SRK was on the verge of a boom in South Africa when Andy Robertson departed for North America in August 1977. Over the following decade, it greatly expanded the range of services being offered, which was why it was able to support its sister operation in North America during the 1982 downturn. In spite of the worsening racial tensions, the firm grew across the country, and its increasingly solid reputation brought international work. It created a bankable brand in civil engineering as well as mining, with landmark projects and the widening scope of its work.
SRK also continued to attract the best and the brightest. Brian Wrench arrived at SRK in May 1977. After graduating from Natal University, he joined Frankipile as a site engineer on a paper mill piling contract and then worked for their in-house geotechnical investigation group (Soiltech) based in Durban.

He spent two years with Soil Mechanics in the U.K. before returning to Soiltech in Johannesburg, where he worked with Robertson. When Caldwell went to North America, Wrench took over the Triomf Fertilizer Plant project in Richards Bay. He also became more involved with Gemlab, providing oversight from the consulting practice perspective.

“While my main activities had been with geotechnical projects, we also had a big push working with industrial companies dealing with wastes that were present on their sites and looking hard to find ways to sell the material to others, if possible,” Wrench says. “Some wastes would have economic value and have constituent parts that could be reused. We also were involved in figuring out how to store materials so they were left in a safe condition.”

In September 1977, Steffen recruited Rick Skelton, who was planning manager at Nchanga Mine, with an eye to developing the company’s mine planning and computing expertise. He had invited him when SRK first started up, but Skelton didn’t have the confidence for consulting. Since then he’d completed a postgraduate degree at the Royal School of Mines and worked for two years at Anglo American in Johannesburg. His projects included the feasibility studies for the Iwaneng and Letseng diamond mines, the Navachab gold mine and Amcoa’s Arnot Colliery project, which was the first strip mine being planned in South Africa to use large draglines. Skelton was one of mining’s first real computer experts.

“Most of my early work was involved with computer software in mining and the management of geological data,” he says. “SRK offered the career choice that I was looking for: developing my passion for computers and mining.”

Early projects included mine planning for Shangani, Dorowa and Union Carbide. There were also several diamond projects including Letseng, Orapa, Jwaneng, Letlhakane and Finsch. The feasibility study for Shell’s Pering Mine was one of the early project evaluations carried out by the team.
Most pit planning projects required computer evaluation. The only commercial software was the RTZ Open Pit Design (OPD) system that ran on large IBM mainframes — desktop PCs had not yet been developed. SRK senior staff encouraged the use of computers and development of software. After initially using the Wits University mainframes, which were slow and expensive, SRK agreed to invest in a Data General (DG) mini-computer that required its own air-conditioned facilities. Having a “free” in-house computing facility stimulated SRK’s development of a range of technical software.

A mathematician with expertise in modeling rock mechanics for stress analysis who was working with Kirsten and Stacey, Tony Diering was persuaded by Skelton to work on the development of the geology and mining software programs. “We thought that all the geological data manipulation and mathematics required was perfect for a computer,” Skelton explains. “It takes a long time to do the calculations behind the decisions we make as engineers. If you could simply change the parameters in a calculation and push a button — that would save a lot of time and manual effort. A computer with a good program allows you to consider more variables and options. Diering was the genius — I just provided the specifications and told him what we wanted the program to produce. He put all the lines of code together and we were able to successfully model an ore body and evaluate issues that nobody had realised before. It was incredible from an economics perspective.”

A key project was the Buffalo Fluorspar Mine, which was facing closure because the main ore body was becoming depleted. SRK was appointed to perform a strategic life-of-mine (LOM) plan for the deposit. To evaluate the LOM options, SRK proposed developing an equivalent to the OPD software system, but written on the DG in-house machine, for considerably lower usage costs. The general manager at Buffalo supported SRK and approved the ZAR7,000 budget. Tony Diering was again SRK’s key analyst for writing the code. The final product was functionally far richer than any other that was available and it could run on the mini-computer.

“Although we had quoted the client a budget of ZAR7,000 on that first project, the final bill, given all the research and development, was nearly double — ZAR12,000. But the client happily paid, given the savings and profit reaped from the decisions made...
from understanding the geological model and planning implications,” Skelton says. “The Buffalo Mine could economically mine and develop a large low-grade ore body that had been ignored for development — the pit life was extended for many more years.”

The Dynamic Mine Planning System (DMIPS) was born, and SRK engineers were soon using the software and providing feedback for its development on other projects. Peter Franklin, a Camborne School of Mines — educated mining engineer who was employed by Gold Fields at Kloof, joined the mine planning team. He quickly took an interest in the new desktop HP 9845 machines and converted the DMIPS code to HP Basic with the additional objective of developing the mine-scheduling functionality. This was used for the Jwaneng Mine planning, and a program named Short Term Evaluation and Planning System (STEPS) was written to support the project. With these commercial uses and potential product sales, it was only natural SRK management began to consider starting a new company whose business objective was the development and sale of mining and technical software.

“In 1981, when I eventually felt that we had a product that we might be able to sell, we established the computer software company — Geotechnical Engineering and Mining Computing Services — generally known as Gemcom,” Skelton says.

The mining team grew to about five people over the next few years, including Peter Carr and Chris Hinde — both mining engineers who had been educated in the U.K. and had come to South Africa for field experience. Another Wits graduate, Dave Bentel, applied to join SRK after Tony Brink, for whom he had been working on an outfall sewer through Soweto in 1977, encouraged him to do so.

Mike Smith interviewed him and he started in 1978. “Smitty soon became an invaluable mentor in design, construction and operation of tailings and water management facilities,” Bentel says, “but I first worked for Brian Middleton. I had to write computer cards for him, and I didn’t have a clue what I was doing, not the slightest clue. After I wrote the punch cards, I would take them in big boxes over to the university and run them through the mainframe. I’d sit there and watch the girls until the printout came.”

When Mike Smith and John Robbertze landed a massive job in Welkom, one of the country’s biggest mining areas in the Orange Free State, Bentel opened a project office late in 1979. The city founded in 1948 to support mines in the area was the vision of Sir Ernest Oppenheimer, chairman of Anglo American Corporation. It was part of the Matjhabeng District Municipality, an administrative area that covered the extensive gold fields; its name in Sesotho meant “where nations meet” — an allusion to the migrant labourers from nearby Lesotho, Mozambique and elsewhere who inundated the area, hoping for a job.

“Anglo American wanted five tailings impoundments and hundreds of miles of pipeline built in one year,” Bentel says. “My job was to supervise construction. The truck SRK bought for me was percentage-wise the biggest profit centre for the whole company. For the rest of the decade I met fantastic people, had amazing clients and got incredible design and construction experience. It was great. My wife, Barbara, and I had three kids there.”
VENTURE: Gemcom

Gemcom was established as an SRK subsidiary in South Africa in 1981 headed by Tony Diering, Rick Skelton and Peter Franklin. The original product was the Dynamic Mine Planning System (DMIPS), created for Buffalo Fluorspar in Northern Transvaal and Nuclear Mendoza in Argentina. Later, the team was joined by Gavin O’Connell-Jones, Chris Barnes, Essop Salloo and Josh Stern.

Around 1982, Gemcom in South Africa was approached by Mincom, an Australian mining software developer looking to expand the international market for its coal evaluation software. Gemcom was appointed agent for Mincom for its coal software products Geodas, Geolog, Miner2 and later Minestar. These products were supported by O’Connell-Jones (Geodas), Skelton (Miner2) and Andy MacDonald (Geolog).

The Mincom business product MIMS was also marketed with some success until Mincom opened its own office in South Africa in 1992. A North American base was considered better for developing and marketing the software because of the increasing sanctions against South Africa. In 1985, Diering and Franklin moved to Vancouver to establish Gemcom Services Inc. DMIPS became the basis for PC-Mine, developed in Vancouver in 1985, and was the seed for the Vancouver Gemcom development. The Gemcom suite of products eventually included applications for mine planning, exploration management, scheduling and pit optimisation.

