GEOLOGICAL REPORT AND EXPLORATION WORK PROGRAM FOR THE EVALUATION OF THE ECONOMIC POTENTIAL OF BLOCK-9 HOSTING COPPER AND GOLD MINERALIZATION.

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SUBMITTED BY:

FIVE SEAS INTERNATIONAL LLC,

MUSCAT, OMAN.

TO THE MINISTRY OF COMMERCE AND INDUSTRY

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1. INTRODUCTION:

Block-9 constitutes the northern part of Samail Ophiolite Belt. It is situated in the western side of Oman Mountains. It has an area covering approximately 396 sq km. The point number 2 and 3 are located in the tertiary gravel, whereas point 3 and 4 are in the hills. The area can be accessed by Muscat-Barka-Rustaq black-top road up to Badya and further in the gravel by camel track for about 10 km. Preliminary geological studies of the outcrops exposed in the tenement area were made by a team comprising the undersigned, Naushad Ahmad Ansari, Sr. Geologist, Mr. Sajeer Ahammed, Production Manager and Mr. Waseem Ahmad, field coolie. The study area forms a polygon bounded by lines joining the points given a table 1. Each point is expressed as UTM coordinates in WGS 84 spheroid.

Table-1

Point	UTM Easting	UTM Northing
1.	560486.06	2584827.9
2.	572043.41	2609077.7
3.	585561.39	2609903.2
4.	574210.42	2579668.3

The location map showing the boundaries of the concession area is given in figure-I.

Prior to the present study, the job for conducting spatial data modeling was assigned to Kennex Pty Ltd., an Australian company specialized in predictive modeling for mineral deposits. According to the findings made by the contracting company, Block-9 is an attractive economic target for exploration of Volcanogenic Massive Sulphide (VMS) Copper-Gold Mineralization. The potential of this Block for copper and gold deposits is similar to the deposits being developed at Shinas, Hatta, lasail, Aarja, Ghuzayn, Hay-As-Safil and Rakah.

2. GEOLOGY:

The geological domain in and around the vicinity of the concession area is dominated by the rocks of samail ophiolite with tertiary-quarterly sediments cover, at places. The samail ophiolite is a fragment of oceanic lithosphere originating from the ocean floor of the Neo-Tethys during middle to late cretaceous. The samail oceanic crust got detached and thrust over the Arabian Platform. Within the Neo-Tethys, the oceanic samail basin offshore of Oman was an area of accretion where primary crust was formed at a spreading ridge. Seafloor spreading was interrupted when the stresses were reversed and convergence began

between the Eurasian Plate to the northeast and the African-Arabian Plate to the southwest.

The samail ophiolite is one of the major features of the Oman Mountains. It extends from the south of the Musandam Peninsula to the Batain Coast, south of Ras al Hadd. It is a suitable target area for the discovery of additional volcanogenic massive sequence deposits. The stratigraphic sequence observed in ophiolite corresponds to the lithosphere forming processes at mid-oceanic ridges. The rocks of ophiolite complex consist mostly of tectonized peridotite (Harzburgite-rich mantle rocks), cumulate peridotite (Dunite-rich), layered gabbro, isotropic gabbro, sheeted dykes, basaltic pillow lavas and the sediments consisting of cherts and mud (black shale). The extrusive basaltic lavas are thinner but have great metallogenic importance. This sequence is formed by the products of submarine volcanic eruptions related to sea-floor spreading. They are overlain locally by manganiferous radiolarian sediments that mark the end of the oceanic accretion of the samail basin. The sequence of extrusive pillow lavas are further divided into two, namely the lower extrusives and upper extrusive volcanic rocks. The upper extrusives discomformably overlie lower extrusives with a thin interval of chert or mudstone in between.

The extrusive rocks of the samail ophiolite represent the best metallotects known in Oman for base and precious metals. Copper occurrences exist throughout the samail ophiolite. The associated mineralization most commonly resulted from hydrothermal processes, mainly at the end of the submarine volcanic cycle or during the period of quiescence. This mineralization is generally assigned to the Massive Sulphide Type and related to MORB (Mid-Ocean-Ridge Basalt).

