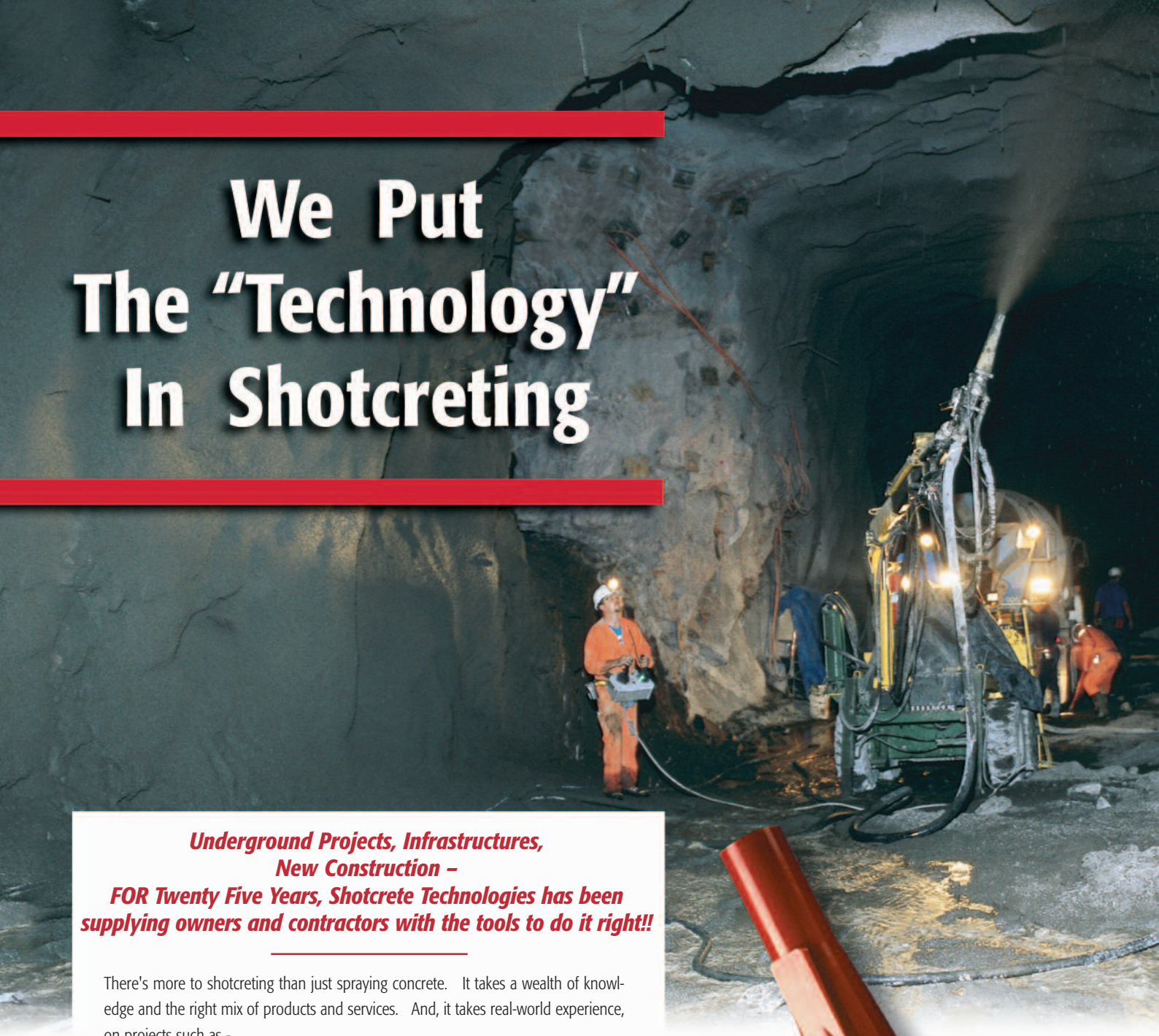
MARCH 2008

tunnels & tunneling NORTH AMERICA



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T&T Group Editor
Tris Thomas
tthomas@wilmington.co.uk

Managing Editor
Amanda Foley
afoley@wilmington.co.uk

International Office
Progressive Media Markets
2 Maidstone Road, Sidcup
Kent, DA14 5HZ, UK
Tel: +44 20 8269 7789
www.tunnelsonline.info

T&TNA Contributors
Shani Wallis
Tonia Jurbin

Designer
Natalie Kyne

Technical Illustrator
Nick Stenning

Group Ad Manager
Gary Tween
gtween@wilmington.co.uk

Production Manager
Loraine Iee

Publisher
David Wildman

North American Office
Steve Caming
488 Allard Hill Road
Conway, NH 03818
Tel: +1 603 447 1187
tunneling@roadrunner.com

Front cover
An Akkerman EPBM completes the Hollyhills Drain project for the Los Angeles Department of Public Works. General contractor Mladen Buntich Construction and tunneling contractor Pacific Boring used the EPBM to jack 84" i.d. reinforced concrete pipe in excess of 1,000ft in one drive.

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The need for fair contracts

Bill Edgerton, PE, Jacobs Associates

Why don't all public owners prepare contracts that offer equitable terms - contracts that are fair? Many owners respond to this question by stating that they have developed their contracts over many years to "prevent contractors from taking advantage of us."

It is easy to see from such statements that unfair contract language is reactive; it's not based on a conscious decision to create unfair (i.e. one-sided) contracts. However, despite the lack of intention, that is the result. Unfair contracts may include inequitable terms and conditions, unreasonable notice provisions, unclear guidelines for pricing changes and resolving disputes, or all of the above.

The terms of most public contracts are not negotiable, and bidders are asked to "price it the way you see it." Given this landscape, there are three really good reasons for owners to make their standard contract language fair to all parties:

First, fair contracts result in more accurate and more competitive bids. Right now, the tunnel construction industry is a seller's market, and an owner attracting even two bidders will benefit from even this low level of competition. Some contracts in recent years have been awarded to a single bidder. The owners I talk to understand that unfair provisions increase the bid cost, but many are willing to pay such a premium to obtain the certainty of a firm price. The problem with this approach, as described below, is that prices based on unfair contract provisions are rarely firm.

Second, fair contracts reduce the likelihood of certain bidder behaviors that are likely to lead to disputes. When bidding is competitive, some bidders will not include all the costs of complying with unfair contract provisions in their bid—instead they will make optimistic and unrealistic assumptions about whether such provisions will be enforced, or assume that there will be distractions or differing site conditions that will allow them to "make up" the impact of the unfair provisions. All of these behaviors will result in disputes and claims. So the owner is hit with the double whammy of more disputes and claims along with higher bid prices.

Third, fair contracts will be supported by dispute adjudicators. When dealing with the inevitable disputes that arise from one-sided contracts, many dispute review boards make their recommendations by ignoring what they consider unfair provisions. Owners often complain in such circumstances that "the DRB is not reading the contract." And although I'd be the first to agree that DRBs should make recommendations based on what the contract says rather than what they think it should say, the truth is that the DRB is reacting, albeit inappropriately, to the one-sided contract provisions.

So given these three good reasons, why don't more public owners re-evaluate their legacy contracts? Sometimes, changing standard terms and conditions can be viewed as caving to high-profile contractors. In other situations, an owner's procurement and legal staff are trying to create contract language that makes their job easier. Unfortunately, this usually works against the objectives of the project delivery staff, who are trying to get competitive bid prices and minimize disputes and claims.

> Ultimately, we all must choose to set aside selfish motivations and do the sometimes difficult work of establishing fairness in our projects

Ultimately, we all must choose to set aside selfish motivations and do the sometimes difficult work of establishing fairness in our projects.

Successful underground construction occurs when individuals work productively toward a common goal. A fair set of terms and conditions establishes a framework for partnership between the owner and the contractor and helps generate shared respect for the other party's objectives.

Companies featured in this issue

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Lake Mead No 3 Intake award due

The Lake Mead Intake No 3 project is shortly due to be awarded to the SA Healy/ Impregilo JV (*T&TNA*, Sept 2007, p6). Comprising 16,000ft (4.8km) of 20ft (6.1m) finished i.d. tunnel plus a 600ft (182m) deep access shaft and a deep intake shaft to the bottom of the lake from the tunnel horizon, the contract is said to be worth $450 million.

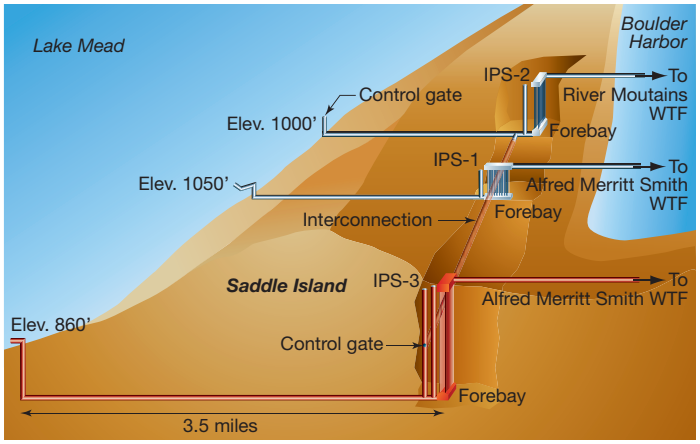
Blake Schmidt, spokesman for client Southern Nevada Water Authority (SNWA), told *T&TNA* it had "recommended Vegas Tunnel Constructors JV (SA Healy/Impregilo) to be presented to the SNWA board of directors for award of 070F 01 C1 [Lake Mead No 3 Intake] in March."

The $650 million project is part of SNWA's Capital Improvements Program (CIP), which was approved at the end of 1995. The plan has four main components: Intake System Improvements; Water Treatment Improvements; Transmission System Improvements & Miscellaneous Improvements (mainly power). Reviewed annually, the CIP was significantly amended to include Intake No 3 in 2005. Currently the CIP is projected at $2.85 billion.