Gemcom in Johannesburg functioned as an agent for Gemcom Services, marketing its suite of products in Southern Africa.

In 1994, SRK’s interest in Gemcom Services Inc. changed from a controlled subsidiary to minority shareholding. Gemcom Services was renamed Gemcom Software International in 1997 and listed as a public company on the Vancouver Stock Exchange.
Tony Dell, who had been with Rand Water, was hired in early 1978. Dell did his graduate work with Jennings while Steffen, Kirsten and Caldwell were lecturing at Wits. At the same time, he met Robertson, who was working with Frankipile and let Dell use its soil laboratory: “I was looking for some specific soil types and Andy gave me access to their files and I spent a couple of days there.”

From its inception, SRK did a lot of work for Rand Water — repairing water supply pipelines and stabilizing sections of the Vaal River. Inspecting the site of a retaining wall, Caldwell told Dell it seemed only natural that he join them. “I felt uncomfortable because SRK were consultants to Rand Water and I didn’t want to upset any apple carts, so I told Jack I’d have to keep thinking about it,” Dell says. “I didn’t take Jack up on the offer, but finally responded to an advertisement.”

Shortly after his arrival, Dell picked up the main office phone to find Jennings on the other end.

“He was a pretty intimidating guy,” he laughs, “a major deity. And he had this deep voice, like the voice of a god, and he said to me, ‘Who’s speaking?’ I said, ‘It’s Tony Dell.’ Without missing a beat, he replied, ‘My, my, my, SRK is getting to be like an old boys’ club, isn’t it?’

JENNINGS: “MY, MY, MY, SRK IS GETTING TO BE LIKE AN OLD BOYS’ CLUB, ISN’T IT?”
Exodus/Opportunity

Unfortunately, the civil strife and racial tension in South Africa were forcing many local professionals to leave the country. Engineers led the exodus: In 1976 and 1977, the numbers of engineers emigrating totalled 483 and 736 respectively. The corresponding figures for medical doctors were 76 and 205, for accountants and auditors 81 and 150. Geotechnical engineers were at the front of the pack. South Africa had become an international pariah state. That was one of the reasons behind Robertson’s move to North America — to provide a landing pad for the increasing number of SRK personnel who wanted out. By providing an exit strategy, the firm hoped it wouldn’t lose their expertise or its significant investment in their development.

As the local professionals left, many British ex-pats, starting with Connelly and Dorey, joined SRK. U.K. graduates were willing to go global for better experience than what was available at home. Africa was a common destination. Neal Rigby, who came aboard about a year after Middleton, was a prime example. In fact, the two men represented the twin streams of young professionals — South African and ex-pat — who joined the original partners to transform SRK from a Johannesburg firm into a global consultancy. Hailing from Warrington in northwest England, Rigby did his mining engineering degree and his PhD in rock mechanics at the University of Wales in Cardiff. From there, he joined Anglo American’s coal division in South Africa.

Several months later, Stacey was in the U.K. recruiting and was given Rigby’s name. When he called the contact number, however, Stacey learned Rigby was already in South Africa. Stacey asked Hendrik Kirsten to track him down, which he did.

“I have no interest in another job,” Rigby told him. “I’m just about to leave one and start another.”

But Kirsten was persuasive. “Why don’t you come and see us?” he suggested.

“Just have a chat and make yourself aware of what we’re doing,” Kirsten continued. “If there’s not an interest now, there may be in the future.”

Rigby and his wife arrived at Europa House the following weekend. Rigby wouldn’t forget the scene — professionals roaring around, two secretaries typing reports, draftsmen beavering away and a receptionist up front, everyone at their posts on a Saturday morning.

“Frankly, I was blown away by what I saw,” he says. “The professionalism, the commitment, the dynamism, it was just a quite remarkable bunch of individuals, and I thought, ‘Wow! This is really something that does excite me.’ Even though I wasn’t looking for a job, I ended up joining SRK.”

Upon joining, Rigby was even more impressed with the intellectual achievement underpinning the company’s work and the egalitarianism. Those elements were vital for the first generation of SRK professionals. “Back in the bad old days, engineering consulting companies had this hierarchy of partners, associates and others, whereas SRK was different,” Tony Dell explains. “The partners never thought it was beneath them to get out in the field. Nobody was ever expected to do anything that senior partners wouldn’t do. There was that kind of camaraderie. The other thing that I didn’t find in other companies — there was this feeling that nobody was holding anything close to their chest. Everybody spoke about their projects openly and nobody worried about somebody else trying to hustle them or anything like that. There was this culture of co-operation, this culture of abundance, like there are enough projects to go around, don’t fret.”
Dick Stacey convinced Peter Terbrugge to sign on. Born in Vereeniging, where the Boers and British signed their peace treaty in 1902, Terbrugge had completed his honours degree at Wits. After graduation, he worked for a major road-building firm for a few years, before heading to Imperial College in London to do a master’s in engineering geology. That’s where he met Stacey, who was participating in the master’s course as an academic visitor. “I used to go to Dick’s place on a Sunday for lunch — his wife, Judy, would make a slap-up meal because I was a bachelor then,” says Terbrugge. “Dick tutored me on the highly theoretical part of the course in the afternoon and I ended up creaming it.”

Master’s degree in hand, Terbrugge returned to South Africa to work on the country’s first hydroelectric scheme. In 1979, Stacey called. Terbrugge accepted his offer.

In Over Your Head

“I didn’t actually know what the hell I was doing when I joined, I was in so far over my head,” Terbrugge laughs. “I learned to swim. We never had a spare moment in those days. We used to arrive in the morning and those of us who worked with Oskar would gather in his office. Mike Smith was a great raconteur. He had lots of stories and he would entertain us with them before we started the day. We used to roll with laughter. It was a fantastic dynamic.”

By comparison, Kirsten, who had more to do with the firm’s civil side, was all business.

“If you approached Hendrik at five o’clock with a problem, you would sit down, and reel out your problem to him, and finish at say six o’clock. You then pushed off. You’d come back in the morning and Hendrik would have your answer for you, along with reams of explanations and calculations — everything. Hendrik used to sleep from half nine until four in the morning and that was it. He’s that kind of guy. He’s a super brain.”

Terbrugge loved the work ethic.

“Almost everybody at SRK used to come in on Saturday morning. You just did it. You had work to do. It was often a time to discuss your issues with other guys. Someone used to go across the road and buy muffins for us and we’d have muffins and tea and a good old chinwag. Often we used to go for lunch and then the guys would drift off back home.”

Whether they realised it or not, those who had common cause with the founders and early partners of SRK were developing a culture. Their shared work-hard, play-hard, share-the-rewards values were becoming as much a part of SRK culture as the near-sacred Friday night happy hour.
By the end of the 1970s, the Plein Street offices were bustling six, often seven, days a week. The company’s first messenger and general office assistant, Elias Zwane, remembers the engineers being either out in the field and unreachable, or at their desks, madly preparing reports. There seemed to be no happy medium for them. In those days, there was no email or even facsimile transmission, and telephone service was erratic. Zwane collected the mail, carried packages to clients, made bank deposits and, once a week, bicycled around collecting cheques from the mining companies. It was always hectic, he said.

Elias Zwane kept things moving at Plein Street.

Hendrik Kirsten, seen here with his wife, Yvonne, at the farewell dinner of the Third International Congress on Rock Mechanics in Denver, Colorado, October 1974 – the year SRK was formed.

On Yvonne’s right is Graham Hilliard, who worked at Ninham Shand – the large consulting firm that later partnered with SRK on the Lesotho Highlands scheme. Behind Graham is Dave George, who was with the South African Department of Water Affairs.

During this trip, Hendrik and Yvonne also visited the Grand Canyon.


