YDiG?

BC's Magazine for Trenchless Construction

NASTT BC

Cover Story:

HDD Power

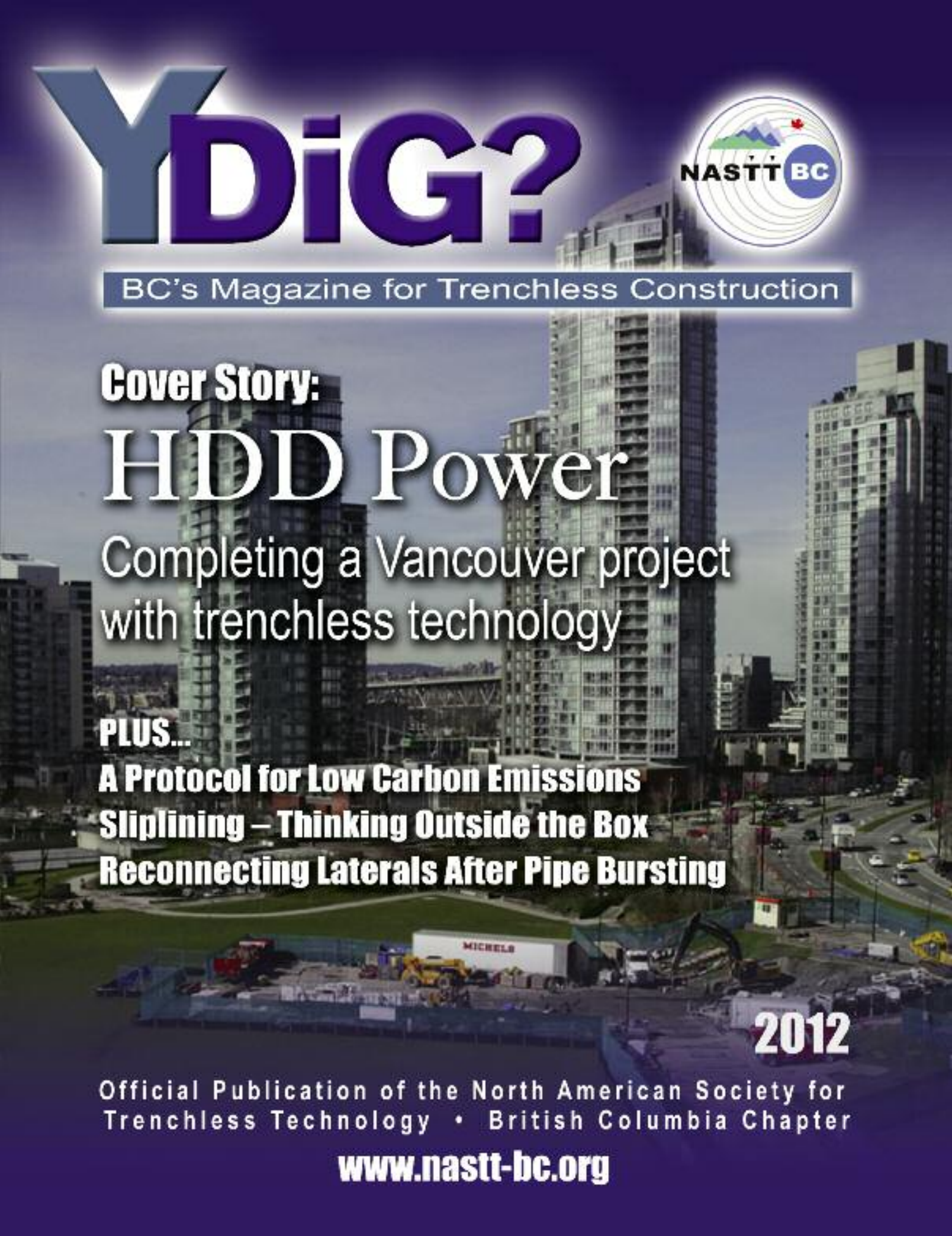
Completing a Vancouver project with trenchless technology

PLUS...

A Protocol for Low Carbon Emissions

Sliplining – Thinking Outside the Box

Reconnecting Laterals After Pipe Bursting



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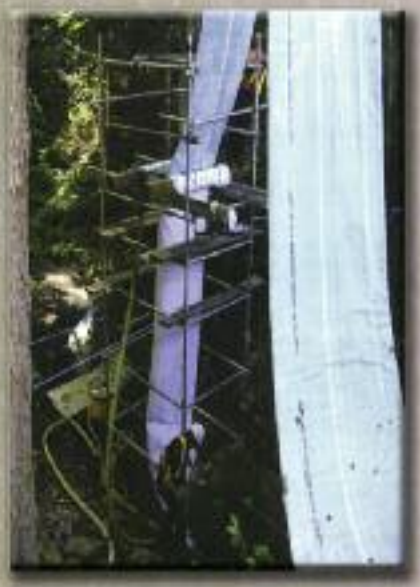





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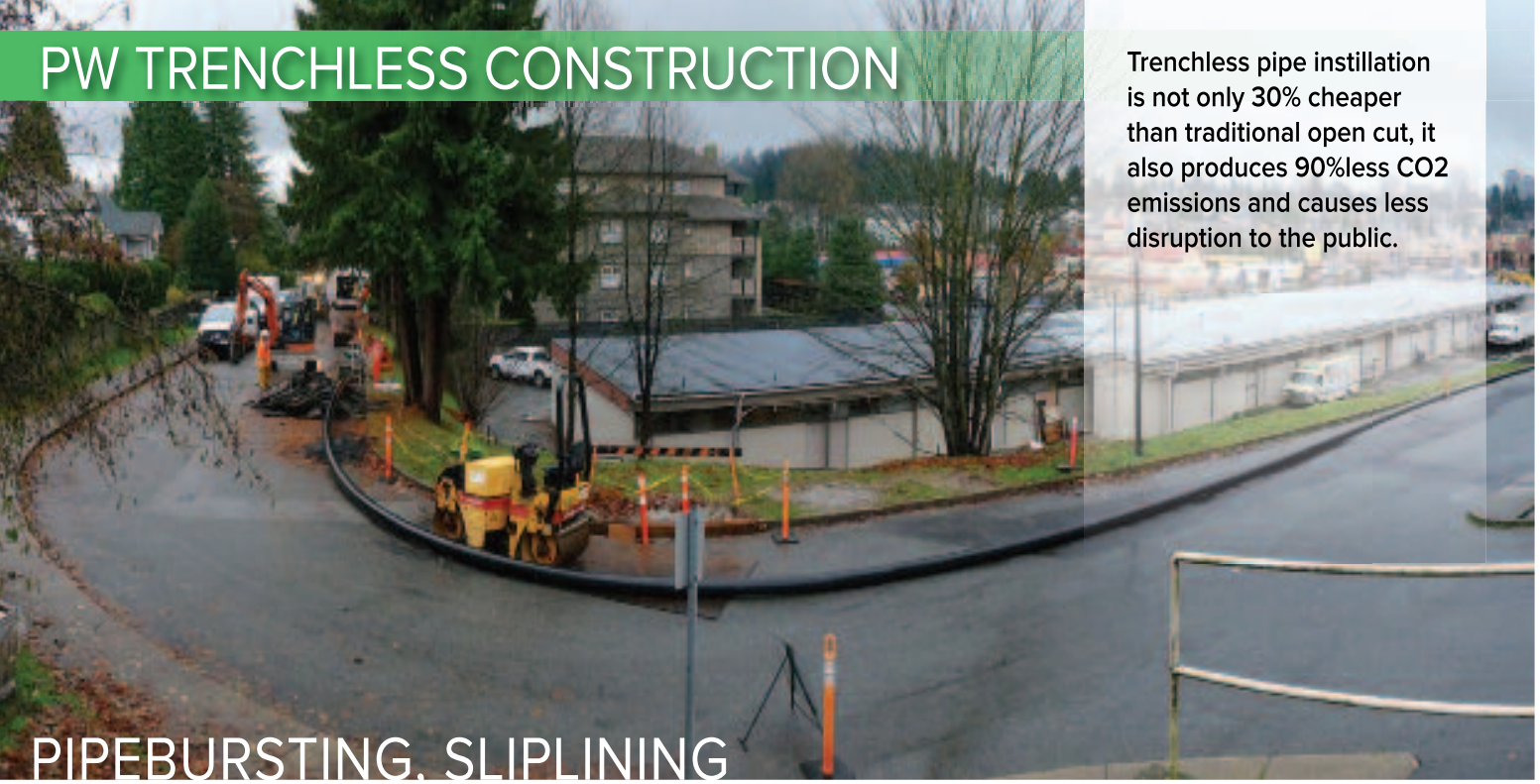
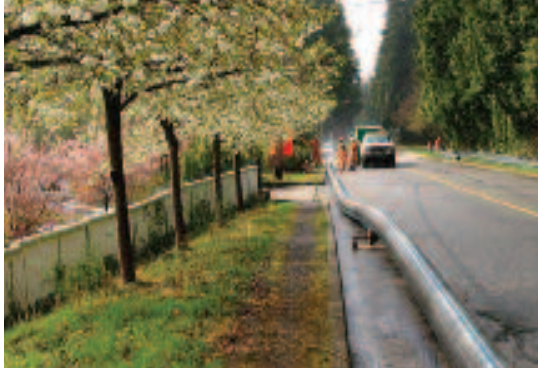
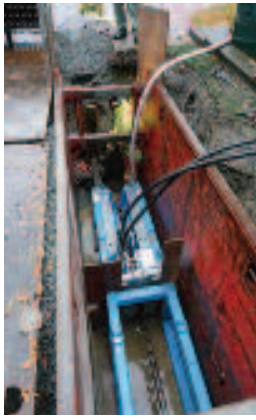
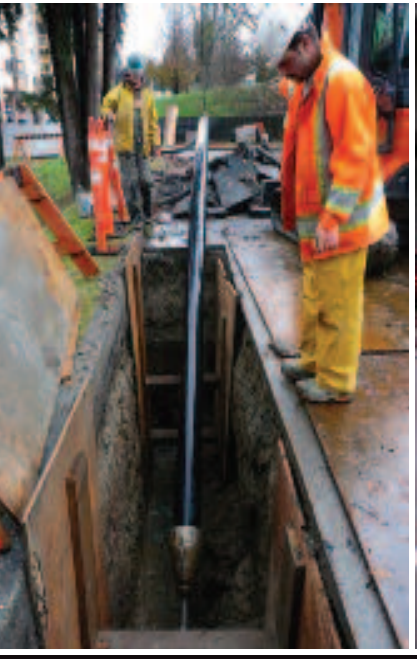
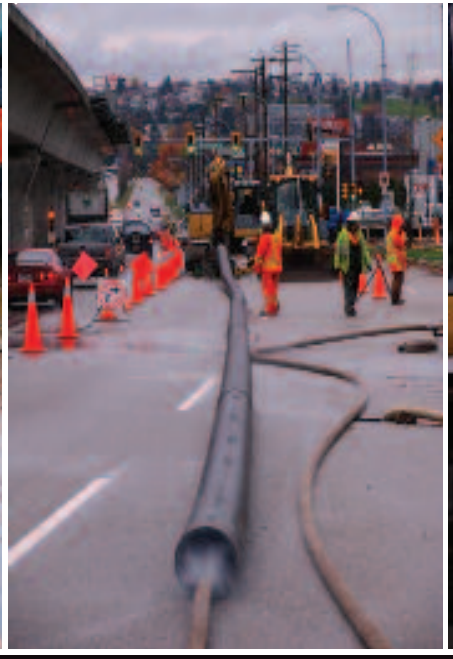


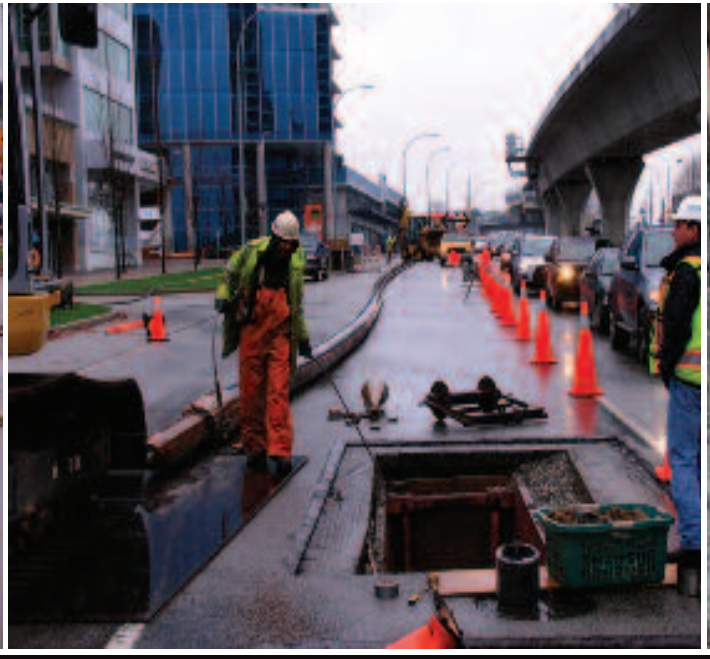




PIPEBURSTING, SLIPLINING







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Y-DiG?