The Intake No 3 design was awarded to a JV of MWH and CH2M Hill and got underway in August 2005. Its $36.3 million contract spans 1,146 design days and is due to be complete by mid-September this year.

The new intake at 860ft (260m) asl will replace existing intakes should the surface of Lake Mead drop below 1050ft (320m) asl. Recently water levels have fallen significantly due to drought conditions across the western states. The new intake will also provide access to the better quality of water at deeper levels.

T&TNA was told that a precast concrete segmental lining would be employed on the tunnel, which it was claimed would be the deepest subaqueous tunnel constructed with a pressurized face TBM in the world to date.



Above: Fig 1 - Existing and planned Lake Mead intakes; Top left: Falling water levels in the lake are immediately apparent

Hydrostatic pressures with present lake conditions are approximately 15 bar. If the lake level rises during construction this could rise to 17 bar. Hyperbaric cutterhead interventions will be required.

Additional challenges will include the tunnel alignment crossing the old Las Vegas Wash Channel, a historic stream channel with reduced cover between the lake bottom and the tunnel crown.

SNWA is also requesting proposals for contract 070F 05 C1, connections and modifications to Lake Mead Intake No 2. The scope of work includes connection to the existing intake, such as a 22ft (6.7m) diameter x 380ft (116m) deep shaft; a 14ft x 16ft (4.3m x 4.8m) modified horseshoe tunnel 270ft (82.5m) long; and a 14ft x 16ft modified horseshoe tunnel 250ft (76m) long.

A pre-bid meeting is due for March 28, with bid opening on April 21. *T&TNA* has learnt bid package plans are being held by Ameron, Construction Notebook, Guy F Atkinson, Traylor Bros, Barnard Construction, Ferguson Waterworks and Sierra Plan Room. ■

Repairs for Twin-cities

A study has raised concerns that 15 miles of tunnel under Minneapolis will require $75 million in repairs, in order to safeguard against failures due to heavy rains.

With some of the tunnels greater than 100 years old, many were built using un-reinforced concrete or masonry. Increased runoff and heavy rains are creating pressures the tunnels weren't designed to withstand.

Talking to local press, Leonard Krumm, an engineer with CNA Consulting Engineers who has just finished a six-year study on the tunnels' condition, said excessive water pressures had cracked or burst tunnel walls in some places. If this leads to a failure or partial blockage, there is a real risk the stormwater could back up and flood the area the tunnel was built to protect.

The city of St Paul is reportedly spending $10 million to fix cracks and breaches in concrete tunnels under its remit. At one fracture, water wore an opening 88.5ft (27m) long and 19.7ft (6m) high. Two workers engaged in these works were drowned last July after they were stranded underground during a deluge. ■

Miami finally gets go-ahead

On February 15, the Florida Department of Transportation (FDOT) was able finally to announce the Miami Access Tunnel (MAT) consortium as the winning bidder for the Port of Miami Tunnel.

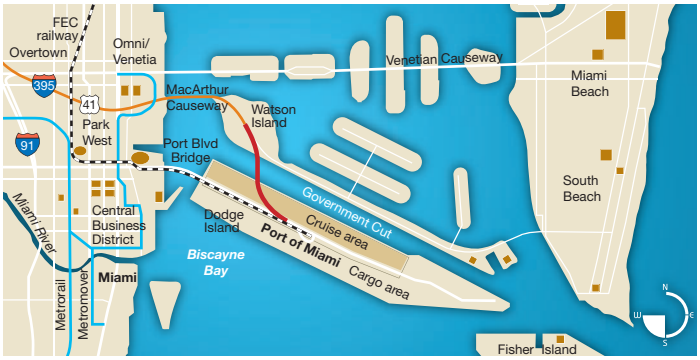
The $914M sub-sea highway tunnel (Fig 1), which has been planned for nearly 20 years, has recently been facing an uncertain future due to a failure to secure $55M of funding from the City of Miami as part of the finance agreement.

T&TNA had a spokesman explain the financial situation on the project. Sponsored by FDOT, the local partners on the project are the City of Miami and Miami-Dade County. The Port of Miami is a county function, but the tunnel will be built on land belonging to the City. FDOT is scheduled to pay half of the project's construction, approximately $457M. The County is responsible for paying $402M towards the project and the City is to invest $55M ($5M in land use and $50M in capital contributions). The County has been committed since July 2007, but the City has only just agreed to its contribution.

Three teams submitted bids in May 2007 to design, build, finance, operate and maintain the tunnel throughout a 35-year concession agreement. The MAT consortium, led by Bouygues with investment bank Babcock & Brown, was named as preferred partner last year, but formal selection was not possible until all the funding was secured.

Final designs for the project should be complete within 12 months and the twin tubes should be open for traffic by late 2012. ■

Below: Fig 1 - Alignment of the Port of Miami Tunnel



Dragados acquires Schiavone

As part of a continued expansion into the US public works sector, Spanish construction giant, Dragados, part of the ACS Group, has acquired New Jersey based Schiavone Construction.

T&TNA spoke with Paul Scagnelli, Schiavone's Executive Vice President and Chief Engineer, about the acquisition, which he commented was for significantly more than the $50M being reported by some sources, together with what effect it may have on Schiavone's operations. Scagnelli said that rather than be subsumed into Dragados USA, the Schiavone name and brand would continue to exist as a subsidiary with the same staff, offices and corporate identity.

Asked about the possibility of any job losses as part of the acquisition, which Scagnelli put at "over $100M", he replied that on the contrary, corporate goals laid out by Dragados are for significant growth over the next few years and for Schiavone this would likely mean an increase in staff rather than losses.

Dragados has considerable equipment and R&D resources in Spain and communications were said to be already opening up with the intent to collaborate as much as possible. He said the acquisition by Dragados brought advantages associated with more availability of capital and easier bonding, which he felt could bring more opportunities within Schiavone's grasp.

At the time of the acquisition, Scagnelli told *T&TNA* that Schiavone had $800M of works on its books. Relating to the recent news (*T&TNA*, Dec 2007, p5), that Schiavone has been awarded New York's No. 7 Line Extension in JV with Skanska and JF Shea for 1.5 miles (2.5km) of twin tube rock TBM subway tunnels, Scagnelli said the team had begun to mobilize at the end of 2007 and that this process was continuing. *T&TNA* was also told that Herrenknecht has been picked as the preferred supplier for the project's two TBMs.

Said to be the largest single procurement contract ever awarded by the Metropolitan Transportation Authority (MTA), at $1.45 billion, Scagnelli went on to describe the challenges associated with the project. These included time, difficult cavern excavations, track lowering at Times Square and underpinning existing subways.

Scagnelli confirmed that the awarded contract does not include the station at 41st and 10th, but that there was an option to include it as a scope change at a later date. He said the MTA was redesigning the station in question and that discussions were underway to establish a design and estimate for the option, which was understood to be subject to available funding being secured by the MTA.

It was noted that the JV partners had been informed along the way about the Dragados acquisition and Scagnelli summed up their response saying; "They were happy with Schiavone, so should be even happier with the extra backing of Dragados." ■

Final breakthrough at Beacon Hill

On March 5, the second of two 4,300ft (1,3km) long TBM drives through Beacon Hill, in Seattle, broke through, marking the end of tunneling works on the scheme (*T&TNA*, May 2007, p19).

The 21ft (6.4m) diameter Mitsubishi bored through the headwall of the East portal after averaging 25ft (8m)/day through glacial till for Seattle's Link light rail tunnels. *T&TNA* was told that the TBM had holed through within 5mm of its target and had achieved a best performance of 50ft (16m)/day.

"Link light rail in Seattle truly is seeing the light at the end of the tunnel, or tunnels in this case," said Sound Transit Board Chair and Seattle Mayor, Greg Nickels. The tunnels form part of the Central Link scheme, on which construction got underway in 2003. It is currently about 90% complete and on schedule to begin service between downtown Seattle and Sea-Tac International Airport in 2009.

Sound Transit's contractor, Obayashi Corp, launched the 100m long TBM on this, its second, trip through Beacon Hill in July last year. Along its route the TBM installed over 800 pre-cast concrete segments. The tunnels connect through a NATM/SEM station 50m below the surface of Beacon Hill. Obayashi is building this facility, together with an elevated station at Mt Baker.

Test runs of the light rail trains are currently underway between Sound Transit's Operations and Maintenance Facility and the Downtown Transit Tunnel. Further tests are scheduled at the end of the summer.

T&TNA was told that more than 6 million manhours have gone into construction since the project broke ground, with the recordable injury rate for 2007 at 4.32 against a national average of 5.9 for construction projects.

Such achievements of the workers was paid tribute by Nickels: "Later this summer we will be ready to roll Link light rail trains through the hill as we prepare for passengers in 2009. This is a major milestone for the men and women who have been a part of the construction." ■

Celebrations at the East portal of Beacon Hill

McNally progress

Tunneling is progressing well on McNally/Aecon JV's two sewer projects for the York Durham Sewer System, north of Toronto, Canada (*T&TI*, Oct 07, p36). On the $70.5 million 19th Avenue (YDSS Interceptor) project, the 10.6ft (3.25m) diameter Lovat EPBM "Motorclara" has been mining well, reaching the last shaft on its 2.24-mile (3.6km) long drive in November. The mining operation was then relocated to this shaft to allow clean out and patching of the 1.43-miles (2.3km) of completed tunnel concurrent with the remainder of the drive. "Motorclara" was re-launched in January and to date has completed nearly 400 of the 1100 rings on this drive.

