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Geology and Mineralization at the Ishmas Kabir Gold Prospect, Ishmas Gold District, Kingdom of Saudi Arabia

by

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GEOLOGY AND MINERALIZATION AT THE ISHMAS KABIR GOLD PROSPECT, ISHMAS GOLD DISTRICT, KINGDOM OF SAUDI ARABIA

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ABSTRACT

Ishmas Kabir ancient gold mine is located approximately 60 km southeast of the city of Ranyah and 9 km northwest of Jabal Ishmas in the southwestern part of the Ishmas gold district. The mine workings are located near the eastern edge of a flat plain covered by eolian sand and drained by Wadi Bishah. Two elongate dumps, 75 m wide and 530 m long (combined length), comprise the workings. Rising 4 m above the plain, they are prominent features in this area of low relief.

Core drilling (1,023 m total depth drilled) was conducted to define the extent of potential gold occurrences at the prospect. The two northeasternmost of the four holes drilled unequivocally intersected the gold-bearing main vein zone. Drill hole 1, the northeasternmost hole drilled, passed through significant lengths of altered wall rocks + quartz veins containing >100 ppb Au (threshold value). The average gold concentration of all intercepts in drill holes 1 through 4 is 278 ppb; the total length of drill core that assayed above the gold threshold value is 13.46 m. The highest gold concentration (1,620 ppb) reported in geochemical assay results was obtained from a 0.33 m length of core in drill hole 1. Gold-intercept occurrences are not economic in the rocks drilled; no further deep drilling is recommended at this time.

Gold concentrations in samples obtained from mine dumps are much higher than in drill-core samples. Samples collected by earlier workers assayed 3-7 g/t, and tonnage estimates of mine spoil have been estimated to be as high as 120,000 tons. A possible sampling bias in earlier studies may favor larger gold-enriched, samples relative to samples from quartz tailings. Further work at Ishmas Kabir should be limited to defining gold resource potential in the dumps and in the oxidized, near-surface quartz-vein system.

Primary gold at the Ishmas Kabir gold prospect occurs with quartz veins and associated sericite + pyrite alteration hosted by quartz diorite and mafic dikes. The highest gold concentrations both in dumps (earlier studies) and drill core (this investigation) are found with limonite + hematite in breccia zones, in stringer veins,

and in sericitic alteration envelopes surrounding quartz veins. Secondary gold is significant in this system and attests to the importance of oxidizing, acidic solutions.

Quartz veins intersected by drill holes are surrounded by mylonite schist. Quartz and carbonate veins less than 5 mm thick are boudined, whereas thick quartz veins ($\leq$ 1.2 m) have disrupted and brecciated margins; mylonitized country rock envelops quartz-vein fragments. Sulfide mineralization associated with vein formation predates this rock-deformation event. Contemporaneous brittle and ductile deformation of quartz veins and country rocks occurred during the Nabitah orogeny. Supergene gold enrichment took place much later.

INTRODUCTION

LOCATION AND PHYSIOGRAPHY

The Ishmas Kabir ancient gold mine (MODS 01458; lat 20° 52.03' N. and long 43° 13.25' E.) is located approximately 60 km southeast of Ranyah, the principal city of the region, and 9 km northwest of Jabal Ishmas, the highest mountain in the area. The mine workings are situated in the southwestern part of the Ishmas gold district mapped by Doebrich and White (1989). The location of this district is shown in Figure 1; the location of the mine is shown in Figure 2.

The Ishmas Kabir ancient mine workings are near the eastern edge of a broad, relatively flat, rolling plain drained by Wadi Bishah, 15 km to the west. The depressions on the mine dumps, the flanks of the dumps, and the surrounding plain are covered by Recent eolian sand. The mine site is accessible to four-wheel drive vehicles using desert tracks.

Ishmas Kabir mine consists of two elongated, slightly offset mounds (dumps) of mine spoil rising 3-4 m above a surrounding plain. The combined length of the dumps is 530 m and the approximate width is 60 m. Mine spoil consisting partly of white-to-maroon iron-oxide-stained vein quartz surrounds trenches whose long axes are parallel to the trend (N. 65° E.) of the dumps.

The remains of a village are located just to the north of the dumps, midway between the distal ends of the mine workings. Fragments of broken white vein quartz are present both on the dumps and at the village. The presence of stone grinding wheels, anvils, and hammers verifies the physical methods used to beneficiate ore; numerous slag buttons found within and near the village attest to metallurgical activity at the mine.

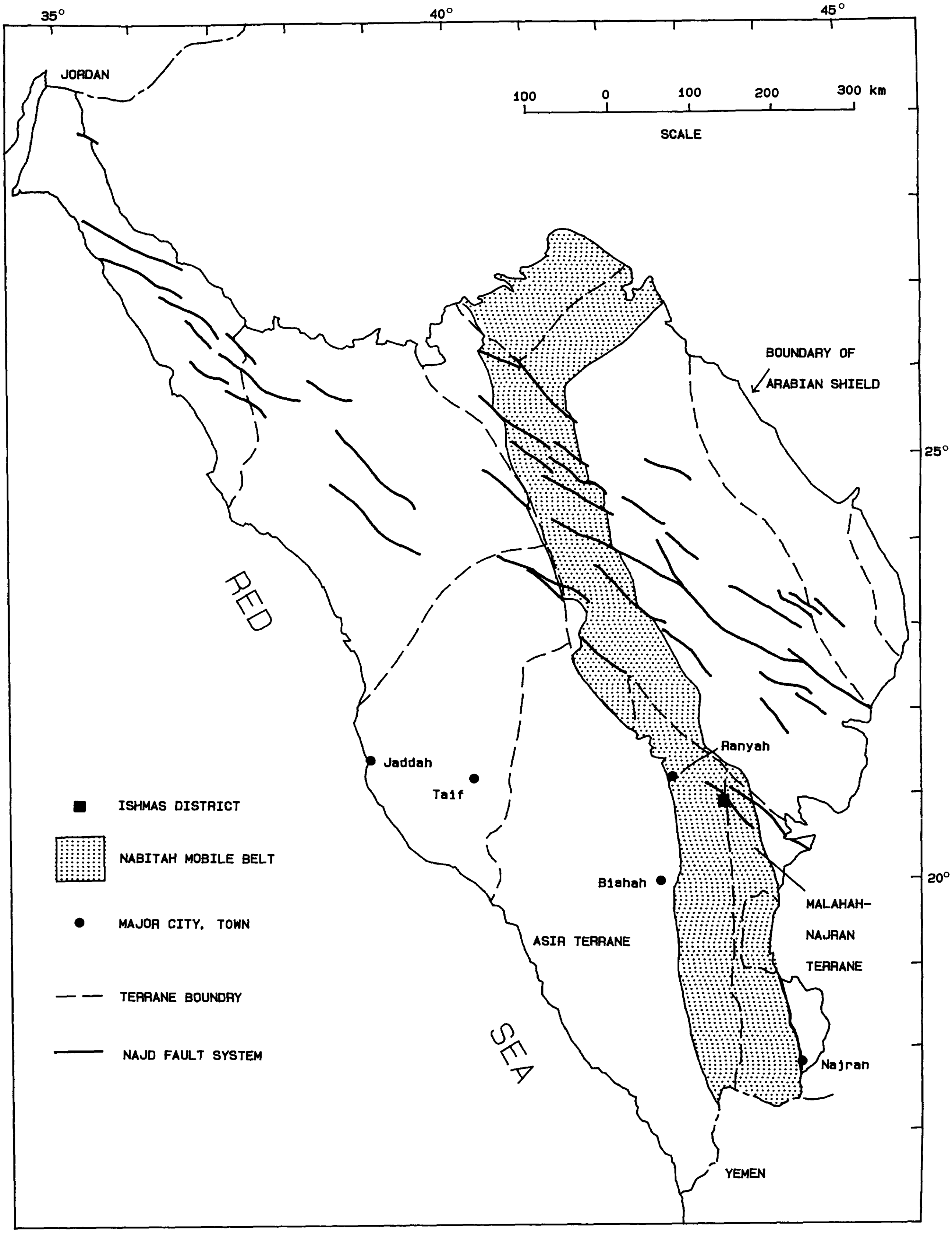

Figure 1.--Generalized map of the Arabian Shield (modified after Johnson and Vranas, 1984; Stoeser and Camp, 1985; Johnson and others, 1987; and Doebrich and White, 1989).

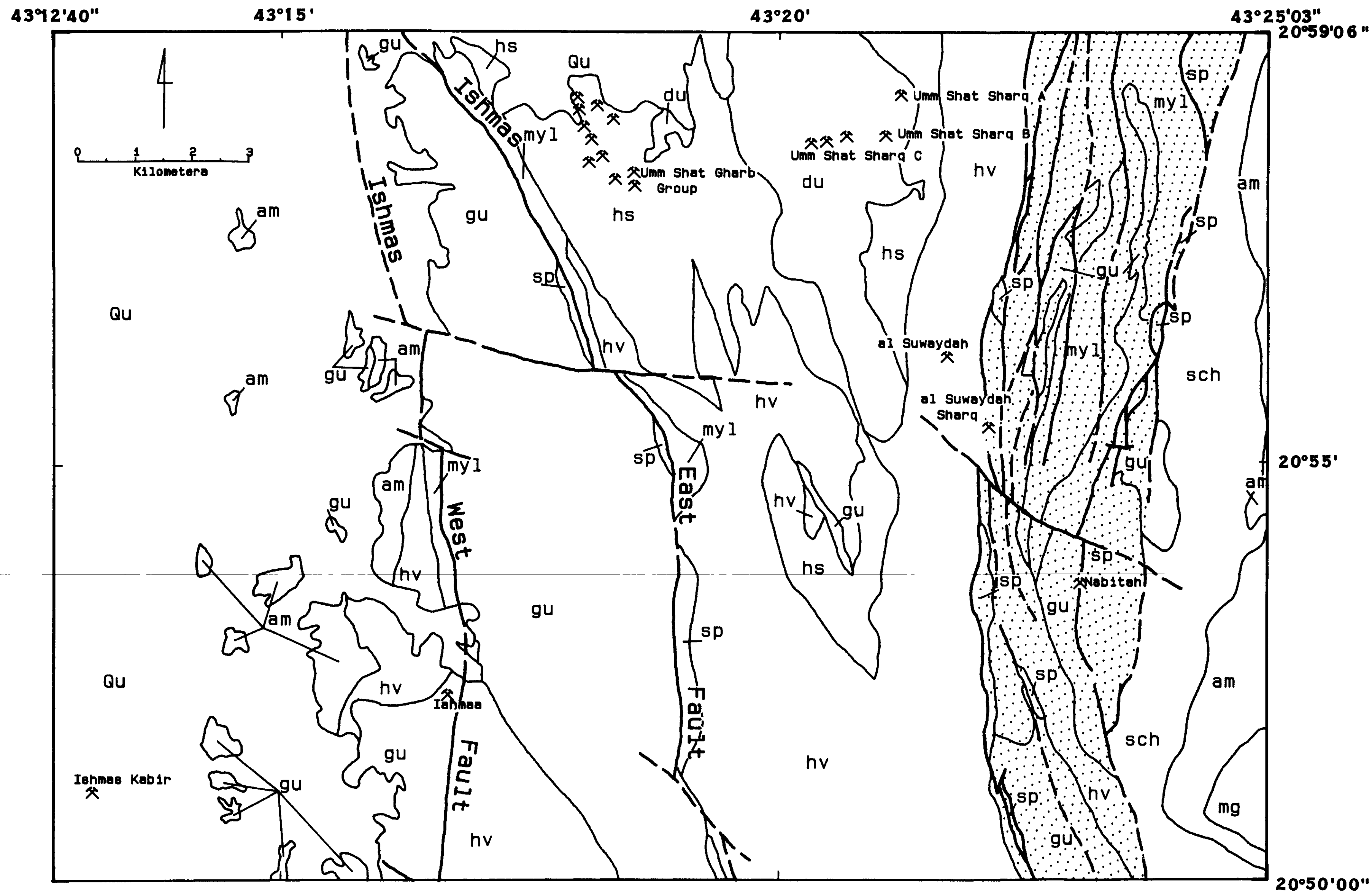

FIGURE 2.--Generalized geologic map of the Ishmas gold district showing the location of Umm Shat Sharq and Ishmas Kabir ancient mines (modified after Doebrich and White, 1989).

EXPLANATION

Qu	Undivided Quaternary cover
sp	Serpentinite
myl	Mylonite
sch	Schist-cataclastic microbreccia, mylonite, chert, marble, basalt, mylonite gneisses, and schist
am	Undivided amphibolite
mg	Monzogranite
du	Undivided intrusive rocks of intermediate composition: tonalite, dacite porphyry, and quartz monzodiorite
gu	Undivided mafic intrusive rocks: gabbro, diabase, and minor diorite
hs	Undivided volcanic wacke, sandstone, marble, chert, carbonate, and minor basalt
hv	Undivided basalt, andesite, and dacite; intercalated tuff breccia, crystal-lithic lapilli tuff, ash-fall and ash-flow tuff, laminated to thin-bedded ash-fall and water-lain tuff
	FAULT--Dashed where approximate
	NABITAH FAULT ZONE--Faults dashed where approximate
ISHMAS KABIR ⚒	ANCIENT MINE SITE

(Modified from Doebrich and White, 1989)

Previous Investigations

Several prospect-related geologic investigations preceded drilling activity at Ishmas Kabir. Bogue (1954) and Schaffner (undated report) first examined the mines (Ishmas ancient mine and Umm Shat Gharb) in the Ishmas gold district. Smith (1964) first discovered, conducted grab sampling of, and reported on the West Ishmas mine (Ishmas Kabir). Three trenches were cut across the Ishmas Kabir mine dumps, and then sampled, in follow-up work conducted by Gonzales (1974). Worl (1979) collected grab samples and mapped the mine workings. Boyle and Atkinson (1982) briefly examined the deposit in light of placer-gold potential. White and Doebrich (1988) re-examined the mine dumps and cut a trench to establish vein attitudes and mineralization controls.

Ground geophysical surveys were conducted by Last and others (1988) at Ishmas Kabir. Magnetic, VLF, and EM GENIE surveys were carried out on a 600,000 m^2 survey grid established using a theodolite, tape, and compass.

Present Investigation

Four diamond drill holes, each having a bearing of 145° and alternate inclinations of 45° and 60°, were designed to test gold grades and vein extent. Collar locations (Figure 3) were arranged lineally along the extent of the ancient dumps.

Fox and Longyear 44 wireline drill rigs were utilized in the prospect drilling. Core-drilling (by BRGM) commenced with the operation of a single drill rig (Fox) on January 29, 1988. A second rig (Longyear 44) began drilling on March 12, 1988. Drilling in the last hole was completed on May 9, 1988. A total of 1,023 m was drilled in four holes. PQ-, HQ-, and NQ-sized core was recovered.

The last assay group from the first submittal of samples was received on August 13, 1988. Potential sample-preparation problems warranted resubmission of samples on November 13, 1988. Subsequently, the last gold-assay group of this second submittal was received on January 29, 1989.

Methods

The core obtained from each drill rig was split with a diamond saw, laid out, measured, sampled, and logged. Sample intervals were determined by lithologic breaks and were not to exceed a 1.0 m length in any mineralized interval. Sample sizes were 3.0 m in unmineralized country rock. Samples were submitted for assaying to the chemistry laboratory of the Directorate General for Mineral Resources under the direction A. Hakim with J. Curry of the U.S. Geological Survey as his technical advisor.

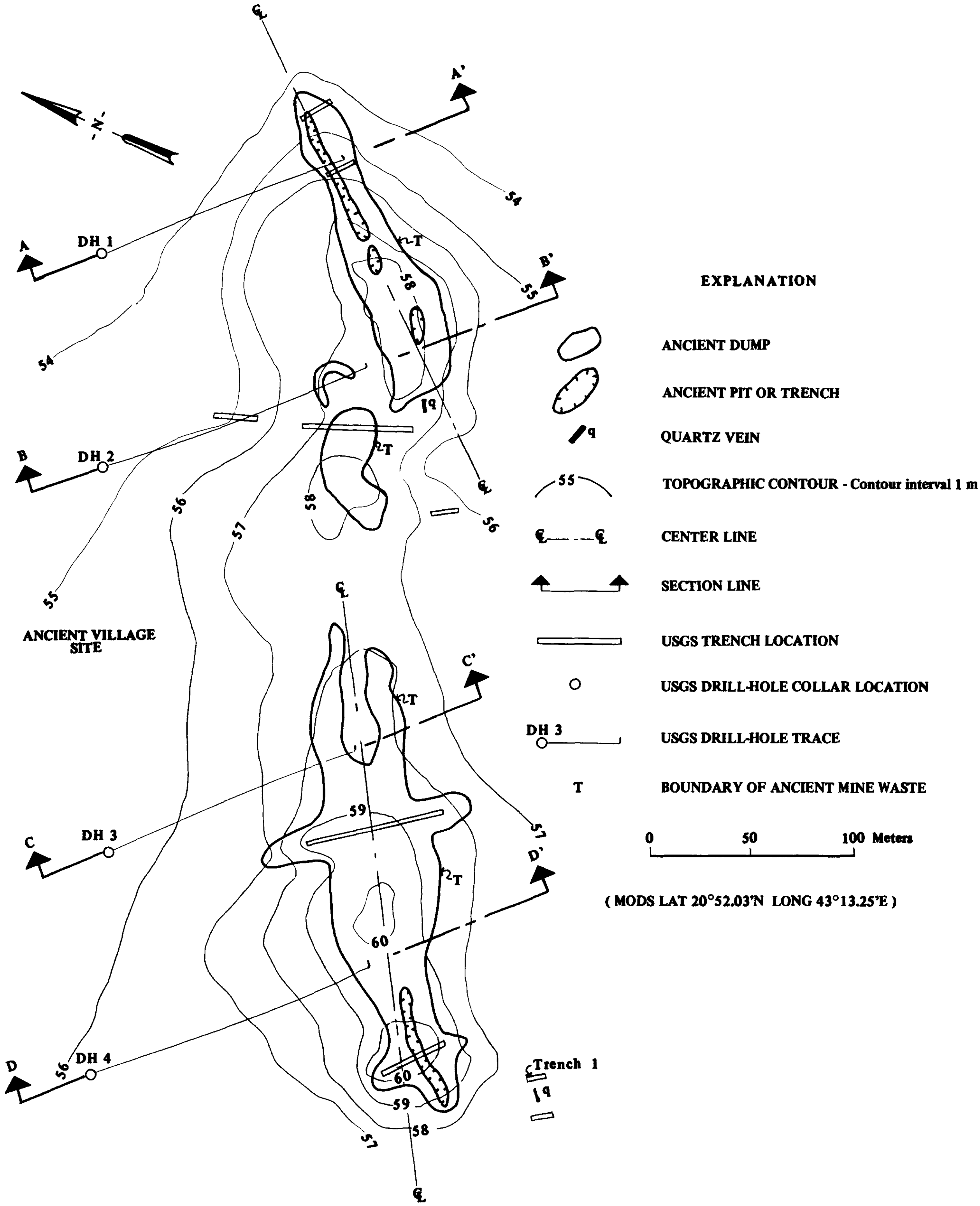

Figure 3.--Map of the Ishmas Kabir ancient gold mine. Sections A-A', B-B', C-C', and D-D' contain drill holes 1, 2, 3, and 4, respectively.

Stained and polished petrographic thin sections prepared by the USGS mineralogy-petrology laboratory were examined using a Leitz ORTHOLUX microscope. Electron-microbeam analyses of mineral compositions were conducted using a JEOL T 300 scanning electron microscope with a TRACHOR Northern Si (Li) energy-dispersive detector; the microscope was operated by Mir Amjad Hussain of the U.S. Geological Survey. Standard atomic-absorption analytical techniques were used to assay samples by the chemistry laboratory.

ACKNOWLEDGMENTS

The authors are indebted to Jeff Doebrich (USGS) for his helpful advice and constructive thoughts pertaining to field studies. Saeed Liban and Rashid Samater (USGS) conducted a topographic survey at Ishmas Kabir. The USGS Field Services unit, under the direction of Thomas Lee, provided field support. Willis H. White (USGS) generously assisted in efforts to get this project under way. Robert Kamilli (USGS) assisted the project with logistical management. Eric Bookstrom (USGS) digitized and plotted the regional location maps. Jacques Boutin (BRGM) supplied the USGS with drilling equipment, supplies, and personnel. Roger Voirol (BRGM) agonized through four months of terrible weather to provide the project with on-site drilling supervision resulting in the excellent recovery of the drill core. The authors wish to thank Peter Johnson (J V Associates) and Mike Garrison (USGS) for their helpful comments and criticisms of this manuscript.

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GEOLOGIC SETTING

The Ishmas gold district consists of two precratonic island-arc terranes joined together by a collisional suture zone, the Nabitah mobile belt (Schmidt, 1981A; Stoeser and others, 1984; Stoeser and Camp, 1984 and 1985; Doebrich and White, 1989; Figure 1). This suture zone includes the north-trending Nabitah fault zone, which (in the Ishmas district) specifically separates the Asir terrane to the west from the Malahah-Najran terrane (Johnson and Vranas, 1984; Smith and others, 1984) to the east. Johnson and Vranas (1984, 1989) assigned the Halaban-group rocks east of the Nabitah fault zone (Kellogg and others, 1986) to the Malahah-Najran terrane on the basis of 1) the greater abundance and size of sulfide-mineral deposits in this terrane relative to contemporary arcs of the Asir terrane to the West, and 2) the presence of a narrow linear aeromagnetic anomaly (Nabitah fault zone) separating the easternmost Ranyah magnetic province (Asir terrane) from the Tathlith magnetic quiet zone (westernmost Malahah-Najran terrane). A seismic profile across the Arabian Shield defines a lateral seismic-velocity boundary in the lower crust at the Nabitah suture (Mooney and others, 1985; Gettings and others, 1986). The Najran terrane was included in the Afif terrane east of the suture zone by Stoeser and Camp (1984, 1985).

North-trending precratonic layered rocks in the Ishmas gold district contain lower-greenschist to amphibolite-grade metamorphic rocks of the Halaban group (Gonzales, 1974; Doebrich and White, 1989). An amphibolitized volcaniclastic sequence (am) constitutes both the easternmost and westernmost outcrops in the district (Figure 2, modified after Doebrich and White, 1989). Basalt, tuff, ferruginous chert, marble, schist, cataclastic schist, and mylonitic schist (sch) comprise a north-trending belt adjacent to the eastern margins of the Nabitah fault zone. In the northcentral part of the district, north-trending precratonic layered rocks include metamorphosed volcanic wacke, tuffaceous sandstone, marble, chert, ferruginous carbonate rocks, and minor basalt units (hs). Undivided basalt, andesite, dacite flows, and tuff (hv) surround the sedimentary and minor basalt units (hs) to the east, south, and southwest.

Approximately 30 percent of the exposures in the Ishmas gold district mapped by Doebrich and White (1989; Figure 2) are plutonic igneous rocks that intrude precratonic Halaban-group rocks evolved between 785 and 746 Ma (Smith and others, 1984). Pretectonic, fault-bounded, fine-grained gabbro and fine-grained diabase (gu) intrudes the westernmost parts of the Nabitah fault zone. A large layered-gabbro lopolith (gu) crops out in the western part of the district and predates the Nabitah compressional orogeny that was proposed by Stoeser and others (1984) to have occurred from 680 to 640 Ma in the southern part of the Nabitah mobile belt. A monzogranite stock (mg) in the eastern terrane also predates the orogeny. In the north-central part of the district, the emplacement of tonalite, dacite porphyry, and quartz monzodiorite stocks (du) postdates the Nabitah orogeny.

Rocks of greenschist-grade regional metamorphism are found throughout the Ishmas gold district, and rocks characterized by the highest metamorphic grades are found proximal to the Nabitah fault zone (Doebrich and White, 1989). Doebrich and White (1989) proposed that 1) regional grades of metamorphism are associated with the Nabitah orogeny and 2) amphibolite-grade mineral assemblages in the district represent contact-metamorphic aureoles on the early gabbro and monzogranite plutons. However, Gonzales (1974) reported that almandine-amphibolite-grade regional metamorphism characterizes Hali-group rocks located 2 km west of the Ishmas Kabir mine and east of the Nabitah fault zone (Halaban-group rocks of Doebrich and White, 1989, and Schmidt, 1981B).

Mylonite and ultramylonite units (myl) crop out extensively in the district (Doebrich and White, 1989; Figure 2). These ductile-deformation features are typically siliceous, north-trending rock units spatially associated with the Nabitah, Ishmas East, and Ishmas West fault zones recognized by Gonzales (1974). Mylonite zones (combined thickness of 2 km) are present within the Nabitah fault zone. The high strain rates typical of mylonite formation are ascribed to Nabitah orogenesis. Mylonitization, accompanied by faulting and shearing, followed a period of protolith folding during the orogeny. Partially mylonitized serpentinite bodies (sp) were diapirically injected upward into the crust along the Nabitah, Ishmas East, and Ishmas West fault zones during the Nabitah orogeny.

Approximately 25 km northeast of the Ishmas Kabir ancient mine, the Nabitah fault zone is truncated by southern boundary faults of the younger northwest-trending Najd fault zone (Gonzales, 1974; Worl, 1978). Stoeser and Camp (1984, 1985) proposed that movement along these structures occurred between 630 and 550 Ma. Northwest-trending Najd-age faults cut post-orogenic dacite porphyry and quartz monzodiorite in the north-central part of the Ishmas gold district (Doebrich and White, 1989).

PROSPECT GEOLOGY

LITHOLOGY

Examination of Ishmas Kabir trench samples led White and Doebrich (1988) to conclude that veins and associated mineralization were hosted by foliated quartz diorite. Subsequent drill-core examination (presented herein) verified this observation and provided more specific compositional details. Each of four geologic cross sections across the ancient workings (locations shown in Figure 3) include individual drill-hole observations.

Quartz Diorite

Modal analyses of two relatively unaltered core samples (Table 1; IK 1-34.5a and IK 1-34.5b are from one sample) obtained from drill hole 1 defined country-rock compositions somewhat distal to zones of mineralization. Petrographic examination of thin sections have established modal compositions of these samples: 7-9 percent interstitial quartz, 19-20 percent clinopyroxene, 9-20 percent brown biotite, 2-4 percent green biotite, 45-53 percent plagioclase, 1-6 percent interstitial potassium-feldspar, 0.5-4 percent epidote, and less than 1 percent accessory zircon, apatite, magnetite, and ilmenite. Two biotite phases are present in these samples: a primary brown biotite and a secondary green biotite associated with epidote. Actinolite (?), a product of pyroxene alteration, is found between pyroxene grains and rims of green biotite + epidote. Locally, interstitial myrmekite is present at plagioclase grain boundaries. The grain sizes of these rocks range from 0.5 to 2.0 mm.

Plagioclase grains are continuously zoned with compositions ranging from 32.53 to 58.3 mole percent anorthite, from 66.73 to 40.89 mole percent albite, and from 0.74 to 0.82 mole percent orthoclase. The arithmetic average and standard deviation for 22 microbeam analyses of plagioclase is as follows: 37.45 ± 5.64 mole percent anorthite, 61.37 ± 5.54 mole percent albite, and 1.17 ± 0.82 mole percent orthoclase (Table 2). These andesine compositions are diagnostic of quartz diorite rocks (Moorhouse, 1959).

Table 1.--Modal analyses of quartz diorite samples from drill holes 1 (IK1-34.5a and IK1-34.5b) and 3 (IK3-169.9). Downhole depths of samples are 34.5 m in drill hole 1 and 169.9 m in drill hole 3. Normalized (to 100 %) percentages of quartz, plagioclase, and K-feldspar are shown.

	MODAL ANALYSES		
	IK1-34.5a (Volume %)	IK1-34.5b (Volume %)	IK3-169.9 (Volume %)
Quartz	7.10	7.23	8.75
Plagioclase	47.9	53.2	40.2
K-feldspar	5.35	5.67	0.97
Clinopyroxene	20.0	19.7	19.3
Biotite (brown + green)	16.7	12.3	20.5
Sericite	0.58	0.10	5.35 (after plag.)
Epidote	2.04	0.59	4.28
Opaques	0.39	1.17	0.29
Clay	0.00	0.00	0.29
Other	0.00	0.10	0.10
No. of Counts	1,028	1,023	1,028
	NORMALIZED PERCENTAGE		
Quartz	11.77	10.94	15.84
Plagioclase	79.36	80.48	82.40
K-feldspar	8.87	8.58	1.76
	100.00 %	100.00 %	100.00 %

Table 2.--Plagioclase compositions determined by energy-dispersive analysis of sample IK1-34.5b (drill hole 1, 34.5 m depth). Calculated anorthite (An), albite (Ab), orthoclase (Or), and celsian composition (Cel) are also listed.

