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Photo courtesy Whistler Tourism/Steve Rogers

LET THE GAMES BEGIN!

Surveying the Olympic Venues

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By Katherine Gordon

On July 2, 2003, when Brian Brown heard the news that his hometown of Whistler, British Columbia had won the 2010 Olympic and Paralympic Winter Games bid, there was more than one reason to celebrate. A passionate skier, the land surveyor hadn't missed a season at local ski resort Whistler/Blackcomb in nearly 50 years. He couldn't think of a better place in the world to hold the 2010 Games.

Brown also knew a great deal of surveying work would need to be done for the numerous new venues, including the Nordic ski tracks and ski jump at Whistler Olympic Park, a sliding center, and an athletes' village. "To say that it would be a lot of work is quite the understatement," laughs Brown. "It was going to be a Herculean task. It wasn't just the venues required, there was also all the infrastructure to support the events—new roads and bridges, pedestrian access to the competition sites, a new lift, and even a new sewage treatment plant."

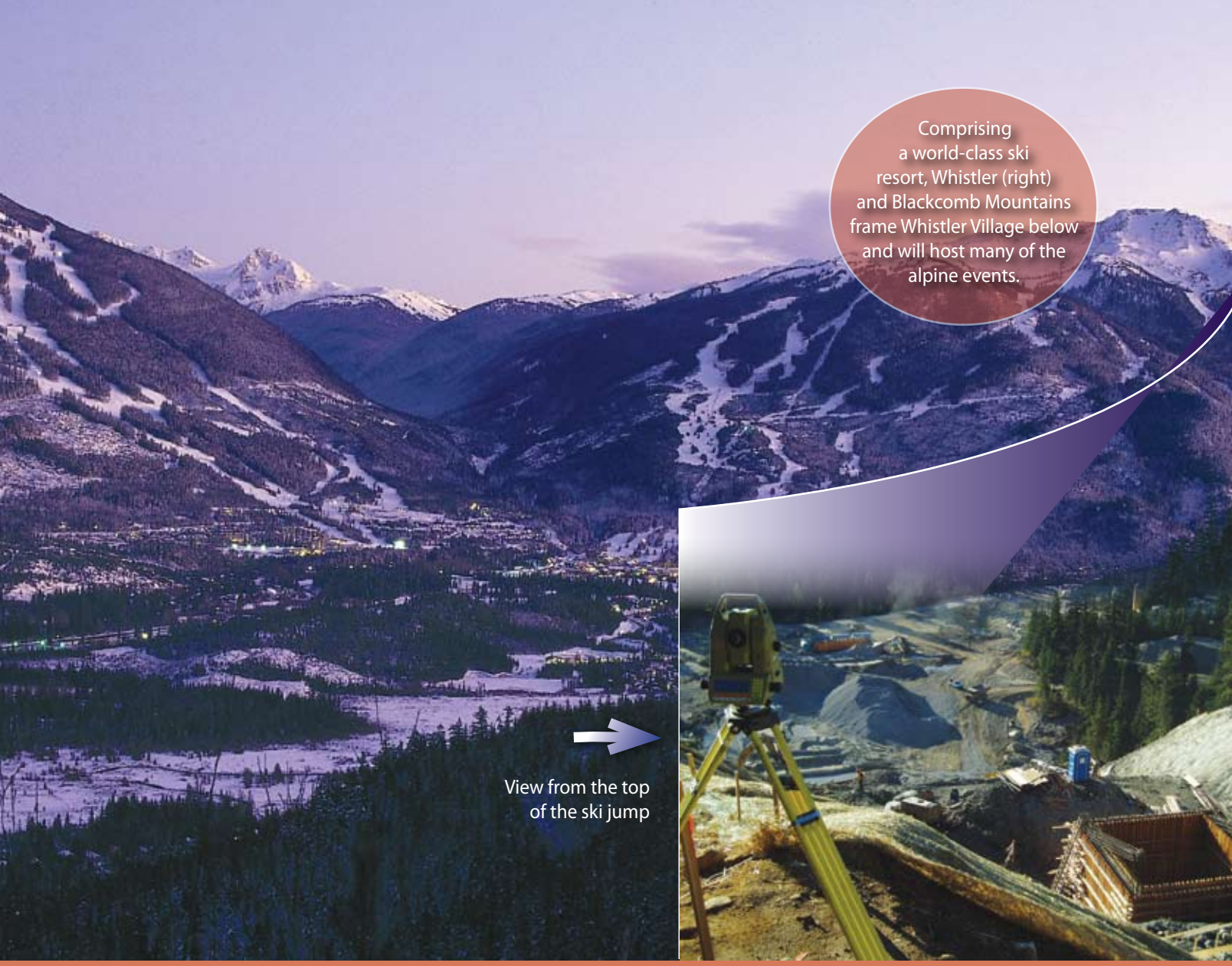
Brown knew that the Vancouver Organizing Committee for the 2010 Olympic and Paralympic Winter Games, or VANOC, had to start work from scratch on constructing almost every venue except the downhill sites, which are located in an existing ski area (even those required realignment work for environmental impact mitigation and to improve their safety features). VANOC would also have to get the work done on challenging terrain and in equally challenging circumstances.