Adrian Smith
Hired to develop SRK’s new hydrochemistry service which soon creates opportunities in other industries

Peter Terbrugge
After tutoring Peter on engineering geology theory at Imperial College, Stacey invites him to join SRK in 1979

Jonathan Levy
Joins to assist in water-supply studies and soon becomes an expert in waterhammer analysis

Peter Labrum
Starts in 1979 as structural engineer for Kowyns Pass rock-fall chutes; engineers many other key projects

Chris Page
Contributes a special talent for innovative underground mining methods which help secure major projects for SRK

Wits Water Research
Four-year study of surface water resources of Southern Africa, headed by Midgley, Pitman and Middleton

Gemcom
1981: The software company Geotechnical Engineering and Mining Computing Services, or Gemcom, is formed

1981: Gemcom, a software company Geotechnical Engineering and Mining Computing Services, is formed.

1981: Gemcom is formed.

Jonathan Levy
Joins to assist in water-supply studies and soon becomes an expert in waterhammer analysis.
Geotechnics and Structures

Soils and foundations were core services from inception and SRK marketed its civil geotechnical expertise. It was hired, for instance, to deal with loose boulders periodically dislodged from the 120-metre-high rock face that loomed over the highway through the Kowyns Pass, which traverses the picturesque Drakensberg escarpment from Graskop to Hazyview.

Steffen and Rob Dorey investigated various ways of securing the loose rock. But the client opted for a rockfall shelter much like the snow avalanche chutes across mountain roads in Europe. Kirsten designed the shelter and a just-hired Peter Labrum oversaw its construction in 1979.

The son of a Zimbabwean bank manager, Labrum grew up moving around the country until he did his engineering degree at the University in Durban. He was initially turned down for a job because SRK was looking for another water engineer, but Kirsten phoned him back, saying they also needed a structural engineer.

Labrum left after a year or so to pursue his love of bridge building. Kirsten nagged him for nearly a decade to return to SRK before he finally agreed in 1989 and took over the firm’s structures and civil engineering division, founded by Peter Townshend.

Standard Bank approached Kirsten in 1978 about building a high-rise on the footwall of old mining stopes that effectively represented an almost vertical subterranean cliff face. On his advice, the bank acquired the near-worthless land for a fraction of the cost of prime land in the centre of the city and stabilised it to the satisfaction of the regulating authority by constructing 60-metre-deep mass concrete keys in the old workings. The six-storey services centre straddled the old mine workings and was the first major office building in Johannesburg to be built on undermined ground.
An Expanding Menu of Services

There were 60 or so staff when Robertson left for Vancouver. Within two years of his departure, there were 100 staff and the firm had established its water expertise — a promising new market for SRK. One of the key projects was the 1978 commission that sent Richard Connelly to the uranium belt in Beaufort West, the capital of the arid Great Karoo Region in the Western Cape, to do groundwater studies. Connelly had attended a dewatering course at the University of Missouri Rolla on his 1976 visit to North America and subsequently attended a groundwater modeling course in South Africa. The Beaufort West project was the launch pad for groundwater and hydrochemistry development. “It provided the opportunity to expand our downhole hydraulic testing capabilities,” Connelly says.

After sending his résumé to SRK, Adrian Smith, a brilliant geochemist, was hired unseen to develop a hydrochemistry service in 1979. He developed models of contaminant migration on the project. Smith left for Vancouver in January 1982, but returned later that year during the North American downturn. He went back to Vancouver in 1984.

The partners realised that SRK needed to invest in more hydrological expertise to service and expand the new water market. In 1978, Steffen talked Brian Middleton, who had joined a year before to do geotechnical engineering, into spending three days a week back at Witwatersrand working on pioneering hydrological research with one of the top theorists in the field. Professor Des Midgley infected him with his enthusiasm for the marvels of water.

“It was an extraordinarily exciting period,” Middleton says. “We were developing mathematical models and writing computer programs to model hydrological processes, and then using them to simulate river flows in un-gauged catchments. The computer was still fairly new in those days and everything had to be done with punch cards — who remembers punch cards? We’d carry these many boxes of cards to the mainframe computer, which sat in a massive floor in the central building with a huge air-conditioning unit to keep it cold. It didn’t ever get very warm.

And if you ever dropped a box of those cards you had to re-sort them all in order because if one was out of synch, the program crashed.”

Middleton did a master’s degree and wrote his thesis on the Vaal River Basin, one of the most important water systems in South Africa: 40 percent of the GDP of the country was generated in the region. His newly developed expertise was invaluable in pioneering water-related services in SRK and developing an integrated surface water/groundwater offering — probably the first in South Africa, where surface water was the domain of the engineers and groundwater, the scientists. SRK was able to deal with more issues in greater depth and offered more insightful expertise. It had always done some hydrological and hydraulic work: at Nchanga in Zambia for example, where SRK designed stream diversion and water-storage facilities. Now the firm could expand its services.

“The area that we developed very early on, which now is done worldwide, is mine-water management,” Middleton says. “We’re probably among the first people who went into mines and said, ‘You’ve got water all over...”
the place. You’ve got surface water and groundwater, and you’ve got tailings ponds; you’ve got water in the bottom of the pit and you’ve got rivers close by — how do we ensure that this is balanced and water quality is being maintained?”

More water professionals were hired. Jonathan Levy joined to assist Middleton in water-supply studies and soon became an expert in waterhammer analysis. Professor Andy Ward from Kentucky State University led research and projects in erosion and sedimentation. Middleton and Ward pioneered research into small catchment hydrologic responses. Tony van Schalkwyk joined in 1983 and took over Middleton’s initiative in stormwater management. A growing recognition of SRK’s expertise in this area was the award in 1985 of the stormwater master plan for the entire city of Welkom — it included analysing and identifying rainwall, runoff and groundwater issues for the entire catchment area, using innovative stormwater risk assessments to identify trouble spots and finally designing and implementing remedial measures — a project that would last a decade.

Robey Chipps joined as a hydrogeologist in 1986. He became interested in using imagery from meteorological satellites. “In 1988, at the very beginnings of global commercialisation of satellite remote-sensing technologies using Landsat and SPOT Image, SRK developed probably an ‘industry first’ in southern Africa with an in-house digital imagery processing (DIP) capability,” he recalls. “The intention was to undertake specialised processing of mainly satellite image data for analysis, mapping and monitoring of landscapes and land-cover information inter alia to support environmental vegetation cover and impact assessments, surface and groundwater resources studies, and fracture trace mapping for large-scale geotechnical investigations for tunneling projects in remote areas.”

**PROFILE: Adrian Smith**

Adrian Smith was a bona fide SRK star from the moment he joined in Johannesburg in April 1979. He had graduated with an honours degree in geology from the University of Durham, completed a postgraduate diploma in geochemistry at Oxford and his PhD in hydrochemistry at the University of London. Smith was a specialist in groundwater and surface-water pollution investigations as well as environmental impact assessments of waste-disposal operations. He was a pioneer in his field, assisting the mining and other industries to look at the application of science and engineering to solve some of their long-standing technical problems.

He moved to SRK Vancouver in January 1982, and managed that office for some time before moving on to establish his own consulting firm around 1987.

Over a career that spanned a quarter-century, he handled more than 300 projects in the United States, Canada, the U.K., France, Zimbabwe, Botswana, South Africa, Namibia, Zambia, Brazil and Australia. He published more than 60 papers and was a true world-leader in his field. It is no exaggeration to say that he contributed greatly to the profession’s thinking about geochemistry. The book he authored with colleague Terry Mudder, *Chemistry and Treatment of Cyanidation Wastes*, remains a definitive treatise in their field.

Smith served as an adjunct professor at the University of Waterloo, and was an associate editor of both the *Canadian Geotechnical Journal* and the *Mining Environmental Magazine* until his untimely death in late 1995.
Connelly and Chipps put together a business plan to purchase a Sun workstation, which was an expensive piece of equipment in those days. “We won a large project to develop hydrogeological maps and a GIS database for the Transkei,” Chipps says.

