CHAPTER V
ECONOMIC EFFECTIVENESS OF THE GEOLOGICAL INVESTIGATION

Based on Contract No. 01/2014/VLSK of *"Prospecting for gold at the scale of 1:25,000 over the 199.1 km^{2}area in North, Northeast of Vang Tat, San Say, Attapeu, Dak Chung district, Se Kooing province of the Lao's People Democratic Republic"*dated 9 March 2014 between the Viet Lao Minerals JSC.and the Minerals Association under the Vietnam General Assocation of Geology;

Based on the documents of field investigation and testwork result, total costs for the mineral investigation, prospecting at 1:25,000 scale over the 199.1km2 area in the Northeast of Noong Key Ucand Vang Tat Kang are summarized in the following table.

Total cost of mineral investigation and evaluation scaled 1:25,000 over the 199.1 km^{2}area is VND 280,785,981.97/km^2, equivalent to US$13,370.76 USD/km^2.

TABLE SUMMARIZING THE COMPLETED WORK VOLUME

No.	WORK DESCRIPTION	UNIT	QUANTITY	COMPLETED	COMPLETION PERCENTAGE
I	GEOLOGICAL WORK				
A	MAKE GEOLOGICAL – MINERAL MAP				
1	Prepare project for the 115 km^2area at 1/25,000 scale (one sheet)	Km^2	199.1	199.1	100%
2	Prepare a summary report for the 115km^2area at 1/25,000 scale (one sheet)	km^2	199.1	199.1	100%
B	MINERAL EVALUATION AT 1:25,000 SCALE				
1	Outdoor work –without radioactive observation	Km^2	199.1	199.1	100%
2	Indoor work at 1:25,000 – without radioactive observation	Km^2	199.1	199.1	100%
C	HEAVY MINERALS – GEOCHEMISTRY WORK				
1	Heavy mineral – Outdoor work	Sample	225.00	228	101%
2	Stream sediment geochemistry work	Sample	143.00	190	133%
3	Heavy mineral – Indoor work	Sample	225.00	228	101%
4	Stream sediment geochemistry	Sample	143.00	190	133%
5	Outdoor work - Heavy minerals at 1:10,000 scale (estimates)	Sample	75.00	90	120%
6	Indoor work – Heavy minerals at 1:10,000 scale	Sample	75.00	90	120%
D	SAMPLING	Sample			
1	Channel sample (10 x 5 cm in size), ground condition categorized VII-VIII	Sample	100.00	118	118%
2	Pan sample – weighted 10 kg	Sample	25.00	40	160%
E	GEOLOGICAL WORKS				
1	Outcrop clearance (ground condition categorized IV)	M^3	500.00	600	120%
4	Swallow trenching (ground condition categorized VIII –No	M^3	200.00	200	100%

	blasting)				
5	Trenching without compaction	M^3	200.00	200	100%
F	SAMPLE PREPARATION AND ANALYSIS				
1	*Preparation of samples in various kinds*	Sample			
1.1	Heavy mineral sample		225.00	318	141%
1.2	Pan sample weighted 10 kg		25.00	40	160%
1.3	Petrographic sample		100.00	100	100%
1.4	Mineralogical sample (polished)		50.00	50	100%
1.5	Samples in all kinds (3 - 7 kg) (for analysis of chemical properties)		243.00	308	127%
2	*Analysis of samples in various kinds*				
1.1	Heavy mineral sample – (the whole)	Sample	225.00	318	141%
1.2	Petrographic sample		100.00	100	100%
1.3	Mineralogical sample		50.00	50	100%
1.4	Pan sample – (the whole analysis)		25.00	40	160%
1.5	ICP – MS method		143.00	190	133%
1.6	AAS method (Au - Ag …)		100.00	118	118%
G	DETAILED INVESTIGATION AT 1:10,000 SCALE				
1	Detailed investigation at 1:10,000 - 15 km^2 (outdoor)	km^2	15.00	18	120%
2	Detailed investigation at 1:10,000 - 15 km^2 (indoor)	km^2	15.00	18	120%
H	COMPUTER-RELATED WORK				
1	Digitizing field map at 1:25,000 scale	sheet	1.50	2	133%
2	Digitizing geochemical map at 1:25,000 scale	sheet	3.00	6	200%
3	Digitizing heavy minerals map in groups	sheet	4.50	8	178%
4	Digitizing geological and mineral map at 1:25,000 scale	sheet	1.50	2	133%