	Average ± Std. Dev. (21 analyses)	Maximum Anorthite Composition	Maximum Albite Composition
Na_2O	8.12 ± 0.87	5.18	9.05
Al_2O_3	26.41 ± 1.00	29.99	25.41
SiO_2	56.29 ± 1.39	51.90	58.27
K_2O	0.23 ± 0.16	0.16	0.15
CaO	8.93 ± 1.18	13.36	7.98
FeO	0.21 ± 0.09	0.28	0.17
BaO	0.01 ± 0.04	0.00	0.00
TOTAL - -	100.20 %	100.87 %	101.03 %
An	37.45 ± 5.64	58.30	32.53
Ab	61.37 ± 5.54	40.89	66.73
Or	1.17 ± 0.82	0.82	0.74
Cel	0.01 ± 0.05	0.00	0.00

Dikes

Dikes intersected by drill holes (Figure 4) include altered mafic rocks, possibly fine-grained diabase and andesite, and felsic rocks (granite and granite pegmatite). Very fine-grained quartz (<0.2 mm) was observed in thin sections of probable altered andesitic dikes. Sericite + carbonate + chlorite mineral associations dominate the mineralogy of the altered mafic rocks. Hydrothermally altered mafic dikes typically host carbonate and quartz veins, especially at dike contacts with quartz diorite.

VEINS

Ishmas Kabir was mined by the ancients using techniques current to those times. The ore was processed mechanically to separate vein gangue, as evidenced by broken chips (<3 cm) of white vein-quartz tailing scattered upon mine dumps and at the village site. Dump spoil consists of coarse quartz and schist fragments, quartz chips (tailing), and eolian sand.

A 4-m-long outcrop of white vein quartz of indeterminate width is present on the easternmost mound of dump material; the direction of elongation of the vein is subparallel to the N. 65° E. bearing of the mound (Figure 3). A trench cut by White and Doebrich (1988) at the southwestern end of the dumps defines the vein strike and dip as S. 31° W. and 50° NW., respectively.

Louis Gonzales (September 13, 1971, USGS unpublished report, 2 p.) described a 110-cm-thick open cut striking N. 55° E. and dipping 75° S. The walls of the ancient cut (exposed in three trenches dug by a bulldozer) apparently had not moved from their original position at the time they were examined by Gonzales. The walls themselves are slickensided fault planes that cut mylonite and fault breccia cemented by carbonate and quartz. Ore-mineral groups observed in dump spoil include 1) malachite, azurite, and limonite boxwork after sulfide minerals, 2) sooty chalcocite, and 3) sparse pyrite and chalcopyrite. Ribbon structures (crustification ?) and vugs were common in vein gangue. A 10-m-deep ancient shaft, located 10 m from one of the trenches, passed through a milky white quartz vein.

Drill-core observations more specifically define the nature of these veins and vein-associated alteration. These observations are presented in the sections that follow.

Vein Mineralogy and Texture

Various proportions of quartz, rhombohedral carbonate-group minerals, chlorite-group minerals, pyrite, trace amounts of chalcopyrite, limonite, and

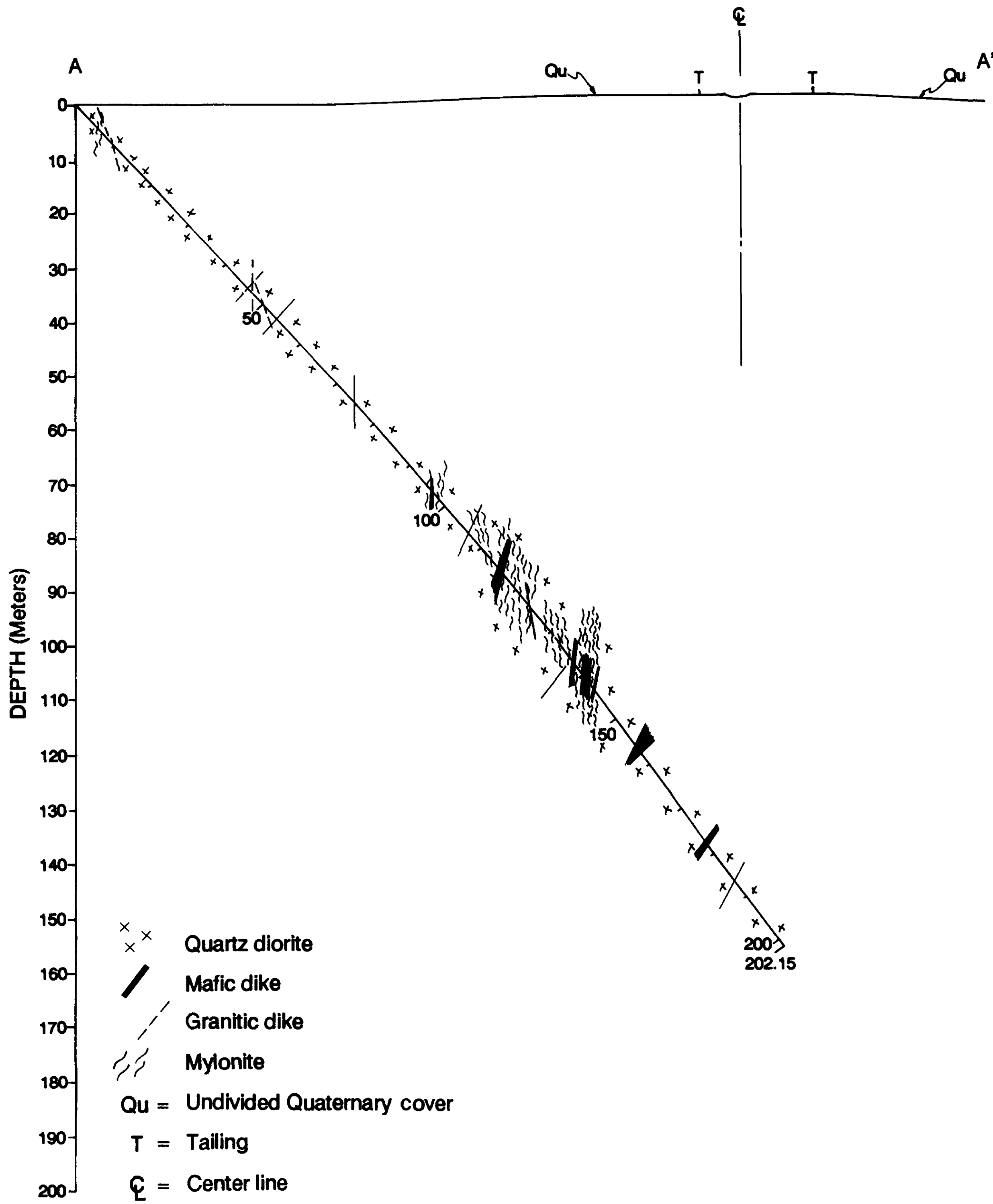


Figure 4.--Geologic cross sections A-A', B-B', C-C', and D-D' (locations on Fig. 3) containing drill holes 1, 2, 3, and 4, respectively. Medium-grained quartz diorite is intruded by mafic and granitic dikes; later mylonite is shown. Trench map data is projected onto section D-D'. Each dump centerline, C_L, is located on the sections; "T" represents the limit of actual mine dump material (tailing; Fig. 3) not covered by Recent eolian sand.

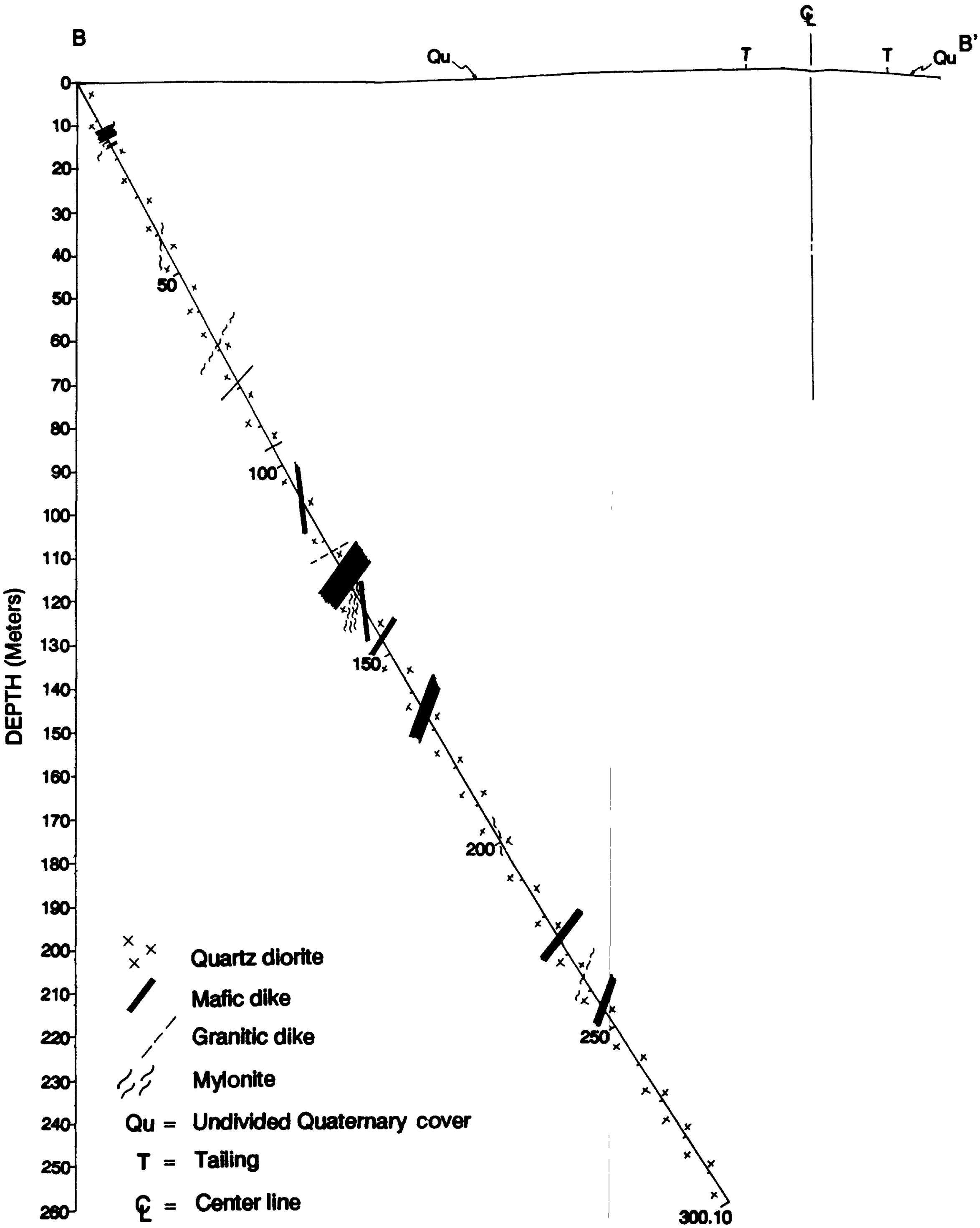


Figure 4.--Geologic cross sections A-A', B-B', C-C', and D-D' containing drill holes--(continued).

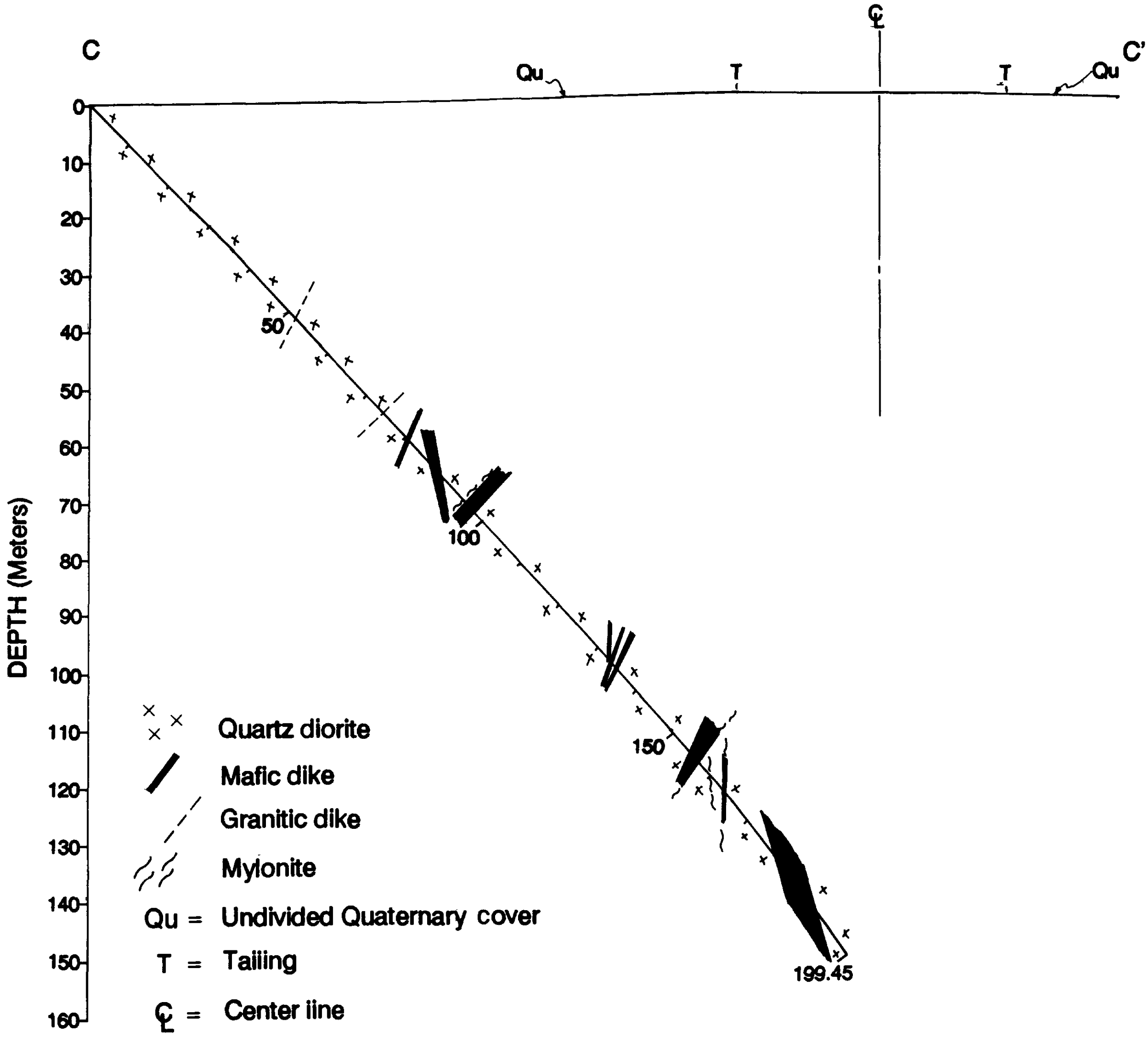


Figure 4.--Geologic cross sections A-A', B-B', C-C', and D-D' containing drill holes--(continued).

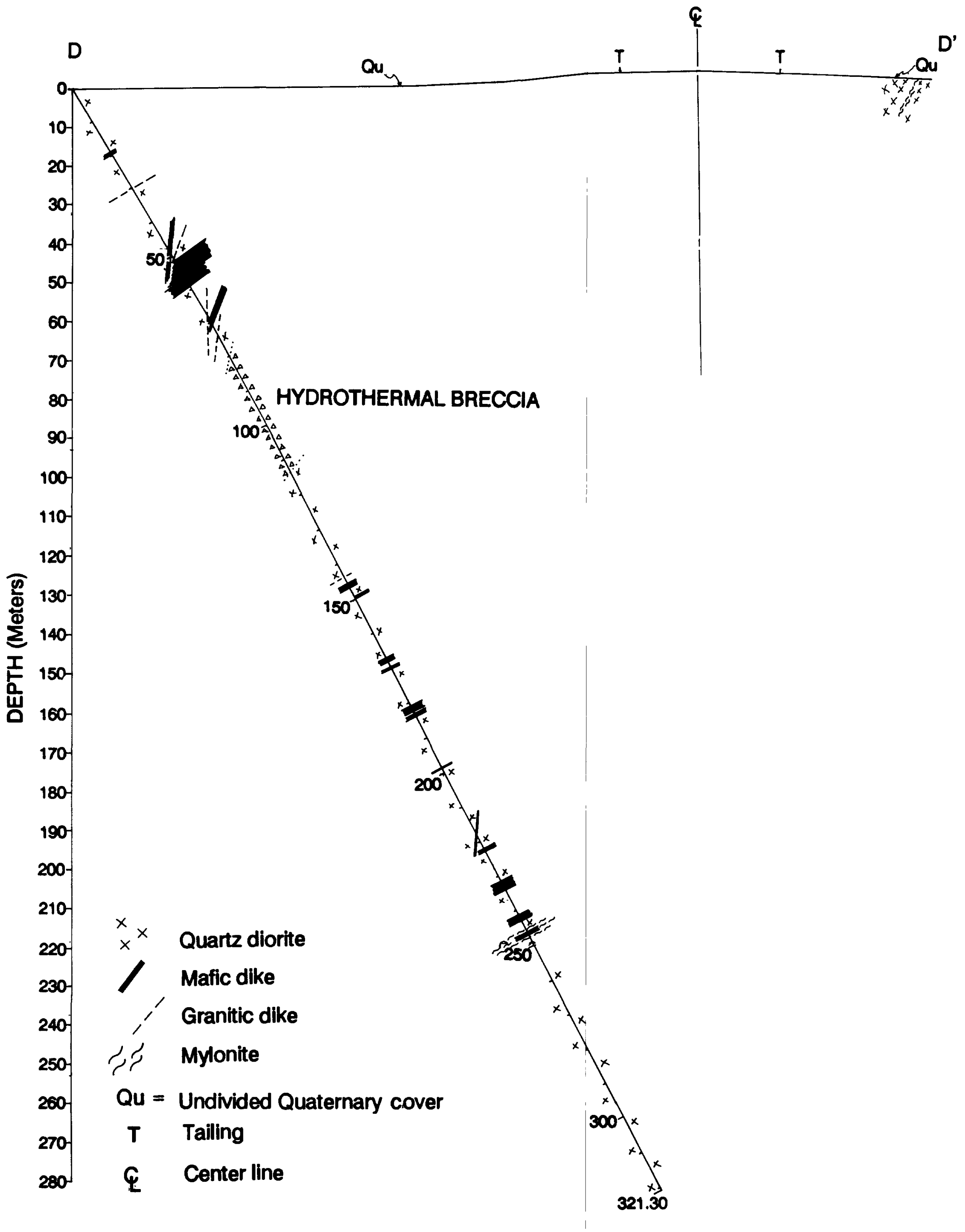


Figure 4.--Geologic cross sections A-A', B-B', C-C', and D-D' containing drill holes--(continued).

hematite fill vein structures. No gold was visible in veins intersected by drill core. Carbonate minerals analysed as calcite (1 percent MgO, 1 percent FeO, < 1 percent MnO, 53 percent CaO by weight), but dolomite-specific staining indicated the presence of a minor occurrence of a magnesium-rich carbonate phase in thin-section samples. Selected chlorite compositions from quartz + carbonate + chlorite veins are listed in Table 3. Magnesium in these veins is preferentially concentrated in chlorite rather than in associated rhombohedral-group carbonate minerals.

Table 3.--Vein chlorite compositions determined by energy-dispersive analyses for sample IK1A-59.6 (drill hole 1, 59.6 m depth).

	Average (Wt. %)	Std. Dev. (Wt. %)
Na_2O	0.34	0.27
MgO	20.86	0.68
Al_2O_3	17.84	0.94
SiO_2	29.28	0.74
K_2O	0.07	0.07
CaO	0.24	0.20
TiO_2	0.10	0.18
Cr_2O_3	0.06	0.08
MnO	0.12	0.08
FeO	20.67	0.77
Cl	0.05	0.07
TOTAL	89.63	

Thick veins containing more than 95 percent quartz define the main vein zone in drill hole 1 (Figure 5). The arithmetic average thickness and standard deviation of quartz veins in the zone is 0.14 m ± 0.31 m for a range of thicknesses from 3.0 mm to 1.2 m. Comparable vein thicknesses are not present outside of this zone in any of the drill holes. The margins of a 1.2-m-thick quartz vein are brecciated and cemented by carbonate-group minerals. Veins containing more than 50 percent carbonate minerals are invariably less than 2 cm thick.

Crystals of quartz commonly are surrounded by pocket fillings of carbonates (calcite and dolomite/ankerite), chlorite minerals, or carbonate + chlorite. Rhombohedral carbonate minerals surround quartz crystals in as much as 5 percent of the hanging wall portion of thick quartz veins. Foliated country rocks contain either disrupted or boudined quartz and carbonate veins.

Stringers (less than 1 mm thick) of chlorite ± carbonate ± pyrite commonly are observed with carbonate-dominant vein types in these rocks. Although not as abundant as chlorite stringers, biotite + epidote stringers are present in less-altered quartz diorite country rocks.

Pyrite is the principal sulfide found in vein fillings. Its occurrence is markedly less frequent in quartz and carbonate veins than in adjacent altered wall rock. Trace occurrences of chalcopyrite with pyrite were noted in veins containing quartz.

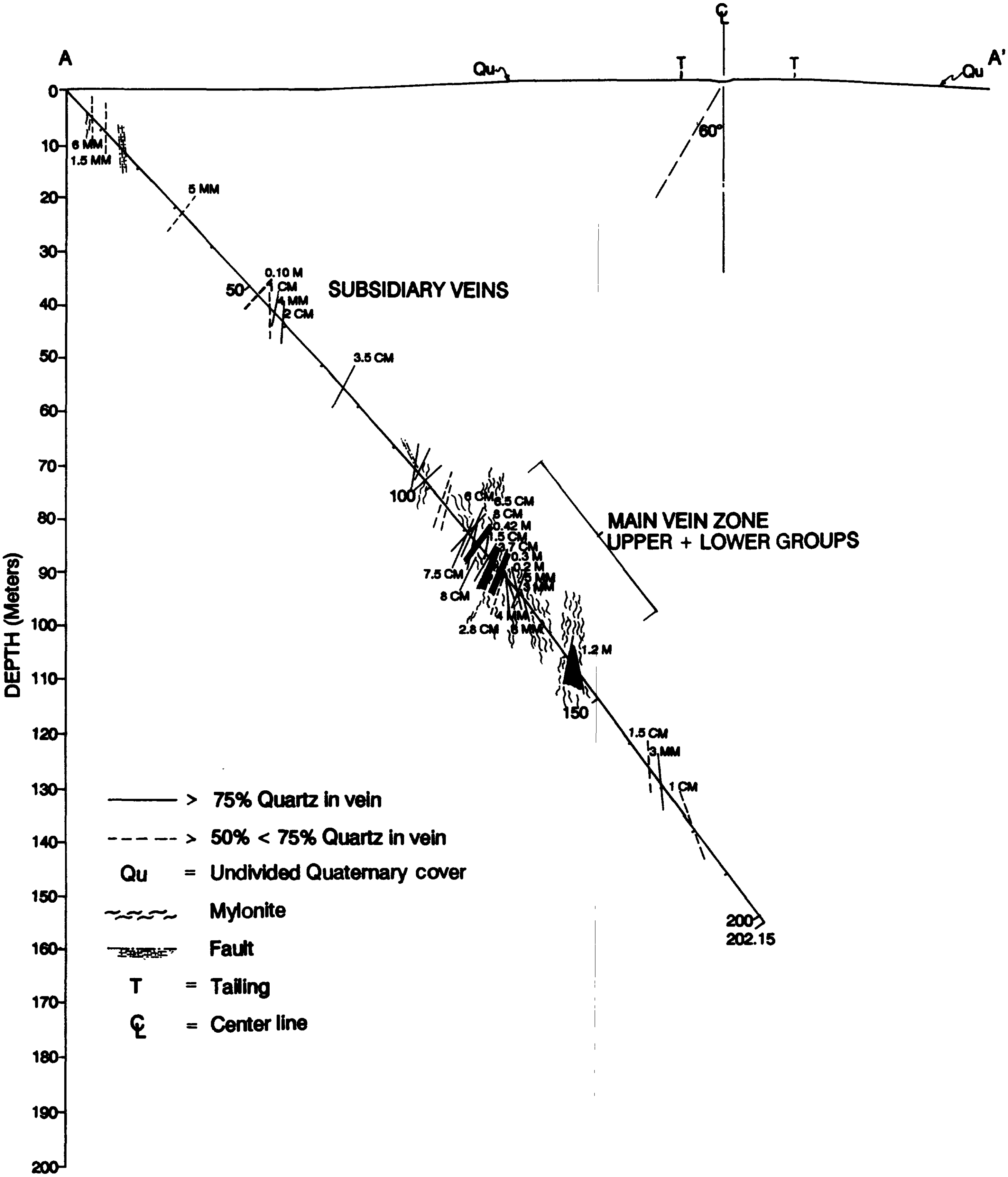
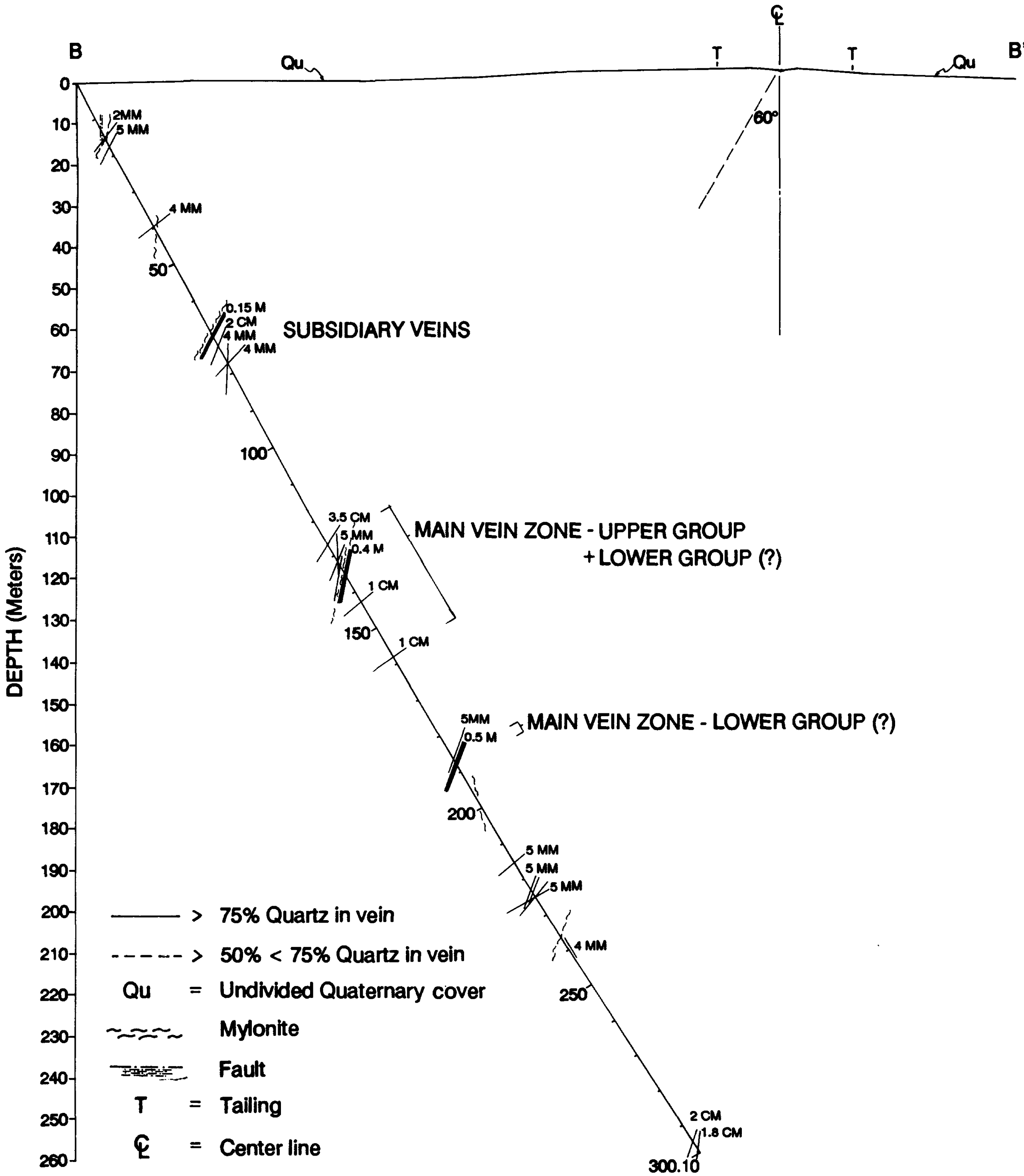


Figure 5.–Geologic cross sections A-A', B-B', C-C', and D-D' (location on Fig. 3) containing drill holes 1, 2, 3, and 4, respectively. Quartz veins, vein thicknesses, mylonitized country rocks, faults, and hydrothermal breccia are shown on drill hole traces. Quartz veins mapped in trench 1 (Fig. 3) are projected (dashed line) to the drill hole trace in D-D'. The 60° dip of quartz veins mapped by White and Doebrich (1988) is represented relative to the center line (C_L) of dumps. T = dump tailing not entirely covered by Recent eolian sediment.