“We purchased raw satellite data from NASA. This was really groundbreaking consulting in southern Africa.”

“Although focused on mining, we also took our knowledge of surface water, groundwater and chemistry into consulting outside the mining industry,” Middleton adds, “which we thought was a good thing at the time — providing water services and environmental liability work for groups like African Explosives and Chemical Industries.”

A major drought in the mid-1980s led to the threat of serious water shortages in the Pretoria, Witwatersrand and Vereeniging areas. As a result, SRK was awarded a large project by the Department of Water Affairs to carry out an investigation to provide emergency water supplies from the extensive dolomite formations in the region. “We had seven different contractors with multiple drilling rigs operating for several months, seven days a week, over a very large area,” Connelly says. “This provided a huge boost to the development of groundwater services.”

Among the key people who joined the team were Allan Harley, Pierre Bouw and Chris Taylor.

Publication was a key to the water section’s success. SRK organised a major conference on groundwater issues; it helped form the groundwater division of the Geological Society; it was active in the water division of the SA Institution of Civil Engineering; and SRK professionals offered themselves as experts, on television and other media. Given the importance of water resources in South Africa, the firm also proposed to the Department of Water Affairs and the Water Research Commission that it develop a nation-wide groundwater database and a groundwater map.

But perhaps the largest and most prestigious success was the study into the surface water resources of South Africa (including Lesotho and Swaziland). Carried out by the Hydrological Research Unit of Wits for the Water Research Commission, it was a four-year study headed by Midgley, Bill Pitman and Middleton. The study started in 1979 and was completed in 1982. It proved to be an invaluable tool for climatologists, researchers, planning engineers and others involved with hydrological processes in South Africa.

Middleton had long wanted a dam specialist to fill a gap in SRK’s water expertise and the water resource work they were doing. Alan White filled it admirably.
**PROJECT: Standard Bank Headquarters Building**

**CLIENT:** Standard Bank

**SCOPE:** SRK worked with structural engineers Lillicrap, Wassenaar and Partners, the principal consultants responsible for the structural design of a new bank headquarters building in central Johannesburg. Conventionally suitable sites were limited and costly. A site in the right location was available at a reasonable cost, but it sat atop the workings of old gold mines. The development process required special foundation measures to ensure stability, and that had necessitated governmental approval. SRK carried out the investigation of the site, including gaining access to the abandoned mines to inspect their condition. SRK subsequently designed a stabilisation solution that involved the construction of sub-vertical concrete pillars in the old mine stopes to a depth of 60 metres below the surface. The six-storey structure was subsequently built across the outcrops of the old stopes.

**OUTCOME:** This was the first major development of its kind to be permitted over undermined ground. SRK’s design and presentation regarding the safety and stability of the structure convinced the government mining engineer to approve the procedure. The project’s success (it has now been in use for 30 years) paved the way for two adjacent developments over similarly undermined ground.

The Witwatersrand Gold Rush of 1886 launched more than a century of gold mining below Johannesburg.

While the gold mines to the west of Johannesburg are currently the deepest and richest in the world, many of the original mines are abandoned – leaving a labyrinth of tunnels and shafts. The resulting geotechnical hazards include mining-induced earthquakes, rock bursts and the formation of sinkholes.

SRK’s foundation design helped transform the previously unusable site into prime real estate.
White had his first contacts with SRK in 1981, when Gary Jones and Eben Rust went to Zimbabwe to undertake piezometer cone penetrometer testing of the 30-metre-deep alluvium in the Save River bed near Chisumbanje. Charlie Rae, then manager of SRK Zimbabwe, carried out seismic traverses as part of the investigations for this dam. Over the next few years, SRK (with Horst Marker taking over after Rae moved on) undertook geotechnical investigations for a number of the dams for which White was responsible.

In late 1986, Middleton offered White a position with SRK Johannesburg and he moved to South Africa to join SRK’s water group in March 1987. His first project was as resident engineer, under the guidance of Jonathan Levy and Jones, for the fast-track construction of the 20-metre-high Cathkin Park dam, built in 1987 for the Drakensberg Sun Hotel to supply water and support recreational activities. White’s return to Johannesburg from Natal coincided with SRK becoming involved in the upsurge of dam safety initiatives following a change in policy in July 1986 by the Department of Water Affairs, South Africa.

Underground Mining Rock Mechanics

In the early days, SRK rarely consulted on routine underground-mining, rock-mechanics projects in South Africa. The mining companies had in-house capabilities that were adequate for dealing with the standard mining layout planning and rock engineering problems typical of the tabular deposits in the gold and platinum mines. SRK was only approached when there were more difficult issues, or when massive mining was involved. An early example was an appointment by Gold Fields to investigate the rock-mechanics reasons for fracturing at the tunnel face and sidewalls in a gold mine at a depth of 2,000 metres. This led to the development by Dick Stacey of the extension-strain-fracture initiation criterion.

The group of SRK-ers that handled the early underground mining contracts included Kirsten, Stacey, Rigby, Andy Houghton, Chris Page, Essie Esterhuizen and Diering. Houghton had worked with Bieniawski and CSIR, and brought both geological engineering and rock engineering skills. Page joined SRK from the mines in Zambia. With a PhD in rock mechanics, he added considerable specialist capabilities. However, it was his practical experience and knowledge of underground mining methods that really provided value. These skills led him subsequently to move to Canada where they were in great demand. Before leaving, though, Page suggested to Stacey that they co-author a book documenting the tools and methods they employed daily. Together they wrote Practical Handbook for Underground Rock Mechanics, published in 1986 by Trans Tech in Switzerland.

SRK also developed significant in-house numerical analysis capabilities before such packages were available commercially. Examples were the adaptation of Stacey’s 2D finite element analysis capable of modeling jointed rock and his 3D finite element program, which was adapted to fit on SRK’s mini-computer. Diering made a big contribution to the analysis capabilities — for his MSc and DEng, he wrote unique 2D- and 3D-boundary element packages for SRK.

These capabilities enabled SRK to become involved in numerous “non-standard” projects. An example was the analysis of stress distributions around the block caving at Shabanie Mine in Zimbabwe. Several other projects in Zimbabwe made use of SRK’s sophisticated capabilities, including an investigation into the collapse
of a crown pillar at Epoch Mine — which raised concerns about whether further development of the surface crater could impact surface infrastructure — and the selection of appropriate pillar and stope dimensions for the mining method at Shangani.

As well, Stacey became involved in the “stope corer” project in the early 1980s. The mining industry in South Africa for the previous 50 years had been looking for economically viable ways of mechanically breaking the hard rock in the deep-level mines. The “stope corer” was one such project that a subsidiary company of De Beers proactively pursued for a number of years with SRK’s assistance. The project unfortunately turned out to be uneconomic. However, Stacey learned a tremendous amount about stress-induced fracturing under controlled conditions, which made the project particularly worthwhile for SRK.

De Beers’s Premier Mine also financed SRK in the late 1980s to investigate whether, and under what conditions, steel fibre–reinforced shotcrete would be equivalent to mesh-reinforced shotcrete as surface support in tunnels that are subjected to very large deformations. This was another novel problem and big challenge. Kirsten established an industry-funded Shotcrete Working Group that took the development program further for a number of years and showed, for example, that long polypropylene fibres were more suitable than steel fibres in some applications.

SRK became involved at El Teniente Mine in Chile, after a major rockburst in the early 1980s. This extended over about a six-year period and was part of a significant move by SRK into South America. Dennis Laubscher, Stacey and Dave Ortlepp formed a three-man team to address El Teniente’s problem. They provided interpretations of the rockburst events and recommendations on seismic monitoring, rock support and a geotechnical department; supervised “rockburst” testing of support by blasting underground; and designed a drop-weight dynamic testing system for rock support.

