



# SRK 2

## THE NEW VENTURE

Steffen, Robertson and Kirsten began their working partnership with each man already fairly busy — they moved what they were doing on their own into a shared environment and planned to grow as a result of synergy. Each brought clients into the partnership. Although the success of a specialised geotechnical services firm might not be assured, the men and their expertise were in demand from the moment they set up shop.

**O**n the eve of starting with SRK in December 1973, Kirsten had been asked by the Rand Water Board (Rand Water) to assist with the repair of a 2.1-metre-diameter segmented concrete pipeline that had failed under pressure and washed away part of the highway in Edenvale.

The contract involved redesigning all the anchor blocks over several kilometres of pipeline, as well as redesigning the concrete spigot-and-socket joints at the bends. The work became an SRK project and lasted for months, and Rand Water later sold the patent rights for the joints Kirsten designed to the French pipe supplier. The success of the project ensured SRK's relationship with Rand Water would continue for years.

“When we were in the office, we invariably walked next door and discussed our projects with each other,” says Steffen, who had tailings and similar work on the go. “We sought out each other's advice — should I do this, or that — we bounced ideas off the other partners. Andy was on a job site most of the time, so we didn't see him a lot. But we got together every Friday over beers and told each other what we'd been up to. It was the one time in the week we were sure of being able to meet. We were finding our feet and it took us that first year to get some of the larger projects that allowed us to build up the office and develop our own in-house relationship. As the office grew, our very distinct and

different areas of business bled into each other and much more cross-pollination took place. It became a much more homogeneous operation.”

Steffen and Robertson left the day-to-day details of managing the office to Kirsten. “It somehow just fell to me to hire the secretary, the first accountant and the support staff we needed as the practice grew,” he recalls.

Kirsten was fastidious. Robertson didn't have the patience for such quotidian demands and Steffen's personality had already marked him as the firm's figurehead.

John Robbertze, who had been working with Robertson at Frankipile and filling in on weekends, started as a full-time draftsman a few months after SRK was established — the first or second employee depending on whom you ask. Ken Schwartz arrived the same day as Robbertze and liked to quip: “I think I held the door for John, that's why he was the first employee.”

Born in 1948 in the western Transvaal, in the picturesque hamlet of Lichtenburg, Schwartz was another Wits graduate who had studied under Jennings



Ken Schwartz on-site with Professor J. E. Jennings in 1978.

## 1969 – 1974

### Geophysical Instruments

In 1969, Robertson forms Geophysical Instrumentation (Pty) Ltd. – the 1st venture to fuel his entrepreneurial drive



### SRK Is Born

Steffen, Robertson and Kirsten is formed and opens its first office in Europa House in Johannesburg

### Edenvale Pipeline

One of SRK's first major projects for Rand Water Board, who would become an important long-term client



### John Robbertze

Hired as draftsman and SRK's first full-time employee only a few months after the company is formed



### Ken Schwartz

Had he not held the door open for Robbertze, Ken would have been SRK's first employee

and Steffen. He played inter-faculty rugby against Kirsten, who was with the mining engineers. After graduation, he worked for the Johannesburg City Council engineering department for a few years before joining Arup in their geotechnical division.

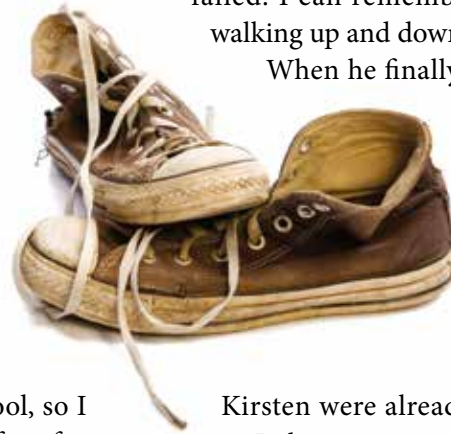
“In early 1974, I saw an advertisement that Oskar, Andy and Hendrik were starting up,” Schwartz says. “I joined with them on the first of April 1974 — April Fool’s Day. Andy later told me he’d started off his practice (GEMS) on the first of April the previous year. April Fool’s Day was a good omen.”

Dirk van Zyl was hired at almost the same time. Born in Vryburg, he grew up on a farm about 90 kilometres west of Johannesburg.

“I attended a two-room schoolhouse where there were about 34 students from first grade to seventh grade,” van Zyl says. “My biggest stress growing up as a kid was waiting for the end of school, so I could stop wearing shoes and go barefoot for the summer.”

Van Zyl earned a civil engineering degree from the University of Pretoria before joining the Council for Scientific and Industrial Research. He was working there in early 1974 when he attended a soil mechanics course taught by Robertson. The two men hit it off.

“They had just formed SRK, and I thought it would be nice to get into that end of the practice, so after thinking about it for a day or so, I picked up the phone and called Andy,” van Zyl says. “We had an interview, and they were so busy that initially I started working on weekends with Hendrik in the field on the Rand Water project before I even officially booked into the office for Monday to Friday work. I spent the weekends inspecting the seven-foot-diameter pipes that had failed. I can remember spending many Saturdays walking up and down inside the pipeline.”



When he finally arrived to work in the office, aside from the three principals, van Zyl found the secretary, Robbertze and Schwartz.

“It was dynamic,” van Zyl explains. “New things were happening all the time. Steffen, Robertson and

Kirsten were already well known in the industry — Robertson not so much as Steffen in the mining industry, certainly, but he was very well established on the civil side. And they maintained really close ties with the other existing general consulting firms rather than treating them as competitors.”

The partners also constantly emphasised the need to be at the forefront of technology.

