah B. Hood
A winning streak: Three past winners of the OSSGA Student Design Competition gauge the impact on their careers
Advertisers' Index
The Final Rehab: Lakeland Estates



Gearing up for change

he times they are a changing. I know, I know – it's been said before. In fact, Dylan recently won the Nobel Prize in literature for (among other things) making that very observation. But like all true things, it's worth repeating.

Ontario is experiencing a huge amount of change and we have to be ready for it. We're catching up for years of under-investment in infrastructure. That means we're repairing roads, bridges, transit and water mains. On top of that, Ontario's population is projected to grow by 30 per cent, or almost 4.2 million, over the next 26 years, from an estimated 13.8 million on July 1, 2015, to more than 17.9 million by July 1, 2041.

That means we also have to build. A lot. We are expecting increased investment in infrastructure which means even more roads, bridges, transit and water mains (as well as retail outlets, schools and hospitals). Everyone, from all levels of government to industry to community groups, needs to grapple with how to handle that growth.

Where do we get the materials from? How can we ensure that we keep the costs of all this development under control to keep the price down? How do we protect the environment and develop policies that ensure we are all responsible stewards of the planet? How do we satisfy the competing demand for that scarcest of resources: land?

These are big issues. And these are the issues that the government and the aggregate industry are currently grappling with. The provincial government has tabled legislation to revise the *Aggregate Resources Act*.

They are also nearing completion on their ambitious, coordinated review of the Greenbelt Plan, the Oak Ridges Moraine Conservation Plan, the Niagara Escarpment Plan and the Growth Plan for the Greater Golden Horseshoe. As if that weren't enough they are also looking at how planning decisions are made through a formal review of the Ontario Municipal Board. That's a lot of change.

Throughout this important work, OSSGA's position is simple and consistent. To ensure that Ontario remains environmentally and economically responsible, it is vital that the province maintains access to high-quality, close-to-market aggregate.

It is critical that we collectively move beyond the "not in my backyard thinking" to a balanced approach that recognizes that the more restrictions there are on developing new aggregate sites, the farther that aggregate will need to travel. That means more trucks, more greenhouse gas emissions and higher taxes.

Stone, sand and gravel are truly the essential foundation of Ontario's economy and infrastructure. Our members are proud of their work to supply aggregate material – and to work with all stakeholders to ensure they do so in the smartest way possible.

In this issue of *Avenues*, we are particularly proud to celebrate the major buildings and projects that helped form the foundation of our great country. As you are aware, Canada celebrates its 150th birthday this year. To highlight this momentous occasion, our article *From Kingston to Ottawa: Canada at 150* looks at

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Avenues is printed on 10% post-consumer FSC certified paper using soya based inks. When necessary to mail an issue in an enclosure, we use an environmentally-friendly, 100% oxo-degradable poly-wrap the public buildings built in Ontario with local stone. After all, it was local stone that built our most memorable government institutions, and it was local stone that was used to construct the defences that protected us from our neighbours to the south in the War of 1812.

Stone was also used to help create one of Ontario's most beautiful horticultural gems – the stunning Rock Garden at the Royal Botanical Gardens in Burlington. The garden was developed on the site of a former gravel pit that appears on city maps as early as 1859. It serves as a wonderful example of how aggregate sites can contribute to building complete, environmentally friendly communities long after the resource is gone.

But the story of stone and aggregate is an evolving one. Today, we continue to create Canada's history of tomorrow through the construction of major highway projects, hospitals, schools, subways and transit infrastructure throughout the province. So we have also taken the time to examine the technical aspects of today's industry, from road construction to the growing use of drones and aerial site imaging at pits and quarries. You can read how this new technology is providing industry professionals with better, safer options for stockpile management.

We also look at the people side of the business through our great career profile interviews with some of the best and brightest in the province. Ryan Held of CBM Aggregates discusses his life as a sales professional, while Danielle Solondz, an executive project coordinator at TOARC, talks about her work in bringing new life to legacy sites.

Finally, we look back to some of our first Student Design Competition award winners to see how their careers have unfolded since winning their awards. On the flip side, we look at how Envirothon, a high-school competition, may well be grooming future aggregate experts now that an aggregate module has been added to the contest.

So while we celebrate Canada's 150th birthday and recognize the importance of celebrating what was, we feel it's equally important to take time to embrace what will be. Let's all work together to recognize change, and to use it as an opportunity to build a stronger tomorrow.

Norman Cheesman Executive Director, OSSGA Today, we continue to create Canada's history of tomorrow through the construction of major highway projects, hospitals, schools, subways and transit infrastructure throughout the province

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As the country celebrates its 150th birthday, we look at the important role aggregate played in the construction of Ontario's public buildings





Ontario abounds in historic public buildings built with local stone, clockwise from top left: Confederation Building, Parliament Buildings, Royal Canadian Mint, Parliament Buildings (2), Kingston City Hall, St. George's Cathedral, Kingston Fortifications ntario's stone, sand and gravel has played a vital role in the protection and formation of Canada – from the limestone fortifications in Kingston and up the Rideau Canal to the impressive and stately Parliament Buildings in Ottawa. The seat of government and the foundation of Canadian democracy is de facto built on aggregates.

Modern Canadian history is, to a great measure, defined by the work done by the aggregate industry. The literal foundations of the country's most important institutions were built by the hard work of this industry with the local stone in Ontario. Our stone built our most hallowed buildings and protected our country at its most vulnerable. As is evident in Kingston, the early defence of the country from invading American forces was strengthened by the abundance of quality local limestone.

Kingston is one of the most important and historic cities in Canada. It has a long and storied history: it was the first capital of the province of Canada, home of its first Prime Minister John A. MacDonald, and an

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important political and economic centre during Canada's formative years. Kingston sits on a wealth of limestone; in fact, it is nicknamed the "limestone city." The stone produced in Kingston is a grey hue and has been used in local building since the formation of the city. This limestone came into existence some 470 million years ago when the site on which Kingston is now located was covered by a large warm water sea. The formation of limestone in the region is the result of the sea depositing sediment, minerals and organic materials.

"The early defence of the country from invading American forces was strengthened by the abundance of quality local limestone" In 1840, Kingston suffered a major fire. The fire claimed much of downtown Kingston, and as a result a new municipal building had to be constructed. Reflecting its status as the capital, the new city hall and capital building of the Province of Canada was a magnificent limestone building on the waterfront. The building was designed by George Browne and completed in November 1844. While it was the first capital building of the province of Canada, it didn't last very long as the seat of power – in 1844 the capital of Canada was moved to Montreal.

Limestone buildings can be seen throughout downtown Kingston. The Old Post Office, also known as the Former Post Office and the Old Kingston Post Office, was built between 1856 and 1859, while the Kingston Customs House, another National Historic Site of Canada, was constructed in 1856 and 1859 by the Province of Canada. The Customs House, according to the Canadian Register of Historic Places, "is constructed of limestone and is situated in the centre of the city of Kingston on a block shared by the former Kingston Post Office

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Local stone was used in the construction of the defensive fortifications around Kingston, which began with the outbreak of the War of 1812

and a limestone stable associated with the two public buildings. It is part of a cluster of 19th-century public and commercial buildings, including the Kingston City Hall, in the immediate vicinity."

MILITARY CONSTRUCTION

Perhaps the most important use of limestone in the city was in the defensive fortifications and military installations. The Register of Historic Places describes these in the following way: "Kingston Fortifications National Historic Site of Canada is located in and around the harbour area of Kingston, Ontario. Situated at the mouth of the Cataraqui River, and overlooking the confluence of Lake Ontario and the St. Lawrence River, the fortifications consist of five separate 19th-century military installations, including Fort Henry National Historic Site of Canada (NHSC),

The walls of the Rideau Canal were constructed using material that reflected the local geology



Fort Frederick, part of the Point Frederick Buildings NHSC, the Murney Tower NHSC, Shoal Tower NHSC, and Cathcart Martello Tower. An inter-related defence system, the concentration and orientation of the limestone fortifications towards the water convey their essential purpose as a defensible platform for guns. Built between 1832 and 1840, the Kingston fortifications represent the apogee of smooth bore technology. Construction of the fortifications began with the outbreak of the War of 1812, when a number of simple defensive works were hurriedly built around the harbour, including blockhouses at Point Henry, Point Frederick and Murney Point."

These fortifications were constructed to protect the Rideau Canal, the city and the country from invasion. Kingston then established itself as a major centre for life in Upper Canada following the War of 1812 and the completion of the Rideau Canal.

Built between 1826 and 1832, the Rideau Canal runs 202 kilometres from Kingston Harbour to Ottawa. As Canada celebrates its 150th birthday, the history of the country can be explored through

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Local stone has been crucial to the development of Canada, and the aggregate industry has much to be proud of: clockwise from top left, the Royal Canadian Mint, Kingston City Hall, the Parliament Buildings, Kingston's Old Post Office









a journey up the canal: its walls were constructed using local material that reflects the local geology. The canal itself is a UNESCO World Heritage Site – it was carved out of a wilderness that was wild and dangerous. A thousand workers died during the construction of the canal from accidents and malaria, and many of these unfortunate labourers are buried along its banks.

The canal was built to prevent American forces from invading Upper Canada via the St. Lawrence River and to provide an alternate supply route that was secure.