Two major volcanic episodes are represented at the top of the ophiolite pile. The volcanic rocks generally belong to one of the two types of magmatism: the first is related to sea-floor spreading at the accretion ridge with material derived from large magma chambers; the second is of island-arc type with material derived from smaller magma chambers. The first episode is also called 'Geotimes' by certain authors.

Although, occurrences of fracture-filling or vein sulphides may be encountered throughout the samail ophiolite, but the interesting mineralization is very localized. It occurs mainly at the top of the pillow lavas of the lower extrusives. Sulphide disseminations indicate localized hydrothermal activity. The major period of hydrothermal activity occurred at the end of this basal volcanic episode. It is at its peak that most of the massive-sulphide deposits are found. The end of this first

volcanic episode is marked by the deposition of chert and mudstone. It was contemporaneous with a system of deep fracture which cut the ophiolitic pile; paleofractures that not only acted as pathways for the mineralized fluids, but also delineated sea-floor depressions where sulphides locally accumulated in the immediate vicinity of the hydrothermal vents. The top of the basalts was intensely fractured and impregnated by the sulphides and silica. These stockworks are characterized by sulphide veinlets and disseminations within a chloritized rock. Most of the massive sulphide deposits and the gossans resulting from their weathering are situated at the contact between lower extrusives and the upper extrusives. The fracture zones associated with the mineralization were reactivated during later tectonic and volcanic episodes, which explains the common presence of late intrusive complexes in the mineralized area.

More than 400 mineralized occurrences have been recorded in the Oman Mountains, although at present, a large number of these are considered as being of little economic interest. It is possible that later work may reveal new interesting targets. The Oman suphide deposits usually have low gold grade like most sulphide deposits associated with submarine tholeitic basalts.

Geological fieldwork carried out in and around Block-9 reveals the presence of interesting outcrops and gossan.

- At location number 1 (0562233 easting and 2593178 northing), an outcrop is found exposed. The in-situ rocks consist mostly of meta-basic igneous rocks, serpentinites, meta-pelitic to meta-psammitic gneisses and schists with intercalations of meta-carbonates. The schists are quartz veined, at places. The schistosity planes are found well developed. The trend of the schistosity plane is north-south with dips of the orders of 55 degrees in western direction. The country rocks are jointed and fractured. They are well exposed on the bank of a wadi trending east-west and whose width goes upto 150m, at places. The rocks exposed on the other bank of the wadi at location (0580178 easting and 2593451 northing) are more or less similar in lithology and they dip in the opposite direction indicating that the wadi is structurally controlled and follows a fault plane. Broken rock fragments, breccias, meta-calcareous rocks, a great deal of rupturing and fracturing in the parents rocks, silicification and mineralization are observed along and in the near vicinity of the fault plane.

- At location number 3 (0580954 easting and 2593254 northing), a well developed gossan was encountered during the field traverses. Green, blue, brownish and reddish coloured minerals like malachite, azurite, cuprite, chalcocite etc were found on the surface of the leached zone. Oxidized broken fragments of quartz vein containing sulphide minerals were found exposed and scattered in this localized zone. Precipitation of iron oxide, reddish in colour was seen on the upper surface of this zone. This was an interesting discovery leading to confirm the existence of sulphide deposits in the concession area which needs to be examined in detail.

- At location number 4 (0573934 easting and 2580248 northing), the exposed strata are largely comprised of metamorphosed calcareous rocks, calcite veined bluish and greenish dolomite, meta-basic grayish and greenish igneous rocks following the trend of the bedding planes of these calcareous rocks and the metallogenic ferruginous rocks lying just above basic litho-unit. A vertical section exhibiting a sequence of these rocks, right from the bottom to top, is found well developed. This location is near to the point number 4 of our concession area.

- The point number 2 and 3 of the given area are largely in the wadi gravels wherein no outcrop could be seen exposed. However, long traverses on foot across the study area, particularly along the linear depressions, tributaries and wadi, are expected to lead to the exposures of different litho-units.