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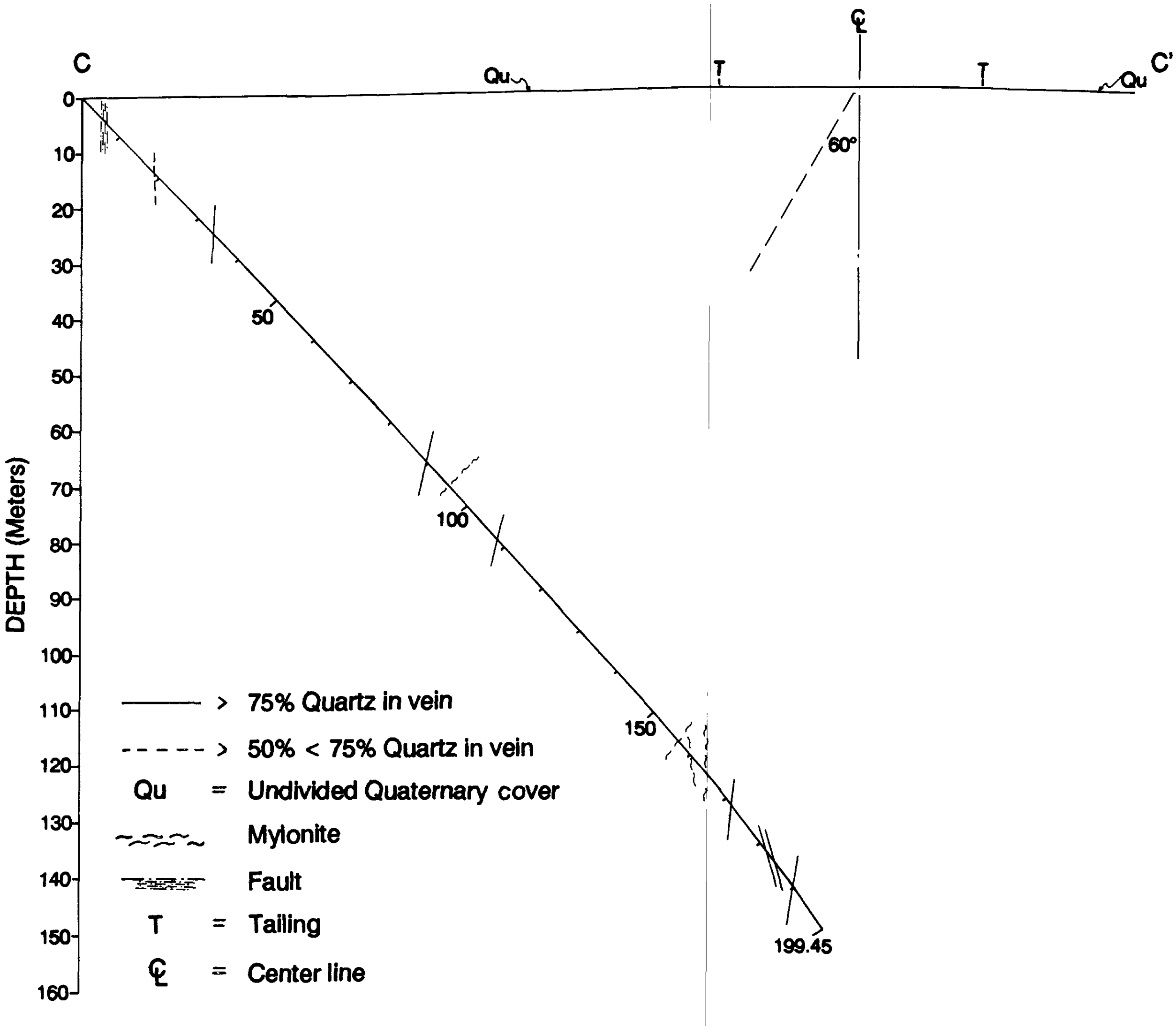

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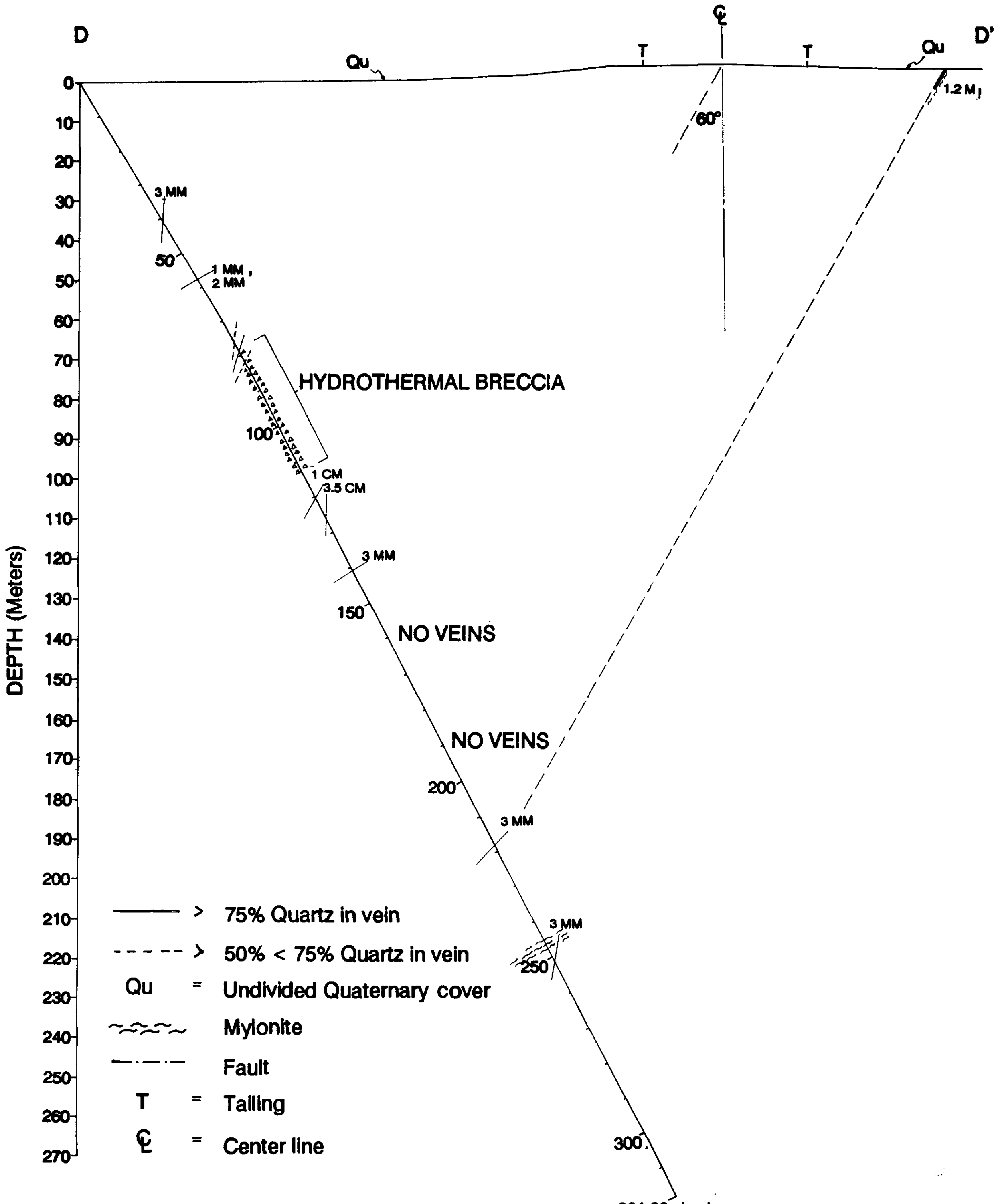

Figure 5.--Geologic cross sections A-A', B-B', C-C', and D-D' containing drill holes--(continued).

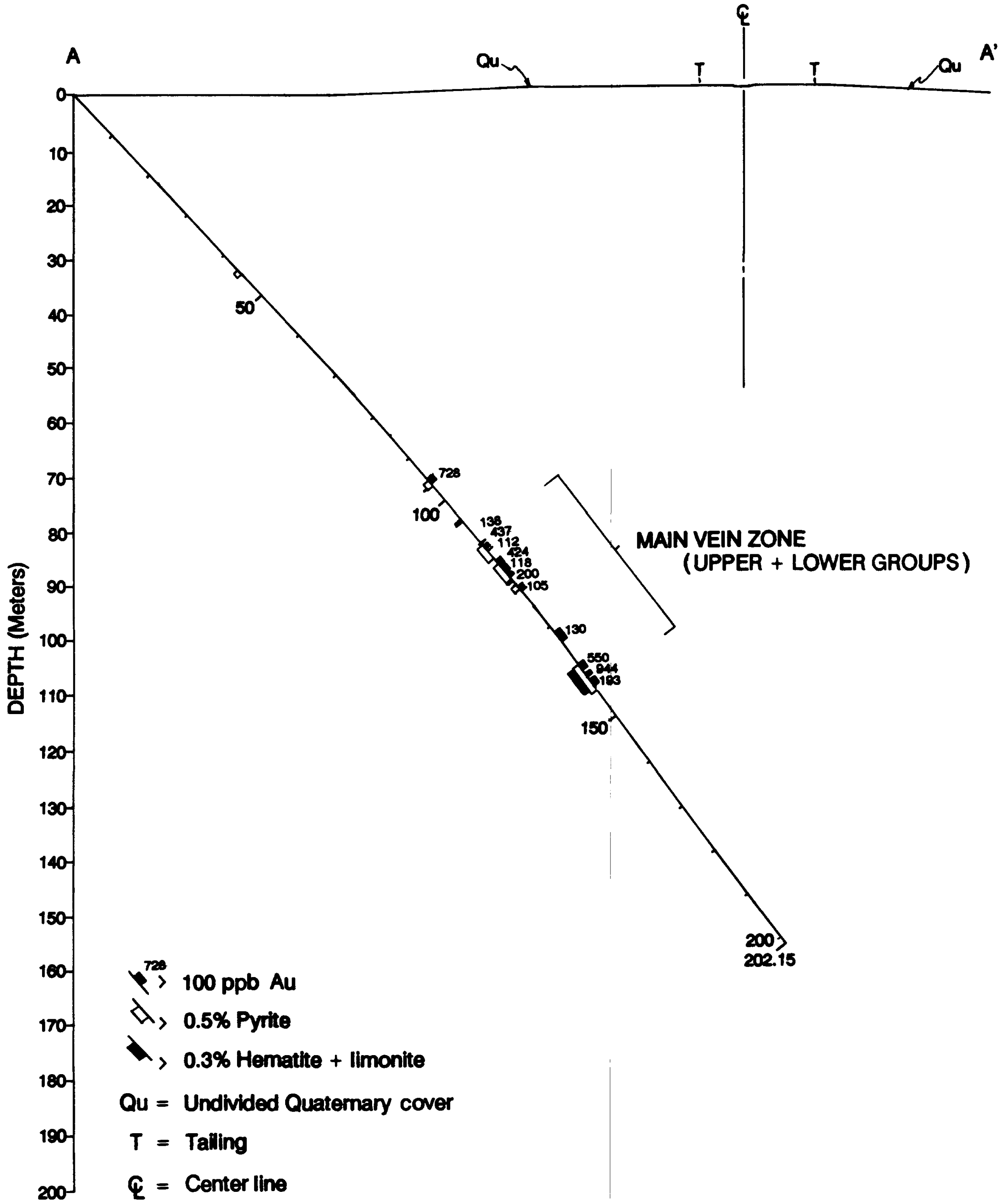

Figure 6.--Geologic cross sections A-A', B-B', C-C', and D-D' (location on Fig. 3) containing drill holes 1, 2, 3, and 4, respectively. >100 ppb Au, >0.5 % pyrite, and >0.3 % hematite + limonite occurrences are located on drill hole traces. Dump centerlines and mine tailing not covered by Recent sediment are represented by C_L and T, respectively.

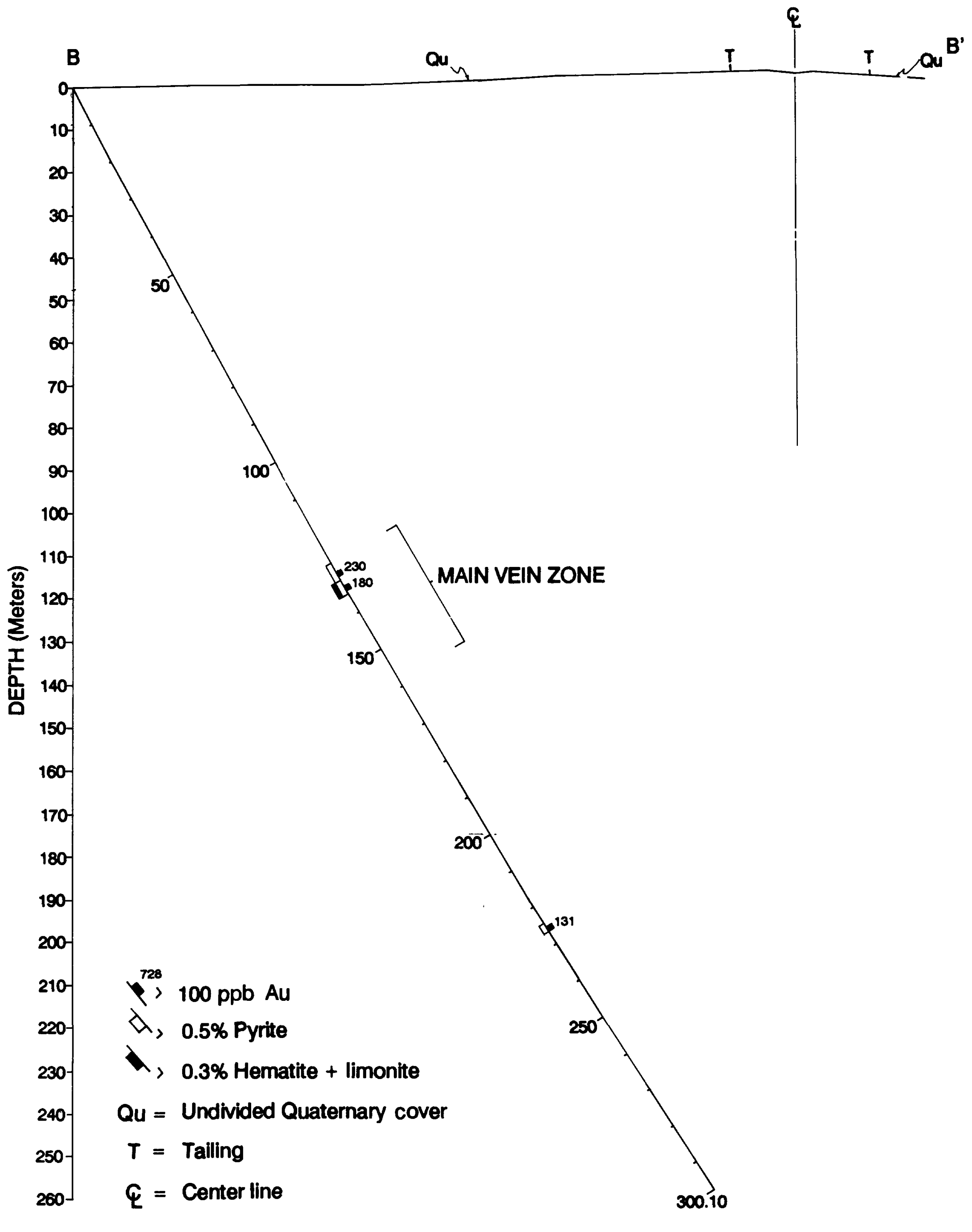

Figure 6.--Geologic cross sections A-A', B-B', C-C', and D-D' containing drill holes--(continued).

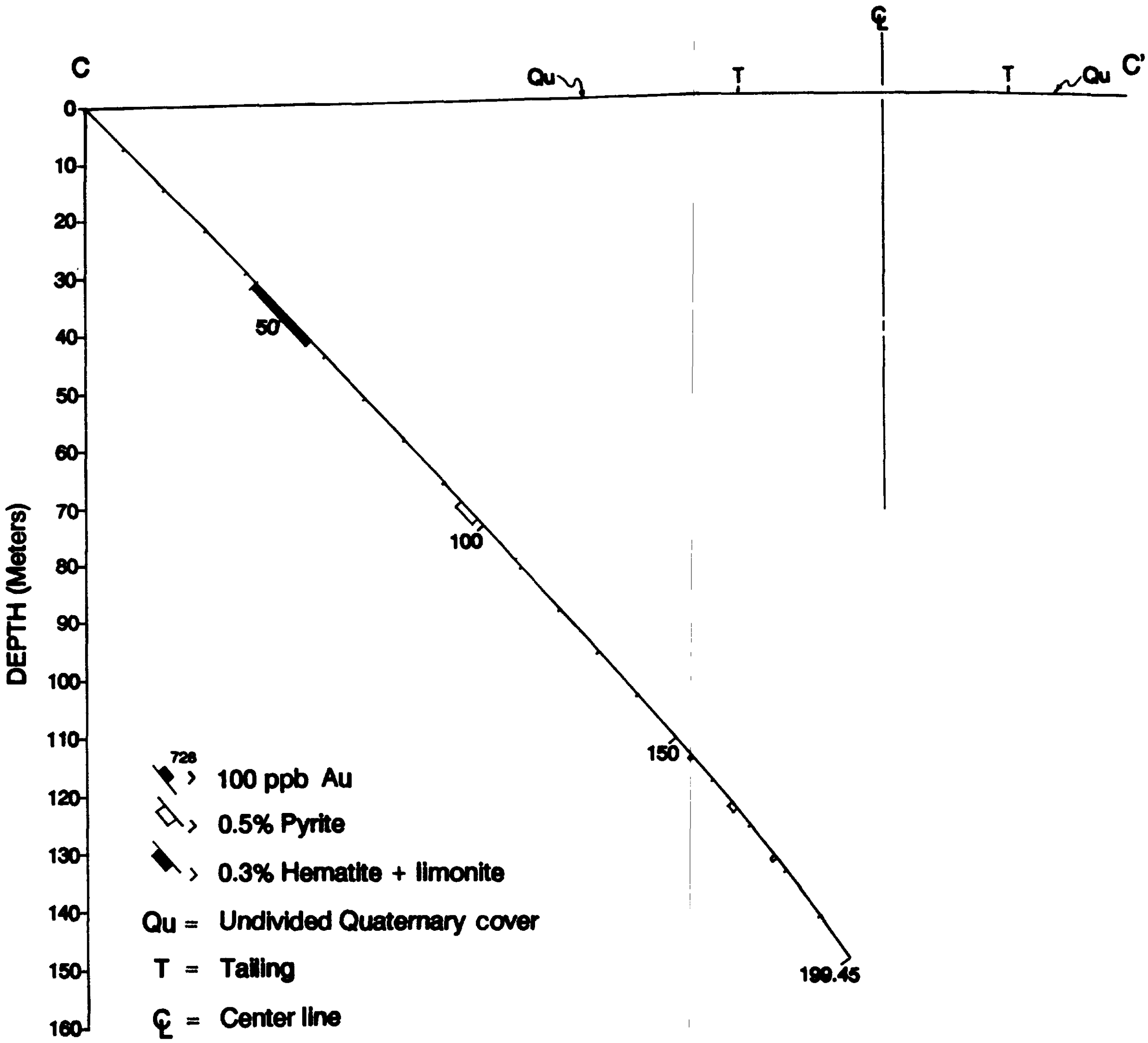

Figure 6.--Geologic cross sections A-A', B-B', C-C', and D-D' containing drill holes--(continued).

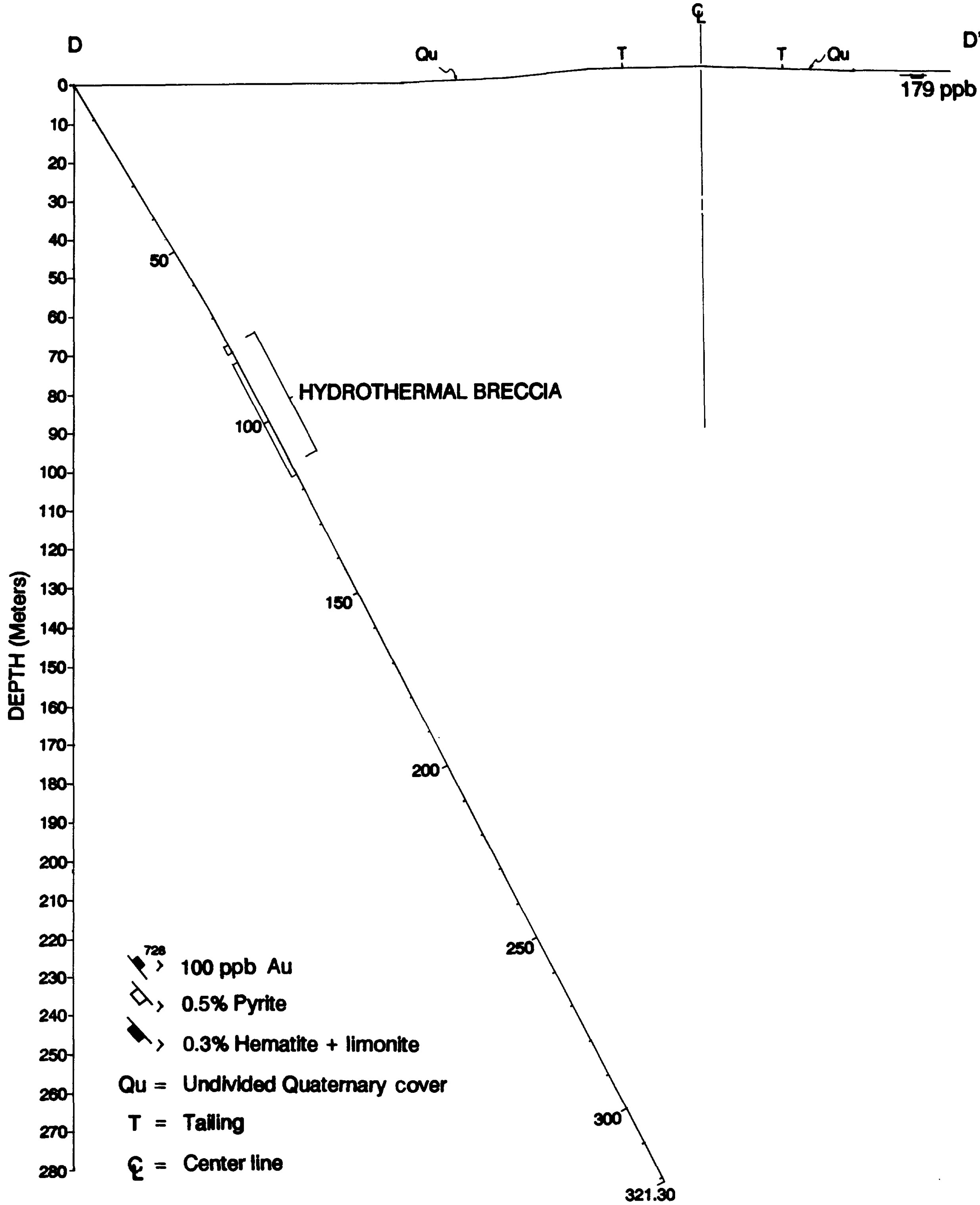

Figure 6.--Geologic cross sections A-A', B-B', C-C', and D-D' containing drill holes--(continued).

Limonite and hematite are pseudomorphous after pyrite and also coat irregular fractures cutting quartz veins (see also White and Doebrich, 1988). These oxides typically are found in the weathered zone of oxidation that extends downward 12-20 m below the present erosion surface. Additionally, the presence of these iron oxides in faults, brecciated veins, and hydrothermally altered foliated wall rocks correlates with drill-core intervals with the highest gold concentrations (Figure 6). These oxides define zones of oxidation (supergene enrichment?) surrounded by what are otherwise hypogene rocks.

An autoclastic hydrothermal-breccia body, intersected in drill hole 4 (Figure 4), consists of 5-10 percent by volume matrix. This matrix contains (by volume) 45 percent carbonate, 35 percent quartz, 5 percent chlorite, and 3-5 percent pyrite cubes. Pyrite concentrations as high as 10 percent by volume are distributed throughout both the breccia matrix and clasts. Pyrite grain sizes are characteristically less than 3 mm in the matrix and less than 1 mm in clasts. No hematite or limonite were observed in the breccia body. Essentially, the hydrothermal-breccia matrix is a vein filling.

In the hydrothermal breccia, angular to subangular clasts of altered quartz diorite and subordinate altered mafic dike rock generally exceed 1 cm in size. Fragments (1-2 cm) of vein quartz are somewhat rare, but they are significant. None of the clasts are foliated and quartz veins are not present within the clasts. Very little rotational and translational movement of larger clasts is apparent in the drill core, and there is no evidence of fault-generated comminution of fragments.

Spatial and Temporal Relationships of Veins

Last and others (1988) defined four subparallel electromagnetic conductors (1.5-2 mho conductance) at Ishmas Kabir. The two southernmost conductors are related to geologic contacts, whereas the other two are related directly to the ancient workings. The alignment of conductor traces (projected to the surface from a depth of about 20 m) is nearly parallel to the direction (N. 65° E.) of elongation of the dumps. These conductors may be spatially equivalent to the vein zone at the mine. Traces of this zone also are subparallel to the intrusive contacts defined by the presence of magnetic anomalies southeast of the dumps.

The vein zone (main vein zone) mined by the ancients at the Ishmas Kabir mine was intersected throughout 32.91 m of core in drill hole 1, the northeasternmost of the four drill-hole sites. Within the main vein zone, an uphole group of quartz veins extends from 110.70 m to 121.00 m, and a downhole group of quartz veins extends from 139.10 m to 143.83 m. Significantly, the downhole group of veins is enriched in limonite + hematite relative to the uphole group of veins.

The main vein zone projects through at least two 1-m intervals in drill hole 2; drill hole 3 did not intersect the main vein zone. Veins containing quartz are plotted on cross sections (Figure 5). Based on data obtained from drill holes 1, 2, and 3, the main vein zone pinches out with increasing depth and at least part of it plunges gently northeastward.

The hydrothermally derived autoclastic breccia was intersected in drill hole 4 at a downhole depth of 80-113 m. This breccia body may be spatially equivalent to the surficial expression of the main vein zone. The apparent thickness of this zone is comparable to the main vein zone intersected in drill hole 1. However, vein attitudes measured in a footwall trench at the westernmost end of the dumps do not project to the intersection of the breccia in drill hole 4 (W.H. White, USGS archived data; Figure 5). Either a fault offset, a subsidiary vein set, flattening of vein structures, or the en echelon arrangement of veins within the main vein zone could account for the observed discrepancy between the position of the breccia body and the projection of quartz veins from the surface.

Veins are frequently present both at dike intrusive contacts and within dikes. Mafic and leucocratic dikes do not cut veins of any compositional category. Drill-core data indicate that the veins were formed subsequent to dike emplacement.

The cross-cutting relationships among veins of all categories are significant. Although biotite stringers are not common, a 1-cm-thick quartz vein cuts and offsets biotite stringers in drill hole 3. Quartz-dominant (> 75 percent quartz) veins commonly are cut by irregular carbonate-dominant (> 50 percent rhombohedral carbonate-group minerals) stringer-vein types. Furthermore, the presence of quartz clasts in the carbonate-dominant autoclastic breccia matrix supports the early (relative to carbonate-dominant veins) formation of quartz veins. Carbonate-dominant veins, on the other hand, are not cut by quartz-dominant veins: they appear to be cut mostly by chlorite-dominant veins. Carbonate + chlorite stringers cut clasts and matrix in the breccia body in encountered drill hole 4. The proposed temporal sequence (arranged from earliest to latest) of formation of spatially equivalent veins is proposed as follows: 1) biotite (epidote), 2) quartz (carbonate), 3) carbonate (quartz + chlorite), and 4) chlorite (carbonate).

A paragenetic sequence is readily definable within a continuum comprised of 100 percent chlorite-100 percent carbonate-100 percent quartz-gangue fillings in vein structures. Quartz crystals project from vein margins into carbonate and chlorite pockets, clearly indicating an earlier origin for the quartz. Similarly, the presence of chlorite pods within carbonate-group-mineral phases defines generally later crystallization of chlorite. The presence of chlorite pods near vein margins (yet surrounded by carbonate-group minerals) could evidence temporal overlap of these phases. The paragenetic sequence for gangue phases within veins is 1) quartz, 2) carbonate, and 3) chlorite. Vein pyrite appears to have formed throughout this sequence.