On the Langstaff Trunk Sewer (which is being constructed with the Bathurst Collector under a single $79.5 million design-build contract) another 3.25m diameter Lovat EPBM "Enviro" has also advanced well, despite some challenges. "The ground is highly variable, switching between firm clays to very fine silts, sand and gravel within the space of one push," explained Steve Skelhorn, McNally's Project Manager on 19th Avenue. "The ground conditioning system required a lot of experimentation to reach a set-up that would allow us to adjust the foam/polymer injection at a moments notice. The downhill grade added to the problems, as any water would flow into the TBM making life difficult for the crews." To date 1100 of 2900 rings have been built at Langstaff.

On the Bathurst Collector the third of the JV's identical Lovat EPBMs, "Laura", completed the first of two drives in mid-December. This 1.3-mile (2.1km) downhill drive was primarily through consolidated tills and clay. TBM removal proved challenging with a relatively small diameter 18ft (5.5m) recovery shaft, located in a very small site on a busy intersection. In January 2008, the TBM was re-launched from the same drive shaft for the second 1.55-mile (2.5km) drive. To date 350 of the 2100 rings have been completed.

It is anticipated that 19th Avenue project will be completed in summer of this year and the Langstaff and Bathurst projects in late autumn. ■

Canada Line ahead of schedule

In Vancouver, the Seli-SNC Lavalin JV, InTransitBC, has completed the Canada Line bored tunnels ahead of schedule (*T&TNA*, Mar 2007, p13).

On March 02, the project's 440 tonne TBM broke through into what will eventually be the Canada Line's Waterfront Station. The event marks the completion of two side by side bored tunnels using a Lovat 20ft (6.1m) diameter mixed face EPBM from just south of False Creek to just north of Pender Street in downtown Vancouver.

The 1.52-mile (2.45km) long drive was started in mid-2007 and was scheduled to take 10 months to complete along a route consisting of sandstone, glacial till with granitic boulders with a high watertable. The tunnel internal diameter is 17.5ft (5.3m) and the alignment sees the depth vary between 23ft and 98.5ft (7m and 30m) below the city surface. Completion of this second tunnel means the 2nd Avenue worksite can now be transformed from servicing the tunnel construction to construction of the station.

British Columbia Premier Gordon Campbell said: "This breakthrough represents an important milestone for this project, which will significantly improve transit service for people throughout the Lower Mainland." Applauding what is arguably a greater achievement than finishing ahead of schedule, Premier Campbell added: "I want to congratulate all of the workers for their hard work and dedication and for completing this critical phase of the Canada Line without a single lost-time injury or accident."

When complete, the Canada Line rapid transit system will run fully separated from traffic between a transportation hub at the Waterfront Centre to Vancouver International Airport. The scheme features 16 stations, two bridges, 11.8-miles (19km) of tunnel and elevated guideway, parking and bus facilities to give a transit capacity equivalent to 10 road lanes. Designed as a commuter line with a secondary function for airport transit, it is widely perceived as being a key infrastructure component for Vancouver's hosting of the 2010 Olympic and Paralympic Winter Games. In reality, the link has been planned for several years and in fact the Olympic hosting dates are more of a driver to avoid construction during the event.

The Can$1.9 billion project is funded by the federal government, the Province of British Columbia, the Greater Vancouver Transportation Authority (TransLink), the Vancouver Airport Authority and the City of Vancouver. InTransitBC is the private sector partner and is responsible for the design, construction, partial finance, maintain and operation of the system. It also assumes most construction and operation risks. This approach was chosen to give access to private sector innovation and efficiencies, whilst giving the private partner an incentive in a long-term successful transit system. It also ensures ownership of the line remains in public hands.

Lawrence Cannon, Federal Minister of Transport, Infrastructure and Communities said: "This successful project clearly demonstrates the benefits of public-private partnerships in large-scale transportation infrastructure projects." Whilst praising the site teams, TransLink chair, Dale Parker, was also looking forwards when he said: "Every one of them can be proud of this amazing accomplishment and with the Premier's massive transit program, it's exciting to realize we will be celebrating many more "breakthroughs" for Metro Vancouver's transit system in the coming years." ■

Above: **The Lovat EPBM breaks through in downtown Vancouver**

Below: **(From left) Deputy Project Mgr Brendan Henry, BC Premier Gordon Campbell, Project Mgr Andrea Ciamei, Mario Laudadio of SNC Lavalin and Remo Grandori, President of SELI**

	Best 24hr production		Best weekly production	
	Drive 1	Drive 2	Drive 1	Drive 2
Sandstone	18 rings 25.2m	20 rings 28m	97 rings 135.8m	100 rings 140m
Till	19 rings 26.6m	21 rings 29.4m	77 rings 107.8m	105 rings 147m

MTA sues over Gold Line

In mid-February, the Los Angeles County Metropolitan Transportation Authority (MTA) filed a reported $25 million lawsuit against the design and build team responsible for a stretch of the Pasadena Gold Line, which was completed in 2003.

T&TNA was told by an MTA spokesperson that they could confirm a lawsuit had indeed been filed on February 15 in "LA Superior Court case #BC385585", but that no further comment would be forthcoming due to pending litigation.

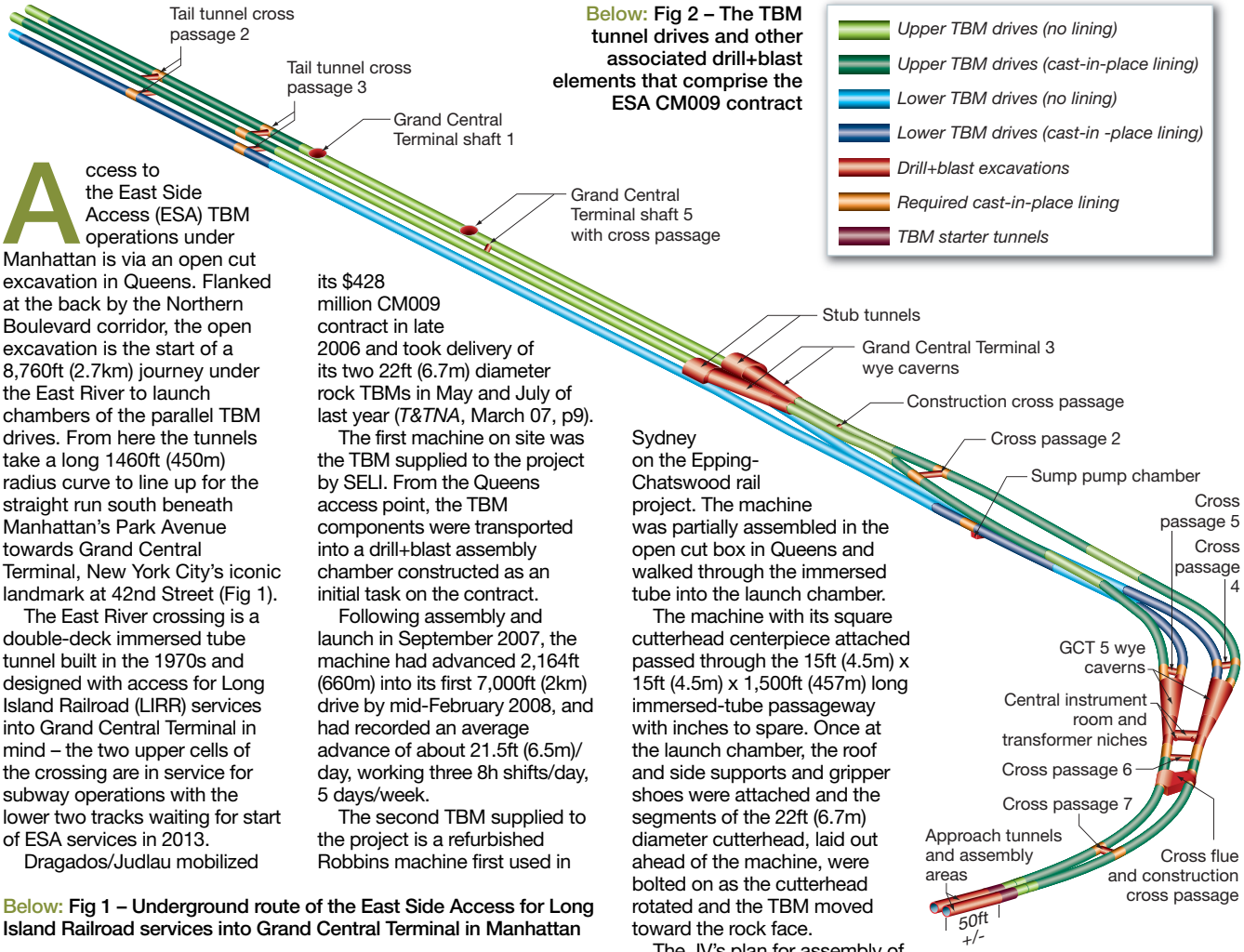
Press reports said the lawsuit claimed the contractors failed to meet construction standards outlined in the contract and it cited breach of contract and negligence. Amongst others, reports said the lawsuit named Kiewit Pacific, Washington Infrastructure Services and Parsons Corporation.

T&TNA was not able to obtain a response from Parsons or Washington Infrastructure Services (part of URS Corporation by acquisition since November 2007), prior to going to press, but a spokesman for Kiewit said: "Because this matter is now in litigation, we will not be able to discuss any details publicly. We are disappointed with the current situation because we believed we had a good relationship with the Gold Line Authority, including an open and cooperative dialogue and process to address issues as they arose. This legal action has taken us by surprise. While we disagree with the premise and need for the lawsuit, we also remain committed to resolving any legitimate remaining issues with the MTA Gold Line."