Work on it was completed by hand, with excavation done with ordinary hand tools. According to history buff Ken Watson, who's written extensively on the canal, "Rock was laboriously handdrilled and blasted with either merchant powder (a somewhat unstable mix of nitre, sulphur and charcoal) or black powder. The large stones that make up the locks were set in place using simple hand cranes. Much of the skilled rock work was done by French Canadians who had experience on other lock projects and British Isles stonemasons."

OTTAWA'S SANDSTONE

At the other end of the canal is the City of Ottawa, our nation's capital. As we have examined in a previous *Avenues* article (Volume 4, Issue 1), the City of Ottawa has a rich heritage built on a foundation of local Nepean sandstone. Nepean sandstone is described as "medium grained, mottled white to cream coloured, almost pure, quartz sandstone with irregular rust spots." It is related to Potsdam sandstone, which is found further south in northern New York State; however, Nepean sandstone is harder.

COVER STORY 📥

Construction of Canada's iconic Parliament Buildings in Ottawa -Nepean sandstone was the primary material used in the exterior walls

The most famous examples of local stone use in Ottawa can be found in the Parliament Buildings. Use of local stone in the Parliament Buildings dates back to the construction of the original buildings in 1859. The original requirements for the buildings called for native stone from Gloucester or Hull, which is grey in colour; however, as the project moved forward, the architects suggested that Nepean sandstone be used. Nepean sandstone is lighter in colour, a warm ochre-coloured stone and more durable. As a result, Nepean sandstone was chosen as the primary stone to be used on the exterior walls of the Parliament Buildings.

After the fire of 1916, the Parliament Buildings had to be reconstructed. Again, Nepean sandstone was chosen to be the stone used on the exterior walls. Most of the stone for the Centre Block and all of the stone for the Peace Tower came from the Campbell Quarry. It was located on Lot 3, Concession II in Nepean Township (now part of the City of Ottawa) until



1962, when the property was bought by the National Capital Commission. Stone can still be seen in situ around this site.

Today, the legacy of Nepean sandstone is seen in many buildings in Ottawa – the Canadian Museum of Nature, the Royal Canadian Mint, the Canadian War Museum, the Connaught Building, the Langevin Block and the Nepean Town Hall all contain Nepean sandstone. As is the case with other areas rich in quality building stone, there are also many residential buildings and buildings of local significance that used Nepean sandstone.

Local stone has been crucial to the development of Canada – from the construction of its first capital, to its most important waterway, to the country's current capital. Local stone has defended our borders and is the foundation of our most important buildings. The aggregate industry has a history to be proud of as it takes its place in the development of Canada.



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High-school students participate in forestry training as part of the Envirothon competition

OPENING YOUNG MINDS

By Sarah B. Hood

Envirothon helps raise student awareness of aggregates with a new module dedicated to the topic

nvirothon, a team-based competition for high-school students, has been challenging young brains and stimulating interest in environmental science careers for more than 20 years. Now, for the first time, a new module dedicated to aggregates has been added to the program.

Run by Forests Ontario, the competition aims to inspire future environmental leaders. It has reached almost 200 schools and produced more than 10,000 alumni since it launched in 1994, and now stretches across North America and beyond. At its core, Envirothon is a competition for five-person groups of high-school students who complete a number of challenging activities based on five areas of environmental study. (*For more information on how the competition works, see the sidebar on pg. 17.*)

The introduction of a new aggregates study module marks a big plus for the industry's efforts to raise awareness for aggregates among the general public. It represents a critical new focus for the competition as well. "Aggregates is

something new for us," says Allison Hands, education coordinator for Forests Ontario. "Before, it was something we might have touched on in Land Use (one area of study in the competition), but we didn't have such a pointed resource."

Introduced in 2016, the aggregates module was developed through a partnership between Forests Ontario and the Ontario Aggregate Resources Corporation. Like other Envirothon modules, the aim is to help students understand how they are impacted by the selected topic, in this case, aggregates. For instance, they are made aware that if they drive to school, then the road they drive on contains aggregates. "We talk about how they are consumers of that product," notes Hands. "We like as much as possible to include case studies of that activity, and we try to frame most of the resources with at least some Ontario context."

ABCS OF AGGREGATES

The new study module starts with a definition of aggregates and a summary of production and consumption in Ontario. It then proceeds to sketch an overview of the industry, its importance to the provincial economy, its environmental impact and the regulations that govern it. A considerable section is given over to the geological origins of Ontario aggregates. Aggregate reuse or recycling and the reclamation of aggregate sites are also treated in some depth. In addition, students learn how aggregates are used in many aspects of their everyday life and about potential careers in the industry.

Two activities are included. In the first, students choose a single use for aggregates from a list that includes such diverse applications as asphalt shingles, municipal water filtration systems and toothpaste. Then they must research the entire life cycle of that aggregate from extraction to final use.

The second activity is more hands-on. Students actually perform a grain sieve analysis to determine the proportions of different grain sizes within a soil sample, using a balance, sieves and brushes. They are required to classify each component of the sample – from cobble down to colloid mud – and note the weight of each one. A glossary at the end introduces students to fairly technical vocabulary, defining such terms as crown land, esker, grubbing and kame. "A lot of what we do with Envirothon is we want students to look at the environmental



The Envirothon competition teaches students various skills, such as soil testing, shown here



sciences and the systems that they're a part of to better understand their goals and make informed decisions," explains Hands.

With a deeper comprehension of industries that have an impact on the environment comes the realization that there are no simple solutions to environmental challenges because the systems that govern them are so complex. This is a lesson that Hands herself learned early in her career. "Before I started with Forests Ontario, my dad encouraged me to look at a forestry degree, but I told

"The introduction of the aggregates module to Envirothon will expose Ontario high-school students to the industry"





Hands-on learning is an important part of the competition and will now include grain sieve analysis in the aggregates module

him 'I don't like the idea of cutting down trees," she recalls, noting that she now understands that, "there's a lot that goes on within these industries to mitigate the negative impacts, and realistically, we need these products in our everyday lives."

The introduction of the aggregates module to the popular Envirothon competition will potentially expose hundreds of Ontario high-school students to a better understanding of the industry. It may even inspire some to seek a career in aggregates should they pursue studies in environmental sciences, which many do. "We do a survey every year, and over 70 per cent of students say they will consider a career in the environmental sciences," confirms Hands.

In the end, Hands is pleased with the addition of a topic that forms an important part of the environmental picture, yet is rarely taught in a high-school setting. Says Hands: "We're really excited to be expanding the repertoire of resources to include some of these components that aren't normally [studied] in the classroom to help students think critically about these problems and the issues that their generation will face."

ENVIROTHON: HOW IT WORKS

While Envirothon began its life in Ontario, it has blossomed into a network that spans North America as well as a few international locations. The competition is administered differently within different schools. While competing students are drawn from the entire high-school population, teams can be comprised of students from a single grade or mixed. In some cases, the competition is integrated into the regular classroom curriculum, while in others it's an extracurricular activity.

When students sign up for the program they receive a set of resources that team members can use for independent study. Four areas of study are consistent from year to year – Aquatic Ecosystems, Forestry, Wildlife, and Soil and Land Use (which includes the new aggregates module). A fifth study area is chosen annually by the organizers. Invasive Species was covered in 2016 and this year the topic will be Sustainable Agriculture.

Participants from every region take part in at least one hands-on training day in April, outdoors if possible, and learn how to handle various tools used by environmental scientists, like clinometers (used to measure the heights of trees) and soil augers for taking samples. Students then return to the classroom setting for further study before convening for a testing day.

Each participating group faces written tests on four core topics at the regional level, as well as an eight-minute oral presentation. "Students are given a scenario that relates to the current issue; then they are given a set of resources and time to prepare a presentation for a set of judges that is essentially a solution to the scenario that they are provided with," explains Allison Hands, education coordinator for Forests Ontario, which manages the competition.

Regional winners proceed to the provincial competition, which takes place in May, where they face more testing and a tenminute presentation. The final stage is at the North American level, which takes place in late July or early August. Peterborough's Trent University hosted the North American showdown in 2016, and in 2017 it will move to Mount St. Mary's University in Emmitsburg, Maryland. Teams cover their own travel expenses and subsidized fees, adding up to about \$2,000 per team, mostly raised through corporate sponsorship and fundraising.



The future for a f

n the ground and in the air, new technologies are bringing greater efficiencies and cost savings to aggregate operations. Among the most popular of these are unmanned aerial vehicles (UAVs – aka "drones"), which are being used by an increasing number of aggregate suppliers for aerial site imaging and stockpile management.

Drones have been available to the construction industry for years, but only recently have lower prices, technological advancements, and easier control options made them a more common sight. "We have seen a massive uptake of UAV/ drone technology by aggregate producers, especially in the last year," reports Martin Flood with AirGon LLP.

This is due in large part to an improved regulatory environment, which is opening up commercial drone activity both in the U.S. and Canada. "This has allowed aggregate producers to deploy the technology safely and legally themselves or turn to a robust and growing service provider community to subcontract the field work," notes Flood.

Today, more and more companies are using drones to conduct fast and accurate topographical site surveys. They work by using photogrammetric mapping to capture images from up high, upload them to a cloud-based system, stitch them together in a computer, and generate a 3D map for analysis.

As Murray Hunt, owner of High Eye Aerial Imaging Inc., explains: "It's the same process as when an employee walks out with a GPS rover, puts a stick in the ground every 20 metres, takes a shot, and then collects data for that spot down to within a couple of centimetres. The difference with drones is that the process is much faster and it's as if that employee were putting that stick down every two inches."