**No kidding ...**

**April 1, 1973:** A. Robertson opens first office.

**April 1, 1974:** Ken Schwartz joins SRK.

**April 1, 1974:** John Robbertze joins SRK.

**April 1, 1978:** SRK Canada would open.

**April 1, 2009:** SRK Sweden would open.



**Dirk van Zyl**

SRK was so busy, Dirk was set to work immediately following his interview without a chance to sign in



**John Weaver**

SRK’s first engineering geologist. Jennings always insisted one accompany him on site visits

**Malawi Rail Project**

SRK hired for geotechnical work on a proposed 150-mile rail line from the capital Lilongwe to Zambia

**Bafokeng**

Following the 1974 tailings pond breach, SRK is retained to design and monitor the replacement dam



Oskar Steffen and Richard Connelly flanked by clients en route to Dorowa mine in Rhodesia (now Zimbabwe). During the war years of the early '80s, weaponry was a requirement for travel!

“Even that first year, academics from England or elsewhere who knew Jennings would come through the office and give a seminar,” van Zyl says. “Right from the start, SRK decided it was going to take the lead and really push the envelope from the technical perspective, and we did.”

After his project with Kirsten, van Zyl worked with Steffen.

“That’s when I got to work on my first tailings project. I saw what it was about and I thought, ‘Wow! This is what I want to do the rest of my life.’”

There was a lot of wow-factor in some of the early projects SRK took on — their scope, their impacts, their remote and difficult locations, their staggering size.

John Weaver was the first engineering geologist to join SRK. Jennings always insisted on an engineering geologist accompanying him on site

visits and advised all geotechnical engineers to do the same. His collaboration over many years with

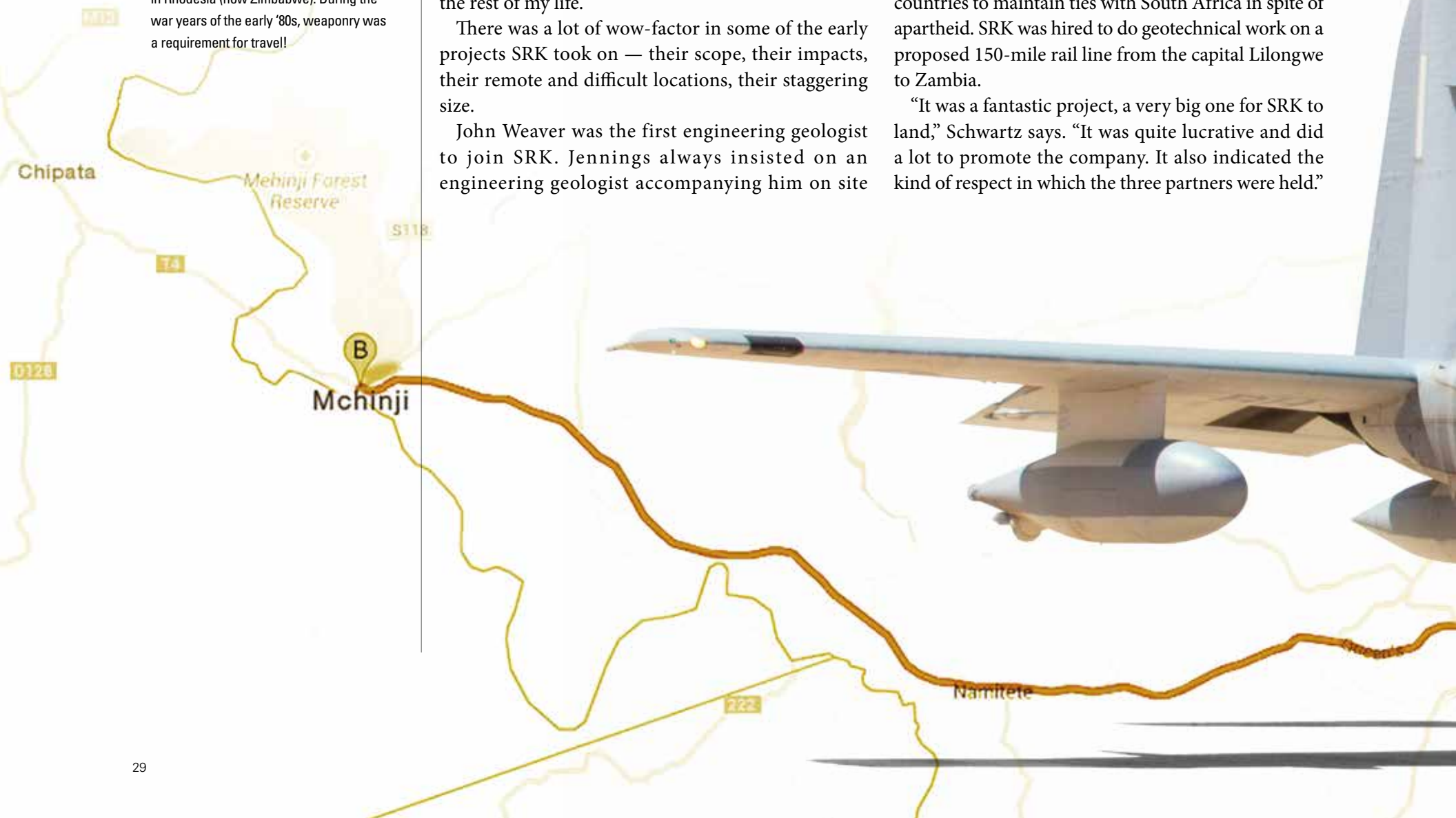
Tony Brink — who also taught at Wits and wrote the definitive four-book series Engineering Geology of Southern Africa — was testament to that. The SRK partners agreed with that approach.

Later that first year, Robertson won a contract in Malawi (formerly the landlocked British-administered Nyasaland, surrounded by Zambia,

Tanzania and Mozambique), one of the few African countries to maintain ties with South Africa in spite of apartheid. SRK was hired to do geotechnical work on a proposed 150-mile rail line from the capital Lilongwe to Zambia.

“It was a fantastic project, a very big one for SRK to land,” Schwartz says. “It was quite lucrative and did a lot to promote the company. It also indicated the kind of respect in which the three partners were held.”