The scope of work in question was a $260 million contract that included a 1,170ft (357m) long, 30ft (9.14m) wide cut-and-cover tunnel as part of the first 13.7-mile (22km) long phase of the subway line. ■

Mining under Manhattan for Grand Central access

Two TBMs working on the East Side Access project in New York are into their initial 7,000ft (2km) drives and the contractor, the Dragados/Judlau JV, is in negotiations to progress further elements of the total $6.3 billion project for the MTA (Metropolitan Transportation Authority). **Shani Wallis** visited the project in December 2007 to appreciate the scale of the undertaking



Below: Fig 2 – The TBM tunnel drives and other associated drill+blast elements that comprise the ESA CM009 contract

Access to the East Side Access (ESA) TBM operations under Manhattan is via an open cut excavation in Queens. Flanked at the back by the Northern Boulevard corridor, the open excavation is the start of a 8,760ft (2.7km) journey under the East River to launch chambers of the parallel TBM drives. From here the tunnels take a long 1460ft (450m) radius curve to line up for the straight run south beneath Manhattan's Park Avenue towards Grand Central Terminal, New York City's iconic landmark at 42nd Street (Fig 1).

The East River crossing is a double-deck immersed tube tunnel built in the 1970s and designed with access for Long Island Railroad (LIRR) services into Grand Central Terminal in mind – the two upper cells of the crossing are in service for subway operations with the lower two tracks waiting for start of ESA services in 2013.

Dragados/Judlau mobilized its $428 million CM009 contract in late 2006 and took delivery of its two 22ft (6.7m) diameter rock TBMs in May and July of last year (*T&TNA*, March 07, p9).

The first machine on site was the TBM supplied to the project by SELI. From the Queens access point, the TBM components were transported into a drill+blast assembly chamber constructed as an initial task on the contract.

Following assembly and launch in September 2007, the machine had advanced 2,164ft (660m) into its first 7,000ft (2km) drive by mid-February 2008, and had recorded an average advance of about 21.5ft (6.5m)/day, working three 8h shifts/day, 5 days/week.

The second TBM supplied to the project is a refurbished Robbins machine first used in Sydney on the Epping-Chatswood rail project. The machine was partially assembled in the open cut box in Queens and walked through the immersed tube into the launch chamber.

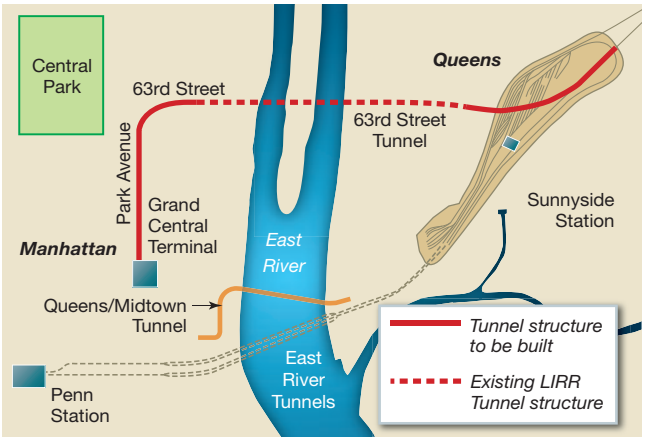
The machine with its square cutterhead centerpiece attached passed through the 15ft (4.5m) x 15ft (4.5m) x 1,500ft (457m) long immersed-tube passageway with inches to spare. Once at the launch chamber, the roof and side supports and gripper shoes were attached and the segments of the 22ft (6.7m) diameter cutterhead, laid out ahead of the machine, were bolted on as the cutterhead rotated and the TBM moved toward the rock face.

The JV's plan for assembly of the two machines differs from the plan suggested by the contract documents. Two independent chambers replaced excavation of a large 33ft (10m) x 54ft (16.5) x 80ft (25m) cavern recommended to accommodate full assembly of both machines and provide a common end wall into which the 40ft (12.2m) long TBM starter tunnels would be excavated. That chamber would have taken considerable time to excavate.

A 96ft long x 26ft horseshoe-shaped chamber was needed for the SELI machine because it is a shielded machine and would not pass through the immersed tube tunnel in an assembled state. Nevertheless, that chamber plus the smaller 76ft (23.2m) long x 24ft (7.3m) horseshoe-shaped chamber excavated for launch of the Robbins TBM totaled much less than the suggested assembly chamber and starter tunnels.

Once the second TBM was ready to launch, a counter frame was erected in the adjacent tunnel to protect the slim 5ft (1.5m) pillar of rock between the drives and support the machine's 2,300psi (15.85MPa) gripper force as it pushed off.

Below: Fig 1 – Underground route of the East Side Access for Long Island Railroad services into Grand Central Terminal in Manhattan



Above left: **Assembly of the SELI machine in the Manhattan launch chamber;** Right: **Assembly of the Robbins main-beam gripper TBM in the open access shaft in Queens**

By mid-February, the machine was 720ft (219m) into its first 1.24-mile (2km) long drive and had maintained an average of 17ft (5m)/day, working also three 8h shifts/day, 5 days/week. To date the SELI machine had recorded a best advance of 109ft (33m) in 24h and the Robbins machine had logged a best of 97ft (29m) in 24h.

Continuous conveyors

Before launching the machines, Dragados/Judlau JV worked also on installing the continuous conveyor system that will muck all major Manhattan excavation works to a stockpile in Queens. Supplied by The Robbins Company, the conveyor is a complex set up. Belts in each running tunnel payout from headframes located in a chamber excavated under an earlier ESA contract.

At this point, muck from both TBM-drive conveyors transfers onto a single belt that travels back through a lower compartment of the East River immersed tube tunnel to the open box access point. Here the horizontal belt discharges onto a 110ft (33.5m) deep vertical belt as part of a set that lift material up and over Northern Boulevard and on to the stacking conveyor.

In total, more than 16,000ft (nearly 5km) of conveyor will be supplied to the contract. The 36in (900mm) wide conveyor behind the SELI machine is calibrated to travel at 10ft (3.35m)/sec and carry a maximum 650 ton of muck/h.

The belt behind the Robbins machine, also 36in wide, runs at 9ft (2.8m)/sec and carries 816 ton of muck/h. The 6,000ft long x 36in wide transfer system from Manhattan back to the stockpile (1.8km x 900mm) is sized to transport a combined TBM production of 1,200 ton/h running at a top speed of 9.8ft (3m)/sec.

In the grand scheme of things, the two TBMs on contract CM009 will excavate four drives for a total 24,000ft or 7.7km. Each will pass through the location of two large station caverns, to be excavated beneath Grand Central Terminal, which will eventually house eight platforms for the Long Island Railroad (LIRR) commuter trains - four platforms in each cavern, two above two. At the end of the first drives, the TBMs will be retrieved and relaunched from two large chambers to provide four TBM running tunnels into the station caverns (Fig 2).

The JV's machines are completing the two upper tunnels first, one through and on beyond each of the station cavern zones to provide back shunting and storage tunnels for LIRR trains in operation.

Once at the dead-end of their first drives, the TBMs return to a bifurcation chamber, enlarged from the initial drives, and relaunch into the two lower tunnel drives.

These run almost always in line and about one tunnel diameter below the first two drives and pass through the station cavern zones to the end of the back-shunt/storage tunnels at about 38th Street.

Under a separate contract, these initial four TBM tunnels will split again into four shorter drill+blast headings to complete access for LIRR trains to all eight new station platforms and to the four back-shunt tunnels.

Schist behaving poorly

For the most part, the rock on the first two drives has been behaving well to excavation. The famous Manhattan Schist of the region is well known as a competent, high-RQD material with an average compressive strength from 3,000-30,200psi (20-208MPa).

During the visit, *T&TNA* walked into the leading tunnel with Dragados project managers and noted the smooth competent profile of the bore, in which even the four 10ft (3m) long PM 24 Swellex bolts installed every 6ft (1.8m) across the crown, some holding 7ft (2m) long x 10in (250mm) wide mine straps as required, looked excessive. Other than the bracing at the start of the second TBM drive, there was one short 20ft (6m) zone of crushed rock on the leading drive, through which seeping water was observed and full round steel sets were installed on 5ft (1.5m) centers.

A report in mid-February however indicated that rock conditions on both drives had since deteriorated and that more support than anticipated was being installed. Through the full 24,000ft (7.7km) of TBM tunneling, contract CM009's GBR (geotechnical baseline report), had anticipated installation of about 1,150ft (350m) of full round steel sets and another 8,940ft (2.7km) of 120° arch-only sets in rock Classes 3 and 2 respectively. The majority, some 48%, of the drives was to be in rock Class 1 with 10ft long PM24 Swellex bolts installed four per row every 6ft. Mesh and mine straps are also installed by the crews as a safety measure.

In identified fault zones, the documents call for consolidation and water control grouting. To comply, the JV has assembled a grouting station flat car with room for bags of dry materials along with the grout mixers and injection pumps.

Shield vs mainbeam

Being different in design, the two rock TBMs are experiencing different issues in poorer conditions. It was an initial proposal by Dragados to finish the project's rail tunnels with a one-pass precast concrete segmental lining that introduced a SELI double-shielded machine to the project (*T&TNA*, May 2006, p6).

The contract documents were amended to include the alternative and after contract award, when the JV signed the purchase order for supply of a new machine with SELI, precast segmental lining was still the selected method – not for geological reasons, but to maximize the timesaving advantages of the double-shielded telescopic gripper machine concept that erects the lining and excavates the tunnel as a one-pass operation.

It was following further discussions with the Client, and transfer of all geological risk to the JV should it proceed with a precast option, that the alternative was dropped in favor of a traditional in-situ concrete second pass lining.

This change of strategy forced a total review and reorganization of the contract's method statement. The order for the contract's second TBM was yet to be signed and the JV requested Robbins to supply an

Below left: **Walk of the partially assembled Robbins TBM through the immersed tube to the launch starter tunnel;** Below right: **Start of the twin TBM drives and headframes of the conveyors**

Top: **The main conveyor belt, which runs through the East River immersed tube, back to Queens;** Middle: **Finger hood at the back end of the SELI TBM;** Bottom: **View along the leading TBM tunnel at up to 120ft (36m) beneath the street's of Manhattan**

open main beam machine. The first machine was already in fabrication and SELI was requested to modify the original order by removing the tailskin, segment erector and secondary thrust cylinders and fit instead a finger hood to the back of the gripper-shield, two drill booms for rockbolting and a ring erector for installing steel sets.