Also appealing to aggregate suppliers is a drone's ability to conduct highly detailed stockpile volume measurements. This is done by piloting a drone around a stockpile, taking pictures from the top and around the perimeter, and sending that field data to a cloud-based system where it is analyzed and used to create volumetric reports. "With a drone, you're able to cover the entire pile on a two-inch square grid. That means you can pick up all the little ripples, valleys, and humps in a pile to get much more detailed data," says Hunt.

Taking flight is also becoming easier. Automation apps are available for mobile devices that allow employees to preprogram a drone's flight path, set survey and measurement parameters, and define the quality of the photos. It's even predicted that drones are on the way to becoming completely automated, allowing them to take off, perform surveys, upload data, land and recharge with zero input from owners.

Hunt says it is developments like these that are fuelling drone demand: "The companies we work with have fully accepted that the data we can get them is better and more accurate than what they've got in the past. It's only a matter of time before technologies like this become the norm."

SMARTPHONE IMAGING

Closer to the ground, there is also advanced mobile software for calculating stockpile volumes. U.S.-based Stockpile Reports' own iPhone image processing software, for instance, was released in 2013 to give aggregate producers a faster and more accurate way to tackle inventory management. The concept behind smartphone imaging is relatively simple. A sophisticated camera program is used by employees to take a small video of the stockpile, after which the best images are selected from that video, uploaded to a cloud-based system, and downloaded to create detailed 3D reports. The technology is easy to use and can sync up to other users, providing data from any number of sites and projects.

"This enables the entire team to participate," explains Tony Jacobson, vice president of products with Stockpile Reports. "For multi-site operations, companies can dole out that responsibility to their entire team and knock out inventory in a couple hours for a whole operation. For example, the Texas Department of Transportation has over 5,000 stockpiles around the state. Now that 700 employees are trained with our app, they can take inventory for the entire state within a week."

With interest in these technologies at an all-time high, and the barriers to entry at an all-time low, Jacobson believes tools like these are only going to become more available. "Companies are becoming aware of how much quicker and easier things are with drones and mobile technology,"



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(Above) Drones can capture images from up high, which can then be uploaded to a cloudbased system, stitched together in a computer and used to generate a 3D map for analysis. Photo courtesy of High Eye Aerial Imaging

(Right) An example of a point grid image taken with the help of an aerial unmanned vehicle operated by High Eye Aerial Imaging

(Below) Stockpile Reports' iPhone image processing software gives aggregate producers a faster and more accurate way to tackle inventory management





he says. "2017 is the year we're going to see a majority of companies looking into these new tech solutions."

INDUSTRY WINGMEN

While advances like drone automation threaten to squeeze out user interaction, specialists like Hunt believe there will always be a demand for those who can do the job right, and more importantly, safely. "The technology is making it easier for untrained people to gather the data, but Transport Canada is planning to make their use safer by requiring all UAV operators to go through training and meet certain requirements. Once those rules kick in, you're going to see more companies come to companies like ours instead of investing in drone training, which can get costly with turnover," explains Hunt.

Moreover, even though drone technology is more accessible than ever, Flood says it still pays to work with a service partner that has invested in drones specifically designed for photogrammetric mapping. "You're not doing a simple fly-through video of your cottage," he stresses. "So while many of these commercial off-the-shelf kits are certainly very good drone platforms, the cameras and other secondary aspects of the system don't lend themselves to performing true survey-grade mapping out of the box."

Flood predicts the demand for expert data processing and analysis will keep service providers like AirGon busy, even if most of their input is to the back-end of the process: "We see most major aggregate producers



moving to enterprise-level drone operations to capture and maintain stockpile volumes in near real-time, at least weekly - if not daily - across their entire organization within the next two to three years," he says. "Some producers will outsource this work to service providers, while others will internalize it completely. However, we see a hybrid model, where the aggregate producer handles all the fieldwork and flying, but works with a service provider to perform the analysis, growing in popularity. It eliminates the mobilization logistics and associated costs of having to move the kits on-site, while still avoiding burdening existing staff with yet more repetitive data analysis tasks."

Certainly, flying drones is just one part of the process, and making good use of that field data requires comprehensive analysis and reporting tools. Here again is where there is a benefit to working with third-party experts who are already equipped for the job. "We make those investments in software and high-capacity computers so we can take that data and provide highly accurate reports. In fact, the back-end work is about 70 per cent



Operating drones is just one part of the process - making good use of the field data requires comprehensive analysis tools and reporting tools. Photo courtesy of High Eye Aerial Imaging

of the job," says Hunt. "There are options to outsource that reporting overseas, and that's fine if everything is working great. As soon as something isn't right, or the client wants something changed, then it becomes an issue."

The revolution won't happen overnight, but technologies like drones and mobile imaging software will inevitably become the standard on job sites across many industries. How companies incorporate these technologies will vary, but it's clear that drones are more than a passing fad.

Says Jacobson: "Companies are realizing the potential of these technologies, and now that the 'shiny new object' syndrome is wearing off, they're asking, 'How can we now get serious with this?"



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CAREER PROFILE

MY JOB R-O-C-K-S!

The Ontario Stone, Sand & Gravel Association boasts nearly 300 member companies, employing more than 7,000 people whose roles are directly related to the aggregate industry. Each of these people has a unique and interesting story to tell about how they came to work in aggregate. While we can't interview them all, this regular feature highlights the diverse and interesting careers available within the industry, and showcases the people who make a difference to their companies and their communities. Want to learn even more? Visit ossga.com/my_job_rocks

BUILDING A GREAT CAREER CBM Aggregates' Ryan Held sets his sights on a successful career in aggregates

Aggregates

Q: What is your job title and what does it encompass?

A: I am the sales and marketing manager for CBM Aggregates Ontario. I manage the sales and marketing of our various products from all of our locations across Ontario. I lead a great team of sales representatives, dispatchers and the inside sales department for CBM Aggregates.

Q: What is it about your job that other people wish they got to do?

A: I get to meet so many different kinds of people, and because aggregates are used in so many different applications, these are people from all sorts of different industries. Every day presents something new. I'm not sitting in the office all day; instead, I get to go out and meet and build relationships with both customers and employees. As well, there are lots of different interesting industry and social events we get to take our customers to – something I'm sure other people wish they could do.

Q: What do you find most challenging in your work?

A: The most challenging aspect is the amount of problem solving that is needed on a day-to-day basis. You need to make

sure your customer is happy and also that the company is pleased with the result. So you have to find the right balance that works for everybody.

Q: Describe your typical day on the job and how your work contributes to your company.

A: There is no real typical day as a sales manager: some days are spent in meetings for the company where we can be discussing safety, sales, budgets, strategy, performance or quality. Other days are spent doing customer and site visits. It's a job where you have to think on your feet because lots can happen in the course of a day. The obvious way that a sales manager contributes to the company is the revenue that is generated from the sale of the products we sell. By monitoring things like price volume and quality you can help not only the company but also the customer.

Q: How did you get interested in this field?

A: I started as a summer student 17 years ago with Blue Circle in London. I worked in the quality control department where I learned the products. Sales was never something I thought of doing, but a sales representative job was posted with CBM and I thought, "I know the products I will be selling and I know some of the customers I would be selling to. So why not try to get an interview and see if it's a fit?" And it was.

Q: What sort of education or experience do you have that is relevant to your job?

A: I went to the University Of Western Ontario. While there isn't really a sales course you can take at the university, I did take some business and sociology courses.

Q: What advice would you give to others looking for a possible career in aggregates?

A: It's a career that is overlooked and one that isn't well known, but I think aggregates is a great industry with many possibilities. I would look at starting in a quality control role because that's where you learn about the products. You learn how to make the products, and you also learn about the customers that you sell the products to. Once you know that, you can move on to the production, sales, safety or lands departments. But knowing the product and how it's made is a great way to "springboard" into something else. Keep an open mind about aggregates. It is something that is always going to be needed and it doesn't just build roads and buildings, it can also build a great career.

CAREER PROFILE 🛶

TOARC's Danielle Solondz enjoys her role in helping landowners rehabilitate their land

Q: What is your job title and what does it encompass?

A: I'm the executive project coordinator for The Ontario Aggregate Resources Corporation (TOARC). TOARC, as the trustee to the Aggregate Resources Act (ARA), is responsible for the mandates set by the Minister of Natural Resources and Forestry. I'm responsible for some of these mandates, such as the rehabilitation of sites where licences or permits have been revoked; the collection and publication of information, including the education and training of those in or interested in the aggregate industry; and the rehabilitation of abandoned pits and quarries across the province.

Most of my time is spent managing TOARC's Management of Abandoned Aggregate Properties (MAAP) program. When the ARA was put into effect, the aggregate industry represented by OSSGA agreed that \$0.005 per tonne of licence fees payable would be dedicated to a program with the purpose of rehabilitating former extraction sites. An approximate amount of \$400,000 to \$600,000 is made available on an annual basis to rehabilitate the 8,000 legacy sites located across the province. It's my job to ensure that qualifying sites are inventoried to determine the Trust's responsibility, and for those sites that require rehabilitation, I work with my MAAP team to ensure that the sites are rehabilitated to a higher level of function.

Q: What is it about your job that other people wish they got to do?

