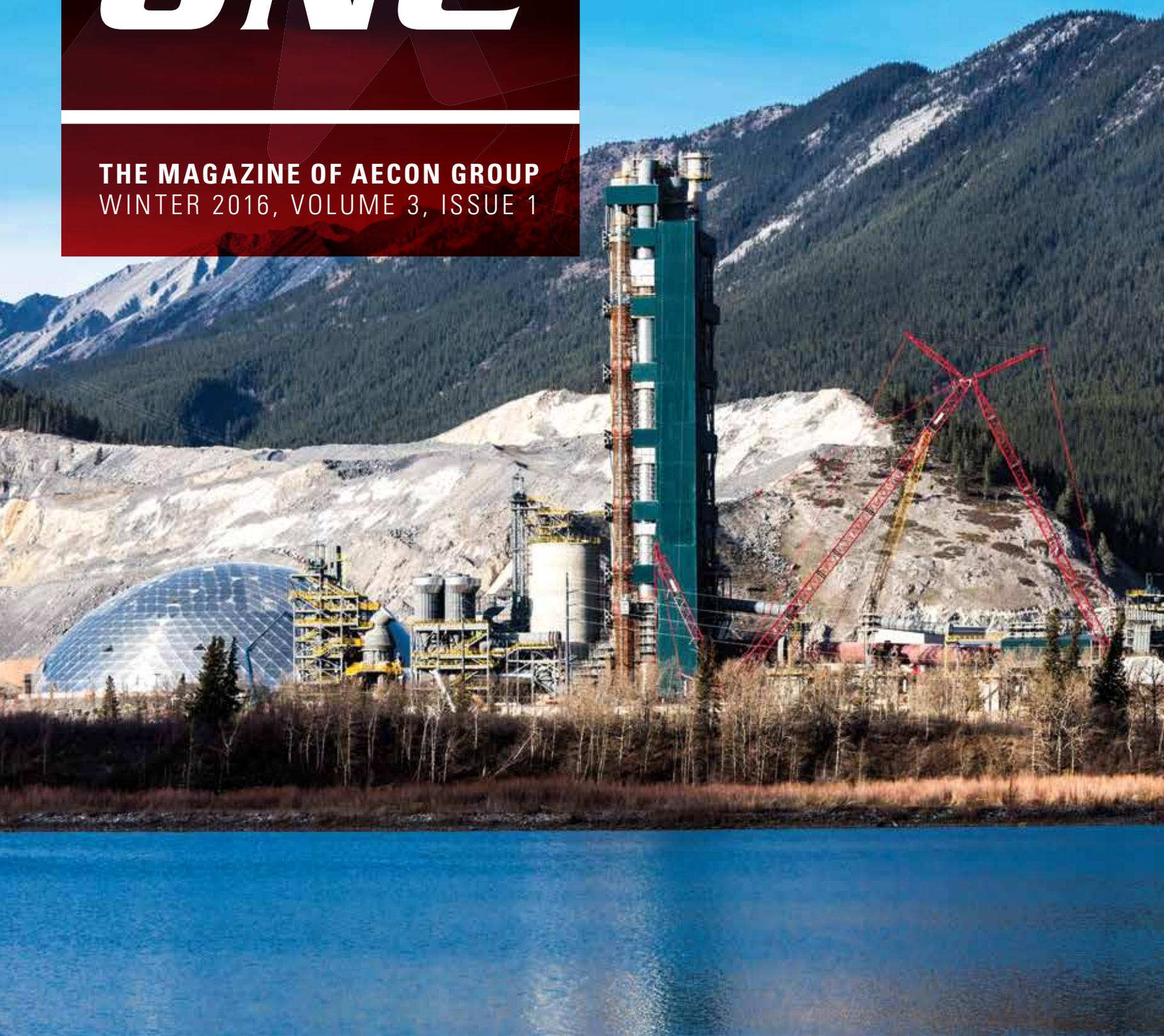


ONE

THE MAGAZINE OF AECON GROUP
WINTER 2016, VOLUME 3, ISSUE 1



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K+S Potash Canada's New
Saskatchewan Mine

GENERATING INTEREST? DAM RIGHT!

The John Hart
Hydroelectric Project

CLEAN WATER

Regina Wastewater
Treatment Plant
Upgrade Project

EDMONTON'S MOD YARD IN FULL SWING

The North West Redwater
Refinery Project

ARE YOU WINTER READY?

Reduced visibility, slippery conditions and extended commutes are all hallmarks of winter driving. Keep your personal safety – and the safety of your co-workers and family – top of mind this season by ensuring your vehicle is well equipped for winter safety hazards. Review “**Winter Driving Safe Work Practices**” in the Aecon RedBook and follow up with your EHS representative for additional safety measures.

AECON SAFETY MATTERS ... MOST!

ONE

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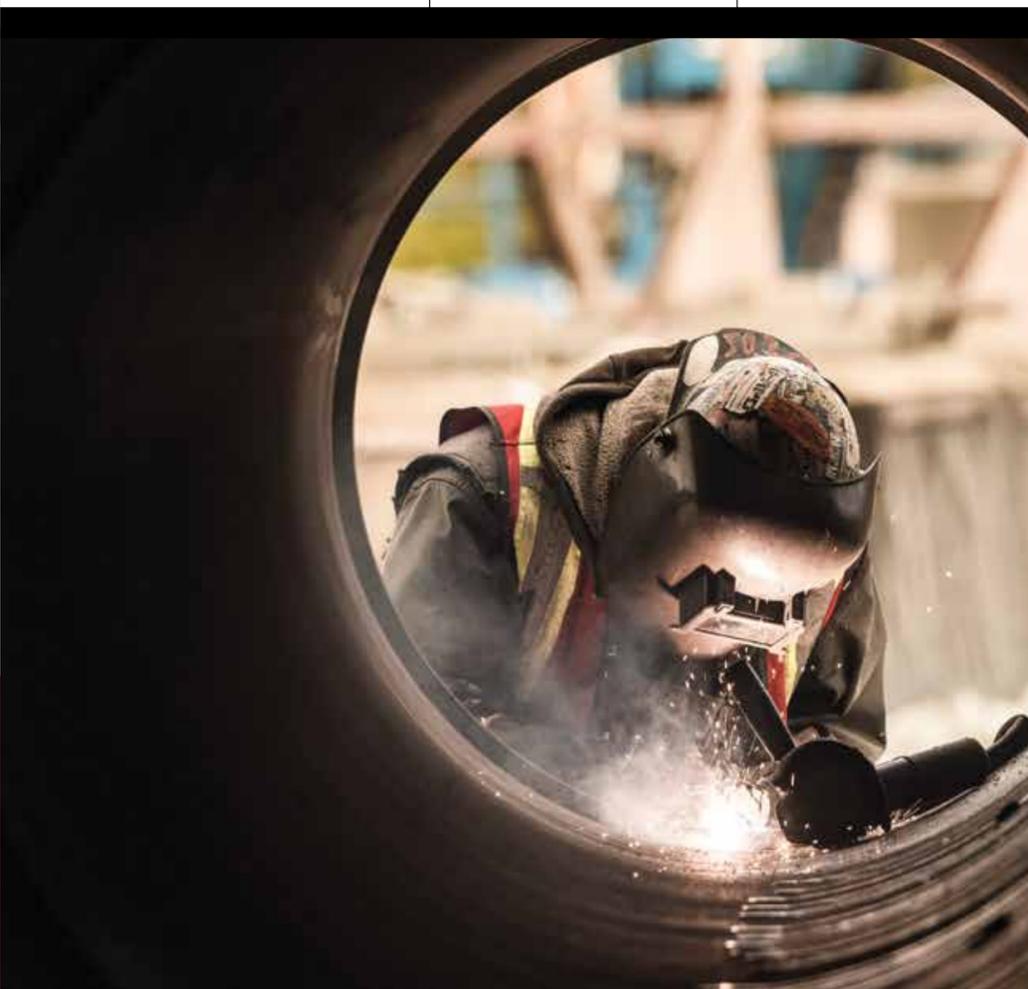
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ABOVE:
WELDER AT THE JOHN HART GENERATING
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BACK COVER:
WORKERS AT THE JOHN HART GENERATING
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This magazine includes certain forward-looking statements that contain information concerning possible or assumed future results or operations of Aecon. These forward-looking statements are based on current operating plans and are subject to risks and uncertainties. Although Aecon believes the expectations reflected in these forward-looking statements are reasonable, it can give no assurance the expectations of any forward-looking statements will prove to be correct.

AECON'S VISION:

To be the first company people go to for building things that matter.

AON
BESTEMPLOYER
PLATINUM | CANADA | 2016

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DIVERSIFICATION BY DESIGN

By Teri McKibbin
President and Chief Executive Officer



WANETA POWER PROJECT, BRITISH COLUMBIA

Aecon's vision is to be the first company people go to for building things that matter and nowhere was that more evident than in the scope and diversity of what Aecon accomplished across Canada in 2015.

This past year, we completed several projects in Ontario, including the Lower Mattagami River Project, the massive Parkway West compressor station in Mississauga, and we are currently engaged in a number of significant refurbishment initiatives at the Darlington Nuclear Power facility. Aecon also completed the Waneta Power Project in British Columbia, built the Areva Mine processing facility in Saskatchewan, and completed the tower at Lafarge's cement plant in Exshaw, Alberta.

Thanks to our AirLinx team, the Union Pearson (UP) Express is now running from downtown Toronto to Pearson International Airport along the new elevated track structure and stopping at the beautiful terminal we built. We are working on the new LRT line for Waterloo; closing in on the completion of the Sheppard West Subway Station on the York-Spadina line in Toronto; and we're constructing the Anthony Henday ring road around Edmonton.

And that's just a few of the projects we have been involved in. The list goes on. Our strategy of diversification is really paying off as we realized revenue growth in all four segments of our business, and our backlog of \$3.4 billion, as of September 2015, is the highest on record.

In 2015, we landed our largest contract yet. As part of the Crosslinx joint venture, Aecon will not only finance, design, build and operate the Eglinton Crosstown Light Rail Transit Line, but it will maintain the system for 30 years under a long-term concession agreement. This \$5.3-billion project is the largest infrastructure undertaking in Ontario's history.

It is an impressive resume, all the more so considering the difficult economic times. Two years ago, for example, the price of oil was about \$120 a barrel. Today, it is much less than that.

The drop in oil prices had a predictable effect on the Alberta oil sands industry. Some companies cut back on production; some curtailed projects and delayed others. But despite challenges in the oil

sector, there is still work to be done as is evident in this issue of ONE Magazine. Our Mining group is developing the Fort Hills oil sands project, while Aecon Industrial West is working on the largest fabrication project in its history, supplying and installing pipe rack modules to the Sturgeon Refinery near Edmonton – the first refinery to be built in Canada in 30 years.

Meanwhile, our diversification strategy allowed us to focus our efforts on other market segments, which is how you will find our logo on construction sites across the country. Whether it is a hydroelectric project in British Columbia, a potash mine in Saskatchewan, or a pioneering project to harness tidal energy in Nova Scotia, all of these projects are profiled in this issue.

Aecon is strategically diversified by design. Over the years, we have acquired some of the best known builders, contractors and industrial enterprises in order to provide our clients with a broad portfolio of services that all operate under

OUR STRATEGY OF DIVERSIFICATION IS REALLY PAYING OFF AS WE REALIZED REVENUE GROWTH IN ALL FOUR SEGMENTS OF OUR BUSINESS, AND OUR BACKLOG OF \$3.4 BILLION, IS THE HIGHEST ON RECORD.

the banner of ONE Aecon – one focus, one goal, one team, and one company.

But just as it takes time to build a major infrastructure project, it takes time to build a unified company. One of the basic principles of construction is that you build from the ground up. It doesn't matter whether you are building a road, a bridge or a building, the structure is only as strong as its foundation. This is equally applicable to building a business.

Three years ago, we realized we were at a tipping point. We had some 20 different business units, many of which were still operating using their old systems. The systems were outdated, unable to communicate with each other and no longer effective. We needed what is known in the trade as Enterprise Resource Planning (ERP), integrated business process management software to manage the work flow and automate many back of office functions related to technology, services and human resources.

It was an enormously risky undertaking. Two out of three ERP projects fail. We put our best people on this multi-million dollar initiative and after two and a half years of tireless work, we have successfully converted our systems to one common platform. We called the project "Bedrock" and it is living up to its name. We now have the strong foundation we need to continue to build our company.

Systems are important but we never forget the importance and the contribution of our employees. This is not an easy profession. Whether we are building a new transit line, opening a mine or refurbishing a power plant, our clients depend on us to complete the work to the highest standards of safety and quality and to do so on time and on budget. Expectations are high and the pressure to get things done can be enormous. Our employees have to be dedicated, single-minded and prepared to make sacrifices, often involving long hours in remote locations, away from friends and family. I am exceptionally proud of what they have accomplished, and I am thankful for the tremendous support their families provide them as we continue to build things that matter. Today, Aecon's foundation is stronger than ever on many fronts.

Teri McKibbin is the President and Chief Executive Officer of Aecon Group Inc.

FORT HILLS

HEAVY CIVIL CONSTRUCTION

The newly opened Fort Hills mine in the resource-rich area of Fort McMurray, Alberta, is regarded as one of the best undeveloped oil sands mining assets in the Athabasca region. And, for Aecon Mining, this project, the largest excavation contract in the company's long history in the Albertan oil sands, is a welcome beacon in this region given the current economic climate.