The distance from the face to the point where primary lining can be installed on the SELI shield however was said to be not a critical issue. Poorer conditions along the Manhattan tunnels are manifest by more intense jointing in the schist rather than by soft or squeezing behavior. The first opportunity for erecting crown support behind each machine is some 35ft (10.7m) from the face or about 8h after excavation for the SELI shield and about 19ft (5.8m) or 5h for the Robbins machine. In poorer conditions the two TBMs are erecting about the same amount of additional support.

By the end of February, progress by both machines was markedly slower than the 67ft (20.5m)/day anticipated by the contract's program, due in part to more than predicted support needed in both drives. The SELI and Robbins machine cutterheads are dressed with 37 and 34 x 19in backloading cutters respectively, supplied for both by Robbins. Cutter consumption in the abrasive schist is said to be better than expected with some 60 discs consumed in the first combined 2,164ft (659m) of tunnel boring to mid-March.

Chambers and caverns

One of the poorest reaches of rock on the alignment is at the point where the large bifurcation chambers for start of the second two TBM drives must be excavated. These 'wye' caverns are located beneath 59th Street and Lexington Ave and it was said that despite much study and consideration, they could not be moved into better rock quality. The JV said it will use grout injection to stabilize conditions ahead of multi-drift excavation of these maximum 32ft high x 54ft 4in wide (9.7m x 16.5m) caverns.

There are several other chambers and caverns needed on the alignment, including a second 'wye' chamber close to the station caverns (GCT 3 wye caverns), several cross passages and a large 580bcy (back yd^3 - 440m^3) sump at the low point of all four TBM drives at about 53rd Street (Fig 2).

All these associated structures will be excavated after the TBM drives, using the TBM tunnels either as access points or for break up to new enlarged profiles. Earlier experiments to use roadheaders as an alternative in the tough and abrasive schist proved unsatisfactory and will therefore be drill+blast operations. All muck will be transported via the continuous conveyor belts back to the Queens site for disposal.

The same is true for the two station caverns to be excavated under Grand Central Terminal. Construction of these is split into separate contracts, the first of which is for excavation of both cavern top headings and their escalator and elevator connections. The 1,500ft long x 27ft high x 58ft 6in span (457m x 8.2m x 17.86m) headings will be drill+blast excavations breaking up from the TBM drives.

At going to press, the Dragados/Judlau JV was in advanced negotiations with MTA for award of this estimated $700 million contract. Benching of the caverns to their full 66ft 6in (20.25m) height is a separate contract and the JV has also expressed interest in completing that contract as well.

Geotechnical surveys by MTA's lead designer Parsons Brinckerhoff predict that most of the large caverns and drill+blast excavations, except the two GCT 5 wye caverns, are located in sound Manhattan Schist.

TBM turn around

At the end of their first drives, the two TBMs will be retrieved from the dead-end headings to begin their second drives, after which they will again have to be retrieved for recovery through the Queens box. Both machines were pre-prepared for this maneuver. The four sections of the Robbins cutterhead will be unbolted, hydraulic extensions will retract the shields, roof and side supports, and the front shoe will collapse for pull back.

The SELI machine was designed also with an innovative collapsing mechanism, that retracts the shield cans to a smaller diameter than even the reduced diameter of the initial segmental lining proposal, and without major disassembly. It will take longer obviously than the main beam gripper machine "but not too much" it was said, "and if it is needed for a contract in the future, the option always remains to re-install the tailskin, erector and thrust rams to operate as a standard double shield". The "self-collapsing" design of the SELI shield will save substantially in labor costs during retrieval.

This turn around of the machines for relaunch into their second drives is expected in spring 2009, with the first of the main Manhattan contracts underway and the second for the station caverns' top headings soon to be confirmed, the full ESA project is scheduled to be complete by 2013.

Labor complement

By mid-February 2008, the Dragados/Judlau JV had a full complement of about 210 workers on the contract. Most are members of, and recruited from, the Local 147 Sandhogs, Local 15 operators, Local 3 electricians and Local 731 laborers unions, with six TBM technicians from Spain.

Management of the contract comprises nine engineers assigned from Dragados' head office in Spain and another 17 full-time employees from local partner Judlau. The JV says that between a union workforce, different tunneling techniques to Europe, the language barrier, and difficult conditions, the Manhattan TBM tunnels contract is an immense undertaking, but one that it is ready to take on. ■

Aecom undertakes triple buy-out

Technical and management service provider Aecom has instigated or completed three major acquisitions during the 1Q 2008, at the same time as reporting a 63% gain over net income for the corresponding period from the previous year.

Most recently on March 3, Aecom completed its acquisition of Tecsult, a 1,100 employee strong engineering firm based in Montreal, Quebec, Canada. The acquisition was described as an important addition to Aecom with Tecsult's primary strength being its hydropower expertise.

On February 12, Aecom announced it had signed a definitive agreement to acquire Earth Tech Inc, a business unit of Tyco International Ltd., for $510M cash. Headquartered in California, Earth Tech provides consulting, engineering and design / build / operate (DBO) services to water / wastewater, environmental, transportation and facilities clients globally. With 7,000 employees worldwide, Earth Tech had revenue of $1.3 billion for the 2007 fiscal year.

Aecom plans to divest Earth Tech operations that do not align with its core business and strategic objectives, which it estimates could yield proceeds of $175 to $200 million. Aecom President and Chief Executive Officer, John Dionsio, said: "By adding Earth Tech to Aecom, we immediately strengthen our position in our core water and wastewater markets… Externally, this merger strengthens our ability to win mega infrastructure assignments, environmentally smart projects and outsourcing by federal agencies."

One day earlier on February 11, Aecom had announced it had agreed to acquire another California based firm, Boyle Engineering, who specializes in the water sector. Employing over 600, Boyle has a strong presence in the southeast and western United States. Phil Petrocelli, Boyle President and Chief Executive Officer said: "Joining Aecom will provide an excellent opportunity to expand our client offerings – by practice area and geographically."

Targeted sale for Team Mixing

On February 8, Team Mixing Technologies Inc, part of the Target group of companies - a leading producer of dry-mix concrete and cement products, in western Canada - announced that it had been acquired by The Quikrete Companies, one of North America's largest manufacturers of packaged concrete.

With manufacturing and distribution facilities near Vancouver, British Colombia, Team Mixing Technologies, offers a diverse product line and specialised engineering services for the mining and concrete products industry.

"Today's ever increasing competitive business environment dictates even more focus on growth and stronger presence in both the Canadian and the USA markets," said Team Mixing Technologies' Dennis Arbour. "To meet these future challenges an alliance with a larger company will give Team Customers, Team Suppliers and its staff, the tools and resources to be even more successful in the future."

Snee sets up NYC-based consultancy

Dr Christopher Snee

Dr Christopher Snee has established a private consulting firm, based in New York. The practice specializes in engineering geology and hydrogeology related to tunneling, mining and deep excavations. Examples of recent projects are tunnels and caverns for the Second Avenue Subway and 7 Line Extension in New York City and the Santiago Metro; deep excavations for tall buildings in New York City; underground disposal of nuclear waste; surface and underground mining and sub-aqueous tunnels. The firm is actively engaged in projects in North and South America, Asia, Australia and Europe. For further information visit www.sneegeoconsult.com.

A biding influence

Robert A Pond (1941-2008)

Over the past number of years, there hasn't been a topic of discussion, point of policy, or trending development within the US tunneling industry that hasn't felt the guiding influence of Bob Pond. He had that rare gift of being a combining rather than dividing force between players of the industry, qualities that served him well as an experienced arbitrator and member on the Construction Industry Panel for the American Arbitration Association. Be it owners, designers, contractors, suppliers, insurers, unions, committees, associations, tunnelers in general, or the media, Bob was a frequent and willing industry spokes-person and promoter.

That wholesome influence, in an industry that can be fractious at the best of times, was lost to us on February 18 when Bob died of cardiac failure. It's difficult to imagine a successor of equal ability or influence; there's hardly a development on the practical side of the US industry that isn't a legacy of Bob's involvement. He was in particular a good friend and a supporter of *T&TNA*. We are among so many who will miss him. Among his many contributions to *T&TNA*, Bob wrote a Viewpoint in March 2004 titled 'Tunneling: A business or Russian roulette with paper bullets?' and the many Frontier-Kemper projects featured in *T&TI* and *T&TNA* include application of the V-Mole blind shaft sinking machine to excavate the tourist access shaft at Hoover Dam, in Nevada (*T&TI*, Dec 1991, p35), and the Ashlu Creek TBM tunneling hydro project in this issue of *T&TNA*.

Bob retired in December 2007 from his senior management position with Frontier-Kemper after more than 37 years with the company. But even in retirement you could catch Bob on the phone in his Evansville headquarters' office, which was an Aladdin's cave of mementoes from his early days in the mining business, his years in the civil tunneling industry, and of company and personal awards and recognitions and of his favorite hobbies of writing, about anything that came to mind, and gun sports, which, as a fervent advocate of the second amendment, he promoted and supported with equal enthusiasm as tunneling and mining.

After attending the Colorado School of Mines, Bob's rise to the top most level of Frontier-Kemper management began in 1960, when he and two partners formed and operated Hardrock Contractors, a specialist tunnel and mine construction company, and progressed through foreman with Climax Molybdenum Company; engineer with Homestake Mining Company and a designer and sales rep for Denver Air Machinery before joining the Kemper Frontier JV as project manager for on the Gathright Dam Cut-Off Wall contract in Virginia in 1972. With formation of Frontier-Kemper he managed construction of coal mine shafts and slopes until he became mining group general manager in 1978. He was then promoted to executive vice president in 1989 and elected a company director in 1994.