A: I get to help landowners across the province who may otherwise be unable to rehabilitate their land due to the cost. When you hear landowner's stories about them having plowed around the legacy site for the past 40 years and then see them put that same field into crop the following year, it is incredibly rewarding. I also get to see safety concerns, such as steep eroding banks, turned back into habitat, wildlife corridors, extended forests and wetlands. A lot of people working in environmental reclamation positions may only return to one or two sites a year; I get to work with the MAAP team to return to over 30 sites a year.

Q: What do you find most challenging in your work?

A: Usefulness of a site is quite subjective. One of the difficulties is making sure our staff, as well as a landowner, communicates what's possible for the rehabilitation of a site and how it relates to what is wanted. For

example, returning a site to agricultural use may not be practical if there is no topsoil or organic material remaining that could be utilized for such purposes. Other solutions may have to be considered, which leads me to the next most challenging aspect of our job, lack of organics on site. Many legacy sites have had their topsoil stripped and removed off-site. Consequently, we always struggle to reintroduce organics to these sites. The good news is that it can be done. Through the rehabilitation of these legacy sites we're learning how to ensure that our modern-day practices of stripping sites sets up the conditions we need for successful final rehabilitation.

Q: Describe your typical day on the job and how your work contributes to your company.

A: My days vary quite a bit depending on what time of year it is. In the winter months, I spend a lot of my time updating our databases and reporting on the previous years' rehabilitation and research projects. We review that we have enough legacy sites lined up to rehabilitate the following year, and if we think we need more we review our databases to target more sites. As soon as spring hits we're in full project tendering mode until the end of the fall

CAREER PROFILE



and need to ensure that site plans are completed, contracts are written, permits are in order and contractors are hired. Summer months bring more site visits. I spend this time visiting newly revoked licences or permits, completed legacy project sites or meeting with landowners to discuss rehabilitation options. We're also scouting for the next year's projects and prepping to have sites GPS'd with a drone or by our rehabilitation supervisor in the fall. I'm also responsible for presenting MAAP's rehabilitation projects to municipalities and the public.



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Q: How did you get interested in this field?

A: I always enjoyed science and earth processes. When I was completing my master's degree I spent a lot of time in northern Alberta working with the forestry and oil industries to examine their industries' effect on the environment. It was rewarding to help measure the impact that extraction of natural resources has on the environment as well as contribute to research that helps to minimize the effects extraction has. I am aware of the industries' practices for extraction and am able to contribute to it being completed in a responsible way through research as well as rehabilitating old aggregate sites that were intrinsic to building Ontario. I was actually working on a research project funded by TOARC for better rehabilitation of wetland systems, which led me to my career here.

Q: What sort of education or experience do you have that is relevant to your job?

A: I have an undergraduate degree in biology and physical geography and a master's degree in biogeochemistry. I was also fortunate to have worked with a variety of other extractive industries before working in aggregates, which gave me some insight into the challenges industries face and how important cooperation between industry, research and the public is. When I came into the aggregates scene I had little experience with this industry and its operations. I'm quite lucky that I have mentors at TOARC and in the industry who continue to help me increase my knowledge.

Q: What advice would you give to others looking for a possible career in aggregates?

A: The aggregate industry has so many different avenues. The longer I am in my position, the more I see the possibilities. There are so many careers for people, from engineers, to planners, to environmental scientists, to machine operators. Just about any interest you have will likely have a spot in aggregates.

In terms of advice, the industry is always evolving so be sure you are ready to change with the environment and be aware of the different opportunities that this industry has. Also, be well aware that you will be explaining what aggregates are repeatedly to friends and family! And I'd suggest learning the difference between a pit and a quarry before going to a job interview!

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ROAD BUILDING 101

Ever wonder what's involved in building a road? Hint: aggregates are used at virtually every stage

hey connect us, make our travels safer, and keep our economies running. Yet we often take our roads for granted. In reality, it's hard to overstate the value those roads provide in our lives, and the importance of aggregate materials in their construction.

"The quality of the aggregates is one of the most important aspects of building a road," says Ryan Essex, vice president with The Miller Group. "Aggregate quality alone does not guarantee success, since the roadbuilding process must still be performed utilizing construction best practices. That said, without the appropriate quality of aggregate built into the road, you are fighting a significant uphill battle and, most times, a losing one."

Aggregates are used at all stages of road construction. Once a potential road site has been surveyed, cleared and removed of excess material, a layer of compacted aggregates are put down to establish a solid foundation for the overlying layers.

"That's engineering 101," says James Gordon, materials manager with Fowler Construction. "The first thing you have to do when building a road is deal with the water on the site. So you need aggregates that will drain and have the structural integrity to withstand the environment the road is being put into, and that can change quite a bit."

Once a base has been laid, subsequent granular layers are added to form the road. These layers can include a wide range of materials that use aggregates, such as a recycled material, asphalt, concrete and crushed stone. Other aggregate materials such as gabion stone and rip-rap materials are also vital to the road building process, as they are used for ditching and drainage structures.

Choosing which aggregates to use in road building comes down to a number of design factors, including traffic volumes and



"Aggregates are the essential materials for building Ontario. That can be in building schools, churches, hospitals and road infrastructure such as roads and bridges to name a few"

Ryan Essex, The Miller Group

environmental conditions. Those factors also determine the type of aggregates used, whether sand and gravel materials, or more commonly, crushed aggregates such as quarried limestone that achieve easier compaction and create a more stable road.

By way of example, Dan Leclerc, customer service and logistics manager with Lafarge Canada, notes: "A township spec may only use a granular product [from a pit], but certain highway specs are moving away from this to limestone products because even though the cost is a little more expensive, the turnaround of completion is a lot quicker and more suitable for the job compared to doing different layers of granular product."

Essex adds that it is extremely important to utilize aggregates for their highest end use. "That means if an aggregate source is approved with aggregates that meet or exceed the requirements for high strength structural concrete, it would be best served to use those specific aggregates in high strength structural concrete, rather than [using them] as pipe bedding or granular base. Similarly, aggregates that meet or exceed the requirements for hot mix asphalt surface course on 400 series highways are used for that, rather than base courses or shoulder material."

The quality of the aggregates is no doubt important to a road's ability to withstand the tests of time. In the road building industry, that quality is measured through gradation, i.e., the size mix of particles in the product, physical property tests, and specifications that hold aggregates to a high standard.

LOCATION, LOCATION, LOCATION

The location of aggregate sources is also an important factor. The further the supply of aggregates from the job site, the more time it takes to complete the job and the more it costs to pay for the trucks and fuel to get it there. "Half the price of aggregate is delivery, so the location is almost everything," says Gordon. "The closer you are, the better."

That can be a challenge for road builders in the Greater Toronto Area (GTA) as new aggregate sources are beginning to move away from the city. Aggregate producers are responding to the challenge by creating depots closer to job sites in order to help reduce transport times, using fewer trucks, and facilitating faster road construction turnarounds.

"If you want to do a high-profile job or something with visibility, you need to be well positioned to move mass amounts of aggregates in one day," says Leclerc. "When the 407 Phase 1 started a couple years back during the winter, suppliers transported over 500,000 tonnes of limestone from the Brechin area east of Lake Simcoe to pits which were located to the south in the Uxbridge area. The daily average requirement was greater than 180 trucks a day from the Brechin area, but with suppliers moving that material during the off seasons (late fall to early spring) we were able to cut that to a third during peak summer placement season. So sourcing is a big thing when fixing or building roads."

Being close to market also has its environmental advantages, notes Gordon. "You're burning a lot of fossil fuels if you're relying on a lot of trucks over a long distance. Assuming the materials are produced the exact same way no matter where you go, it's better to go with supply that requires a shorter haul, since that means less damage to environment and infrastructure."

Ultimately, says Gordon, "We want to source those high-quality aggregates as close to market as we can with the most sustainable route possible."





By Sarah B. Hood

How a 19th-century gravel pit became a \$20-million tourist attraction at the Royal Botanical Gardens in Burlington

n April 29, 2016, the Royal Botanical Gardens (RBG) in Burlington celebrated the official opening – or reopening – of the David Braley and Nancy Gordon Rock Garden. It was the culmination of a three-year, \$20-million project to rejuvenate a remarkable landmark that has been attracting visitors since the 1930s.

What many don't know, however, is that the story of this beautiful Rock Garden reaches even further back into the history of the Hamilton-Burlington area: it was once a gravel pit situated to take advantage of the region's considerable aggregate resources.

The redesign of the Rock Garden, which hasn't changed much since it first opened, represents RBG's largest capital project to date. Named for lead donors David Braley and Nancy Gordon, the Rock Garden Rejuvenation Project was also supported by the federal and provincial governments, with each contributing \$7 million. Today's 9,074-square-foot revamped garden was designed by Janet Rosenberg & Studio with accessibility and sustainability in mind. The paths have been reconfigured with gentler grades, and lighting and sound systems have been upgraded. The popular Tea House added in 1962 has been renamed Garden House and will be a versatile space that houses archival exhibits.

The garden's 143,800 individual plants represent 2,411 different species. Of these, about 42,000 were planted during the redesign and many are herbaceous perennials and grasses chosen for their environmental advantages. The reconfigured garden now includes more pollinator-friendly plants, Ontario native species, as well as drought-resistant plants that require less labour to maintain, consume less water and generate a smaller carbon footprint.

BURLINGTON HEIGHTS

The Rock Garden is located on Burlington Heights, a 2.5-kilometre isthmus rising about 30 metres above Lake Ontario between Hamilton Harbour and Cootes Paradise. "It is part of a larger landform called the Iroquois Bar that runs from Locke Street in Hamilton across Cootes Paradise Marsh and into Burlington," says



Dr. David Galbraith, head of science at the Royal Botanical Gardens. "It's a baymouth bar that was formed when Lake Iroquois (the ancient, larger lake the preceded Lake Ontario) was still in place. The whole area is sand and gravel, very compacted in some places."