North American Society for Trenchless Technology - BC Chapter

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ALSO...

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Y-Join NASTT BC?

The British Columbia Chapter of the North American Society for Trenchless Technology (NASTT)

NASTT BRITISH COLUMBIA CHAPTER: Leaders in Innovation

The BC Chapter of NASTT was established 2005, and exists to promote the use of trenchless technology in B.C. through education and standards. NASTT-BC has worked hard over the last 6 years to have trenchless standards adopted throughout the Province. In 2008, work began by the Chapter to develop a tool for accurately determining the reduced carbon footprint that various trenchless technologies offer - the Carbon Calculator! In wide use across North America, a revised version has now been completed and will be used by trenchless professionals to illustrate perhaps the most important benefit of trenchless - a reduced carbon footprint! Other chapter achievements include:

- In the MMCD's new Platinum book, CIPP and Pipe Bursting are included, with remaining trenchless methods to follow.
- NASTT-BC has worked hard to provide training programs for government and consultants, as well as contractors, on the cost and carbon savings available.
- NASTT-BC has worked to be a leader in promoting the use of trenchless as a low cost /low carbon method of construction.
- Since 2005, the chapter has published their Annual Magazine Y-DIG?
- The chapter and Y-DIG? Magazine is a great way for consultants to promote their successes, for cities to learn about the projects, methods, lessons and experiences of other cities, and for all 3 partners (owners, consultants and contractors) to share information.

WHAT IS NASTT?

Founded in 1990, NASTT is a not-for-profit, educational and technical society that is dedicated to promoting the benefits of trenchless technology for public awareness through education, training and research. NASTT is the definitive resource for trenchless professionals like you, who are concerned with underground systems and the applications of trenchless technology.

Trenchless Technology

By using trenchless technology methods, you are reducing the impact of underground construction on your community. The benefits of trenchless technology are priceless:

- Minimizes surface disruption & trenching
- Reduces public inconvenience
- Cost-effective methods
- Less traffic congestion
- Widely utilized & accepted
- And this all adds up to - REDUCING CARBON FOOTPRINT BY UP TO 90%!

Membership

If you're interested or concerned in underground systems and the application of trenchless technology, then NASTT membership is right for you.

NASTT connects you to the people and businesses involved in the trenchless industry.

NASTT is your link to thousands of trenchless professionals and leaders working in regional, national and international levels. Membership is open to individuals, agencies and companies involved with providing gas, water, sewage, communications and electrical services.

Your Regional NASTT Chapter: Get Involved

NASTT has a network of nine regional chapters throughout North America. Regional chapters offer valuable educational and networking opportunities in your local area. Share your ideas, network with colleagues and find solutions to your everyday challenges. When you join NASTT, you automatically become a member of your regional chapter and a member of the International Society for Trenchless Technology (ISTT).

JOIN NASTT and NASTT-BC TODAY!

For further information visit www.nastt.org or call Gloria Grill at 604-436-6719 Gloria.Grill@metrovancouver.org

President's Message

KARL MUELLER

It has been an exciting year in British Columbia for trenchless technologies. This past year the board of directors has continued with the good work from last year, and has been actively promoting the benefits of trenchless technologies across the province. This year's board is well represented with members of the contracting, supplier, consulting engineering and municipal and regional government communities, with the latter most representing 40 per cent of the board.

The society increased its efforts in providing trenchless technology education, hosting four full-day Best Practices seminars (HDD and Pipe Bursting) in Vancouver and Victoria in June, and again in October in Vancouver and Victoria (CIPP Lining and Lateral Rehabilitation). The courses were presented in conjunction with NASTT national and were very well received. The association also presented a "Trenchless 101" course in Kelowna, which was well received and attended. Moving forward this year we plan to host more informal half-day educational seminars throughout the province.

There is increasing demand in municipalities to use trenchless technologies. Metro Vancouver continues to use trenchless technologies to rehabilitate its large-diameter sewers. The City of White Rock, District of Saanich, City of Richmond, City of Burnaby, City of North Vancouver, and City of Abbotsford all use trenchless technologies to rehabilitate and/or install infrastructure. Trenchless projects such as the City Central Transmission Project and installation of a new culvert at CN's Chetwynd railyard are highlighted in this issue as examples of work recently undertaken. Trenchless technologies are definitely a part of the design and construction toolbox in the Lower Mainland and on Vancouver Island, and the industry is making progress in the rest of the province.

For years NASTT-BC has been promoting the environmental benefits of trenchless construction techniques – first with the initial carbon calculator and now with the carbon protocol. The carbon calculator allows designers to calculate the carbon savings obtained through the use of trenchless technologies compared to conventional open-cut construction. The calculator has been a great tool and, with the support of NASTT national and others, it has been developed further to the next level. The Carbon Protocol is the next tool allowing municipalities to obtain carbon credits with the use of trenchless technologies to offset their carbon emissions. (See David O'Sullivan's article elsewhere in this issue.)

In last year's message I highlighted the need for additional trenchless contractors in the province and particularly the interior. The traditional contractors are still serving the Lower Mainland well and an established Albertan contracting company has made inroads into the province with regard to projects in the interior. However, the market can still use additional expertise.

In 2012/2013, the society will again be working closely with the national organization to bring training seminars and other learning opportunities to you. I would like to thank the board for all its efforts this past year presenting and hosting events throughout the province. I would also like to thank our many volunteers and speakers without whom the events would not be the successes they have been. It looks like this will be a busy year for the industry and NASTT-BC.

Karl Mueller
President, NASTT-BC

Future Looks Very Bright for Trenchless in B.C.

What's Been Done & What's To Come

MIKE WILLMETS
EXECUTIVE DIRECTOR, NASTT

As NASTT enjoys its 21st year of service to the trenchless industry, I want to take a few moments to express my appreciation and gratitude to the members of the British Columbia Chapter (NASTT-BC). Undoubtedly, our regional chapters are NASTT's eyes, ears and voice at the local and provincial levels. NASTT-BC's stellar efforts of hosting four recent NASTT's Good Practices courses have vaulted you to the top of our training program standings. Well done and "Thank you" to the organizers and attendees.

Turning to the recently completed 2012 NASTT No-Dig Show in Nashville, I can happily report an excellent event that featured 155 peer-reviewed technical papers, making it our strongest technical program ever. We also set a new record with the number of exhibitors where the latest trenchless products were showcased. NASTT also launched the newly created Trenchless Hall of Fame with inaugural inductions for the late Gary Vermeer (founder of the Vermeer Corporation), Frank Cannon (longtime Baroid employee and industry champion) and Bernie Krzys (owner and publisher of Trenchless Technology Magazine). The Hall of Fame is intended to preserve the outstanding accomplishments of exceptional individuals and honour their contributions to the trenchless industry. I'm very proud of the quality product that the NASTT No-Dig Show delivers, and we are already working on next year's event in Sacramento, California. Don't miss that!

As for the rest of 2012, NASTT has many key initiatives in process, all geared toward making our society stronger and more vital to the trenchless industry. Many of our fellow Canadians are major players in these initiatives with representation on the NASTT Board of Directors and the working committees. This is especially true with the annual No-Dig Show Program Committee. Thank you all for helping to expand the reach of trenchless technology in North America and abroad!

I want to share with you one of NASTT's top goals for 2012 as the assistance of our Regional Chapters will be vastly important. As we try to move the industry forward and grow our Society, we need to continue to expand the awareness of trenchless technology for municipal and utility owners. These are the decision makers that need to engaged and welcome to our events and ultimately to our membership. As we all know, the public sector is constantly faced with shrinking budgets which unfortunately leave little room for training. However, NASTT believes this demographic is critical to growing the trenchless industry as well as increasing awareness of the tremendous social and environmental benefits of trenchless technologies. Our Society can provide the important technical knowledge and networking opportunities needed to evolve North America's infrastructure engineering.

Another very exciting project that we believe will aid in our quest to reach more municipal and utility members is the NASTT Carbon Calculator program. In order to promote trenchless technology as a "green" alternative, NASTT has collaborated with a consortium of North American gas and electric utilities to develop a calibrated comparison tool between traditional open-cut construction and trenchless applications. The first phase of this project is expected to be completed by mid-2012 and further information will be forthcoming.

Over the last year, NASTT has worked very hard to better disseminate our message to the public, as well as our members seeking information about various trenchless technologies. Our website (www.nastt.org) received a major makeover with new information and the ability to access data faster and more efficiently. We've also launched our own magazine, NASTT's Trenchless Today, which is intended as a conduit between NASTT and its membership. The stories in these pages feature the faces and voices of our invaluable volunteers, who tirelessly promote the trenchless industry.

Best wishes and continued success to NASTT-BC, and I hope to see you in Sacramento!

Michael J. Willmets
NASTT Executive Director

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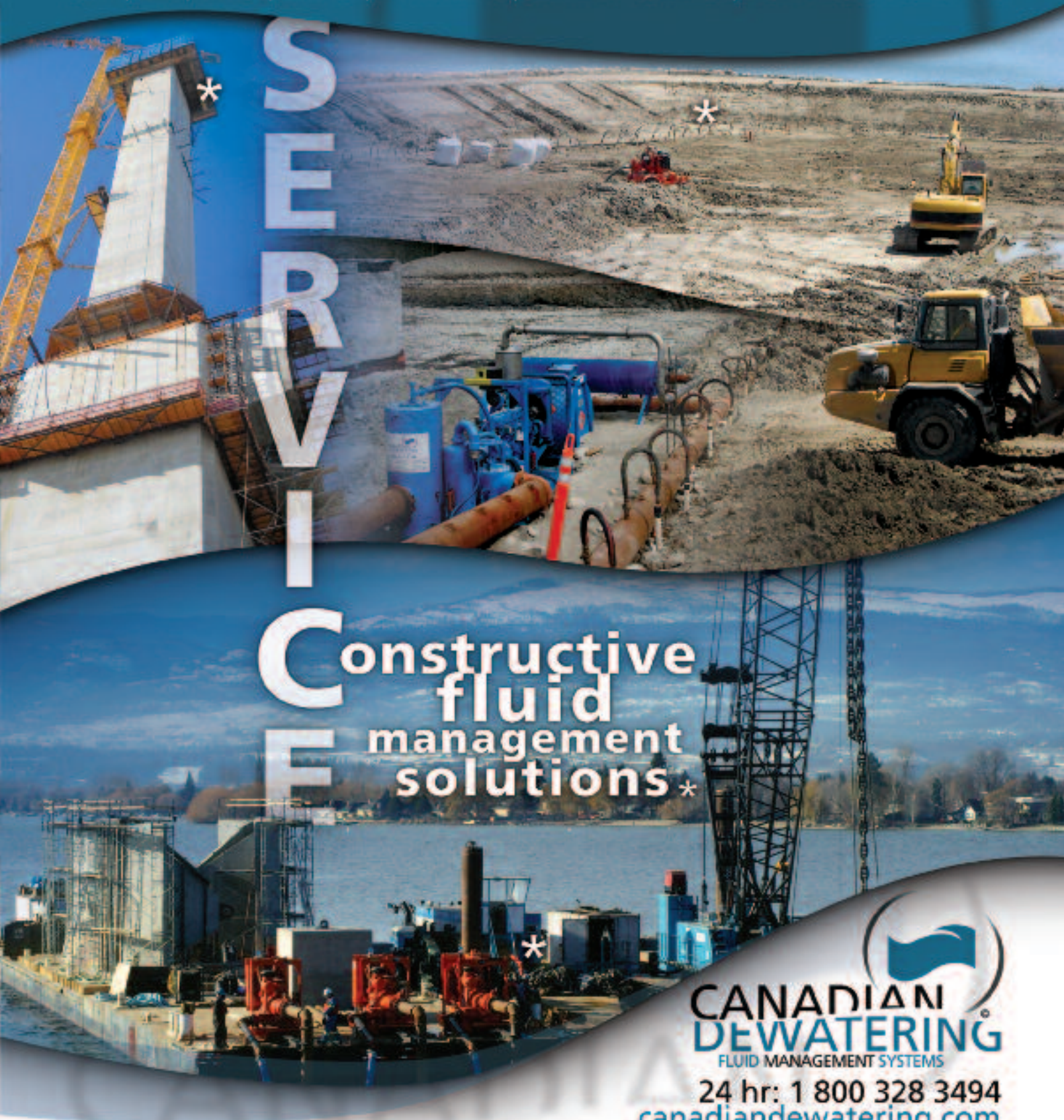