The dynamic testing of rock support at El Teniente led to further research and to contracts from the Safety in Mines Research Advisory Committee in South Africa. These occupied Ortlepp, Stacey and others for about 10 years. Their publications and their collaboration with individuals in institutions in Australia and Canada have been internationally recognised.
PROJECT: Nchanga Copper Mines, Republic of Zambia

CLIENT: Konkola Copper Mines plc

SCOPE: SRK has been involved with the Nchanga mines since the late 1960s when Oskar Steffen set up its soils lab and worked as the open pit manager. Since then, open pit studies have been carried out by Oskar, Horst Marker and Peter Terbrugge, as well as Alan Naismith and Bruce Murphy, both of whom held tenures at the mine before joining SRK.

Mining the open pits at Nchanga has always been challenging due to the complicated nature of the geology, with the westerly plunging syncline having a shallow dipping south limb and a near vertical north limb, both containing moderate to highly folded zones. Slope design issues are exacerbated by the deep weathering and complexity of materials, which vary from soft soils to hard rock.

OUTCOME: SRK has helped manage the mine’s pit slopes and improve its geotechnical systems, including introducing safety-critical monitoring systems using radar technology. In addition to conducting regular reviews of both the open pit and underground mines, SRK is actively involved with engineering both aspects of Nchanga’s operations.

Engineering a balance of cost and stability
Open pit mine design involves a complex set of criteria to determine the optimal pit slope. The goal is to create as steep a slope as possible while maintaining the desired safety factor.

Too steep, and the pit walls will fail. Too shallow and you increase the volume of overburden that must be removed to reach the ore body.

An increase of a few degrees can translate to millions of dollars in stripping costs.

right: The failure of the North wall which occurred in 1970, prior to SRK’s involvement at Nchanga in 1974. Since then SRK’s monitoring of the slope stability has provided early indicators that allowed adequate time to move equipment and personnel prior to expected slope failures.

dead right inset: Well managed, engineered slope.

below: Modern open pits now employ technologies such as Slope Stability Radar (SSR). These systems track the movement of slopes in the mine and provide an early warning if movement accelerates prior to a slope failure.

photo courtesy of GroundProbe Pty Ltd.
Environment

Connelly and Middleton were among the first to appreciate the dawning regime of global environmental legislation. The practice started developing a suite of services within SRK to meet the need generated by the new green regulations. The firm recruited environmental specialists — Jonathan Shopley was the first.

Bryony Walmsley joined in November 1983. “I can still clearly remember holding myself in a chair in Oskar Steffen’s office as I realised he and Adrian Smith were offering me a job! The reason I was so excited was that I had been looking for a job as an environmental consultant in the U.K. for almost a year and had drawn a blank — why? Because incredible as it may seem now, environmental consultancies did not exist in the U.K. at that time. But now here I was on holiday in South Africa and being offered a job. There was a string attached, though — I had to start immediately as Adrian was about to move back to Vancouver, and he wanted me to start before he left. I shared offices with the hydrogeology team — Dave Harpley and Alison Dehrman. After Adrian left in January 1984, Andy Ward became my boss.”

Walmsley started an in-house magazine, titled *Insight*, which profiled interesting projects, restaurant reviews, SRK office news, jokes, stories and other bits and pieces. “It was fun while it lasted but eventually the task was taken over by professionals as the company and its reputation went global,” she says.

By 1985, Andy Ward had left and Walmsley was reporting to Fanie Geldenhuis.

Geldenhuis was a trailblazer in environmental management in South Africa. He started his career in 1960 in the Department of Technical Services before quickly moving on to the Council for Scientific and Industrial Research. He joined Tsumeb Corporation in Namibia in 1963 as their assistant chief chemist, and left two years later to become director of McLachlan & Lazar Analytical Chemical Laboratories, the lab SRK used for chemical analysis. He remained with McLachlan & Lazar until 1985, when he moved to SRK.

Popular and famed for his prodigious memory, Geldenhuis had singular knowledge and experience of pollution control, mine closure and rehabilitation planning, acidic mine drainage, waste management and the application of risk analysis in environmental management. He was the author of a number of oft-cited publications, and his work for SRK took him to Brazil, Indonesia, Kamchatka, Mongolia, Siberia, Suriname and elsewhere. Regrettably, Geldenhuis passed away in 1995.

Under Geldenhuis, the team carried out several of the first environmental impact assessments done in South Africa, slowly building up a database of specialists and working closely with engineering specialists at SRK, especially the groundwater and hydrology departments.

One of the most memorable studies undertaken during the late 1980s was the development of catchment management plans for the river systems flowing into the Kruger National Park. The Department of Water Affairs was concerned that some of the perennial rivers in the park were drying up because of the irrigation demands of local farmers. SRK was awarded the Letaba/Shingwedzi River catchment study and the environment team spent many days working in the park, flying over the area in helicopters and sitting at night around the campfire with some of the country’s most esteemed limnologists debating the need for minimum flow requirements and how to determine them.

Walmsley recalls that her most notable achievement was the work she did with Dr. Ed Watkins in the late
1980s on tailings dam revegetation. “We tested the growth of various species in a controlled environment in various tailings and soil/tailings mixes. We worked on platinum, manganese, kaolin, gold, lead-zinc and copper tailings. The successful species were then incorporated into seeding mixes for planting on the mines. We also did research on how to maintain the vegetation on the tailings dam once it had matured, including the use of fire, grazing, cutting and through judicious seed selection and natural succession.”

Through the 1980s, the environmental department slowly grew, with people like Mary-Jane Muller, Nick King, Margaret Rawitz and Dave Morrey coming and going. Walmsley left in 1990, and Joe de Beer took her place.

Zeitgeist

It could appear chaotic, but there was an underlying organisation and direction. Some professionals worked independently, pursuing individual projects as if they were sole practitioners until they were needed on a team; others would be already working as a team on a large, complicated venture. A client could be in South Africa or anywhere else in the world. If someone in the North American office needed expertise that was available in South Africa, it was made available.

Hired in May 1978 as a tracer in the drawing office, Sandy McDonald says initially she wasn’t sure it was the kind of company for which she wanted to work, with its frenetic activity and oversized personalities, but she grew to love it. All the drawing in those days was done by hand.

“We certainly worked hard and had lots of fun,” she recounts. “Money was hard to earn and we were all very diligent and knew if we did not pull our weight we would be out of work. Our office hours were always more than eight per day.”

“The assignments were varied,” she says. “For example, the final drawings for a study of proposed railway routes across the Kalahari included details of topography, geology, infrastructure, watersheds, ecology (flora, wildlife, marine life) as well as conservation/tourism and heritage sites. It was fantastic to illustrate it.”

Aside from the broad range of work, McDonald appreciated the positive energy in the office. The senior partners emphasised internal cohesion and team spirit. This approach became especially important as South Africa grew more and more isolated through sanctions, and the firm feared losing its connections with the international geotechnical community. To maintain those ties, to feed fresh ideas into the business and to ensure that the firm kept up with research, SRK started inviting notable researchers and scientists to spend a sabbatical in Johannesburg.
The Visiting Specialist Scheme

Working with academics had started with Jennings and continued when Steffen arranged for Geoff Blight — the professor of construction materials at Wits who had oversight of the geotechnical discipline after Jennings retired — to participate on projects by coming to the office on a weekly basis. This was extended into the international arena.

It was a way of achieving technology and information transfer without big contracts that attracted attention. Working with academics had started with Jennings and continued when Steffen arranged for Geoff Blight — the professor of construction materials at Wits who had oversight of the geotechnical discipline after Jennings retired — to participate on projects by coming to the office on a weekly basis. This was extended into the international arena.

It was a way of achieving technology and information transfer without big contracts that attracted attention.

With South African mining companies leading the world, scholars were happy to visit below the radar. It was an innovative idea that kept SRK apprised of leading-edge work in spite of the embargos and anti-apartheid protests.