Whistler, located in the heart of British Columbia's Coast Mountain Range, is a world-renowned ski area for good reason, where skiers enjoy steep slopes and long runs on Whistler and Blackcomb Mountains at both low and high altitude. Only an hour-and-a-half's drive from Vancouver, the area also has spectacular scenery, boasting thickly-forested hills liberally endowed with tumbling mountain creeks and waterfalls.

Getting surveying and construction equipment in and out of the sites would prove no simple task. Working in dense bush and on slopes steep enough for Olympic competition wouldn't be easy either. On top of everything else, winter is a long season at Whistler, constraining construction activity as a result of both weather and intense visitor activity. The 10,000-strong town quadruples in size during peak ski season, and accommodation for large crews becomes difficult to arrange.

Construction workers set foundations for the luge track near the finish line.

The Whistler Sliding Centre hosts luge, bobsled, and skeleton races.



Comprising a world-class ski resort, Whistler (right) and Blackcomb Mountains frame Whistler Village below and will host many of the alpine events.

View from the top of the ski jump

With steep mountains and exacting standards, surveying for the 2010 Olympic and Paralympic Winter Games venues in Whistler, British Columbia proved no ordinary job.

Brown was up for the challenge, but he knew he couldn't do it alone. He immediately called Jim Christie, manager of engineering surveys for McElhanney Consulting Services in Vancouver. "We had worked together many times before in the Whistler area," says Brown. "I knew we'd make a good team for the bid." Christie, also a land surveyor, agrees. "McElhanney definitely wanted to get involved."

Celebrating its centenary in 2010, McElhanney Consulting and its sister company McElhanney Land Surveying comprise a surveying, mapping, and engineering partnership with more than 800 staff members in branch offices throughout western Canada. When Brown called Christie to see if he would be interested, McElhanney Consulting was about to undertake extensive surveying work for improvements to the Sea-to-Sky Highway, the main access route to Whistler from Vancouver. Christie jumped on board immediately.

"We thought that combining Brian's local knowledge and connections with our extensive resources and experience would be ideal," he recalls. "McElhanney has also been sponsoring two Canadian athletes, Nordic skier Sara Renner and alpine skier and Paralympian Matt Hallat, so this felt like another good fit for us. Besides," adds Christie, "it just looked like good fun."

Start with the Bidding

Before the fun, however, came the bidding process. Starting in 2003, VANOC issued requests-for-proposals for each phase of construction of every venue, including the necessary surveying components. "I knew accuracy was going to be an important component of the bids—the venues have to meet Olympic qualifying measurements and have to be 'homologated.' That's a new word we learned along the way!"

says Christie. Homologaters, as it turns out, are the people who check and certify the official specifications of every venue for consistency with other sporting venues on the international circuit, so record-breaking results can be measured accurately and fairly against previous records set elsewhere in the world. Getting measurements absolutely accurate was therefore essential.

But VANOC also simply didn't have time for mistakes or repetition. With short windows of opportunity for construction and an ambitious schedule to have the venues built in time for the competition, both VANOC and the Whistler 2020 Corporation, which owns the Athletes' Village, wanted detailed surveys of the venues completed in fast timelines.

"They couldn't do the Athletes' Village like a typical development project, for example," says Christie. "They wanted all the detailed survey information up front, because they were under such huge time pressure for completion. They needed to be able to make design decisions as they went along, with all the information at hand, because they knew they wouldn't have time to go back and do more surveys." The pressure was on for the Brown and McElhanney team to get everything right first time.

300 crew days had to be squeezed into 7 weeks, including weekends, so we could get it done in time.

The partners planned carefully to ensure they could meet the challenge, but that was easier said than done in some cases. They had only ten weeks from start to finish to do detailed topographical surveys, drawings, and quality control checks and deliver final plans for the Athletes' Village site, for example. The area covered 263 acres of rough, irregular terrain, dense with trees and heavy underbrush and populated by numerous resident black bears, which posed a constant hazard to unwary crews. "That was very challenging," states Christie. "Winter was coming—we ended up finishing the job in snow. Basically, 300 crew days had to be squeezed into 7 weeks, including weekends, so we could get it done in time. We used as many as ten crews between us."

Tying the survey into control that had been done for the Sea-to-Sky Highway, the crews used total stations and conventional methods for most of that part of the project, using GPS where possible around the clearer edges of the site. Brown and Christie delivered digital plans to their client on time. "Another reason Whistler 2020 Corporation picked us for that job," adds Christie, "is that they liked the environmentally friendly option of using different survey methodologies and equipment to minimize cutting lines through the trees, as well as providing digital plans rather than paper, and we were happy to accommodate that."