AS WITH ALL OIL SANDS PROJECTS, THE SCALE OF THE WORK IS IMPRESSIVE, DWARFING MOST OTHER TYPES OF CONSTRUCTION PROJECTS. THE TAILING'S POND WILL BE JUST OVER EIGHT MILLION SQUARE METRES WITH A 400 METRE WIDE DIKE AT THE BOTTOM. THE INITIAL MINING CUT WILL BE 1.5 KILOMETRES WIDE AND ONE KILOMETRE LONG AND UP TO 40 METRES DEEP.

In an energy-hungry world, Canada stands in an enviable position, being third in the world when it comes to the size of its oil reserves. But since 97 per cent of the country's reserves are positioned in northern Alberta's oil sands, getting them to market can be a formidable challenge. Unlike conventional oil reserves that can be readily pumped to the surface, extracting the oil from the mix of sand, water, clay and bitumen (a thick, viscous type of oil) is no easy task. Most of the reserves are relatively deep underground, forcing producers to inject steam to soften the bitumen in order for it to be pumped to the surface. Only about 20 per cent of Alberta's oil reserves, like those at Fort Hills, are relatively close to the surface and can be recovered using open-pit mining. Large shovels scoop the oil sands into trucks, transporting them to crushers where the large clumps are broken down. The oil sands are then mixed with water and other additives and transferred by pipeline to a plant that separates the heavy oil from the other components. The tailings (water, sand, clay and residual oil) are pumped into ponds where the sand and

clay settle to the bottom and the water can be recycled for reuse in the process.

Estimated to cost a total of about \$13.5 billion, the Fort Hills mine is expected to start production as early as the fourth quarter of 2017 and within 12 months, will be at 90 per cent of its planned production capacity of 180,000 barrels per day. With an estimated 3.3 billion barrels of bitumen in reserve, the mine will be able to operate for about 50 years.

In June 2014, Fort Hills Energy LLP awarded Aecon Mining a contract worth about \$123 million to build the main open pit tailings dikes, the haul roads and to make the initial mining cut. At the peak of the project, Aecon Mining will have about 350 employees on site operating an impressive array of equipment including two Hitachi EX5500 shovels. According to mining-technology.com, the Hitachi EX5500 is the eighth largest hydraulic mining excavator in the world with a loading shovel bucket capacity of 27 cubic metres. The site also includes one Hitachi EX3600 shovel and 25 haul trucks, each with a capacity of 240 tonnes (about 8-times the size of a



PROJECT FILE

Fort Hills – Heavy Civil Construction

CLIENT: Fort Hills LLP (Suncor, Teck, Total partnership) with Suncor as operating partner

LOCATION: 90 km north of Fort McMurray, Alberta

AECON GROUP: Aecon Mining

TIMING: June 2014 – April 2016

TYPE OF CONTRACT: Unit Price

CONTRACT VALUE: \$123 million

SCOPE:

// Opening cut of Fort Hills mine operating pit
// Construction of dike structure and haul roads

AECON EMPLOYEES ON SITE AT PEAK:

350 staff and craft workers

KEY EMPLOYEES:

Scott Ryan – Senior Site Manager
Mark Leavoy – Senior Site Manager
Chris Bethke – Superintendent – Operations
Cory McLean – Superintendent – Operations
Billy Drover – Superintendent – Operations
Ken St. Croix – Superintendent – Maintenance
Byron Payne – Superintendent – Maintenance
Abdullah Gul – Assistant Superintendent – Operations
Ramsaran Persaud – Senior EHS Team Lead
Lorne Hiscock – EHS Site Lead
Lorne Stout – Operational Safety Mentor
Lysa Theobald – Senior Project Coordinator
Luis Pardo – Project Coordinator
Joe Skrepnek – Project Coordinator
Stephen Ross – Survey Team Lead
Spencer Hansen – Survey Coordinator

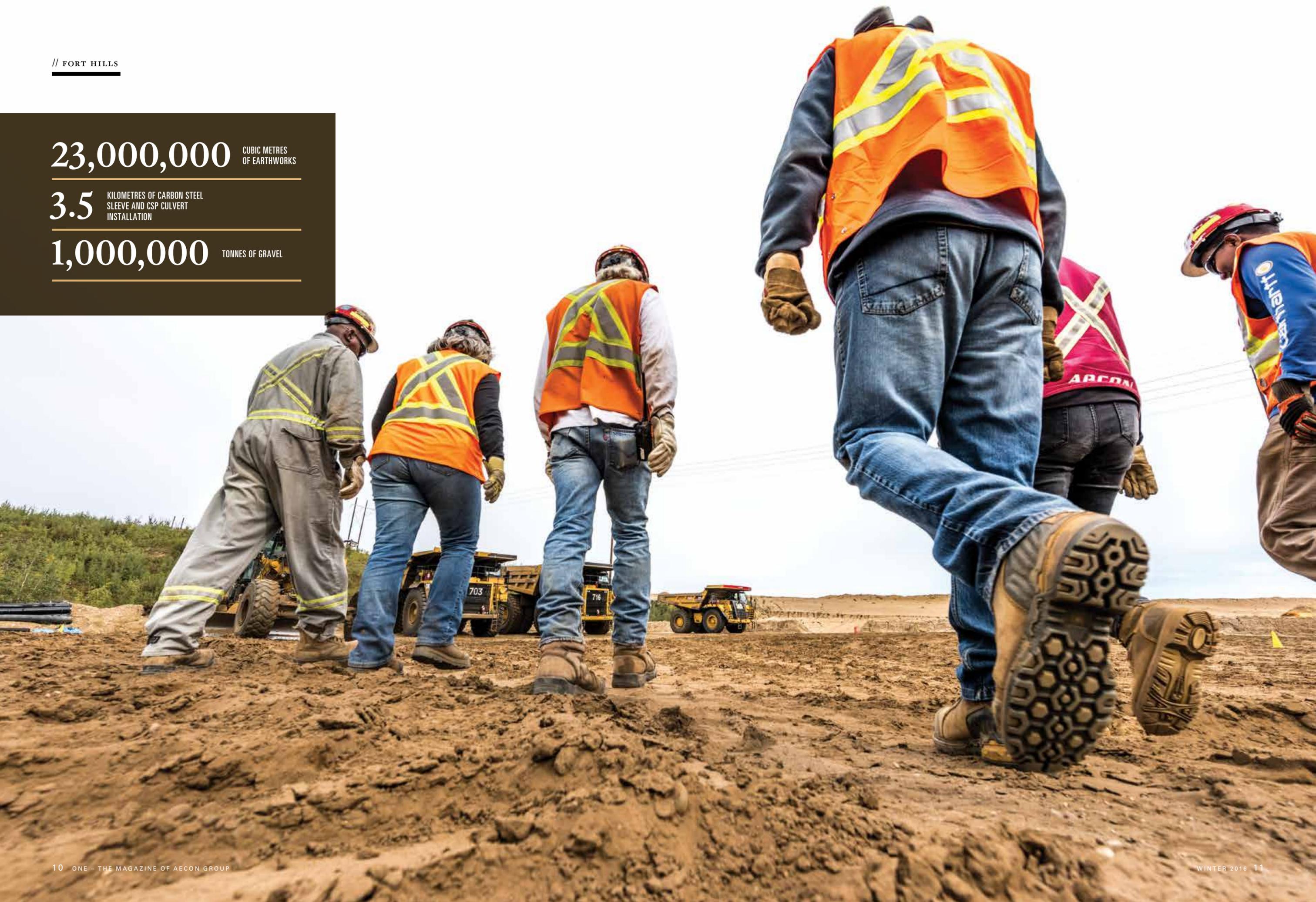
QUANTITIES:

// 23,000,000 cubic metres of earthworks
// 3.5 kilometres of Carbon Steel Sleeve
and CSP Culvert installation
// 1,000,000 tonnes of gravel

23,000,000 CUBIC METRES
OF EARTHWORKS

3.5 KILOMETRES OF CARBON STEEL
SLEEVE AND CSP CULVERT
INSTALLATION

1,000,000 TONNES OF GRAVEL



BY THE TIME AECON MINING HAS FINISHED, WE WILL HAVE MOVED ABOUT 23 MILLION CUBIC METRES OF EARTH.

— SCOTT RYAN, SENIOR SITE MANAGER



typical dump truck), seven Cat D10 and D11 bulldozers, four Cat 24M graders, and other assorted equipment for the lighter civil work.

As with all oil sands projects, the scale of the work is impressive, dwarfing most other types of construction projects. The tailing's pond will be just over eight million square metres with a 400 metre wide dike at the bottom. The initial mining cut will be 1.5 kilometres wide and one kilometre long and up to 40 metres deep. Senior Site Manager

Scott Ryan notes that by the time Aecon Mining will finish the work, "we will have moved about 23 million cubic metres of earth."

"Material utilization is very important to Suncor," he says. "The objective is to produce no waste, so virtually all the materials that will be used in the construction will come from the overburden that we are stripping to open the pit."

Work began immediately after the contract was awarded and by mid 2015, says Alex Klimick, Aecon Mining's vice president, the work was 65 per cent complete. "Things have gone very smoothly and we are already about four months ahead of schedule," says Klimick. Assuming that we don't suffer through a particularly severe winter, we should be in good shape to finish the work by April 2016, three months ahead of the scheduled completion date."

DID YOU KNOW?

Over the last 138 years, the companies that now make up Aecon have been involved in some of the most famous projects in Canada – the CN Tower, the St. Lawrence Seaway, and Montreal's Trudeau International Airport, to name just a few. But few people know that there is one other notable addition to the list: one of Canada's most iconic symbols – the Grey Cup.

The Grey Cup has had a rough time since it was first presented in 1909. It has been stolen twice and damaged six times, three of which were at the hands of the Edmonton Eskimos.

The first time the Eskimos broke the cup was in 1978. During the celebrations that followed Edmonton's victory over the Montreal Alouettes, Tom Wilkinson, the quarterback, dropped the cup when he was jostled by some rowdy fans. Dan Kopley, one of the Eskimos' linebackers, caught it but he too got knocked and

the trophy dropped to the turf and broke. Fortunately help was close at hand.

"Our family has been rabid Edmonton Eskimos fans for as long as I can remember," recalls J.D. Hole, a member of the Aecon board of directors and at one time, president of Lockerbie and Hole, which Aecon acquired in 2009. "My uncle, J.F. Hole, was president of the Eskimos that year and when the cup broke, he was there to offer our services."

The cup was taken back to the Lockerbie and Hole shop, where a team of plumbers, delighted to be able to apply their skills to something other than piping, soldered it back together again in time for the Grey Cup parade the next day.

OUR FAMILY HAS BEEN RABID EDMONTON ESKIMOS FANS FOR AS LONG AS I CAN REMEMBER. MY UNCLE, J.F. HOLE, WAS PRESIDENT OF THE ESKIMOS THAT YEAR AND WHEN THE CUP BROKE, HE WAS THERE TO OFFER OUR SERVICES.

—J.D. HOLE
AECON BOARD OF DIRECTORS
FORMER PRESIDENT, LOCKERBIE & HOLE

K+S POTASH CANADA'S NEW SASKATCHEWAN MINE

Saskatchewan has a number of firsts on its resume – it produces more wheat, more mustard and more hockey players (per capita) than any other province. But if you are in the agricultural business, there is one Saskatchewan product that outweighs all the others. The province has the largest deposits of potash in the world and produces about a third of the world's supply – more than 11 million tonnes a year.

BUILDING A LASTING LEGACY

MOST POTASH IS MINED USING CONVENTIONAL UNDERGROUND TECHNIQUES BUT IN CERTAIN SITUATIONS, ESPECIALLY WHERE THE RESERVES ARE AS DEEP AS THEY ARE AT THE LEGACY SITE, PRODUCERS USE A TECHNIQUE KNOWN AS SOLUTION MINING, WHICH HAS LESS IMPACT ON THE ENVIRONMENT ABOVE GROUND.

Farmers around the world rely on potash fertilizer to maximize their yields and with demand expected to outstrip supply, Saskatchewan's mineral wealth caught the attention of K+S Group, a German company that is the world's largest salt producer and the leading supplier of potash in Europe. In June 2012, K+S Potash Canada, a subsidiary of the K+S Group, broke ground on its Legacy Project potash mine near Bethune, Saskatchewan, about 60 kilometres northwest of Regina – a \$4.1-billion development that will be the first new potash mine in Saskatchewan in more than 40 years.

The mine, which will extract potash 1,500 metres below the surface using solution mining technology, will start production in 2016 and should be producing two million tonnes a year by the end of 2017.

In June 2013, Aecon was awarded the first of a series of contracts for the

Legacy Project that included early cavern development work, well pad construction, structural steel fabrication and erection, foundation construction and mechanical, piping, electrical and instrumentation work for the tank farm and the plant.

