Preliminary Review of the Environmental Impacts of the Hidden Valley Gold Mine, Papua New Guinea

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1. Background and Brief History

The Hidden Valley gold-silver (Au-Ag) mine is located in the Wau-Bulolo gold field of Papua New Guinea (PNG), about 90 km south-southwest of Lae and some 300 km north-northwest of the capital Port Moresby, shown in Figure 1. The region is part of the Morobe Province. The project is located in the headwaters of the Bulolo and Watut Rivers, with the Watut River being a major tributary of the Markham River which reaches the ocean near Lae.

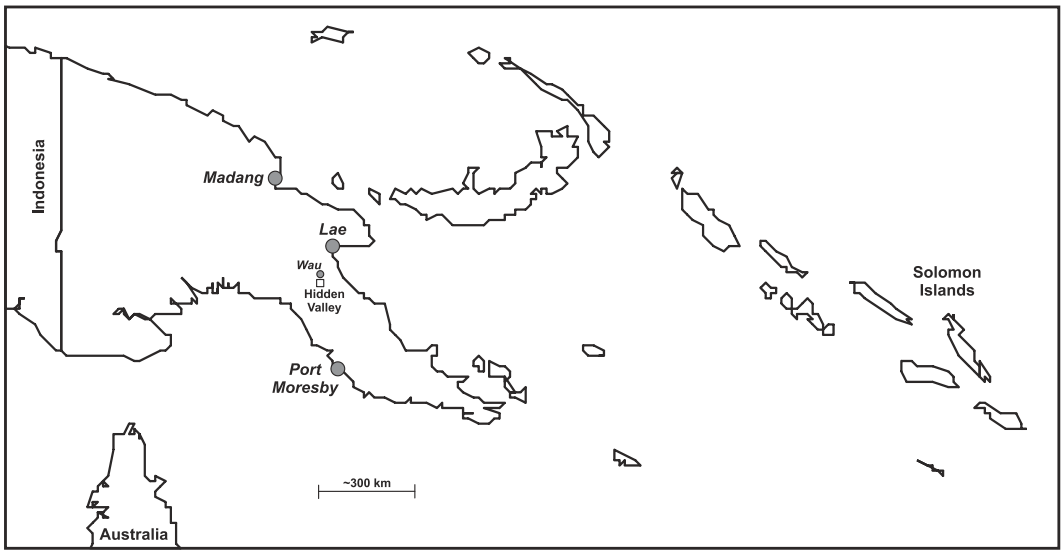

Figure 1: Location of the Hidden Valley Au-Ag mine, Papua New Guinea

An Environmental Impact Statement (EIS) for the project was publicly released in February 2004, proposing two open cut mines, a carbon-in-pulp (CIP) process plant and an engineered tailings dam. Approval of the EIS was given by the PNG Government in March 2005. Although Harmony Gold began development of the Hidden Valley project in September 2006, Newcrest became a joint venture partner in August 2008, initially at 30% but rising to a 50:50 joint venture at the commencement of commercial production in June 2009. The partnership is known as the Morobe Mining Joint Venture (or 'MMJV').

From July 2009 to December 2011, the Hidden Valley gold mine has processed 7.85 million tonnes (Mt) of ore, averaging about 2.16 grams per tonne (g/t) of gold, to produce 13,267 kilograms of gold (or ~427,000 ounces) and more than 75,000 kilograms of silver (>2.5 million ounces). Annual processing capacity is presently about 3.5 Mt of ore, grading ~2.1 g/t Au and ~26 g/t Ag, to produce about 6,500 kg Au and 50,000 kg Ag per year. As of 2010, reported total mineral resources remaining are 103 Mt grading 1.69 g/t Au and ~31 g/t Ag – (~5.6 million ounces Au, 101 million ounces Ag). At present mining rates, this gives a mine life of more than 25 years. A view of the current site is shown in Figure 2.

Figure 2: Hidden Valley Au-Ag mine, Papua New Guinea, showing overland conveyor belt from the Hidden Valley pit to the central process plant and tailings dam (SMEC, 2010b)

During construction of the project, major issues arose with respect to managing waste rock and erosion problems. Although it is claimed by the MMJV that these issues are now effectively resolved, and current operations minimise all erosion offsite, the downstream communities in the Watut River have been publicly complaining about the ongoing extent of impacts, especially sedimentation and poorer water quality and perceived health impacts.

To date, an independent study or review has not been conducted on the environmental impacts and issues associated with the Hidden Valley Au-Ag mine, with very little of the company studies being publicly available. The lack of company data and reports is also complicated by the litigation initiated by the Union of Watut River Communities against the MMJV, which remains open (despite no active progress for over a year).

During 2010, the PNG Government's Department of Environment and Conservation ('DEC') engaged engineering consultants SMEC International to review and formally audit the status of environmental management at the Hidden Valley project, including a major study of the erosion and additional sedimentation to the Bulolo and Watut Rivers caused by Hidden Valley (SMEC, 2010a,b). Although the MMJV has numerous internal studies and reports, these are not publicly available – nor were most of them available for the SMEC reports. Despite repeated requests for these reports, data and relevant information, the MMJV has refused to co-operate and be transparent.

As such, this brief review focusses on the principal findings of the two SMEC reports, including some of the data presented in the SMEC reports concerning impacts on the Watut River. It is expected that further detail will be completed after the site visit to the project area in April 2012.

2. The SMEC Reports: Principal Findings

The SMEC reports systematically examined the environmental management systems that were in place during the construction phase of the Hidden Valley project, as well as those in early 2010 after commercial production had started.

