CHAPTER VI

RESERVES CALCULATION METHODS

VI.1. RESERVES CALCULATION NORMS

On the basis of regulations on the classification of reserves and solid mineral resources promulgated in accordance with Decision No 06/2006/QĐ-BTNMT of the Minister of Natural Resources and Environment dated June 07, 2006 and reference on the reports on the results of primary gold exploration in Yen Bai, Thai Nguyen provinces as well as based on distribution characteristics of gold content and geological structures of the explored blocks, we have used the most feasible norms for delineation of ore bodies as well as reserves calculation of primary gold in the exploration area as follows:

*** Qualitative norms**

- Marginal content: Au ≥ 0.6g/T
- Minimum content of engineering: Au ≥ 2g/T
- Minimum industrial content of block: Au ≥ 3g/T

*** Thickness norms**

- Minimum thickness of ore block, given 0.5m. When the thickness of ore body < 0.5m, multiple of mxg/T > 0.6mg/T then this block can be taken for reserves calculation.
- Thickness of gangue interbed is considered as part of ore body:

$$\frac{\sum m_k}{\sum m_q + \sum m_k} \leq 0{,}5 \quad (1)$$

Where:

m_q: Length of the sample having content ≥ 0.6g/T;

m_k: Length of the sample having content < 0.6g/T

VI.2. CHOOSE OF THE RESERVES CALCULATION METHODS

In case, ore bodies of primary gold with complicated shape and the exploration engineerings were arranged on parallel lines, the method of parallel section was used for reserves calculation.

- Total reserves of metallic gold of every category equal to total reserves of gold of every block in the ore body, which was calculated by the formula:

$$Q = \sum_{i=1}^{N} Q_i \quad (2)$$

Where: + Q_i (g): reserves of metallic gold in i^{th} ore block (i = 1, N);

- The reserves of metallic gold of every reserve block was determined by the formula:

$$Q_i = S_i \,.\, L_i \,.\, D.C \qquad (3)$$

In which:

+ S_i (m^2) - Average area of i^{th} block for reserves calculation;
+ L_i (m) - Length of block i (space between 2 sections);
+ D - Dry density of ore (t/m^3) ;
+ C – Average content of block of metallic gold (g/T) .

VI.3. DETERMINATION OF THE RESERVES CALCULATION NORMS

VI.3.1. Determination of area

Average area S_i of the i^{th} reserve block lying between two sections was determined by the formula:

$$S_i = \frac{S1 + S2 + \sqrt{S1.S2}}{3} \quad (4)$$

Where:

+ S1 and S2 (m^2): area of ore body on sections which were determined in computer.

For the marginal blocks, their average area was calculated to equal 1/3 of cross surface of ore body on section.

VI.3.2. Determination of content

- The average content of metallic gold in exploration engineering was determined by the formula:

$$C_{ct} = \frac{\sum_{i=1}^{n} C_i L_i}{\sum_{i=1}^{n} L_i} \qquad (5)$$

In which:

+ C_i (g/T): Content in the i^{th} sample;
+ L_i (m): Length of the i^{th} sample;
+ n : Number of collected samples in exploration engineering.

- The average content of metallic gold in reserve block was determined by the formula:

$$C_k = \frac{\sum_{i=1}^{n} C_{cti} L_{cti}}{n \sum_{i=1}^{n} L_{cti}} \quad (6)$$

Where:

+ C_{cti} (m): Average content in ore body at the i^{th} engineering;

+ L_{cti} (m): Total length of samples ivolved in reserves calculation cross cutting ore body at the i^{th} engineering;

+ n : Number of engineerings in reserve block.

VI.3.3. Determination of density

Ore dry density was determined by the arithmetic mean method.

$$d = \frac{\sum_{i=1}^{n} d_i}{N} \quad (7)$$

Where:

+ d_i : Ore dry density of i^{th} sample (T/m^3);

+ N : Number of dry density samples.

VI.4. THE PRINCIPLES OF DELIMITING BOUNDARIES FOR RESERVES CALCULATION AND CLASSIFICATION OF RESERVES AND RESOURCES.

VI.4.1. The principles of delimiting boundaries for reserves calculation

Boundaries for reserves calculation were delimited on the basis of requirements on the norms for reserves calculation as mentioned in item I.

The delimitation of ore blocks which meet the industrial norms in the exploration engineerings was done in the following order:

- Based on the norms of monosample content to delimite boundaries between ore fragments satisfying industrial nomrs, ie to delimite blocks samples having content higher than 0.6g/T.