"With some projects, it's a home run – a huge contract covering most of the job. This project was a little more like a series of singles and doubles. Over the course of it, the value of our work more than tripled as various contracts were awarded, which goes to show that if you get enough base hits, you can still put up a good score," says John Salter, vice president of Aecon Mining and Construction Services. "This is a significant project for Aecon Mining. It builds on the expertise that we have developed on previous potash projects in New Brunswick and Saskatchewan, and once again demonstrates that our broad array of resources gives our clients a one-stop shop that ultimately saves them



PROJECT FILE

Legacy Project

CLIENT: K+S Potash Canada GP

LOCATION: Bethune, Saskatchewan

AECON DIVISIONS: Aecon Mining Construction Services, Aecon Construction Management Inc., Aecon Foundations, Canonbie Contracting

SCOPE:

// Mechanical, piping, electrical & instrumentation installation for the early cavern development, well pads, load out area, and the evaporation, crystallization and clarification plant
// Structural steel fabrication and installation for the load out structures
// Concrete piling and foundations for the plants and well pads
// Earthworks, settlement ponds, site grading, and main access road upgrades

TIMING: June 2013 – December 2016

AECON EMPLOYEES ON SITE AT PEAK:

AMCS – 800

ACMI – 250

Total direct employee-hours for all projects – 2,500,000

SAFETY: By December 2015, more than 2,000,000 employee-hours LTI free

KEY EMPLOYEES:

AMCS:

Geoff Akehurst – Project Director

Joe Riley – Project Manager, (ECD and ECC Projects)

Sixten Waniandy – Project Manager, (Well Pads), Assistant Project Manager, (ECC & load out MPEI)

Graeme Morris – Project Manager, (Load Out Steel and MPEI),

Assistant Project Manager, (ECD)

Carl Baron – Construction Manager, (ECC)

Andy Robson – Construction Manager, (ECC), General Superintendent, (ECD)

Harvey Seymour – General Superintendent, (ECD, Load Out Steel and MPEI)

ACMI:

Ken Mattson – Project Manager

Bernie Puetz – Senior Project Coordinator

Jeff Kirkaldy – Senior Superintendent (Main Site)

Frank Atwood – Senior Superintendent (Well Pads) Aecon Foundations

Joseph Hakim – Project Manager

Otmar Frohlich – Senior Superintendent

QUANTITIES:

AMCS:

ECD MPEI – Pipe – 6,368 m.; Cable Tray 13,482 m.; Cable 41,335 m.

Well Pads MPEI – Pipe – 17,704 m.; Cable Tray 10,108 m.; Cable 55,778 m.

Load out MPEI – Pipe – 7,527 m.; Cable Tray 8,742 m.; Cable 58,445 m.

ECC MPEI – Pipe – 36,632 m., Cable Tray 17,468 m.; Cable 280,169 m.

Load out Steel – 6,000 tonnes; 44 conveyor gallery modules

ACMI:

26,000 cubic metres of structural concrete, 2,700 tonnes of reinforcing steel

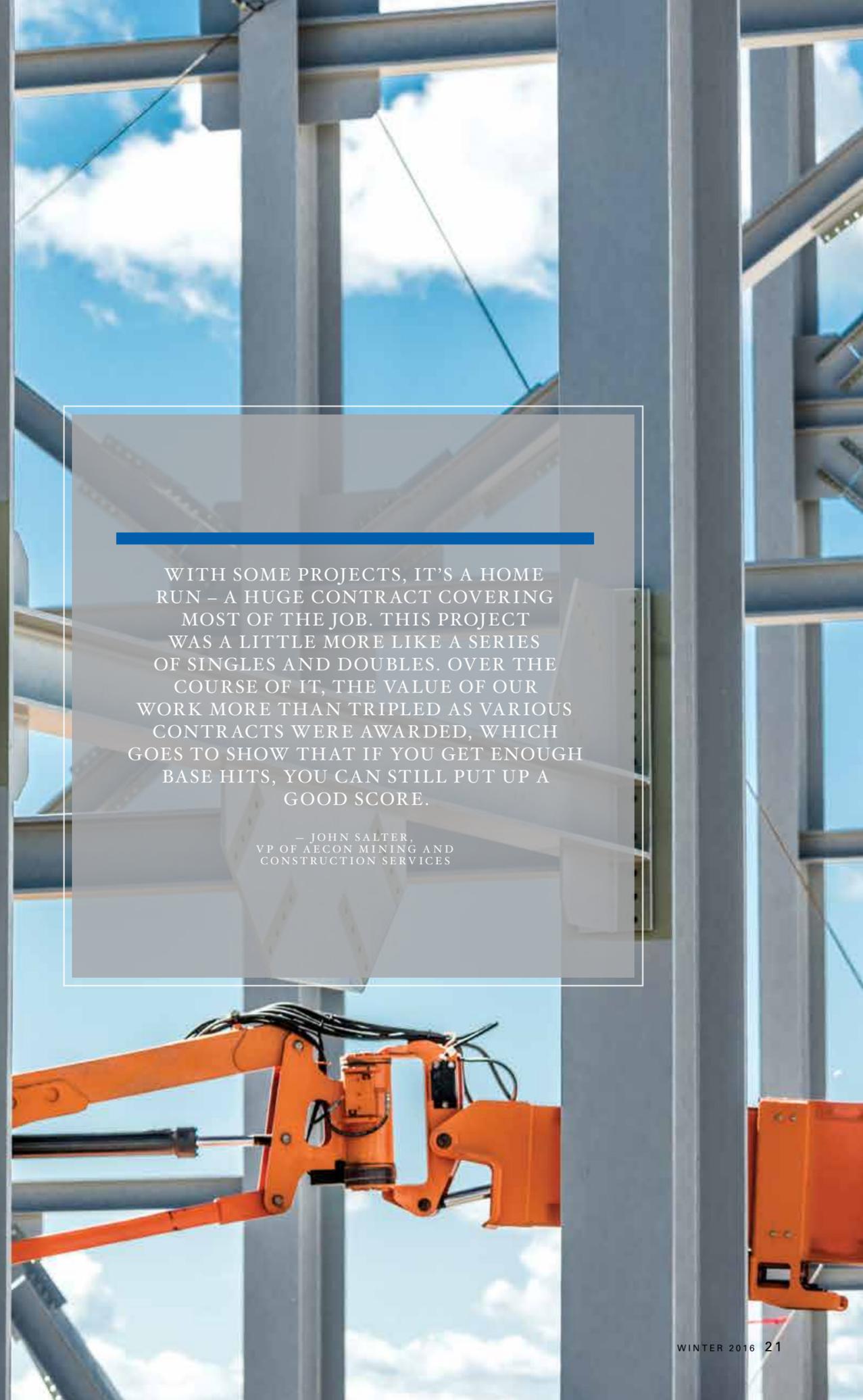
Aecon Foundations:

1,300 concrete piles



WITH SOME PROJECTS, IT'S A HOME RUN – A HUGE CONTRACT COVERING MOST OF THE JOB. THIS PROJECT WAS A LITTLE MORE LIKE A SERIES OF SINGLES AND DOUBLES. OVER THE COURSE OF IT, THE VALUE OF OUR WORK MORE THAN TRIPLED AS VARIOUS CONTRACTS WERE AWARDED, WHICH GOES TO SHOW THAT IF YOU GET ENOUGH BASE HITS, YOU CAN STILL PUT UP A GOOD SCORE.

– JOHN SALTER,
VP OF AECOM MINING AND
CONSTRUCTION SERVICES



POTASH IS BASICALLY A SALT AND LIKE ALL SALTS, CAN BE EXTREMELY CORROSIVE, SO A NUMBER OF THE FACILITIES AT THE LEGACY MINE ARE BUILT USING WOOD RATHER THAN STEEL. WHILE THE LOAD OUT FACILITY WILL BE A STEEL STRUCTURE, THE STEEL IS COATED WITH 15 MILLIMETRES OF PAINT, ABOUT DOUBLE THE THICKNESS OF THE NORMAL COATING, AND WE HAVE TO BE EXTREMELY CAREFUL WHEN WE ARE LIFTING AND CONNECTING THE STEEL TO MAINTAIN THE INTEGRITY OF THE CORROSION PROTECTION COATING.”

— MARC NOEL, TRADE SUPERINTENDENT

time and money. Our ability to execute heavy civil earthworks, structural concrete foundations and piling, structural steel and mechanical piping, and electrical gives Aecon a competitive advantage in the marketplace.”

A MINING SOLUTION

Most potash is mined using conventional underground techniques but in certain situations, especially where the reserves are as deep as they are at the Legacy site, producers use a technique known as solution mining, which has less impact on the environment above ground. Hot water is forced into the reserves through injection wells, dissolving the potash and creating an underground cavern in the process. The brine is then pumped back through a second well to the processing

plant where the water is evaporated and the potash is crystallized. The potash then goes to a dry plant for final processing, sizing and packaging after which it is loaded on rail cars for shipping to market.

There are two distinct aspects to a solution mine – the solution mining deep underground and the above ground processing facilities, explains Geoff Akehurst, AMCS’s project director. “Obviously, both are important but it’s the solution mining that dictates the project schedule. You can’t just pump brine to the surface. You have to develop the caverns until they are large enough to feed the processing plant.”

Unlike some projects where contractors are awarded large all-encompassing contracts, AMEC Foster

Wheeler (the project’s engineering, procurement and construction manager) has segmented it into a series of smaller contracts.

In July 2013, AMCS was awarded its first contract for “early contractor involvement” – planning and constructability reviews for the early cavern development while the cost estimate was being finalized. Three months later, it was awarded its first construction contract for the mechanical, piping, electrical and instrumentation work for the early cavern development. By December, Aecon Mining and Construction Services had mobilized and was on site along with Aecon Foundations, which was doing concrete work for the first two field well stations. By July 2014, AMCS had two more



AT THE PEAK OF THE PROJECT FOR THE PROCESSING FACILITIES, AECON WILL HAVE ABOUT 800 TRADE EMPLOYEES ON SITE. THE PROJECT IS EXPECTED TO BE FINISHED BEFORE THE END OF 2016.



contracts to build four well pads. Aecon Construction Management Inc. was responsible for excavation and backfill, concrete installation and concrete piling for the well pads, as well as site grading and access road upgrades.

"It was absolutely critical to get the early cavern development work well pads built by October 2014 so that K+S Potash Canada could start developing the caverns on schedule," notes Ken Mattson, Aecon Construction and Mining Inc. project manager. "It wasn't easy. It was cold when we started work in December 2013 and it stayed brutally cold for the rest of the winter, which ruled out any opportunity to get a head start on the earthworks. And then to make matters worse, we had an

extraordinarily wet summer. At one point, the entire Legacy Project was shut down for three days. But in spite of the inclement weather and the complicated logistics of coordinating with all the other contractors on-site, ACMI (which did the site work) and AMCS (doing the mechanical, piping, electrical and instrumentation) met all the project milestone dates."

Meanwhile, with work on the early cavern development under way, attention turned to the above ground facilities. ACMI was awarded its first contract in April 2014 for work that would eventually encompass concrete piling and foundations for the debrining and drying processing plant, the compaction plant, the dry services corridor, the cooling

and transfer towers and the load out structures.

"We had to do a lot of foundation work – in total, about 26,000 cubic metres of concrete and more than 2,700 tonnes of reinforcing steel," says Mattson. "And because of the soil conditions on site, Aecon Foundations (a division of Aecon Construction Group) installed 1,300 concrete piles – some as big as 3.2 metres in diameter and 20 metres deep."

AMCS is involved in the above ground load out facility construction as well, erecting 6,000 tonnes of structural steel, including the associated conveyor galleries and transfer towers – Aecon Mining's first structural steel contract.

"While there is nothing particularly unusual about the load out structure, there is one significant difference between this and a lot of other industrial jobs," points out Graeme Morris, the project manager for this phase of the project. "Potash is basically a salt and like all salts, can be extremely corrosive, so a number of the facilities at the Legacy Mine are built using wood rather than steel. While the load out facility will be a steel structure, the steel is coated with 15 millimetres of paint, about double the thickness of the normal coating, and we have to be extremely careful when we are lifting and connecting the steel to maintain the integrity of the corrosion protection coating."

By the end of 2015, ACMI will have completed all of its work at the main site and the load out structural concrete. AMCS will complete the structural steel, mechanical, piping, electrical and instrumentation work for the load out area.

Meanwhile, in September 2014, AMCS was awarded the mechanical, piping, electrical and instrumentation work for the evaporation, crystallization and clarification plants – the largest of the Aecon Legacy Mine project contracts. It is, says Akehurst, "an extremely complex job and a very tough build."

"The processing plant has five separate buildings and some pretty impressive equipment. The crystallizer unit, for example, which is being

fabricated off site, is 30 metres high, 10 metres wide and weighs more than 200 tonnes."

"We're installing the mechanical, piping, electrical and instrumentation for the plants and the numbers are equally impressive – 36 kilometres of piping, 17 kilometres of cable tray and almost 300 kilometres of cable. When you are installing duct work that is almost two metres in diameter, 60 metres above the ground with limited access, the challenges are obvious."

At the peak of the project for the processing facilities, Aecon will have about 800 trade employees on site. The project is expected to be finished before the end of 2016.

MEET:

PEOPLE MATTER

BRIAN RIVERS

ESTIMATING AND CONTROLS MANAGER
AECON UTILITIES



With over four decades of experience as an Estimator behind him, Brian Rivers has solidified his reputation as an authority in the field. Having worked for one of Aecon's predecessors, Cliffside Pipelayers, for the majority of his career, he has been an integral part in laying the foundation for the company that Aecon is today. And while his role has been a reflection of the company's ever-evolving journey, his passion for working as an Estimator hasn't wavered since day one.