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Trenchless Technology & the Low-Carbon World

David O'Sullivan
PW Trenchless

In 2008, British Columbia introduced The Climate Action Plan and with other provinces and states in North America looked to set up government-supported systems to reduce carbon emissions. Because trenchless technology by its nature causes no or much less ground to be excavated, we could see that there was a potential to offer a utility construction method that had a smaller carbon footprint.

A little explanation of the key advantage of trenchless: When one looks at the process of installing a utility, the biggest item in terms of carbon emissions is the excavation and replacement of material. The volume of the pipe is generally very small (often 1% of the overall excavation), so if we could install that utility in some other way and avoid the excavation then there are major carbon savings to be had. It is on this concept that we have developed a trenchless carbon calculator and a trenchless protocol.

One of the additional items brought in with this legislation was that if a local government wanted to share the carbon tax collected, it had to agree to be carbon-neutral in its "day-to-day operations." The province was mandated to be carbon-neutral by 2010, and the cities were to be carbon-neutral in their day-to-day operations starting in January 2012.

The guidelines for what constitutes day-to-day operations are defined in the Toolkit (www.toolkit.bc.ca/carbon-neutral-government), a document produced by the B.C. government to help cities comply with this new and very innovative policy.

In this policy you will see that construction projects (capital works) are outside the requirements of carbon neutrality and outside the confines of a government's "day-to-day" workload. This means that any carbon reductions resulting from different ways of doing work can be transferred into carbon offsets. These offsets can then be used to apply against the regular emissions from day-to-day operations.

It is now accepted that trenchless technology can reduce carbon emissions by up to 90% (NASTT-BC) or 79% (E-Calc), and these reductions can then be transferred into credits or offsets and traded within the operations of a city.

The problem is how to measure these known savings in a way that complies with standards that will allow us to use the savings as offsets. PW Trenchless Construction Inc. has, with the help of Habitat, developed a Trenchless Carbon Protocol to define a way to transfer these known carbon reductions

into something useful.

A protocol is a legal document that provides the details on how to generate a carbon credit. It is drafted by a group like Habitat and approved by an accredited approver (such as KPMG) to guide a user in how to create a carbon credit. There are very strict rules on how one creates a carbon credit, like the rules from ISO 14064, or the rules put out by the Pacific Carbon Trust, a B.C. government body charged with collecting credits for B.C. government bodies.

We in the developed world need to reduce our dependence on fossil fuels. To do this, we must be able to sell the concept to the public, and that means that the method we choose has to cost the same or less than existing methods and not alter how we live.

Countries like China and India are demanding to rise to "First World" levels of development, and they see that the only way to get there involves emitting carbon as we do. So if we as the First World develop ways for them (and ourselves) to install utilities with lower carbon emissions, it will be accepted.

Remember, the main measure of countries' progress to the First World is the increase in life expectancy from the current 50 years in some places to the 75-plus we in the First Word enjoy. That life-expectancy increase is largely achieved through the provision of clean water and sewage removal. Those two major items are as a result of the existence of good utilities.

Trenchless technology can offer the installation of those high-quality utilities while emitting much less carbon than would have been emitted had traditional open-cut methods been used.

That is a nice statement to say, but how do we prove it and then measure it? The proving is done through testing and observation, and there are papers published showing the savings.

"We in the developed world need to reduce our dependence on fossil fuels. To do this, we must be able to sell the concept to the public"

In B.C. we have an opportunity to use these savings to advance the use of trenchless, and that is by using these carbon savings to create carbon credits and transfer these credits within the cities developing them.

To do so, we need a protocol. This Trenchless Carbon Protocol is a document that follows ISO 14064 standards on how to create a carbon credit.

However, we feel that local governments will never be able to generate enough carbon reductions or offsets to be able to have credits for sale. It is much more likely that any credits generated from a trenchless program will be used in the day-to–day operations of the local government. This is because at the present time the capital programs of local governments do not have to be carbon-neutral while day-to-day operations do. When the capital works have to be neutral, then trenchless will assist local governments in lowering carbon emissions.

The Trenchless Carbon Protocol is available at www.nasttghgcalculator.com and is free for use by anybody.

Welcome to this new and exciting development in trenchless technology.

Power to the People

Michels Canada uses HDD in Vancouver project

Craig Vandaelle
Michels Canada

In the City of Glass, you don't have to look far to find shimmering beacons showcasing the heights of human accomplishment.

The glass condominium towers that dominate the skyline in Vancouver are a powerful metaphor for the city that has come to be known as "Hollywood North." As the third-largest film production centre in North America, Vancouver is a rapidly growing hub that has showcased the best and brightest the world has had to offer in the past few years, from the 2010 Winter Olympics to the Stanley Cup Finals.

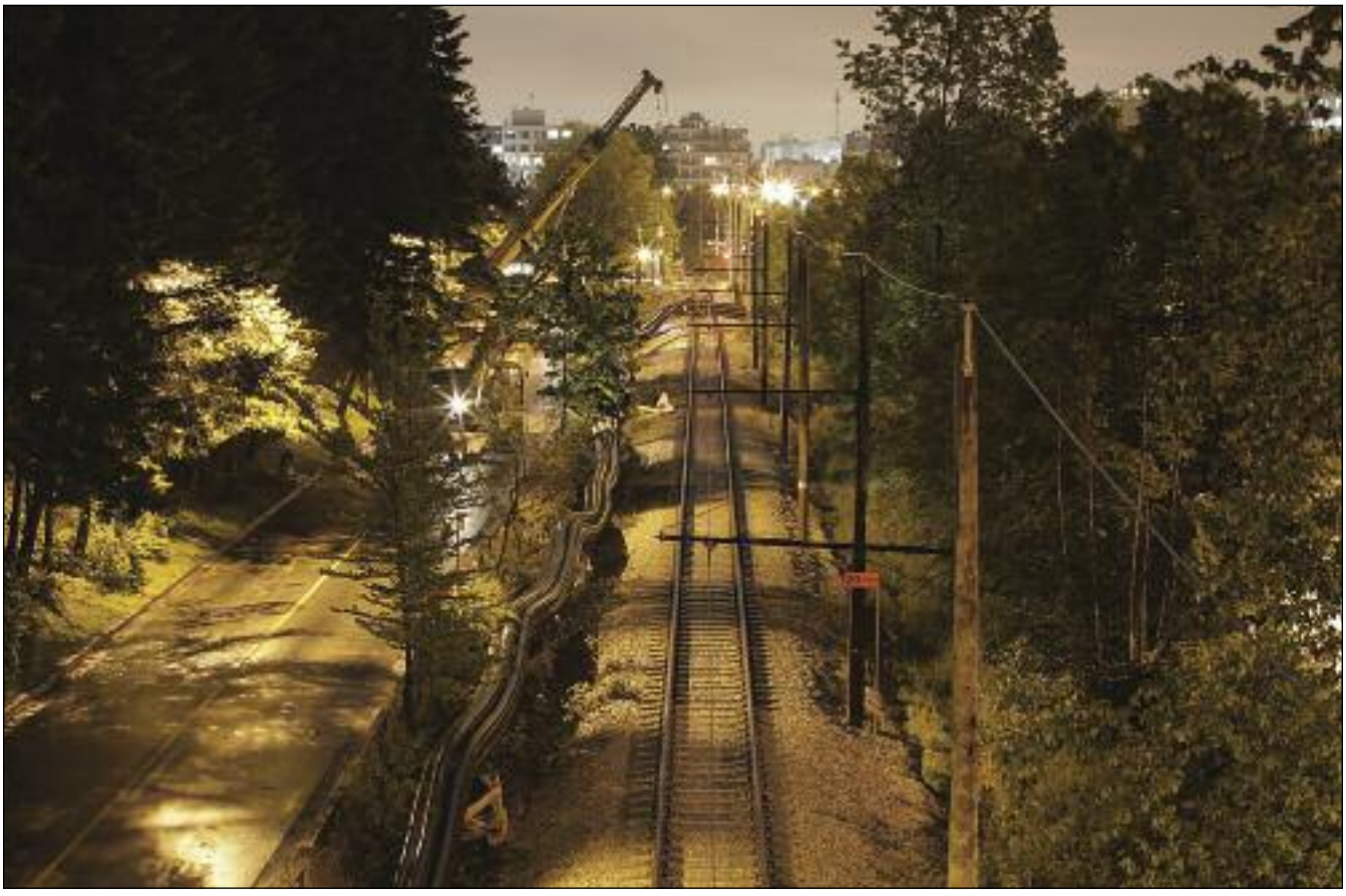
Through it all, Vancouver has been on the world stage.

And in the thick of it all was Michels Corporation.

Michels Canada, a subsidiary of the Brownsville, Wisconsin-based company, was the prime contractor on the Vancouver City Central Transmission (VCCT) Project, a complicated job that required the use of horizontal directional drilling (HDD) to install a power cable duct bank under False Creek in the heart of downtown Vancouver.

Despite (or, perhaps, because of) all the activity in downtown Vancouver, the high-voltage installation was the most significant power project to be built in Vancouver in the last 30 years and was necessary to meet demand and strengthen reliability in the city's fast-growing neighborhoods.

The project, owned by BC Hydro and engineered by Golder & Associates, consisted of nearly five miles of 230-kilovolt underground transmission circuits, including the 2,789-foot



Michels Canada was prime contractor in the Vancouver City Central Transmission Project for BC Hydro

HDD crossing.

The 44-inch-diameter crossing housed a duct bank consisting of seven 10-inch HDPE ducts, five four-inch grout pipes and one five-inch grout pipe. Michels was responsible for the supply and assembly of the ducts and grout pipes, which ultimately weighed 342,000 pounds.

Additionally, Michels grouted the annular space between the borehole walls and the bundle, and constructed a transition on either end of the crossing from an HDPE to a PVC duct system, which then was terminated in cable vaults.

All told, it was one of the most challenging pipe pulls achieved by Michels and the biggest duct bundle grouting job ever undertaken in North America.

Additionally, because of the busy downtown site, logistics and public relations were a primary concern.

In order to mitigate noise in David Lam Park (a popular Olympic celebration site during the games), Michels used sound mats and hospital mufflers on equipment, and further simply shut down non-essential equipment whenever possible.

