Text **Rod Stewart**
Director (Construction Management)
UWP Consulting
rods@uwp.co.za

Managing construction risk in

UWP CONSULTING was appointed by Albidon (Zambia) Limited in September 2007 to manage the construction of its tailings storage facility (TSF) at Munali nickel mine, which is located in the Kafue district in south-eastern Zambia.

The Munali TSF is one of a number of infrastructure construction projects currently being managed by UWP in terms of its integrated construction unit (ICU) contract methodology. The ICU approach is a particularly effective risk management tool when undertaking construction projects in dynamic environments, and in addition has proven to be an extremely cost-efficient alternative to more conventional contracting methodologies.

UWP's responsibilities on ICU projects extend well beyond those typically borne by construction management professionals and encompass the scheduling of works and construction resources, the overall management of resource utilisation on site, quality control, and thus ultimately the delivery of the end product in conformance with the design specifications.

Four major ICU projects – including the Munali TSF – are currently being undertaken in Zimbabwe and Zambia in the mining and commercial agriculture sectors. The aggregate value of construction works managed by UWP on these projects at completion will be more than R600 million.

AIMS AND OBJECTIVES

Construction of the tailings storage facility is part of a larger greenfields mining and ore processing project at Munali nickel mine. The aim of the TSF component of the project was to ensure that the construction of the facility was sufficiently advanced to accept tailings from the ore-processing plant when these were first produced. In addition, the return water infrastructure components of the TSF were to be completed by this juncture so that water could be recovered and returned to the plant.

As is the case with all mining sector projects, the overall safety of the construction process is of paramount importance. Strict compliance with legislated and site specific safety regulations was thus a prerequisite.

ABOUT THE PROJECT

The Munali TSF comprises an earthfill embankment (or starter wall in tailings parlance) with a total length (first phase) of just more than 1 800 m. The embankment has a 1:2 upstream slope, a 1:3 downstream slope, and a top width of 6 m. The maximum wall height is just over 10 m. The total volume of earthworks including the foundation key, all drainage, topsoil stripping, and landscaping of the basin to expedite recovery of water was approximately 390 000 bank cubic metres.

In addition to the main embankment, the TSF comprised a toe drain, a solution trench, sewers connecting the toe drain to the solution trench, a decant tower and access embankment, storm water drains and drainage structures, erosion control measures, and an access road.

The installation of tailings delivery and return water pipes and pumps did not form part of the UWP scope.

The final cost of construction of the TSF was US$3,89 million and this phase of the project was completed in five months.

CHALLENGES AND INNOVATIONS

The project presented three major challenges: communications, logistical, and environmental.

Communications

The structure of the project team for the Munali TSF was not ideal: the facility was designed in Australia for an Australia-based client and constructed in Zambia by a Zambian contractor under the management of a South African consultant. Although this in itself is not problematic, time and cost constraints precluded any pre-construction phase meetings between any of the parties.

The construction budget and associated construction resource schedule was developed by UWP on the strength of e-mailed design drawings, a bill of quantities, and a telephonic discussion with the client regarding the overall layout and physical features of the site. Exclusive but intensive use was made of electronic media for client–designer–construction manager communications. The success of this approach was borne out by the fact that the final cost of construction exceeded the original budget by a mere 2 % – which is a notable feat when cognisance is taken of unforeseen circumstances encountered during construction, and the fact that contractor remuneration for ICU projects is on a *de facto* cost plus basis.

Logistics

All manufactured construction materials were sourced and imported from South Africa. Construction of the Munali TSF was a fast-track project and the ordering of construction materials was therefore necessarily late, and also unfortunately coincided with the construction and associated industries year end recess. The booming South African construction industry placed a further constraint on the availability of materials.

UWP allocated a dedicated logistics manager to the project whose sole purpose was to liaise with suppliers, clearing agents, and transport companies to ensure that all supply and logistics constraints were addressed, and that materials supply issues did not impact on the construction programme. This early intervention by the UWP project

African infrastructure projects

manager proved to be both necessary and successful.

Environmental

The Munali TSF was, by its very nature, largely an earthworks operation. Construction commenced in early November 2007 at the commencement of what proved to be the wettest summer in 100 years in Zambia. The management of plant resources and the rescheduling of works, where possible, by UWP site personnel, limited the total cost of reworking and weather-related delays to US$5 000 – or less than 1 % of the cost of construction.

PROJECT STATUS

The construction phase of the Munali TSF was completed in mid-April 2008.

CONCLUSION

A letter of commendation was received from the client in late May 2008. The letter also stated that the facility was not yet in use due to the delayed completion of the ore-processing plant. The overall project objective of completing the facility prior to the first deposition of tailings from the plant was thus easily achieved. The client commended UWP on the quality of construction, with the TSF being described as 'the Rolls-Royce of tailings dams' by a senior representative of Fraser Alexander, a world-renowned company which specialises in the field of tailings dam construction and management. □

Project Team

- **Client** Albidon (Zambia) Limited
- **Design Engineer** D E Cooper (Perth, Australia)
- **Construction Manager** UWP Consulting
- **Contractor** Teichmann plant (Zambia) Limited

Source:
http://www.saice.org.za/downloads/monthly_publications/2008/CivilEngJul08/#/0