You have had a remarkably long career with Aecon in a field that not many people know much about. Did you choose to be an estimator or did it choose you?

It chose me. I didn't know what I wanted to do when I left high school. There wasn't any one thing driving me so I went to Ryerson in Toronto to study engineering. I started in mechanical but after a month, I realized I may not have known what I wanted to do but this definitely wasn't it. I took a few months off and switched into civil engineering technology.

How did engineering technology translate into estimating?

The college seemed to think that jobs were plentiful but after a month of looking, it became apparent that there weren't quite as many jobs out there as they had told me. I got a job at a small engineering firm but after three or four months, the firm ran out of work and since I was the last one hired, I was the first one out.

I went back to Ryerson to look at the job postings and saw a notice for a job with Cliffside Pipelayers. I met Harry Bradley, who was

the manager of estimating, and I was excited about the opportunity, so much so that I passed up on another job while I waited for the call. Fortunately, Harry came through. I joined the company and I have been here ever since.

How did the job with Cliffside translate into a lifetime career with Aecon?

Cliffside Pipelayers was the original Aecon Utilities. It started in the gas business in 1957 and by the time I joined, it had expanded into water and sewage and installation work for various hydro and utility companies. Not long after I started, the Morton brothers who owned Cliffside sold it to Banister. Banister acquired Foundation in 1987 and became BFC. Then in 1999, Armbro acquired BFC and, of course, Armbro became Aecon.

The names may have changed over the years but the work that we do and the companies that we do it for haven't, so for all intents and purposes, I've worked for the same company for the last four decades. Not many people can say that but then again, with career

THERE'S NO GREATER RESPONSIBILITY THAN SAFETY. WHEN WE DIG THE GROUND UP, WE NEED TO BE CONSTANTLY AWARE OF DANGEROUS SITUATIONS.

—BRIAN RIVERS,
ESTIMATING AND CONTROLS MANAGER, AECON UTILITIES

expectations being a lot different today, I'm not sure many would want to say that.

You didn't plan to be an estimator and yet that has been your area of expertise your entire career. What did you find appealing about the field?

I have always been good with numbers and estimation is all about getting the numbers right. It is also very creative — every job is different. I liked bidding work. I couldn't wait for Monday to come around.

Estimating is absolutely fundamental to our business. The company wins or loses based on our ability to submit a bid that is competitive enough to get the award and yet still allows us to be profitable.

Back when I started, we didn't have to look for work. We were on bidders' lists and as the tenders came in the door, the manager would walk by and drop them on my desk. We lived and died by hard bidding. Every day, there was a new project — sometimes as many as 10 or 12 a week.

How do you put a bid together?

You start by looking at the drawings and assessing the job. Then, you go to the job site, camera in hand, and walk the entire job. I never did a bid without doing a site visit to check out the conditions. When I get back, I mark up the drawings with the pictures and do the takeoff. It's a very methodical process.

Do you do much consulting with the people in the field?

Years ago, not as much. By the time I became a manager, I had been estimating for 16 years and the two estimators who worked with me both had more than 10 years of experience, so we only needed help if a job had some unusual aspects to it.

Estimators today have less experience. They often move on to other fields after a few years. Jobs are also a lot more complex. We encourage our estimating team to go over bids with the operations people to make sure that they have covered all of the contingencies and that the job is constructable.

When a job is over, do you go back to see how well the costs and profitability matched the bid?

We do a post project analysis on the larger jobs. Back in the day, I probably went over every job that was awarded. We would be bidding up until December when work stopped, so we did a lot of research over the winter.

Today we bid right through the year, so we are a lot more selective about the jobs that we analyze.

And if a job isn't profitable, is it the estimating department that gets the blame?

Hardly ever. We do get a lot more pats on the back today if the job goes well and we don't get blamed as much if things don't go according to plan. Management recognizes that estimation is only a part of the total picture and does acknowledge

the work that we do and the efforts we make.

There were jobs where the conditions were favourable and the guys were able to do much better than we expected.

How has estimating changed over the last 40 years?

When I started, we did all our calculations by hand. I had a great big mechanical calculator that took up about half the desk. I was always impressed at the end of the day by how much paper there was on the floor.

By the early 1990s, we had moved on to a mainframe computer using a fairly basic spreadsheet. It was a big improvement but if you changed a formula, it took about 45 minutes to recalculate everything. A few years later, we switched to Lotus spreadsheets on personal computers and that was the way we did things until the current implementation of a new estimating program called Hard Dollar.

Back when I started, it would take a day or two to complete a bid for a typical of job worth, say, about a million dollars. Today, we've cut that in half and we can make almost instantaneous adjustments to take into account various conditions and situations. We still do the takeoff by hand but everything else is automated.

Google Earth and Google Maps, which have only been around a few years, have also helped considerably because we can see in tremendous detail what we are dealing with without having to leave the office. Even so, it's still important to go out to the

site. My motto is, you don't bid a job unless you have physically walked it.

What is the biggest job that you have worked on?

The Toronto Hydro general contract, which is worth about \$40 million over four years. My team started work on that in June 2014.

It usually takes us a couple of days to do a bid for a typical job of about, say, a million dollars. It took us two and a half months to pull the Toronto Hydro bid together.

You have been involved in a lot of different projects over the last forty years. What do you think is your biggest accomplishment?

It's not the estimating that I am most proud of. It's the people.

Over the 25 years that I have been a manager, I've had 32 estimators working for me. Estimation provides a great training ground. You get to see all facets of the company, from the labour in the field to upper level management. A lot of the people that started in estimating have used that experience to go on to bigger and better things in the company.

Melissa DaSilva, for example, has been with us for eight years and I like to think that I have helped shape her into the go-to person she has become for so many things in the estimating department.

Or take Dave Moore, who is the head of estimating. How many people can say, like I can, that they hired their boss?

I have always felt that as a manager, my job was to make sure my people had the tools to do the work and to maintain a good, open relationship. They know what my expectations are and I am always ready to give them feedback.

You're 65 years old. Do you have any plans for retirement?

A few years ago, I decided that I needed to be in better shape. I hit the gym, lost almost 60 pounds, and I am in the best shape of my life.

Even so, it's probably time to ease into retirement. I am cutting back to four days a week and we'll see how that goes. But for now, I still enjoy coming to work and that's what counts.

EMPLOYEE FILE

BRIAN RIVERS

POSITION: Estimating and Controls Manager

DIVISION: Aecon Utilities

EXPERIENCE:

1973 – 1985 Cliffslope Pipelayers/Banister – Estimator

1986 – 1988 Cliffslope Utilities/Banister – Estimator

1989 – 1993 Cliffslope Utilities/Banister – Manager of Estimating

1994 – 2000 BFC Utilities – Manager of Estimating

2000 – present Aecon Utilities – Manager of Estimating

EDUCATION:

Ryerson – Diploma in Civil Engineering Technology (1972)

AECON FAMILY CONNECTION:

Sean Connolly (stepson) – Driver for Aecon Utilities

HOMETOWN: Scarborough, Ontario

CURRENT HOME: Janetville, Ontario

HOBBIES AND INTERESTS: Woodworking, maintaining his 135-year-old home, and looking after the family menagerie of 10 cats and three dogs

GENERATING INTEREST? DAM RIGHT!

THE JOHN HART HYDROELECTRIC PROJECT

Scott Marshall is nothing if not enthusiastic. “If you want to build something important, there’s nothing better than a hydroelectric project,” says Aecon’s Project Manager for the John Hart Generation Station venture in British Columbia.

THIS IS NOT ONLY THE FIRST PUBLIC PRIVATE HYDROELECTRIC CONSTRUCTION PROJECT IN CANADA BUT ALSO, ONE OF THE LARGEST ON RECORD.

“H ydroelectric projects are enormous undertakings that really have an effect on people’s lives and as a builder, you get to see virtually every aspect of construction,” says Project Manager Scott Marshall. “The John Hart project is like the Waneta project (a similar hydroelectric project built a few years ago by the same Aecon – SNC-Lavalin consortium). It’s a once in a lifetime opportunity.”

Making it better is a succinct summary of what BC Hydro wants to achieve. In operation since 1947, the John Hart Generating Station in Campbell River, British Columbia delivers about 10 per cent of BC Hydro’s customer power demands on Vancouver Island but after 68 years of operation, the aging facility needed to be replaced. Once completed in 2018, this \$1.1-billion project will maintain reliability and increase the generating station’s annual power output by almost 10 per cent, improve earthquake resistance and protect downstream fish habitats. In early 2014, a joint venture between Aecon Construction

and SNC-Lavalin Constructors Pacific Inc. signed a \$225-million design-build contract (Aecon’s share) that will help redevelop one of Vancouver Island’s most important generating facilities.

This is not only the first public private hydroelectric construction project in Canada but also one of the largest on record. The Canadian Council for Public Private Partnerships gave the project its Gold Award for Project Financing, citing “its unique combination of a sole equity provider and debt financing made up of a short-term loan, \$299 million senior bonds, with an average life of 13 years, and payments from BC Hydro.”

The project has four main components: a replacement generating station constructed about 600 metres upstream from the existing facility; a new tunnel, 8.1 metres in diameter and 1.5 kilometres long, that will replace three smaller pipelines; a new water intake at the John Hart Spillway Dam; and a new water bypass facility. The existing generating station will continue to operate until the new facility is completed, after which the consortium will remove the existing



OLD PENSTOCKS BEING REMOVED IN THE AREA BEING REFORESTED

PROJECT FILE

John Hart Generating Replacement Project

CLIENT: BC Hydro

LOCATION: Campbell River, British Columbia

JOINT VENTURE: Aecon Constructors and SNC-Lavalin Constructors Pacific Inc. (60/40)

AECON GROUPS: Aecon Infrastructure – Heavy Civil

TIMING: June 2014 – December 2018

CONTRACT VALUE: \$225 million (Aecon’s share)

SCOPE:

- // New water intake at existing John Hart dam
- // Replacement of three 1.8 kilometre long above ground penstocks with a 2.1 kilometre long tunnel
- // New underground generating station
- // New water bypass facility
- // New tailrace outlet structure

AECON EMPLOYEES ON SITE AT PEAK:

40 staff and 250 trade workers

KEY EMPLOYEES:

- Scott Marshall, Project Manager
- Sean Cody, Assistant Project Manager
- Drew Reicheld, General Superintendent
- Jan Bielenberg, Design Coordinator
- Dale Mogielka, Quality Control Manager
- Jim Dow, Safety Manager
- Frank Trauzzi, Business/Labour Relations Manager
- Nathalie Dinmissen, Project Engineer
- Rory Peters, Project Coordinator
- Francis Gonella, Field Engineer
- Ratko Ivanovic, Field Engineer
- Bradley Chow, Field Engineer
- Anthony Holmes, Superintendent
- Kevin Betnaza, Superintendent
- Walter Boutilier, Superintendent
- Billie Boutilier, Superintendent
- John Boyce, Project Coordinator
- Dillon Hawkins, Safety Advisor
- Noella Tarasoff, Senior Project Administrator
- Pieter de Weever, Site Safety Advisor

QUANTITIES:

- // 2,730 tonnes of rebar
- // 58,000 cubic metres of powerhouse excavation
- // 300,000 cubic metres of rock excavation
- // 57 cofferdam piles
- // 500 tonnes of structural steel
- // 45,000 cubic metres of concrete
- // 15,000 cubic metres of shotcrete

THE WOODEN PENSTOCKS FOR THE OLD GENERATING STATION WILL BE REPLACED BY AN ENORMOUS TUNNEL, 8.5 METRES IN DIAMETER AND 1.5 KILOMETRES LONG, THAT WILL, AT ITS DEEPEST POINT, CUT THROUGH BEDROCK MORE THAN 100 METRES BELOW THE SURFACE. THE TUNNEL WILL CARRY UP TO 124 CUBIC METRES OF WATER PER SECOND; ENOUGH TO FILL AN OLYMPIC-SIZED SWIMMING POOL IN 20 SECONDS.



How Hydroelectric Generating Stations Work

Hydroelectricity plants capture the energy of moving water to provide safe, clean renewable energy with virtually no greenhouse gas emissions.

Hydroelectric plants start upstream, using a dam to raise the level of the river. It is the reservoir behind the dam that stores the energy of the water. As the water is released from the reservoir, it flows through pipes called penstocks to the generating station. The farther the water falls, the more power it has and the more water that flows through the station, the more power that can be generated.

The force of the water flowing through the generating station turns the turbines, which converts the water's kinetic energy into mechanical energy. A generator connected to the turbines by a shaft converts the mechanical energy into electricity.

About 95 per cent of the Campbell River flows through the John Hart Generating Station. The water will provide 132 megawatts of capacity – enough electricity to power 80,000 homes.

P3 Awards 2015 PROJECT OF THE YEAR

The John Hart Generating Station Replacement Project has been named the best public private partnership of the year at an awards ceremony in New York in October 2015.

The prestigious black tie event, hosted by P3 Bulletin and considered to be the Oscars of the infrastructure development industry, brought together more than 300 key public private partnership leaders to recognize outstanding project achievements in North, Central and South America.

The John Hart Generating Station was given the Gold Award for Best Waste/Energy/Water Project and the prestigious Judges Award for Projects Grand Prix.

generating station and its three wooden penstocks and reforest the surrounding area.

