



Determination of Gold Head Grade for Gold Exploration in alluvial Deposit on Henry's Concession, Bibiani-Western Region, Ghana

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Abstract: *The aim of this study is to determine the gold head grade in alluvial deposit (Henry's concession) which falls within the Basin granitoid (Asenanyo Granitoid)-undifferentiated contact with Birimian Metasedimentary rocks. Fifteen (15) samples were systematically collected from the concession and assayed to determine the gold value of the ore prior to exploitation. Out of the fifteen (15) samples taken from eight (8) holes, three samples representing two holes (HN 1, HN 2 and H1) showed average head grades of 0.003, 0.001 and 0.0005 g/m*. The average gravel layer of the concession is 0.16 m. There was no observed distinct relationship among the holes and the values obtained are very low suggesting that, the gold mineralisation within the concession is not viable.*

Key words: *Geology, Gold, head grade, exploration and alluvial deposit*

3. Introduction

The geology of Southwest Ghana is dominated by the Birimian Supergroup metasedimentary and metavolcanic rocks and various granitoid intrusions (Fig 1.1). Granitoid intrusions are subdivided into two types: Belt Type (Dixcove) granitoid and Basin Type (Cape Coast) granitoid. Belt type granitoids (ca. 2180 Ma, Allibone et al., (2004) possess a metaluminous character, are often tonalite to granodiorite and are confined to Birimian metavolcanic belts (Hirdes and Leube , 1989). Basin granitoid (~ 2116-2088 Ma., Allibone et al., 2004b) have a peraluminous character and higher K and Rb relative to belt granitoids, are mainly granodiorite , and associated with the central portions of Birimian metasedimentary basins (Hirdes and Leube , 1989) .

Within the Birimian Supergroup, north-east and metasediments (Fig. 1.1) along which striking mafic metavolcanic belts are separated from intervening metasedimentary (dominantly turbiditic) basins by major faults: These faults probably controlled early syn-Birimian sedimentary basin down-faulting (Hirdes and Leube , 1989). Dating of granitoid rocks (Belt Type granitoids) that cut the Birimian metavolcanic rocks constrains the age of

with the intrusion of basin type granitoid rocks and probably reactivated the Belt bounding faults as thrust fault. The two metavolcanic belts are the shanty Belt and Sefwi-Bibiani Belt.

The Sefwi-Bibiani Belt rock successions have been metamorphosed to greenschist facies and tight isoclinal and overtuned folds are present. Gold deposits developed within the Birimian Supergroup of Ghana are often located near the interfaces of metavolcanics and metasediments (Fig. 1.1) along which regional shears are developed (Abott, 2011). These shear zones are locally splayed which also contained gold deposits. The undulating alluvial terrain covered most part of the basement rocks in the area and where expose dips are generally steep between 50-55E, whilst the general strike is N-NNE.

The Henry's concession is located at approximately $06^{\circ} 24.42'$ latitude and $02^{\circ} 18.16'$ longitude West after the Ashanti Belt to the east (Fig1.1). It covers an area of approximately 0.0875 Km^2 at about 8km away from Bibiani town (Abott, 2011). It is accessible by road . The concession is situated along valley and flank on both sides by hills. There is a small stream south of the concession running in a W-E direction . The Henry's concession is an alluvial deposit which falls within the Basin granitoid (Asenanyo Granitoid)-undifferentiated contact Birimian Metasedimentary rocks (Fig. 1.1). Primary gold in the area is associated with quartz developed in a shear zone generally 5-20m wide. Petrological investigation shows that quartz is often dark grey to smoky and fills fissures as veins and stockworks. Invariably, quartz porphyry occurs at the foot and hanging walls of shear zone often defined by graphitic gouge. Sulphides such as pyrite, arsenopyrite, pyrrhotite chalcopyrite occur with the gold and the schistose host rocks exhibit carbonate alteration and are often graphitic, The ore body is closely associated with graphitic shear zones, and intrusions of granites, quartz porphyry, and dykes and aplites are closely associated with the gold emplacement (Abott, 2011). Gold mineralization associated with primary gold deposits in the area show average grade mined at 10.3g/. Though selective high grade mining was the order of the day but it was common to find grades as high as 7.0g/t in the old waste dumps and in the adjoining walls of mined out stopes (Abott, 2011). Given these high grades associated with primary gold mineralisation in the areas it implies that the alluvial deposits may be mineralized. It is based on this premise that this present study aimed at conducting preliminary investigation of the associated alluvial in the surrounding to assess their gold mineralisation potential.