Kirsten administered the Visiting Specialist Scheme. The program included billing time on SRK projects, mentoring SRK staff, presenting short courses at universities and participating in seminars and symposia. The visitors included Ed Nowatzki of the University of Arizona, Joram Amir of Jerusalem, John Nelson and Dave McWhorter from Colorado State University, and Tom Haan from Ohio State University.

Nowatzki had worked on the landing gear and traction systems for NASA’s lunar module. He co-authored an authoritative book on soil mechanics for off-road vehicle engineering that became the standard reference. Amir consulted on everything from underground power stations and dams to bridges, buildings and salt pans. He was a specialist in piling and the sonic testing of piles. Nelson provided valuable insights into collapsible and expansive soils and into modeling seepage of pond water through tailings storages. McWhorter specialised in the use of mathematical models and laboratory experiments to solve flow problems in porous media. Haan was a water specialist.

Elias Zwane couldn’t believe he got to meet Nowatzki: “Everyone in South Africa listened to the radio as the Apollo spacecraft landed on the moon. It made me so happy and proud to have shaken the hand of the man who helped design the legs of the spaceship.”

To round out the company culture, there was an SRK soccer and hockey team, and a team in a business squash league on Wednesday nights. SRK fielded a team of runners in the annual consulting company relay race: Warwick coerced the less keen runners into participating. SRK also often had golf days.

Pretoria

In spite of the growth and proliferation of projects across the country, SRK was at first reluctant to move outside of Johannesburg, even though some of the staff, who lived in Pretoria less than an hour’s drive away, urged it. There were all sorts of practical barriers to expansion within the country. But it proved inevitable, and SRK formed a partnership with BL Wiid and Partners.

Ben Wiid and Kirsten had met as postgraduate students in the mid-1960s on an engineering geology course taught by Tony Brink. They were involved in 1973 in the development of a 24-storey building in...
downtown Johannesburg, close to the outcrop of old mine workings. They worked together again in 1978 on a nearby site where a seven-storey building was being constructed. Dick Stacey was also involved on the project. As a result of the long-standing association, Kirsten persuaded Wiid to form a partnership with SRK in 1978.

Wiid was a friend of many at SRK. A racing car driver in his early days, an accomplished painter and a gourmet, he was an outstanding engineering geologist with excellent contacts. There was a lot of work as both Eskom and Iscor were undergoing massive expansions in the area.

Gary Jones, who knew Steffen and Robertson from shared duties in the geotechnical division of the South African Institution of Civil Engineers, joined in 1981 from the Road Research Institute. Rob Pullen, one of the most senior engineers in the department of water affairs, also joined SRK. He started in Johannesburg and commuted from Pretoria. Together with Middleton, Pullen was instrumental in securing the multi-year, multi-discipline water basin studies for the Letaba/Shingwedzi and Mogalakwena Rivers. The Letaba study started in 1987 and the Mogalakwena in 1989. Alan White, Bas Wijers and Tony van Schalkwyk moved from Johannesburg, and Carel Haupt joined, to work on these projects.

The Pretoria office quickly grew to 25 people because of the design and construction supervision work for the Tours Dam. Among those who came aboard were two young geotechnical engineers named Eben Rust and Gerard Heymann — both now professors at the University of Pretoria.

The growth of the office and the burgeoning need for administrative controls and procedures became anathema to Wiid, who decided to revert to his own practice. Pullen also left to join a specialist water consultancy established by former colleagues from the Department of Water Affairs.

Unfortunately, the power-station boom and the basin studies came to an end; the work for other consultants in Pretoria dried up because they saw SRK’s civil work as competition to their own business. So the decision was reluctantly made in 1993 to merge back, with most of the staff, into the Johannesburg office.

Natal

SRK’s move into Durban was similarly driven by personal contacts. In that case, Kirsten and Stacey had a long association with Zakrewski Associates Incorporated (ZAI). One project they worked on was the Makro Wholesale Department Store to the west of Johannesburg on shallowly undermined land on which construction had until then been completely prohibited by the government mining engineer. Gerrie Sonnekus, a partner of ZAI, was the project engineer, and that relationship convinced Kirsten that ZAI could benefit from SRK’s geotechnical expertise. He persuaded Wyndham Rodell, the managing director, in 1978 that a partnership of 51 percent for SRK and 49 percent for ZAI to create SRK Natal would be a good idea. Initially Schwartz flew to Durban one day a week to spend the day in the ZAI offices. Peter Allen was later recruited as the lead SRK engineer supported by Schwartz, from Johannesburg. The arrangement with ZAI lasted for only a year, after which SRK continued independently.

SRK Natal under Peter Allen focused mainly on foundation investigations and remained a small practice. Allen left SRK in the mid-1980s to consult on his own.
PROJECT: Lesotho Highlands Water Project

CLIENTS: The Lesotho Highlands Development Authority and the Trans Caledon Tunnel Authority of South Africa

SCOPE: The plan was to supply water from water-rich Lesotho to water-scarce South Africa, in particular the densely populated, highly industrialised Pretoria-Johannesburg-Vereeniging area.

During Phase 1A, SRK was a member of the consulting consortium that carried out the feasibility study and associated site investigation work, and the design and construction supervision for the building of
- Katse Dam, a 185-metre-high double-curvature concrete arch structure;
- the Transfer Tunnel, 45 kilometres of 5-metre-diameter bored tunnel, fully concrete lined, plus drill and blast access tunnels and shafts — to carry water from Katse Reservoir to the Muela power station;
- the Delivery Tunnel South, a 20-kilometre-long, 5-metre-diameter bored tunnel (predominantly unlined) from the Transfer Tunnel outfall to the South African border; and
- the Delivery Tunnel North, a 21-kilometre-long, segmentally lined tunnel that connected to the Delivery Tunnel South and carried the water to the Ash River Outfall from where it flowed into the Vaal Dam.

During Phase IB, SRK was a member of various consulting consortia responsible for the design and construction supervision of the
- Matsoku Diversion, a 25-metre-high weir and a 6-kilometre drill and blast, 4-metre horseshoe-shaped tunnel to divert water from the Matsoku River into the Katse Reservoir; and
- the Mohale Tunnel, a 32-kilometre-long, 5-metre-diameter bored, fully lined tunnel that carries water from the Mohale Dam into the Katse Reservoir.

OUTCOME: This major infrastructure project was completed successfully and is operating well.
In 1978, Kirsten also approached Charles Liebenberg, a renowned bridge engineer who founded Liebenberg & Stander (now L&S Consulting (Pty) Ltd.) in Cape Town. As with ZAI in Durban, he suggested SRK supply Liebenberg & Stander’s long-standing needs for in-house geotechnical expertise.

Tony Dell, who had shortly before joined SRK in Johannesburg, was keen to move to Cape Town as manager of the local subsidiary, SRK Kaap. The work was done out of Liebenberg & Stander’s office, but did not fulfill SRK’s expectations. The Liebenberg & Stander partners handed over all the difficult problems to the joint venture and kept most of the straightforward work to themselves. SRK bought out Liebenberg & Stander within a year and continued independently.

The new office quickly landed significant projects — earth-embankment sewage maturation ponds for the municipality of Atlantis, which were designed to prevent earthquake-induced liquefaction (a project for which Robertson provided computer software from North America); the design of foundations for the Bloukrantz Gorge Bridge; the earthworks and settlement-sensitive foundations for the Atlantis Diesel Engine Factory, the associated forge and foundry, and design work for a dynamite factory. But, because of national security concerns, the dynamite factory drawings given SRK had been redacted and extensive areas were blacked out. “We were to design a magazine, a reservoir, railway line and roads but we didn’t know what the specifications and loads were or what was where,” Dell laughs. “So we pretty much had to design for every eventuality, which was interesting. After we’d been struggling for about six weeks, there was a two-page spread in the newspaper with a diagram showing exactly where everything was. After that, life became a little easier.”