GETTING UNDER WAY

The contract was signed on February 2014 and by June, the Aecon/SNC joint venture was on-site and work was under way. Just over a year later, about 25 per cent of the work was complete.

"With any project this size, there's an awful lot of planning and organization needed before you can actually get under way," says Marshall. "And because this is a design build project, we have been heavily involved with the engineers to make sure that constructability is an integral part of the design. We're always going to encounter a few unexpected challenges on site but

the more we can anticipate at the design stage, the more likely we are to complete the project on time and on budget."

The consortium is currently working simultaneously in three distinct areas of the project: the intake, which brings the water from the reservoir to the powerhouse; the tailrace, which returns the water from the powerhouse to the Campbell River; and the powerhouse.

The wooden penstocks for the old generating station will be replaced by an enormous tunnel, 8.5 metres in diameter and 1.5 kilometres long, that will, at its deepest point, cut through bedrock more than 100 metres below the surface. The tunnel will carry up to 124 cubic metres of water per second; enough to fill an Olympic-sized swimming pool in

20 seconds. The consortium is currently stripping the overburden and installing a cofferdam so that the level of the reservoir can be maintained once tunnelling starts.

The length of a football field and 40 metres high, the powerhouse, will be an impressive structure. At least it would be if anyone could actually see it, says Marshall. "The powerhouse will be 100 metres below the surface and completely hidden from view, which will considerably reduce the visual impact that this project will have on the surrounding park. But it does mean that we have to do an enormous amount of excavation work, about 300,000 cubic metres of rock in total, in order to create enough space to build the structure. We will be using most of the excavated rock on site and providing some of it to nearby First Nations for construction projects."

The powerhouse will also have two tunnels for access: a 116-metre-long service tunnel for air, power and pedestrian access and the main access tunnel which will be 384 metres long.

Creating the space in which to build the powerhouse is a massive undertaking and the consortium has been using three shifts, working around the clock, to get the job done. The first task was to build an open cut excavation, 20 metres wide, 40 metres deep and 120 metres long, to gain access to the portal face in the bedrock. Once there, the crew switched to a drill and blast operation to create the tunnel leading to the powerhouse. It typically took about a day to blast five-metres of rock, remove the rubble and then reinforce the tunnel with rock ties and shotcrete. By March 2015, the

tunnel was finished and the crew was able to start work on the cavern that will contain the powerhouse. By the end of the year, about half the cavern had been completed.

"Working in these conditions with only one entrance for materials to move in and out, every move has to be orchestrated," notes Marshall. "And while we have tried to anticipate every contingency, there are always some unexpected twists. About 100 metres underground, we ran into an area of unconsolidated rock that was mostly rounded cobbles, certainly not what you expect in bedrock, so we had to switch to soft tunnelling techniques to advance the work. We would have designed around it if we had known about it but that's part of the challenge of working on a project of this magnitude."

The tailrace, the last of the three work zones, will ultimately be a 650-metre-long tunnel that will take the water from the powerhouse to the Campbell River, just upstream of the existing station. The consortium is currently doing some demolition work at the existing powerhouse and has started excavation for the new tunnel.

The entire project is expected to be finished by the end of 2018.

GREEN LIGHT

Just how a frog got into the deepest section of the tunnel is still a bit of a mystery but it was there, 300 metres from the entrance. Chris Beers, BC Hydro's Environmental Monitor, carried the frog back to the surface and released it in a nearby wetland with hope that the

NOT ONLY HAVE WE HIRED AND TRAINED ABOUT A DOZEN WORKERS FROM LOCAL FIRST NATION COMMUNITIES, BUT WE HAVE ALSO, THROUGH THE WORKING GROUP, OPENED UP OPPORTUNITIES FOR FIRST NATION WORKERS TO GO ON TO OTHER PROJECTS AS WELL.

—SCOTT MARSHALL, PROJECT MANAGER

grateful amphibian would warn its fellow frogs about the horrors of taking a wrong turn in a construction site. It didn't work. Next month, two more frogs were taken back to the surface.

Since the generating station is located in Elk Falls Provincial Park, environmental considerations have infused virtually every aspect of the project. Designed with much of the structure underground to reduce its environmental footprint, the new facility features a unique bypass facility. About 95 per cent of the

Campbell River flows through the generating station, which means that with the current design, if multiple turbines fail, the water below the station could be reduced. This can lead to potential impacts on the fish as it can take about an hour for full flows to be recovered. The new generating station will have a water bypass system beside the powerhouse to immediately divert water around the turbines and protect the fish habitats downstream.

"Working in an area surrounded by a provincial park only adds to the pressure of ensuring that we do everything we can to avoid harming the environment," says Nathalie Dinnissen, the project engineer. "And it's not just frogs that we have to be concerned about. We have found endangered snails on site. We had to suspend work for three weeks because of nesting birds. We have built barriers to stop barn swallows (a protected species) from nesting in the construction zones. And we found a colony of bats in the

powerhouse so we built bat houses in other areas of the project to show them that there might be a better place to live."

The consortium is well aware that is not just the natural environment that needs to be protected. The Campbell River is the prime source of drinking water for nearby communities. "If we mess up, we could have 35,000 people on a boil water advisory," says Marshall. In order to ensure that the water remains uncontaminated, the consortium is using

a double silt curtain to seal work areas along the river. Water is pumped to a temporary mobile treatment plant before being returned to the water course. Work at the cofferdam is currently 50 per cent complete with no adverse impact on water quality.

BC Hydro has also made a commitment to local First Nations, not only involving them in the design of the project but also providing opportunities for hiring and procurement. The consortium has taken up the challenge.

"We have a monthly working group with 18 affiliated unions and local First Nations to update them on the project's progress and our hiring requirements," says Marshall. "Not only have we hired and trained about a dozen workers from local First Nation communities, but we have also, through the working group, opened up opportunities for First Nation workers to go on to other projects as well."

CLEAN WATER

THE REGINA WASTEWATER TREATMENT PLANT UPGRADE PROJECT

The City of Regina is more than just Saskatchewan's capital. It is the province's civic and cultural hub. It is also the launching point for Saskatchewan's burgeoning natural resource and agricultural industries that have made this one of Canada's fastest-growing provinces. But the city's rapid growth has come at a cost and Regina has strived to maintain its 50-year-old wastewater treatment facilities.

COMPARED TO TRADITIONAL PROCUREMENT PROCESSES, THE PUBLIC PRIVATE PARTNERSHIP IS EXPECTED TO SAVE \$138 MILLION OVER THE LIFE OF THE PROJECT AND IS BEING WIDELY PRAISED AS A UNIQUE ARRANGEMENT THAT WILL SERVE AS A MODEL FOR P3 PROJECTS ACROSS THE COUNTRY.

By 2013, Regina's population had reached about 200,000 and its wastewater treatment facilities were rapidly approaching the limits of their capacity. At the same time, the province revised the city's wastewater treatment plant operating permit, mandating new wastewater effluent standards that will come into effect on January 1, 2017.

None of this was a surprise. In 2008, knowing that it would need to eventually upgrade the water treatment plant, the city increased utility rates to finance the expansion. By 2011, AECOM Canada had started to develop plans for the plant's overhaul.

In June 2014, after extensive planning, analysis, discussion and debate (including a local referendum), Regina negotiated a \$350-million public private partnership with EPCOR Water Prairies Inc. The consortium, led by EPCOR Water Services Inc., includes Aecon Water, Graham Infrastructure, and Stantec. EPCOR Water Prairies is not only upgrading the treatment plant, but will also operate and maintain it for the next 30 years.

The new plant will have an increased capacity of 25 per cent and will be able to meet the needs of a population of up to 260,000 people, the anticipated size of the city by the year 2035. It will also meet the new effluent quality standards that the Saskatchewan Water Security Agency has mandated, while operating with better efficiency, lower energy consumption and fewer greenhouse gas emissions.

Compared to traditional procurement processes, the public private partnership is expected to save \$138 million over the life of the project and is being widely praised as a unique arrangement that will serve as a model for P3 projects across the country.

UNDER CONSTRUCTION

Built more than 50 years ago, Regina's wastewater treatment plant was outdated and nearing the end of its service life. While it did an acceptable job of removing solids and biological wastes, the plant was unable to remove all of the nutrients and nitrogen that were causing environmental problems when the effluent was discharged into the local waterways.



PROJECT FILE

Regina Wastewater Treatment Plant Upgrade Project

CLIENT: EPCOR for the City of Regina

LOCATION: Regina, Saskatchewan

JOINT VENTURE: Graham-Lockerbie Stanley JV (GLS) (Aecon Water and Graham Construction)

AECON GROUP: Aecon Water Infrastructure Inc.

TIMING: June 2014 – December 2016

TYPE OF CONTRACT: P3

CONTRACT VALUE: \$150 million

SUMMARIZED SCOPE:

- // Convert a lagoon treatment plant to a new biological nutrient removal treatment plant
- // Retrofit, refurbishment and new construction

GLS EMPLOYEES ON SITE AT PEAK:

170 trades and 40 staff

KEY EMPLOYEES:

- Jeff Pigott – Senior Vice President, Social Infrastructure
- Glen Sinclair – Vice President, Aecon Water
- Garry Germscheid – Construction Manager
- Jamie Abernethy – Project Manager

QUANTITIES:

- // Excavation – 375,000 cubic metres
- // Concrete – 17,000 cubic metres
- // Reinforcing Steel – 1,800 tonnes
- // Underground ducting for new electrical feed – 2.5 kilometres
- // Underground piping (up to 54-inch diameter) – 2 kilometres

PEOPLE NEVER CONSIDER WHAT HAPPENS AFTER THEY DRAIN THE KITCHEN SINK OR DO LAUNDRY, BUT THERE IS A COMPLICATED PROCESS THAT WE HAVE TO GO THROUGH TO RESTORE THE WATER TO ITS PRISTINE STATE. THE OLD PLANT WAS RELATIVELY BASIC IN NATURE. THE NEW PLANT WILL BE MUCH MORE SOPHISTICATED, WHICH PRESENTS SOME INTERESTING SITUATIONS FROM A DESIGN AND CONSTRUCTION POINT OF VIEW.

—JAMIE ABERNATHY
PROJECT DIRECTOR, AECON WATER

The new water treatment plant will be considerably more sophisticated. The existing grit removal system will be upgraded. New secondary treatment facilities will include biological reactors and secondary clarifiers, sludge thickening, UV disinfection upgrades, and improvements to the existing anaerobic digesters and biogas systems.

This project also comes with its own unique challenges, says Jamie Abernathy, Aecon Water's project director.

"People never consider what happens after they drain the kitchen sink or do laundry, but there is a complicated process that we have to go through to restore the water to its pristine state," he says. "The old plant was relatively basic in nature. The new plant will be much more sophisticated, which presents some interesting situations from a design and construction point of view."

"The new environmental regulations come into effect on January 1, 2017 so we have a very specific and very tight

deadline to meet. And to make matters a bit more complicated, we have to keep the current water treatment facility operating while we do all of the upgrades."

Fully aware of the tight regulatory deadline, Regina executed an early-works agreement with GLS (the design and construction team) to begin some elements of the work even though Stantec had not yet finished the final design. Construction was under way in June 2014, almost three weeks before financial close, and on August 1, 2014,



THE C.W. CHUCK WILLS AWARD

The Canadian Council for Public-Private Partnerships (CCPPP) awarded the City of Regina's Wastewater Plant Project the C.W. Chuck Wills Award for Municipal Infrastructure at the 2014 National Awards for Innovation and Excellence in Public-Private Partnerships.

"The City of Regina is honoured to receive this award," says Regina Mayor Michael Fougere. "Entering into a P3 of this type and this scope was new territory for us, and we're glad to see others recognize how much work went into getting this deal done right. We recognized early on that a project of this scope was going to be different. While P3s won't be an option for every project we take on, in this case, it gave us a clear path towards the best possible deal for taxpayers."

P3 Bulletin THE P3 AWARDS

In October 2015, the City of Regina's Wastewater Plant project was runner-up to the John Hart Generating Station Replacement project in the Best Waste/Energy/Water Project category.

The P3 Awards by P3 Bulletin recognize and reward outstanding achievements in public-private partnerships in the U.S., Canada and Latin America.

less than a month after financial close, EPCOR became the city's wastewater treatment provider.

Much of the heavy construction associated with the project involves the bioreactors and the secondary clarifiers.

Once the wastewater has passed through primary treatment, where the grit is removed, it moves on to the bioreactors, where bacteria break down the solids in the water.

"It's not quite like what people picture when you tell them that you're building a reactor," says Abernathy. "It is essentially a large concrete box, 120 metres long, 60 metres wide and eight metres deep, divided into three sections, with mechanical agitators to keep the microbes in contact with the wastewater. And interestingly, it is open to the air.

The water only stays in the reactors for about three hours and it is constantly moving, so even with the fierce Regina winters (and it can get pretty cold), the water will never freeze."

The wastewater then moves on to the three new concrete secondary clarifiers, each one 38-metres in diameter and six metres deep, where more of the solid waste is removed by sedimentation.

By the time the project is complete, GLS will have excavated more than 375,000 cubic metres of soil (equivalent to 124 Olympic-size swimming pools), poured over 17,000 cubic metres of concrete and installed more than 1,650 tonnes of reinforcing steel.