As early as 1858, city maps show a gravel pit on the Burlington Heights site where the Rock Garden is today. By the early 1860s, the gravel was apparently being used for the construction of track for the Great Western Railway and the Toronto, Hamilton and Buffalo Railway, all now disused. "In 1920, the Ontario Department of Mines described the gravel pit as being in operation by the Hamilton Sand and Gravel Company. They employed 12 people, the gravel pit covered 5.5 acres, and it was 35 feet deep," Galbraith says.

Meanwhile, around the end of World War I, Hamilton was laying the groundwork for ambitious plans for its future. In 1917, the City of Hamilton Planning Commission received a report on the potential development of the district that focused on three assets: the Lake Ontario beach strip, the mountain (as the edge of the Niagara Escarpment is known in Hamilton) and Burlington Heights, which was in rough shape at the time. "It was covered with fences and telegraph wires," says Galbraith.

Nonetheless, in 1926 the City of Hamilton purchased 55 acres of the Burlington Heights as an extension of the city's park system, with a view towards creating a magnificent park-like gateway for travellers arriving from the direction of Toronto on Highway 2. The following year, a national competition was launched to find an architect who could help fulfil this goal, and Carl Borgstrom of the firm of Wilson, Bunnell and Borgstrom was chosen from among a dozen submissions for his plans for the Rock Garden. "The Rock Garden serves as a beautiful example of how one can dramatically transform a former aggregate site into something useful, memorable, and environmentally beneficial"





Historical pictures of the RBG Rock Garden, a major tourist attraction that has been attracting visitors in droves since the 1930s

Construction began in 1929, but from the get-go there was a fairly obvious challenge: a shortage of stone. "There was no stone there; it was a 5.5-acre hole," points out Galbraith. "Borgstrom's plan called for quarrying limestone from the Niagara Escarpment." Ultimately, an estimated 10,000 tonnes of limestone was brought in from around Red Hill Valley.

A more serious challenge emerged with the stock market crash of 1929 and the subsequent Great Depression. "Only later in the construction did they get funding from other levels of government to help with the project," notes Galbraith.

A great champion of the Burlington Heights development, and the Rock Garden in particular, was RBG founder Thomas Baker

"An estimated 10,000 tonnes of limestone was brought in from around Red Hill Valley to build the original Rock Garden"



McQuesten, a Hamilton alderman and, at various points, Minister of Municipal Affairs, Minister of Mines, and Minister of Public Works and Highways. "His huge drive was to introduce Hamilton to what was called the City Beautiful Movement," says Galbraith, referring to the harmonious urban planning that informed city building in Canada between about 1893 and 1930.

McQuesten was instrumental in bringing to fruition numerous important projects that are still landmarks of the southwestern Ontario landscape, such as the Queen Elizabeth Way, the Burlington Skyway and the Niagara Parkway. He also supported the creation of horticultural colleges. "McQuesten was convinced the only way you could create beautiful cities was if you had trained horticulturalists," Galbraith says.

With the alderman's support, the Rock Garden was finally completed in 1931, initially as an open driving park before the rest of the Royal Botanical Gardens were consolidated under their present name. More than just a tourist attraction, the Rock Garden continues to serve as a beautiful example of how one can dramatically transform a former aggregate site into something useful, memorable, and environmentally beneficial.





A winning streak By Andrew Brooks

Three past winners of the OSSGA Student Design Competition gauge the impact on their careers

very year, OSSGA's annual Student Design Competition invites students to submit a full-fledged rehabilitation design for an Ontario aggregate extraction site to a panel of industry judges. The competition is open to post-secondary students in Ontario who are in a program tied to landscape architecture, planning, ecology, environmental design, engineering, as well as other relevant streams. Winners receive monetary prizes and their projects are displayed at OSSGA's Annual Conference.

Avenues recently checked in with three past winners of the competition to find out how the award has impacted their chosen careers. We asked them about their winning entries, what they've been up to since they won, and what the award means to them and the industry.

PAUL HARTNETT FIRST PLACE, 2001

Rehabilitation Supervisor, TOARC

Paul Hartnett was one of the first winners of the Student Awards program when it first launched in 2001. He was in the University of Guelph master's program in landscape architecture at the time, when he and a fellow student decided to participate in the competition and took home

Their entry outlined a residential development for a site in Brantford, along the Grand River. The plan called for a mix of housing and open green space with trails connected to the Bruce Trail. These same ideas then became the basis for Hartnett's master's thesis in landscape architecture.

first prize.

"I think a large part was the practicality of it, the realistic 'buildability' of it," says Hartnett when asked about the winning features of his submission. "And the economic benefits to the producer, post-extraction. It also explored the notion of looking at extractive sites for development as an alternative to developing prime agricultural land - integrated land use management."

Hartnett is currently a rehabilitation supervisor with the Management of Abandoned Aggregate Properties Program at The Ontario Aggregate Resources Corporation (TOARC). After graduation, he worked as a lands manager for J.C. Duff Sand and Gravel, before moving on to hold the same position at CBM Aggregates after J.C. Duff was purchased by St. Marys Cement. He joined TOARC in 2010. "I thought the project would be a good portfolio piece," Hartnett says. "I was focused on the aggregate industry from the beginning of my master's. I was trying to get into the industry and thought it would help with that."

Hartnett notes that the competition is based on requirements established in the Ontario Aggregate Resources Act, which makes it a very useful learning exercise. "The design competition for aggregates is really based on the act and the drawings for a licence: the existing condition, how the site would be extracted over time and what the final rehabilitation plan would be," he says.

Hartnett adds that many schools now encourage their students to enter competitions to practise their studio work and to create a portfolio piece they can put to good use once they graduate. The benefits are obvious, he notes. "It gives them a bit more practical experience with design. They have something to show a prospective employer, whether it's a landscape architecture firm or somebody in the aggregates industry - or some other industry."

ELI PADDLE FIRST PLACE, 2003

Professor, Environmental Design and Planning, Landscape Design, Fanshawe College

When he was still a master's student in the University of Guelph's landscape architecture program in 2003, Eli Paddle won first place in the OSSGA Student Design Competition, along with two fellow students. The team's winning entry was a proposal for a golf course in the Collingwood area.

It was a prescient move: the Collingwood area has since become one of Ontario's prime leisure and retirement destinations, with an influx of wealthy residents with lots of spare time and money to

burn. "We did an analysis of the surrounding area," recalls Paddle. "What we saw was a large population of people seeking recreation. There wasn't a high number of golf courses at that time – but there certainly is now!"

Today Paddle is a professor of environmental design and planning, and of landscape design, at Fanshawe College in London. He believes the proposal won in part because it showed a strong understanding of the rehabilitation process. He also believes that number crunching helped their cause. "We had costing to support our solution. Rather than just giving them a pie-in-the-sky solution, we were able to demonstrate that there was an economic benefit, that there would be some gain from it rather than just being another provincially mandated rehab solution. Not everybody crunched the numbers on their projects at that point."

The financial side is one aspect of rehabilitation projects that Paddle is careful to emphasize to his students now. He also believes the requirements for entry to the competition have an important pedagogical value. In two of his courses – one on hardscape materials and one on illustration – Paddle's students have to put together an actual submission according to the contest guidelines. "They aren't forced to submit their projects, but they do have to finish their design," he says. "So it would only be in their best interest to actually submit."

When his students do enter, they give their instructor ample cause to be proud. "My students usually do very, very well against competition you might not otherwise think they'd be able to compete with. We're the underdog in the contest because we're teaching at a college level. Our students are competing against the University of Guelph and the University of Toronto, and last year against master's-level students."

After graduating, Paddle ran his own consultancy and then started teaching part-time. He has continued with the teaching since completing his PhD and credits the OSSGA Student Design Award with helping him advance his academic career, and possibly that of many of his students. "The award is a great thing to have on your resume," he notes. "It may help to point employers to where you stack up versus your competition. I look back at it as one of the most complete projects that we got to do. And I'm thankful to OSSGA for the opportunity that it gives to our students."

"The competition provides an interesting challenge, and it goes beyond aggregates since current and future development includes infill and brownfield development"

Stephanie Jarvis, Underleaf Design

STEPHANIE JARVIS SECOND PLACE, 2005

Landscape Architect, Underleaf Design

Currently a landscape architect with Underleaf Design, a boutique design firm, Stephanie Jarvis entered the OSSGA design competition in 2005 when she was an undergraduate student in the University of Guelph's landscape architecture program. While most submissions

to the OSSGA Student Design

competition are a team effort, Jarvis' project was unique in that it was a solo effort.

As Jarvis describes it, her plan for an aggregates pit in Aberfoyle, Ontario focused on long-term economic viability. "It encompassed the idea that the development process would be self-sufficient, requiring the least amount of money possible to start it," she says. "Essentially it would begin with the sale and development of a highend residential enclave on a portion of the site that would provide the funds to develop a links style golf course, built in phases. It also specified year-round activities that the site would play host to."

The award definitely helped Jarvis land her first job in site planning and rehabilitation after graduation, she says. After working in the industry for a while, she then joined the Municipality of Milton as an environmental planner, which she says helped her in her continued dealings in the aggregate field. "I was able to [effectively] approach the aggregate industry, as well as many other areas such as source water, natural heritage and sustainability, as an environmental planner," she explains.