There was so much work, Horst Marker, Warwick and others traveled down from Jo’burg to provide support.

Peter Rosewarne relocated to the Cape office from Johannesburg in early 1985 to set up a groundwater section there and handle the growing work in that area. Another ex-pat, from Brighton in the south of England, Rosewarne had studied geology at the University of London. He joined SRK in 1982.

“I was in the Department of Water Affairs and it was a pretty dead-end job,” he says. “You turned up in the morning, went home in the evening and you could almost do what you liked in between. There was no sense of urgency. I decided seven years was enough in the government service.”

Rosewarne landed the water master plan for Bisho, then the capital of the Bantustan nation Ciskei, which was a long-term, big-budget job. Later, SRK was asked to do the Ciskei National Water Plan, work that would take a decade. It provided an anchor for the Cape Town water practice and drove its growth throughout the 1980s.

The rural water supply work gave SRK the impetus to move into Port Elizabeth and East London to service those areas.
Hex River Tunnel

The Cape Town office was Kirsten’s favourite, and he landed the project that put it on the map and greatly enhanced SRK’s reputation in civil engineering. The contract, which made the office a hub for more than a decade’s worth of work, involved blasting a new tunnel through the Hex River Mountains on the main rail route between Johannesburg and Cape Town.

The mountains had always posed a formidable obstacle to building a railway between the coast and the inland mines. Construction conundrums in the 19th century forced the original engineers to use a unique size of narrow railway track, known as Cape gauge, which became the norm in South Africa. Replacing the original line and tunnel began after the Second World War, but the work had a lurching, stop-start quality for various reasons until 1979, when a new proposal was adopted.

Towards the end of 1980, the South African Railways asked SRK to provide their tunneling expertise on construction of the 13-kilometre-long railway tunnel between Kleinstraat and De Doorns. It was a staggering feat of engineering and rivaled Bafokeng for significance to the company.

Graham Howell joined in 1985 to strengthen the structural and geotechnical section under Dell. Howell was a recent PhD graduate from Cape Town University and had carried out numerous numerical analyses for Dell over the years. He was soon working on the Hex River project. “My involvement with Hendrik in those days was stimulating and exciting, and exactly what I needed to develop my engineering understanding, but it was also actually somewhat surreal, in a sense,” he says. “Hendrik would arrive in the Cape Town office, ensconce himself in my office, where we would work for hours and sometimes days together without much interaction with the others (it seemed to me). No sooner had he left the office and returned to Jo’burg than he would be on the phone to me for hours. Hendrik is my personal mentor and always will be.”
Another ex-pat hired in 1980, Allan Haines transferred to Cape Town from Johannesburg in 1985 to take over management of the project as the number of staff devoted to it increased over the years and Dell was preparing to move to the Lesotho Highlands project as the chief geotechnical engineer.

A no-nonsense Scot, Haines was born in Dunfermline, Fife. After graduating from Strathclyde University, he went to work for Roan Consolidated Mines in Chibuluma, Zambia. He returned to the U.K. in 1977 to do research at the Imperial College until 1979, then he went back to work at Nuttall Geotechnical Services in London. SRK hired him from there.

“I accepted the job and soon found myself in Johannesburg reporting to Dick Stacey,” Haines said. “After joining SRK, working with Oskar and Hendrik, I began to have a true understanding of the technical side of consulting — how to be professional, how to communicate, how to write reports and explain things to people. I had been working for about five years before that, but realised that I didn’t know so much.”

The South African Railways engineers had posted the Hex tunneling contract following a standard method. But the rock did not respond as predicted by the rock mass classification system. The tunneling took much, much longer than anyone expected and costs ballooned.

SRK provided specialist input and numerous field staff throughout construction to evaluate the painstaking progress. Construction on the tunnel began in 1980 and was expected to finish four years later; it was not completed until April 1989. It was the longest railway tunnel in Africa when it opened that November.

The contract had been awarded for ZAR26 million. The final bill came to ZAR180 million, and it set off an extensive litigation over the final bill that took several years to resolve. Kirsten and SRK were marshalled as the technical experts by the railway company. The lawsuit eventually reached the South African Supreme Court and the case ultimately compelled broad changes in rock mass classification, tunnel design and contract law.

During his last year in Cape Town in 1990, and for much of the following few years, Haines spent time with the legal team preparing for court, writing up expert witness statements and reading documentation for the advocates.

Howell, who was the project manager for SRK’s support of the litigation, remembers the sudden closure of the case in September 1993.

“At the time, I was working very closely with the senior advocate preparing technical information for his cross-examination in the days to come,” he says. “It was a Tuesday afternoon, I think, and he said that he would be in court the next day and would give me a ring when the morning court session was adjourned. He phoned me the next morning at about 11 a.m. to tell me that the case had been settled.”

Howell was shocked.

“This was devastating,” he says, “as we had up to 50 staff working on various aspects of the case at that time. To have such a major demand on manpower one day and nothing the next was a big problem.”

“Still, it was a fantastic project for SRK and taught us all a tremendous amount. We never got official disclosure of the conditions or the settlement, but it leaked out that it was about ZAR200 million and was the result of the intervention of the then French and South African governments.”

Haines says the Hex River project experience helped him tremendously. “I was later able to pass along those insights to ensure younger staff understood the very significant repercussions and outcome that can flow from decisions professional engineers and others make on a daily basis.”
More Tunnels

The Hex River project was only one of several large-scale contracts that SRK landed in the 1980s that burnished its reputation.

Johannesburg City Council hired it to design and supervise the boring of the Delvers Street Cable Tunnel in 1981 and the Anderson Street Sewer Tunnel in 1982. New recruit Kevin Holley worked on both. The Delvers Street tunnel was about 800 metres long and in places came to within 2 metres of the overlying road surface in soft soils. The Anderson Street tunnel was about 500 metres long and about 10 metres below the surface. Both were a success.

In 1984, the Department of Water Affairs insisted SRK be appointed for the rock-engineering work on the feasibility study for the Mvumase River Hydroelectric scheme on the Drakensberg escarpment in Natal. A pilot exploratory tunnel was constructed initially and, unfortunately, a rockfall occurred, seriously injuring SRK’s Isak Venter.

A year later, SRK was appointed by Rand Water to design and oversee construction of a 4-metre-diameter by 500-metre-long drill-and-blast water-main tunnel through the dolomites underneath the Vaal River. The project turned into a nightmare for Kirsten, Stacey and Ian Cameron-Clarke.

The cavities in the dolomite absorbed an enormous amount of cement grout, hugely adding to the cost of the project.

The relationship with Rand Water took a severe knock as a result.

Growing Pains

Organisational decision making within SRK remained informal throughout the 1970s, but in the 1980s, the company’s growth changed that — first with the establishment of subsidiary companies within South Africa and then with a firm-wide restructuring near the end of the decade.

Although he was in North America, Robertson was involved in most decisions and all significant managerial discussions. There were numerous trans-Atlantic telephone calls back and forth between the three founders, who remained the dominant forces within the firm. The startup capital for the North American business came from South Africa, so there was a lot of interest in how the new offices were doing. There were two or three board meetings a year.

The senior partners were the principal managers.

HOWELL:
“TO HAVE SUCH A MAJOR DEMAND ON MANPOWER ONE DAY AND NOTHING THE NEXT WAS A BIG PROBLEM”

There were casual weekly get-togethers and more formal monthly meetings among this circle of senior managers. The firm was still very much characterised by personality and drive. People traded information daily — who was most persuasive, who wanted to do what, who did someone know? I think we should open an office here, I know so-and-so, let’s approach him or her.