While the heavy construction is the most visible part of the project, GLS is also upgrading some of the existing

facilities and installing sophisticated new technology. The sludge from the primary treatment tanks will go to refurbished digesters. Centrifuges will dewater the digested sludge, which will then be trucked to the new leachate collection system, retrofitted from an existing lagoon. The digestion process provides the plant with an additional environmental benefit. The biogas released as the sludge is broken down in the digesters can be recycled in the plant, reducing the amount of natural gas needed to fire the boilers. The new facility will also include a wet weather flow treatment system so that the city can store large storm flows that might overwhelm the plant's capacity and return them for treatment when the storm subsides.

The grit vortex system, comprised of circular concrete tanks with paddles that separate the grit from the wastewater during the primary treatment stage, is a prime example of the creative engineering that has gone into this project, says Garry Germscheid, the construction manager. "Instead of building a new set of tanks, we poured the grit vortex tanks in existing rectangular tanks that were no longer needed – just one example of how we were able to reuse a lot of the existing infrastructure to save cost."

GLS also installed two prefabricated stainless steel tanks for the dissolved air flotation system. A crane lifted the 35-tonne rectangular tanks (each one 12 metres long, four metres wide and three metres deep) into place in a newly

constructed building prior to the roof being installed.

Other installation work includes two kilometres of underground ducting for a new primary 25-kilovolt electrical feed (the above ground line that is being replaced was susceptible to power failures), about 2.5 kilometres of underground piping up to 54-inches in diameter, and more than 40,000 weld and groove inches for the process piping. The joint venture is also installing the ultraviolet system that will disinfect the water before it goes into Wascana Creek.

"A lot of people don't consider wastewater treatment to be a very sophisticated process but some of the equipment is quite high-tech and the plant is fully automated," says Abernathy.

"We're installing a lot of instrumentation and controls and we will have three employees dedicated to programming the control system. Our expertise and ability to program, automate and integrate the complete mechanical process is one of Aecon Water's strengths and this is what sets us apart."

By September 2015, the project was about 70 per cent complete and on schedule to meet the start date of December 30, 2016.

PICTURE THIS

There's no denying what computer graphics can accomplish today. Detailed, accurate and realistic three-dimensional renderings are a powerful tool for design and construction.



“Even the best-trained engineers and architects can have difficulty translating two-dimensional plans and drawings into a finished design,” explains Graham Hyde, Aecon Group’s virtual design and construction manager. “But show the team a three-dimensional rendering and everyone can immediately see where things fit and where they don’t.”

In January 2015, Stantec started sending the project’s two-dimensional design drawings to Hyde’s graphics team in Vancouver in order to have them converted into a three-dimensional computer model.

“There were two parts to this project – the Greenfield site, where we are

building all new facilities, and the Brownfield section, where we are retrofitting some of the existing portions of the plant,” explains Hyde. “For the new construction, we created the model straight from the drawings but we went one step further for the retrofit. We went to Regina and did a laser scan of the plant and then converted it into a computer model. It took about two weeks to do the scan and another three weeks to convert the data but once we were finished, we had a perfect replica of the plant, which we could use to superimpose the new pipe work and equipment.”

It took six months and three designers to complete the three-dimensional

rendering of the water treatment plant. The project team then reviewed the model for constructability, after which the drawings were sent to a pipe fabrication shop in Calgary and to the site. The spools will be checked against the model when they leave the shop and then checked once again when they arrive on site.

Virtual Design and Construction (VDC) is quickly becoming an established tool to help manage complex development projects. As we continue to use and advance this tool, we will be able to identify more of its benefits, adds Hyde.

MEET:

PEOPLE MATTER

CAMILLE WALLACE

PROJECT COORDINATOR
AECON CONSTRUCTION AND MATERIALS LIMITED



Camille Wallace wanted nothing more than to spend her life digging up dinosaur bones and nursing animals back to health as a veterinarian. But a chance job offer after graduating from university suddenly diverted her plans away from biology in the most unexpected way.

Three years ago, you were newly graduated and about to set sail on your career as a marine and freshwater biologist. Today, you're a project manager and key member of Aecon Construction and Materials Limited (ACML). Why the career change?

While I was a waitress, I befriended a couple who sat in my section a few times a week. Surprisingly, they offered me a position with their company, Kiwi Newton, as soon as I graduated. I was shocked initially because I didn't know anything about their industry. I took them up on their offer, thinking it would hold me over until I found work in the sciences, but I ended up falling in love with construction and realized that this is where I was supposed to be.

You quickly worked your way up through Kiwi Newton before being hired by Aecon. Obviously, something sets you apart.

I bring a different perspective as a project coordinator because of my background and education. I started from

the bottom, asked a lot of questions, avidly listened and learned to respect the field. I'm very confident in asking for help and I'm open to learning new things. Aecon has a great team of people who are 100 per cent supportive of that attitude. They want to see motivated young people come into the industry eager to learn and grow.

What has been your experience working in a traditionally male-dominated industry?

When I started my career, I was the first female in a male team. We had females on the administrative staff, but not on the shop floor. I was tested and trained, but everyone was very professional and treated me with respect. When I came to Aecon, I was really impressed with how important culture and diversity is to the company. It feels like the next level coming out of a smaller company like Kiwi Newton.

Everyone has been really welcoming here and I've never felt isolated. I always have managers asking me to

join them on site to see work being done and to learn something new. Gender isn't an issue, so I hope that doesn't deter people from applying within the industry. If you show genuine interest and excitement, they will help you progress and develop.

For women looking to get into the construction industry, are there any insights you would give them to help break the gender misconception?

I would say the same thing to anyone: get hands-on experience and really learn from those around you. Statistics show that younger generations aren't considering construction as a career for lots of reasons, but look what happened to me. Once you get out there, you might find that you like being outside, building things. You won't know what you're interested in until you're really exposed to it. I never pictured myself working with concrete and I love it.

I BRING A DIFFERENT PERSPECTIVE AS A PROJECT COORDINATOR BECAUSE OF MY BACKGROUND AND EDUCATION. I STARTED FROM THE BOTTOM, ASKED A LOT OF QUESTIONS, AVIDLY LISTENED AND LEARNED TO RESPECT THE FIELD.

— CAMILLE WALLACE,
PROJECT COORDINATOR, ACML



EMPLOYEE FILE

CAMILLE WALLACE

TITLE: Project Coordinator with ACML

EXPERIENCE:

2012 – 2014 General Labourer (Acting Precast Production Manager), Kiwi Newton Constructors Ltd.

2014 – Present Project Coordinator, Aecon Construction and Materials Limited

EDUCATION:

Bachelor of Science: Marine and Freshwater Biology, Minor: Geography, The University of Guelph

HOMETOWN: Timmins, Ontario

CURRENT HOME: Waterdown, Ontario

HOBBIES AND INTERESTS:

Working part-time on a dairy farm

EDMONTON'S MOD YARD IN FULL SWING:

CONSTRUCTING CANADA'S
FIRST REFINERY IN 30 YEARS

THE NORTH WEST REDWATER REFINERY PROJECT

A pipe module is an impressive piece of industrial equipment – a 30 metre long prefabricated unit weighing about 40 tonnes. But that's nothing compared to the 16 super modules Aecon Industrial is assembling for the Sturgeon Refinery Project. Each super module, weighing in at more than 180 tonnes, will be fabricated with four pipe modules stacked together.

It's all part of a groundbreaking project – the first refinery to be built in Canada in 30 years and Aecon Industrial's largest module contract to date.

THE REFINERY, ESTIMATED TO COST \$8.5 BILLION, WILL CONVERT BITUMEN FROM THE OIL SANDS INTO HIGHER VALUE PRODUCTS, MOST NOTABLY ULTRA LOW SULPHUR DIESEL. IT WILL ALSO BE THE FIRST REFINERY IN ALBERTA TO INCORPORATE CARBON CAPTURE AND STORAGE FROM THE ONSET IN THE DESIGN.

A REFINED MOVE

The North American refining industry has changed dramatically over the past 40 years and not necessarily for the better. Even though Canada's oil extraction industry has seen unprecedented growth (it was only 50 years ago that development of the oil sands started), the number of Canadian refineries has dropped from 40 to 19 as the refining industry has become increasingly concentrated with major oil companies south of the border. The last new refinery in Canada was built in 1984.

This is a trend that the North West Redwater Partnership is hoping to change. In November 2012, the Alberta government gave North West Upgrading Inc. and its partner, Canadian Natural Upgrading Limited, the go-ahead to build a new refinery in Sturgeon County, 45 kilometres north-east of Edmonton.

The refinery, estimated to cost \$8.5 billion, will convert bitumen from the oil sands into higher value products, most notably ultra low sulphur diesel. It will also be the first refinery in Alberta to incorporate carbon capture and storage from the onset in the design. The carbon dioxide from the refining process will be

captured and delivered to Alberta oil producers for enhanced oil recovery.

Construction of phase one of the refinery project is expected to be completed by the end of 2016, with the 50,000 barrel of bitumen per day refinery going into production in the third quarter of 2017.

By the spring of 2013, construction was under way and in October 2014, Aecon Industrial started work on a \$339-million contract for the fabrication and installation of modules and piping for two of the refinery's units.

"We have been involved in this project since its early days as it went through several iterations, and by early 2012, we were working with the engineering firms on the budget so we were, naturally, very pleased to be awarded the contract," says Stan Shewchuk, the president of Aecon Industrial Western.

The order for 344 modules, which will involve more than 2,000 employees, will be the largest fabrication project in Aecon Industrial's history.

And even though Aecon Industrial's fabrication facility in Sherwood Park, Alberta is the largest in the country,



PROJECT FILE

PROJECT: Sturgeon Refinery, Alberta

AECON DIVISION: Aecon Industrial Western

LOCATIONS:

Fabrication and modules – Sherwood Park, Alberta

Off module fabrication – Cambridge, Ontario (Aecon Industrial Central)

Site Construction – Sturgeon, Alberta

SCOPE:

Unit 20-LC-Finer – pipe and module assembly (contract with Fluor)

Unit 80 – U and O pipe rack and flare area – pipe fabrication and module assembly, site installation (contract with North West)

FABRICATION STATISTICS:

Unit 20 – 194 modules

550,000 diameter-inches pipe welding
60,000 metres of pipe –
1/2 to 36 inches diameter
6,800 tonnes structural steel

Unit 80 – 149 modules

300,000 diameter-inches welding
50,000 metres of pipe –
1/2 to 60 inches diameter
4,700 tonnes structural steel

CONTRACT VALUE: \$339 million

TIMING: Oct 2014 – Dec 2016

EMPLOYEES ON SITE AT PEAK: 2,000+

SAFETY: As of October 2015, no LTIs per 1.8 million employee-hours

KEY EMPLOYEES: Aecon Industrial West

Stan Shewchuk – President

Shane Cunningham – Vice President, Fabrication and Modules

Ron Chorney – Director, Construction Operations

Jay Grant – Operations Manager, Fabrication and Modules

Jamie Kohlman – Module Yard Manager

Taylor Orrell – Fabrication Shop Manager

Keith Schwanak – Site General Superintendent

Ian Vibe – Piping Superintendent

Raymond Snow – Structural Superintendent

Wayne Nykoluk – Electrical Superintendent

Eddie Berrios – Heavy Lift Superintendent

Jorge Abarzua – Site Services Superintendent

AECON MODULE FABRICATION FACILITY

LOCATION: Sherwood Park, Alberta

FACILITIES:

Two pipe fabrication shops and module yards
North Yard (Blue);
South Yard (Yellow)

PROJECTS:

// Fabrication and assembly for industrial and petrochemical clients
// Fabrication and assembly to support Aecon industrial field projects
// 1,900 modules assembled from 1999 to 2015

COMBINED RESOURCES:

// Land – 142 acres
// Fabrication Shops – 148,000 square feet; 20,000 to 25,000 diameter inches per week
// Module Assembly – 115 acres; up to 200 modules at a time
// Warehouses – 36,650 square feet

the ambitious and aggressive schedule will stretch the division's resources to the limit. But given the current state of the oil industry in Alberta, says Shewchuck, it couldn't have come at a better time.

MODULES AND MORE

Pipe modules have become the preferred way to build large industrial complexes for good reason. Instead of struggling to assemble all the components in the field, contractors can install large pre-fabricated modular sections – typically about 8 metres high, 8 metres wide and 40 metres long – that combine piping, heat tracing, insulation, cable trays, lighting fixtures, catwalks, valves and inline instrumentation into a single pre-fabricated package. Compared to traditional assembly methods, pipe modules are built with factory precision and can be installed quickly and efficiently without having to worry about the vagaries of the weather.

Aecon Industrial's pipe module fabrication facility in Sherwood Park, a small hamlet just east of Edmonton, is the largest in the country. Its two yards, about a kilometre apart, cover more than 142 acres (larger than 70

football fields). The two fabrication shops, with a combined area of 148,000 square feet (about the size of a typical Walmart supercenter) can produce 600,000 diameter-inches of welds a year while the module yards can assemble up to 200 modules at a time.

But even that, says Shane Cunningham, vice president of fabrication and modules, was not going to be enough for the North West refinery project. Fortunately, he says, the Aecon Industrial facilities in Cambridge, Ontario were there to back us up. "Cambridge will be fabricating pipe spools (prefabricated pipe for installation in the field) and that was instrumental in getting us the contract."