Jarvis has since returned to landscape architecture. While the projects she now works on tend to be smaller in scale, she nonetheless feels her experience with rehabilitation is standing her in good stead. "Rather than working on huge acreages the way you do when you're doing rehabilitation, I'm focusing on smaller properties like residential ones or commercial ones. It's a much more focused area to design in. The principles of rehabilitation can be helpful when you try and get the look of a wider, more sweeping area into your design for a smaller space. I luckily got to do a bunch of different things, and they've all tracked back to the same ideas and principles."

Jarvis is especially proud that her winning project was the only one-person entry that year, and says it has helped her advance in her multifaceted career. "The competition provides an interesting challenge, and it goes beyond aggregates since current and future development, especially with Ontario's policy direction, includes infill and brownfield development. Being able to see the opportunities in sites that aren't greenfield is an asset."

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LAKELAND ESTATES

Lakeland Estates is a stunning residential and recreational area in the Township of Osgoode, now part of Ottawa. It was also once a gravel pit before it underwent the transformation that turned it into the beautiful oasis it has become today.

To commemorate this impressive transition, the site was awarded OSSGA's Bronze Plaque back in July 1987. The plaque, presented to Spratt Sand and Gravel and the Township of Osgoode, remains a testament to the power of transformation. It also serves as a reminder that to obtain an aggregate licence, all producers must draw up a detailed plan on how they will rehabilitate their site over the long term.

At OSSGA, we are proud to celebrate the best of these rehabilitation projects with our Bronze Plaque Award. Established in 1975, it remains OSSGA's most prestigious award, reserved for outstanding examples of cutting-edge rehabilitation of pits and quarries in Ontario.

There are many award-winning sites spread out all across Ontario, and we look forward to celebrating them with you in this new, regular feature of *Avenues*.

For more examples of award winning final rehabilitation projects, visit: ossga.com/bronze_plaque

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FICTION.

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2016 OSSGA INDUSTRY ADVANCEMENT AND STUDENT DESIGN AWARDS

CELEBRATING THE STORY OF AGGREGATE IN CANADA

COMMUNITY RELATIONS

The Community Relations Award recognizes those who have demonstrated leadership in promoting good neighbour relations, community involvement, education and industry awareness.

Dufferin Aggregates – A Division of CRH Canada Group Inc.

Acton Quarry Town of Halton Hills

Building strong community ties and lasting neighbour relations are chief priorities at Dufferin Aggregates' Acton Quarry. Onsite, these commitments are demonstrated through the adoption of noise and dust mitigation processes and equipment, traffic safety initiatives, the quarry's Blasting Beyond Compliance program, and numerous environmental efforts.

Within its community, Acton Quarry supports local organizations like the Darling Home for Kids and the MS Society, and it regularly donates funds and material to local sports clubs, schools, community events, and fundraisers. In 2016, it hosted its yearly tree-planting initiative with Scouts Canada, where Acton Quarry volunteers paired with 350 scouts to plant 3,000 native tree and shrub species as part of the site's rehabilitation and eco-friendly initiatives.

Rounding out its community relations, Acton Quarry hosts an annual Open House for over 200 neighbours, government officials, community stakeholders, quarry staff and their families, as well as the Earth Rangers organization. It also works with local media outlets to share news of its operations and company initiatives.

Dufferin Aggregates – A Division of CRH Canada Group Inc.

Carden Quarry Township of Ramara

The spirit of community thrives at Dufferin Aggregates' Carden Quarry. In addition to donating thousands of dollars in funds and material goods to local charities and implementing other initiatives in the Township of Ramara, Dufferin Aggregates' staff help conduct annual year-end clean-ups along Cranberry Lake Road. The quarry also supplies its neighbours with a free load of aggregate and holds an open house and conducts tours for members of the public interested in learning more about the quarry's operations, its people and the importance of aggregates in the industry.

Within its boundaries, Carden Quarry takes a number of measures to minimize the impact of its operations on neighbours. Noise is controlled through a CPL noise reduction system and dust is mitigated through regular site maintenance, road watering and the recent addition of spray bars. Potential impacts from site traffic are addressed through a Truck Safety Policy, and the site takes numerous measures to stay in compliance with its water usage requirements.

These and other activities are shared with the community through Carden Quarry's communication program. It includes regular meetings, a local community engagement plan, an Environment Management System, and CRH's comprehensive public relations program.

A SPECIAL THANKS TO THE JUDGES

The Industry Awards review panel was comprised of judges invited from outside the industry, including Mhairi McFarlane, Nature Conservancy of Canada; Nic Schulz, Cornerstone Standards Council; Mike Williams, Ducks Unlimited Canada; Bryan Lewis, Halton Hills Councillor; James Bakker, MNRF Aggregate Technical Specialist; and Hal Leadley, MNRF Coordinator, Resource Development. They were supported by OSSGA member Kevin Fitzpatrick of WSP Canada Inc. and Danielle Solondz of The Ontario Aggregate Resources Corporation (TOARC).

The Student Design Award review panel was comprised of judges from outside the industry, including Stephen Douglas, an MNRF Aggregates Inspector, as well as members of OSSGA's Rehabilitation and Species at Risk Committees: George Antoniuk, The Miller Group; Stephanie Balzer, Nelson Aggregate Co.; Debra Kakaria, MHBC Planning; and Kevin Fitzpatrick, WSP Canada Inc.

Supported by

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COMMUNITY RELATIONS

Dufferin Aggregates – A Division of CRH Canada Group Inc.

Milton Quarry Town of Milton

Employees at Dufferin Aggregates' Milton Quarry are continuously demonstrating their commitment to the quarry's neighbours and surrounding community. In addition to going to great lengths to protect its 20 neighbours against noise, dust and traffic from its operations, part of the quarry's rehabilitated space serves as a public access viewing area within the Bruce Trail network.

As well, Milton Quarry staff regularly lead initiatives within the community. They include helping to organize and run an annual Earth Week tree-planting event in association with Scouts Canada, hosting student tours as part of the Dufferin Aggregates Education Program, and

lending support to Dufferin Aggregates' yearly Ready Mix Drum Sponsorship Program in support of Halton Healthcare Services. On top of this, the Milton Quarry sent money, materials and volunteers to a wide range of charities, community organizations, local clubs and fundraisers. Milton Quarry's Community Advisory Panel (CAP) ensures there is ongoing dialogue between quarry staff and Milton residents, and its Environment Management System (EMS) tracks, documents and addresses concerns that arise.

Dufferin Aggregates – A Division of CRH Canada Group Inc.

Mosport Pit Village of Orono

Tree planting, open houses, local volunteerism and onsite events are just a handful of ways that Mosport Pit shows its support for the Municipality of Clarington. In 2016, it sent volunteers and made approximately \$5,500 in monetary and material donations to a number of local groups and organizations, including the Orono Santa Claus Parade and Fall Fair, Durham Children's Groundwater Festival, In the Face of an Angel Golf Tournament and the Dufferin Aggregates Ready Mix Drum Sponsorship Program in support of local hospitals.

Mosport Pit's neighbourly spirit is also found throughout its 172-hectare site. The pit employs extensive maintenance to mitigate noise and dust and takes measures to ensure traffic safety and eco-friendly resource use. Its Zero Harm day is held to encourage safe practices among its staff; this year they celebrated 15 years with no lost-time injuries.

Lafarge Canada Inc. – A Member of LafargeHolcim

Caledon Pit Town of Caledon

Caledon Pit takes community relations to heart both on- and off-site. On the site, noise, dust and safety mitigation equipment and practices help minimize the effects of its operations on neighbours. Off-site, staff are familiar faces at community events. Highlights include the Caledon Council Community Golf Tournament, which Lafarge sponsored at a platinum level, and the Peel Children's Aid Foundation's Holiday Wishes Program. As part of the Children's Aid program, Caledon Pit staff sponsored a family for the holidays and delivered Christmas gifts.

One of Caledon Pit's more popular events is its annual Pit Run. Held since 2012 and co-hosted with Aecon Construction, last year's run took place in September, with over 100 runners participating in a 5-km or 10-km run through the property. Neighbours, employees, family members and friends joined Caledon Pit employees for a 1-km Kids' Fun Run, sponsor expo, equipment displays and tours, all of which helped raise \$30,000 in support of the Caledon Central Public School and their Food Exchange program.

COMMUNITY RELATIONS

Lafarge Canada Inc. – A Member of LafargeHolcim

Woodstock Quarry Township of Zorra / County of Oxford

At Lafarge Canada Inc.'s Woodstock Quarry, being a good neighbour means more than ensuring the safety of staff and visitors on and around the site. It means using berms and barrier walls around the 550-hectare site to reduce noise, while also conducting extensive blast monitoring to minimize vibrations and taking multiple measures to control dust.

For Woodstock Quarry staff, being a member of the community means getting involved in a wide range of local events and charitable initiatives. This includes sponsoring IKO Charity Golf Tournaments, holding fundraisers in support of Woodstock's Domestic Abuse Services Centre, hosting a Scoutrees planting event, donating to local sports organizations and contributing concrete to the Woodstock Police Association to build a new kennel for a police dog.

In addition, Woodstock Quarry's doors are open to students and community members who want to learn more about the quarry, aggregates and site safety.

Walker Industries – Walker Aggregates Inc.