**SCHWARTZ:**  
**“IT WAS A FANTASTIC PROJECT, A VERY BIG ONE FOR SRK TO LAND”**



That October, Schwartz headed into the remote Malawi wilderness to begin surveying.

Vehicles were in short supply, so SRK bought a Toyota Landcruiser, which Schwartz and John Davies, a young Welsh engineering geologist and recent SRK recruit, drove to Lilongwe through Rhodesia (now

Zimbabwe) and Mozambique.

The drive was an unforgettable experience through some of the most rugged bush.

“The project was certainly a milestone in my career,” Schwartz recalls, “and it was a pretty big milestone in SRK’s life as well.”

The bush war had just escalated in Rhodesia and another war was just ending in Mozambique — this prevented SRK from trucking in drilling equipment, which was instead transported in a hired Hercules transport plane.

#### Planes, trains and automobiles

The terrain and politics of southern Africa in the '70s posed major logistical challenges.

Here a Mercedes truck, two drilling rigs and trailers are loaded into a Hercules at Jan Smuts airport in October 1974 to go to Malawi for the site investigation of the proposed Lilongwe-Mchinji railway line.



There were really no specialized mining consultancies in South Africa in those days. The mines had their own technical people and rarely used consultants — the near opposite of today where companies rely on consultants for technical expertise so that staff can concentrate on the operations. There also were not many open-pit mines in southern Africa and few people had the knowledge of soil and rock mechanics together with the technical expertise that SRK possessed. Their skill set differentiated the company and was a huge advantage.

“We were very lucky,” Robertson says of that first year. “I think we looked like we were too young to sue. South Africa wasn’t a very litigious society and provided you were enthusiastic and honest, there weren’t too many setbacks. We had good clients — the big mining houses included — and we offered cutting-edge technology.”

In short order, the contracts started to flow in, and with each new contract the company brought in more engineers and specialists. They relied on personal contacts and recommendations from

Jennings. With their involvement at the university and Jennings as their mentor, promising students were quickly flagged. The first professional hires were much like Schwartz and van Zyl — most were friends, colleagues from a job or former students; all driven, like-minded engineers who believed in working hard and playing hard.

The professional staff who came aboard over those first few years — Dirk van Zyl, Ken Schwartz, Jack Caldwell, Richard Connelly, Rob Dorey, Rick Skelton, Brian

Middleton, Mike Smith and Dick Stacey — were a critical first generation who embodied the vision of Steffen, Robertson and Kirsten.

**ROBERTSON:  
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**1975 – 1976**



**Mike Smith**

Mike Smith's construction experience is a critical addition to SRK's early service offering



**Richard Connelly**

Richard Connelly is the first of a cadre of talented British ex-pat professionals to join SRK South Africa



**Rob Dorey**

Rob's ability to come at a challenge from an innovative — often unorthodox — direction gets him hired



**Dick Stacey**

Develops rock fracture criterion for Gold Fields; co-authors rock mechanics handbook with Chris Page



**Jack Caldwell**

Joins SRK in 1976 and starts work with the design of the Bafokeng dam replacement

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AND UNDERSCORED THE NEED FOR  
ITS SPECIALISED INSIGHT.

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## The Bafokeng Disaster

The rolling grassland inhabited by the Royal Bafokeng Nation, “the people of the Dew,” lies about 150 kilometres northwest of Johannesburg. Tribal lore holds that the Bafokeng settled in the Rustenburg Valley, a dry bushveld, because of its heavy overnight dew, a proverbial promise of fertility and prosperity. The main occupation was farming until the discovery in 1924 of the Merensky Reef, an extensive mineralized zone up to a metre thick that contained one of the richest platinum finds ever.

The Impala Platinum Mine began operating in July 1969, producing 100,000 ounces of platinum a year. Production was stoked by the booming Japanese jewelry market and, more important, the introduction of global vehicle-

emission laws that mandated the use of platinum-

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square, and when the outer slope gave way it unleashed a tsunami of muddy sludge. The tailings flowed across the landscape, scouring everything in their path — buildings and equipment were swept away, the shaft collar was engulfed, and 13 workers were trapped and drowned. The wave of slurry cascaded down the Kwa-Leragane River valley. Four kilometres from the breach, the spreading fan was nearly 1 kilometre across and 10 metres deep. The Vaalkop Dam downstream was clogged with sediment.

“Jennings was immediately called in by Union Corporation, which owned Impala,” Steffen says, “because he was the expert

in the country. He took me along, saying, ‘Let’s go have a look at this. I have no idea what’s happened.’”

They were overwhelmed by the devastation.

“It was a terrible scene,” says Steffen, who was on an annual retainer as a consultant to the builder, Fraser Alexander, South Africa’s biggest tailings contractor. He was responsible for reviewing their dams and providing technical advice. He couldn’t believe what he saw.

“We got there, the shaft was underwater and we knew there were people down below drowned. It was horrible. The whole valley was covered in tailings. It was a disaster.”

The tragedy underscored the previously unrecognized risk that tailings ponds and dams presented, and the need for geotechnical expertise. There were only rudimentary guidelines on their construction, and there were no requirements for regular inspections or maintenance.

### THE WEEKLY MAIL

South Africa's oldest quality news source | November 12, 1974 | Johannesburg

#### British Lions South African 1974 Tour

There have been thousands of flights to rugby over the years, but few match the excitement of a return flight by the British Lions on their tour of South Africa in 1974.

The first of a series of public events to celebrate the tour will be a performance by the British Lions on the 11th of November. It will be held at the Vaalkop Dam, the site of the Bafokeng disaster.

The British Lions will be accompanied by a band of 100 members of the South African Air Force. The band will perform at the Vaalkop Dam, the site of the Bafokeng disaster.

