

The Whittle Story

A Live Book

The story of how Lady Bountiful lived up to her name

By Norm Hanson, August 2018

My connection with “Whittle” began a little before I met Jeff.

I had moved from Adelaide to join a mining entrepreneur in Melbourne a couple of weeks before the stock market crash of 1987. Unfortunately, his companies lost around \$150 million that day. Even more unfortunately, he had borrowed (unsecured) much of that from the merchant banking arm of the state bank and had used the borrowing to buy shares in a complex series of inter-related company share ownerships to gain control of a number of junior mining companies. With the stock market crash, most of these shares became near worthless. Think of a collapsing house of cards! The bank had also lent even more to other fashionable “entrepreneurs”, so it was disaster for the state bank and looked likely to bring down the state government. The bank really wanted their money back! Not surprisingly they were not interested in the worthless shares.

Several of the companies, including Centaur Mining, had some decent prospects in Western Australia, most just north of Kalgoorlie. Money to do anything (especially exploration and particularly drilling) was understandably scarce, so one of the projects, called PanGlow, was discussed for sale to Pancontinental. They were interested but wanted a viable mine design first.

I discussed this with Micromine, a Perth-based mining software house. They told me about Whittle 3D, Jeff's first Lerchs-Grossmann based program and we had Micromine Consultants run it for us. The Pancontinental Engineers were delighted. The design had the right slopes and a nicely curved shape. They purchased the project straight away and had it operational within a couple of months. This gave Centaur enough cash to drill and prove up a much bigger project near Broad Arrow (also on the highway north of Kalgoorlie towards Lenora). The area was close to the old Lady Bountiful Mine and became known as Lady Bountiful Extended. Most of the best gold was close to the surface and had been missed (not sampled) by earlier exploration. The project just kept looking better and extending as drilling results came in.

The Joint Ore Reserve Committee of the three principal mining professional societies had begun writing guidelines for reserve reporting since the Poseidon days in the 60s. In early 1988, they significantly updated and formalised the guidelines, which soon became known as the JORC code. The important issue was that the code was accepted into the Australian Stock Exchange (ASX) listing rules in February 1989.

In early November 1989, while exploration was in full swing, my boss asked me how we could get a JORC compliant Ore Reserve. I explained about the importance of a competent person and even suggested we needed more than a single person. (Centaur was all exploration staff and geologists, no mining or metallurgy staff at that time.) I also explained the way resources needed to be classified as Measured, Indicated and Inferred, based on confidence, and that only Measured and Indicated could be used in Ore Reserves reports, not forgetting the important aspect that the life of mine plan must be demonstrated to be economically and technically viable. He was genuinely interested and asked many important questions. Then he asked: "How long will this take?" and I said: "Perhaps 6 months". He quickly replied "EXPLETIVE! I promised the bank I'd have one by Friday. Can't you do something on the computer?" My response "That is on the computer" wasn't the desired response. Friday came and went with no JORC report, but pressure was still on to get the JORC Ore Reserve asap. I had been following up on the PanGlow success and had heard from Micromine that Jeff was working on the idea of building a cashflow and ability to change price and assess the design using NPV (the most accepted measure as the best way to evaluate large long term project like mines). This sounded a perfect way to speed up the process (i.e. using the computer). So I phoned Jeff (he was working just down the road at Newcrest at the time) and asked him to come to the Centaur office and discuss his approach and outcomes.

Financing an operation was still a massive hurdle and the idea was mooted that the bank could take over the operation until all the required loan money was repaid. But the bank also had no way to get enough finance, so that "deal" had reached a stalemate. Somehow Rothchild's became involved. They would organise a Gold Loan, where enough gold bars to get the operation underway would be provided to the bank on a 2.5% interest (i.e. 2.5% more gold would be returned with the original gold, also as gold bars). The bank was then obliged into organising to sell the gold and finance the mining operation. So Jeff came to speak to the senior staff of Centaur, some experts from Rothchild's and a few bankers.