By far the greatest volume of early-formed quartz veins in all drill holes is found in the main vein zone, an observation that contrasts with the more widespread occurrence of carbonate-dominant veins. No evidence for crustified layering in main vein zone quartz veins exists in drill core; each of these veins probably represents one filling event.

ALTERATION

Three alteration associations were noted during the petrographic examination of thin sections made from samples of dioritic country rocks and mafic dikes. These associations include 1) green biotite + epidote + plagioclase + pyroxene + biotite + quartz ± actinolite, 2) sericite + feldspar + quartz + pyrite, and 3) sericite + carbonate + chlorite + quartz + pyrite. These association types resulted from the alteration of primary feldspar, clinopyroxene, and biotite, respectively. In this report, further references to these associations will be abbreviated as follows: 1) green biotite + epidote, 2) quartz + sericite + pyrite, and 3) carbonate + chlorite + pyrite.

Green biotite and epidote in stringers apparently have the same composition as secondary green biotite and epidote occurring specifically at grain boundaries. Secondary biotite at grain boundaries is somewhat wedge shaped and the apex of any individual grain is attached to a substrate composed of either pyroxene or biotite. The wide portion of the green-biotite wedges project into plagioclase; therefore, the direction of growth is from pyroxene and brown biotite into plagioclase. Additionally, epidote prisms are aligned subparallel to the growth direction of biotite.

The formation of these secondary phases involved a plagioclase-consuming reaction. Felty actinolite (?) reaction rims may also be present between green biotite and clinopyroxene. The hydrothermal solutions responsible for this association could have had a late magmatic origin. The secondary quartz + sericite + pyrite mineral association distinctly envelops quartz-dominant veins. Feldspar and ferromagnesian minerals are completely consumed by sericite, a term loosely used herein for all white mica minerals. This mineral association is best developed adjacent to thick quartz veins in foliated quartz diorite.

Veins containing significant to dominant carbonate fillings (with quartz) are enveloped by sericite + carbonate + chlorite + pyrite. Although sericite appears to be the dominant mineral immediately adjacent to the vein, it is also disseminated with carbonate minerals in relict plagioclase more distal to the vein structure. Sericite after plagioclase, carbonate after plagioclase, and chlorite after ferromagnesian phases typify the alteration association. Clots of carbonate-group minerals partially surrounded by chlorite and discontinuous stringers of carbonate ± chlorite commonly are identified in thin section.

The aforementioned mineral-alteration associations are spatially and temporally related to specific vein types that include earliest biotite + epidote (biotite + epidote association), quartz dominant (quartz + sericite + pyrite association), and latest carbonate dominant (sericite + carbonate + chlorite + pyrite association). Consequently, later carbonate veins cutting earlier quartz veins superimpose their alteration envelopes upon the earlier alteration associations, thereby confusing the interpretations of carbonate + chlorite-bearing associations.

Contemporaneous Ductile and Brittle Deformation Features

Quartz diorite and mafic dikes proximal to quartz veins are characterized by mylonite deformation folia aligned subparallel to quartz-vein structures. Gonzales (1974) and Worl (1979) observed schistose rock fragments on the Ishmas Kabir dumps and proposed that the ancient workings might be situated close to the contact of a diorite intrusion with schist. White and Doebrich (1988) recognized foliation in quartz diorite bounding the quartz-vein footwall in a trench exposure.

Medium-grained quartz diorite abruptly grades into foliated mylonites, which are typified by micaceous layers separating mylonitized quartzofeldspathic layers. Porphyroclasts (< 1 mm) of quartz, plagioclase, and biotite are embedded in a mesostasis of feldspar, sericite, and quartz (< 1 mm grain size) in the mylonitic layers. Deformed pyrite and sericite porphyroclasts have a characteristic augen-like appearance in foliated, sericitized quartz diorite wall rocks of quartz veins. Pyrite crystals are not significantly deformed where they are enclosed by carbonate minerals. Microdisplacements along micaceous foliation planes offset a 6-mm-thick quartz (80 percent) + carbonate (20 percent) vein in drill hole 1 at a downhole depth of 122.7 m. The deformation of these rocks postdates vein formation and sulfide mineralization.

All veins occurring in mylonitized rocks are deformed in various ways. Carbonate veins and quartz veins less than 5 mm thick display boudinage when surrounded by foliated rocks. On the other hand, brecciated margins of thick quartz veins evidence disruption textures adjacent to foliated country rocks.

Deformation foliation is best developed in the lowermost (downhole) group of veins in the main vein zone intersected by drill hole 1 (figures 4 and 6). Very closely spaced folia (< 1 mm thick) enclose a 1.2-m-thick quartz vein at a downhole depth of 142 m. The uppermost 0.26 m and lowermost 0.16 m of this vein are brecciated. Angular clasts of quartz-vein fragments, including quartz crystals (< 1 cm), are set in a carbonate matrix. Wall rock fragments have plastic flow features and they typically wrap around quartz clasts. Limonite and hematite are enriched both in these breccias and in surrounding foliated quartz diorite and mafic dikes. The central part of the vein is stark white, massive, and barren.

FAULTS

Few significant faults were noted during core logging (Figure 5). A nearly vertical (?) fault containing breccia fragments was intercepted in drill holes 1, 2, and 3. The N. 65° E. trend of this structure is nearly parallel to the strike of veins and the orientations of dumps.

A fault in a sheared, mylonitized mafic dike at 96.5 m in drill hole 1 contains anomalous concentrations of gold and silver. Gouge-coated, mylonitized, foliated quartz diorite fragments were recovered, indicating postmylonitization movement on the structure. A N. 55° E. strike on slickensided fault planes bounding a mined-out vein at the surface was measured by Louis Gonzales (September 13, 1971, unpublished report). These fault surfaces cut cemented fault breccia and mylonite.

Last and others (1988) defined two sets of faults on the basis of results obtained from a magnetic survey. These faults trend 313° and 13° (azimuth) and are ascribed to left-lateral Najd and Nabitah faults, respectively.

GEOCHEMICAL RESULTS FROM DRILL-CORE SAMPLES

A threshold value of 100 ppb Au was chosen from 563 drill-core samples (Figure 7) in order to define vein-system mineralization patterns. Twenty-five samples (4.4 percent of the total samples collected from drill core) assayed above this threshold limit. Twenty-two of the samples exceeding 100 ppb Au were obtained from drill hole 1, whereas three came from drill hole 2.

Table 4 lists silver, copper, lead, zinc, arsenic, molybdenum, tellurium, and gold concentrations for samples containing >100 ppb Au (only drill hole 1 and 2 samples contain > 100 ppb Au). The highest gold concentrations reported in this table are 1) 1,620 ppb at a downhole depth of 96.27 m to 96.60 m (0.33 m total) from a fault zone in drill hole 1 and 2) 1,500 ppb at a downhole depth of 141.37 m to 141.63 m (0.26 m total) from the lower vein group in the main vein zone in drill hole 1. The highest silver concentrations reported in this table are 1) 13.00 ppm from 96.27 m to 96.60 m (0.33 m total) in drill hole 1 and 2) 2.70 ppm from 96.60 m to 96.72 m (0.12 m total) in drill hole 1. Arithmetic averages of silver, arsenic, and tellurium concentrations are significantly higher (by inspection) in those samples containing >100 ppb Au than average concentrations of the same elements in the total sample population. A complete listing of assay results is presented in the Appendix 1.

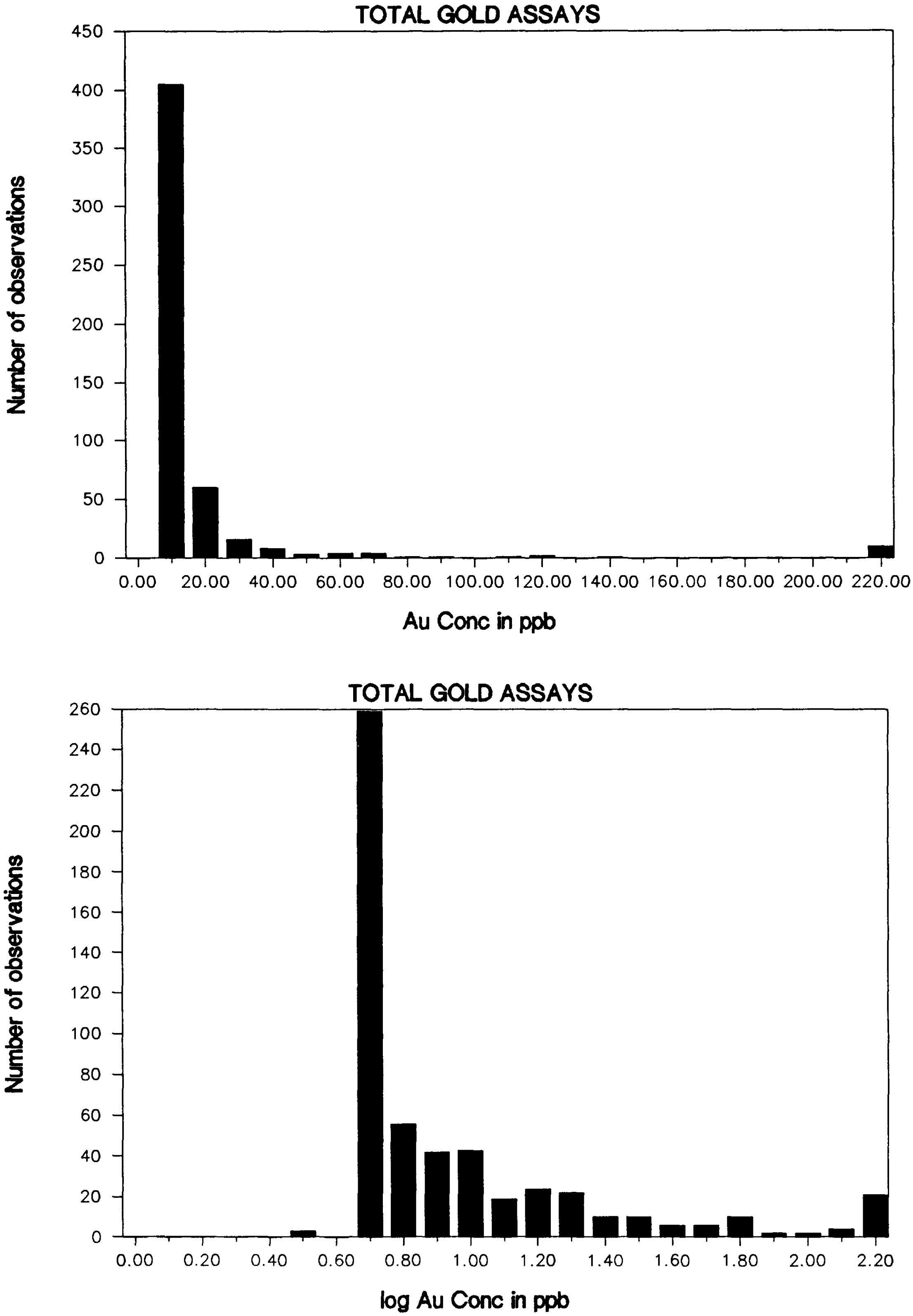

Figure 7.--Histograms of gold concentration (ppb) and log gold concentration (ppb) of all samples from drilling program (563 sample assays). Gaps between bars separate class intervals and are not representative of population characteristics. Samples containing >220 ppb Au and >2.20 log ppb Au are included in the largest class interval in each histogram.

Table 4.—Chemical analyses of samples (563) containing >100 ppb Au (threshold concentration) from drill holes 1, 2, 3, and 4.

Rass No.	FROM	TO	INT. (m)	Ag (ppm)	Cu (ppm)	Pb (ppm)	Zn (ppm)	As (ppm)	Mo (ppm)	Te (ppm)	Au (ppb)
********	****	**	***	*****	*****	*****	*****	*****	*****	*****	*****
235036	95.73	96.27	0.54	0.52	30	6	70	10	1	50	220
235037	96.27	96.60	0.33	13.00	45	15	70	40	3	165	1620
235038	96.60	96.72	0.12	2.70	25	7	50	40	6	105	560
235055	110.92	111.07	0.15	0.25	150	10	30	0	5	20	138
235057	111.20	111.34	0.14	0.62	45	5	40	15	5	5	420
235058	111.34	112.00	0.66	0.12	65	5	50	10	3	5	440
235060	112.10	112.20	0.10	1.20	80	12	10	20	30	35	112
235070	115.03	116.00	0.97	0.10	10	10	70	0	2	25	130
235071	116.00	116.22	0.22	0.10	10	7	50	0	2	25	170
235072	116.22	116.36	0.14	0.10	5	4	40	15	4	25	190
235073	116.36	116.46	0.10	0.10	30	15	10	10	20	30	115
235075	116.60	117.50	0.90	0.20	55	4	40	5	4	35	118
235077	117.67	118.02	0.35	0.05	15	8	20	5	15	45	200
235084	121.00	122.00	1.00	0.15	70	5	40	0	3	45	105
235095	132.00	133.00	1.00	0.10	40	5	200	0	0	0	130
235096	133.00	134.00	1.00	0.05	50	3	60	0	0	0	130
235103	139.10	139.92	0.82	0.05	30	4	60	0	0	35	550
235105	140.95	141.37	0.42	0.05	5	4	45	20	0	10	600
235106	141.37	141.63	0.26	0.16	6	6	10	30	3	50	1500
235108	142.42	142.58	0.16	0.11	4	4	10	20	3	5	360
235110	142.75	143.10	0.35	0.05	5	3	8	10	7	20	220
235111	143.10	143.83	0.73	0.12	20	7	55	5	0	5	180
235415	130.00	131.00	1.00	0.10	8	4	75	0	1	0	230
235419	132.75	133.75	1.00	0.70	6	7	40	40	9	0	180
235468	226.00	227.00	1.00	0.00	20	10	50	15	4	10	131
			MIN.	0.00	4.00	3.00	8.00	0.00	0.00	0.00	105.00
			MAX.	13.00	150.00	15.00	200.00	40.00	30.00	165.00	1620.00
			AVG.	0.83	33.16	6.80	48.12	12.40	5.20	30.00	349.96
			STD.	2.55	32.55	3.37	37.12	12.97	6.84	35.97	387.06
			NO.	25	25	25	25	25	25	25	25

STATISTICAL DATA FROM DRILL HOLE NO. 1,2,3 AND 4 - ALL SAMPLES

	Ag	Cu	Pb	Zn	As	Mo	Te	Au
MIN.	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
MAX.	13.00	350.00	55.00	200.00	40.00	30.00	165.00	1620.00
AVG.	0.14	44.11	5.98	49.93	2.64	3.65	10.85	24.00
STD.	0.62	39.07	6.24	15.67	5.65	2.92	16.14	103.13
NO.	562	562	562	562	562	562	562	563

Plots of silver, copper, lead, zinc, arsenic, molybdenum, and tellurium concentrations versus gold in samples containing >100 ppb Au are shown in Figure 8. Only arsenic and tellurium demonstrate possible positive correlation with gold. Definitive correlations between silver and gold, copper and gold, lead and gold, zinc and gold, and molybdenum and gold are suspect.

Downhole plots (Figure 9) of gold concentration in each drill hole diagrammatically present the distribution of gold concentrations higher than the 100-ppb threshold value. Anomalous gold concentrations are limited to 1) the main vein zone in drill holes 1 and 2, and 2) a fault zone in mylonite immediately above the main vein zone hanging wall in drill hole 1. These gold occurrences also define anomalous silver concentrations, although the correspondence between the two elements is not well defined.

Twenty-five intervals from drill holes 1 and 2 having >100 ppb Au define the sixteen intercepts presented in Table 5. The largest calculated gold intercepts defined by weighted average [$\sum XY/\sum Y$ (X=concentration, Y=sample interval)] are 944.12 ppm from a downhole depth of 140.95 to 141.63 m (0.68 m) and 0.727 ppm from 95.73 to 96.72 m (0.99 m) in drill hole 1. The gold and silver weighted averages for all samples containing >100 ppb Au are 278 ppb and 0.51 ppm, respectively. The gold-silver ratio in these samples (based on total weighted average) is 0.55. The sum of all intercept lengths is 13.46 m, which is 1.32 percent of the 1,023.20 m drilled.

Weighted averages calculated for 58 samples containing gold and silver (drill hole 1) collected throughout the entire main vein zone from a downhole depth of 110.70 m to 143.83 m (33.13 m total) are 93.82 ppb Au and 0.12 ppm Ag (Table 6); the gold-silver ratio is 0.78. However, the average gold concentration on a per sample basis is 121 ppb (± 227 ppb = one standard deviation), whereas silver is 0.16 ppb (± 0.20 ppm). Comparatively, the average concentrations of gold and silver in the 563 samples assayed (Table 4) on a per-sample basis is 24.00 ppb (± 103.13 ppb) and 0.14 ppb (±0.62 ppm), respectively. The average sample size throughout the main vein zone was 0.57 m (± 0.38 m) (Table 6).

The distribution of gold concentrations exceeding 100 ppb between veins and wall rocks within the two vein groupings in drill hole 1 is shown in Table 7. The data obtained from the uphole group of veins (110.7 - 121.0 m) clearly show that gold concentrations are higher in sericitized wall rock (181 and 132 ppb) than in either the quartz veins (43.7 ppb) or the less-altered country rocks (43.8 ppb). However, both the veins and the wall rock are enriched in gold (367 and 394 ppb, respectively) relative to less-altered country rocks (51 ppb) in the downhole quartz-vein group (139.1 - 143.83 m). The downhole vein group is enriched in hematite + limonite relative to the uphole vein group (< 0.1 percent compared to < 1.5 percent). Gold in the uphole group probably is locked in pyrite found in sericite + feldspar + quartz + pyrite alteration associations. No visible gold was found in either the wall rock or veins.

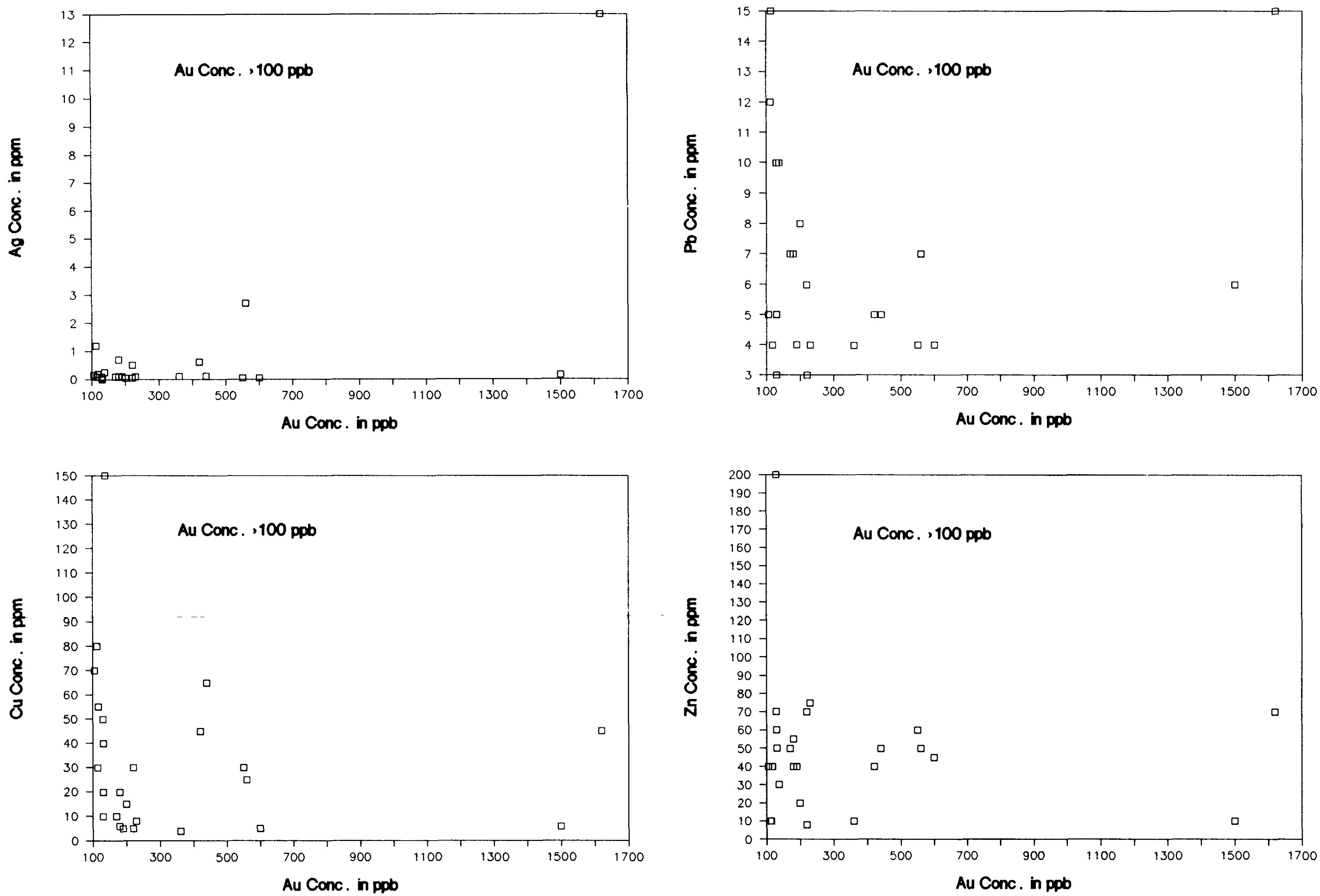

Figure 8.--Variation diagrams of silver, copper, lead, zinc, arsenic, molybdenum, and tellurium concentration versus gold concentration in samples containing >100 ppb Au.

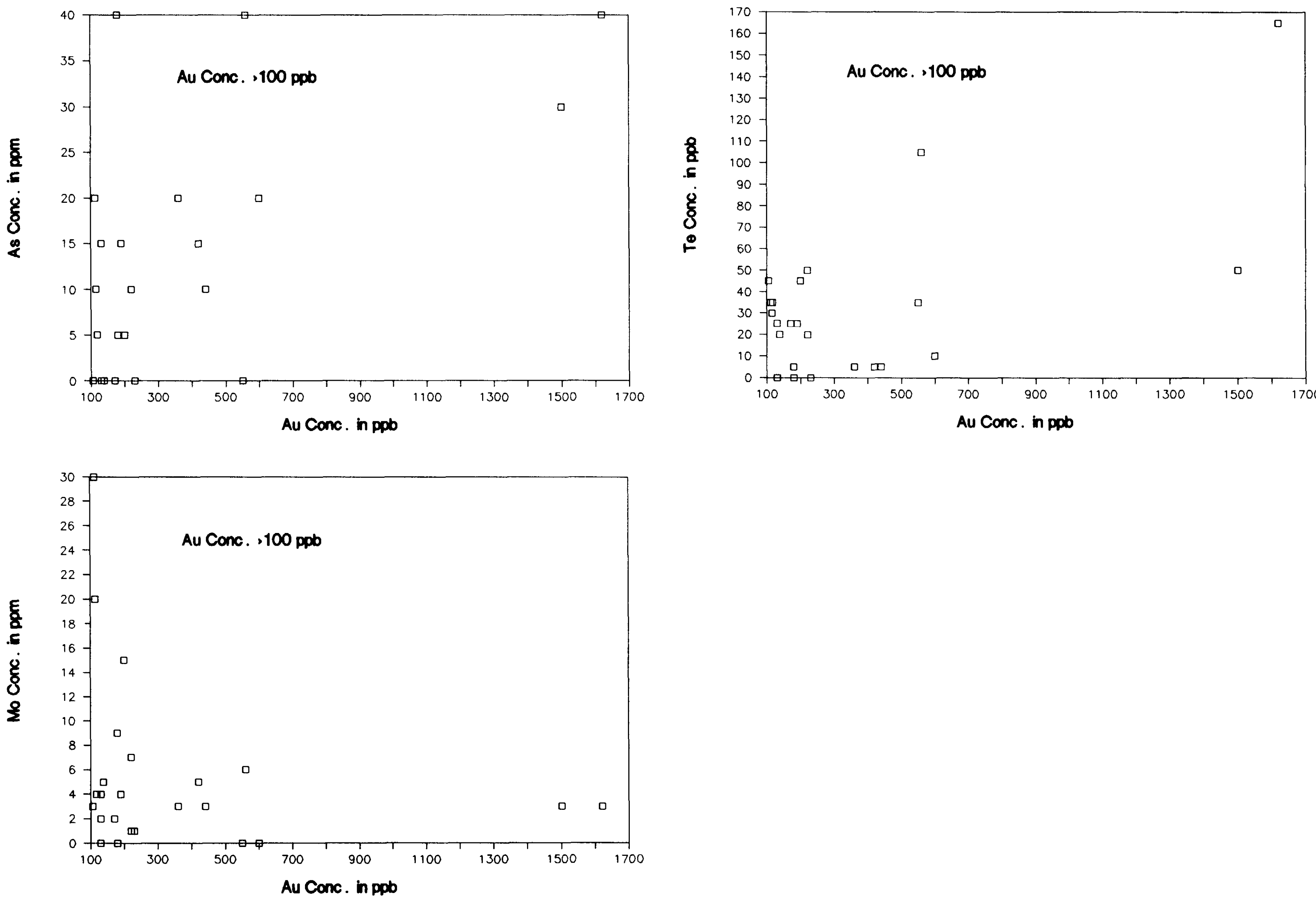

Figure 8.--Variation diagrams of silver, copper, lead, zinc, arsenic, molybdenum, and tellurium concentration versus gold concentration in samples containing >100 ppb Au--(continued).

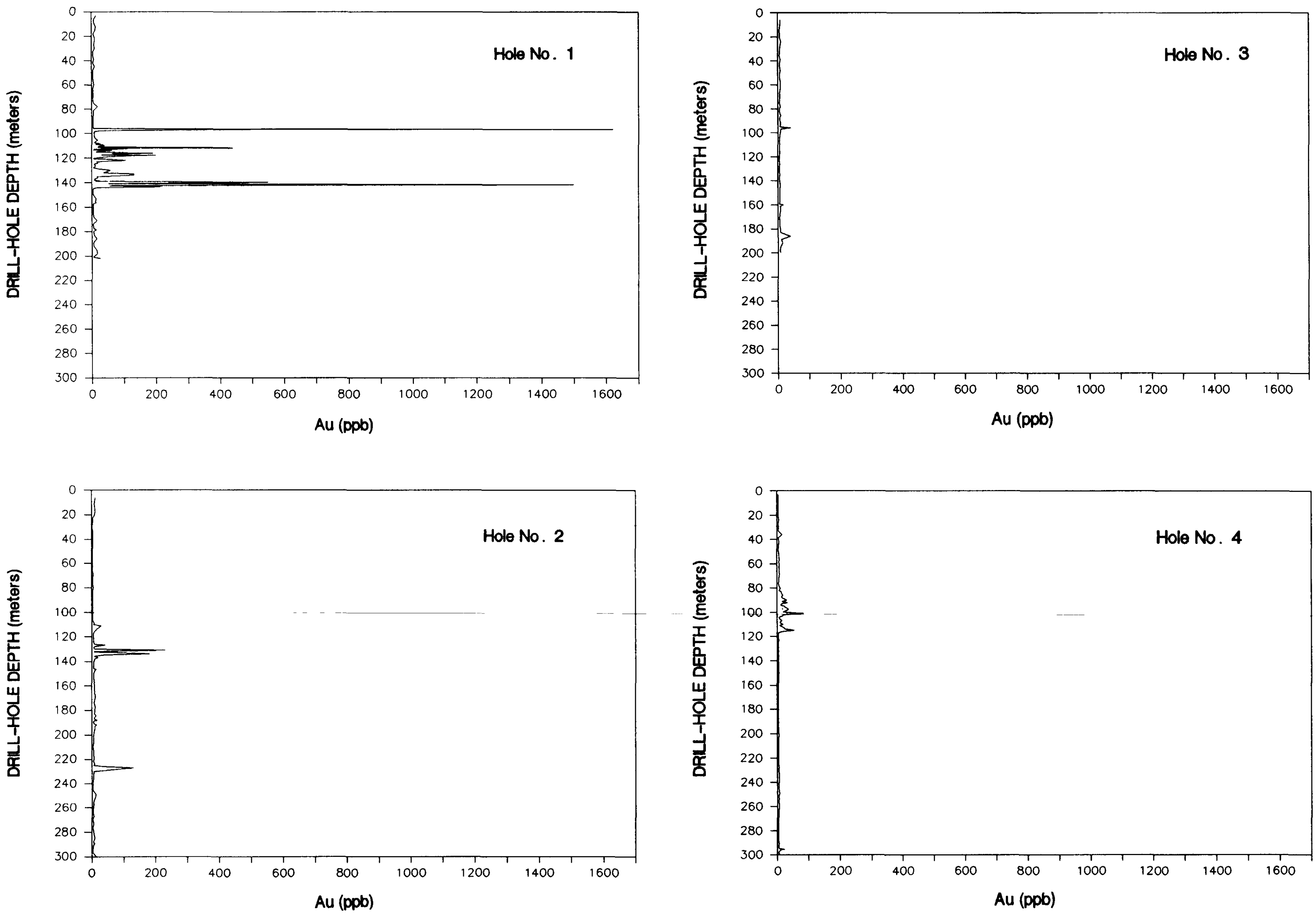

Figure 9.--Depth versus gold concentration (ppb) diagrams for drill holes 1, 2, 3, and 4. The main vein zone occurs at 110 - 144 m in drill hole 1 and 130 - 160 m in drill hole 2. Anomalous gold concentraions at 96 m in drill hole 1 occur in a fault zone.