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## Bafokeng Platinum Mine Disaster Leaves 13 Dead

By David Ward

On the morning of 11 November, 1974, the southern end of the No. 1 tailings dam at Bafokeng failed. The liquid tailings flowed through the breach in the dam wall, engulfed a central shaft of the mine, and flowed on down the valley of the Kwa-Leragane River. The Royal Bafokeng mine, one of the richest platinum finds ever, was destroyed. Thirteen men were killed. The disaster was the worst mining disaster in South African history.



The flood of mudflowed down the valley of the Kwa-Leragane River, and on down the valley of the Kwa-Leragane River. The Royal Bafokeng mine, one of the richest platinum finds ever, was destroyed. Thirteen men were killed. The disaster was the worst mining disaster in South African history.

The British Lions will be accompanied by a band of 100 members of the South African Air Force. The band will perform at the Vaalkop Dam, the site of the Bafokeng disaster.



The volume of material that spilled from the Bafokeng tailings dam was approximately 3,000,000 m<sup>3</sup>.

Or enough to deposit a layer of heavy muck one foot deep over the entire city of Paris – that's streets, plazas, rooftops, parks, the river Seine, Notre Dame – everything – the whole area occupied by the city of Paris.

Initially, no one could understand why the Bafokeng dam had collapsed. Some speculated that a leak occurred along a sandy layer in the wall, initiating “piping” erosion, the kind of seepage that often undermines levees; some insisted that a bulldozer sent to raise the perimeter wall caused vibration-induced

liquefaction; still others believed that the bulldozer compressed the soft sand of the wall too much, allowing the water to spill over the top, triggering the breach.

Union Corporation asked Jennings and SRK to determine the cause.

## Understanding Bafokeng

The mid-1970s were days of extreme security fears in South Africa as racial tensions within the country mounted. The mining houses were fortified. Armed security guards met the SRK consulting team. Each person’s name and affiliation were slowly and solemnly recorded in a black book by the officers; drawings were unrolled and inspected; if someone made the mistake of bringing a briefcase, it was opened, its contents unceremoniously dumped and each individual item scrutinised. Only then would the guards summon the person the team had come to see and allow them to be marched to the allotted meeting room.

Blackie Swart, the head mechanical consulting engineer for Union Corporation, liked to meet

in the conference hall — a vast, wood-paneled room of solemn silence — to discuss the Bafokeng job. Through tall windows, you could see the sun sparkle off the glass of adjacent buildings. In the middle of the room stood a long, ornate conference table of imposing bulk. But there were no chairs. Meetings proceeded quickly, with consultants, engineers and managers standing around the table, rolling out drawings as needed, pointing to this or that, gesticulating as they spoke. There was no board to sketch on; everyone was expected to come prepared with acceptable drawings. Swart made decisions rapidly, issued instructions with equal

speed, and quickly dispatched the consultants with new orders.

Steffen was perfect in these meetings: calm, confident, fast with concepts and soothing when Swart raised budget questions — for the costs had spiraled quickly out of control. Steffen never cared a whit

about the budget. It could always be increased, in his view, or hours trimmed from the bill. Get the right answer was Steffen’s only true mantra.

Back at the office, he emphasised to the team that the only thing that counted was the right solution.

“We did a whole lot of investigation work to try and discover why suddenly the whole thing failed after we had been using the same technology for so many years without incident.”

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The site data was collected by Jack Caldwell, Jennings’s colleague at Wits, who had lectured Schwartz and was a friend of SRK’s founding partners. Mike Smith, a Wits graduate, was hired in January 1975 to help. Smith had spent three years in construction before bumping into his old professor, Steffen.

“I was very lucky to be in the right place at the right time,” says Smith, also a South African farm boy. “Oskar was a good teacher and he was down-to-earth — you didn’t have to be a PhD candidate to work with him. What he really valued in me was my construction experience.”



Checking passbooks in the mid-'70s was as commonplace as the security obstacle course you had to run to enter the South African mining houses.

Steffen and Jennings spent months in the soils lab building models and testing theories. They were convinced the failure was related to the layering of material as it had been deposited in the construction process. They believed there was a seepage path somewhere that allowed water to infiltrate and compromise the dam wall.

“We discovered that it was a piping failure,” Steffen says. “There was a permeable layer of very fine material that allowed the water to begin leaking out of the sidewall, causing local erosion or piping. It worked its way back from the sidewall until it collapsed the wall. But it took quite a few months before we could

determine that without any doubt. Piping had not been identified as a problem in the past.”

In hindsight, the absence of maintenance programs, emergency planning and the other components of today’s best practices is obvious. The dam collapse tragically exposed safety risks that hadn’t been anticipated. As a result, the management of such facilities was changed forever. The disaster was considered “an act of God” by the coroner’s inquest — but it was understood to be the product of a widely used technology whose long-term effects and hazards had been only partially understood.



For continuity of flow between sections

$$v_0 A_0 = v_1 A_1.$$

# PROJECT: Bafokeng Re-engineered

**CLIENT:** Impala Platinum Limited



**SCOPE:** Mining of the Bafokeng deposit, 15 kilometres north of Rustenburg in the vicinity of Phokeng, began in 1968, and construction of the first tailings disposal facility started the same year. In 1975, SRK was appointed to design a new tailings impoundment to satisfy all statutory requirements after the notorious catastrophic collapse of the initial tailings dam. Impala decided that the new dam had to be designed, operated and monitored in a way that the probability of loss of life due to a dam failure was less than one

in 1 million. SRK was involved in the detailed design of the entire facility, including flow-slide analyses and risk-based design; the preparation of tender documents and specifications; site supervision and construction management. The dam was designed to be operational until 2040. SRK has also been involved in ongoing monitoring of the facility, including the preparation of detailed quarterly reports; groundwater and pollution-control monitoring; and rehabilitation and revegetation program design and management.

**OUTCOME:** In 1977, the design of the Tailings Dam 4 complex was completed, and in 1978, building of the complex was initiated with the construction of Buttress Dams 5A, 5B and 5C. Deposition on Dam 4 began in 1981, and SRK was appointed to monitor the facility.