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The meeting was understandably technical and the key players feigned interest but were looking at their watches. One early key question was around Measured and Indicated resource being used for Ore Reserves and Jeff quickly and correctly said that was easy. The resource category could be used as a rock type and only measured and indicated processed during the pit optimisation. Jeff was running through his overhead slides, explaining the nested shell design and came to the cash flow summaries (the same reports that are still in the GEOVIA Whittle software today). Suddenly all eyes were on the screen as Jeff was explaining how the mining sequence could be used to discount the cash flow over time and derive the NPV of the project. He also showed the plot of NPV versus pit size with the nice up-turned shape and clear optimum value. One of the Rothchild's staff asked to go back to the cash flow and asked: "Was the schedule based on a simulation?" Jeff explained it was a straight-forward depletion of the resource following the two extremes of a top-down mining approach, or an inner shell first, then shell-by-shell. I do not remember whether Jeff used the terms "Best and Worst Case Mining" for these sequences or even that these marked the boundaries of feasible economic outcomes, but there was discussion amongst those present. A cheque book was soon produced, and Jeff was asked how much the software would cost. I suspect he had not even begun selling what was to become Four-D, but after a short pause he said \$14,000. The room went quiet. Then he added "US dollars". Some muttered that it was expensive (and not yet proven). Then the question was asked: "That's expensive. Could we rent it monthly?" After a little thought, Jeff said "Yes, 10% per month". I believe a cheque for 3 months' rental was drafted soon after.

Sensibly, Centaur lined up a group of good mining consultants, but exploration was still in progress and the potential project limits were growing (already some 5 km wide and 7 km long). This was a massive data set and the 40-megabyte hard drives and 640Kb Memory PCs we had in Melbourne at the time could barely handle the block models and some test optimisations, suggesting we needed more computer power. Therefore, it was organised to use some new Unix workstations owned by Australian Mining Consultants in Perth. Christmas was approaching and the 12th January was set as a deadline. As we were still drilling, I took two geologists, a draftsman and a half-a-dozen geology students from Melbourne RMIT to Perth, where we rented an office in South Perth. For close to a month we had staff and students collating and checking drilling results and plotting sections. Table space was at a premium, so a lot of work was done on the floor or on round-the-clock shifts.

Each day, I and two other geologists would interpret rock type and grade boundaries. Then the interpretation would be digitised over-night and final sections produced and reviewed the next day. Along with the students, I was producing sectional estimates as well as both inverse distance and simple kriged block models with supporting variography. Two separate sets of consultants produced conventional cross-sectional estimates versus kriged block models. We were also transferring the models to AMC as they were building and running a few test optimisations. Some of the results were fed back to the field to better target the last-gasp drilling program leading up to the Christmas break. There was a lot of work to do and it got done. Better still, the resource modelling from all groups/methods was generally in agreement. A desirable drill spacing was worked out between all the contributing consultants to ensure that any zone was a relatively straight line between three adjacent holes, and the entire model classified looking at the prepared

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cross-section. Areas with less than 3 adjacent intersections were included in the model, but classified Inferred. Using re-blocking and ore parcels to preserve the grade distribution, the whole model was shoe-horned into a re-blocked model which had grown to almost 11 km long. Fortunately, on the larger computers and using virtual memory, these large optimisations were feasible and just required overnight runs.

The geological interpretations were suggesting that the best gold was in a series of old paleo channels and exploration had started to focus on following those. The consensus among most engineers and geologists was that the mine needed to start at one end of the channel and then follow the channels. Some suggested starting in the south, others suggested starting at the north where the stripping was lower. However, the Whittle Lerchs-Grossmann pit shells began with a lot of separate pits (the inner shells at lower gold prices) near the centre of the project that eventually joined into about 3-4 super pits closer to the then gold price.

The pit optimisation and a set of preliminary mine designs to satisfy the payback conditions were created by the deadline. The bank and Centaur were very pleased. However, there would be a slight change of plans because of the favourable nature of the gold loan in those tough financial times, the objective was changed from the best NPV to the most gold recovered, with Centaur also paying back the loan to the bank with recovered gold bars, plus a little extra as interest.