Table 5.--Gold and silver intercept data with tabulation of weighted average ($\Sigma XY/\Sigma Y$) and summed sample length (ΣY) calculation shown for each intercept. X = gold and silver concentration; Y = core-sample length.

Au and Ag INTERCEPT CALCULATIONS
ISHMAS KABIR DRILL HOLES #1, #2, #3, AND #4
FOR SAMPLES WITH >100 ppb Au

	RASS NO.	From (Meters)	To (Meters)	Interval (Meters)	Ag (ppm)	$\Sigma XY/\Sigma Y$ Ag (ppm)	ΣY Length (Meters)	Au (ppb)	$\Sigma XY/\Sigma Y$ Au (ppb)	ΣY Length (Meters)
Drill	235036	95.73	96.27	0.54	0.52	4.94	0.99	220	728	0.99
Hole #1	235037	96.27	96.60	0.33	13.00			1620		
	235038	96.60	96.72	0.12	2.70			560		
	235055	110.92	111.07	0.15	0.25	0.25	0.15	138	138	0.15
	235057	111.20	111.34	0.14	0.62	0.21	0.80	420	437	0.80
	235058	111.34	112.00	0.66	0.12			440		
	235060	112.10	112.20	0.10	1.20	1.20	0.10	112	112	0.10
	235070	115.03	116.00	0.97	0.10	0.10	1.43	130	424	1.43
	235071	116.00	116.22	0.22	0.10			170		
	235072	116.22	116.36	0.14	0.10			190		
	235073	116.36	116.46	0.10	0.10			115		
	235075	116.60	117.50	0.90	0.20	0.20	0.90	118	118	0.90
	235077	117.67	118.02	0.35	0.05	0.05	0.35	200	200	0.35
	235084	121.00	112.00	1.00	0.15	0.15	1.00	105	105	1.00
	235095	132.00	133.00	1.00	0.10	0.075	2.00	130	130	2.00
	235096	133.00	134.00	1.00	0.05			130		
	235103	139.10	139.92	0.82	0.05	0.05	0.82	550	550	0.82
	235105	140.95	141.37	0.42	0.05	0.09	0.68	600	944	0.68
	235106	141.37	141.63	0.26	0.16			1500		
	235108	142.42	142.58	0.16	0.11	0.11	0.16	360	360	0.16
	235110	142.75	143.10	0.35	0.05	0.10	1.08	220	193	1.08
	235111	143.10	143.83	0.73	0.12			180		
Drill	235415	130.00	131.00	1.00	0.10	0.10	1.00	230	230	1.00
Hole #2	235419	132.75	133.75	1.00	0.70	0.70	1.00	180	180	1.00
	235468	226.00	227.00	1.00	0.00	0.00	1.00	131	131	1.00

TOTAL $\Sigma XY/\Sigma Y$ Au (ppb) = 278
TOTAL $\Sigma XY/\Sigma Y$ Ag (ppm) = 0.51
ΣY (Meters) = 13.46

Table 6.--Main vein zone gold and silver concentrations characterizing core samples from 110.70 m to 143.83 m in drill hole 1. $\Sigma XY/\Sigma Y$ = weighted average, ΣY = summed sample length, X = gold, silver concentration, Y = sample length (meters), s_x = standard deviation of sample intercept, x_x = arithmetic average sample concentration, y = arithmetic average sample intercept (meters), s_y = standard deviation of sample length, n = number of samples.

	Au	Ag
$\Sigma XY/\Sigma Y$	93.82 ppb	0.12 ppm
ΣY	33.13 m	33.13 m
x_x	121 ppb	0.16 ppm
s_x	227 ppb	0.20 ppm
y	0.57 m	0.57 m
s_y	0.38 m	0.38 m
n	58	58

Table 7.--Comparison of gold concentrations between vein quartz, vein-alteration envelopes, and proximal country rock from uphole and downhole groups of quartz veins in the main vein zone, Ishmas Kabir drill hole 1. Uphole group assay intervals begin at 110.70 m and end at 121.00 m; downhole group intervals begin at 139.10 m and end at 143.83 m.

	Au concentration (ppb) $\Sigma XY/\Sigma Y$	Cumulative sample length (meters)=ΣY	Aver. sample length (meters)	Std. dev. sample length (meters)	No. of obser-vations
UPHOLE QUARTZ-VEIN GROUP:					
Quartz Veins (>80% vein)	43.7	1.43	0.18	0.12	8
Sericitized Wall rock + Vein Quartz (<20% vein)	181	0.50	0.25	0.14	2
Sericitized Wall rock (>80% w.r.)	132	5.04	0.32	0.27	16
Less Altered (Sericitized) Country Rocks Proximal to Veins + Alteration	43.8	3.36	0.83	0.27	4
Total =	93.7	10.30	0.34	0.30	30
DOWNHOLE QUARTZ-VEIN GROUP:					
Quartz Vein (>80% vein)	367	1.56	0.39	0.28	4
Sericitized Wall rock (>80% w.r.)	394	2.14	0.54	0.30	4
Less Altered (Sericitized) Country Rocks Proximal to Veins + Alteration	51.0	1.03	-	-	1
Total =	311	4.73	0.53	0.32	9

Gold concentrations in the lower vein group in drill hole 1 (Table 8) are highest in the brecciated-vein hanging wall (1,500 ppb) and the foliated sericitized zone above the vein (600 ppb). The brecciated-footwall portion of the vein also contains anomalous gold concentrations (360 ppb). Concentrations of hematite and limonite are higher in the hanging wall of the vein (1.0 percent) than in the footwall (0.2 percent). Pyrite concentrations are locally higher in the hanging wall of the vein (0.5 percent by volume), but for the most part are comparable to footwall concentrations (0.7 percent by volume). Gold concentrations in the vein core are 61 ppb; only a trace of iron oxide is contained there. Tellurium and arsenic are below instrument detection limits in the vein core, but they are relatively enriched in the brecciated-vein margins and foliated wall rocks.

Table 8.--Compositional characteristics of 6 samples from the main vein zone (lower group) in Ishmas Kabir drill hole 1 (139.92 m - 142.75 m), including 1.2-m-thick quartz vein, brecciated-vein footwall, brecciated-vein hanging wall, and adjacent foliated country rock (sericitized).

	Length (meters)	Au (ppb)	As (ppm)	Te (ppm)	Limonite+ Hematite (Vol.%)	Pyrite (Vol.%)
Foliated Zone	1.03	51	0	10	0.5	3.0
Foliated Sericitized Zone	0.42	600	20	10	0.5	5.0
Brecciated Vein Hanging Wall	0.26	1500	30	50	1.0	0.5
Milky-white Vein Core	0.79	61	0	0	Trace	0.5
Brecciated Vein Footwall	0.16	360	20	5	0.2	0.7
Foliated Sericitized Zone	0.17	55	12	20	0.2	3.0

GEOCHEMISTRY OF ANCIENT DUMPS AND TRENCHES

Smith (1964) reported assay results of composite grab samples collected along the length of the dumps at 250-foot (76.2 m) intervals (Table 9). The highest and lowest gold concentrations obtained were 28.8 and 0.69 g/t (0.84 and 0.02 oz/ton), respectively. The arithmetic average of eight sample groups was 7.06 g/t Au (0.21 oz/ton Au), a relative enrichment of 29.2 times the average gold value of the calculated weighted averages (242 ppb Au) for samples containing >100 ppb Au in the main vein zone. This relative gold enrichment in the mine spoil increases to 75 times the weighted average (93.82 ppb Au) across the entire length (33.13 m) of core obtained in the main vein zone encountered in drill hole 1. Furthermore, Smith's (1964) sample assays yielded 4.20 g/t Ag (0.12 oz/ton Ag). The gold-silver ratio of these averages is 1.68, which is 2.15 times that of the ratio in the main vein zone intersected in drill hole 1 (gold-silver ratio = 0.78).

Gonzales (September 13, 1971, unpublished report) reported an average of 0.08 oz/ton Au for several sluice samples apparently collected from three trenches; a total dump tonnage of 100,000 t was estimated. Gonzales (1974) reported 3 g/t Au from dump samples and a dump tonnage of 120,000 tons. Worl (1979) reported 184 ppm Au in a single sample collected from the main vein zone mine dumps; two 3-kg dump samples averaged 6.2 g/t Au. These data are presented in Table 9.

Gold concentrations in trench samples collected in the main vein zone footwall assayed at 270 ppb across a 120-cm-thick quartz vein and 260 ppb in 30 cm of argillized and foliated quartz diorite below the footwall of the vein (White and Doebrich, 1988; Table 9). Anomalously high copper concentrations (150 ppm and 100 ppm) were obtained in 30 cm and 170 cm of argillized and well-indurated footwall quartz diorite. Silver, arsenic, lead, and molybdenum concentrations were comparatively insignificant. Only the trench mapping data for trench 1 (Figure 3), mapped by White and Doebrich (1988), was located in archived files; this data appears on section D-D' (figures 4, 5, and 6).

DISCUSSION

VEIN-FORMATION MODEL

Gold-bearing veins and alteration associated with the main vein zone plunge to the northeast in drill holes 1, 2, and 3. The autoclastic hydrothermal breccia encountered in drill hole 4 may be contiguous with a near-surface autoclastic breccia body represented by carbonate-matrix breccia rock fragments found in dump spoil. If this spatial contiguity does exist, then the breccia body in drill hole 4 is either an offset or a flatter portion of the main vein zone relative to vein attitudes across drill holes 1, 2, and 3. The hydrothermal breccia may be a more distal carbonate-rich portion of the main vein zone.

Clusters of quartz veins that consist of > 75 percent (by volume) vein quartz mark the passage of mineralizing hydrothermal solutions of specific composition through structures now filled by these veins (main vein zone). On the other hand, carbonate quartz ±chlorite phases found in more broadly dispersed structures, either spatially equivalent or proximal to the main vein zone, precipitated from either later, spatially equivalent hydrothermal solutions or distal, temporally equivalent hydrothermal solutions. These CO_2-rich solutions circulated through larger volumes of country rock than did the earlier solutions that circulated through main vein zone structures. Therefore, the main vein zone could be a remnant of an early hydrothermal plume whose composition differed from those of later-evolved, wide-spread, CO_2-charged hydrothermal solutions now represented by carbonate-dominant vein fillings. This hydrothermal plume may have been a parent solution from which these CO_2-rich solutions evolved, at least in part.

Table 9.—Gold-assay results and tonnage estimates for Ishmas Kabir dump and trench samples reported in earlier investigations.

Au Concentration	Tonnage	Sample Description	Reference
0.21 ±0.26 oz/ton 0.84 oz/ton (high value) 0.02 oz/ton (low value)	--	Aver. of 5 grab samples coll'd along a 250 ft-interval parallel to length of dumps	Smith (1964)
0.08 oz/ton	100,000 metric tons	Sluice samples taken from 3 trenches dug in 1968. Reported as an aver. concentration for dump.	Gonzales (September 13, 1971, unpublished report)
0.25 oz/ton	--	Sample of coarse fragments.	Gonzales (Ibid. 1971)
3 g/t	120,000 tons	Not reported	Gonzales (1974)
6.21 g/t 8.6 g/t 3.82 g/t	--	Two 3-kg dump samples	Worl (1979)
270 ppb	--	120-cm qtz-vein sample	White and Doebrich, 1988
260 ppb	--	30-cm altered footwall channel samples in lower portion of main vein zone SW of dumps.	

MINERALIZATION MODEL

Average gold concentrations in the mine dumps (7,060 ppb) are significantly higher than those found in the main vein zone (278 ppb) (drill holes 1 and 2). Likewise, limonite + hematite concentrations are significantly higher in mine spoil found on the ancient dumps than in drill core obtained from the main vein zone. The highest gold concentrations are associated with limonite + hematite (after pyrite). Also, anomalous gold concentrations are spatially coincident with the alteration association sericite + feldspar + quartz + pyrite, which envelops quartz veins in drill hole 1. Significant primary gold mineralization appears to have occurred prior to the development of later carbonate + chlorite + quartz + pyrite associations.

Hematite and limonite occurrences in the main vein zone and hanging wall fault zone attest to the significance of later acidic solutions. Iron-oxide-bearing brecciated quartz-vein margins in the mineralized main vein zone evidence enhanced porosity and permeability available to gold-bearing solutions responsible for secondary gold mineralization. Similarly, limonite- and hematite-filled stringers proximal to the mineralized fault zone at 96.5 m (drill hole 1) formed from acidic solutions circulating within these structures; limonite and hematite is pseudomorphous after pyrite in sericitically altered quartz diorite hosting these stringers. Gold concentrations appear to have been enhanced by oxidizing (perhaps descending supergene) solutions circulating through these permeable zones.

It is likely that the solutions responsible for gold enrichment of the vein system mined by the ancients similarly enriched primary gold associated with sulfide mineralization at the depths intersected by the drill hole. This process apparently accumulated higher concentrations of gold in those rocks mined at the surface relative to those found at depth in drill hole 1. A supergene gold-enrichment process could explain why the gold-silver ratios in dump samples are higher than in drill-core samples. Typically, all spoil examined on the dumps contains only rare pyrite; all sulfides that were originally present have been oxidized to limonite + hematite. On the other hand, oxidized wall rocks containing the highest gold concentrations encountered in drill hole 1 contain 2-10 percent (by volume) pyrite and $\leq$ 1 percent (by volume) limonite + hematite.

A well-defined positive functional relationship exists between tellurium and gold in the variation diagrams whereas a poorly defined positive correlation exists between arsenic and gold (Figure 8). Sporadic dissolution of phases by oxidizing solutions could have significantly contributed to the data scatter observed in the variation diagrams (in which arsenic, tellurium, and silver are plotted versus gold).

Potential Gold Resources

The results obtained from assays of samples collected from relatively deep drill holes are not encouraging. The concentrations of gold and associated silver in gold intercepts are highest in limonite + hematite-bearing gouge-filled faults and brecciated quartz veins that are proximal to sericitized wall rocks originally containing pyrite. Only the northeasternmost of the holes drilled (drill hole 1) contains veins and structures comparable to those described from surface exposures in other earlier investigations. Gold assays performed on core samples obtained within intercepts across the main vein zone in drill hole 1 indicate that these deposits are, at best, subeconomic. However, dump material and the near-surface vein system may have economic potential as a small heap-leachable gold resource.

The Ishmas Kabir ancient mine dumps are approximately 75 m wide and 4 m high. Gonzales (1974) estimates that there are 120,000 tons of dump spoil averaging 3 g/t in sluiced trench samples consisting of fist-sized rock fragments, fine-grained (< 3 cm) quartz tailing, and eolian sediment fractions. A sample of coarse fragments collected by Gonzales (September 13, 1971, unpublished report) is significantly enriched in gold (0.25 oz/t) relative to sluice samples (3 g/t); a possible bias is indicated that favors gold enrichment in coarse fragments relative to samples containing all fractions. Grab samples collected by Smith (1964) might not be representative of actual dump grades. Two 3-kg samples collected by Worl (1979) provide limited information for the estimation of gold grade. Further sampling and definition of the bedrock surface clearly are required if adequately defined grade-and-tonnage figures are to be obtained.

Boyle and Atkinson (1982) performed an on-site inspection of the deposit to determine gold-placer potential during aerial reconnaissance of the region. They concluded that there was no potential for the occurrence of placer gold at Ishmas Kabir.

Relative Age of Deposit and Deformation Features

Mylonite foliation density increases toward quartz veins and is best developed in quartz diorite and mafic dikes adjacent to the thickest quartz veins. These ductile-deformation textures are typical of dynamically metamorphosed rocks that are characterized by high strain rates. On the other hand, carbonate-cemented breccias found along thick quartz-vein margins adjacent to mylonitized wall rocks record a completely different brittle-material response to stress. Ductile deformation and concomitant brittle-deformation textures postdate quartz-vein filling, wall rock alteration, and primary sulfide (pyrite) mineralization. All vein types cut quartz diorite, mafic dikes, and granitic dikes at Ishmas Kabir, and vein formation clearly postdates the emplacement and crystallization of these intrusive bodies.

The formation of very large mylonite zones in the Ishmas gold district has been attributed to the Nabitah orogenic event by Doebrich and White (1989). Mylonite deformation textures in quartz diorite and dikes probably resulted from the ductile response of these rocks to compressive stresses generated during the Nabitah orogeny (680-640 Ma). Similar mylonitic features are present at the Nabitah ancient mine and possibly at Ishmas and Al Suwaydah ancient mines (White and Doebrich, 1988). Therefore, the mylonite-forming deformational event in evidence at these deposits is proposed to be the same one that formed the Ishmas Kabir mylonites. Furthermore, it is suggested that Ishmas Kabir auriferous quartz veins and the associated alteration formed during the earlier of two district-wide quartz-vein-forming events recognized by White and Doebrich (1988). These events include 1) a deep-seated, Nabitah-age vein- and mylonite-forming event and 2) a post-Nabitah-age faulting and vein-forming event.

FAULTS

The presence of slickensides at podiform quartz-vein margins at the Ishmas and Al Suwaydah ancient mines indicates post-vein movement along fault structures. Similarly, slickensides on cemented fault breccia (vein breccia?) and mylonite at Ishmas Kabir ancient mine define both post-vein and post-mylonite displacements. These slickensides record fault movements younger than the mylonitization event and formation of the quartz veins (pods); these movements are probably of post-Nabitah age. The mineralized fault zone containing mylonite fragments in the main vein zone hanging wall (drill hole 1) postdates ductile deformation at Ishmas Kabir and is likewise of post-Nabitah age.

On the basis of the results of a magnetic survey, Last and others (1988) proposed the existence of a gabbroic intrusion located southeast of Ishmas Kabir. The boundaries of the magnetic anomalies that define this intrusion are oriented nearly parallel to the trend of the ancient workings. It is possible that a pre-existing intrusive contact directly influenced the attitude of the main vein zone structures such that the general strike (S. 30° W.) differs significantly from the trend (N. 5° W. - N. 5° E.) of Nabitah-age vein structures (White and Doebrich, 1988).

NABITAH-AGE QUARTZ VEINS AND WALL ROCKS: DEFORMATION MODEL

The brittle response of quartz-vein margins and the more ductile response of surrounding country rocks to contemporaneous stress can be explained hypothetically by examining the mechanical properties of diorite, quartz, and quartzite. Handin (1966) presents pertinent short-term triaxial-compression data obtained during tests conducted at nearly constant strain rates of 0.5-5 percent per minute. These data are as follows:

Material	Temp. (°C)	Confining Pressure (bars)	Ultimate Strength (bars)	Total Strain (percent)
Diorite	150	1,010	6,130	2.6
Salem, Massachusetts	500	5,050	7,100	24.0
Quartz				
(load paral. c)	24	2,580	51,000	4.8
(load perpen.r)	500	5,070	31,000	4.8
Quartzite	24	1,010	10,790	5.2
Sioux,	24	2,020	12,970	2.0
Minnesota	500	5,070	16,900	3.7

Because the total strain for diorite is 5.0 times greater than quartz and 6.5 times greater than quartzite (at 500° C), quartz veins can be expected to exhibit more brittle properties than diorite under these loading conditions. Diorite may exhibit higher total strain than quartz veins at temperatures <500° C and >150° C. The ultimate strength of quartz and quartzite at 24° C is 8.3 times and 1.8 times greater, respectively, than diorite at 150° C. Quartz veins are likely to exhibit physical properties somewhere between those of quartz and quartzite. Based on the higher ultimate strengths of quartz and quartzite, quartz veins are proposed to carry significantly larger stresses than the surrounding diorite. A concentration of stresses in quartz veins at temperatures significantly less than 500° C could have caused brecciation of the veins, whereas adjacent diorite became mylonitized.

White and Doebrich (1988) proposed that compressional forces formed mica schist and mylonite (of Nabitah age) at considerable depths within the earth's crust. Furthermore, they suggested that the emplacement of auriferous podiform quartz masses (veins) at Ishmas, Nabitah, Al Suwaydah, and Al Suwaydah Sharq ancient mines occurred in the late stages of schist formation during Nabitah-age faulting. The pod-like shape and slickensided surfaces of these quartz bodies were supposedly the result of the same tectonic event that produced the faults. Hydrothermal quartz filled dilated fault structures in deep crustal regimes, resulting in podiform morphologies. The podiform shape of larger quartz masses are more common than tabular vein morphologies; the largest body is 65 m long and 5 m thick.

The podiform quartz masses described by White and Doebrich (1988) formed in response to the same orogenic stresses that produced mylonite schist in wall rocks at Ishmas Kabir. However, these pod-like forms may be incipient diapirs that are younger than the original quartz-vein structures. Greater total strain in mylonite relative to quartz masses (veins) characterizes deformation in response to

Nabitah-age orogenic stresses. Differential movements across these highly deformed mylonite-schist units at quartz-vein boundaries subsequently accommodated relative upward movement (perhaps of small absolute magnitude) between less-dense quartz bodies and more-dense enclosing dioritic rocks. The generation of stresses and the resultant deformation of rocks thereby augmented incipient upward diapiric emplacement of the quartz bodies.

The effective concentration of stresses in quartz-vein bodies and the resultant formation of mylonite precludes the deep-crustal conditions of vein and mylonite formation proposed by White and Doebrich (1988). Furthermore, the presence of chlorite in alteration associations in the Ishmas Kabir system requires that subsequent regional-metamorphic grades be no greater than lower-greenschist facies. Therefore, conditions did not exist for moderately deep burial typified by middle-greenschist to amphibolite metamorphic grades (Gonzales, 1974; Worl, 1978, 1979; White and Doebrich, 1988; Doebrich and White, 1989) either during or after vein development.

CONCLUSIONS

Various estimates of the grade and tonnage (3-7 g/t Au contained in 100,000 t - 120,000 tons of ancient dump spoil) may justify further investigation of the resource potential of gold at Ishmas Kabir. Possible sampling bias, coupled with this range of gold grade-and-tonnage estimates warrant resampling of the dump material. Additionally, the presence of outcrop under the northeasternmost of the two dumps may indicate that significant bedrock underlies dump spoil, thereby casting some doubts upon the accuracy of the grade-and-tonnage estimate above. The relatively fine-grained nature of spoil fragments, as well as the probable association of gold with limonite and hematite, may make bulk heap-leaching methods of gold recovery viable.

At Ishmas Kabir, anomalous gold concentrations defined by deep drill-hole intercepts are noneconomic. The total length of drill core containing gold concentrations > 100 ppb is 13.46 m, which is 1.3 percent of the 1,023.20 m drilled. Fourteen of sixteen gold intercepts are located in the main vein zone; the average gold concentration of all intercepts is 278 ppb. The highest value reported in assay results is 1,620 ppb Au over a core length of 0.33 m at a downhole depth of 96.6 m in drill hole 1. This same interval contained the largest silver concentration (13 ppm). The average silver concentration (based on weighted average calculations) at auriferous intercepts was 0.51 ppm.

Anomalous gold concentrations (> 100 ppb) coincident with the main vein structures are nearly played out (relative to dump concentrations) at a depth of 150 m in drill hole 2 and are completely absent from drill hole 3. This zone of mineralization, best defined in drill hole 1, gently plunges to the northeast. A breccia body characterized by < 100 ppb Au concentrations in drill hole 4 is comparable in apparent thickness to the main vein zone encountered in drill hole 1, and it may be an offset continuation of the main vein zone. This body is an autoclastic hydrothermal breccia consisting of quartz-diorite clasts set in a matrix of vein-forming mineral phases.

The largest gold concentrations reported in drill-core assays were found in secondary-enriched (supergene-enriched?) main vein zone rocks and in a fault in the main vein zone hanging wall. Hematite + limonite are pseudomorphous after pyrite and also coat fractures. Mine spoil at the Ishmas Kabir ancient mine is characteristically more oxidized and contains more gold than rocks encountered in drill core. Secondary gold enrichment has dispersed and concentrated gold throughout permeable zones in quartz veins.

Primary gold occurs with sericite + feldspar + quartz + pyrite associations in alteration envelopes on quartz veins (> 75 percent quartz < 25 percent rhombohedral-carbonate-group minerals). Quartz-vein occurrences are principally limited to the main vein zone of vein structures, which was mined at the surface by the ancients. Carbonate- and chlorite-dominant veins are widely dispersed throughout quartz-diorite country rocks.

Vein mineralogies vary between end-member quartz-carbonate-chlorite compositions. The paragenetic sequence of these minerals in vein structures is quartz (earliest)-rhombohedral carbonate-chlorite (latest). Quartz-dominant veins are older than spatially equivalent carbonate-dominant veins.

All veins cut all rock types. The principal rock type hosting veins is a medium-grained plutonic quartz diorite intruded by mafic dikes and minor leucocratic dikes. Veins commonly are found within dikes and at dike contacts.

Sulfide mineralization associated with vein formation predates rock deformation. Quartz veins were subjected to brittle deformation, whereas surrounding country rocks were mylonitized contemporaneously during the Nabitah orogeny. Fault movement within and adjacent to the main vein zone postdates the Nabitah orogeny. Oxidation of sulfides, principally pyrite, took place much later.

RECOMMENDATIONS

Any further assessment of resource potential for gold at the Ishmas Kabir prospect should be limited to evaluation of the economic potential of the ancient dumps and the near-surface vein system. To this end, a comprehensive sampling program of the dump material would be necessary to accurately redefine gold grade-and-tonnage figures. If gold reserves in the dumps are economically attractive, additional drilling close to the dumps may be warranted. Subsequent drilling should be limited to shallow holes that would identify near-surface gold occurrences in the main vein system. No further deep drilling is recommended at this time.

DATA STORAGE

DATA FILE

All field and laboratory data for this report, including field notes, core-log sheets, all geochemical analytical results, field notebooks, and polished core samples are stored in Data File USGS-DF-09-10 in the Jeddah office of the U.S. Geological Survey Saudi Arabian Mission.

MINERAL OCCURRENCE DOCUMENTATION SYSTEM

Updated information was added to the Mineral Occurrence Documentation System (MODS) for the Ishmas Kabir prospect, MODS 01458. No new MODS files were established.

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APPENDIX 1

Geochemical-assay results for Ishmas Kabir drill hole 1.

Geochemical-assay results for Ishmas Kabir drill hole 2.

Geochemical-assay results for Ishmas Kabir drill hole 3.

Geochemical-assay results for Ishmas Kabir drill hole 4.

Appendix 1.--Geochemical-assay results for Ishmas Kabir drill hole 1.

