The Jinfeng gold deposit: A new mine leading the way for foreign investment in Guizhou Province, China

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Abstract. The Jinfeng is the largest known Carlin-type gold deposit in the Peoples Republic of China, with an identified mineral resource of at least 3.5 m oz of contained gold. Jinfeng is a structurally controlled deposit within Triassic turbiditic sediments that overly Permian limestone. This sequence has a multi-phase deformational history dominated by NE-SW compression and to a lesser degree NW-SE compression. These events have produced a complex series of gentle to tight folds, and reactivated thrust and transfer faults. This provided the setting for gold mineralisation, which occurred late in the deformational history and is mainly confined to second-order faults F3 and F2. Gold mineralisation occurs in carbonate- and clay-rich rocks. Alteration accompanying gold mineralisation includes replacement of carbonate minerals by quartz, and deposition of arsenical pyrite rims to primary pyrite and arsenopyrite. Late in the mineralisation cycle orpiment and native arsenic were deposited with minor calcite. Gold is found mainly in the arsenical pyrite rims and a lesser amount in arsenopyrite. The June 2004 total Mineral Resource estimate, using a 2gpt Au cut-off, is 20.9 million tonnes at 5.1gpt Au and the total Proved and Probable Ore Reserves are estimated at 11.6 million tonnes at 5.5gpt Au. The project will support annual gold production of approximately 180,000 ounces once full production is achieved in 2006. Both open cut and underground mines will be operated, with initial ore production coming from the open cut. The designed treatment rate is 1.2 million tpa, with provision for expansion. The ore at Jinfeng is refractory but responds well to bio-oxidation and Sino Gold has opted for a BIOX® circuit to treat a flotation concentrate prior to standard CIL leaching to recover the difficult to liberate gold. Overall gold recovery is expected to be 85%. The pre-production capital costs for the project are estimated at approximately US$70 million.

Keywords. China, Jinfeng, gold, sediment hosted, Carlin type.

1 Introduction

The Jinfeng is the largest known Carlin-type gold deposit in the Peoples Republic of China, with an identified mineral resource of at least 3.5 m oz of contained gold (Fig. 1). It is currently being explored and developed by Sino Gold Ltd. Sino Gold holds 82% equity in the Sino-Foreign joint venture with Chinese partners. Development began in early 2005, and full production is scheduled for mid-2006. Open-pit and underground operations will produce approximately 180,000 ounces annually from refractory ore using the BIOX® process.

The area may have been first exploited last century as a mercury and arsenic mine for Chinese medicines. Jinfeng was discovered in 1986 by Brigade 117 of the provincial Bureau of Geology and Mineral Resources (BGMR) following up on a stream geochemical anomaly. BGMR subsequently drilled approximately 20 km of diamond core and drove 8 km of underground heading to delineate the deposit, but beneficiation of the sulphide ore proved problematic. Starting in 2002, Sino Gold began an exploration program that included more than 45 km of diamond drilling and more than doubled the previous resource.

2 Geological setting

Jinfeng, often referred to as Lannigou, is situated in SW Guizhou Province, an agrarian area of steep hills and narrow valleys with elevations between 400 and 800 m adjoining rugged limestone karst country. Rifting of the Yangtze craton during the Precambrian to Cambrian produced a sedimentary basin which now hosts numerous Carlin-type deposits. Locally, Triassic turbidites host the vast majority of gold mineralization. These rocks overly Carboniferous through Early Triassic limestone which core the N-S elongate Laizhishan dome less than 1 km to the west. The sequence has a multi-phase deformational history dominated by NE-SW compression and to a lesser degree NW-SE compression. These events have produced a complex series of gentle to tight folds and thrust and transfer faults, and provided the setting for gold mineralization (Fig. 2).

3 Gold mineralisation

Gold mineralisation occurred late in the deformational history and is tightly confined to second-order faults, known locally as the F3 and F2, which cut the turbidites. These faults were warped during deformation. The main F3 orebody is a moderately- to steeply-dipping shear zone with several rolls along the 800 vertical meters it has been explored to date (Fig. 3). This orebody trends N73W, and in long section plunges moderately-steeply to the ESE. Several important ore domains are present where splays de-