In 2003, during a routine geotechnical investigation, hard layers were encountered within the tailings facility. Two subsequent investigations, in 2004 and 2005, concluded that this was due to the high concentration of



slag material at these levels. The main concern was whether the hard layers might affect the stability of the structure. An extensive geotechnical investigation was then carried out that provided valuable insight into the behaviour of the tailings dam and concluded the hard layers did not affect the overall stability of the structure.

The raising of the two 5.5-metre-diameter reinforced concrete penstock towers to 80 metres (from 40 metres) was completed during 2008. These towers are currently in full operation.

Visual inspections of the two penstock pipelines have been carried out since 2005, and revealed some deterioration in both. After nearly 30 years in service, it was decided that remedial measures were needed. Work began first on the northern pipeline, a 2,000-metre-long concrete pipeline under 70 metres of tailings with an internal diameter measuring 1.26 metres with access only from its ends (tower and outlet works). Design and specification commenced in 2011. The design specified an internal

sleeve of epoxy-coated steel cylinder sections, 1.1 metres in diameter and 10 millimetres thick, with the annulus between the concrete and steel grouted to form a composite structure that could sustain the loads for the design life and beyond. Attention to detail during construction was critical and complicated by access from the outlet end only.

Construction began in early 2012 and the work was successfully completed by March 2013. The reconstruction is a unique feat of engineering. The final solution

proposed by the contractor — Stefanutti Stocks — was to insert 10-metre-long steel cylinder sections into the concrete pipe using a specially designed motorised wheeled buggy. Initially only three or four sections could be installed per day, but with time, the distance decreased and the frequency increased.

In 2013, Impala opted to construct a new dam and gave SRK responsibility for its design, though construction at the moment is deferred.





The staggering size of many modern tailings storage facilities qualifies them for that exclusive list of man-made structures visible from space. They share many similar characteristics with heap leach facilities – the modern versions of the gold cyanidation operations pioneered by De Beers in the late 1800s.



Heap leach facility at Alamos Gold's Mulatos Mine in the Sierra Madre Occidental mountain range, Sonora, Mexico.

From the moment in 1867 when Erasmus Jacobs plucked a diamond from the Orange River's mud, mining transformed Africa. The discovery ended the isolation of the Boers, who had moved inland over the years, and brought a flood of new people — in 1871, after an 83.5-carat gemstone was found, the population of Kimberley alone mushroomed almost overnight to 50,000. The additional discovery of gold on the Witwatersrand exacerbated tensions, fueled British expansionism and sparked local wars with the indigenous people and Boers.

Still, the industry did not develop in the style of California's or Australia's, where change came in every-man-with-a-pan-can-get-rich rushes. Huge capital financing from British and European banks was ultimately required for the deep underground mines in South Africa and state-of-the-art science required to coax wealth from the rock deep beneath the veld.

Cecil Rhodes, Alfred Beit and Barney Barnato, who formed De Beers Consolidated Mines in 1888, required mountains of cash and new technology to build their economic empire. Their philosopher's stone was not sweat but cyanidation, a patented 1887 process that dissolved far more gold from crushed ore than traditional mercury leaching. Within a dozen years, cyanidation turned South Africa into the world's leading gold producer.

Bafokeng created a whole new focus on geotechnical expertise within mining, Mike Smith explained, and spotlighted the technology that became an SRK specialty — slimes dams and tailings impoundments, or as the Chamber of Mines called them, residue deposits.

"Steffen, Caldwell and Jennings were at the forefront of the engineering and re-engineering of tailings dams that occurred as a result of the disaster," Smith says. "It played a significant role in the volume of work that

came to us. For a period of time, everyone came to us for tailings dam work — we were almost a monopoly."

SRK learned immensely important lessons from the Bafokeng collapse. As a result, when Jennings handed in his report on the disaster in October 1975, Union Corporation gave SRK the contract to build the replacement dam. Steffen immediately hired Caldwell to do the design work. He moved into an office with Smith.

"To be quite honest, platinum tailings are quite different from gold tailings, which people had a lot of experience with," Caldwell says. "I was probably the only one in the country at that stage who had walked across platinum tailings and knew their properties."

The replacement dam Caldwell designed involved a series of smaller dams that created a set of steps around those parts of the impoundment's 12-kilometre perimeter that exceeded 60 metres in height. At its highest, the impoundment wall would be nearly 120 metres — and could go higher.

"The dam was a major project for SRK," Caldwell says. "It became a mainstay of the Jo'burg office tailings sector as we annually inspected and reviewed it."

Schwartz and Caldwell headed to Botswana later in 1976 for a diamond project in Jwaneng, "a place of small stones," about 120 miles west of Gaborone, in the Naledi River valley of the Kalahari Desert. Caldwell scouted the area for a tailings impoundment site while Schwartz undertook a foundation investigation for the mine plant. The drive into the area, Caldwell recalls, was dust and sand, and more sand — an arid wasteland. It became the richest diamond mine in the world.

The mine, part of Debswana Diamond Company Ltd., a partnership between De Beers and the government of Botswana, sat atop three kimberlite pipes, produced roughly 11 million carats of diamonds and employed 2,100 people annually.

# A Growing Band of Brothers

Dick Stacey started on the same day as Jack Caldwell in January 1976. Born in Durban in 1943, he had grown up in Rhodesia before returning to South Africa for his university education. Mining was in his genes — his two great-grandfathers were mine managers in gold mines in Bendigo and Coolgardie, Australia. After earning his degree, Stacey ended up working for the Council for Scientific and Industrial Research. Dick Bieniawski, head of rock mechanics for the CSIR, steered him toward postgraduate work in rock slope stability, the topic of his doctorate. After completing his doctorate, Stacey moved to London to study engineering geology at Imperial College.

In October 1974, Stacey returned to South Africa and joined DL Webb and Associates, a Durban consulting company. A year later, Kirsten invited him to consider joining “a group of keen, like-minded young men.” Stacey met SRK’s partners the following Saturday — and found everyone in the office wearing shorts.