The exit side was located at the intersection of two narrow streets on a seven-degree hillside. The work area was small at just 130-feet-by-26-feet, and it was nearly within arm's reach of adjacent apartment buildings.

Michels crews found themselves on a first-name basis with the area residents and often carried groceries, delivered packages, and stopped operations in order to assist residents.

This type of helping attitude resulted in kudos from Elsie Roy Elementary School (which sat less than 500 feet from the project site) and the City of Vancouver fire and police departments.

In fact, City of Vancouver Assistant Fire Chief Wade Pierlot said the project was "(The) best managed, most organized project that has ever been done in Vancouver."

One of the project's major milestones was the move of the 342,000-pound product bundle from the pipe make-up location on the Heritage Railway Corridor through nearly a mile of city streets to the pullback location. During this move and subsequent pullback, 14 city blocks in the downtown area were closed or partially closed to traffic.

Karl Casselman, a reporter and camera operator for Global News, remarked: "You just don't see a kilometer of pipe going by your living room window every day. That's reality TV. This is amazing."

British Columbia Minister of Energy Richard Coleman was invited to visit the project site during the pullback stage, which was completed on May 31 and drew rave reviews from Golder & Associates, the site project engineer.

"Michels did not just set the bar high," said engineer Adrian Hansen, "they broke the bar and threw it over the high-rise buildings of Vancouver."

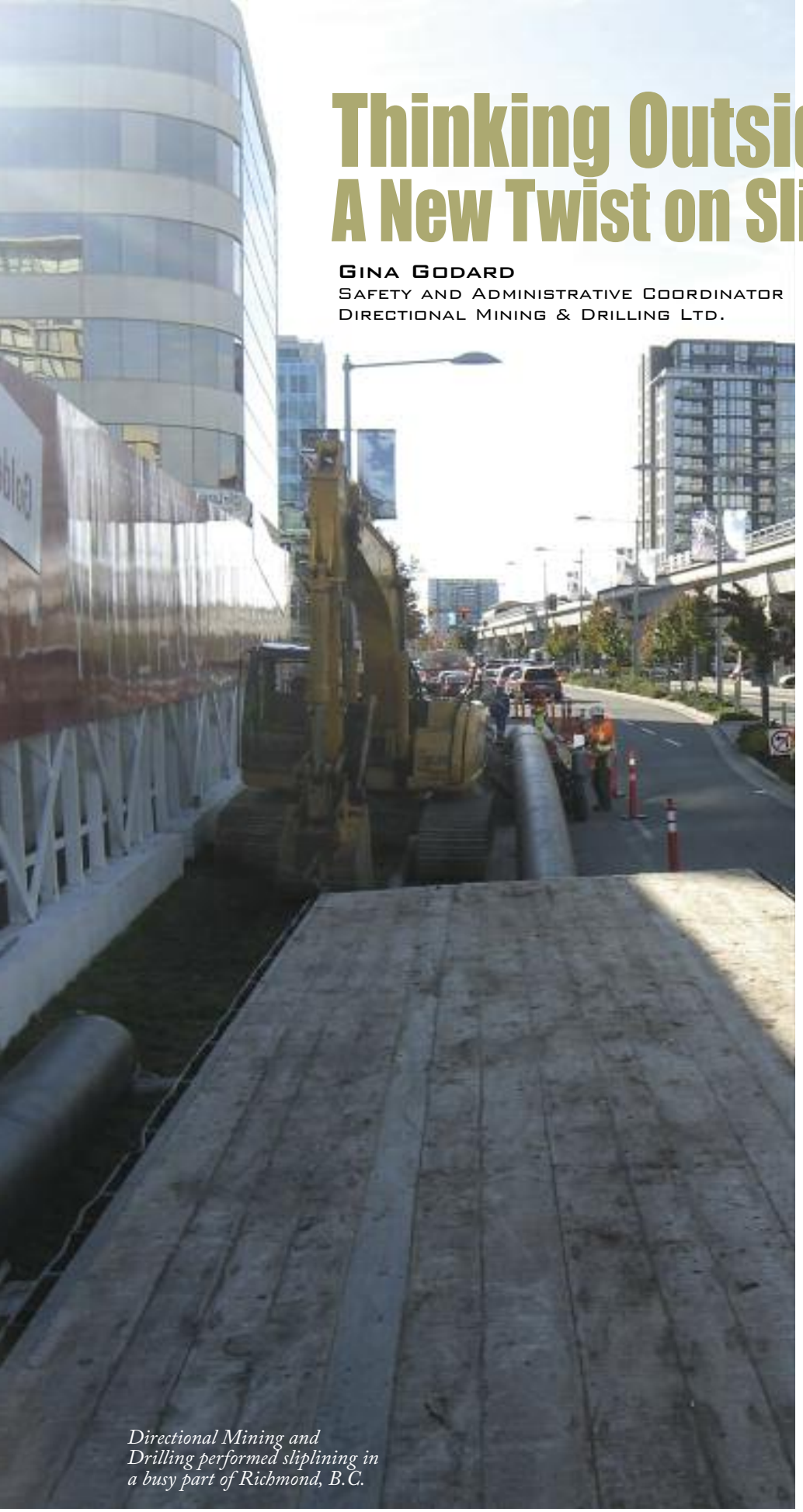
BC Hydro was also very pleased with Michels' work, which was performed by a diverse team spanning across Michels Canada, Michels Pipeline Construction, Michels Directional Crossings, Michels Power, Michels Tunneling, Michels Environmental Resource Group and Pilchuck Contractors (a Seattle-based subsidiary of Michels).

"Michels exhibited the strong safety culture that BC Hydro looks for in a contractor," said BC Hydro Senior Project Manager Marcel Reghelini. "(Our) ability to deliver such a complex and disruptive project was made easier by Michels' commitment to support BC Hydro's public communications and consultative efforts.

"(We) received ... a number of compliments about ... the helpfulness of Michels' staff during the challenging times. This is an incredible achievement considering the scope of the job and the neighborhoods in which it was carried out."

Thinking Outside the Box: A New Twist on Sliplining

Gina Godard
Safety and Administrative Coordinator
Directional Mining & Drilling Ltd.



Directional Mining and Drilling performed sliplining in a busy part of Richmond, B.C.

(With thanks to Anthony Fu, Project Engineer for the City of Richmond, for his input and clarification of details in this article.)

When aging infrastructure such as water mains and sewers in a downtown core need replacing, the municipalities are faced with one big problem: how to complete the works with as little disruption to the public as possible.

This was the situation faced by the City of Richmond recently. Almost one kilometre of 40-year-old concrete-lined steel water main had been decommissioned in 2009, and a new line installed. However, in order to ensure water service was never interrupted to this busy corridor, the City proactively decided that a secondary line would be needed for whenever repairs or maintenance were done on the main line.

The problem the City faced was this: The line runs down one of their busiest roads and crosses two of their main intersections. Richmond Centre Mall, the Sky Train station, the bus hub and City Hall are all positioned along this corridor.

In addition, due to funding guidelines, works had to be underway immediately and would be taking place during municipal elections and the Christmas shopping season. Full open-cut installation was out of the question, and installation by traditional horizontal directional drilling was also not an option due to the labyrinth of existing utilities. Therefore, the City chose to

utilize the existing 30-inch line and revitalize it by installing a new 22-inch line through it. It was decided that sliplining would be the best possible solution to this problem.

The project was tendered with the installation being proposed to be completed in three sections. Lane closures of up to a full city block would be needed at the entry point with a small closure at exit. Entry and exit pits would be dug, a section of the existing line cut and removed, and the new 22-inch DR11 HDPE would be fused and slipped in. While not as disruptive as open-cut, the congestion that would have resulted and the length of time needed to complete the three sections by traditional sliplining still would have resulted in considerable inconvenience to the public.

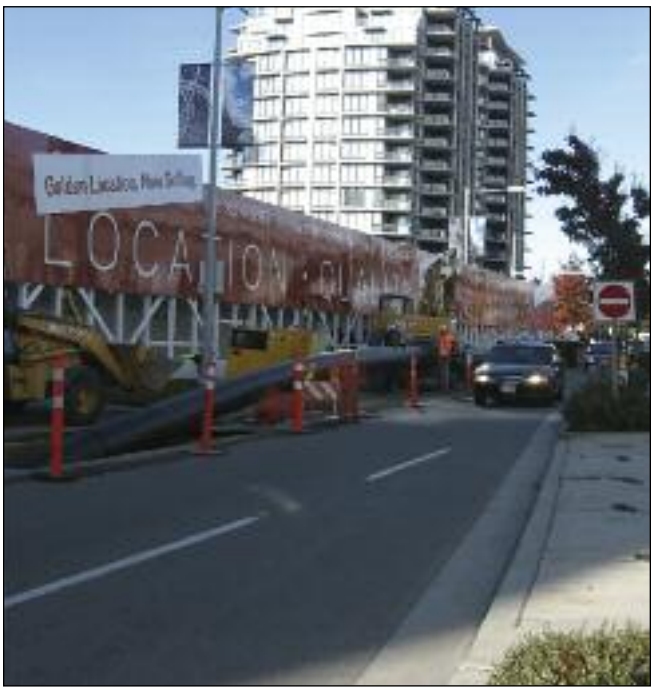
The City of Richmond awarded the project to Directional Mining & Drilling Ltd. (DM&D). Having done hundreds of projects in highly congested urban settings over the years, DM&D was proficient in handling these very sorts of situations. Complex or problematic projects offered an opportunity to explore innovative ways to utilize HDD technology.

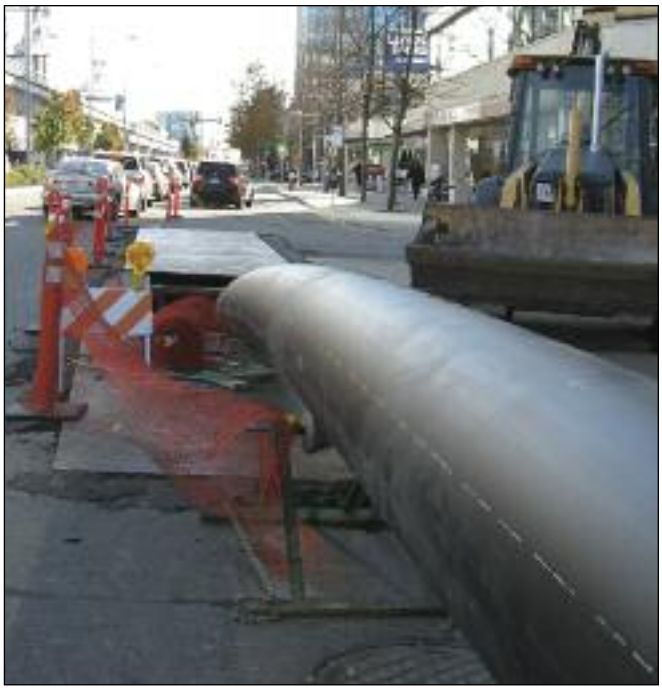
After project award, a closer look at the area resulted in Jack Maloney, owner of DM&D, coming up with an alternative plan. While there was no way around the lane closures for the tie-ins and hydrant installations, instead of doing the line in three sections, why not treat it as a drilling job and complete it in one shot?

The methodology proposed to the City was as follows: set up a drill in the park located across from the start of the sliplining section; push drill rods down through the existing line to the end and pullback with a reamer attached to "proof" the line; push rods back to exit, hook up to the new pipe and pull it in. By completing the sliplining works this way, the only road closure required for the initial installation would be a 90-metre section of the curb lane at the exit point where the pipe would be staged and fused on the fly, and briefly a small pit at entry to verify the steering head entering the line.

Helping to make option even more attractive was the exit point was located outside the heavy congestion zone and public impact would be significantly reduced. When presented with this alternative, the City of Richmond agreed to proceed with the new methodology.