Figure 1: GEOLOGICAL MAP OF GOLD DEPOSITS
South-West Guizhou Province, China

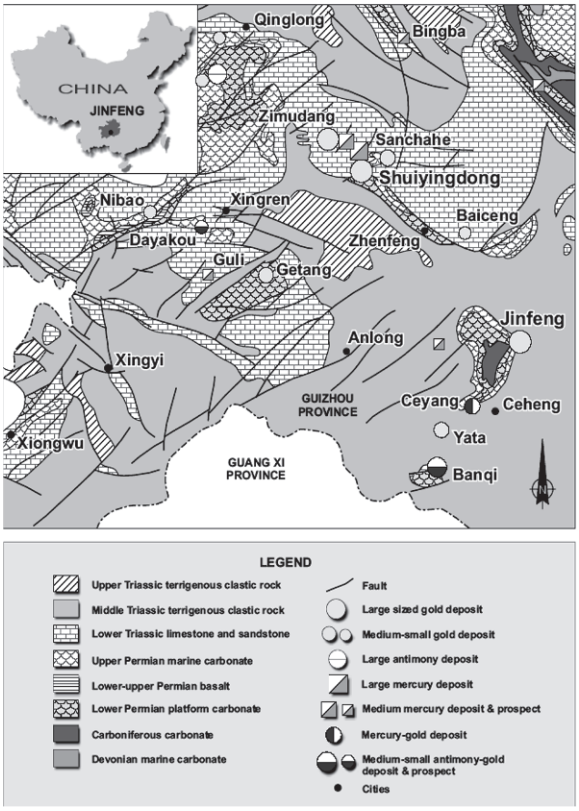
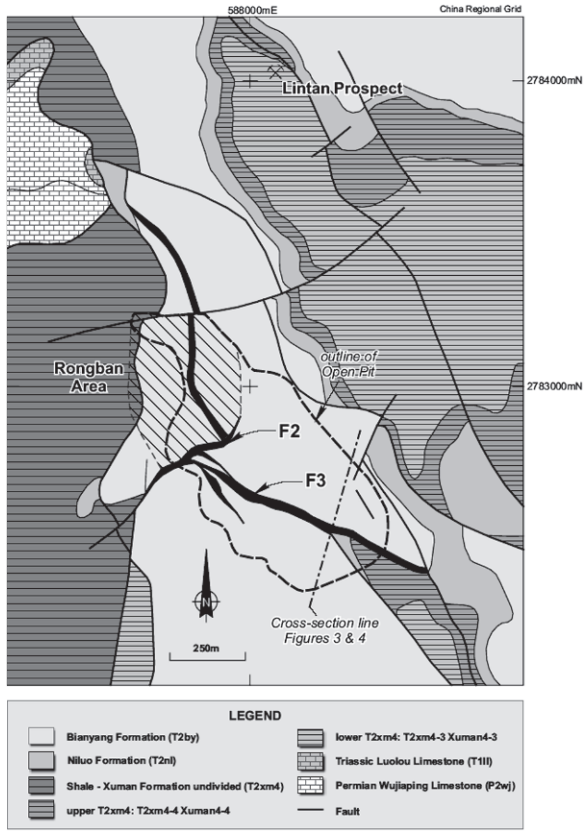


Figure 2: GEOLOGICAL MAP OF JINFENG AREA
Guizhou Province, China



veloped off the F3 late in the deformational history. Mineralization in the F3 is open to the E and at depth. The F2 (N20E, 85E) crosscuts the F3, and is only mineralized near this intersection. Further to the W, only scattered bits of mineralization are encountered in local shear zones.

Gold mineralization occurs in carbonate- and clay-rich fine sand facies turbidite rocks. Carbonate minerals, both cements and veins that formed earlier in the deformational history, were replaced by quartz. Accompanying this main stage is the deposition of arsenian pyrite rims to primary pyrite and arsenopyrite. Late in the mineralization cycle orpiment and native arsenic were deposited with minor calcite. Gold is found mainly in the arsenian pyrite rims and a lesser amount in arsenopyrite.

Gold and mercury are tightly confined to fluid conduits, whereas arsenic and antimony are disseminated up to 30m from these structures. Host rocks contain high concentrations of reactive iron, suggesting that sulphidation was the main mechanism for gold precipitation.

4 Resource development

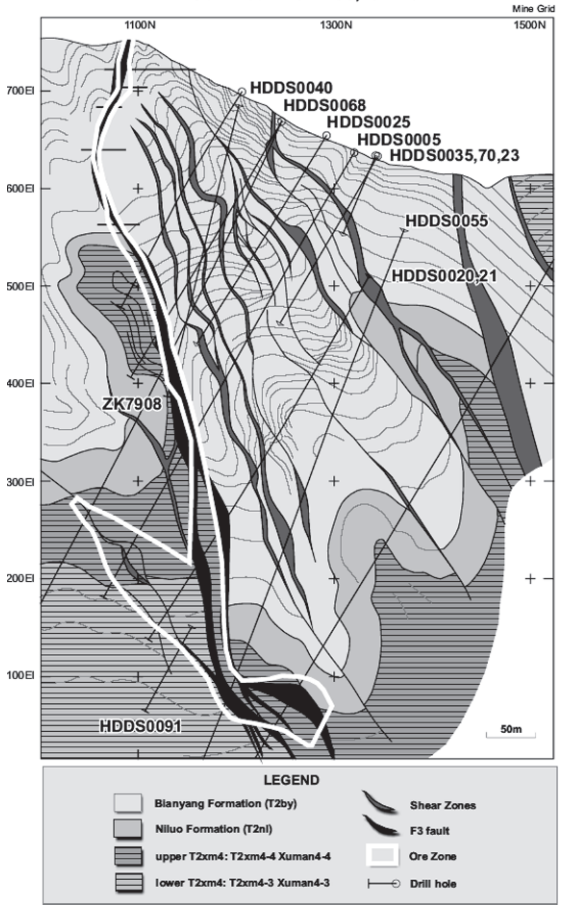
Drilling, completed since the June 2004 resource estimate, continued to produce new intercepts that fall within the open cut design. These intercepts are related to both footwall and hanging wall splay faults not intersected by previous drilling (e.g. 21.7m @ 7.6gpt Au down-hole in HDDS-101). Additional drilling is expected to increase the amount of gold that is recoverable from the designed open cut.