Aecon Industrial will be providing pipe modules for two of the refineries units – 149 modules for Unit 80 and 194 modules for Unit 20. Unit 80 includes the utilities and offsite support facilities and the flare stack. Unit 20, the LC-Finer, is a highly sophisticated unit that uses hydrogen and a catalyst bed to break down the bitumen and produce diesel, kerosene and naphtha. It is the key production unit for the refinery and its completion will define the refinery's

critical path. The third generation modules for Unit 20 will be the most complex that Aecon has built.

"Such a massive job with such a critical timeline puts a tremendous strain on our people and our facility," says Cunningham. "With up to 160 pipe modules being assembled in the yard at the same time, coordinating operations, quality control, engineering, and materials management is absolutely critical. One of the innovations we have introduced for this project are a number of prefabricated work stations throughout the yard. Having the tools and the supervisors' offices close to the fabrication work should help improve efficiency."

But the biggest challenge, he adds, is manpower.

"To get this job done, we need more than 1,200 skilled workers from just about every trade you can think of – pipe fitters, welders, iron workers, electricians, insulators, operators, and scaffolders. And every one of them has to understand the Aecon way of doing things; safely and efficiently."



TO GET THIS JOB DONE, WE NEED MORE THAN 1,200 SKILLED WORKERS FROM JUST ABOUT EVERY TRADE YOU CAN THINK OF – PIPE FITTERS, WELDERS, IRON WORKERS, ELECTRICIANS, INSULATORS, OPERATORS, AND SCAFFOLDERS. AND EVERY ONE OF THEM HAS TO UNDERSTAND THE AECON WAY OF DOING THINGS; SAFELY AND EFFICIENTLY.

—SHANE CUNNINGHAM, VICE PRESIDENT OF FABRICATION AND MODULES

Every new worker is given safety training when they join and the fabrication shops have set up special training courses for all of its welders.

Work on the modules for Unit 80 started in October 2014 and should be completed by the end of this year. Work on the Unit 20 modules started in January 2015 and is expected to be completed by May 2016.

Aecon Industrial is also fabricating an oxygen line for Unit 80. Since the line must be absolutely spotless, with no

hydrocarbon contamination whatsoever, it will be fabricated in what could be compared to operating room conditions. The dedicated tools used to fabricate the line will be quarantined and the line chemically washed and then sealed before it is transported to the site.

PUTTING IT ALL TOGETHER

The Sturgeon Refinery Project is providing Aecon Industrial with another notable first – its first major site assembly contract. Aecon Industrial will be erecting

the flare stack, installing various lines throughout the units, placing the modules and doing the final tie-in of the modules with pipe spools, electrical, instrumentation and heat tracing.

The flare stack, which is about 100 metres high, will be lifted into place in three sections. Following this, it will be connected to a 60-inch diameter steel line that will act as a header to carry gas to the stack, notes Keith Schwanak, Aecon Industrial's site superintendent.

“Welding a 60-inch diameter line 30 metres above the ground in the middle of an Alberta winter is going to be for us, one of the most challenging aspects of this project,” he says.

But perhaps the most spectacular component of the installation project will be the assembly of the super modules. Modules are limited by the maximum size that can be transported over public roads from the fabrication yard to the construction site but at the construction site, all bets are off.

Aecon Industrial will be assembling super modules for Unit 80, each one of which will consist of four modules stacked one on top of the other, supported by a structural steel base, about five metres high. The finished super module, about 20 metres tall and weighing more than 180 tonnes, will be moved from the site assembly yard to the refinery by a Mammoet Self-Propelled Modular Transporter (known as an SPMT), a platform vehicle with typically 40 to 50 wheels that is used to move

massive loads, too heavy or too big to be transported by trucks. It will take almost a day to make the one-kilometre move.

Installation work on Unit 80 started in April 2015 and is expected to be completed by the end of 2016. At the peak of the installation work, Aecon Industrial will have about 500 trade employees on site.



TIME AND TIDE...

THE CAPE SHARP TIDAL PROJECT

TESTING THE WATERS

It is as reliable and predictable as clockwork. Twice a day, the tide washes in and twice a day, it washes back out; a constant ebb and flow driven by the gravitational pull of the sun and the moon. And nowhere in the world is this better demonstrated than in the Bay of Fundy, home to the highest tides in the world.

THE OCEAN FLOOR IS A HOSTILE AND CORROSIVE ENVIRONMENT. GENERATORS NEED TO BE NEAR POPULATED AREAS AND THE TIDAL CURRENTS NEED TO BE STRONG ENOUGH TO GENERATE ELECTRICITY EFFICIENTLY, WHICH IS WHY THE BAY OF FUNDY, WITH ITS HIGH TIDES AND CLOSE PROXIMITY TO LAND, IS CONSIDERED TO BE ONE OF THE MOST PROMISING SITES FOR TIDAL POWER IN THE WORLD.

While a visit to Nova Scotia is not complete without witnessing the incredible tides of the Bay of Fundy, which can reach as much as 16 metres (about the height of a five-storey building), the rise and fall of the ocean is attracting the attention of more than just tourists. Each tide brings in about 160 billion tonnes of sea water into the bay, which is more than four times the estimated combined flow of all the world's freshwater rivers. This means that each tide carries an enormous amount of potential energy. If the tides in the Minas Basin, an inlet at the northern end of the Bay of Fundy, could be tapped, scientists calculate that they could generate as much as 2,500 megawatts of electricity, equivalent to about two nuclear power plants.

Tidal energy has a lot to commend it. It is, like wind and solar power, a renewable form of energy with no greenhouse emissions and it has an additional, distinct advantage. Tidal energy can be predictable but tapping into that energy has proved to be more

difficult than expected. The ocean floor is a hostile and corrosive environment. Generators need to be near populated areas and the tidal currents need to be strong enough to generate electricity efficiently, which is why the Bay of Fundy, with its high tides and close proximity to land, is considered to be one of the most promising sites for tidal power in the world.

In 2009, the Fundy Ocean Research Center for Energy (known as FORCE) was set up with federal and provincial funding and within a year, it had identified a test site about one kilometre offshore on the Minas Passage with four berths, where companies could deploy their turbines.

One of the companies that's testing its technology in the Minas Basin is Cape Sharp Tidal, a joint venture between Emera and OpenHydro, a DCNS company specializing in the design, manufacture and installation of tidal turbines. Cape Sharp Tidal is planning to install two turbines in the bay in the coming months, each one capable of generating two megawatts



PHOTO COURTESY OF MIRIAM BEACH

PROJECT FILE

The Cape Sharp Tidal Project

CLIENT: OpenHydro Technology Canada

AECOM DIVISION: Aecom Atlantic Industrial (part of Aecom Energy)

LOCATIONS: Dartmouth and Pictou, Nova Scotia

SCOPE: Fabrication and assembly of two turbines and a deployment and recovery barge

EQUIPMENT STATISTICS:

Turbines: diameter – 16 metres
weight – 1,000 tonnes
generating capacity – 2 megawatts

Barge: length – 64 metres
width – 37 metres
weight – 680 tonnes

CONTRACT VALUE: \$22 million

TIMING: Started December 2014

EMPLOYEES ON SITE AT PEAK:
280 trade employees

KEY EMPLOYEES:

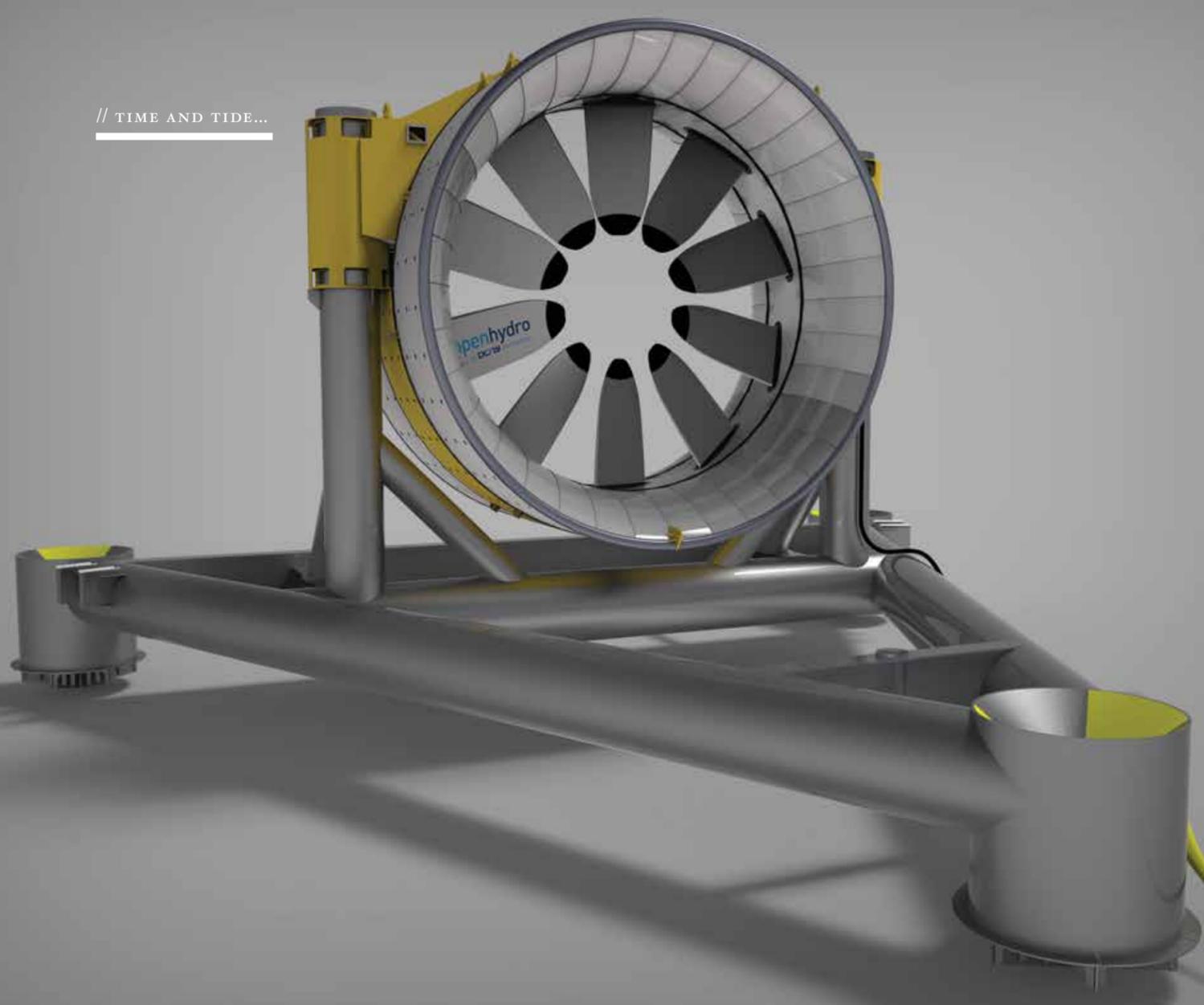
Mike Jones – Project Manager
Peter Struthers – Project Manager

DARTMOUTH:

Jerry Berkvens – Shop Manager
John Dove – Supervisor
Rick Anthony – Supervisor
Wade Swinamer – Supervisor

PICTOU SHIPYARD:

Bo Kell – Shop Manager
Brendon Fitzpatrick – Supervisor
Blair Martell – Supervisor
Bruce Morton – Supervisor
Steve Baker – Supervisor
Tim Braniff – Supervisor
Shawn Forsyth – Supervisor
Paul MacNeil – Supervisor



of electricity, enough to power about 1,000 homes.

In late 2014, OpenHydro Technology Canada awarded Aecon two contracts, one for the fabrication and assembly of the two turbines and another for the construction of the barge that will be used to take the turbines out to sea.

BARGING AHEAD

At Aecon's fabrication shops in Dartmouth and Pictou, Nova Scotia, workers raced to complete the fabrication of the barge and turbines.

"Pictou hadn't seen this type of activity in a long, long time," says Brendan McCormick, Aecon Atlantic Industrial's senior manager of project controls. "At the height of the project, we had almost 300 trade workers in the shops

working on the fabrication; the largest employment job in our history."

Aecon has had two distinct contracts to fulfill – the fabrication and assembly of the two underwater turbines and the barge that will be used to carry them to their berth.

The two turbines, which bear a striking similarity to giant fans, are 16 metres in diameter and weigh 1,000 tonnes with ten reinforced plastic blades. The blades, imported from Europe, are set at a fixed pitch so that the turbine will rotate when the tide comes in and when it goes out. Each turbine will be mounted on a subsea base, a triangular frame that will sit directly on the seabed.