In preparation for the actual sliplining, the existing line





Despite complications, sliplining was completed in only a few days and with minimal impact on environment

needed to be cut into at the entry and exit points. While the exit point was quickly completed, the entry point proved not so easy. Anyone in the construction industry knows that what is shown on a drawing and what is actually installed underground can be two very different scenarios. The entry pit was located in the dedicated left turn lane at a major intersection, and upon excavation it was found that not only was the line deeper than anticipated, but when installed a thrust block of mammoth proportions had been poured. What should have been a small one-metre-deep pit to cut open the existing concrete steel lined pipe turned into two-metres-plus of sheet-piled excavation that required the closure of the turn lane and the fast lane. Jack hammers were unable to make a dent in the thrust block and a concrete breaker needed to be brought in to complete the work.

Once removed and the existing pipe exposed and opened up, the excavation was reduced to a more manageable size and preparations for mobilization of the drilling equipment could begin.

For the job, DM&D brought in its 260,000-pound Tulsa Rig iron rig with 30-foot rods. An area in the park 11 metres wide by 18 metres long was prepared for the set-up. Rig mats were used first as ramps from the road, and down the steps to prevent any damage to the sidewalks and brick work, then placed onsite to help minimize disturbance to the grass. The drill, control house, rod trailer and excavator were then moved in.

On October 29, 2011, the "drilling" begins. From the rig set-up to the entry of the existing line is a distance of 27 metres. In that area, there are the park drains, a Telus duct bank, street lighting, a storm line, a gas main and a water main. DM&D needed an entry angle of 15 degrees in order to get underneath all these and just 8.5 metres to come back up to the elevation of the existing pipe. A customized steering shoe was used to accomplish this quick down-and-up. On October 30, with all utilities safely cleared and the steering head in the existing line, proofing of line was ready to start.

DM&D had scheduled four days for the proofing of the line. The rods were to be pushed down to exit and a 26-inch reamer would be attached and pulled back to rig side. The first 77 rods went down smoothly and took less than five minutes a rod.

Approximately two-thirds of the way through, however, an obstruction was encountered. There were no valves in the area and the drawings didn't show anything that might shed light onto what it could be. When equipment was moved into position to excavate down to determine the problem, another example of "drawings-versus-reality" was found: We discovered a section of the line had been cut out and removed, with the ends being capped.

Drill site of Directional Mining and Drilling project in Richmond

Further excavation was required to find out where the line began again. It was determined that the line had been removed so other utilities could cross and it had never been noted on any as-builds. The capped ends had to be opened up and the steering head monitored as it was pushed through the open section and back into the existing line. Once past this section, DM&D pushed the rods through to exit, installed the reamer and pulled back to rig side to complete the proofing of the line. The new 22-inch pipe would come through with no problems.

On November 3, with the reamer removed and the rods pushed back to exit, fusing and pullback of the new 22-inch pipe began. The staging area had no extra room for storage, so the pipe was brought in a load at a time and left on the trailer. One at a time, the sticks of pipe where moved from the trailer and placed into the Connectra fusing machine. Each stick was 18 metres and with staging, prepping, fusing and cool times, 12 to 14 sticks a day were installed.

It only took 4.5 days to complete the 950-metre section with disruptions only happening at a single location and away from the most highly congested areas. By thinking outside the box, and utilizing HDD equipment to perform sliplining works, the City of Richmond was able to complete much-needed infrastructure replacement in a sustainable manner while minimizing financial costs and negative impacts to the public and environment.

Pipe Bursting Method: Addressing Client Concerns

Denis Dias
PW Trenchless

In this article we would like to focus on a recently concluded project where the client was initially inclined to opt for open cut method due to various concerns with pipe bursting operations.

The Clayton area, located east of Surrey, is developing at a rapid pace and to cope with the new development, the existing utilities are being upgraded to meet the demand. P.W. Trenchless was approached by the project consultants to provide a quote to upgrade an existing sewer by pipe bursting. The location was along 72nd Avenue between 192nd Avenue and 194th Avenue. The total length of sewer main that required upgrade was approximately 440 metres, with 33 service connections and a depth that ranged from 13 feet to 16 feet.

Although P. W. Trenchless Construction was shortlisted for these works (mostly due to major cost benefits), we were requested to respond to the client's various concerns regarding pipe bursting operations. The biggest concerns were the shallow grades of existing pipe being less than 0.5% and the close proximity of the existing 675-millimetre-diameter concrete storm pipe.

The client's inclination towards open-cut was somewhat reasonable as it was a bit of a challenge to have this sewer main pipe burst. Concerns raised by the client during pre-award stage were:

1. Noting the number and the proximity of service connections on this main, pipe bursting offers no advantage (cost / duration).
2. Maintaining these services without interruption and without breaking the noise bylaw would be a challenge.
3. 300mm HDPE pipe would be required for pipe bursting to have the equivalent internal diameter of 250mm.
4. The proximity of the 675mm concrete storm pipe may be affected by pipe bursting.
5. Achieving the required grade within an acceptable tolerance may be an issue.

David O'Sullivan, owner of P.W. Trenchless and well experienced with dealing with the above challenges, required little effort to convince the client to agree with pipe bursting

method. The reasoning was based as follows:

1. Minimum foot print was required to excavate the laterals for re-hookup to the new main and was surely an advantage regarding cost.
2. Unlike open excavation, pipe bursting methods do not require shutdown of services nor they have to be bypass pumped. Also, trenchless methods use minimal equipment contrary to the heavy equipment and trucking that would be necessary for open-cut. Hence the question of the noise bylaw does not arise
3. 250mm HDPE pipe has an internal ID of 239mm which was accepted in the design. To upsize 8-inch to 12-inch was not a problem.
4. The 675 storm was one metre away from sewer main and the zone of influence for this upsize was less than 500mm at the ratio of 1:10 diameter of pipe upsize. Also, PWT would use static burst equipment rather than the pneumatic method to avoid vibrations on the existing storm pipe.
5. The existing pipe was installed only a few years back on firm ground in a new trench with import backfill. Based on his knowledge and experience, David was confident that there would be no issues. Even though the sewer pipe had grade less than 0.5%, he could assure the client that the grade would be maintained within tolerance, and would prove itself.

The Project Engineers confirmed that cost was a major factor in deciding method of construction. We later found that the cost of pipe bursting was considerably lower, almost 35% lower.

The major factors that influenced higher costs for open-cut were the depth of the sewer main, the ground water, the close proximity to existing utilities running alongside the sewer main and the existing utilities crossing the trench line.

P. W. Trenchless was awarded this project and completed it successfully without compromising the existing grades of sewer main or damaging the existing storm main.

It is important to point out that the major contribution of this trenchless method that went unnoticed was the reduction in carbon footprint and (as a result) reduced contribution to global warming.

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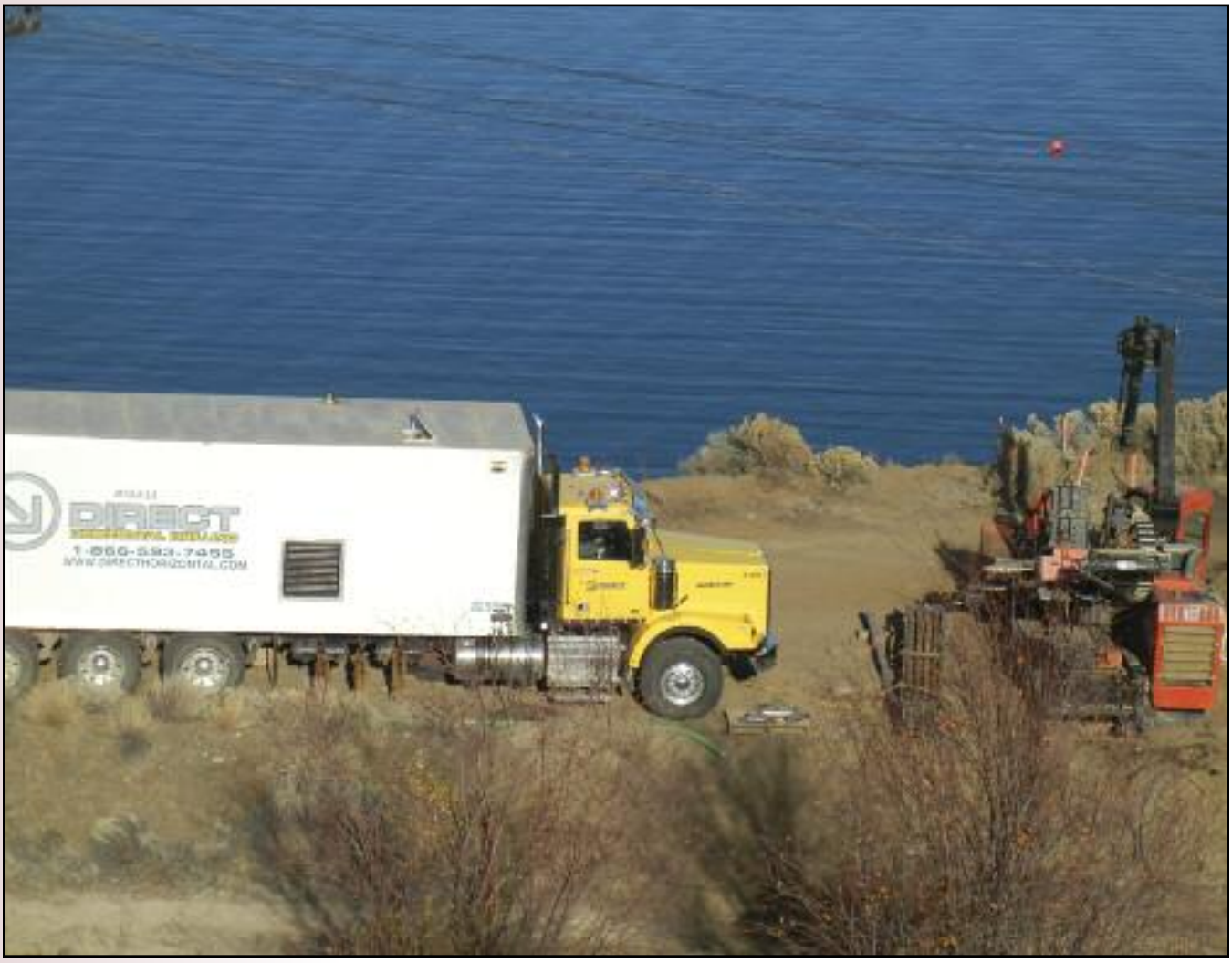
Trenchless Shore Project Near Kamloops

Justin Hedemann
Business Development,
Direct Horizontal Drilling

Located within central British Columbia and situated at the confluence of the two branches of the Thompson River, Kamloops boasts a population of roughly 90,000. Aboriginal for "meeting of the waters" and rightly dubbed "Hub City," it lies on the Trans-Canada Highway and at the junction of several rail lines, waterways and area roads, making it a prime central locale for a wide range of enterprise.

Once covered by water, the geology of the Kamloops region is a patchwork of volcanic and sedimentary rocks, forested areas, grassland and secret ponds proving conducive to many industries. While agriculture, forestry and manufacturing all contribute to the economic strength of the region, it is the strong history of mineral exploration and mining (spanning well over 100 years) that has proven to be a $6-billion industry for both the province and its interior communities.

Just 10 kilometres west of Kamloops, the New Afton mine



Direct Horizontal Drilling on site to construct twin HDPE shore approaches

construction project initiated development in 1999 when New Gold Inc. acquired an option on the historical Afton mine property and completed staking of surrounding areas. While the original copper mine operated for a period of 20 years, doors were closed when copper ore could no longer be economically mined by open-pit methods. Through the development of an underground block cave mine and flotation concentrator, the New Afton project (full production to commence in the second half of 2012) is anticipating a per annum production of 75 million pounds of copper, 214,000 ounces of silver and 85,000 ounces of gold over a 12-year mine life.

Divers help complete a crucial part of the New Afton trenchless work

To meet the requirements of new construction and developmental upgrades that the mine is undergoing, New Gold Inc. in partnership with Kamloops Augering contracted Direct Horizontal Drilling in October of 2011 to construct two twin 18-inch HDPE shore approaches for water intake.