Thus, on the basis of the geological observations and assessment, it may be inferred that the volcanogenic massive sulphide deposits occur in the concession area which needs to be examined in detail.

3. THE EXPLORATION PROGRAM:

On the basis of the geological assessment made during the traverses in the tenement area and review of literature, the exploration program on prospecting the copper deposits is split up in two phases of activities.

- Phase-I: The preliminary study
- Phase-II: The detailed study

This approach is considered as cost effective in exploration as the result from phase-I would lead to conclude to some extent on the quality and quantity of the economically extractable copper deposit to justify the need to undertake the detailed study.

Phase-I: The preliminary study:

The activities for the preliminary study will include the following:

1. Study of the geological literature and review of the pre-existing data.
2. Geological fieldwork / survey
3. Collection of representative samples.
4. Chemical analysis of the collected samples.
5. Data interpretation
6. Compilation of the Preliminary report.

Phase-II: The detailed survey:

The results of the preliminary study would define the scope of the detailed study. However, on a general approach, the activities for this phase would include the following:

1. Topographical survey and Base Map production
2. Geological mapping
3. Geophysical Survey
4. Drilling and pit sampling
5. Sample analysis and determination of overall grade of the mineral.
6. Estimation of Reserves.

4. Methodology for Phase-I:

4.1 SURVEY OF LITERATURE AND PRE-EXISTING DATA:

It includes review of literature, previous works, geological and topographical maps, satellite image, relevant data and information. Satellite images and relevant data will be obtained from the concerned ministry and agencies. Site accessibility will be examined and plan framed to carry out the required survey.

4.2 GEOLOGICAL FIELD WORK / SURVEY:

The boundaries of the concession area shall be marked. Geological fieldwork will include taking a series of field traverses on foot along the main wadies, tributaries, fault planes and across the strike direction etc in the given area. Lithological and structural studies like physical characters of rocks, their dips, strikes, folds, joints, faults and foliated planes, if any shall be made. Special attention will be given to study the outcrops bearing signature of copper mineralization. Geological sections at various locations shall be prepared. Each section shall be studied with regard to ore homogeneity, bed thickness and presence of intercalated layers of other rocks so as to define ore grade and estimate the visual reserves. Preliminary geological reserves of the resource shall

be estimated by making use of the surface area of the exposed rocks and their average elevations.

4.3 COLLECTION OF SAMPLES:

Based on the studies of the various litho-units exposed in the study area, representative samples of the ore and the host rocks shall be collected from different locations. Changes in the lithological characteristics of the parent strata shall be noted. The location of the sample site shall be marked. A profile of sample locations shall be prepared. Samples shall be preserved and transported to Muscat for laboratory analyses.

4.4 CHEMICAL ANALYSIS:

The selected samples of Copper ore and the relevant rocks shall be subjected to chemical analysis through a recognized laboratory in Muscat. The chemical tests will be to see the percentage of copper. The results of the chemical analysis will be evaluated by identifying the elements which could have an impact on the characteristics of copper ore for its industrial use.

4.5 COMPILATION OF PRELIMINARY REPORT:

The data collected from the activities of the different stages cited above shall be used to prepare a geological report with due recommendations. The report shall highlight the probable reserve size and its grade, and also define the scope of work for phase-II.

5. METHODOLOGY FOR PHASE-II:

5.1 TOPOGRAPHIC SURVEY AND BASE MAP PRODUCTION:

A topographic survey of areas of interest in the concession area will be conducted by a qualified and experienced team using Advance total station, a surveying instrument and standard accessories. A denser network of observation points will be noted so as to record sharper topographical definitions. The survey data will be processed using appropriate GIS software to produce a topographic map at a scale of 1:2000 with a contour interval of 5 m with all ground features and definitions. This map will also be used to develop a mining plan and calculation of reserves.

5.2 GEOLOGICAL MAPPING:

It will entail a comprehensive geological survey to produce a detailed geological map of areas of interest in the concession area on 1:2000

scale. The map will exhibit different mappable litho-units with their distinguished contacts with each other. Surface outcrop with their distinct rock types will be marked on the map. Also, structural features shall be marked on the map in order to interpret the probable subsurface extension of the rocks bearing copper deposit. With the help of large scale geological map, cross-sections will be developed to calculate the minable reserves.