4. Methodology

a. Sampling

Fifteen samples (15) were taken from eight (8) holes at the gravel layers within the alluvial deposits of Henry's concession at Bibiani in the western region of Ghana. These samples were collected along at an interval of about 150 feet) and across (at an interval of about 100 feet) the valleys of the concession containing the alluvial deposit.

b. Sample Preparation and Experimental Methods

The samples were subjected to particle size distribution analysis (PSDA) followed by Knelson concentration of the size fractions. Knelson concentrates of each size product was then panned and carried through amalgamation and retorting.

c. Procedure

The samples containing the ore of the gold were ground and sieved through 100 mesh particle size to obtained particle size fine enough to allow the maximum exposure of the gold surface to the mercury, As the ore is mixed with mercury in amalgamation drum, to

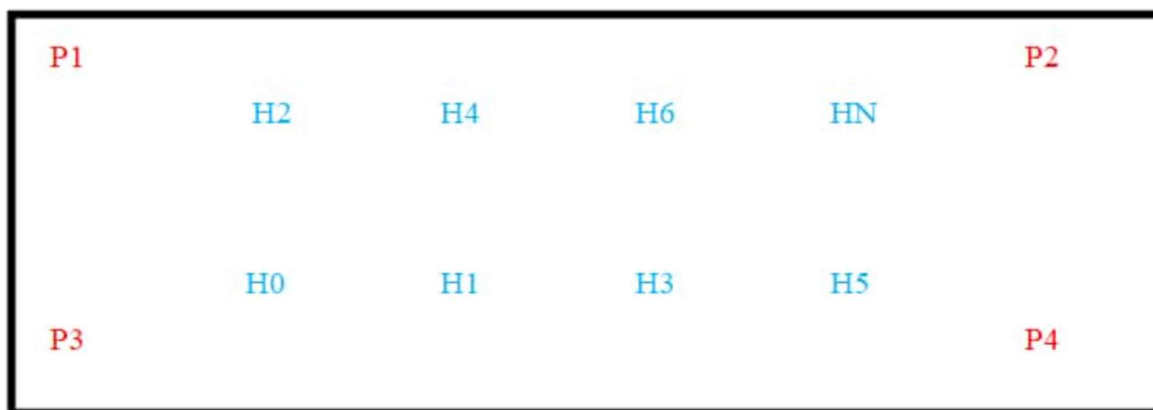


Fig. 1.2 Sampling Points on the Concession

metal bonds with the mercury, amalgam. Water was added to the mixture to help disperse the ore and to promote a better precious metal to mercury interface and the waste (barren) ore pulp were caused to travel different paths to effect separation. Precious metal (gold) was covered from the mercury by retorting the mercury from the amalgam and is done in a cast iron retort or steel retort. The retort was half full filled with small balls of amalgam, as room is required for the vaporized mercury.

Distillation was performed at a very low temperature and heat applied very gradually for bout 2 hours, until 1,500 degree F is reached.

The recovered gold obtained was then weighed and the grades estimated. Refer to Table 1.1 for the results.

5. Results and Discussions

This section presents the results and discussions. Results of the gold obtained from the studies are shown in Table 1.1 below.

Table 1.1 Results of the Analysis

Holes	Samples	Average Area	Au (g)	Au (g/m ³)	Average g/m ³
HN	HN 1	0.2000	0.0006	0.0030	0.00200
	HN 2	0.2000	0.0002	0.0010	
HO	H 03	0.1500	0.0000	0.0000	0.00000
H1	H 1	0.2000	0.0000	0.0000	0.00025
	H 13	0.2000	0.0001	0.0005	
H2	H 2	0.1500	0.0000	0.0000	0.00000
	H 21	0.1500	0.0000	0.0000	
	H23	0.1500	0.0000	0.0000	
H3	H 32	0.2000	0.0000	0.0000	0.00000
	H 33	0.1500	0.0000	0.0000	
H4	H 4	0.1000	0.0000	0.0000	0.00000
H5	H53	0.2000	0.0000	0.0000	0.00000
	H 54	0.1500	0.0000	0.0000	
H6	H 62	0.1000	0.0000	0.0000	0.00000
	H 63	0.1000	0.0000	0.0000	
Average		0.1600	0.00006	0.0003	

The eight holes from which the samples were taken are HN, HO, H1, H2, H3, H4, H5 and H6. Two of the holes indicated the presence of gold. These holes are HN and H1. From Table 1.1 above, three of the samples from two holes that recorded gold are HN 1, HN 2 and H 13. HN 1, HN 2 and H 13 recorded 0.0006, 0.0002 and 0.0001 g respectively. The average gold head 0.0030, 0.0010 and 0.005 g/m³gm respectively. While holes HN and H1 are 0.0020 and 0.00025 g/m³ respectively. There was no observed distinct relationship among the holes and the values obtained are very low.

6. Conclusion and Recommendation

a. Conclusion

From the results of the samples examined, there was no observed distinct relationship among the holes and the values obtained are very low. These therefore suggest that, the gold mineralisation within the concession is not viable.

b. Recommendation

Further investigations should be conducted around the holes that indicated the presence of gold.

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