Founded in 2000, Direct Horizontal Drilling is an industry leader with a reputation for success in some of the toughest

drilling environments in the world. The company provides complete services and expert solutions whenever HDD and river crossings are necessary and as such, the requirements of the New Afton mine project were easily met.

Because of the steep slopes and embankments surrounding the worksite, Direct Horizontal Drilling mobilized a tracked 80,00-lb. drilling rig to better accommodate the tight set-up and restricted work area. The bore path was designed with a 26-degree entry angle with a 50-metre radius curvature until exit point into the lake bed.

While a seven-inch Tri-Hawk pilot hole was initially drilled in combination with the Paratrack II navigation system to ensure maximum tracking accuracy, the exit point could not be confirmed by divers due to silt formation and the nature of the lake bed disturbance caused by the exiting of the drill bit. To remedy this, high-pressure air was then injected from the rig through to the exit point so as to assist the divers in location.

With visual confirmation of the exit point 18 meters below water surface and right on target, divers were then employed to break down the seven-inch BHA using hydraulic power tongs with extended hoses to reach the lake floor where typical surface exit side operations take place. Utilizing buoyancy bags, the 24-inch reamer was then lowered to the connection point and, through radio communication with the driller, connection was made and torqued using the hydraulic power tongs.

Eighteen-inch HDPE was then lowered to the connection point and connected to the 24-inch reamer; using this formation, Direct was then able to carry out a simultaneous ream and pipe pull install. Drilling and reaming times were significantly shortened because of the soft lake bed formations, with the actual drilling and reaming portion taking approximately 12 hours per drill in total.

Experience tells us each project is unique and comes with its own challenges, and this project was no exception. A known layer of gravel was encountered from zero to 25 metres, causing some initial concern for the 24-inch pull ream as the formation did not allow for a seamless pull-back. To prevent tool failures and/or stuck pipe, Direct tunneled a small excavation to extend the entry pit, allowing for the reamer and pipe to exit freely into the rig.

Total duration of the project was 12 days, with both HDPE installs completed safely, within the scheduled timeline and within budget.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After the Washout:
KAB installs new culvert at Chetwynd railyard

Harry Dickinson, AScT.
Kamloops Augering & Boring Ltd.

The Peace River area of northern British Columbia was hit with a once-in-40-years rainfall event last summer which created an abnormally high volume of runoff. This deluge caused quite a bit of havoc on existing culverts not only for Canadian National Railway (CNR) but for the province's Ministry of Transportation & Infrastructure as well. The railway and highways suffered numerous washouts. Damage to CNR systems included a major washout within its railyard in Chetwynd.

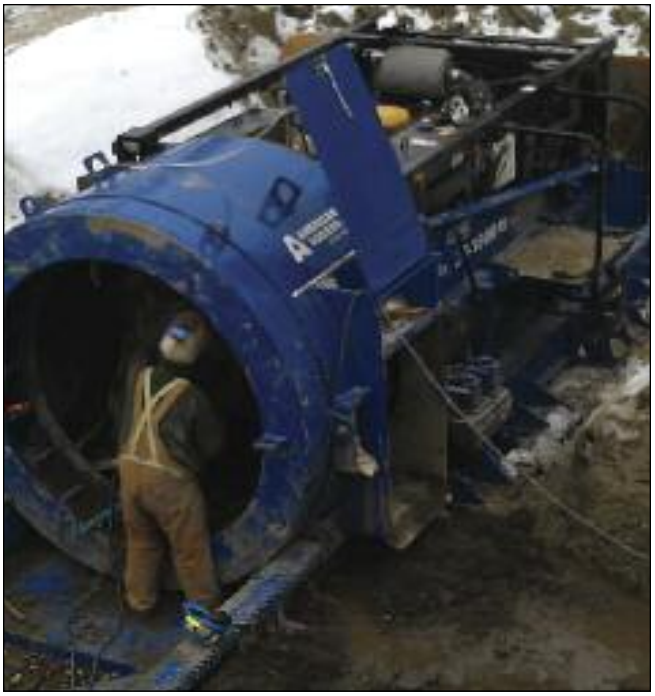
Kamloops Augering & Boring (KAB) was successful in bidding for the contract to install a new 220-foot-long, 72-inch-wide culvert where the washout had taken place.

KAB had opted for doing a conventional horizontal auger-bore installation due to the expected clay and silt material. A new 84/96-1800 American Augers bore machine was chosen to do the job.

To expedite installation and minimize down time, Permalok Pipe was the preferred culvert material. This would allow for quick pipe changes and minimize welding time. However, problems in the pipe's availability caused delays from time of order to job site delivery. The project was not started until late November, about five months after the storm.

The installation of the steel casing was going as planned until we encountered a change in ground conditions at approximately the 100-to-120-foot mark. The material had changed from good firm clay to completely saturated gravel and sand.

The crossing now had two major obstacles to overcome. The change in ground conditions significantly increased our jacking loads and was causing failure with our reaction wall. Secondly, ground loss was a significant and real risk.



An 84/96-1800 American Augers bore machine used in culvert installation

Due to the loose unconsolidated ground conditions, the auger boring methodology gave way to pipe ramming. The remaining 100 feet was installed with our TT Technologies Apollo Hammer. This resolved our backstop and ground condition problems. With diligent monitoring of our grade by cleaning out the casing regularly, we were able to install the casing as per design.

After the Burst:
Reconnecting Laterals with Improved Inserta Tees

Preston Creelman, PEng
Specification Engineer, Royal Municipal Solutions

Inserta Tees now come with specially contoured stub botttoms

For many years now, Inserta Tees have been used as one method for connecting service laterals to sewer lines. They have been the preferred choice for reconnecting laterals to mainlines installed by pipe bursting.

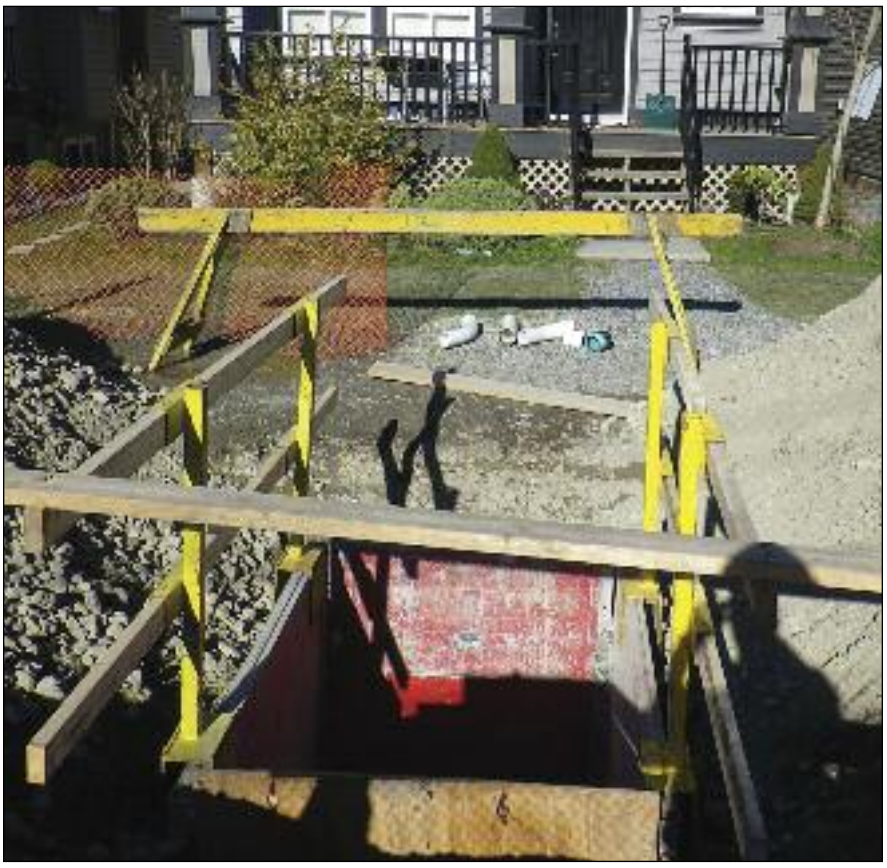
As the mainline pipe does not have to be cut through and the Inserta Tees are small, they work well in the trenchless process. Only a small "box" is necessary as a service pit for an installer to safely work within. And as they are so quick to install, often they have allowed services to be reconnected quickly, providing same-day sewer replacement without interruption of service. However, they have had one drawback: Stubs are sometimes over-inserted.

Over-insertion of the lateral stub interferes with full flow of the mainline; therefore, some owners still view Inserta Tees with skepticism. Their concerns have now been addressed.

New-style Inserta Tees have specially contoured stub bottoms which prevent over-insertion. As these new stubs now afford almost 360 degrees of contact around the hole in the mainline, the lateral stub cannot be pushed too far into the boot. Therefore, it now will not protrude excessively into the flow area of the new mainline pipe. The stub stops with just the chamber visible below the bottom of the boot.

The manufacturer has had numerous individual stub mandrels machined so that the stub bottom is curved or contoured to follow evenly around the outside of the mainline

Inserta Tees now come with specially contoured stub botttoms



pipe. They denote these new parts as Fat Boy, and products are available to fit many pipe types – SDR 35, KorFlo, Ultra Rib, Concrete, HDPE, etc.

For many years, either a set of "dimples," a plastic ring/bead of weld or just a line was all that prevented a stub from going too far down inside the boot and into the flow area of the mainline pipe. The dimples provided only two points of contact; if the stub was not pushed in evenly, then only one point contacted the outer wall first. With just slightly additional more force than necessary, the stub kept on going, only to be discovered when the video inspection was done to allow for final acceptance. The ring/bead style was designed for the them to push into the boot until the ring/bead (or line) was even with the top of the boot. As the boot is flexible rubber, again the stub could easily slide down too far into the

boot and stick out into the mainline.

These new-style Inserta Tees with the "saddle-shaped" lip formed at the stub bottom contours to the outside diameter of the mainline pipe. This complete, contoured lip creates a stop at the bottom of the boot which prevents the stub from going too far. Even if the stub does not enter the boot evenly, it will not go in too far. As the first point of the lip reaches the bottom, it checks up and "waits" for the rest, thereby straightening the stub in to boot.

Because this new contoured, full-contact lip creates such a strong stop, installation can be done quicker. The installer does not have to stop and check, stop and check; he/she just pushes the stub into refusal, and affixes the clamp. Both four- and six-inch Inserta Tees now have "contoured" stubs which accommodate virtually all lateral connections.

"With these contoured bottoms," says Phil Russo (Project Manager, PW Trenchless), "my guys can install them quicker. You can see they fit around the pipe without the boot. We do not have to worry about going in too far."

Owners can now specify Inserta Tees for the lateral re-connection mechanism with the assurance that potential full flows in the newly installed mainline will not be compromised.