Chemical Analysis Of ISHMAS KABIR # 1

																	Graphite Furnace RE- RUN			
				Ag	Cu	Pb	Zn	As	Bi	Mo	Ni	Co	Cd	Sb	Te	Au	Au	Te	Au	Au
Rass No.	FROM	To	Int./M	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppb)	(ppb)	(ppm)	(ppb)
********	****	**	*****	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**
235004	1.50	3.00	1.50	0.10	45	5.00	65.00	10.00	0.00	5.00	70.00	30.00	0.10	0			9	10.00	0.01	15
235005	3.00	6.00	3.00	0.10	35	4.00	60.00	10.00	0.00	6.00	50.00	20.00	0.10	0			10	10.00	0.00	8
235006	6.00	9.00	3.00	0.10	65	10.00	60.00	10.00	0.00	5.00	50.00	30.00	0.10	0			10	0.00	0.00	8
235007	9.00	12.00	3.00	0.10	60	5.00	70.00	10.00	0.00	5.00	50.00	30.00	0.10	0			10	10.00	0.01	13
235008	12.00	15.00	3.00	0.10	25	8.00	75.00	10.00	0.00	5.00	60.00	30.00	0.00	0			6	10.00	0.01	11
235009	15.00	18.00	3.00	0.10	10	4.00	50.00	10.00	0.00	6.00	60.00	30.00	0.00	0			11	15.00	0.00	5
235010	18.00	21.00	3.00	0.20	180	5.00	60.00	10.00	0.00	2.00	70.00	20.00	0.00	0			9	15.00	0.01	10
235011	21.00	24.00	3.00	0.10	15	10.00	65.00	10.00	0.00	2.00	50.00	20.00	0.00	0			6	10.00	0.01	9
235012	24.00	27.00	3.00	0.10	100	18.00	60.00	10.00	0.00	12.00	50.00	30.00	0.00	0			14	15.00	0.00	7
235013	27.00	30.00	3.00	0.10	45	4.00	42.00	0.00		5.00				0	0.00	0.00	0	10.00	0.01	9
235014	30.00	33.00	3.00	0.00	25	2.00	55.00	10.00		5.00				0	0.00	0.00	0	10.00	0.00	4
235015	33.00	36.00	3.00	0.10	110	2.00	40.00	0.00		2.00				0	0.00	0.00	0	0.00	0.00	4
235016	36.00	39.00	3.00	0.00	25	3.00	35.00	10.00		3.00				0	0.00	0.00	0	0.00	0.00	8
235017	39.00	42.00	3.00	0.00	20	2.00	35.00	10.00		2.00				0	0.00	0.00	0	0.00	0.00	4
235018	42.00	45.00	3.00	0.00	15	2.00	40.00	10.00		4.00				0	0.00	0.00	5	0.00	0.01	10
235019	45.00	48.00	3.00	0.00	25	1.00	35.00	10.00		6.00				0	0.00	0.00	5	0.00	0.00	4
235020	48.00	51.00	3.00	0.00	35	1.00	35.00	10.00		3.00				0	0.00	0.00	13	0.00	0.00	4
235021	51.00	54.00	3.00	0.00	30	3.00	54.00	10.00		0.00				0	0.00	0.00	5	0.00	0.00	4
235022	54.00	57.00	3.00	0.15	55	19.00	70.00	0.00	0.00	0.00			0.00	0	0.10	0.00	13	15.00	0.00	5
235023	57.00	60.00	3.00	0.00	25	3.00	50.00	10.00	0.00	3.00			0.00	0	0.10	0.00	5	35.00	0.00	7
235024	60.00	63.00	3.00	0.00	30	3.00	48.00	10.00	0.00	0.00			0.00	0	0.10	0.00	8	25.00	0.00	4
235025	63.00	66.00	3.00	0.10	80	4.00	45.00	10.00	0.00	0.00			0.00	0	0.00	0.00	5	0.00	0.00	4
235026	66.00	69.00	3.00	0.10	70	8.00	55.00	10.00	0.00	0.00			0.00	0	0.00	0.00	5	0.00	0.00	4
235027	69.00	72.00	3.00	0.00	20	4.00	55.00	10.00	0.00	4.00			0.00	0	0.00	0.00	5	0.00	0.00	4
235028	72.00	75.00	3.00	0.10	25	4.00	55.00	10.00	0.00	4.00			0.00	0	0.00	0.00	5	0.00	0.00	6
235029	75.00	78.00	3.00	0.10	65	3.00	55.00	10.00	0.00	2.00			0.00	0	0.00	0.00	11	0.00	0.02	18
235030	73.00	81.25	3.25	0.10	45	2.00	55.00	10.00	0.00	4.00			0.00	0	0.00	0.00	5	0.00	0.00	5
235031	81.25	84.00	2.75	0.10	25	3.00	45.00	10.00	0.00	4.00			0.00	0	0.00	0.00	5	0.00	0.00	6
235032	84.00	87.00	3.00	0.00	20	3.00	35.00	10.00	0.00	3.00			0.00	0	0.10	0.00	5	20.00	0.00	4
235033	87.00	90.00	3.00	0.00	40	2.00	33.00	10.00	0.00	4.00			0.00	0	0.00	0.00	5	0.00	0.00	4
235034	93.00	93.00	3.00	0.00	40	2.00	35.00	10.00	0.00	2.00			0.00	0	0.10	0.00	0	15.00	0.00	4
235035	93.00	95.70	2.70	0.10	30	3.00	50.00	10.00	0.00	1.00			0.00	0	0.10	0.00	0	25.00	0.00	4
235036	95.73	96.27	0.54	0.52	30	6.00	70.00	10.00	0.00	1.00			0.12	0		0.20	200	50.00	0.22	220
235037	96.27	96.60	0.33	13.00	45	15.00	70.00	40.00	0.00	3.00			0.20	0		2.30	2300	165.00	1.62	1620
235038	96.60	96.72	0.12	2.70	25	7.00	50.00	40.00	0.00	6.00			0.45	0		0.35	350	105.00	0.56	560
235039	96.72	97.74	1.02	0.60	50	6.00	60.00	0.00	0.00	1.00			0.20	0		0.05	66	65.00	0.02	26
235040	97.74	98.50	0.76	0.62	30	10.00	70.00	0.00	0.00	1.00			0.20	0		0.05	71	50.00	0.01	8
235041	98.50	99.50	1.00	0.10	30	4.00	60.00	0.00	0.00	2.00			0.10	0		0.05	31	50.00	0.01	7
235042	99.50	100.50	1.00	0.10	35	7.00	65.00	0.00	0.00	0.00			0.10	0		0.05	73	60.00	0.01	7
235043	100.50	101.50	1.00	0.10	50	8.00	60.00	0.00	0.00	0.00			0.10	0		0.05	51	55.00	0.01	7
235044	101.50	102.50	1.00	0.10	30	5.00	60.00	0.00	0.00	1.00			0.10	0		0.05	40	55.00	0.01	7
235045	102.50	103.50	1.00	0.14	35	8.00	60.00	0.00	0.00	1.00			0.20	0		0.05	44	35.00	0.01	9
235046	103.50	104.50	1.00	0.10	40	6.00	65.00	0.00	0.00	2.00			0.10	0		0.05	40	25.00	0.01	11
235047	104.50	105.50	1.00	0.10	45	6.00	50.00	0.00	0.00	4.00			0.10	0		0.00	12	20.00	0.02	18
235048	105.50	106.50	1.00	0.11	60	10.00	60.00	0.00	0.00	6.00			0.10	0		0.00	18	25.00	0.01	11
235049	106.50	107.50	1.00	0.05	25	8.00	60.00	0.00	0.00	4.00			0.10	0		0.00	0	25.00	0.01	8
235050	107.50	108.50	1.00	0.12	40	5.00	60.00	0.00	0.00	6.00			0.15	0		0.00	9	25.00	0.03	26
235051	108.50	108.70	0.20	0.05	7	10.00	45.00	0.00	0.00	4.00			0.50	0		0.00	7	25.00	0.01	11
235052	108.70	109.70	1.00	0.11	35	6.00	50.00	0.00	0.00	4.00			0.20	0		0.05	20	20.00	0.04	40
235053	109.70	110.70	1.00	0.11	35	4.00	60.00	0.00	0.00	3.00			0.10	0		0.05	18	0.10	0.02	20

Appendix 1.--Geochemical-assay results for Ishmas Kabir drill hole 1--continued.

Chemical Analysis Of ISHMAS KABIR # 1

																	Graphite Furnace	RE- RUN		
				Ag	Cu	Pb	Zn	As	Bi	Mo	Ni	Co	Cd	Sb	Te	Au	Au	Te	Au	Au
Rass No.	FROM	To	Int./M	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppb)	(ppb)	(ppm)	(ppb)
********	****	**	*****	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**
235054	110.70	110.92	0.22	0.25	110	7.00	50.00	0.00	0.00	2.00			0.30	0		0.05	46	10.00	0.06	62
235055	110.92	111.07	0.15	0.25	150	10.00	30.00	0.00	0.00	5.00			0.30	0		0.05	46	20.00	0.13	138
235056	111.07	111.20	0.13	0.10	15	3.00	4.00	0.00	0.00	4.00			0.05	0		0.05	40	15.00	0.02	19
235057	111.20	111.34	0.14	0.62	45	5.00	40.00	15.00	0.00	5.00			0.30	0		0.34	340	5.00	0.42	420
235058	111.34	112.00	0.66	0.12	65	5.00	50.00	10.00	0.00	3.00			0.10	0		0.05	38	5.00	0.44	440
235059	112.00	112.10	0.10	0.10	40	10.00	50.00	0.00	0.00	3.00			0.15	0		0.05	11	5.00	0.03	28
235060	112.10	112.20	0.10	1.20	80	12.00	10.00	20.00	0.00	30.00			0.15	0		0.05	45	35.00	0.11	112
235061	112.20	112.70	0.50	0.10	15	5.00	35.00	0.00	0.00	5.00			0.20	0		0.05	42	0.00	0.05	53
235062	112.70	112.79	0.09	0.10	5	4.00	8.00	0.00	0.00	30.00			0.10	0		0.05	22	0.00	0.08	79
235063	112.79	112.87	0.08	0.10	2	8.00	55.00	0.00	0.00	5.00			0.15	0		0.00	5	0.00	0.01	7
235064	112.87	112.95	0.08	0.10	10	6.00	7.00	10.00	0.00	15.00			0.10	0		0.00	2	0.00	0.02	11
235065	112.95	113.02	0.07	0.10	6	5.00	40.00	0.00	0.00	12.00			0.10	0		0.00	21	45.00	0.03	26
235066	113.02	113.45	0.43	0.10	25	6.00	50.00	0.00	0.00	3.00			0.10	0		0.00	20	40.00	0.01	6
235067	113.45	113.60	0.15	0.10	10	12.00	35.00	25.00	0.00	3.00			0.15	0		0.00	45	70.00	0.06	63
235068	113.60	114.60	1.00	0.10	15	7.00	40.00	0.00	0.00	3.00			0.20	0		0.00	11	25.00	0.02	23
235069	114.60	115.03	0.43	0.10	7	7.00	50.00	0.00	0.00	3.00			0.20	0		0.00	16	0.00	0.02	14
235070	115.03	116.00	0.97	0.10	10	10.00	70.00	0.00	0.00	2.00			0.40	0		0.00	71	25.00	0.13	130
235071	116.00	116.22	0.22	0.10	10	7.00	50.00	0.00	0.00	2.00			0.30	0		0.00	75	25.00	0.17	170
235072	116.22	116.36	0.14	0.10	5	4.00	40.00	15.00	0.00	4.00			0.25	0		0.00	55	25.00	0.19	190
235073	116.36	116.46	0.10	0.10	30	15.00	10.00	10.00	0.00	20.00			0.10	0		0.00	44	30.00	0.12	115
235074	116.46	116.60	0.14	0.90	310	8.00	50.00	5.00	0.00	5.00			0.70	0		0.00	30	35.00	0.06	62
235075	116.60	117.50	0.90	0.20	55	4.00	40.00	5.00	0.00	4.00			0.25	0		0.00	33	35.00	0.12	118
235076	117.50	117.67	0.17	0.40	95	4.00	30.00	20.00	0.00	7.00			0.25	0		0.00	9	45.00	0.03	31
235077	117.67	118.02	0.35	0.05	15	8.00	20.00	5.00	0.00	15.00			0.05	0		0.05	53	45.00	0.20	200
235078	118.02	118.30	0.28	0.05	5	7.00	3.00	0.00	0.00	7.00			0.10	0		0.05	29	30.00	0.09	90
235079	118.30	119.00	0.70	0.30	90	6.00	30.00	5.00	0.00	2.00			0.15	0		0.05	34	45.00	0.04	40
235080	119.00	120.00	1.00	0.20	90	6.00	50.00	0.00	0.00	2.00			0.15	0		0.00	13	30.00	0.01	12
235081	120.00	120.28	0.28	0.05	5	5.00	40.00	0.00	0.00	2.00			0.20	0		0.00	8	25.00	0.01	6
235082	120.28	120.50	0.22	0.05	5	4.00	4.00	0.00	0.00	3.00			0.10	0		0.00	6	20.00	0.01	7
235083	120.50	121.00	0.50	0.10	50	5.00	35.00	0.00	0.00	3.00			0.25	0		0.05	29	35.00	0.05	54
235084	121.00	122.00	1.00	0.15	70	5.00	40.00	0.00	0.00	3.00			0.20	0		0.20	200	45.00	0.10	105
235085	122.00	123.00	1.00	0.16	130	5.00	50.00	0.00	0.00	3.00			0.20	0		0.00	16	30.00	0.02	16
235086	123.00	124.00	1.00	0.23	30	4.00	55.00	0.00	0.00	0.00			0.13	0		0.00	13	30.00	0.02	19
235087	124.00	125.00	1.00	0.14	30	4.00	50.00	0.00	0.00	3.00			0.05	0		0.00	2	25.00	0.01	7
235088	125.00	126.00	1.00	0.05	70	4.00	50.00	0.00	0.00	2.00			0.10	0		0.00	4	30.00	0.01	12
235089	126.00	127.00	1.00	0.05	80	4.00	50.00	0.00	0.00	2.00			0.10	0		0.00	4	5.00	0.01	10
235090	127.00	128.00	1.00	0.15	60	6.00	50.00	0.00	0.00	0.00			0.10	0		0.00	7	0.00	0.01	6
235091	128.00	129.00	1.00	0.16	100	5.00	50.00	0.00	0.00	0.00			0.10	0		0.00	6	5.00	0.03	26
235092	129.00	130.00	1.00	0.12	40	4.00	40.00	0.00	0.00	0.00			0.20	0		0.05	29	0.00	0.06	58
235093	130.00	131.00	1.00	0.18	40	4.00	50.00	0.00	0.00	0.00			0.10	0		0.05	33	0.00	0.05	48
235094	131.00	132.00	1.00	0.05	45	4.00	70.00	0.00	0.00	0.00			0.10	0		0.05	70	0.00	0.04	36
235095	132.00	133.00	1.00	0.10	40	5.00	200.00	0.00	0.00	0.00			0.14	0		0.05	41	0.00	0.13	130
235096	133.00	134.00	1.00	0.05	50	3.00	60.00	0.00	0.00	0.00			0.05	0		0.00	25	0.00	0.13	130
235097	134.00	135.00	1.00	0.10	50	6.00	60.00	0.00	0.00	0.00			0.05	0		0.00	11	0.00	0.02	17
235098	135.00	136.00	1.00	0.10	60	6.00	60.00	0.00	0.00	1.00			0.10	0		0.00	17	5.00	0.02	18
235099	136.00	137.00	1.00	0.05	30	5.00	60.00	0.00	0.00	1.00			0.10	0		0.00	3	0.00	0.01	10
235100	137.00	138.00	1.00	0.05	30	4.00	55.00	0.00	0.00	1.00			0.05	0		0.00	13	20.00	0.01	8
235101	138.00	138.50	0.50	0.10	20	7.00	55.00	0.00	0.00	2.00			0.10	0		0.00	0	15.00	0.03	23
235102	138.50	139.10	0.60	0.05	20	4.00	50.00	0.00	0.00	1.00			0.05	0		0.00	9	15.00	0.01	11
235103	139.10	139.92	0.82	0.05	30	4.00	60.00	0.00	0.00	0.00			0.15	0		0.50	500	35.00	0.55	550

Appendix 1.--Geochemical-assay results for Ishmas Kabir drill hole 1--continued.

Chemical Analysis Of ISHMAS KABIR # 1

																	Graphite Furnace RE- RUN			
				Ag	Cu	Pb	Zn	As	Bi	Mo	Ni	Co	Cd	Sb	Te	Au	Au	Te	Au	Au
Rass No.	FROM	To	Int./M	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppb)	(ppb)	(ppm)	(ppb)
********	****	**	*****	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**
235104	139.92	140.95	1.03	0.10	8	5.00	50.00	0.00	0.00	0.00			0.25	0		0.10	96	10.00	0.05	51
235105	140.95	141.37	0.42	0.05	5	4.00	45.00	20.00	0.00	0.00			0.30	0		0.48	480	10.00	0.60	600
235106	141.37	141.63	0.26	0.16	6	6.00	10.00	30.00	0.00	3.00			0.15	0		0.62	620	50.00	1.50	1500
235107	141.63	142.42	0.79	0.05	4	6.00	5.00	0.00	0.00	6.00			0.05	0		0.00	19	0.00	0.06	61
235108	142.42	142.58	0.16	0.11	4	4.00	10.00	20.00	0.00	3.00			0.20	0		0.20	200	5.00	0.36	360
235109	142.58	142.75	0.17	0.14	2	10.00	25.00	12.00	0.00	2.00			0.23	0		0.38	380	20.00	0.06	55
235110	142.75	143.10	0.35	0.05	5	3.00	8.00	10.00	0.00	7.00			0.05	0		0.00	34	20.00	0.22	220
235111	143.10	143.83	0.73	0.12	20	7.00	55.00	5.00	0.00	0.00			0.25	0		0.00	22	5.00	0.18	180
235112	143.83	144.27	0.44	0.11	30	5.00	70.00	0.00	0.00	0.00			0.05	0		0.00	4	10.00	0.02	16
235113	144.27	145.00	0.73	0.00	40	4.00	60.00	10.00	0.00	3.00			0.00	0	0.00	0.00	5	0.00	0.00	4
235114	145.00	146.00	1.00	0.00	40	3.00	70.00	10.00	0.00	9.00			0.00	0	0.00	0.00	5	0.00	0.00	4
235115	146.00	147.00	1.00	0.00	45	4.00	70.00	10.00	0.00	10.00			0.00	0	0.10	0.00	0	40.00	0.00	4
235116	147.00	150.00	3.00	0.00	55	4.00	60.00	10.00	0.00	8.00			0.00	0	0.10	0.00	7	25.00	0.00	4
235117	150.00	153.00	3.00	0.00	60	5.00	60.00	10.00	0.00	4.00			0.00	0	0.00	0.00	5	0.00	0.00	13
235118	153.00	156.00	3.00	0.00	50	4.00	55.00	10.00	0.00	10.00			0.00	0	0.00	0.00	0	0.00	0.02	11
235119	156.00	156.56	0.56	0.00	105	5.00	120.00	10.00	0.00	9.00			0.00	0	0.00	0.00	5	0.00	0.01	14
235120	156.56	157.43	0.87	0.00	35	3.00	80.00	10.00	0.00	4.00			0.10	0	0.00	0.00	0	0.00	0.02	4
235121	157.43	158.29	0.86	0.00	40	5.00	80.00	10.00	0.00	4.00			0.10	0	0.00	0.00	0	0.00	0.00	4
235122	158.29	159.00	0.71	0.00	50	5.00	70.00	10.00	0.00	8.00			0.00	0	0.00	0.00	5	0.00	0.00	4
235123	159.00	162.00	3.00	0.00	40	5.00	55.00	10.00	0.00	3.00			0.00	0	0.00	0.00	0	0.00	0.00	4
235124	162.00	165.00	3.00	0.00	70	4.00	60.00	10.00	0.00	4.00			0.00	0	0.00	0.00	0	0.00	0.00	4
235125	165.00	168.00	3.00	0.00	70	5.00	75.00	10.00	0.00	7.00			0.00	0	0.10	0.00	6	25.00	0.00	5
235126	168.00	171.00	3.00	0.00	55	3.00	65.00	10.00	0.00	12.00			0.00	0	0.00	0.00	5	0.00	0.02	16
235127	171.00	174.00	3.00	0.00	55	4.00	55.00	10.00	0.00	4.00			0.00	0	0.00	0.00	0	0.00	0.00	4
235128	174.00	177.00	3.00	0.00	45	4.00	50.00	10.00	0.00	6.00			0.00	0	0.00	0.00	0	0.00	0.00	5
235129	177.00	177.46	0.46	0.10	100	3.00	50.00	12.00	0.00	10.00			0.00	0	0.00	0.00	5	0.00	0.00	5
235130	177.46	178.50	1.04	0.00	55	8.00	75.00	10.00	0.00	3.00			0.00	0	0.00	0.00	0	0.00	0.02	14
235131	178.50	180.00	1.50	0.00	60	55.00	60.00	10.00	0.00	7.00			0.00	0	0.00	0.00	5	0.00	0.01	6
235132	180.00	183.00	3.00	0.00	35	3.00	55.00	10.00	0.00	4.00			0.00	0	0.00	0.00	0	0.00	0.01	7
235133	183.00	186.00	3.00	0.00	50	2.00	50.00	10.00	0.00	4.00			0.00	0	0.00	0.00	0	0.00	0.02	15
235134	186.00	189.00	3.00	0.00	45	5.00	60.00	10.00	0.00	6.00			0.00	0	0.00	0.00	0	0.00	0.01	5
235135	189.00	192.00	3.00	0.00	75	2.00	55.00	10.00	0.00	3.00			0.10	0	0.00	0.00	0	0.00	0.01	6
235136	192.00	195.00	3.00	0.00	50	3.00	50.00	10.00	0.00	7.00			0.00	0	0.00	0.00	0	0.00	0.02	14
235137	195.00	198.00	3.00	0.00	60	5.00	65.00	10.00	0.00	12.00			0.00	0	0.00	0.00	0	0.00	0.02	17
235138	198.00	201.00	3.00	0.00	35	4.00	65.00	10.00	0.00	7.00			0.00	0	0.00	0.00	0	0.00	0.00	4
235139	201.00	202.15	1.15	0.00	10	3.00	75.00	10.00	0.00	4.00			0.00	0	0.00	0.00	0	0.00	0.03	25

TOTAL 200.62
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Min	0.00	2	1.00	3.00	0.00	0.00	0.00	50.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00
Max	13.00	310	55.00	200.00	40.00	0.00	30.00	70.00	30.00	0.70	0.00	0.10	2.30	2300.00	165.00	1.62	1620.00
Avr	0.22	44.09	5.82	51.18	6.57	0.00	4.26	56.67	26.67	0.11	0.00	0.02	0.05	56.54	16.99	0.07	73.99
Std	1.13	37.96	5.18	22.15	7.33	0.00	4.63	8.16	4.71	0.12	0.00	0.04	0.22	215.39	22.81	0.21	210.50

Appendix 1.--Geochemical-assay results for Ishmas Kabir drill hole 2.

Chemical Analysis Of ISHMAS KABIR # 2

Rass No.	FROM	To	Int./M	Ag (ppm)	Cu (ppm)	Pb (ppm)	Zn (ppm)	As (ppm)	Bi (ppm)	Mo (ppm)	Cd (ppm)	Sb (ppm)	Te (ppm)	Au (ppm)	Graphite Furnace Au (ppb)	Graphite Furnace Te (ppb)	Au (ppm)	RE-RUN Au (ppm)	RE-RUN Au (ppb)
********	****	**	*****	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**
235346	0.00	6.15	6.15	6.30	35	2	40	10	0	9	0.10	0			10.00	0.00	0.01		12
235347	6.15	9.00	2.85	0.20	40	2	50	10	0	2	0.00	0			7.00	0.00	0.01		10
235348	9.00	12.00	3.00	0.20	55	2	50	10	0	5	0.00	0			5.00	0.00	0.01		9
235349	12.00	13.30	1.30	0.10	25	4	50	10	0	3	0.10	0			2.00	0.00	0.01		10
235350	13.30	14.64	1.34	0.10	30	7	40	10	0	1	0.10	0			2.00	0.00	0.01		10
235351	14.64	15.83	1.19	0.10	30	6	35	0	0	3	0.10	0			2.00	0.00	0.01		12
235352	15.83	16.43	0.60	0.10	25	6	75	0	0	1	0.10	0			2.00	0.00	0.01		10
235353	16.43	17.00	0.57	0.10	55	4	65	0	0	1	0.10	0			2.00	0.00	0.01		11
235354	17.00	20.00	3.00	0.10	45	3	85	0	0	1	0.10	0			2.00	0.00	0.01		10
235355	20.00	23.00	3.00	0.10	50	3	50	0	0	3	0.10	0			2.00	0.00	0.00		4
235356	23.00	27.00	4.00	0.10	55	2	40	0	0	3	0.00	0			2.00	0.00	0.00		4
235357	27.00	30.00	3.00	0.10	40	3	40	0	0	3	0.10	0			2.00	0.00	0.00		0
235358	30.00	33.00	3.00	0.10	40	1	45	0	0	4	0.00	0			2.00	20.00	0.00		4
235359	33.00	36.00	3.00	0.10	45	2	50	0	0	3	0.10	0			2.00	15.00	0.00		4
235360	36.00	39.00	3.00	0.10	40	2	40	0	0	2	0.00	0			2.00	15.00	0.00		4
235361	39.00	42.00	3.00	0.10	35	3	55	0	0	1	0.10	0			2.00	20.00	0.00		4
235362	42.00	45.00	3.00	0.10	45	2	45	0	0	2	0.00	0			4.00	25.00	0.00		4
235363	45.00	48.00	3.00	0.10	45	2	50	0	0	2	0.10	0			6.00	20.00	0.00		4
235364	48.00	51.00	3.00	0.10	40	1	35	0	0	2	0.00	0			2.00	15.00	0.00		4
235365	51.00	54.00	3.00	0.10	45	2	80	0	0	2	0.10	0			2.00	15.00	0.00		4
235366	54.00	55.00	1.00	0.10	50	0	35	10	0	8	0.00	0			2.00	0.00	0.00		4
235367	55.00	56.00	1.00	0.10	45	0	40	10	0	4	0.10	0			2.00	0.00	0.00		4
235368	56.00	57.00	1.00	0.10	40	0	35	10	0	3	0.00	0			2.00	0.00	0.00		4
235369	57.00	58.00	1.00	0.10	50	0	45	10	0	5	0.10	0			2.00	0.00	0.00		4
235370	58.00	61.00	3.00	0.10	40	0	45	0	0	7	0.10	0			2.00	0.00	0.00		4
235371	61.00	64.00	3.00	0.10	55	1	45	0	0	5	0.00	0			0.00	25.00	0.00		4
235372	64.00	67.00	3.00	0.10	50	0	50	0	0	10	0.10	0			0.00	25.00	0.00		4
235373	67.00	69.10	2.10	0.10	65	1	60	10	0	9	0.10	0			2.00	15.00	0.00		6
235374	69.10	69.54	0.44	0.10	10	0	45	0	0	10	0.00	0			2.00	10.00	0.00		4
235375	69.54	70.00	0.46	0.10	40	2	55	0	0	5	0.10	0			7.00	10.00	0.01		7
235376	70.00	71.00	1.00	0.10	50	2	50	0	0	2	0.10	0			2.00	10.00	0.00		4
235377	71.00	74.00	3.00	0.10	45	2	50	0	0	2	0.10	0			2.00	0.00	0.00		4
235378	74.00	77.00	3.00	0.10	50	2	50	0	0	7	0.10	0			2.00	0.00	0.00		4
235379	77.00	80.00	3.00	0.10	55	3	55	0	0	1	0.10	0			0.00	0.00	0.01		6
235380	80.00	83.00	3.00	0.10	45	1	40	0	0	5	0.00	0			2.00	0.00	0.00		4
235381	83.00	84.00	1.00	0.10	45	1	45	10	0	2	0.10	0			2.00	0.00	0.00		4
235382	84.00	85.00	1.00	0.10	50	3	45	10	0	3	0.10	0			2.00	0.00	0.00		4
235383	85.00	86.00	1.00	0.10	50	1	45	10	0	4	0.10	0			2.00	0.00	0.00		4
235384	86.00	89.00	3.00	0.10	50	1	40	0	0	4	0.00	0			2.00	3.00	0.00		4
235385	89.00	92.00	3.00	0.10	40	0	40	0	0	2	0.10	0			2.00	3.00	0.00		4
235386	92.00	95.00	3.00	0.10	40	4	60	0	0	6	0.10	0			2.00	0.00	0.00		4
235387	95.00	96.00	1.00	0.10	40	3	40	0	0	7	0.00	0			2.00	10.00	0.00		4
235388	96.00	97.00	1.00	0.10	60	3	50	0	0	4	0.10	0			2.00	10.00	0.00		4
235389	97.00	98.00	1.00	0.10	110	2	35	0	0	2	0.10	0			4.00	3.00	0.00		4
235390	98.00	101.00	3.00	0.10	55	3	40	0	0	5	0.10	0			2.00	10.00	0.00		4
235391	101.00	104.00	3.00	0.10	50	1	45	0	0	2	0.10	0			2.00	0.00	0.00		4
235392	104.00	107.00	3.00	0.20	45	6	60	0	0	6	0.10	0			0.00	0.00	0.00		4
235401	107.00	109.30	2.30	0.01	35	2	50	0	0	5		0	0.00	0.00	10.00	0.00	0.01		9
235402	109.30	109.82	0.52	0.01	20	1	55	0	0	5		0	0.00	0.00	9.00	0.00	0.01		5
235403	109.82	111.00	1.18	0.01	45	2	45	0	0	5		0	0.00	0.00	9.00	0.00	0.03		29
235404	111.00	114.00	3.00	0.35	40	1	50	0	0	5		0	0.00	0.00	24.00	0.00	0.02		16
235405	114.00	117.00	3.00	0.10	35	2	50	0	0	8		0	0.00	0.00	13.00	0.00	0.01		5

Appendix 1.--Geochemical-assay results for Ishmas Kabir drill hole 2--continued.