- Determination of interbeds: For the complicated ore bodies (zone and vein), interbeds should be determined by formula (1).

VI.4.2.Block delimitation and reserves classification

The variable characteristics of the content of gold element, the variable characteristics of thickness and the level maintenance of primary gold ore body following strike and dip allow to attribute the Vang Tat Gold Mine into Mine group III.

In accordance with Decision No 06/2006/QĐ- BTNMT dated 07-6-2006 issued by the Minister of Natural Resources and Environment regulating for primary gold of mines of group III, a grid for drilling and engineering controlling reserves of category 222 following the strike is 40m÷60m, while a grid controlling following the dip is also 40m÷60m and it can limitedly extrapolate on the basis of geophysical data. At this stage the only categories of reserves 122; 333 and category of resources 334a have been calculated.

- Reserves block at category 112 was calculated in the framework of controlled ore bodies at 2 adjacent exploration lines and extrapolated following the dip not exceeded 25m from the engineering with gold of industrial content.

This reserves block was calculated for ore bodies with already known structure and content by many drill holes, drifts and outcrops.

- Reserves block at category 333 was calculated extrapolating folowing the strike from reserves blocks of category 122, but not exceeded 50m or the rest parts of ore bodies at the lines, which were controlled by solitary engineering meeting gold, were calculated and extrapolated following the strike and dip not exceeded 50m. This reserves block was used for ore bodies with already known structure and content as ore bodies TQ1, TQ2, TQ3, TQ4.

- The inferred resources at category 334a were calculated for ore bodies and ore occurrences locating at expanding parts of known ore bodies, which were determined by trenches, outcrops and solitary drift. The strike and dip were realized based on geological surface data and geophysical ones.

VI.5. THE RESULTS OF RESERVES CALCULATION

The above-mentioned norms and principles allow to determine:

- Reserves blocks at category 122 include 122-TQ1-K1, 122-TQ1-K2, 122-TQ2-K3. 122-TQ4-K4. Total reserves of Au at category 122 are 3160kg (See in detail the table VI.4).

- Reserves blocks at category 333 include 333-TQ1-K5; 333-TQ1-K5; 333-TQ1-K6; 333-TQ1-K7; 333-TQ2-K8; 333-TQ2-K9; 333-TQ2-K10; 333-TQ3-K12; 333-TQ4-K13; 333-TQ4-K14; 333-TQ4-K15. Total reserves of Au at category 333 are 4200kg (see in detail the table VI.5).

- The inferred resources at category 334a were calculated for following ore bodies:

+ Expanded parts to the North and to the South of ore bodies TQ1 and TQ2: category 334a : 2500kg.

According to the data obtained from solitary engineerings, Au occurrence and primary gold ore were found in trenches at from line 3 to line 9 and in drift L.Ib-line 26. Structure of ore body, mineralization type, content and distribution characteristics (near the boundary with greenschist and quartzitic sandstone) of these primary gold ore occurrences are similar to that of ore bodies TQ 1 và and TQ2. It is proposed that the inferred resources of this expande part are corresponding to known reserves at category 122 of these ore bodies, ie about 2500kg.

+ Expanded part to the North of the ore bodies TQ 3 and TQ 4 at category 334a : 1500kg.

According to geophysical data, at the North of ore bodies TQ3 and TQ4 there exist polarized and resistivity anomalies. These anomalies are simolar to that caused by known ore bodies. Stretching space to the North of geophysical annomalies is about 300m. It is predicted that inferred resources at category 334a of the expanded part are

corresponding to calculated reserves at categories 122 and 333 of ore bodies TQ3 and TQ4 is1500kg.

+ Inferred resources of deep part (deeper than 100m) of ore bodies TQ1, TQ2, TQ4 at category 334a were predicted to be 2000kg.

Because of lack of deep study conditions (no deep drill holes, no sounding, etc), so the extrapolation of continuous part following the strike and dip of ore bodies can not be made. The reserves of a part under 100m deep will be confirmed and upgraded in further stage. It is previsedthat the resourves at the depth from 100m to 200m equal 50% of the reserves from surface to the depth of 100m, ie, about 2000kg (it is suggested that the content will be reduced following to the depth increase and because of there is absent secondary enrichment zone).

Total resources at category 334a are inferred to be about 6000