Bob was a 38-year member of SME and served for 12 years as a director of AUA (American Underground Construction Association) and was on the first board of its successor, the UCA of SME. He served a term as president of the American Society of Civil Engineers Construction Institute and was chairman of the 1995 RETC conference.

Bob leaves his wife of 34 years, Peggy and their family of four girls, three boys, 14 grandchildren, and two great-grandchildren.

A career tunneler

Robert J Jenny (1932 – 2008)

For his entire career, Robert Jenny was dedicated to tunneling. Throughout his career and until just weeks before he died on February 23, at age 76, Bob not only witnessed but contributed towards safer and more cost effective design and excavation of tunnels and underground space.

After founding his own consulting engineering firm in 1965, Bob and Jenny Engineering Corporation of Springfield, New Jersey, was involved in various ways on many leading projects world-wide, from China and Asia to the UK and across the USA. In 1983 the firm worked in a design-build collaboration with Traylor Bros of Evansville, Indiana, to design the running tunnels associated with the defining Orchard Boulevard Station and Tunnels contract for the Singapore metro and consulted on the construction of the Shanxi Wanjiazhai Yellow River Diversion Project in China (*T&TI*, July 2000, p27) and on the design of the undersea crossover cavern for the UK side of the Channel Tunnel (*T&TI*, Dec 1990, p15; April 1992, p25). In the United States, the company designed tunnels, shafts, substations and underground structures on 26 tunnel sections of the Washington Metro and Bob served as project director for geotechnical engineering and construction management contracts for New York's City Water Tunnel No. 3. Bob was a great friend and supporter of *T&TI* and *T&TNA* and was always ready to share his knowledge, experience, and information with the staff and reporters.

Bob and Jenny Engineering pioneered the use of innovative tunneling techniques in the USA, introducing in 1970 the first fully encapsulated epoxy resin ground support dowels for tunnels in the USA and in 1992 joined the pioneering effort to introduce NATM (New Austrian Tunneling Method) in soft ground for underground stations and tunnels in the USA.

From graduating with a BSc degree in Civil Engineering from the Newark College of Engineering, NJIT, and an MSc in Civil Engineering with specialization in geotechnical engineering, Bob was a licensed Professional Engineer in 36 States in the USA, and Canada, a land surveyor in New York and New Jersey, and a licensed professional planner in New Jersey.

As well as lecturing widely, Bob co-authored two books on 'Tunneling-The State of the Art' and 'Tunneling-The State of the Industry'. He was named 1993 Engineer of the Year by the ASCE (American Society of Civil Engineers) and in 1988 the New Jersey Small Business Person of the Year by the US Small Business Administration. Recently he accepted appointment to the NJIT Board of Overseers and was always a regular at the US tunneling conferences.

Bob was a decorated army veteran of the Korean War and was an active volunteer and officer in the United States Coast Guard Auxiliary. He is survived by his wife Marcelline, son Matthew, daughter Barbara Rita and four grandchildren and is missed by the team at Jenny Engineering and tunnellers on the international stage.

TBM drive for clean energy from Ashlu Creek

Crews are past the first of six major fault zones as 4m diameter TBM excavation moves into high gear on the 2.7-mile long tunnel for the Ashlu Creek run-of-the-river hydro project, in British Columbia, Canada. *T&TNA* contributor **Tonia Jurbin** reports

The $125 million, 50MW Ashlu Creek hydro project is one of many clean energy projects in planning or construction by Innergex Renewable Energy Inc in British Columbia (BC). The run-of-the-river project includes excavation of a 4m (13ft) diameter x 4.4km (2.73-mile) long TBM bored tunnel, which is presently in full production and advancing at an average rate of 10–15m/day with peaks of 23m/day.

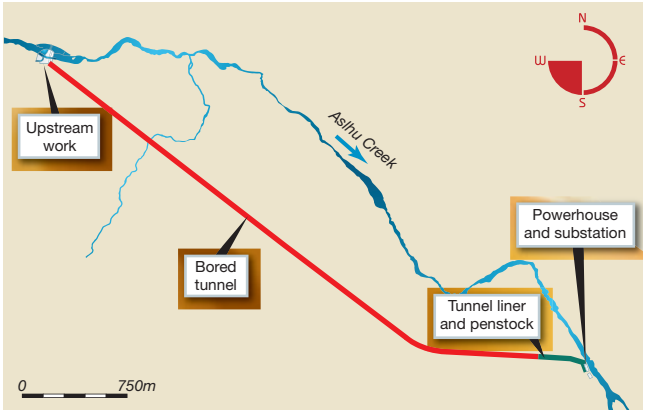
Planned originally to start in 2004, construction was delayed due in large part to the project's high profile location. Situated about a 90-min drive northwest of Vancouver and less than an hour's drive from the Whistler ski resort, the permitting process took longer than anticipated. Run-of-the-river projects in BC typically require more than 50 permits, licenses, reviews and approvals from more than 14 regulatory bodies.

While there are supporters of the project, including the Squamish First Nations who will own the facility in 40 years, there was also considerable opposition, especially from outdoor recreation enthusiasts. There are about 410,000 named creeks in BC with hydro power potential setting off heated debates about who should have the right to use the water and how. Public scrutiny during the community consultation stage of this project presented challenging hurdles for Innergex.

Innergex's prime contractor for the project is Ledcor CMI Inc of Vancouver and Frontier Kemper Constructors Inc (FK) of Evansville, Indiana, USA, has a fixed price contract with Innergex for tunnel excavation. Tunnel designer for FK is the Vancouver office of Hatch Mott MacDonald.

Once notice to proceed was granted, Ledcor CMI excavated the downstream portal area, under about 20m of rock and overburden, between September 2006 and February 2007. The first stage of the 4.08m diameter x 4.4km tunnel then started in mid-February 2007 when Frontier Kemper sub-contracted RokTek Services Inc of Prince George, BC to excavate the starter tunnel. The 600m^3 of the 31m long x 4.6m horseshoe tunnel took about a month to drill and blast and support with rockbolts, mesh and shotcrete in the crown.

With RokTek working the starter tunnel FK's crews were free to focus on the main event – arrival and assembly of some 40 truckloads of TBM parts and supplies from its Indiana home base some four-days drive away. The TBM launched in late June 2007 and tunneling crews in FK's team of about 50 employees and staff were running three 8h shifts/day, 5 days/week towards a contractual completion date of June 2009. This was later increased to 7 days/week to meet an early completion date of December 2008. By late February, excavation was advancing at an average rate of 10-15m/day with peaks of 20-23m/day.



Above: **Fig 1 – Plan of the project's 2.7-mile (4.4km) TBM tunnel**

At 620m into the drive, crews encountered the first of six major faults in the massive granitic rock of the alignment. It was said the fault didn't produce a significant volume of water and rockbolts, mesh and 26 partial ring sets were used to traverse the 15-20m zone. The modified 300° sets of steel rib supports, without invert segments and secured with rock bolt connections along lower sidewalls, were successfully installed and facilitated TBM advance through this section of poor rock conditions. "The method provided a stable support system, where subsequent final support/lining can be installed at a later time, and allowed for continued tunnel excavation," said Dean Brox for Hatch Mott MacDonald.

The report from Brox in late February explained that the TBM was just over 1km or about 25% through the tunnel drive. At that time he told *T&TNA* that crews are "currently going through what we expect to be the worst of the faults, F2. There is some altered rock but the TBM is progressing okay with the crews installing pattern bolting and mesh in the crown."

Of the other faults it was reported that fault F4 could be up to 1.5 times the length of the F1 fault.

The TBM is fitted with two drill rigs for rockbolting and probing. Probe drilling is

Below: **Aerial views of the upstream intake working site on Ashlu Creek (left) and of the downstream site and portal of the TBM drive (right)**

Above left: **TBM launch zone at the face of the starter tunnel;** Middle: **Installing support through fault zone F1;** Right: **Modified 300° steel set supports without invert sections through fault F1 (above photos by D Brox)**

Above: **The 4.08m diameter Wirth TBM and its crew during on-site assembly at Ashlu Creek**

undertaken 50m in advance of each fault and the probe length and overlap is 12–15m. If a probe hits water it will either be left to drain off or, depending on the volume, the location will be grouted. Water inflows over the 1km long heading to late February was said to be low at about 6 litres/sec (100gpm).

Water make over the 4.4km length of the tunnel, under the maximum overburden of 600m and measured at the portal, is expected to be some 32litres/sec.

The 1% uphill grade of the drive allows water to drain to the portal and makes mucking the 57,000m^3 of material easier using trains of four 10m^3 muck cars. Ledcor is using much of the tunnel muck at the intake and for Forest Service Road improvements. Locals are happily volunteering to use the bulk of the remainder for property improvements and flood protection downstream of the project.

The 1200kW Wirth TBM cutterhead is dressed with 30 x 17in cutters. The high quartz content granite is abrasive but at time of press there was insufficient data to comment on cutter consumption.

The TBM is about 16m long and totals 140m with the trailing backup. The machine is fitted with a PPS precision guidance system to manage the alignment that can be challenging in the massive hard rock with compressive strength in excess of 225MPa. There is one major curve of 450m radius on the alignment. The TBM does have steerability and difficulties are not anticipated on such a wide turn.

The tunnel exit shaft at the intake end of the project will be a 130m deep x 3.5m raisebore that is scheduled to start in 2008 and take about three months to complete. It will be undertaken by a division of FK that specializes in raisebores.

The hard rock TBM tunnel is expected to remain largely unlined with lining only required at fault zones "where shotcrete will likely suffice," said Brox. A steel lining at the downstream end will be installed by others.