In concise terms, the SMEC reports found:

- systematic non-compliance with permit and approval conditions, with 10 potential non-compliances and only partial compliance with 30 conditions from a total of 73 conditions, including failure to achieve certification of the environmental management system (based on ISO14001);
- a lack of waste rock and erosion controls during construction, including a weakness in the permit conditions which set no limit for suspended sediment in waters draining the site during the construction phase;
    - an internal study for the MMJV suggested that some 20 to 30 Mt of waste rock and mine-related sediment had entered the Watut River;
    - of the eroded waste rock, approximately 30% was potentially acid-forming – that is, it contained sulfide minerals which when exposed to the surface environment would chemically react to form sulfuric acid and leach heavy metals and salts from the waste – providing a major environmental hazard to aquatic ecosystems and users of the Watut River;
    - the EIS predictions of equal but minor impacts on the Bulolo and Watut Rivers was severely deficient, since the impacts have been about 90% to the Watut River instead and quite significant (especially with respect to erosion of waste rock);
- a failure to operate waste management and landfill practices in accordance with the approved plan;
- the sewage treatment system was overloaded and causing a major risk of pathogen and nutrient contamination to downstream users of the Watut River;
- systematic failure to maintain a thorough environmental monitoring regime for aspects such as ecological, air quality, noise, vibration, hydrometeorology, and water and sediment quality monitoring, including rigorous data management and permit review procedures;
- a single grab sample of water from the Watut River showed slightly elevated concentrations of some heavy metals and cyanide compared to environmental baseline studies, which suggested the need for a more thorough study of possible pollutant sources and pathways.

As part of the permit and approval conditions for the Hidden Valley mine, a compliance point is located at Nauti downstream in the Watut River – although there is no clear map showing this location in the SMEC reports nor by the MMJV. The total suspended sediment ('TSS') in water of the Watut River at the Nauti compliance point is shown in Figure 3. The commencement of road construction in mid-2006 is clearly visible as a major though short-lived spike in TSS levels to ~5,000 mg/L, including another short spike in late 2006 to ~10,000 mg/L. As full-scale mine construction began in June 2007, TSS levels gradually rose to a new peak of about 23,000 mg/L in mid-2007, but were declining to around 5,000 mg/L by mid-2009. This period is closely correlated with poor waste rock management practices at the project, which led to excessive erosion into the Watut River. The MMJV did not provide SMEC with any 2010 data to verify if the TSS trend continued to decline.

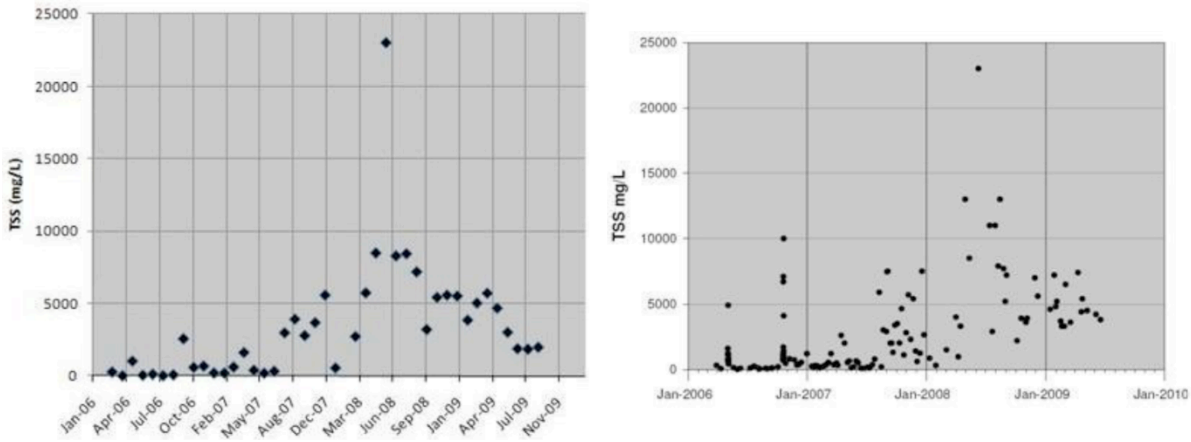

Figure 3: Total suspended sediment (TSS) at the Nauti compliance point in the Watut River, downstream from Hidden Valley (left – monthly mean values; right – individual data points) (SMEC, 2010a)

3. Summary and Future Work

There can be no doubt that the Hidden Valley Au-Ag mine has caused environmental impacts in excess of permit and approval conditions, mainly due to poor environmental management practices during construction – especially concerning waste rock. To date, although the MMJV have conducted a range of studies on the Watut River, most of their reports are not publicly available – and nor were they made available to the PNG Government for SMEC to conduct their reviews. Such secrecy significantly hampers accurate scientific interpretation and only worsens the perception of the impacts from the project to date. To address this challenge, future work will include a more detailed review of the 2004 EIS, other technical studies on the Watut River as well as a visit to the Watut River communities in April 2012.

4. References

SMEC, 2010a, *Independent Environmental Performance Audit of Hidden Valley Gold Mine and Assessment of Mine Derived Sediment*. Prepared by SMEC International Pty Ltd for the Department of Environment and Conservation (DEC), PNG Government, November 2010.

SMEC, 2010b, *Hidden Valley Gold Mine – Environmental Audit Review*. Prepared by SMEC International Pty Ltd for the Department of Environment and Conservation (DEC), PNG Government, December 2010.