Chemical Analysis Of ISHMAS KABIR # 2

															Graphite Furnace			R E - R U N	
Rass No.	FROM	To	Int./M	Ag (ppm)	Cu (ppm)	Pb (ppm)	Zn (ppm)	As (ppm)	Bi (ppm)	Mo (ppm)	Cd (ppm)	Sb (ppm)	Te (ppm)	Au (ppm)	Au (ppb)	Te (ppb)	Au (ppm)	Au (ppm)	Au (ppb)
235406	117.00	120.00	3.00	0.10	50	2	50	0	0	8		0	0.00	0.00	13.00	0.00	0.01		6
235407	120.00	123.00	3.00	0.10	35	1	50	0	0	7		0	0.00	0.00	13.00	0.00	0.01		6
235408	123.00	124.58	1.58	0.10	35	1	60	0	0	3		0	0.00	0.00	15.00	0.00	0.01		6
235409	124.58	125.60	1.02	0.10	45	1	60	0	0	3		0	0.00	0.00	16.00	0.00	0.01		9
235410	125.60	126.48	0.88	0.10	40	1	60	0	0	2		0	0.00	0.00	15.00	0.00	0.01		9
235411	126.48	126.85	0.37	0.10	45	2	50	0	0	4		0	0.00	0.00	28.00	0.00	0.05		42
235412	126.85	128.00	1.15	0.10	25	1	55	0	0	4		0	0.00	0.00	18.00	0.00	0.01		11
235413	128.00	129.00	1.00	0.10	30	2	60	0	0	2		0	0.00	0.00	17.00	0.00	0.01		6
235414	129.00	130.00	1.00	0.10	35	3	60	0	0	1		0	0.00	0.00	14.00	0.00	0.01		10
235415	130.00	131.00	1.00	0.10	8	4	75	0	0	1		0	0.00	0.00	5.00	0.00	0.23	0.20	230
235416	131.00	132.00	1.00	0.10	30	4	65	0	0	1		0	0.00	0.00	4.00	0.00	0.01	0.02	9
235417	132.00	132.23	0.23	0.10	15	2	85	10	0	2		0	0.00	0.15	135.00	0.00	0.01	0.02	7
235418	132.23	132.75	0.52	0.60	8	8	60	20	0	2		0	0.00	0.00	36.00	0.00	0.07	0.07	66
235419	132.75	133.75	1.00	0.70	6	7	40	40	0	9		0	0.00	0.15	135.00	0.00	0.18	0.18	180
235420	133.75	134.80	1.05	0.10	30	2	30	0	0	5		0	0.00	0.00	17.00	3.00	0.05	0.05	42
235421	134.80	135.80	1.00	0.00	7	1	60	0	0	2		0	0.00	0.00	8.00	3.00	0.01		8
235422	135.80	137.00	1.20	0.00	40	2	55	0	0	2		0	0.00	0.00	14.00	0.00	0.02		19
235423	137.00	138.00	1.00	0.00	20	0	50	0	0	3		0	0.00	0.00	9.00	0.00	0.01		9
235424	138.00	141.00	3.00	0.00	50	1	50	0	0	5		0	0.00	0.00	7.00	0.00	0.01		6
235425	141.00	144.00	3.00	0.00	40	1	50	0	0	2		0	0.00	0.00	7.00	0.00	0.01		6
235426	144.00	146.02	2.02	0.00	60	2	40	0	0	4		0	0.00	0.00	8.00	10.00	0.01		5
235427	146.02	146.40	0.38	0.20	300	2	20	0	0	12		0	0.00	0.00	16.00	15.00	0.02		14
235428	146.40	147.00	0.60	0.10	60	1	40	0	0	4		0	0.00	0.00	10.00	0.00	0.01		10
235429	147.00	150.00	3.00	0.10	35	0	40	0	0	6		0	0.00	0.00	9.00	0.00	0.01		6
235430	150.00	153.00	3.00	0.00	70	0	40	0	0	4		0	0.00	0.00	4.00	0.00	0.01		6
235431	153.00	156.00	3.00	0.00	30	1	45	0	0	3		0	0.00	0.00	4.00	3.00	0.01		7
235432	156.00	159.00	3.00	0.00	30	2	40	0	0	2		0	0.00	0.00	4.00	0.00	0.01		9
235433	159.00	162.00	3.00	0.00	35	2	45	0	0	4		0	0.00	0.00	4.00	0.00	0.01		9
235434	162.00	164.05	2.05	0.00	25	3	40	0	0	4		0	0.00	0.00	4.00	0.00	0.01		9
235435	164.05	165.00	0.95	0.00	15	4	75	0	0	2		0	0.00	0.00	4.00	0.00	0.01		10
235436	165.00	166.00	1.00	0.00	30	5	70	0	0	1		0	0.00	0.00	7.00	0.00	0.01		9
235437	166.00	167.00	1.00	0.00	40	7	60	0	0	3		0	0.00	0.00	8.00	0.00	0.01		11
235438	167.00	167.82	0.82	0.00	30	4	65	0	0	1		0	0.00	0.00	5.00	0.00	0.01		11
235439	167.82	169.00	1.18	0.00	30	4	25	0	0	6		0	0.00	0.00	8.00	0.00	0.01		12
235440	169.00	171.00	2.00	0.00	20	2	45	0	0	2		0	0.00	0.00	6.00	0.00	0.01		10
235441	171.00	174.00	3.00	0.10	20	10	40	0	0	4		0	0.00	0.00	6.00	0.00	0.01		8
235442	174.00	177.00	3.00	0.10	50	10	45	0	0	2		0	0.00	0.00	11.00	0.00	0.01		11
235443	177.00	180.00	3.00	0.10	30	10	45	0	0	2		0	0.00	0.00	11.00	0.00	0.01		10
235444	180.00	183.00	3.00	0.10	20	10	45	0	0	6		0	0.00	0.00	6.00	0.00	0.01		9
235445	183.00	184.00	1.00	0.00	30	10	50	0	0	5		0	0.00	0.00	7.00	0.00	0.01		13
235446	184.00	185.00	1.00	0.00	30	11	55	0	0	3		0	0.00	0.00	9.00	0.00	0.01		12
235447	185.00	186.00	1.00	0:00	50	11	55	0	0	1		0	0.00	0.00	12.00	0.00	0.01		8
235448	186.00	187.00	1.00	0.00	25	10	60	0	0	1		0	0.00	0.00	9.00	0.00	0.01		9
235449	187.00	188.00	1.00	0.00	30	8	50	0	0	6		0	0.00	0.00	9.00	65.00	0.02		17
235450	188.00	189.00	1.00	0.00	20	7	65	0	0	1		0	0.00	0.00	4.00	0.00	0.01		6
235451	189.00	190.00	1.00	0.00	10	10	60	0	0	2		0	0.00	0.00	4.00	0.00	0.01		6
235452	190.00	191.00	1.00	0.00	25	10	60	0	0	3		0	0.00	0.00	8.00	0.00	0.01		8
235453	191.00	192.00	1.00	0.10	90	9	60	0	0	2		0	0.00	0.00	6.00	0.00	0.02		15
235454	192.00	193.00	1.00	0.10	100	9	55	0	0	3		0	0.00	0.00	8.00	0.00	0.01		10
235455	193.00	195.00	2.00	0.43	300	9	55	0	0	3		0	0.00	0.00	4.00	0.00	0.01		10
235456	195.00	198.00	3.00	0.00	12	10	50	0	0	2		0	0.00	0.00	4.00	0.00	0.01		7
235457	198.00	201.00	3.00	0.00	25	10	55	0	0	2		0	0.00	0.00	4.00	0.00	0.01		6

Appendix 1.--Geochemical-assay results for Ishmas Kabir drill hole 2--continued.

Chemical Analysis Of ISHMAS KABIR # 2

Rass No.	FROM	To	Int./M	Ag (ppm)	Cu (ppm)	Pb (ppm)	Zn (ppm)	As (ppm)	Bi (ppm)	Mo (ppm)	Cd (ppm)	Sb (ppm)	Te (ppm)	Au (ppm)	Graphite Furnace Au (ppb)	Graphite Furnace Te (ppb)	RE - RUN Au (ppm)	RE - RUN Au (ppm)	RE - RUN Au (ppb)
********	****	**	*****	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**
235458	201.00	204.00	3.00	0.10	40	10	55	0	0	2		0	0.00	0.00	4.00	0.00	0.01		6
235459	204.00	207.00	3.00	0.00	30	10	60	0	0	3		0	0.00	0.00	4.00	0.00	0.00		5
235460	207.00	210.00	3.00	0.00	25	10	50	0	0	6		0	0.00	0.00	4.00	0.00	0.00		4
235461	210.00	213.00	3.00	0.10	60	10	45	0	0	6		0	0.00	0.00	4.00	0.00	0.00		5
235462	213.00	216.00	3.00	0.10	140	10	45	0	0	4		0	0.00	0.00	4.00	0.00	0.00		5
235463	216.00	219.00	3.00	0.12	150	15	40	0	0	3		0	0.00	0.00	4.00	0.00	0.01		7
235464	219.00	222.00	3.00	0.00	80	9	40	0	0	3		0	0.00	0.00	4.00	0.00	0.01		6
235465	222.00	224.00	2.00	0.00	140	10	45	0	0	5		0	0.00	0.00	6.00	0.00	0.01		9
235466	224.00	225.00	1.00	0.00	15	10	40	0	0	4		0	0.00	0.00	8.00	0.00	0.01		5
235467	225.00	226.00	1.00	0.11	30	10	35	0	0	3		0	0.00	0.00	15.00	0.00	0.04		34
235468	226.00	227.00	1.00	0.00	20	10	50	15	0	4		0	0.00	0.00	7.00	10.00	0.13		131
235469	227.00	230.00	3.00	0.00	10	9	50	0	0	3		0	0.00	0.00	4.00	0.00	0.01		7
235470	230.00	233.00	3.00	0.00	15	7	35	0	0	2		0	0.00	0.00	4.00	0.00	0.01		6
235471	233.00	236.00	3.00	0.00	50	8	40	0	0	6		0	0.00	0.00	4.00	0.00	0.01		6
235475	236.00	239.00	3.00	0.00	20	9	45	0	0	3		0	0.00	0.00	4.00	0.00	0.00		4
235476	239.00	242.00	3.00	0.00	15	9	45	0	0	2		0	0.00	0.00	4.00	0.00	0.00		4
235477	242.00	244.14	2.14	0.00	25	10	55	0	0	3		0	0.00	0.00	4.00	0.00	0.00		4
235478	244.14	245.58	1.44	0.00	30	9	60	0	0	4		0	0.00	0.00	4.00	0.00	0.00		4
235479	245.58	249.00	3.42	0.00	40	9	50	0	0	2		0	0.00	0.00	14.00	0.00	0.02		13
235480	249.00	252.00	3.00	0.00	250	9	45	0	0	6		0	0.00	0.00	14.00	0.00	0.01		10
235481	252.00	255.00	3.00	0.00	50	9	40	0	0	6		0	0.00	0.00	4.00	0.00	0.01		5
235482	255.00	258.00	3.00	0.00	25	8	30	0	0	2		0	0.00	0.00	6.00	0.00	0.01		6
235483	258.00	261.00	3.00	0.00	50	8	30	0	0	2		0	0.00	0.00	2.00	10.00	0.00		4
235484	261.00	264.00	3.00	0.00	25	7	30	0	0	7		0	0.00	0.00	2.00	3.00	0.00		4
235485	264.00	267.00	3.00	0.00	30	9	30	0	0	4		0	0.00	0.00	2.00	15.00	0.00		5
235486	267.00	270.00	3.00	0.00	35	8	25	0	0	2		0	0.00	0.00	2.00	10.00	0.00		4
235487	270.00	273.00	3.00	0.00	50	9	25	0	0	5		0	0.00	0.00	5.00	3.00	0.01		7
235488	273.00	276.00	3.00	0.00	35	8	35	0	0	5		0	0.00	0.00	4.00	10.00	0.00		4
235489	276.00	279.00	3.00	0.00	35	8	40	0	0	6		0	0.00	0.00	4.00	0.00	0.00		5
235490	279.00	282.00	3.00	0.00	40	10	45	0	0	7		0	0.00	0.00	6.00	3.00	0.01		7
235491	282.00	285.00	3.00												5.00	0.00	0.01		10
235492	285.00	287.75	2.75	0.00	40	9	45	0	0	3		0	0.00	0.00	5.00	0.00	0.01		5
235493	287.75	288.92	1.17	0.00	30	8	45	0	0	4		0	0.00	0.00	5.00	10.00	0.01		7
235494	288.92	289.15	0.23	0.00	65	9	50	0	0	5		0	0.00	0.00	6.00	3.00	0.01		10
235495	289.15	289.45	0.30	0.00	50	8	45	0	0	1		0	0.00	0.00	5.00	10.00	0.01		8
235496	289.45	291.00	1.55	0.00	40	10	45	0	0	5		0	0.00	0.00	4.00	0.00	0.01		6
235497	291.00	294.00	3.00	0.00	35	9	40	0	0	4		0	0.00	0.00	4.00	0.00	0.00		4
235498	294.00	297.00	3.00	0.00	30	8	40	0	0	6		0	0.00	0.00	4.00	0.00	0.00		4
235499	297.00	300.10	3.10	0.00	25	10	40	0	0	2		0	0.00	0.00	4.00	0.00	0.00		14

TOTAL 300.10
*****

	Ag	Cu	Pb	Zn	As	Bi	Mo	Cd	Sb	Te	Au	Au (ppb)	Te (ppb)	Au (ppm)	Au (ppm)	Au (ppb)
Min	0.00	6.00	0.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00
Max	6.30	300.00	15.00	85.00	40.00	0.00	12.00	0.10	0.00	0.00	0.15	135.00	65.00	0.23	0.20	230.00
Avr	0.11	45.54	4.97	48.20	1.50	0.00	3.74	0.07	0.00	0.00	0.00	7.89	3.25	0.01	0.09	11.87
Std	0.53	41.63	3.79	11.31	4.81	0.00	2.20	0.05	0.00	0.00	0.02	16.06	7.82	0.03	0.07	0.03

Appendix 1.—Geochemical-assay results for Ishmas Kabir drill hole 3.

Chemical Analysis Of ISHMAS KABIR # 3

															Graphite Furnace		RE- RUN	
Rass No.	FROM	To	Int./M	Ag (ppm)	Cu (ppm)	Pb (ppm)	Zn (ppm)	As (ppm)	Bi (ppm)	Mo (ppm)	Cd (ppm)	Sb (ppm)	Au (ppm)	Te (ppm)	Au (ppb)	Te (ppb)	Au (ppm)	Au (ppb)
********	****	**	*******	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**
235393	3.00	6.00	3.00	0.22	15	5	40	10	0	2	0.10	0	0	0	30	0	0.01	7
235394	6.00	9.00	3.00	0.10	40	4	55	10	0	2	0.10	0	0	0	49	0	0.01	7
235395	9.00	12.00	3.00	0.32	22	5	50	10	0	4	0.10	0	0	0	18	0	0.00	6
235396	12.00	15.00	3.00	0.17	30	7	60	10	0	4	0.10	0	0	0	12	0	0.00	4
235397	15.00	18.00	3.00	0.34	40	8	45	10	0	2	0.10	0	0	0	9	0	0.00	5
235398	18.00	21.00	3.00	0.36	40	7	45	10	0	2	0.10	0	0	0	9	0	0.00	5
235399	21.00	24.00	3.00	0.20	65	7	50	15	0	3	0.10	0	0	0	15	0	0.01	10
235400	24.00	27.00	3.00	0.10	35	4	50	15	0	4	0.10	0	0	0	14	0	0.01	7
235472	27.00	30.00	3.00	0.10	10	3	40	20	0	4	0.00	0	0	0	13	0	0.00	6
235473	30.00	33.00	3.00	0.10	15	3	40	20	0	3	0.00	0	0	0	12	0	0.00	5
235474	33.00	36.00	3.00	0.10	15	2	25	15	0	1	0.00	0	0	0	7	0	0.00	4
235500	36.00	39.00	3.00	0.10	20	22	36	0	0	1	0.00	0	0	0	4	0	0.01	7
235501	39.00	42.00	3.00	0.10	30	20	36	0	0	2	0.00	0	0	0	0	0	0.01	5
235502	42.00	45.00	3.00	0.10	30	23	40	0	0	4	0.00	0	0	0	0	0	0.01	6
235503	45.00	48.00	3.00	0.12	80	21	50	0	0	2	0.00	0	0	0	0	0	0.01	7
235504	48.00	51.00	3.00	0.12	50	22	50	0	0	1	0.00	0	0	0	0	0	0.01	5
235505	51.00	54.00	3.00	0.10	45	18	50	0	0	7	0.00	0	0	0	0	0	0.01	6
235506	54.00	57.00	3.00	0.10	100	20	55	0	0	6	0.00	0	0	0	0	0	0.01	7
235507	57.00	60.00	3.00	0.10	130	20	45	0	0	1	0.00	0	0	0	0	0	0.01	7
235508	60.00	63.00	3.00	0.10	110	20	30	0	0	3	0.00	0	0	0	0	0	0.01	8
235509	63.00	66.00	3.00	0.10	50	20	40	0	0	2	0.00	0	0	0	0	0	0.01	6
235510	66.00	69.00	3.00	0.10	50	23	20	0	0	1	0.00	0	0	0	0	0	0.01	6
235511	69.00	72.00	3.00	0.10	50	20	35	0	0	2	0.00	0	0	0	0	0	0.01	6
235512	72.00	75.00	3.00	0.10	45	20	45	0	0	1	0.00	0	0	0	0	0	0.00	4
235513	75.00	78.00	3.00	0.10	25	24	45	0	0	1	0.00	0	0	0	0	0	0.01	8
235514	78.00	80.00	2.00	0.10	40	20	50	0	0	1	0.00	0	0	0	0	20	0.00	4
235515	80.00	80.50	0.50	0.10	100	20	55	0	0	5	0.00	0	0	0	0	15	0.01	6
235516	80.50	81:00	0.50	0.10	20	18	55	0	0	4	0.00	0	0	0	0	0	0.00	4
235517	81.00	84.00	3.00	0.10	60	20	70	0	0	1	0.00	0	0	0	0	10	0.00	5
235518	84.00	85.50	1.50	0.10	100	20	60	0	0	1	0.00	0	0	0	4	10	0.01	9
235519	85.50	87.00	1.50	0.10	40	23	50	0	0	0	0.00	0	0	0	0	0	0.01	5
235520	87.00	90.00	3.00	0.10	20	22	60	0	0	1	0.00	0	0	0	0	0	0.01	6
235521	90.00	90.70	0.70	0.10	25	22	90	0	0	0	0.00	0	0	0	0	0	0.01	7
235522	90.70	91.10	0.40	0.13	250	22	50	0	0	4	0.00	0	0	0	0	0	0.01	7
235523	91.10	93.00	1.90	0.15	350	20	50	0	0	2	0.00	0	0	0	0	0	0.01	7
235524	93.00	95.00	2.00	0.10	45	21	50	0	0	6	0.00	0	0	0	0	0	0.01	6
235525	95.00	95.90	0.90	0.10	30	26	70	0	0	0	0.00	0	0	0	5	0	0.05	40
235526	95.90	96.80	0.90	0.10	30	24	65	0	0	3	0.00	0	0	0	4	0	0.01	9
235527	96.80	97.80	1.00	0.10	60	30	50	0	0	0	0.00	0	0	0	0	0	0.01	7
235528	97.80	99.00	1.20	0.10	50	21	50	0	0	1	0.00	0	0	0	0	0	0.01	7
235529	99.00	102.00	3.00	0.50	40	20	45	0	0	2	0.00	0	0	0	0	0	0.00	5
235530	102.00	105.00	3.00	0.10	30	20	45	0	0	1	0.00	0	0	0	0	0	0.00	4
235531	105.00	108.00	3.00	0.10	30	19	40	0	0	0	0.00	0	0	0	0	0	0.00	4
235532	108.00	111.00	3.00	0.10	50	20	45	0	0	8	0.00	0	0	0	0	0	0.00	5
235533	111.00	114.00	3.00	0.10	100	19	50	0	0	2	0.00	0	0	0	0	0	0.00	5
235534	114.00	117.00	3.00	0.10	35	20	60	0	0	3	0.00	0	0	0	0	0	0.00	5
235535	117.00	120.00	3.00	0.10	30	19	45	0	0	6	0.00	0	0	0	0	15	0.00	4
235536	120.00	123.00	3.00	0.10	6	18	30	0	0	5	0.00	0	0	0	0	15	0.00	4
235537	123.00	126.00	3.00	0.10	20	20	50	0	0	1	0.00	0	0	0	0	15	0.01	6

Appendix 1.--Geochemical-assay results for Ishmas Kabir drill hole 3--continued.

Chemical Analysis Of ISHMAS KABIR # 3

															Graphite Furnace		RE- RUN	
				Ag	Cu	Pb	Zn	As	Bi	Mo	Cd	Sb	Au	Te	Au	Te	Au	Au
Rass No.	FROM	To	Int./M	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppb)	(ppb)	(ppm)	(ppb)
********	****	**	*******	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**
235538	126.00	129.00	3.00	0.10	40	23	50	0	0	2	0.00	0	0	0	0	10	0.00	4
235539	129.00	132.00	3.00	0.10	115	23	50	0	0	5	0.00	0	0	0	0	10	0.00	4
235540	132.00	135.00	3.00	0.10	60	20	60	0	0	5	0.00	0	0	0	0	15	0.00	5
235541	135.00	138.00	3.00	0.10	30	17	45	0	0	1	0.00	0	0	0	0	15	0.00	4
235542	138.00	141.00	3.00	0.10	110	18	45	0	0	2	0.00	0	0	0	0	10	0.00	5
235543	141.00	144.00	3.00	0.10	25	18	50	0	0	1	0.00	0	0	0	0	10	0.01	8
235544	144.00	147.00	3.00	0.10	30	20	50	0	0	5	0.00	0	0	0	0	20	0.00	5
235545	147.00	150.00	3.00	0.10	50	17	50	0	0	1	0.00	0	0	0	0	40	0.00	5
235546	150.00	153.00	3.00	0.10	55	17	50	0	0	4	0.00	0	0	0	0	15	0.00	5
235547	153.00	154.70	1.70	0.10	60	20	55	0	0	5	0.00	0	0	0	0	10	0.00	5
235548	154.70	156.50	1.80	0.10	35	23	70	0	0	0	0.00	0	0	0	0	15	0.00	5
235549	156.50	159.50	3.00	0.10	60	20	50	0	0	5	0.00	0	0	0	0	0	0.00	4
235550	159.50	160.10	0.60	0.12	55	20	85	0	0	2	0.00	0	0	0	0	0	0.02	17
235551	160.10	161.25	1.15	0.10	85	24	55	0	0	6	0.00	0	0	0	0	10	0.01	6
235552	161.25	161.85	0.60	0.10	40	26	80	0	0	4	0.00	0	0	0	0	0	0.01	7
235553	161.85	165.00	3.15	0.10	40	23	75	0	0	3	0.00	0	0	0	0	0	0.01	7
235554	165.00	168.00	3.00	0.10	40	20	70	0	0	2	0.00	0	0	0	0	0	0.00	5
235555	168.00	171.00	3.00	0.10	50	17	50	0	0	3	0.00	0	0	0	0	0	0.00	4
235556	171.00	174.00	3.00	0.10	50	17	55	0	0	7	0.00	0	0	0	9	0	0.00	5
235557	174.00	177.00	3.00	0.10	50	19	55	0	0	1	0.00	0	0	0	6	0	0.00	5
235558	177.00	178.00	1.00	0.10	50	22	65	0	0	1	0.00	0	0	0	0	0	0.00	5
235559	178.00	180.00	2.00	0.10	40	17	70	0	0	2	0.00	0	0	0	0	0	0.01	7
235560	180.00	183.00	3.00	0.10	20	2	70	0	0	2	0.00	0	0	0	4	0	0.01	7
235561	183.00	186.00	3.00	0.10	25	2	50	0	0	4	0.00	0	0	0	23	0	0.04	39
235562	186.00	189.00	3.00	0.10	20	2	60	0	0	5	0.00	0	0	0	4	0	0.01	9
235563	189.00	190.95	1.95	0.10	30	1	50	0	0	4	0.00	0	0	0	5	0	0.02	14
235564	190.95	192.00	1.05	0.10	50	2	60	0	0	5	0.00	0	0	0	16	40	0.02	14
235565	192.00	195.00	3.00	0.10	55	2	60	0	0	6	0.00	0	0	0	4	10	0.01	7
235566	195.00	198.00	3.00	0.10	55	2	60	0	0	7	0.00	0	0	0	4	0	0.01	6
235567	198.00	199.65	1.65	0.10	55	3	65	0	0	6	0.00	0	0	0	4	10	0.01	7
		TOTAL	196.65															
		*****																
		MIN		0.10	6.00	1.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00
		MAX		0.50	350.00	30.00	90.00	20.00	0.00	8.00	0.10	0.00	0.00	0.00	49.00	40.00	0.05	40.00
		AVER		0.12	52.95	16.57	52.18	1.84	0.00	2.89	0.01	0.00	0.00	0.00	3.59	4.30	0.01	7.03
		STD		0.07	48.03	7.60	12.31	4.79	0.00	2.01	0.03	0.00	0.00	0.00	7.77	8.22	0.01	5.69

Appendix 1.--Geochemical-assay results for Ishmas Kabir drill hole 4.

Chemical Analysis Of ISHMAS KABIR # 4

														Graphite Furnace RE- RUN			
				Ag	Cu	Pb	Zn	As	Bi	Mo	Cd	Sb	Au	Au	Te	Au	Au
Rass No.	FROM	To	Int./M	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppb)	(ppb)	(ppm)	(ppb)
********	****	**	******	**	**	**	**	**	**	**	**	**	**	**	**	**	**
235140	1.75	3.00	1.25	0.00	30	2	48	10	0	1	0.10	0.00	0.05	8	0.00	0.00	4
235141	3.00	6.00	3.00	0.00	35	2	39	10	0	2	0.00	0.00	0.00	5	0.00	0.00	4
235142	6.00	9.00	3.00	0.00	40	3	46	10	0	0	0.10	0.00	0.00	5	0.00	0.00	4
235143	9.00	12.00	3.00	0.00	35	2	41	10	0	3	0.00	0.00	0.05	24	0.00	0.00	4
235144	12.00	15.00	3.00	0.00	35	1	42	10	0	2	0.00	0.00	0.05	50	0.00	0.00	4
235145	15.00	18.00	3.00	0.00	40	2	55	10	0	2	0.10	0.00	0.00	5	0.00	0.00	4
235146	18.00	21.00	3.00	0.00	35	3	45	10	0	1	0.10	0.00	0.00	5	0.00	0.00	4
235147	21.00	24.00	3.00	0.10	50	2	45	10	0	3	0.00	0.00	0.00	0	0.00	0.00	5
235148	24.00	27.00	3.00	0.00	25	1	28	10	0	2	0.00	0.00	0.05	10	0.00	0.00	4
235149	27.00	30.00	3.00	0.00	30	3	55	15	0	5	0.10	0.00	0.00	0	0.00	0.00	4
235150	30.00	33.00	3.00	0.00	50	2	60	10	0	4	0.10	0.00	0.00	0	0.00	0.00	4
235151	33.00	36.00	3.00	0.00	20	2	32	10	0	4	0.10	0.00	0.00	5	0.00	0.02	16
235152	36.00	39.00	3.00	0.00	25	2	28	10	0	0	0.00	0.00	0.00	5	0.00	0.00	4
235153	39.00	42.00	3.00	0.10	35	3	43	0	0	2	0.00	0.00		2	10.00	0.01	6
235154	42.00	45.00	3.00	0.10	15	4	44	0	0	4	0.00	0.00		2	10.00	0.00	4
235155	45.00	48.00	3.00	0.10	40	2	42	0	0	4	0.00	0.00		2	15.00	0.00	4
235156	48.00	51.00	3.00	0.10	30	0	55	0	0	4	0.00	0.00		2	20.00	0.00	6
235157	51.00	54.00	3.00	0.10	22	0	50	0	0	3	0.00	0.00		2	20.00	0.01	7
235158	54.00	57.00	3.00	0.10	40	0	60	0	0	1	0.00	0.00		2	10.00	0.01	8
235159	57.00	58.00	1.00	0.10	22	0	75	0	0	5	0.00	0.00		2	15.00	0.01	6
235160	58.00	59.00	1.00	0.10	55	0	70	0	0	16	0.00	0.00		2	0.00	0.01	6
235161	59.00	60.00	1.00	0.10	90	0	60	0	0	8	0.00	0.00		2	0.00	0.01	8
235162	60.00	63.00	3.00	0.10	30	0	40	0	0	5	0.00	0.00		4	0.00	0.01	7
235163	63.00	66.00	3.00	0.10	30	0	40	0	0	1	0.00	0.00		2	0.00	0.01	7
235164	66.00	69.00	3.00	0.10	25	0	40	0	0	1	0.00	0.00		2	0.00	0.01	8
235165	69.00	72.00	3.00	0.10	60	0	75	0	0	7	0.00	0.00		5	35.00	0.01	6
235166	72.00	73.00	1.00	0.10	80	2	65	0	0	3	0.00	0.00		2	15.00	0.00	5
235167	73.00	74.00	1.00	0.10	55	2	55	0	0	3	0.00	0.00		2	15.00	0.01	6
235168	74.00	75:00	1.00	0.10	40	3	55	0	0	8	0.00	0.00		0	15.00	0.00	5
235169	75.00	76.00	1.00	0.10	10	2	65	0	0	1	0.00	0.00		0	25.00	0.00	4
235170	76.00	77.00	1.00	0.10	95	3	60	0	0	2	0.00	0.00		0	30.00	0.01	6
235171	77.00	78.00	1.00	0.10	30	4	60	0	0	4	0.00	0.00		5	25.00	0.00	5
235172	78.00	79.00	1.00	0.10	65	3	60	0	0	2	0.00	0.00		2	30.00	0.01	8
235173	79.00	80.00	1.00	0.10	50	2	60	0	0	5	0.00	0.00		2	35.00	0.01	10
235174	80.00	81.00	1.00	0.10	20	2	60	0	0	3	0.00	0.00		7	25.00	0.01	9
235175	81.00	82.00	1.00	0.10	5	3	50	0	0	4	0.00	0.00		2	25.00	0.00	5
235176	82.00	83.00	1.00	0.10	13	2	80	0	0	1	0.00	0.00		8	15.00	0.01	13
235177	83.00	84.00	1.00	0.10	42	3	75	0	0	1	0.00	0.00		5	15.00	0.01	14
235178	84.00	85.00	1.00	0.10	55	2	45	0	0	6	0.00	0.00		0	10.00	0.01	15
235179	85.00	86.00	1.00	0.10	25	1	50	0	0	1	0.00	0.00		0	15.00	0.02	19
235180	86.00	87.00	1.00	0.10	27	2	45	0	0	4	0.00	0.00		4	20.00	0.02	15
235181	87.00	88.00	1.00	0.10	52	5	45	0	0	5	0.00	0.00		2	30.00	0.02	15
235182	88.00	89.00	1.00	0.10	25	2	45	0	0	6	0.00	0.00		2	20.00	0.03	24
235183	89.00	90.00	1.00	0.10	20	4	40	0	0	6	0.00	0.00		2	20.00	0.03	31
235184	90.00	91.00	1.00	0.10	22	3	45	0	0	8	0.00	0.00		2	10.00	0.02	16
235185	91.00	92.00	1.00	0.10	27	2	40	0	0	5	0.00	0.00		4	10.00	0.04	33
235186	92.00	93.00	1.00	0.10	20	2	65	0	0	3	0.00	0.00		4	10.00	0.02	15
235187	93.00	94.00	1.00	0.10	12	2	65	0	0	2	0.00	0.00		2	0.00	0.01	11
235188	94.00	95.00	1.00	0.10	10	5	65	10	0	1	0.00	0.00		5	10.00	0.02	24
235189	95.00	96.00	1.00	0.10	15	0	50	10	0	5	0.00	0.00		5	0.00	0.03	26

Appendix 1.--Geochemical-assay results for Ishmas Kabir drill hole 4--continued.