McGregor Quarry Town of Amherstburg

McGregor Quarry takes pride in giving back to its hometown of Amherstburg. It uses noisereducing equipment, vegetated berms and a tree screen around the road boundaries to reduce noise, while seismographs are used to monitor noise and vibrations from blasting operations. Equal focus is placed on reducing dust through routine maintenance and ongoing improvements to the processing plant. Traffic safety is also addressed with a network of traffic lights and signage throughout the property.

The McGregor Quarry is embedded in its community. It donates to organizations like the Unemployed Help Centre, the Windsor/Essex County Humane Society and the Windsor-Essex Children's Aid Society. It also provides assistance and discounted materials to the Essex Region Conservation Authority for various projects. Throughout the year, the quarry opens its doors to teachers and their students for informative field trips and publishes a semi-annual newsletter, *BorderStones*, to inform neighbours and stakeholders of its operations, quarry news and upcoming events.

COMMUNITY RELATIONS

Walker Industries – Walker Aggregates Inc.

Vineland Quarries & Crushed Stone Town of Lincoln

Good neighbourly relations rank high among Vineland Quarries & Crushed Stone's priorities. The site has taken numerous steps to reduce the impact of its operations, such as switching to custom-made tarps over its stockpiles, adding a second water truck, employing an advanced dust control system to mitigate dust, installing custom fabricated soundproof enclosure systems at its primary and secondary plant to reduce noise and dust, and enhancing traffic and site safety initiatives.

Quarry employees are also active within their community. The quarry partners with the 1st Vineland Scouts every Earth Day to clean up roadways, and it regularly makes a donation to their club. It also teams up with Walker Industries to hold the "Together We Can" \$10,000 charity lottery, where 15 employees are given the opportunity to donate \$500 or \$1,000 to a community charity of their choice. Vineland Quarries is happy to invite the community to receptions and tours, and regularly shares news on its operations and employees in its *Stonevine* newsletter.

Walker Industries – Walker Aggregates Inc.

Walker Brothers Quarries Township of Stamford (Niagara Falls)

Continually improving its noise, dust, traffic and safety measures is simply one part of Walker Brothers Quarries' community relations' game plan. The quarry is involved with many local fundraisers and charitable initiatives and hosts field trips and a Construction Day event for students. The quarry also holds a Christmas Wine and Cheese, which is open to neighbours who want to learn more about its operations, discuss issues or meet staff members. These events, updates and articles from Walker Brothers Quarries are all showcased in the company's bi-annual Walkways newsletter.

Quarry staff are always looking for ways to give back to their community. In 2016 they did just that after receiving unexpected proceeds for batteries and scrap metal. Instead of directing the money toward staff functions, they donated it to the Juravinski Hospital in honour of a former employee who had passed away

from cancer. On a second occasion, staff supported a team from the quarry that participated in the Parkinson SuperWalk, raising \$15,000 for Parkinson Canada, the highest amount raised for the charity in the Niagara region.

ENVIRONMENTAL ACHIEVEMENT

The Environmental Achievement Award recognizes OSSGA members that have developed and successfully implemented industry-leading policies, programs or projects that make positive contributions to the environment and motivate leadership within the industry.

Dufferin Aggregates – A Division of CRH Canada Group Inc.

Milton Quarry Town of Milton

Milton Quarry's commitment to environmental stewardship and continuous improvement was on full display in 2016. Thanks to its water conservation methods (e.g., its water recharge system) the quarry was able to water trees in the Region of Halton's Cox Tract during a period of drought. It also continued its progressive rehabilitation effort and paired with Scouts Canada to host its annual tree-planting event.

Other eco-forward activities conducted by the quarry include re-purposing worn-out conveyor belting and installing three electric vehicle-charging stations. As a Class A hydro user (average hourly peak demand between three and five megawatts), Milton Quarry also participates in the IESO Class A Global Adjustment (GA) program to reduce hydro consumption at peak times, reducing the amount of greenhouse gases created by hydro generation.

Waynco Ltd. Waynco Pit

Township of North Dumfries

In 2005, Waynco Ltd. was approached by the Waterloo Stewardship Network with a request to become a partner in enhancing, restoring and creating one of Ontario's largest prairie remnants from the tallgrass prairies and savannahs on its property. Soon after, a plan to regrow a Waynco Prairie was launched with a goal to protect and enhance the endangered tallgrass ecosystem and its native plant and animal species.

Over the past 10 years, the Waynco Rehabilitation Project has included prescribed burns, the creation of an invasive species management plan, extensive seeding and planting, seed collection and ongoing monitoring.

The site has also hosted tours for naturalist groups and has been a focus of study for students at the University of Waterloo. Seeds collected from the project have contributed to the restoration of other prairie lands, including a project at the nearby Savannah Golf Links.

PROGRESSIVE REHABILITATION

The Progressive Rehabilitation Award recognizes ongoing efforts of individual operators in progressively rehabilitating their sites in accordance with their site plans.

Judges' Choice Award

CBM Aggregates – A Division of St. Marys Cement Inc. (Canada), Votorantim Cimentos

Diocese Pit Thames Centre

Approximately 13 hectares of land were rehabilitated on the eastern side of CBM Aggregates' Diocese Pit with the goal of returning the land to agricultural use. From 2004 to 2015, material for the project was transported to the site, after which recycled asphalt was removed and processed for A-gravel and roadside granulars.

Once cleared, the pit floor was contoured and sloped and overburden was applied to create side slopes and raise the floor height by 0.9 metres. In the end, approximately 130,000 cubic metres of material was used to complete the contouring.

In the fall of 2015, nearly 20,000 cubic metres of topsoil was placed at 30-cm depths. Final contouring was achieved later that year, and in April 2016 tilling and seeding with corn commenced. By that summer, the crop was performing well despite the region's extreme heat and dry conditions.

CBM Aggregates – A Division of St. Marys Cement Inc. (Canada), Votorantim Cimentos Archer Pit

Municipality of Brighton

Archer Pit's rehabilitation project took place from August 2014 to September 2015 over 1.8 hectares of the pit's 5.97 hectares of total licensed area. Approximately 6,000 square metres of overburden was moved by CBM's CAT 980 loader and placed to create a 3:1 slope, after which Indewey Excavating graded the material with a 450 John Deere dozer. Next, topsoil was transported from nearby storage berms and spread at a thickness of 12 inches across both the slope and the pit floor.

In the final month of the rehabilitation project, CBM employees seeded this area with a rye and clover mix, applied at a rate of 125 kilograms per hectare.

PROGRESSIVE REHABILITATION

CBM Aggregates – A Division of St. Marys Cement Inc. (Canada), Votorantim Cimentos

Lakefield Pit Township of Selwyn

The rehabilitation of Lakefield Pit's central floor involved 1.25 hectares of the pit's total licensed area of 77.01 hectares. It began in September 2015 with the transfer of approximately 2,000 cubic metres of overburden from a nearby storage stockpile to the target location, after which Doughty Aggregates transported stripped onsite topsoil to cover the site. That topsoil was spread over the rehabilitation area at a thickness of six inches and then graded by a 450 John Deere dozer. In October, employees completed the project by applying 160 kilograms of grass and legume seed mix at a rate of 128 kg/ha, and work wrapped up on the rehabilitation in mid-October.

Dufferin Aggregates – A Division of CRH Canada Group Inc.

Butler Pit Township of North Dumfries

Plans to conduct progressive rehabilitation alongside active extraction were drafted at an early stage in Butler Pit's operations. Those plans included mining 6.2 hectares of land with an approximate face height of 7.5 metres over several phases, and following up immediately with rehabilitation efforts in the extracted areas. By rehabilitating the area so soon after mining, crews were able to quickly stabilize the bank and reduce erosion, establish faster vegetation, enhance site safety, and better protect local wildlife.

Mining for Phase 1 began in April 2015 and concluded with the rehabilitation of 200 metres of slope with 10,000 cubic metres of overburden. During Phase 2, 175 metres of slope was rehabilitated with 5,000 cubic metres of overburden, and in Phase 3 10,500 cubic metres of topsoil was applied at depths between 0.15 and 0.20 metres and seeded.

In the final phase, nearly 30,000 cubic metres of overburden and over 10,000 cubic metres of topsoil were spread to depths of 0.15 metres across the slope. The area was subsequently seeded with three different seed mixes.

PROGRESSIVE REHABILITATION

Lafarge Canada Inc. – A Member of LafargeHolcim

Cook Pit Township of Sunnidale

Cook Pit's rehabilitation efforts took place over the 2015 and 2016 seasons and focused on 1.2 hectares of the 15.2-hectare sand and gravel pit. The intent was to reshape and grade the area to match its surroundings. Material was sourced from onsite operations, including the 8,000 cubic metres of overburden and topsoil moved to complete the rehabilitation. Local contractors were hired to complete the sloping and seeding, which included a mixture of rye, fescue and native species. Existing trees were saved to promote native species regeneration.

In total, Cook Pit's rehabilitation plans were conducted over three areas between 2011 and 2016. Area 1 included the natural regeneration and overgrowth of haul routes, while Area 2 in the southwest portion of the pit required sloping and seeding. Area 3, north of the pit, was completed in 2016.

Lafarge Canada Inc. – A Member of LafargeHolcim Uxbridge Pit

Township of Uxbridge

Rehabilitation on the Uxbridge Pit (formerly the Regan Pit) was conducted with the intent of matching the rehabilitated area with its Core Forest surroundings and creating a wildlife corridor running between the north and south forested areas around the pit. Over 55,000 cubic metres of material was moved from onsite stockpiles to grade and shape the contours of the site, creating a rolling topography to promote the growth of local trees. Additional portions of the site were seeded with a mix of rye, alfalfa, clover and fescue.