Green credentials

Construction of the substation and 2.5km of 230kV transmission line with a price tag of $Can4.5 million was completed in advance of heavy civil work so the TBM could be powered off the grid. It takes about 3MW to run a TBM and being powered off the grid alleviates noise, smoke and fuel transportation issues associated with generators. There is a full time mechanic and electrician on every shift as well as a full time technician dedicated to maintaining the cutterhead. There is also a full time environmental monitor.

To ensure environmental protection, only biodegradable hydraulic fuels are permitted on the project, a decision that added about $0.5 million to the project cost according to Richard Blanchet, Vice President of the Western Region for Hydroelectric Energy, Innergex. "Of course the earlier projects were much cheaper to build but that is because the environmental costs were not taken into account. Environmental costs are built into our projects and so they become a much larger proportion, close to 10%, of the overall cost. Our projects are framed to embed the environmental costs up front in the construction phase."

One of the big challenges has been getting supplies. Site management describes local sales reps as generally unhelpful and report that orders take weeks to arrive. Managers have found it faster and cheaper, especially with the strong Canadian dollar (currently at about par with the $US), to order tools and parts through their Evansville home office or from Seattle. "The economy in BC is red hot right now and working in the heart of one of BC's most popular resorts comes with unique challenges," explained Serge Moalli, Project Manager for FK. Some of these include grizzly bear mating zones near the laydown area and campers that encroach on the site every weekend.

As with everywhere in western Canada, recruiting and retaining personnel has been another pressing challenge. "About 80% of the crew at Ashlu are local hires with little construction experience if any," said Moalli. "Many are part-time ski patrollers at Whistler so recruiting employees to work in a tunnel and turnaround of our workforce, has been a major issue."

Training has been a priority. As Dave Watson, Field Engineer for FK explained: "The industry as a whole is far safer now than it used to be and on this project we give the crews a lot of safety training, especially since the average age is in the early 20s and about two thirds of them are new to the tunneling business. We spend a lot of time on the operating procedures for example. Procedures such as the whistle signals for operating the muck skip dump station and the horn signals for the locomotives."

To late February 2008, with the TBM about 25% through its drive and despite the skilled labor shortage in the construction industry in western Canada and the inexperience of the young, local-hires, there had been no lost-time accidents to report. ■

NAT goes to San Francisco...

2008 North American Tunneling Conference (NAT) June 7-11, 2008 - Hyatt Regency, San Francisco

The 2008 North American Tunneling Conference (NAT) is already shaping up to be a highly-successful event. With four months still to go, the exact order of the conference session program is yet to be finalized, however the number and variety of papers received is impressive.

To kick-start the congress, two short courses and a DRB Update workshop have been organised for Sunday, June 8. Organised by Levent Ozdemir, Professor of Mining at the Colorado School of Mines, the Soft Ground Tunneling one-day short course will encompass presentations on all aspects of tunneling in soft ground and soils, as well as reports on challenging EPB and slurry TBM projects.

The Underground Blasting Technology & Risk Management short course, conducted by professional mining engineer Gordon Revey, is intended as a review for managers overseeing conventional drill and blast works, in order to promote safe and efficient methods. Topics include modern explosive and initiation systems, blasting physics and rock breakage, control of blast-induced ground vibration and air-overpressure, estimating drill-blast costs and risk management.

Following a welcome address by congress chair Greg Raines and vice chair Brenda Bohike, on the morning of June 9, conference sessions will begin. Over 100 presentations are currently due to be given across four Track topics: Technology, chaired by Dennis Ofiara; Design, chaired by Bradford Townsend; Planning & Implementation, chaired by Marc Kritzer; and Case Histories, chaired by Mike Roach.

Alongside the congress, is the accompanying exhibition, which has already sold out - with more than 60 national and international companies taking booths at the show. Industry sponsorship of the social events has also once again been popular and as well as the Icebreaker Reception, Congress Luncheon, and Exhibit Hall Receptions each day, there will also be a UCA Awards Banquet.

Categories include a Lifetime Achievement Award, Outstanding Individual Award, Project of the Year Award and a 'Young Engineers in Tunneling' paper competition. With a closing date of May 9, the competition is designed to encourage young engineers to get more involved in the industry, by offering a travel and accommodation grant to attend the congress. "Based on the concept of the British Tunnelling Society's Harding Prize, three finalists will be invited to make a short presentation during the Congress Luncheon," says Hannes Lagger, who has organised the competition. The winner will receive a $1000 prize, with the runners-up each taking home $500. "The response we have had so far, both in terms of papers submitted and also sponsorship for an ongoing fund, has been fantastic," says Lagger.

For more information on NAT 2008, visit http://uca.smenet.org

TRB conference report

The Transportation Research Board (TRB) held its 86th annual conference in Washington DC on January 14-16. The tunneling industry has been represented at this event for many years under the auspices of Committee AFF60 – Tunnels and Underground Structures, Chaired by Al Brand of Mueser Rutledge Consulting.

This year, three sessions featured underground technology, including presentations on the promotion of large diameter TBMs for the excavation of highway tunnels, chaired by Fulvio Tonon of the University of Texas.

The other two sessions featured presentations and a panel discussion on risk management, chaired by Robert Goodfellow of Black & Veatch. The presenters included Herb Einstein (Update on Decision Aids for Tunneling), Gregg Sherry (UTRC Alternative Delivery Systems Document), Bill Edgerton (UCA Better Contracting Practices Manual) and Terry Mellors (ITIG Risk Management Code of Practice).

Presenters gave detailed updates on their subject areas and the speakers were then gathered in an open forum to take questions from the floor.

The debate was spirited and involved discussion of several points of interest, including how the presentations were interrelated on many major points of risk management. The sessions were well attended and positive feedback was received from attendees, participants and the organizers.

Committee AFF60 is a welcome addition to the TRB, and looks set to continue its initiative of forging closer links between all of the US underground associations.

NAT 2008 EXHIBITORS

ABC Industries	112	Everest Equipment	406	Parsons Brinckerhoff	303
Akkerman	511	Geokon	109	Phoenix Dichtungstechnik	318
American Chemical Technologies	320	Halcrow	408	Putzmeister	106
American Commercial	213	Hatch Mott MacDonald	308	The Robbins Company	418
Antraquip	402	Hayward Baker	208	Ruen Drilling	202
Atlas Copco	414	Heintzmann	404	Sandvik	214
Baroid Drilling Products	313	Herrenknecht	203	Schauenburg MAB	111
BASF	415	Ivy Steel & Wire	206	Shotcrete Technologies	114
Bekaert	410	Jacobs Associates	507	Sika	101
Boart Longyear	311	Jennmar	107	Surecrete/Nittetsu	210
Brookville Equipment	207	Layne GeoConstruction	501	Team Mixing Technologies	412
CDM	108	Leica Geosystems	115	Thunderbird Mining - Zed	409
Cellular Concrete	110	Linabond	200	TNO DIANA	116
CETCO Drilling Products	309	Lovat	403	Towill	305
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FUTURE EVENTS

Tunnel Waterproofing and Shotcrete Symposium
May 5 - 6, 2008
Newark, New Jersey

2009 RETC
June 14 - 17, 2009
Las Vegas, Nevada

2008 Beavers Award Winners

Just over 2,100 Beaver members and guests attended the 53rd Annual Golden Beavers Awards Dinner in Los Angeles, on January 18.

The **Management Award** was presented to **Tom Traylor**, CEO of Traylor Bros Inc, Evansville, Indiana. A former president of the Beavers and current Trustee of the Beavers Charitable Trust, Tom literally grew up in the construction industry. Both his father and grandfather were engineers, with Tom's father William founding Traylor Bros in 1946. Graduating from MIT with Civil Engineering degree, in 1961, Tom started his career with the family business while completing his Masters at Stanford. Beginning as a heading engineer for the Westside Tunnels project, in Seattle, Tom held positions of increasing responsibility, culminating with his appointment as President and COO in 1979. Under his guidance Traylor Bros has evolved from a regional contractor into a leading national heavy-civil organization.

Jay Carlson of Obayashi Corporation, San Francisco, California, received the **Supervision Award**. During his forty-year career, Jay has managed a wide variety of major projects. Starting as a miner, he learned the trade from the bottom up, moving rapidly up the supervisory ladder. He joined Morrison Knudsen in 1968 as a project manager and estimator, bidding tunneling and mine development projects throughout the US. Two years later, at the age of 28, Jay returned to the field as a project manager for Harrison Western on several underground projects and was eventually named the company's Tunnel Division Manager. In the thirty years since, Jay has run tunnel projects for Thyssen, SJ Groves & Sons, Dillingham, Impregilo (SA Healy), Aecon and most recently Obayashi.

The **Engineering Award** was presented to **Ron Heuer** of McHenry, Illinois. Since starting in the tunnel business Ron has been involved in over 900 tunnel projects, in the US and internationally. Studying under Ralph Peck (*T&TI*, p30), Ron earned a BSc in Civil Engineering, a Masters in Geology and a PhD in Civil Engineering (Geotechnical) at the University of Illinois, where he also went on to serve as Associate Professor of Civil Engineering from 1975-78. Since 1975 he has been a consultant on underground construction projects specializing in geotechnical engineering and engineering geology.

From left: **Bob Pope, Tom Traylor, Jay Carlson and Ron Heuer**

Bob Pope Sr, president of Mining Equipment Ltd, Durango, Colorado, received the **Service and Supply Award**. With 20 years of prior experience in the construction equipment business, Bob formed Mining Equipment in 1981 to serve the underground civil and mining industries. Under his guidance, the business has become a major global supplier of rail-mounted plant, ventilation systems and mine hoists.