“They were so casual, it was like talking with a group of friends,” says Stacey, who became a major force in the company over the following quarter-century — even after learning the trio always did their administrative work on the weekends so they didn’t squander consulting time.

All the company meetings were held on Saturday mornings. Robertson also spent Saturdays and Sundays working with his instrumentation company. Everyone was a workaholic, Robertson demonically so.

“Welcome to SRK — the Siberian Rest Kamp!” John Weaver wryly joked.

“I was delighted to work with them,” Stacey says. “It was a fantastic time. The attitude in SRK was to do

interesting work. Everyone was like that. It wasn’t as if they were there to make a lot of money; obviously there was some interest in that, but the focus was always on the technical aspects and doing cutting-edge work.

There was a research content to many of the projects that we did.”

From the beginning, SRK emphasised publication. Consultants were not allowed to advertise in South Africa, so publication was a form of publicity. Robertson told each incoming professional that there were three places for everything they authored: one, a professional journal; two, a paper at a conference; and three, a trade magazine. Every idea could be presented three times in a different form, Robertson maintained.

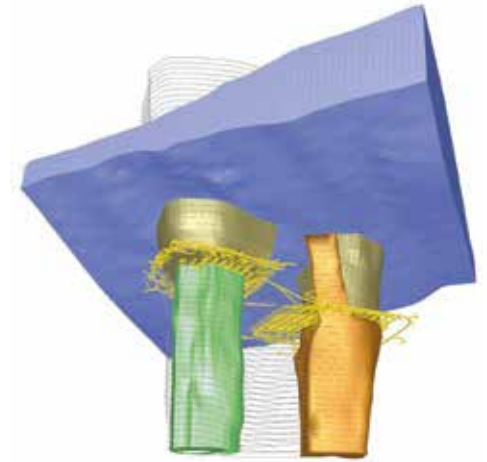
It was one of his mantras.

“We published a lot and it was very effective, especially over the long term,” Stacey says. “Publications hang around for a long time and a lot of people came to us after reading something we had written about a project or practice.”

SRK also believed in maintaining close ties with professional organisations such as the South African Institution of Civil Engineering. Robertson and Steffen, and later Schwartz, were very involved with the geotechnical division of SAICE, which was a big benefit to SRK.

In 1975, as a result of their work for SAICE, they played important roles at the landmark African Regional Conference on Soil Mechanics and Foundational Engineering held in Durban. They developed close ties with colleagues across the continent.

The wives of the founders — Marge Steffen, Yvonne Kirsten and Renée Robertson — were seldom in the office but were incredibly supportive of their



The vast majority of primary diamond mines in the world are kimberlite pipes. These pipes are formed when deep seated magma originating from the base of the lithosphere (150+km) travels upward through the crust and erupts at surface. The actual development and infilling of the pipes can last for days to weeks to months depending on the amount of magma and the volatile contents associated with the magma. The image above shows an eroded kimberlite volcanic system from Botswana comprising two downward tapering pipes infilled with volcaniclastic kimberlite that coalesces at the surface.





workaholic husbands. They fostered a “we’re-all-in-this-together” environment at SRK by inviting new recruits and single professionals home for dinners, hosting parties and ensuring everyone felt like a cherished member of the SRK family.

“People spent long hours working because they loved what they were doing,” Stacey adds. “It was almost like a brotherhood or a family at SRK. We had a Christmas party in Oskar’s home, a party in Hendrik’s home, a party in Andy’s home. We had a children’s Christmas party at my home.”

**R**ichard Connelly joined in January 1975, the first of a cadre of talented British expat professionals to gravitate to SRK. He was working for Geodata, a drilling and geotechnical services company, when he met Kirsten and Robertson on a job site while they still were only thinking about forming SRK. The three men were close in age and hit it off.

Connelly earned a BSc in geology from the University of Sheffield and an MSc in engineering geology from the University of Durham before going to work for Blue Circle Cement, a major cement manufacturing firm. Blue Circle sent him to do exploration and

resource drilling in various parts of Southern Africa, primarily to find cement-making resources. Two and a half years later, he joined Geodata and began doing geotechnical site investigation and laboratory work. Geodata was hired by SRK as part of a big railway contract in Malawi, and Connelly worked there with Schwartz, which precipitated his joining the company.

“We effectively established an office in Lilongwe and took over the government laboratory to do the testing,” says Schwartz. “We were working in very remote regions, there was no support. It was exhilarating.”

Connelly was delighted to be on the other side of the fence, working as the consultant rather than the contractor.

“It was really exciting,” Connelly says. “It was great to be working with such a young, enthusiastic and like-minded team, facing tremendous challenges and solving real problems in the field. And that was the nature of the work with SRK — that was what we all liked to do. More than that, SRK was a family enterprise.”

“In those early days, all three of the partners had very young children. Yet the single guys like me were encouraged to come to their homes — birthday parties



this page from top: Marge Steffen hosting one of the frequent SRK dinners. Yvonne Kirsten in 1986; Yvonne provided typing and office support for SRK’s first office in Johannesburg. Robertson with wife Renée cutting the SRK 10th anniversary cake. Kirsten and wife Yvonne ready for take-off.

facing page: 1983 SRK Christmas party. Richard Connelly is seated in the background behind his wife, Mary, with Karen Harpley and Janet Smith on the couch to her left. On the floor beside Janet is her son, Graeme – the future captain of South Africa’s cricket team!

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**CONNELLY:**  
“MORE THAN THAT,  
SRK WAS A FAMILY  
ENTERPRISE”

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in the office and so on were celebrated always very much as a family unit. I met my wife as a result at SRK — she assisted Andy Robertson with bookkeeping and worked for Jones & Wagener in the same building.”

At the end of the Malawi project in 1975, Schwartz and Connelly returned from Lilongwe in the Toyota Land Cruiser SRK had bought specifically for the job. The war in Mozambique had ended by then — though the journey itself remained hair-raising.