Since acquiring the project, Sino Gold has spent over US$10 million in drilling and underground exploration of the deposit to produce Mineral Resource and Ore Reserve estimates in accordance with JORC, in preparing a Bankable Feasibility Study and completing an Optimization Study.

It has taken almost four years for Sino Gold to successfully progress the world-class Jinfeng Project to the construction and development stage. Construction earthworks began in March 2005. Sino Gold is committed to integrating safety and environmental considerations into all phases of the project: its design, its construction, its operation and its ultimate closure. The utmost priority is placed on the safety and health of employees, contractors and visitors and the protection of the natural environment. The promotion of safe work habits receives the highest priority.

In early 2004, a commitment was made to compensate residents living in the proposed mine area for relocating. A new village area and market place is being built by Sino Gold to replace the existing facility that was also affected by the mine's construction.

Figure 3:
GEOLOGY SECTION 1840E HUANGCHANGGOU PROSPECT
Guizhou Province, China



Regular meetings were held with community leaders in the Sino Gold community centre and in the local villages to explain the progress and impact of the operation and to receive feedback on community concerns. A water supply was provided to the nearby Lannigou village. In total, 360 local people will be trained in technical and administrative skills over a 12-month period.

County and Prefecture government officials have been very supportive of the project and were instrumental in undertaking land measurement for compensation for the 70 hectares of land required by the operation.

The Jinfeng Bankable Feasibility Study was completed in March 2004, but exploration drilling continued to discover additional mineralisation and is having a significant effect on the project evaluation. Subsequently, an Optimization Study was completed following an update of the Mineral Resources estimate in June 2004. Using this resources estimate, the Optimization Study estimated Ore Reserves from mining and treatment operations using a gold price of US$350/oz.

The June 2004 total Mineral Resource estimate, using a 2gpt Au cut-off, is 20.9 million tonnes at 5.1gpt Au and is more than double the original Chinese resource estimate at the time Sino Gold became involved with the project. Total Proved and Probable Ore Reserves are estimated at 11.6 million tonnes at 5.5gpt Au. The project will support annual gold production of approximately 180,000 ounces once full production is achieved in 2006. At this rate, the operation's life will be at least 12 years with cash operating costs estimated to be approximately US$183/oz.

Both open cut and underground mines will be operated, with initial ore production coming from the open cut. Having a 6-year life, with additional drilling, the open cut is expected to produce 6.5 million tonnes at 5.1gpt Au at a strip ratio of approximately 13:1. The underground mine is scheduled to begin ore production in the latter part of 2012 and is expected to produce 6.9 million tonnes at 5.7gpt Au in total.

The designed treatment rate is 1.2 million tpa, with provision for expansion. The ore at Jinfeng is refractory with most of the gold locked up with pyrite. It responds well to bio-oxidation and Sino Gold has opted for a BIOX® circuit to treat a flotation concentrate prior to standard CIL leaching to recover the difficult to liberate gold. Overall gold recovery is expected to be 85%. The pre-production capital costs for the project are estimated at approximately US$70 million, with a more precise estimate being prepared as a result of the design work done by Ausenco and NERIN.

The underground workings will not be accessed from the open cut and this allows the option of accelerating development of the underground mine. As Sino Gold has a very positive view on the geological endowment of the Jinfeng area, a scoping study was completed for a Phase 2 expansion to 1.8 million tonnes per annum, adding 50% to the treatment capacity. This scoping study suggests expansion capability to approximately 300,000 ounces per annum with mining of the underground and open pit occurring in parallel. The estimated capital cost for this expansion is approximately US$14 million.

Ongoing exploration activity at Jinfeng is being directed at locating resources within trucking distance of the future Jinfeng plant to supplement ore supplies and sustain a Phase 2 expansion.

Now that construction has commenced, site activity will rapidly increase during 2005 as China's second largest gold mine is built. Sino Gold is eagerly anticipating 2006, which will be the year when gold production commences.

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