Lafarge crews worked with experienced foresters to determine the best species to plant, based on their likelihood of growth. Selected trees included White Spruce, White Pine, Red Pine, Scots Pine, Larch, Hybrid Poplar and Trembling Aspen. Uxbridge also hosted a community tree-planting event with local community members and Scouts Canada. Future plans include the construction of habitat for snakes, fox and small mammals.

Walker Industries – Walker Aggregates Inc.

McGregor Quarry

Town of Amherstburg

From 2010 to 2016, McGregor Quarry's progressive rehabilitation efforts focused on readying the site for final rehabilitation, and their vision calls for sloped walls leading down to a water-filled quarry. Rehabilitated areas include seven hectares on the site's west wall, 4.5 hectares on its east wall, and 1.38 hectares on the south side.

Throughout the years, these slopes have been sculpted and seeded, and the company has planted trees along the top perimeter. Special seed mixtures (using species native to the region) were used to prevent erosion. The rehabilitation required over one million cubic metres of overburden from onsite sources, and topsoil was spread to depths of six inches. Looking ahead, part of the final rehabilitation will include filling the quarries' south end from an elevation of 125asl to 185asl, which will require 35 million cubic metres of fill. That part of the rehabilitation area will be progressively rehabilitated over the next 100 years of the mine's operation.

PROPERTY ENHANCEMENT

The Property Enhancement Award recognizes operational best practices in a site's entrance, approach and perimeter screening, office and scalehouse areas, employee areas, plant appearance, environmental controls, truck and mobile equipment, and communicative signage. Sites that initially meet the minimum requirements in each of the aforementioned sections are awarded a plaque. Site operators are then provided with an opportunity to win a Gold Bar for each section by meeting the comprehensive list of criteria for each. There are a total of seven Gold Bars that can be achieved.

Miller Paving Limited Carden Quarry Township of Carden One Gold Bar: Environmental Controls

Lafarge Canada Inc. – A Member of LafargeHolcim Burford Pit Township of Brantford Certificate

Lafarge Canada Inc. – A Member of LafargeHolcim Oro Pit Township of Oro-Medonte Plaque

Walker Industries – Walker Aggregates Inc.

McGregor Quarry Town of Amherstburg

Plaque and seven Gold Bars: Entrance, Approach & Perimeter Screening; Office & Scalehouse Areas; Employee Areas; Plant Appearance; Environmental Controls; Trucks & Mobile Equipment; Communicative Signage

Supported by

Generous funding for the competition was provided by The Ontario Aggregate Resources Corporation

STUDENT DESIGN COMPETITION

The Student Design Competition recognizes the most innovative designs for the ecological revitalization of a former pit or quarry. This year, students were challenged to create site plans for Nelson Aggregate's Burlington Quarry on the Niagara Escarpment.

1st Place (\$1,500) – Stonecliff Hatchery

Luke Elwood, Emily Dixon, Mike Hukezalie - University of Guelph

This 1st place award submission repurposes Burlington Quarry's lake as the central element in a hatchery/fishery development. With a mission to "enhance the quality of the land whilst generating new economic values based on sustainability," Stonecliff Hatchery is designed to create sustainable ecological systems; make the site more appealing to pedestrians, cyclists and vehicles; and develop facilities that will support research and education about sustainable fishing practices. Highlights of the extensive rehabilitation plans include the creation of a hatchery, fish cage, processing facility for food production, a boat launch for public fee-fishing in a stocked lake, a maintenance building, observation deck, parking facilities, an educational facility, and a network of movement corridors that will connect users to onsite facilities and focal points.

With all of these elements combined, Stonecliff Hatchery aims to provide Conservation Halton with "an innovative and practical site that will provide not only education for the local communities but also a new economic industry that will provide benefits to the region."

site's rehabilitated habitats.

2nd Place (\$1,200) – Connection Habitat Regatta (CHR) *Michal Laszczuk, Stephen O'Neill, Luozijie Xie - University of Guelph*

As the name for this entry suggests, this student concept weaves themes of connection, habitat and regatta together to transform Burlington Quarry into a natural haven for both humans and native wildlife. To build those connections, the plan calls for the construction of an education centre, a grandstand for sporting events, a conservation area, improvements to the surrounding trail system, and a realignment of the Bruce Trail system to allow visitation of the

Addressing the "habitat" element, CHR proposes a woodland and wetland be created in close proximity to one another, utilizing a vegetation barrier to protect sensitive natural areas from human-use spaces.

Lastly, CHR's "regatta" element is represented by plans to develop a water sports facility that will be fully integrated into the rehabilitated habitats. With this facility, the student team believes the site will be an ideal venue for multinational water sporting events and help provide the region with a naturalized park that benefits both visitors and native species alike.

3rd Place (\$750) – Mount Nemo Memorial Grounds

Brianna Collis, Daniel Rotsztain - University of Guelph

This entry proposes that Burlington Quarry be rehabilitated into a natural memorial and scattering ground: the Mount Nemo Memorial Grounds. It lays out detailed steps to create various active and passive activity zones, including a naturalized forest zone, a memorial forest, ashes burial forest, maple-beech forest and meadow, and contemplation forest.

Visitors to the site are accommodated through a path system, shelters and a community building/ administrative centre. Together, these features create a peaceful and contemplative memorial ground that, according to its designers, will be "harmonious with the surrounding ecology and landscape, create connections to other green spaces, and respond to social and community needs." By instilling land stewardship through memorialization, the Mount Nemo Memorial Grounds will foster a unique, contemplative sense of space for everyone who visits.

Honourable Mention (\$300) – Rejuvenated Living: Nature's Village

Gabriel DiNardo, Suzana Krizsan, Josephine Lenkey - Fanshawe College

Low-impact and sustainable housing, greenhouses, bee farming and a central bird sanctuary are just a handful of the standout features proposed in this holistic submission. In addition to rehabilitation plans, Fanshawe College's Rejuvenated Living: Nature's Village submission calls for the development of a marsh, wetland, grassland, cliff and alvar habitats; an educational hub; and a pedestrian lookout overlooking the marsh and wetland habitats. The creation of new, healthy and diverse ecosystems also promotes the use of species indigenous to the region, including about 140 vascular plant species, 19 different plant communities and around 40 nesting bird species. An onsite island will serve as a dedicated sanctuary for birds, while the sustainable community, inspired by similar communities in Denmark and the Netherlands, will provide off-grid living for its residents.

STUDENT DESIGN COMPETITION

Honourable Mention (\$300) – Hooked

Kyle Foch, Matt Marchese - University of Guelph

With Hooked, students from the University of Guelph envision an "ecologically-focused destination" that will create a link between humans and their natural environment. With this goal in mind, this submission outlines a strategy to create a natural ecosystem with numerous amenities for fishing, camping, hiking and enjoying the site's lake and surrounding trails. Techniques used to facilitate the water component of this transformation include the use of stepped shoals, lurkers and bank cribs, as well as piles and tangles. Features such as an events centre, shade structure and gardening facilities are also included to encourage a deeper connection between visitors and their environment. The aim of the low-impact Hooked eco-recreation centre is not only to educate local residents about their natural surroundings, but to attract more tourists to the natural beauty of the region.

Honourable Mention (\$300) – Transition Park

Yusong Li, Hannah Soules - University of Toronto

This entry separates itself from the pack with a well-defined strategy for using onsite hydrology to develop varied ecosystems for recreational use. The student team considered water the most defining attribute of the site and did not want to lose that in the rehabilitation process. Instead, they sought to celebrate the water element. Their plan will modify the west-side body of water to increase its transition zone, connect it with the other main body of water via streams and channels, and stabilize the site over time. The final rehabilitation includes an outdoor learning centre, boardwalk, rentable cabins, campsites and support for various water activities.

Honourable Mention (\$300) – Hideaway Harbour

Jared Grice, Nicola Moffat, David Quinn - University of Guelph

This submission sees Burlington Quarry reborn as a "gated retreat community" called Hideaway Harbour, catering to both private residential occupants and public visitors. It includes designs for 333 "built-to-order mobile floating living spaces," sourced from a German company. There will also be a community centre for both public and private user enjoyment that will sit on the edge of the water with a wrap around porch that juts onto the water so users can experience both the inside and outdoors. Finally, a wooden boardwalk built along the water's edge will link various features of the development and provide more space for recreational activities and sightseeing. The plan protects local vegetation and wildlife through different naturalization efforts and will, over the long term, generate income for the City of Burlington.

Honourable Mention (\$300) – Ecocentric

Dannah Links, Denise Poon - University of Guelph

Ecological education is the focus of this student entry, which seeks to create learning opportunities for students at all levels through onsite labs, an outdoor classroom and submerged aquarium. Additionally, Ecocentric's plans include steps to create deep water fish habitats, protected fish breeding and feeding bays, and various woodland areas – all with a goal to optimize conditions for the long-term sustainability of native plant and animal species. Located in one of Canada's smallest and most biologically diverse ecozones, the region is home to 25 per cent of species at risk. This accounts for the aim to minimize human impact. To that end, only part of the site will be available to visitors who will otherwise have access to new trails, raised lookouts, outdoor seating, interpretive signage and other human-use amenities.