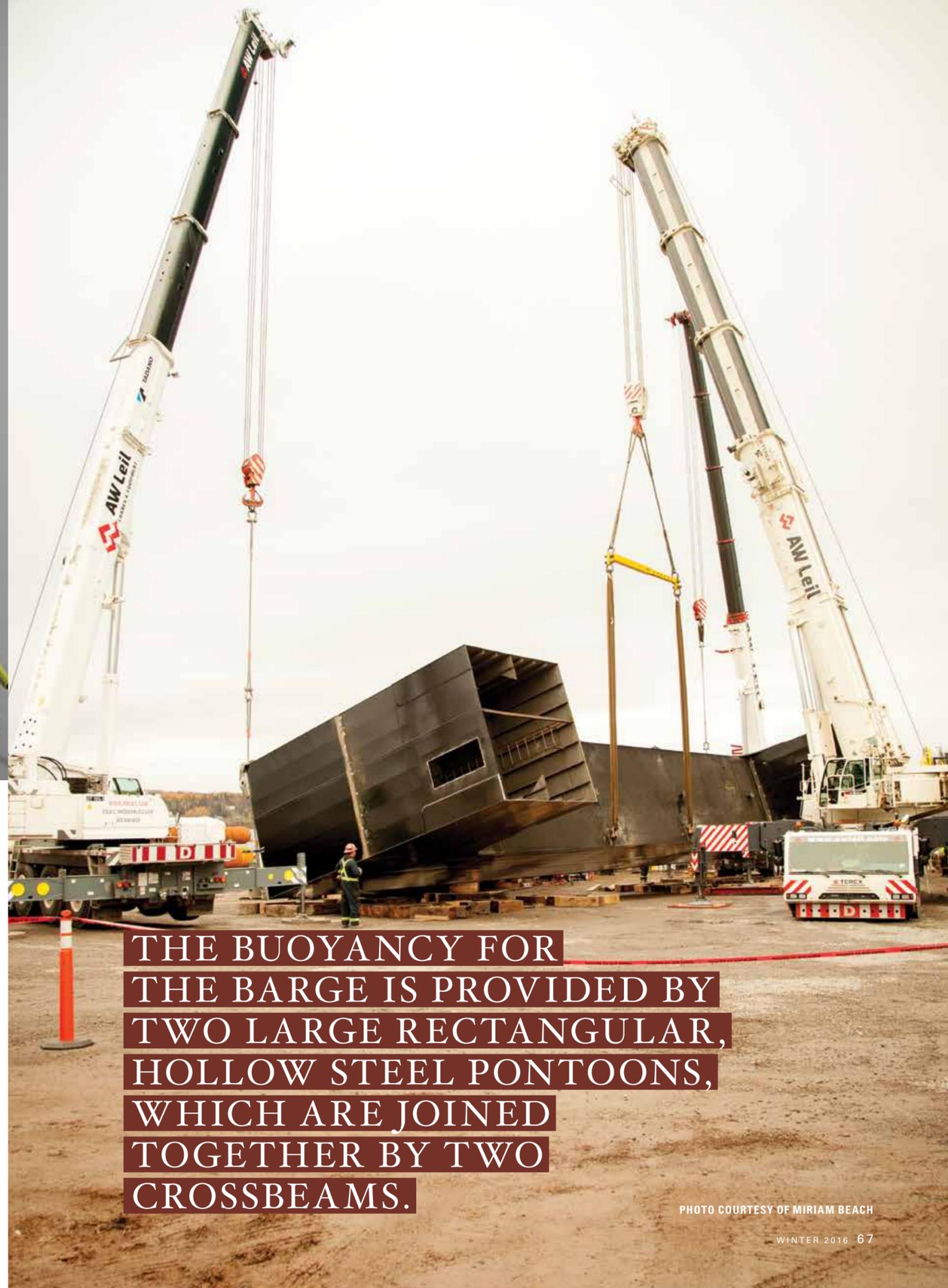
"A few years ago, OpenHydro installed a small test turbine in the bay. The engineers hadn't realized just how strong

the Bay of Fundy's tidal currents are," notes Brendan. "They learned a lot from that early test. The design of these two turbines is also based on the lessons learned from a similar 10-metre turbine that has been in operation in France."

But even though the turbines are massive pieces of equipment, each one about the size of a seven-storey building, they are still precision instruments and the tolerances, Brendan says, are exacting.

"The clearance for the rotor is just a few millimetres and we have dimensional control survey technicians working around the clock to ensure that the allowances are met."

It's highly specialized work and Aecon has operated closely with OpenHydro to



THE BUOYANCY FOR THE BARGE IS PROVIDED BY TWO LARGE RECTANGULAR, HOLLOW STEEL PONTOONS, WHICH ARE JOINED TOGETHER BY TWO CROSSBEAMS.

PHOTO COURTESY OF MIRIAM BEACH



ensure that the turbine assembly went according to plan.

"OpenHydro is acknowledged as a world leader in the manufacture of tidal turbines," says Brendan. "It provided all the instructions on how the assembly sequencing had to proceed and its field engineers were here on site, managing the final assembly work."

The barge used to deploy the turbines is equally impressive, although calling it a barge is a bit misleading, Brendan says. "It's more like a floating platform than a

barge, specifically designed to deploy the turbines in high flow conditions."

The buoyancy for the barge is provided by two large rectangular, hollow steel pontoons, which are joined together by two crossbeams. Three hydraulic winches on the barge will lower the turbine into place and subsequently raise it for maintenance. The assembled barge is 64 metres long and 37 metres wide – slightly bigger than a standard NHL ice rink.

"The Pictou yard gave Aecon a competitive edge for this project," says Ken McCormick, Aecon Atlantic's vice president and general manager. "It is not only a fabrication shop. It's also a shipyard, so we have direct access to water and the use of our marine railway. (The railway is a set of tracks 230 metres long, half of which is underwater, with a 100-metre-long moving platform with a capacity of 3,000 tonnes). There's no overland transportation involved. We launched



PHOTO COURTESY OF MIRIAM BEACH

THE PICTOU YARD GAVE AECON A COMPETITIVE EDGE FOR THIS PROJECT. IT IS NOT ONLY A FABRICATION SHOP. IT'S ALSO A SHIPYARD, SO WE HAVE DIRECT ACCESS TO WATER AND THE USE OF OUR MARINE RAILWAY. THERE'S NO OVERLAND TRANSPORTATION INVOLVED. WE LAUNCHED THE BARGE AT THE YARD AND IT WAS TOWED DIRECTLY TO THE BAY OF FUNDY.

—KEN MCCORMICK,
VICE PRESIDENT AND
GENERAL MANAGER,
AECON ATLANTIC

the barge at the yard and it will be towed directly to the Bay of Fundy.”

Nevertheless, Ken adds, the last phase of the project has been a nerve-racking time. “A year on fabrication and assembly and it all came down to the last few days when we launched the barge. And doing this during the coldest months of the year didn’t make the task any easier.”

The barge was assembled in the yard and then moved on air bags to the sea, where it has been launched for the very

first time. The next phase of the project is to have a crane lift the 16-metre turbine onto the barge, where it will be locked in place, ready to start its final commissioning prior to being towed to the Fundy Ocean Research Centre for Energy (FORCE) test site. It will not be a short trip. Even though Pictou is only about 60 kilometres from the Minas Passage, it’s about as far as you get from its ultimate destination by water. To reach the FORCE test site, the barge will have to be towed almost completely around the Nova Scotia coastline,

THE TWO TURBINES, WHICH BEAR A STRIKING SIMILARITY TO GIANT FANS, ARE 16 METRES IN DIAMETER AND WEIGH 1,000 TONNES...

a distance of about 1,300 kilometres. After the trip and the subsequent deployment of the turbine, the barge will return to collect the second turbine.

In the coming months, the two turbines will be sitting on the seabed, hooked into the subsea cable that joins the berth at the bottom of the bay to Nova Scotia’s power grid, and ready to start generating a new supply of clean energy for the province.

It is said that a rising tide lifts all boats and that’s certainly the hope for this

project – a rising tide of clean energy from the Bay of Fundy that will vault Nova Scotia to the forefront of tidal energy development.

Cape Sharp Tidal’s long-term goal is to install about 300 megawatts of tidal turbine capacity in various locations around the Bay of Fundy by the 2020s.

“This has been a pioneering project not just for Nova Scotia but for Aecon Atlantic Industrial as well – an opportunity to showcase our facilities and the craftsmanship of our

employees,” concludes Ken. “The potential for tidal energy in this region is huge and so too, is the potential for Pictou.”



TO REACH THE FORCE TEST SITE, THE BARGE WILL HAVE TO BE TOWED ALMOST COMPLETELY AROUND THE NOVA SCOTIA COASTLINE, A DISTANCE OF ABOUT 1,300 KILOMETRES. AFTER THE TRIP AND THE SUBSEQUENT DEPLOYMENT OF THE TURBINE, THE BARGE WILL RETURN TO COLLECT THE SECOND TURBINE.

THE AECON SAFETY OPPORTUNITY PROGRAM

By Mike Archambault
Senior Vice President, Chief Safety Officer



In the last issue of Aecon's ONE Magazine, we discussed the Aecon Safety Opportunity program and how it can play an important role in improving workplace safety.

The Aecon Safety Opportunity program was launched in 2014 and it asked our frontline employees and workers to record and submit safety opportunities relating to unsafe acts, conditions, behaviors and to make safety suggestions.

I am pleased and encouraged at the tremendous response we have had from our employees to identify more than 20,000 safety opportunities in this time, which gives us an invaluable perspective from the people who are closest to potential safety problems – our front line employees. With these reports, we have identified key areas on which to focus and, interestingly, some of the biggest concerns relate to not following safe work practices and procedures and not using the right tools and equipment for the job.

Every day, each one of us has to complete various tasks or processes, whether we are operating equipment, welding, lifting, rigging or doing

housekeeping. Each time you do any of these, do you do them the same way? Do you always operate your tools as safely as you could or are there times when you make a conscious decision to not follow the safest practice?

When we complete the same task or process multiple times without any negative consequences, are we more likely to make decisions that deviate from safe work practices? I am certain we can all think of a personal experience where we skipped a step or did something slightly different and something went wrong. The consequences could vary for each of us, but the fact remains that something went wrong.

Think about all of the activities that occur across Aecon each and every day, the list is endless. It is critical that when completing each and every task, regardless of the risk, our priority is to make sure we do it the right way, the safe way – every time. Safe work practices and procedures are established, proven

and accepted ways at completing simple or complex operations safely. Any time we don't follow best practices, or ensure there is a safe work procedure developed, there is an opportunity for something to go wrong. Through our Safety Opportunity program, you are telling us that is exactly what is happening.

Using the right tools and equipment to complete the job is part of following safe work practices and procedures. Hand tools, power tools, mobile and heavy equipment all have specific safe work practices to ensure they are used safely.

"It will only take a second." "We didn't bring it with us." "We can get it fixed later." "We can use it one more time." Sound familiar? Planning your work effectively and knowing the appropriate practices and procedures will help ensure you have the right tools, in the right conditions to complete the job. Not only will having the right tools and equipment available ensure the safety of everyone involved, it is also far more efficient

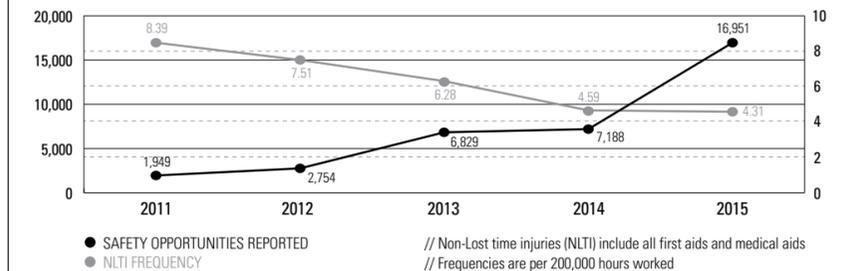
at completing the task. The saying, "Measure twice, cut once," is about being prepared and the same principle applies in making sure you have the right tools at the work face before you start your task.

Following safe work practices and procedures and ensuring you have the right tools for the jobs are essential for you to do your job safely. As part of the Aecon's Safety First core value, we are all responsible to be diligent and follow safe work practices, and ensure our tools are safe for use each and every time. No exceptions. After all, when you take shortcuts, you are not only making that decision for yourself, you are also making that decision for your family, your coworkers and their family, should something go wrong.



THE TREND IS OBVIOUS; THE MORE WE IDENTIFY AND REPORT OPPORTUNITIES, THE MORE EFFECTIVE WE CAN BE AT IDENTIFYING TRENDS AND TAKING ACTION TO REDUCE OUR INJURIES. THERE IS A DIRECT CORRELATION TO THE AMOUNT OF SAFETY OPPORTUNITIES WE REPORT AND A REDUCTION IN WORKPLACE INJURIES.

SAFETY OPPORTUNITIES REPORTED vs. NLTI FREQUENCY



Key safety points to keep in mind:

- // Review and follow the safe work practices applicable to your work.
- // If you have any questions or concerns on safe work practices or procedures, speak with your supervisor.
- // If you observe someone not following safe work practices or procedures, intervene and share your concern with them or their supervisor.
- // Ensure you have received training and instruction on all tools or equipment you may use.
- // Familiarize yourself with safe work practices, procedures and the manufacturers' instructions on all tools and equipment.
- // If you need training, please discuss with your supervisor prior to completing the task.
- // Always inspect a tool before use. If it is damaged or poses a hazard, report it to your supervisor immediately, tag it out of service and do not use it.
- // When operating equipment, always complete any log books and ensure proper maintenance schedules are met.
- // If you have any input to improve safe work practices or procedures, let your supervisor or EHS representative know.
- // Review any Job Hazard Analysis (JHA) associated with your work. If you are still not clear on the hazards identified, discuss with your supervisor.
- // Make sure your Job Assessment Risk Reviews (JARR) reflect and identify the hazards associated with the task.



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