“Strangely enough, I still own that same Land Cruiser,” Schwartz says, 39 years later. “I bought it from SRK and I still use it quite extensively.”

Given Schwartz’s experience in Lilongwe, SRK created Geotechnical Engineering and Mining Laboratory Services, Gemlab. Schwartz became managing director of the separate company established to do soil mechanics and foundation-engineering testing. John Yates, who had run the laboratory in Malawi, became its manager.

SRK was thriving.

Another brash young Brit, with an engineering degree from the University of Glasgow, Rob Dorey responded to a newspaper ad around the same time. Dorey had arrived in South Africa to work on the construction of a nuclear weapons plant just outside of Pretoria. The contractor soon promoted him to running a nearby quarry. That was Dorey’s

introduction to mining. Nine months later, he joined SRK.

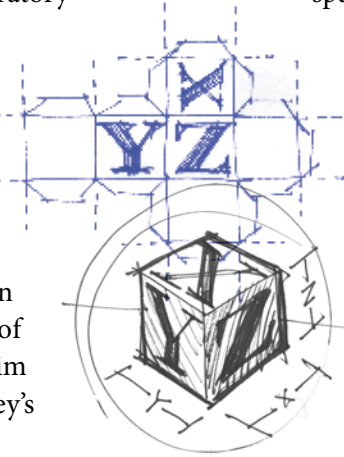
Robertson interviewed him and thought he was terrific. But he warned Steffen, who was doing the hiring: “I’ve shortlisted two engineers for you. They’re going to come in and I think either of them can do the job, but they’re very different. The one guy is very conventional, a solid engineer. He’s going to walk in and he’s going to be dressed like you and me, he’s going to behave like you and me. But I don’t think he’s going to be very creative or innovative. He’s no lateral thinker.”

Robertson paused.

“The other guy that’s going to come in,” he said, “there’s no question he’s a real lateral thinker. He doesn’t just think out of the box, he’s all over the box, under the box, around the box. He’s by far the brightest spark I’ve met in the process.”

They hired Dorey.

In a good-natured dig at SRK’s growing institutional intimacy, Dorey liked to quip that he was employee No. 7 — a wry reference to *The Prisoner*, the short-lived 1967 British TV cult series starring Patrick McGoohan, who played a character trapped in a village where individuals were known only by a number.



**Derek Warwick**

Derek Warwick, an engineering geologist, initially works mainly with the tailings team



**Brian Middleton**

Joins SRK after a few years with civil engineering contractors on projects such as Vaal River Bridge



**Rick Skelton**

Rick Skelton’s arrival helps the company round out its offering of mine planning services

**1975 – 1977**

**SRK (de facto) Lilongwe**

Connelly and Schwartz monopolise the government lab to test their field samples – de facto SRK field office

**Gemlab**

1975: Schwartz is managing director of SRK’s new soil mechanics and foundation-engineering testing company

“Oskar is probably the closest thing to a second father,” he confides. “He took me under his wing. I was only 20-something.”

Dorey, too, thought he was having the time of his life. Everyone did. They shared an invigorating feeling that they were doing amazing things in fantastic places.

“You can’t forget those projects where you are sent to do the geotechnical investigation with a couple of geologists and a couple of junior engineers and everything goes wrong,” adds Mike Smith. “You find out that none of the hotel bookings have gone through and you have to sleep in the hall or on the stairs for a week. That is, if you have a hotel and not just a tent. These are the experiences one remembers. It’s a little bit like being in the military. You always remember the funny and the good times and the good laughs and the camaraderie — as long as you converted the project into a success at the end of the day. That’s what we lived for.”

In 1976, Schwartz recruited Dereck Warwick, another engineering geologist and Wits graduate, who had been working for Hippo Quarries. They had met previously while working for Arup. Projects undertaken by Warwick typically involved geotechnical investigations for foundations, tunnels and development over dolomites.

**SMITH:**  
**“AS LONG AS YOU  
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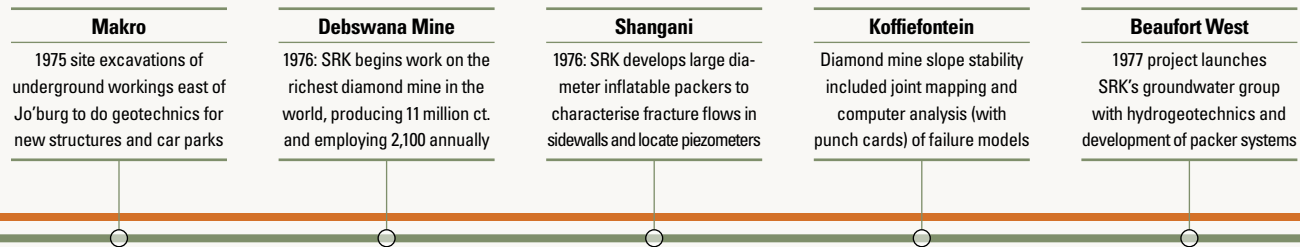
“We worked mostly with Oskar in the early days — doing the geotechnical work with the tailings people and even for the operating plants, with only limited contact with the work Hendrik was doing,” Warwick says. “We got more involved in mining as the company grew. The work was often challenging, not at all straightforward.”

Brian Middleton, who not only attended Wits but also was a cousin of Jack Caldwell, joined in August 1977.

Born in Grahamstown in the Eastern Cape, Middleton had been reared in Johannesburg. After finishing his graduate degree — cum laude and taking the prize in soil mechanics — Steffen urged him to join SRK, but Middleton wanted to build things before considering a career in consulting. For the next few years, he worked on jobs such as the Vaal River bridge project in the Free State. In 1977, he was considering a job in Rhodesia, now Zimbabwe, but the country was aflame in civil war. He telephoned his cousin Caldwell: “Oskar offered me a job a number of years ago and I probably need to do some consulting now. How’s it looking?”

“Please, come in!” Caldwell told him.