While providing topography for the Nordic ski trails and locating their route with GPS was relatively straightforward by comparison, other venues offered scenarios as challenging as that of the Athletes' Village. Christie and Brown also had crews on the ski jump venue, including the ramp and the landing area. "It was an extremely steep slope," says Brown. "Just to stand straight you needed one leg longer than the other! And it was physically challenging moving constantly up and down the slope. We were also dealing with a construction site, of course, so it was hard to keep a clear line of sight. Wherever we went on site we continually had to adapt to the terrain and obstacles in the way."

The survey crews also had to set control far more often than would be required on flat terrain. "There were no simple traverses on this project," Brown explains. The control network repeatedly had to be changed due to the high level of construction activity and the requirement to preserve trees next to the venue to shade it from the warmth of the midday sun.

"And of course, the steeper the ground, the greater the combination of distance and angles, the more room for error," says Christie. "We used a combination of precise conventional equipment consisting of a Leica DNA 03 level with invar rods and a Leica TCA 2003

A Whistler native, Brian Brown relished the opportunity to survey the Olympic venues.

John Lunn, project manager and land-surveyor-in-training, performs a topographic survey in the snow using RTK GPS.

Surveyor Stuart Mastermann at the starting house for the luge track

total station with precise tribrachs for setting the control and conducting the quality control checks during the construction of the facility," he adds. On top of everything else, the location for the ski jump was moved twice before it was finalized, to improve access and visibility.

Sled Track Has Its Challenges

Similar challenges were involved with the track at the Whistler Sliding Centre, used for bobsleigh, skeleton, and luge races. Brown and Christie kept two crews busy much of the time on topographical surveys of the slope, construction control, and quality control of the 1,715-meter (5,626-foot) track. Again using Leica TCA 2003 total stations, Brown and Christie focused on individual spots on a mocked-up fully-finished version of the track to ensure the grade was within a tolerance of three millimeters (less than 1/8 of an inch) of specifications.

"The track can't go out of grade," explains Christie, "for the simple reason that you can't have sleighs bouncing out of it!" A flatness survey had to be done to make sure there were no gaps or imperfections on the concrete. "They basically use a flat pipe, moving it up and down the surface of the track to see if it hits any air pockets. The teams practice in the summer on wheels," he adds, "so any bumps in the concrete could be a huge safety issue."

Bumps might not be the only safety issue for the Olympic teams, however. Brown recalls, chuckling, the first runs down the finished sliding track. "They got a call at the top saying there was a black bear hanging over the edge watching the sleighs go by," he recalls. "Good thing he wasn't fast enough to catch himself an athlete, though!" Neither Brown nor Christie have been down the track themselves, but not because they are worried about bears. "No thanks!" exclaims Christie. "Just walking down the slope next to it was adventure enough," agrees Brown, although he says he is tempted to have a go with one of the professionals if he ever gets a chance.

It has been a long but rewarding experience for both men, who have devoted several years to the Winter Games project. Brown began work as early as fall 2003 on a photo survey for the ski jump site and was still finalizing legal surveys for the Athletes' Village in December 2009. In addition to all the Whistler venues, including the Nordic ski trails, Whistler Media Centre, and Medals Plaza, between their two companies they also worked on the snowboarding venue at Cypress Mountain in West Vancouver and the curling venues and opening/closing ceremony venue at B.C. Place in Vancouver.

In the meantime, both men have tickets to events at the Winter Games. Brown is looking forward to the mens' bobsleigh, the men's and women's alpine giant slaloms, and the women's downhill, and Christie managed to score tickets to the men's gold-medal hockey game and closing ceremonies. "It's going to be great watching the athletes in the finished venues," says Christie. "It feels like a huge accomplishment that is going to mean a great deal to a lot of people all over the world."

Brown concurs. "I've skied those slopes at Whistler so many times over the years," he reminisces. "With all the improvements, Whistler/Blackcomb is rated among the top three downhill courses in the world. Being involved in the survey work has given that an extra dimension I am really going to enjoy every time I'm out there."

In the surveying work required for the Olympics, both Brown and McElhanney extensively used British Columbia-based MicroSurvey Software Inc.'s MicroSurvey CAD software, versions 2004 to 2010. Brown moved to MicroSurvey when the company started working with McElhanney on the joint Olympic projects, to facilitate ease of data sharing with McElhanney. Brown comments: "It really simplified working together."

Katherine Gordon *is a freelance writer and author based in Gabriola Island, British Columbia, Canada. Her award-winning history of land surveying in British Columbia,* Made to Measure, *was published by Sono Nis Press in 2006 (*www.sononis.com*).*