5.3 GEOPHYSICAL SURVEY

Five Seas international will employ an integrated approach in exploring for VMS deposits. Landsat imagery and aeromagnetic data will be used to its best to target area and then ground geophysics and geological reconnaissance mapping and geochemistry will be deployed to define the drill targets. Copper deposits respond well to TEM (Time-Domain electromagnetic), IP (Induced polarization) and magnetics, in cover situations down to at least 150m. Geophysical expressions will be a reliable indication of the areal extents of massive sulphide mineralization and resource potential. Therefore regional exploration will focus on areas of higher IP chargeability.

5.4 DRILLING AND PIT SAMPLING:

It is envisaged to drill boreholes. Their number and depth will depend on the results of geophysical survey. Alternatively, excavation of few pits at the selected spots shall also be dug close to or on the exposed ore body and in and around prospective zones as indicated by IP surveys. The choice to prefer any of the two options would depend on the results of the preliminary study and geophysical survey. The drilling method employed will be rotary drilling using water as fluid with conventional diamond core drilling rig and RC drill testing (Reverse circulation). Core samples will be described and preserved for each meter of drilled depth. Borehole logs and reports will be prepared for each borehole.

Alternatively, pits will be excavated in an appropriate numbers as required using rock breaking machines. The pit dimension will be of the order of 1x1x3(m). The ore samples will be collected with change in depth. A profile of ore quality will be developed. Drilling and pit data will be used to construct cross-sections for different parts of the concession area in order to estimate the available reserves.

5.5 ANALYSIS OF ORE SAMPLES:

The ore samples collected from drilling of boreholes or excavation of pits will be chemically analysed. The basis and the procedure will be the same as adopted in a standard modern laboratory. The chemical tests will be to analyse the percentage of copper and other related elements.

The presence of tracer elements in the ore that may have an impact will be ascertained. The ore quality will be confirmed in conjuction with the earlier analyses results.

5.6 RESERVE ESTIMATION:

Upon completion of the drilling program, the results will be fully examined and cross-sections extended as appropriate to define the resource. Based on the topographical survey and geological cross sections, the resource reserves will be calculated. Results and all related supporting documents will be compiled in a report that will conclude the reserves available in metric ton.

6. TIME SCHEDULE:

It is envisaged that the works for each phase of study can be completed within a time frame given below (commencing after formal notification to proceed with a provision of 7 days as mobilization period).

- Phase-I: Three months
- Phase-II: 12 to 16 months

7. BUDGET:

A summary Budget is provided in the following table

BUDGET FOR OWNER'S EXPLORATION COSTS 3Months					
Note; costs	All in US$ at $1.00=RO 2.60				
Type		Months	Unit Rate	Rate	
Offices	***Management***				
Muscat					
Personnel	Package				
Sr.Geologist		3.0	$2,800	$8,000	
Asst- Leading Hand		3.0	$650	$2,000	
Asst - Field work		3.0	$650	$2,000	
Field Coolies	x 2	3.0	$850	$2,550	
Other Costs	Assumed				
Office rental		3.0	$650	$2,000	
					$/month
			Total	$16,550	$2,000

Exploration expenditure will involve: For 3 Months	
1. Study of the geological literature and review	
3. Geological fieldwork / survey	
4. Collection of representative samples.	$2,500
6. Chemical analysis of the collected samples.	
7. Data interpretation	
8. Compilation of the Preliminary report.	$2,000
TOTAL	$4,500

Grand Total = US$ 21,000 for Phase-I program.

8. REFERENCES:

A book entitled, 'Geology and Mineral Wealth of the Sultanate of Oman', and a Mineral Occurrence and Metallogenic Map of North Oman on 1:500,000 scale, published by the Ministry of Petroleum and Minerals, Directorate General of Minerals, Sultanate of Oman have been consulted while making this proposal.

9. FIGURE - 1: LOCATION OF COPPER BLOCK – 9