A number of key mining contractors, consultants and custom batch processing contracts were immediately negotiated. Fortunately, Jeff was on hand in Perth and within a day or two had developed the .CSV export feature (still in GEOVIA Whittle today) so that the recovered gold produced could be monitored, and, with a small extra analysis in the spreadsheet Excel, the best schedule to recovered gold within the shortest time frame could be established. This had a deadline of the 13th February and again the deadline was easily achieved, with even some extra infill drilling included to help move a few keys sections of inferred resource into the measured and indicated categories. Also, the strategy to start mining in the higher gold producing sections that jumped from one area to another was adopted, and the series of starter pits were designed. (These pits were given beach names because my summer holiday to Sorrento in Victoria was cancelled and my family accompanied me to Perth for the duration. Sorrento was one of the first pits, and other pits had beach names like Bondi, Bells and Cable.)

A series of detailed plans were prepared by Kalgoorlie-based MMC Mining Management Consultants who also managed the mining side of the project. Everything was put in motion over the next couple of weeks, and, by Easter, mining and custom processing of the first ore batch was successfully completed and the ore/gold production was as expected. There was plenty of spare capacity in CIL plants around Kalgoorlie at the time and it was easy to have ore processed as it was mined, with minimal stockpiling. Amazingly the whole Tricontinental loan was repaid in gold by the September - in other words, from starting feasibility design to full payback in less than a year. Centaur went on using the early version of Four-D and rentals eventually paid off the whole purchase price of the software licence.

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Lady Bountiful Extended still holds the position of the closest reserve reconciled against production for any Australasian/Pacific Mine.

At this point, I realised that the Lerchs-Grossmann algorithm connected to detailed cashflow analysis was both a very reliable and powerful way to assess and design an Open Pit. Jeff Whittle had created a wonderful tool for the mining industry.

The Lady Bountiful experience had demonstrated the importance of having solid Measured and Indicated resources, rather than a lot of inferred blue sky. So drilling was very focussed around a viable pit design and Four-D was an important tool. History shows how the Centaur/Great Central Mines team was to go on and discover and/or rediscover a significant series of deposits including Bronzewing and Jundee, many of which became big gold producers. Lots more work for Four-D. The very profitable mining company Plutonic Resources, which developed the Plutonic Bore Mine, was also an early adopter of Four-D, and operated it until 1998, when they were taken over by the large USA based gold miner, Homestake Mining Company for reportedly over \$1 billion.

The surprises for Centaur continued well into the 90s when some of the very surface samples from the northern drilling at Lady Bountiful were re-assayed for nickel and the significant Cause lateritic nickel project was discovered. However, in 2000 a number of unforeseen hardships arose and the development of the mine was put into and remains in mothballs. After a decade of ups and downs, Centaur was finally placed in receivership.

After a little over two years of pressure in the exploration environment, along with other distractions, I left Centaur to start my own consulting practice. Probably on the second day of putting out my shingle in 1990, Jeff gave me a call and asked if I would consider doing some training for him.

My long association with Whittle Programming, and later Whittle Consulting. had begun.

To read Norm's bio please scroll to the next page...

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Norm Hanson, Diploma Geology RMIT, MAusIMM

As a trained geologist, Norm has worked in the Australian and international mining sector for over 40 years.

He is a firm advocate of strategic mine planning and has been witness to the development in this field. Norm has a special interest in computing and mathematics, and in particular, their relationship with and application to exploration and mining.

Norm has worked with Whittle Consulting since 1990 and is a leading Whittle Integrated Strategic Planning trainer. In this role, his geological knowledge and mining

experience is an asset to our clients.

In 1990, Norm formed mining consultancy, Imageo. His consultancy specialises in the computer-based collection and management of mining and earth science information. In particular, he has a professional interest in mining resource and reserve estimation. He now focusses on strategic planning training and his role with Whittle Consulting.