Following the Awards ceremony, James Waltze, Chairman and CEO of Griffith Company, was installed as the 2008 President of the Beavers. Serving with Waltze in 2008 will be Senior Vice President Tom Draeger of Bechtel Corporation; Vice President Mike Phelps of Kiewit Corporation; and Secretary-Treasurer Ron Wells of Stacy and Witbeck Inc.

New appointments: **Halcrow** has announced its new President for North America, **Michael Della Rocca**. Della Rocca brings to Halcrow 30 years' experience in the consulting industry, having held senior executive roles at STV Group, Washington Group International, and Parsons Brinckerhoff. "Building a business in North America is an exciting opportunity, to which Halcrow is fully committed," says Della Rocca. "Halcrow has a great team of people, and I'm looking forward to working with them to take the firm to the next level, across all the sectors we work in." Also joining Halcrow, to strengthen the firm's expertise in program and construction management, is **Nazir Mir**, who was previously Vice President of the capital program department at the New York City Economic Development Corporation (NYCEDC). Nazir brings over 30 years' experience to Halcrow, having managed more than $2 billion in major transportation infrastructure and waterfront development initiatives on behalf of New York City.

Above: **Michael Della Rocca;**
Below: **Nazir Mir**

Engineering promotions: **Jacobs Associates** has recently made some significant promotions: Advancing to Principal and Vice President in late 2007, **John Stolz** has some 27 years of experience in the underground construction industry, including 18 years with Jacobs Associates. His specialties include cost estimating, specifications and contracts, disputes review and resolution, and underground design. Stolz provides technical input on nearly every project under design in the San Francisco office. **Mark Havekost**, promoted to Vice President in late 2007, has more than 14 years of experience in the underground engineering industry. His areas of expertise include design of hard rock and soft ground tunnels, microtunneling, and geotechnical engineering. Havekost manages the Portland, Oregon, office and currently serves as Project Manager for underground design of Portland's Portsmouth Force Main Tunnel. Promoted to Associate in January, **KC Carmichael** has over 20 years of experience in the construction claims industry with a focus on schedule analysis, litigation support, and exhibit preparation as part of dispute resolution. He has worked on many of the Claims Department's recent projects, including the Prado Dam in Corona, California. **Norman Joyal** joined Jacobs' San Francisco office as an Associate this January. He brings over 25 years of civil and geotechnical engineering experience. This includes 20 years as a principal owner in a geotechnical engineering firm that specialized in geotechnical investigations for trenchless projects.

From left: **John Stolz; Mark Havekost; Norman Joyal**

From left: **Tom Zarges; Steve Kesler**

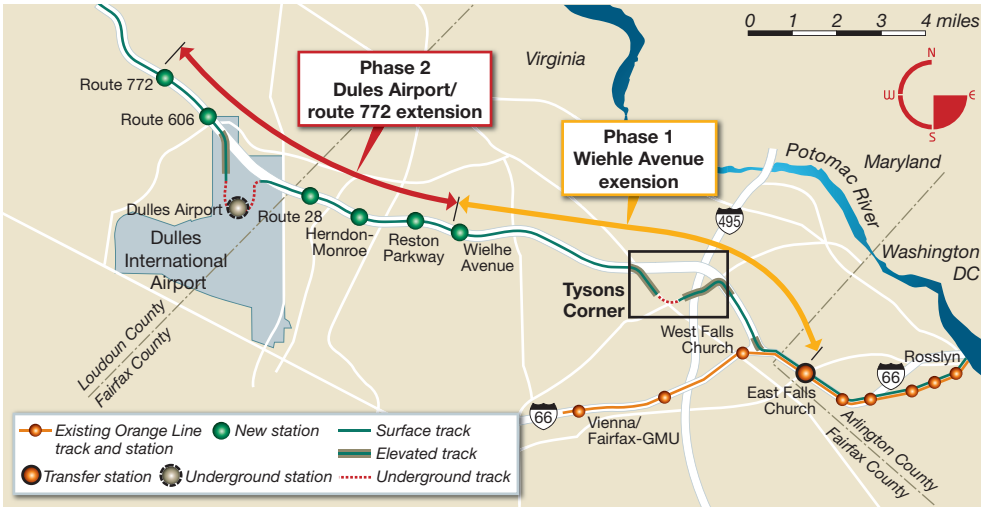
Combining forces: **URS Corporation** has named **Tom Zarges** President of its Washington Division. Zarges, who previously served as the Senior Executive Vice President, will be responsible for worldwide operations. The Washington Division is the former Washington Group International, a $4 billion global engineering, construction and management company acquired by URS in November 2007. Zarges has nearly 40 years of experience in the engineering and construction industry and has managed all of Washington Group International's operations since 2002. **Steve Kesler** has also been named as President of the Mining Business Unit of the Washington Division. Kesler previously was Executive Vice President of business development for the Mining Business Unit of Washington Group International. In his new position, Kesler, who has more than 31 years of experience in executive, management and consulting positions in the mining industry, is responsible for the overall growth and operation of the business unit.

Dulles Link saga continues

Virginia officials are rallying to try and redeem the fortunes of the 24-mile (38.5km) long Dulles Metrorail project following a less than favorable assessment by the Federal Transit Administration (FTA) last month, which inferred that it is unlikely to fund the project as it is currently structured. James Simpson, head of the FTA said in a letter dated January 24 that the first $2.7 billion phase (Fig 1) of the $5.1 billion scheme "does not appear to be a prudent investment".

Simpson's remarks were addressed to the Metropolitan Washington Airports Authority, (MWAA), the lead agency on the project. His concerns were said to stem largely from an arrangement that would see the MWAA oversee design and construction, but then hand the scheme over to the Washington Metropolitan Area Transit Administration (WMATA) for operation of the system.

On February 1, James Bennett, President and Chief Executive Officer for MWAA, replied to Simpson's letter in an attempt to affirm that the project deserved a rating qualifying it for federal funding, which will allow it to move into final design. This response addressed each major identified area of concern: Project Cost Effectiveness; Financial Plan; and, by far the most substantial parts of the letter, Risks and Uncertainties associated with (i) capacity of the MWAA and the project team to manage the project; (ii) the design-build contract; (iii) the ability of WMATA to finance its ongoing system-wide capital needs and maintain the project once constructed.



Above: **Fig 1 - The Dulles Metrorail project, showing the controversial Tysons Corner viaduct option**

Bennett's reply also stressed the need to maintain an open dialogue to work through any issues that were giving cause for concern. On the same day, Virginia Governor, Timothy Kaine, addressed a letter to Mary Peters, Secretary of Transportation, to add his support to the project.

Newspaper reports stated that as a further development to the negative FTA announcement, Republican Delegate Joe May inserted a provision in the House version of the 2008-10 budget at the end of February, which instructs the Virginia Department of Transportation to "re-solicit competitive proposals" for the scheme. Kaine has stated he will oppose any such efforts to force the state to re-bid the work, warning that re-bidding could send a "very damaging message to other potential bidders" for state projects. At a meeting of House and Senate budget negotiators, Kaine was reported to have said that one of his top priorities was to have May's language removed.

The current furor could provide a spark of hope for proponents of a tunneled alternative for the Tysons Corner district (*T&TNA*, May 2007, p13 & 18), who have been seeking to have the current elevated-track portion of the Phase 1 design replaced with a 3.5-mile long tunnel along the same alignment. Scott Monett, president of advocate group Tysons Tunnel said: "It is time to put the current and troubled Dulles Metrorail proposal in the past." He maintained: "The truth is that the current proposal is flawed, overpriced, too controversial and faces too many other challenges."

For more on the ongoing situation visit: www.dullesmetro.com and www.tysonstunnel.com ■

Calgary awarded

Ribs and lagging behind a full face tunneling shield is the lowest of three bid proposals for two new sewer siphon tunnels under the Bow River in the City of Calgary, Alberta, Canada. Bids for microtunneling and pipejacking options were higher, but a deep channel in the gravel beds presents a challenge for Dibco Underground Ltd, the Toronto-based specialist contractor awarded the job.

The 15th Street SE siphon project is needed by the City to increase flow capacity across the river to the treatment plant. Designed for the City by Associated Engineering Ltd, the siphon comprises two separate pipelines of 5ft (1.5m) diameter. "We need one pipeline now," explained City Engineer Gregory Kozhushner. "The second is being installed as part of this project to meet demand through the next 35-50 years." Dibco has selected to complete two 8ft (2.4m) diameter tunnels one above the other.

With the lowest bid, at $Can14 million, Dibco has selected to use an open TBM to excavate the two 1,000ft (300m) long tunnels through the claystone, siltstone, sandstone bedrock beneath the gravels of the river bed between two 100ft (35m) deep access shafts. The siphons will comprise of 5ft (1.5m) diameter Hobas pipelines backfilled into the primary ribs and lagging support of the tunnels and will connect to the existing sewer network via short sections of open cut work, completed under a separate contract. ■

Leadville flood thread prompts action

In Denver, Federal officials are reported to be discussing plans to pump from the watertable near a blocked mine drainage adit to ease pressure from over a billion gallons of trapped water, which some fear could flood through the historic mining town of Leadville.

Pumps will be installed at an abandoned shaft while a plan is developed to drill into the blocked tunnel and pump out the backed-up water. The 3.4km long tunnel normally acts as a collector for old mine workings east of the town and deposits the flows into the Arkansas River north of the town. The tunnel is believed to be at least partially blocked by ground falls.

The federal Bureau of Reclamation acquired the tunnel in 1959 and is said to have stated there is no imminent danger. It is carrying out a study on the blockage and a draft report on its findings is due in July. Nonetheless, regional authority, Lake County, declared a state of emergency in fear that this winter's above-average snowpack could cause a catastrophic blowout.

The Environmental Protection Agency (EPA) developed a $4.5 million plan to seal the tunnel, drill a shaft into it, and pump the water to the Bureau of Reclamation's treatment plant. ■