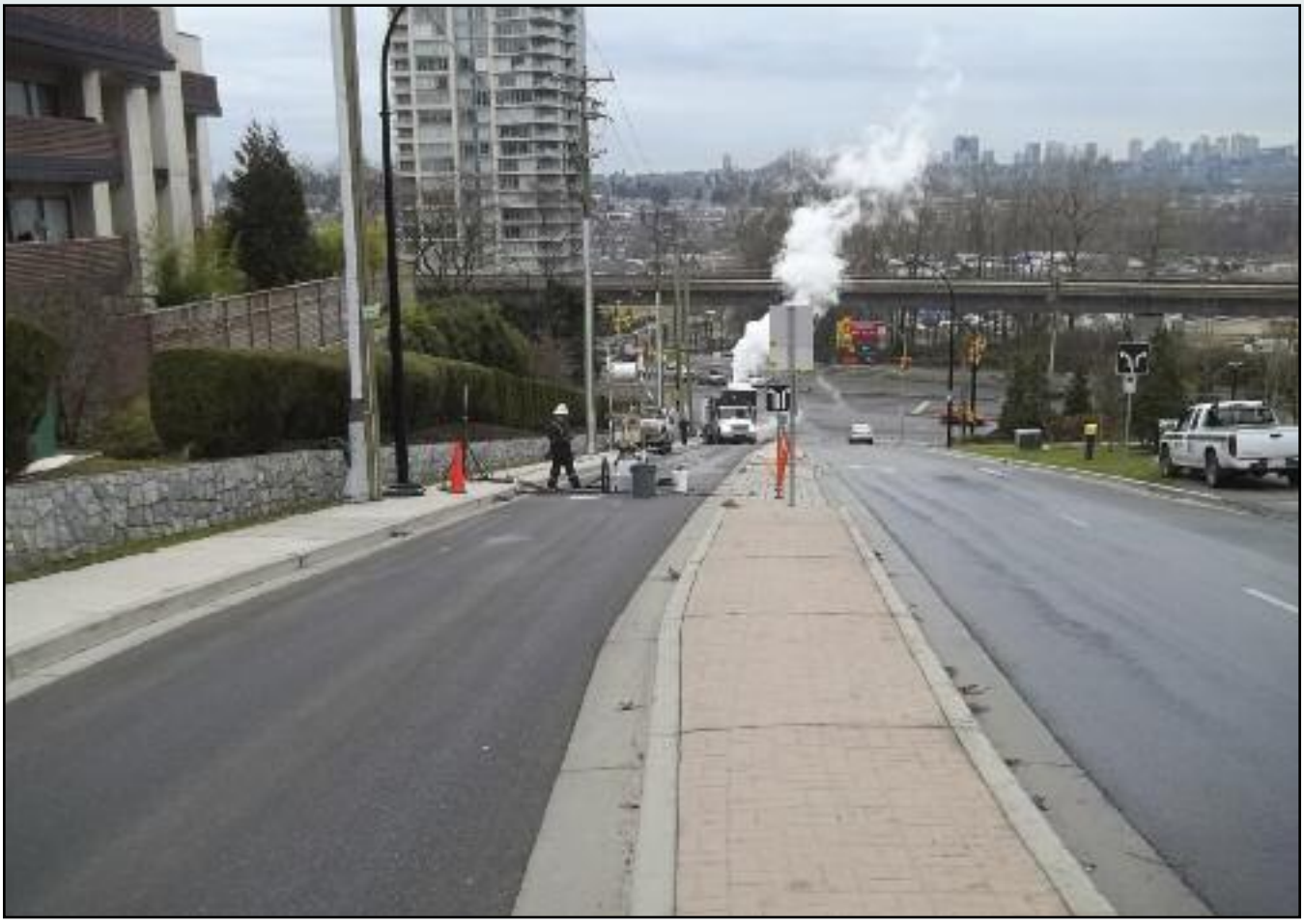
CIPP Success in Greater Vancouver

James Key
DFI Infrastructure Rehabilitation

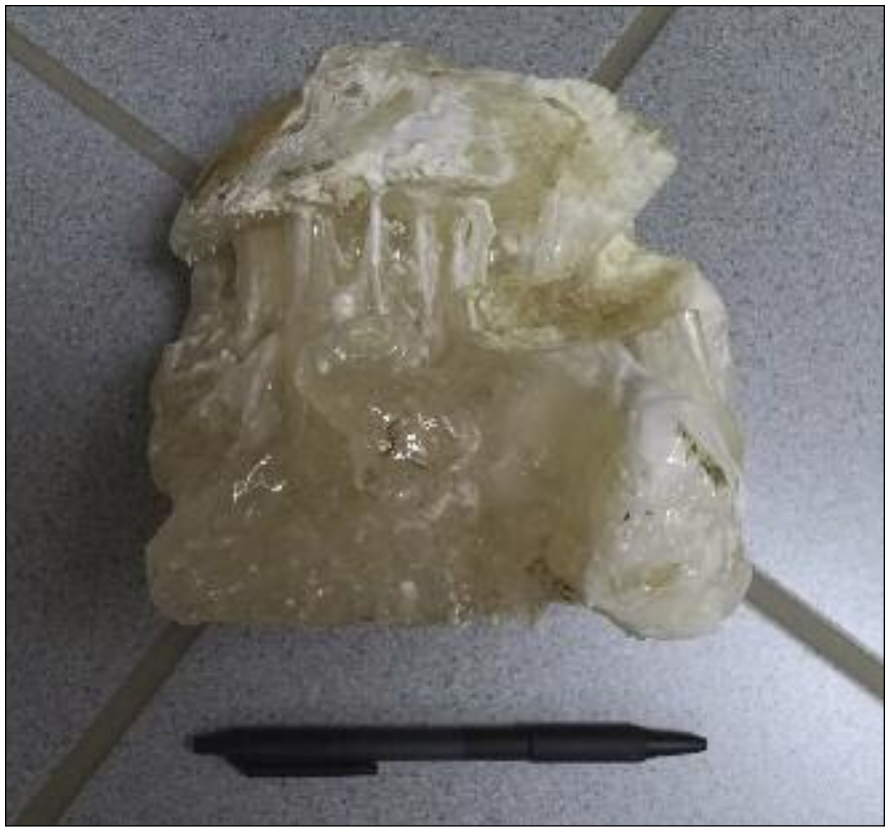
In 2011, DFI undertook three projects within the Greater Vancouver area utilizing an epoxy resin system: 900 metres of 200- to 375-millimetre gravity waste and storm water pipe in New Westminster, 1,600 metres of 150- to 300-millimetre gravity waste and storm water pipe in Burnaby, and 2,100 metres of 200-millimetre waste water pipe in North Vancouver.

All projects were prepared with a Vacall combination unit and Aries camera system, installed with a 3.5-million-BTU boiler, reinstated using Prokassro robotic equipment, and sealed with an Aries system. Wet-out was completed by a computer-controlled mobile unit within 15 kilometres of all construction sites, the day of each shot's scheduled installation.

The City of North Vancouver: The work in North Vancouver was in the lower Lonsdale area on Second Street from St. Georges Avenue to St. Davids Avenue, Fifth and Sixth Streets from Lonsdale Avenue to St Davids Avenue.



DFI completed three projects in the Greater Vancouver area in 2011 using epoxy resin system



Resin slug removed from service

The 2,100 metres was installed in 22 shots during July and August; 152 service lateral connections were sealed.

The City of New Westminster: The work in New Westminster was in the Sapperton area bound by McBride Boulevard to the south, 10th Avenue to the east, Richmond Street to the north, and Carroll Street to the west. The CIPP was installed in 13 shots, 12 of which were completed in August and September and one in October. Fifty-eight service lateral connections were sealed. This contract was administrated by Paragon Engineering and had civil work that was completed by P.W. Trenchless.

The City of Burnaby: The work in Burnaby consisted of lines in Burnaby Heights, Willingdon Heights, Buckingham Heights, Suncrest, Garden Village, Brentwood, Sullivan Heights and Burquitlam. The 1,600

metres of pipe were installed in 15 shots during October, November and December; 102 service lateral connections were sealed. We were assisted by P.W. Trenchless in the open-cut replacement of one line.

The resin used in all projects was a two-part epoxy in the three-to-one ratio. A two-part epoxy system allows the resin to be 100 percent solids, whereas polyester resin can contain as much as 30 percent solvent. Styrene, the most commonly used solvent, is a volatile organic compound and has been classified as a mutagen by the EPA. Given that in British Columbia the Environmental Management ACT regulates toxin release into surface waters, the lower odor emissions and higher laboratory testing results made the epoxy resin seem a good choice.

Out in the field, however, we began to notice performance issues that would prove to be troublesome. The temperature sensitivity became so acute that an ambient temperature change of just a few degrees could alter the viscosity enough to shorten the working life by hours. The cure schedule would only be satisfactory with total isolation; the time required to exotherm would not allow for non-compliance commonly experienced in CIPP. Some of the laterals could build 40 feet of head prior to reaching the bypass point.

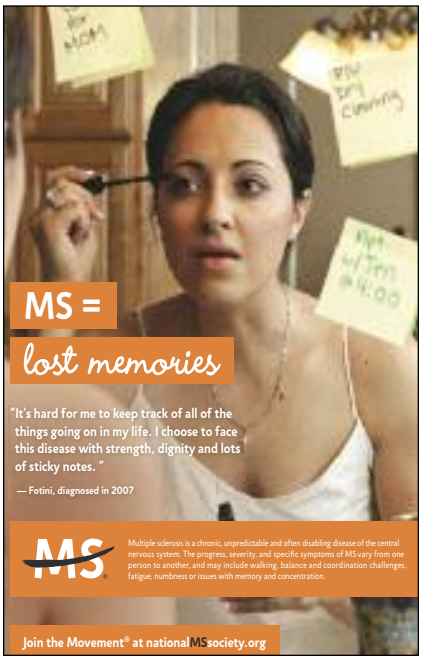
Any deviation in pressure or schedule would result in massive wash-out and migration. It was common to discover 100 percent coverage within service connections. Attempts to contain the wash with pre-liner resulted in soft dimples with plastic backing. Substituting tube could have catastrophic results.

We underwent two material changes – one without issue, and one that resulted in pressure loss with the introduction of heat. We found that test results, although above ASTM standards, were not coming back at claimed levels.

We still received complaints about the odor.

Even though the benefits to using epoxy did not materialize for these circumstances, a good product was making it into the ground.

Throughout the projects, we worked closely with our manufacturers to correct each difficulty and continue installing. At project's end, all the lines except one had been installed with minimal repair work. We came away with a greater understanding of matching product with conditions and can better advise our clients on where to use the products we offer.



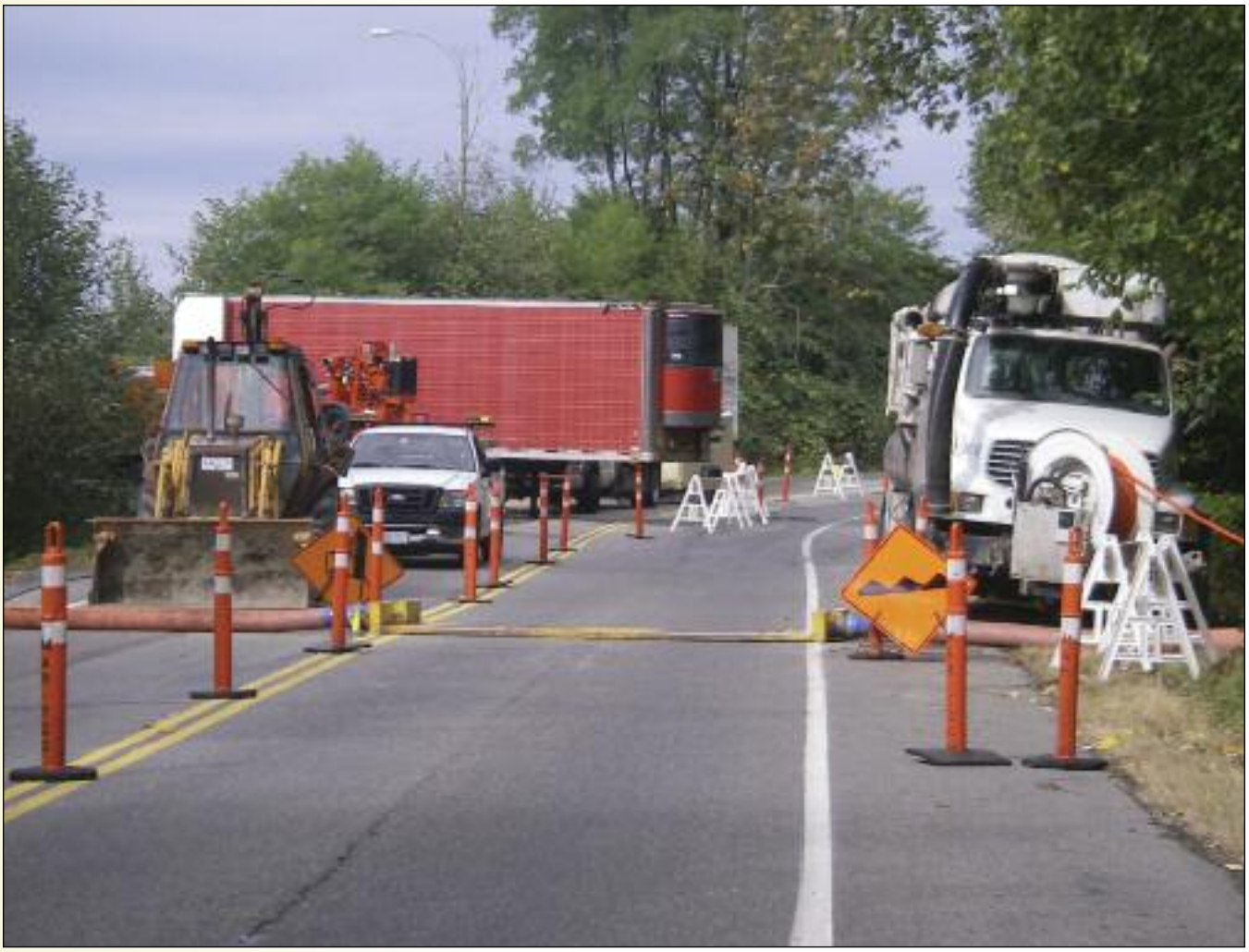
CIPP Installed in Sensitive Area

Bob Taylor
Mar-Tech Underground Services Ltd.