“I went in, had a chat with Kirsten and that was the start of it for me,” Middleton says.





## New Growth Model

The three partners and the other professionals who joined SRK recognised that with more and more people on the payroll, the firm had to continue growing — and not just in southern Africa.

“We quickly came to the same view that we were not going to grow old in that status quo environment,” Steffen says. “We needed to expand the business. Otherwise we wouldn’t survive. That meant we had to play in the global field. That was imperative.”

It also meant that the three founders had to confront the conundrum of share-ownership.

“We saw what the other consulting firms were doing and we didn’t like their model,” Steffen explains. “We wanted the people with whom we were working as partners, so we developed a whole structure around shared participation for people coming in. Andy, Hendrik and I discussed that at great length and went through many options before deciding on the model.”

All three thought employee-ownership was imperative and firmly believed that such a business model meant everyone should have access to all the clients and assets.

“Andy came up with a suggestion that was very different from the way other consulting companies then worked,” Kirsten says. “Senior

partners in consulting companies usually hog the big clients for themselves and don’t let any of the others get close, because if they control the client, they control the business. We didn’t do that.

“We sought to create a company structure that made it possible for people to grow their own practices, to be rewarded for their efforts, and to be supported in tough times from the ruthlessness of the ever-changing consulting marketplace here in South Africa and internationally.”



Kirsten said the rules were kept fairly simple: All professional staff had automatic access to shares and qualified on promotion for increased levels of shareholding. Every case was dealt with on an individual basis within the scope of the guidelines. Members who joined as practicing professionals in their own right were invited to take shares commensurate with the extent, stature and value of their practice. Non-professional staff were invited on merit after substantial service to become shareholders. All stock was to be sold back to the company when an employee retired or resigned to ensure it remained employee-owned. Access to stock was to be kept affordable.

“New shareholders could theoretically within seven years have the exact same number of shares as the founders,” Kirsten says. “We invited people to buy shares every year after their second year. We thought, you know, if we do this, there’s a really good chance they will stay, at least for a while.”

Still, most of the professional staff in the company were young and just starting their careers — few had much discretionary income.

“The encouragement to grow your practice and be part of the company was very different from almost all the other consulting companies,” Connelly says. “Most firms had a few old guys who stayed in the saddle forever and kept everybody else down.”

At the same time as they wrestled with the firm’s corporate structure, the founders also began to confront the growing social crisis in South Africa and its effect on SRK’s future growth. “When you factored in the turmoil of a country in the throes of apartheid, we knew the prospects of developing a large company domestically didn’t seem that good,” Steffen says. “We wanted to attract African people into the business and we couldn’t do that under apartheid. The prospects of growing within the country looked dim. We knew we had to look outside.”



**PITEAU:**  
“OSKAR, YOU DON’T  
KNOW WHAT’S GOING  
TO HAPPEN WITH  
APARTHEID, SO WHY  
DON’T YOU COME  
OVER AND JOIN ME IN  
VANCOUVER?”

## North America Beckons

In 1976, Wits alumnus Doug Piteau returned to South Africa from Canada to attend a major rock-engineering symposium organised by his old pals. Impressed by what his friends had accomplished in only two years, he suggested they should think about working together. The conversation coincided with the three SRK founders’ growth discussion. Piteau was in a partnership, Piteau, Gadsby, MacLeod Limited, and a tentative plan was formed that involved Connelly moving to Vancouver and establishing an SRK office with them. However, a few days before Connelly departed for Canada, that partnership broke up. In spite of that news, SRK’s leadership thought a practice with Piteau remained an opportunity. Connelly visited, but like Steffen before him, he returned with a lukewarm report.

In mid-1977, though, Piteau resurrected the idea. He wrote a letter to Robertson urging the move and called Steffen, pressing him to reconsider too. He insisted that SRK’s tailings expertise would be in great demand as North American mines were now considering the technology. “Oskar, you don’t know what’s going to happen with apartheid, so why don’t you come over and join me in Vancouver?”

Steffen was not personally going to make such a move. He had too many family ties in Swaziland. But he understood why strategically it made sense for the firm and recognised the business opportunity North America represented given SRK’s reputation in tailings.

Steffen told Piteau they’d talk it over.

Robertson, the most entrepreneurial of the three partners, was very excited about giving the prospect another chance. He and his wife had always talked about traveling or doing something different once

he finished his PhD. This was a great opportunity. There were now roughly 60 people working for SRK — about a quarter of whom were working on the Bafokeng project alone. After substantial discussion, the senior shareholders agreed the time was right to make a move into North America.

“We agreed to pay Andy’s fares across, and said ‘We’ll provide you with people as you need them,’” Steffen says.

SRK would acquire a 20 percent share of Piteau & Associates, and Robertson would set up a soils-and-tailings division to promote the technology in the North American market, especially given SRK’s profile with the Bafokeng work.



After the meeting, an excited Robertson decided he needed to get up to speed on tailings, fast. He hired a plane to fly over every tailings dam in the vicinity. Jennings and Caldwell went along for the cramming exercise. They discussed the designs, the successes and the failures as Robertson made extensive notes. He would be the conduit for transporting SRK's expertise into North America.

"Tailings work was fairly new at the time," Robertson says. "There wasn't a lot of literature. The first international conference was in 1974 in Tucson, Arizona, so you can imagine, it was a pretty new thing. Some were designed just like water dams, with tailings behind

them, which was one of the reasons they broke. But there was a true tailings technology. Professor Jennings and Oskar and Jack, too, were the real experts; I hadn't really done a lot of that work."

Fraser Alexander, which had built and operated many of the dams, including Bafokeng, provided Robertson with slides and a similar memory-dump. In return, Robertson agreed to represent them in Canada.

With Robertson barely in the air, Stacey reminded everyone about the staff at Geophysical Instrumentation to which SRK's notorious workaholic founder devoted every weekend: "The two Peters — Peter de Haan and Peter van der Poel — will finally get a Sunday off." ♦