“Most of the early people came on board because they knew one of the partners,” Middleton says. “There was still a very close personal connection between everyone. I came on board because Steffen taught me at Wits, and my cousin-once-removed, Jack Caldwell, worked for them too. Where we could, we leveraged those kinds of linkages.”
But success and expansion compelled corporate and cultural change, and that started to exact a cost. At the end of the 1970s, SRK in South Africa remained small enough to function collegially and for large projects to be co-ordinated through relatively small and fluid management groups involving various combinations of Steffen, Kirsten, Schwartz, Stacey, Skelton, Connelly, Middleton and satellite office leaders. But that small-business, family-like style was strained by the expansion of the following decade.

SRK outgrew the Plein Street offices by 1980 and took over the 16th and 17th floors of 20 Anderson Street, in the hub of the city alongside the big mining firms. Anglo American’s headquarters were two blocks north; down the road were JCI and Rand Mines. It did not take long before the firm occupied three floors. Across the street was an industrial area and that’s where Gemlab was housed when it was created.

Branch offices were established starting in 1978, and in short order SRK had a presence in Pretoria, Cape Town, Durban and Welkom. Horst Marker transferred to Swaziland in late 1979 to work in the GEMS office that had been started earlier by Steffen, and in 1981, he oversaw the establishment of SRK Zimbabwe in Harare. He transferred there in 1983. In the face of this rapid growth it soon became obvious there would need to be changes to the corporate structure in South Africa to reflect their existence, improve governance and provide more opportunity for the younger practice leaders.

In mid-1980, Schwartz and Brian Tromp — a geotechnical engineer who had joined the soils division a few years earlier — left SRK and created their own practice. “This was a very difficult and quite emotional decision,” Schwartz recalls. “I eventually came to the conclusion that I did not fit in with the management style that was being implemented at that time and that there was little that I could do to change it. That practice operated successfully for 30 years. In a way, I suppose that was due to the basics learned in the early days of SRK.”

That same year, Peter de Haan and Peter van der Poel, who had been with Geophysical Instrumentation from early on, also left to set up their own instrumentation company.

The physical demands of SRK’s growth were matched by other challenges of the burgeoning business. The enterprise, which had always operated like an extended family, was starting to feel over-extended. It was tough to keep track of new people you passed in the hallway in Johannesburg, much less keep tabs on distant cousins in Denver or even Cape Town whom you had never met.

“What we were getting at that stage was pressure from the practice leaders saying we need to do our own thing,” Middleton says. “Decision making was centred in Jo’burg and there was some frustration with that. Tony Dell in Cape Town, Peter Allen in Durban and Rob Pullen in Pretoria were saying: ‘We need to grow our offices ourselves and not be so dependent on Johannesburg.’”

Until 1978, SRK was a partnership, first among the three founders and later expanded to include Schwartz and Stacey. The partnership was then changed to an incorporated company, Steffen, Robertson and Kirsten Inc. With the satellite offices and growth across South Africa, it seemed like a natural evolution in 1981 to create a South African holding company (Steffen, Robertson and Kirsten (South Africa Inc.)) and five operating companies: Johannesburg was divided into civil and mining, while Cape Town, Durban and Pretoria were turned into affiliated companies — the result was Steffen, Robertson and Kirsten (Civil) Inc., Steffen, Robertson and Kirsten (Mining) Inc., Steffen, Robertson and Kirsten (Kaap) Inc., Steffen, Robertson and Kirsten (Pretoria) Inc., Steffen, Robertson and Kirsten (Natal) Inc.
The new South African corporate structure initially facilitated broader employee ownership and provided greater responsibility for some of the younger staff who wanted more executive participation. Each company had a board of directors with the idea of opening up the management of the company to the second generation.

While he had been conducting research at the university and developing the water practice within SRK, Middleton also completed an MBA. With the encouragement of Steffen and Kirsten, he had made SRK the case study for his thesis.

“Over its first five years, SRK had grown at a compound rate of 80 percent and, as you can imagine, huge growth of that kind puts pressure on an organisation.

“Luckily we were able to work our way through, managing those pressures and putting business strategies in place that were effective. We formed the Business Strategy Committee in 1983 and we started looking at SRK, the service offerings, where we were going, all of the normal detail that goes into a strategic plan that we today take for granted. It was the start of our formal planning process,” Middleton says.


The advantages of the expansion across South Africa and the changes in corporate structure were self-evident. The disadvantage was that different companies with different sets of shareholders had the potential of inciting internecine competition. There were other issues too. Not all the growth had been organic. For example, Middleton had discussions with Binnie & Partners (South Africa), and the companies merged in 1988, extending the firm’s skills in water and effluent technology, structural engineering and hydraulics. This brought into SRK John Cowan, Mike Slabbert, Elizabeth Carelse, Lewis Prince and the renowned Henry Olivier, who acted as an associate consultant for a number of years.

By its 10th anniversary, SRK had grown to more than 200 people. It was a very different organisation than the three-man operation of 1974. And, understandably, not everyone was happy with its transformation from a band of brothers to a battalion of consultants.

Brilliance, energy and good karma were not enough to sustain a company of such size, and co-ordinating the various SRK corporate units proved more difficult than anticipated. Consulting was a business like any other: if they did not manage the overall business of many inter-connected practices, SRK would fail as surely as if the constituent consultants began mismanaging or offering bad advice in their individual practices.

The work of the Business Strategy Committee was debated in various forums, culminating in a meeting of the South African holding company directors at Helderfontein in 1987. SRK’s leaders were forced to acknowledge that the management structure was hindering rather than enabling the firm’s development. They revisited the structure of the organisation, developed formal rules to avoid and resolve intra-company conflicts, and began to devote attention to the overall organisation and operations of the firm. SRK could no longer function as a family-style business; it faced the daunting task of forging a corporate structure that reflected its unique identity and values, one based on individual excellence, entrepreneurialism, consensus...
and employee-ownership. This in-depth introspective process led to the concept of a partners group—leaders who were consultants in their own right, who would set strategy and formulate policy while ensuring that the culture and values of the organisation remained intact. In essence, a partnership within a corporate structure.

In response to these concerns and opportunities, in 1988, Middleton oversaw the re-amalgamation of the five South African operating companies into a single corporate entity, Steffen, Robertson and Kirsten (Consulting Engineers) Inc. He became the managing director of South Africa and gradually introduced systems, processes and policies appropriate for the consultancy. Many of these have since been implemented broadly across the group.

Andy Barrett was named Johannesburg office manager. Another South African from Wits, Barrett, who was from Jennings’s last graduating year of students, had joined SRK in late 1981. He built his career while simultaneously serving successfully in the army reserves.

“We had conscription in South Africa — 2 years full-time and 12 years of part-time involvement — and after I joined the company, I still had my part-time obligations to the military,” Barrett says. “I ended up running a regiment. When they were looking for someone to take on some management challenges, somebody on the strategy committee said, ‘You should think about Barrett — if he can run a regiment I’m sure he can contribute here as well.’”

Barrett relished the opportunity. In 1989, his peers recognised his organisational talent and created a new post for him, general manager.

“SRK South Africa was approaching 200 or so people at that stage,” Barrett explains. “Things weren’t getting done. The individuals who were responsible for aspects of the administration, accounting, quality control and marketing were client-focused. The business was going well, but we needed to improve our internal systems.”

SRK was a big organisation and needed more formal operational structures. Kirsten and Steffen were clearly in chairman-of-the-board-type roles and the second generation was managing the day-to-day operation of the company. But it was easy to become more corporate and lose the edge that made SRK so competitive — the brilliant intellectual free-spiritedness that set it apart.

The SRK ‘work hard, play hard’ mantra extended far beyond engineering. Always one to embrace new technology, Dave Bentel (foreground), battles it out with Andy Barrett in a Super Mario session, circa 1997.

Perhaps it was Barrett’s military command experience that helped him outmaneuver Bentel with the N64 controller.

Barrett joined SRK in 1981, three years after Bentel. The SRK culture continues to keep them both challenged and engaged over 30 years later.
How to retain energised individuals, attract top people, continue to be creative and not replicate the large firms that were too settled down, too structured, too policy-driven?

That was the challenge.