5	Digitizing maps of prospects and mineral forecast	sheet	1.50	2	133%
6	Digitizing outcrop logs	sheet	2.00	2	100%

TABLE – COST SUMMARY OF RESOURCES AND MINERALS INVESTIGATION AND EVALUATION AT 1:25,000 SCALE OVER THE 199.1 km^2 AREA

Unit: VND

No.	WORK DESCRIPTIOIN	UNIT	UNIT RATE	QUANTITY	AREA FACTOR	COST	COMPLETED	FINAL COST
I	GEOLOGY WORK					7,185,965,766.45		7,705,466,782.08
A	MAKE GEOLOGICAL – MINERAL MAP					1,761,795,171.78		1,761,795,171.78
1	Prepare project for the 115 km^2 area at 1/25,000 scale (one sheet)	Km^2	428,126,462.00	199.1	7,048.73	742,620,608.02	199.1	742,620,608.02
2	Prepare a summary report for the 115km^2 area at 1/25,000 scale (one sheet)	km^2	587,959,155.00	199.1	6,219.60	1,019,174,563.76	199.1	1,019,174,563.76
B	MINERAL EVALUATION AT 1:25,000 SCALE					3,841,480,462.30		3,841,480,462.30
1	Outdoor work – without radioactive observation	Km^2	12,571,829.00	199.1	143.52	2,503,079,728.33	199.1	2,503,079,728.33
2	Indoor work at 1:25,000 – without radioactive observation	Km^2	6,722,171.00	199.10	82.81	1,338,400,733.97	199.10	1,338,400,733.97
C	HEAVY MINERALS – GEOCHEMISTRY WORK					273,249,383.89		330,062,710.00
1	Heavy mineral – Outdoor work	Sample	323,831.00	225.00	3.68	72,862,803.00	228	73,833,468.00
2	Stream sediment geochemistry work	Sample	971,493.00	143.00	6.69	138,924,455.96	190	184,583,670.00
3	Heavy mineral – Indoor work	Sample	85,499.00	225.00	1.12	19,237,526.10	228	19,493,772.00
4	Stream sediment geochemistry	Sample	80,590.00	143.00	0.83	11,524,488.83	190	15,312,100.00
5	Outdoor work - Heavy minerals at 1:10,000 scale (estimates)	Sample	323,831.00	75.00	3.68	24,287,601.00	90	29,144,790.00
6	Indoor work – Heavy minerals at 1:10,000 scale	Sample	85,499.00	75.00	1.12	6,412,509.00	90	7,694,910.00

D	SAMPLING					26,957,221.65		36,661,520.00
1	Channel sample (10 x 5 cm in size), ground condition categorized VII-VIII	Sample	154,040.00	100.00	1.77	15,404,177.40	118	18,176,720.00
2	Pan sample – weighted 10 kg	Sample	462,120.00	25.00	1.77	11,553,044.25	40	18,484,800.00
E	GEOLOGICAL WORKS					202,996,039.50		223,414,600.00
1	Outcrop clearance (ground condition categorized IV)	M^3	204,213.00	500.00	3.16	102,108,079.50	600	122,527,800.00
4	Swallow trenching (ground condition categorized VIII – No blasting)	M^3	453,483.00	200.00	5.00	90,697,600.60	200	90,696,600.00
5	Trenching without compaction	M^3	50,951.00	200.00	0.80	10,190,359.40	200	10,190,200.00
F	SAMPLE PREPARATION AND ANALYSIS					403,553,242.00		1,340,157,318.00
1	*Preparation of samples in various kinds*	Sample				84,860,667.00		109,006,426.00
1.1	Heavy mineral sample		137,168.00	225.00	1.00	30,862,800.00	318	43,619,424.00
1.2	Pan sample weighted 10 kg		243,310.00	25.00	1.00	6,082,750.00	40	9,732,400.00
1.3	Petrographic sample		90,356.00	100.00	1.00	9,035,600.00	100	9,035,600.00
1.4	Mineralogical sample (polished)		198,915.00	50.00	1.00	9,945,750.00	50	9,945,750.00
1.5	Samples in all kinds (3 - 7 kg) (for analysis of chemical properties)		119,069.00	243.00	1.00	28,933,767.00	308	36,673,252.00
2	*Analysis of samples in various kinds*					318,692,575.00		379,440,802.00
1.1	Heavy mineral sample – (the whole)	Sample	406,494.00	225.00	1.00	91,461,150.00	318	129,265,092.00
1.2	Petrographic sample		299,066.00	100.00	1.00	29,906,600.00	100	29,906,600.00
1.3	Mineralogical sample		355,687.00	50.00	1.00	17,784,350.00	50	17,784,350.00
1.4	Pan sample – (the whole analysis)		589,619.00	25.00	1.00	14,740,475.00	40	23,584,760.00
1.5	ICP – MS method		600,000.00	143.00	1.00	85,800,000.00	190	114,000,000.00
1.6	ICP – MS method for ore (estimated)		600,000.00	40.00		24,000,000.00		