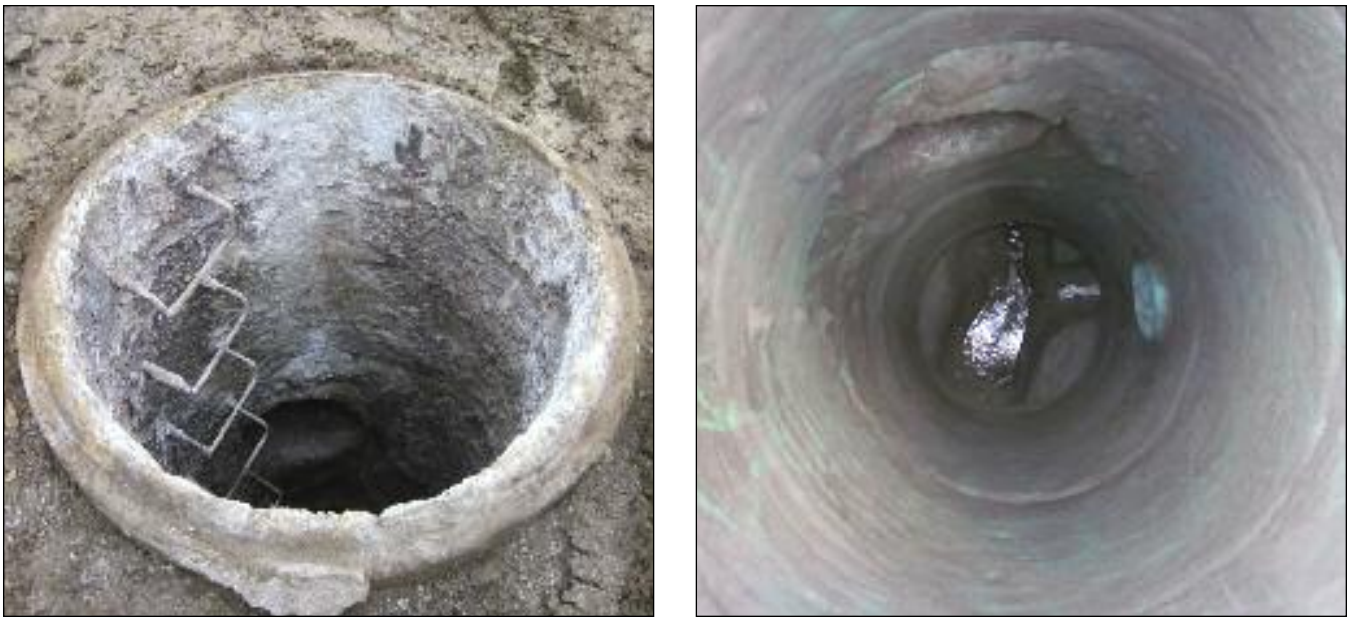
In July of 2011 Mar-Tech was awarded a contract by the City of Abbotsford to install about 200 metres of 525-millimetre-diameter CIPP through an environmentally sensitive easement area which bordered a large park and a creek.

Due to the local requirements and the sensitive area, a resin without styrene produced by Interplastic Corporation was selected for the job. The access to the downstream manholes was through a trail where exposed tree roots and plants had to be protected from equipment that was required at those locations.

The asbestos cement pipe was in very poor condition and located near the outlet of a pumping station. Extreme care



Abbotsford CIPP project included bypass in busy area



Installation manhole before and after being rebuilt

had to be taken to remove the gaskets that were hanging from the joints as well as the cleaning itself.

Like the pipe, the manholes in the area were in very poor condition due to hydrogen sulfide. The worst was the upstream manhole, which was the closest to the pump station.

The next issue was the bypass that was required for this installation. The line carried approximately 170 litres per second which had to be picked up at the installation end right within five metres of the Trans-Canada Highway, then taken across Livingstone Avenue without closing the road (a City of Abbotsford requirement), then through the pathway to a discharge point back into the sewer system not far from a creek.

The setup was started at 7 a.m and by 9 p.m. the line was in place and the equipment off the road for the night.

The following two days, the cleanup was done, manhole lids grouted and the restoration of the areas around the manholes completed.

Next, the installation manhole was rebuilt using Permacast Manhole Renewal. Mar-Tech is a licensed installer for B.C., and recommended this product Abbotsford for this project. Before and after photos show quite an improvement in the manhole's condition.

The system is now in very good condition with a design life for the next 50 years. H2S will no longer be an issue for the sections that were lined with the CIPP process and the manhole that was rebuilt with MS10,000 and Conshield.

Investing in Human Capital

Wayne Nowlan,
Founder and Superintendent, Waterworks Technology School

Is trenchless technology tuned in to the current and looming skills shortages in all sectors of the construction industry? I believe all businesses involved with trenchless technology need to take some time to take a close look at their own situations regarding qualified employees now and in the immediate future.

Anyone involved in almost any part of the construction industry has some idea that there is a skills shortage problem right now and escalating to more serious problems quickly.

It's happening NOW and shortages are escalating FAST! In my role as a former municipal public works superintendent and now involved with training for municipal utilities and other specialty industries, there is never a week that goes by without calls from employers seeking "TRAINED WORKERS" for their enterprises. Often I am unable to provide resumes from my grads because they have already been hired by competing companies. These kinds of experiences are becoming routine, and I suspect the situation is widespread.

So what's the problem? It is a matter of numbers. Michael Atkinson of the Canadian Construction Association has stated that "a top priority for the construction industry in Canada continues to be labour supply, training and retention." Recent numbers from the Construction Sector Council concluded that we will need to attract 395,000 NEW workers by 2018 to replace those expected to retire in the next six years and keep pace with demand during that same period. CSC, in tracking 30 trades and occupations, says 215,000 will leave the industry just by retirements and end of life, representing 24% of all those that were employed in the industry in 2009.

Canadian Chamber of Commerce president Perrin Beatty has said the top concern of its members (420 local, regional, provincial and territorial chambers of commerce) is "the difficulty of finding the right people to do the job." Beatty called on all governments to launch an initiative that includes measures to tackle a skills shortage "crisis" in Canada.

Should we, as businesses involved in trenchless technology, be depending upon governments to fix our serious skills shortages? With 30 years of civil and mechanical infrastructure involvement and another 15 years in the training industry, I say "Absolutely not." When our businesses depend on the best trained and skilled employees, it is obvious to me that we need to get busier on this matter – FAST!

Although the construction industry and, indeed, trenchless technology companies have taken some action to alleviate the skills shortage, it is still simply not enough. This fact is borne out in the problems companies experience already trying to hire trained or skilled employees. The pool of such available workers is currently very shallow, and the depth is becoming even more shallow.

As businesses, we know all too well the importance of ensuring that we make capital investment into machinery and technology. Can we all say that we place the same importance on investing in human capital? There is still a long way to go to encourage construction and business in general to actually take the steps to invest in training and certification for current and incoming employees. When you are fortunate to have some bright young men and women in your employ, you can increase your fortune by sending them on training courses that will be sure to enhance your businesses productivity and future capabilities.

I would like to leave you with the following formulae for more thought:

Minimal Trained Employees = Minimal Quality Projects = Minimal Profit $

Excellent Trained Employees = Excellent Quality Projects = Excellent Profit $$$

IN MEMORIAM: PADDY RYAN O'TOOLE
JUNE 29, 1958 – JULY 16, 2011

NASTT extends our deepest sympathies to the family and friends of Paddy Ryan O'Toole, founder and President of PTR Communications. After a courageous battle with cancer, Paddy passed away peacefully on Saturday, July 16, 2011 with his family and trusty dog Tessa close by his side.

For Paddy, publishing was more than mere work – it was his passion and higher purpose. He took great delight and satisfaction from carefully producing magazines for many of the NASTT Chapters with the highest written and artistic quality possible.

Paddy was forever attentive to the interests of the NASTT community and was a notable proponent and friend of the trenchless technology industry. He worked relentlessly at raising the profile and helping to further the cause of numerous NASTT Chapters. Very simply, Paddy LOVED trenchless! The magazines were his "love made visible."

For those who knew him professionally and personally, Paddy was a great humanitarian with a deep love for the written word. He was a vastly talented writer, gifted musician and remarkably astute businessman. Charming, intelligent and a witty conversationalist, Paddy was always ready with a practical joke or funny play on words.

On behalf of NASTT and all the Regional Chapters, we thank Paddy for his significant contribution to the trenchless technology industry.

Mike Willmets
Executive Director, NASTT

NASTT's 2013 No-Dig Show Call for Abstracts

The Great Trenchless Gold Rush!

Submission Deadline: June 30, 2012

The North American Society for Trenchless Technology (NASTT) is now accepting abstracts for its 2013 No-Dig Show in Sacramento, California, located at the Sacramento Convention Center, March 3-7, 2013.

Prospective authors are invited to submit a 300-word abstract outlining the scope of their paper and the principal points of benefit to the trenchless industry. The abstracts must be submitted electronically via the No-Dig Show website at: www.nodigshow.com by June 30, 2012. NASTT's 2013 No-Dig Show Program Committee will review abstracts in mid-July and notify the primary authors of acceptance immediately afterward. To ensure meaningful and commercial free technical content, all papers will be peer-reviewed. Final papers will be published in the conference proceedings.

Abstracts from the following subject areas are of interest to the No-Dig Show Program Committee:

HDD
- Pipeline Inspection and Locating
- Condition Assessment
- Subsurface Utility Engineering
- I&I and Leak Detection

Cutting-Edge Advances in Pipeline and Manhole Rehabilitation
- Cured-in-Place Pipe Lining
- Sliplining
- Pipe Bursting
- Laterals Rehabilitation
- Grouting
- Lining Materials and Application Methods

New Installations
- New Concepts for Trenchless Equipment, Materials and Methods
- Horizontal Directional Drilling (HDD)
- Microtunneling
- New Applications for Boring Techniques (Auger Boring and Pipe Ramming)
- Pilot Tube Boring (Tunneling)

Trenchless Research and Development
- University and Industry Initiatives
- Education and Training

Environmental Incentives, Challenges and Sustainability
- Carbon Reduction
- Sustainable Construction Practices

Municipal Issues
- Selection Criteria for Contractors
- Development of Submittal Requirements
- Measuring Quality Assurance/ Quality Control
- Project Budgeting and Prioritization
- Selection Criteria for Materials
- Funding for "Green" Technologies
- Lessons Learned

Industry Issues
- Social Costs and Impacts
- Industry Trends, Issues and Concerns

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