1.7	AAS method (Au - Ag …)		550,000.00	100.00	1.00	55,000,000.00	118	64,900,000.00
G	DETAILED INVESTIGATION AT 1:10,000 SCALE					566,519,245.34		679,815,090.00
1	Detailed investigation at 1:10,000 - 15 km^2 (outdoor)	km^2	23,217,786.00	15.00	266.72	348,270,790.80	18	417,920,148.00
2	Detailed investigation at 1:10,000 - 15 km^2 (indoor)	km^2	14,549,719.00	15.00	177.97	218,248,454.54	18	261,894,942.00
H	COMPUTER-RELATED WORK					109,415,000.00		171,895,000.00
1	Digitizing field map at 1:25,000 scale	Sheet	7,812,500.00	1.50	1.00	11,718,750.00	2	15,625,000.00
2	Digitizing geochemical map at 1:25,000 scale	Sheet	7,812,500.00	3.00	1.00	23,437,500.00	6	46,875,000.00
3	Digitizing heavy minerals map in groups	Sheet	7,812,500.00	4.50	1.00	35,156,250.00	8	62,500,000.00
4	Digitizing geological and mineral map at 1:25,000 scale	Sheet	7,812,500.00	1.50	1.00	11,718,750.00	2	15,625,000.00
5	Digitizing maps of prospects and mineral forecast	Sheet	7,812,500.00	1.50	1.00	11,718,750.00	2	15,625,000.00
6	Digitizng outcrop logs	Sheet	7,812,500.00	2.00	1.00	15,625,000.00	2	15,625,000.00
7	Report typing fee	Page	200.00	200.00	1.00	40,000.00	100	20,000.00
II	OTHER COSTS					465,405,293.16		465,405,293.16
1	Cost for checking and acceptance and approval 0.5%xA (Vietnam)					35,929,828.83		
2	Transport cost (Estimate)					150,000,000.00		
3	Camping fee 2% x A					143,719,315.33		
4	Report translation fee (English)	page	250.00	120,000.00		30,000,000.00		
5	Report translation fee (Laos) (estimate)					30,000,000.00		
6	Other fees/charges 1% of Total Cost Estimate					75,756,149.00		
	TOTAL I + II					7,651,371,059.61		8,170,872,075.24

Total cost: VND 8,170,872,075.24(Eight billion one hundred seventy million, eight hundred seventy two thousand, and seventy five Vietnamese dongs)

CONCLUSIONS

The mineral resources investigation, evaluation conducted from 2015 to date over the 199.1 km^2 area licensed to the Viet Lao JSC. has achieved progresses in clarifying mineral resource potentials and prospects within the licensed area, and has complied with regulations of the Lao's Government applied to mineral investment – mining.

The natural resource investigation results indicate clear conclusions relating to the mineral prospects within the licensed area, particularly:

+ Within the investigated area, the predominant mineral resource is gold mineralizationwhile other minerals as shown in the documentations are only initial occurrences.

+ Within the investigated area, gold mineralization occurs in diversified forms, particularly:

- Gold mineralization associated with light-colored dikes and locally scoped hydrothermal mineralization. It is these outstanding findings which clarify origin of mineralization and intrusive formations.
- Gold mineralization developing in quartz-sericiteschists forms large zones with different occurrences, possibly large quartz veins and also sulfide-poor quartz veinlets containing gold, similar to "Vang Tat-type gold" with prospect and stability.
- Placer formations occur locally within valleys. Along with supplies as streams; shear, foliated zones in the valley which contain aforesaid gold mineralization-bearing formations are additional supplies.
- Placer formations have supplies which are not far from the places where gold grains are removed from host rocks.

+ In two areas containing mineralization as mentioned above, the gold prospects exhibits occurrences relating to assemblages of associated elements like Hg, Pd, Ag, Pb, Zn, As, Sb and Cu in different occurrences, especially Hg. These occurrences show that gold mineralization occurs in near-surface areas but the original sources might be at depth. Follow-up investigation will be possibly required in case of favorable technical conditions.

+ Gold mineralization formations developing in metamorphosed terrigenous rocks exhibits clearer mode of occurrence compared with gold mineralization occurrences developing in intrusive formations and obviously larger scope.

+ In these two Areas investigated, the priority should be given to follow-up evaluation of gold mineral in detailed scope in Vang Tat Kang and next to areas to the north east of Noong Key Uc.

This report prepared by the Viet Lao Minerals JSC. and the Minerals Association has received supports and assistances from the Mineral Mining Unit – Ministry of National Defense, leadership of Se Koong andAttapeu provinces and the Department of Geology and Minerals of the Laos. We would like to hereby express the sincere thanks for such valuable assistances and supports.

Hanoi, 15 December 2015

On behalf of the authors

Chief Editor

DoQuocBinh, PhD.

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