Chemical Analysis Of ISHMAS KABIR # 4

														Graphite Furnace RE- RUN			
				Ag	Cu	Pb	Zn	As	Bi	Mo	Cd	Sb	Au	Au	Te	Au	Au
Rass No.	FROM	To	Int./M	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppb)	(ppb)	(ppm)	(ppb)
********	****	**	******	**	**	**	**	**	**	**	**	**	**	**	**	**	**
235190	96.00	97.00	1.00	0.10	35	0	45	10	0	5	0.00	0.00		2	0.00	0.04	35
235191	97.00	98.00	1.00	0.10	66	2	55	10	0	1	0.00	0.00		13	15.00	0.04	36
235192	98.00	99.00	1.00	0.12	122	3	70	10	0	5	0.00	0.00		23	50.00	0.03	27
235193	99.00	100.00	1.00	0.10	40	2	60	10	0	1	0.00	0.00		10	25.00	0.02	19
235194	100.00	101.00	1.00	0.10	35	2	55	15	0	4	0.00	0.00		13	20.00	0.09	84
235195	101.00	102.00	1.00	0.14	40	2	60	10	0	6	0.00	0.00		11	40.00	0.02	22
235196	102.00	103.00	1.00	0.10	70	8	60	10	0	4	0.00	0.00		8	35.00	0.02	18
235197	103.00	104.00	1.00	0.10	7	2	75	0	0	4	0.00	0.00		20	10.00	0.01	7
235198	104.00	105.00	1.00	0.10	7	2	85	0	0	3	0.00	0.00		6	20.00	0.01	7
235199	105.00	106.00	1.00	0.10	10	2	75	0	0	2	0.00	0.00		7	25.00	0.01	10
235200	106.00	107.00	1.00	0.12	100	1	60	0	0	5	0.00	0.00		2	35.00	0.02	16
235201	107.00	108.00	1.00	0.10	45	2	60	0	0	5	0.00	0.00		2	10.00	0.01	10
235202	108.00	109.00	1.00	0.10	40	1	55	0	0	5	0.00	0.00		2	20.00	0.01	9
235203	109.00	110.00	1.00	0.10	22	1	50	0	0	5	0.00	0.00		2	20.00	0.02	19
235204	110.00	111.00	1.00	0.10	10	2	65	0	0	3	0.00	0.00		2	25.00	0.01	8
235205	111.00	112.00	1.00	0.10	12	2	45	0	0	4	0.00	0.00		4	20.00	0.02	16
235206	112.00	113.00	1.00	0.14	50	2	40	0	0	3	0.00	0.00		11	15.00	0.03	23
235207	113.00	114.00	1.00	0.10	50	1	40	0	0	4	0.00	0.00		10	30.00	0.03	25
235208	114.00	115.00	1.00	0.42	300	2	50	0	0	3	0.00	0.00		19	30.00	0.05	54
235209	115.00	116.00	1.00	0.26	220	2	70	0	0	2	0.00	0.00		11	30.00	0.02	15
235210	116.00	117.00	1.00	0.10	15	4	60	0	0	4	0.00	0.00		8	30.00	0.00	4
235211	117.00	118.00	1.00	0.10	50	4	60	0	0	3	0.00	0.00		9	30.00	0.00	4
235212	118.00	119.00	1.00	0.10	20	2	50	0	0	2	0.00	0.00		8	30.00	0.00	4
235213	119.00	120.00	1.00	0.10	13	2	50	0	0	2	0.00	0.00		9	40.00	0.00	4
235214	120.00	121.00	1.00	0.10	10	2	50	0	0	4	0.00	0.00		9	35.00	0.00	4
235215	121.00	122.00	1.00	0.10	7	2	50	0	0	6	0.00	0.00		9	30.00	0.00	4
235216	122.00	123.00	1.00	0.10	6	2	45	0	0	5	0.00	0.00		10	30.00	0.00	5
235217	123.00	124.00	1.00	0.10	8	3	50	0	0	9	0.00	0.00		10	35.00	0.00	4
235218	124.00	125.00	1.00	0.10	25	2	50	0	0	2	0.00	0.00		10	45.00	0.00	4
235219	125.00	126.00	1.00	0.10	30	2	45	0	0	3	0.00	0.00		6	40.00	0.00	4
235220	126.00	129.00	3.00	0.10	30	2	35	0	0	4	0.00	0.00		5	35.00	0.00	4
235221	129.00	132.00	3.00	0.10	30	2	35	0	0	2	0.00	0.00		6	40.00	0.00	4
235222	132.00	135.00	3.00	0.10	35	2	30	0	0	1	0.00	0.00		6	45.00	0.00	4
235223	135.00	138.00	3.00	0.10	25	2	25	0	0	1	0.00	0.00		8	40.00	0.00	4
235224	138.00	141.00	3.00	0.10	135	2	30	0	0	2	0.00	0.00		8	35.00	0.00	4
235225	141.00	143.90	2.90	0.10	13	2	40	0	0	1	0.00	0.00		7	30.00	0.00	4
235226	143.90	144.50	0.60	0.10	14	3	5	0	0	6	0.00	0.00		5	25.00	0.00	4
235227	144.50	145.47	0.97	0.10	4	3	35	0	0	2	0.00	0.00		7	65.00	0.00	4
235228	145.47	147.10	1.63	0.10	25	4	50	0	0	2	0.00	0.00		6	0.00	0.00	4
235229	147.10	147.40	0.30	0.10	10	3	20	0	0	2	0.00	0.00		4	0.00	0.00	4
235230	147.40	148.40	1.00	0.10	10	2	30	0	0	2	0.00	0.00		4	0.00	0.00	4
235231	148.40	149.33	0.93	0.10	15	3	40	0	0	3	0.00	0.00		4	0.00	0.00	4
235232	149.33	149.97	0.64	0.10	20	4	50	0	0	1	0.00	0.00		2	10.00	0.00	6
235233	149.97	150.25	0.28	0.10	22	3	40	0	0	3	0.00	0.00		6	10.00	0.00	4
235234	150.25	153.00	2.75	0.10	35	2	35	0	0	2	0.00	0.00		6	3.00	0.00	4
235235	153.00	156.00	3.00	0.10	45	2	30	0	0	3	0.00	0.00		8	10.00	0.00	4
235236	156.00	159.00	3.00	0.10	35	2	35	0	0	3	0.00	0.00		7	0.00	0.00	4
235237	159.00	162.00	3.00	0.10	30	2	30	0	0	4	0.00	0.00		7	10.00	0.00	4
235238	162.00	165.00	3.00	0.10	30	2	30	0	0	3	0.00	0.00		8	10.00	0.00	4
235239	165.00	167.40	2.40	0.10	30	2	30	0	0	2	0.00	0.00		4	20.00	0.00	4

Appendix 1.--Geochemical-assay results for Ishmas Kabir drill hole 4--continued.

Chemical Analysis Of ISHMAS KABIR # 4

														Graphite Furnace		RE- RUN	
Rass No.	FROM	To	Int./M	Ag (ppm)	Cu (ppm)	Pb (ppm)	Zn (ppm)	As (ppm)	Bi (ppm)	Mo (ppm)	Cd (ppm)	Sb (ppm)	Au (ppm)	Au (ppb)	Te (ppb)	Au (ppm)	Au (ppb)
********	****	**	******	**	**	**	**	**	**	**	**	**	**	**	**	**	**
235240	167.40	168.15	0.75	0.10	45	3	40	0	0	5	0.00	0.00		4	10.00	0.00	4
235241	168.15	169.62	1.47	0.10	50	3	40	0	0	2	0.00	0.00		5	10.00	0.00	4
235242	169.62	170.10	0.48	0.10	35	3	70	0	0	1	0.00	0.00		4	20.00	0.00	4
235243	170.10	171.00	0.90	0.10	55	3	40	0	0	6	0.00	0.00		5	15.00	0.00	4
235244	171.00	174.00	3.00	0.10	40	3	40	0	0	4	0.00	0.00		5	20.00	0.00	4
235245	174.00	177.00	3.00	0.10	45	3	45	0	0	3	0.00	0.00		8	20.00	0.00	4
235246	177.00	180.00	3.00	0.10	45	3	45	0	0	3	0.00	0.00		9	25.00	0.00	4
235247	180.00	180.90	0.90	0.10	40	4	45	0	0	4	0.00	0.00		10	20.00	0.00	4
235248	180.90	181.90	1.00	0.10	25	7	50	0	0	3	0.00	0.00		9	35.00	0.00	4
235249	181.90	182.43	0.53	0.10	60	7	50	0	0	3	0.00	0.00		12	35.00	0.00	4
235250	182.43	182.67	0.24	0.10	30	5	15	0	0	5	0.00	0.00		12	35.00	0.00	4
235251	182.67	183.57	0.90	0.10	40	5	40	0	0	2	0.00	0.00		11	40.00	0.00	4
235252	183.57	183.87	0.30	0.10	25	5	20	0	0	2	0.00	0.00		11	40.00	0.00	4
235253	183.87	184.30	0.43	0.10	20	4	50	0	0	1	0.00	0.00		15	45.00	0.00	4
235254	184.30	185.10	0.80	0.10	30	3	25	0	0	2	0.00	0.00		4	50.00	0.00	4
235255	185.10	185.60	0.50	0.10	20	3	40	0	0	2	0.00	0.00		2	55.00	0.00	4
235256	185.60	186.23	0.63	0.10	20	1	50	0	0	2	0.00	0.00		2	55.00	0.00	4
235257	186.23	187.23	1.00	0.10	35	2	35	0	0	1	0.00	0.00		9	50.00	0.00	4
235258	187.23	187.45	0.22	0.10	70	2	50	0	0	2	0.00	0.00		7	45.00	0.00	4
235259	187.45	188.00	0.55	0.22	115	2	60	0	0	4	0.00	0.00		7	20.00	0.00	4
235260	188.00	189.00	1.00	0.12	90	2	40	0	0	2	0.00	0.00		6	10.00	0.00	4
235261	189.00	192.00	3.00	0.10	25	2	35	0	0	4	0.00	0.00		7	15.00	0.00	4
235262	192.00	195.00	3.00	0.10	45	2	40	0	0	4	0.00	0.00		7	10.00	0.00	4
235263	195.00	198.00	3.00	0.10	50	2	40	0	0	2	0.00	0.00		4	10.00	0.00	4
235264	198.00	201.00	3.00	0.10	45	3	50	0	0	2	0.00	0.00		5	10.00	0.00	5
235265	201.00	204.00	3.00	0.10	70	2	40	0	0	2	0.00	0.00		2	25.00	0.00	4
235266	204.00	207.00	3.00	0.10	15	2	30	0	0	2	0.00	0.00		2	10.00	0.00	4
235267	207.00	210.00	3.00	0.10	30	2	30	0	0	3	0.00	0.00		4	15.00	0.00	4
235268	210.00	211.00	1.00	0.10	25	2	35	0	0	3	0.00	0.00		5	25.00	0.00	4
235269	211.00	212.00	1.00	0.10	30	2	50	0	0	2	0.00	0.00		5	25.00	0.00	4
235270	212.00	213.05	1.05	0.10	20	2	30	0	0	2	0.00	0.00		4	0.00	0.00	4
235271	213.05	213.46	0.41	0.10	30	2	50	0	0	3	0.00	0.00		5	0.00	0.00	4
235272	213.46	214.00	0.54	0.10	30	2	50	0	0	2	0.00	0.00		5	0.00	0.00	4
235273	214.00	217.00	3.00	0.10	30	2	40	0	0	2	0.00	0.00		8	20.00	0.00	4
235274	217.00	218.00	1.00	0.10	25	2	30	0	0	3	0.00	0.00		2	30.00	0.00	4
235275	218.00	218.25	0.25	0.10	35	2	35	0	0	4	0.00	0.00		2	15.00	0.00	4
235276	218.25	218.47	0.22	0.10	22	2	35	0	0	2	0.00	0.00		2	20.00	0.00	4
235277	218.47	219.00	0.53	0.10	25	2	30	0	0	2	0.00	0.00		4	15.00	0.00	4
235278	219.70	220.20	0.50	0.10	20	2	35	0	0	2	0.00	0.00		2	10.00	0.00	4
235279	220.20	220.73	0.53	0.10	16	2	35	0	0	3	0.00	0.00		2	0.00	0.00	4
235280	220.73	221.00	0.27	0.12	35	5	50	0	0	6	0.00	0.00		2	0.00	0.00	4
235281	221.00	222.00	1.00	0.10	32	3	50	0	0	3	0.00	0.00		2	0.00	0.00	4
235282	222.00	225.00	3.00	0.10	40	6	50	0	0	3	0.00	0.00		2	10.00	0.00	4
235283	225.00	228.00	3.00	0.10	75	3	55	0	0	3	0.00	0.00		4	10.00	0.01	5
235284	228.00	229.00	1.00	0.10	45	4	60	0	0	5	0.00	0.00		4	10.00	0.00	4
235285	229.00	230.00	1.00	0.10	45	5	50	0	0	2	0.00	0.00		5	10.00	0.01	5
235286	230.00	231.00	1.00	0.10	30	4	60	0	0	4	0.00	0.00		5	10.00	0.00	4
235287	231.00	231.80	0.80	0.10	50	4	50	0	0	6	0.00	0.00		5	10.00	0.01	6
235288	231.80	232.80	1.00	0.10	25	3	40	0	0	2	0.00	0.00		5	10.00	0.01	5
235289	232.80	233.90	1.10	0.10	20	3	45	0	0	2	0.00	0.00		2	10.00	0.01	5

Appendix 1.--Geochemical-assay results for Ishmas Kabir drill hole 4--continued.

Chemical Analysis Of ISHMAS KABIR # 4

														Graphite	Furnace	RE-	RUN
				Ag	Cu	Pb	Zn	As	Bi	Mo	Cd	Sb	Au	Au	Te	Au	Au
Rass No.	FROM	To	Int./M	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppb)	(ppb)	(ppm)	(ppb)
********	****	**	******	**	**	**	**	**	**	**	**	**	**	**	**	**	**
235290	233.90	237.00	3.10	0.10	50	4	55	0	0	3	0.00	0.00		4	10.00	0.01	5
235291	237.00	240.00	3.00	0.10	45	10	55	0	0	3	0.00	0.00		2	10.00	0.01	5
235292	240.00	241.00	1.00	0.10	40	5	55	0	0	5	0.00	0.00		2	0.00	0.00	4
235293	241.00	242.30	1.30	0.12	150	4	60	0	0	1	0.00	0.00		2	10.00	0.01	6
235294	242.30	243.13	0.83	0.10	45	2	60	0	0	1	0.00	0.00		2	0.00	0.00	4
235295	243.13	244.00	0.87	0.10	50	3	55	0	0	2	0.00	0.00		2	0.00	0.01	6
235296	244.00	245.00	1.00	0.10	100	4	65	0	0	4	0.00	0.00		6	10.00	0.00	4
235297	245.00	246.00	1.00	0.12	80	3	65	0	0	2	0.00	0.00		2	10.00	0.01	6
235298	246.00	247.00	1.00	0.10	45	3	60	0	0	3	0.00	0.00		11	0.00	0.01	5
235299	247.00	248.00	1.00	0.12	85	4	60	0	0	3	0.00	0.00		2	0.00	0.01	6
235300	248.00	249.00	1.00	0.11	80	6	65	0	0	6	0.00	0.00		2	0.00	0.01	8
235301	249.00	250.00	1.00	0.10	45	2	55	0	0	3	0.00	0.00		2	0.00	0.01	5
235302	250.00	251.00	1.00	0.20	25	2	70	0	0	2	0.00	0.00		2	0.00	0.00	4
235303	251.00	251.18	0.18	0.10	15	2	80	0	0	2	0.00	0.00		2	0.00	0.00	5
235304	251.18	252.00	0.82	0.10	55	3	65	0	0	3	0.00	0.00		2	10.00	0.00	4
235305	252.00	253.00	1.00	0.10	40	2	60	0	0	3	0.00	0.00		2	0.00	0.00	5
235306	253.00	254.00	1.00	0.10	45	4	60	0	0	4	0.00	0.00		2	10.00	0.00	5
235307	254.00	255.00	1.00	0.14	45	4	50	0	0	3	0.00	0.00		2	0.00	0.00	4
235308	255.00	258.00	3.00	0.10	45	4	55	0	0	4	0.00	0.00		4	10.00	0.01	6
235309	258.00	261.00	3.00	0.10	45	3	50	0	0	6	0.00	0.00		2	0.00	0.01	6
235310	261.00	264.00	3.00	0.10	40	4	45	0	0	5	0.00	0.00		19	0.00	0.00	4
235311	264.00	265.30	1.30	0.10	45	3	55	0	0	5	0.00	0.00		2	0.00	0.00	4
235312	265.30	266.16	0.86	0.10	30	3	45	0	0	2	0.00	0.00		4	0.00	0.00	4
235313	266.16	267.00	0.84	0.10	45	4	50	0	0	7	0.00	0.00		2	0.00	0.00	4
235314	267.00	270.00	3.00	0.10	45	4	50	0	0	6	0.00	0.00		2	0.00	0.00	3
235315	270.00	273.00	3.00	0.10	50	4	45	0	0	5	0.00	0.00		2	0.00	0.00	3
235316	273.00	276.00	3.00	0.10	50	3		0	0	3	0.00	0.00		4	0.00	0.00	4
235317	276.00	279.00	3.00	0.10	50	4	60	0	0	5	0.00	0.00		2	0.00	0.00	4
235318	279.00	282.00	3.00	0.10	30	2	60	0	0	5	0.00	0.00		2	10.00	0.00	3
235319	282.00	285.00	3.00	0.10	35	3	60	0	0	5	0.00	0.00		4	10.00	0.00	4
235320	285.00	288.00	3.00	0.10	30	3	60	0	0	3	0.00	0.00		2	10.00	0.00	4
235321	288.00	291.00	3.00	0.10	25	2	60	0	0	3	0.00	0.00		2	10.00	0.01	6
235322	291.00	294.00	3.00	0.10	20	2	45	0	0	6	0.00	0.00		5	10.00	0.00	4
235323	294.00	295.00	1.00	0.10	10	5	45	0	0	6	0.00	0.00		2	15.00	0.00	5
235324	295.00	295.57	0.57	0.10	40	7	60	0	0	5	0.00	0.00		2	10.00	0.02	23
235325	295.57	295.83	0.26	0.10	8	5	65	0	0	4	0.00	0.00		2	10.00	0.02	15
235326	295.83	296.02	0.19	0.10	20	2	5	0	0	4	0.00	0.00		2	0.00	0.01	13
235327	296.02	296.19	0.17	0.10	40	7	60	0	0	7	0.00	0.00		2	3.00	0.01	10
235328	296.19	297.00	0.81	0.10	10	4	65	0	0	3	0.00	0.00		2	10.00	0.01	8
235329	297.00	298.00	1.00	0.10	7	4	50	0	0	3	0.00	0.00		6	3.00	0.00	4
235330	298.00	299.00	1.00	0.10	120	3	65	0	0	7	0.00	0.00		10	10.00	0.00	5
235331	299.00	300.00	1.00	0.20	90	3	75	0	0	3	0.00	0.00		5	25.00	0.00	5
235332	300.00	300.25	0.25	0.10	30	2	85	0	0	2	0.00	0.00		2	0.00	0.00	4
235333	300.25	301.00	0.75	0.10	95	3	55	0	0	7	0.00	0.00		2	0.00	0.01	6
235334	301.00	302.00	1.00	0.10	6	2	55	0	0	4	0.00	0.00		0	0.00	0.00	4
235335	302.00	303.00	1.00	0.10	10	2	45	0	0	6	0.00	0.00		0	0.00	0.00	4
235336	303.00	304.00	1.00	0.10	25	3	40	0	0	3	0.00	0.00		2	0.00	0.00	4
235337	304.00	305.00	1.00	0.10	6	3	45	0	0	6	0.00	0.00		2	0.00	0.00	5
235338	305.00	306.00	1.00	0.10	20	4	55	0	0	6	0.00	0.00		2	0.00	0.00	4
235339	306.00	307.00	1.00	0.10	15	3	65	0	0	6	0.00	0.00		5	0.00	0.00	4

Appendix 1.--Geochemical-assay results for Ishmas Kabir drill hole 4--continued.

Chemical Analysis Of ISHMAS KABIR # 4

														Graphite Furnace RE- RUN			
				Ag	Cu	Pb	Zn	As	Bi	Mo	Cd	Sb	Au	Au	Te	Au	Au
Rass No.	FROM	To	Int./M	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppb)	(ppb)	(ppm)	(ppb)
********	****	**	******	**	**	**	**	**	**	**	**	**	**	**	**	**	**
235340	307.00	308.00	1.00	0.10	80	2	70	0	0	5	0.00	0.00		6	0.00	0.01	8
235341	308.00	309.00	1.00	0.10	22	2	55	0	0	3	0.00	0.00		2	0.00	0.00	4
235342	309.00	312.00	3.00	0.10	35	3	55	0	0	3	0.00	0.00		11	0.00	0.00	4
235343	312.00	315.00	3.00	0.10	50	3	53	0	0	2	0.00	0.00		2	10.00	0.00	4
235344	315.00	318.00	3.00	0.10	45	4	64	0	0	7	0.00	0.00		2	10.00	0.00	4
235345	318.00	321.30	3.30	0.10	45	3	53	0	0	3	0.00	0.00		4	10.00	0.01	6
		TOTAL *****	318.85														
			Min	0.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00
			Max	0.42	300.00	10.00	85.00	15.00	0.00	16.00	0.10	0.00	0.05	50.00	65.00	0.09	84.00
			Avg	0.10	39.76	2.71	49.43	1.12	0.00	3.47	0.00	0.00	0.02	5.14	14.58	0.01	7.67
			Std	0.04	33.03	1.46	13.97	3.26	0.00	1.94	0.02	0.00	0.02	5.10	14.36	0.01	8.80

APPENDIX 2

Drill-hole log sheets for Ishmas Kabir drill hole 1.

Drill-hole log sheets for Ishmas Kabir drill hole 2.

Drill-hole log sheets for Ishmas Kabir drill hole 3.

Drill-hole log sheets for Ishmas Kabir drill hole 4.

Appendix 2.--Drill-core log sheet, Ishmas Kabir 1.

KINGDOM OF SAUDI ARABIA
Ministry of Petroleum and Mineral Resources
Directorate General of Mineral Resources

Organization: USGS

Mineral Occurrence: MODS 01458

Drill Hole Number: Ishmas Kabir 1

References

Logged by: Bruce M. Walker

SUMMARY LOG

- XX Quartz diorite
- VV Mafic dike
- ~~ Mylonite schist
- –·–·– Fault
- >75% Quartz veins
- >50 <75% Quartz veins
- <50% Quartz (>50% Carbonate group ± chlorite)
- ++=GR=Granite dike
- PG=Granite pegmatite dike

Scale

Date Started:
Date Completed:
Driller: ADC
Hole Size: Nx - Bx - Ax -

Survey Data

Collar Coord: Lat. Long.
Grid Reference: Elevation:

Subsurface (Tropari or:)

Depth	Inclination	Azimuth	Depth	Inclination	Azimuth
5.0m	-46°	138°			
50.0m	-47°	138°			
101.5m	-49°	138°			
151.0m	-53°	136°			
201.0m	-54	143°			

CORE RECOVERY / VEIN STRUCTURE (including water loss and cementation) / >75% Quartz / >50<75% Quartz Vns / <50% Quartz Vns / Lithology / Oxidation + Weathering / FAULTS + LITHOLOGY + ALTERATION / MINERALIZATION (L H Py Cp)

Depth	RQD	%
0	X	X
	45	100
	85	100
5	73	100
	49	100
	59	80
	19	100
	0	55
10	20	75
	72	100
	50	100
	33	100
	46	100
15	13	90
	0	40
	0	15
	97	100
	85	
20	85	
	55	
	75	
	57	
	94	
25	96	
	54	
	78	
	72	
	71	
30	90	
	45	
	81	
	50	
	69	
35	70	
	81	
	43	
	34	
	55	
40	91	
	100	
	100	
	94	
	85	
45	90	100

Vein structure: Carb.+qtz vns, 3 mm, 12° & 25° CA

Quartz vein annotations: 1.5 cm; 6 mm; 15 mm; 7 mm, 23°; 5 mm; 45°, 5 mm; 30°, 8 mm; 80°, 8 mm; 5 mm, 50°

Faults + Lithology + Alteration:

- No sample.
- Zone of mixed-layer silicates + iron oxides 1.5m–16.3m.
- 9.7–10.4m: Broken zone
- GR, 5mm, 23° core axis (CA)
- 14–16.3m: Broken and sheared fault zone w/0.2–10.0mm fragments.
- Quartz diorite, 2→3mm grain size.
- GR, 40° CA
- Quartz diorite

Mineralization: 0.3; 3.0; 2.0; 2.0

SAMPLE DATA

Length (m)	Interval (m)	Sample Number	Au ppb	Ag ppm	Cu ppm	Pb ppm	Zn ppm	As ppm	Mo ppm	Te ppb
		235004	15	0.1	45	5	65	10		10
		235005	8	0.1	35	4	60	10		10
		235006	8	0.1	65	10	60	10		0
		235007	13	0.1	60	5	70	10		10
		235008	11	0.1	25	8	75	10		10
		235009	5	0.1	10	4	50	10		15
		235010	10	0.2	180	5	60	10		15
		235011	9	0.1	15	10	65	10		10
		235012	7	0.1	100	18	60	10		15
		235013	9	0.1	45	4	42	0		10
		235014	4	0	25	2	55	10		10
		235015	4	0.1	110	2	40	0		0
		235016	8	0	25	3	35	10		0
		235017	4	0	20	2	35	10	2	0
		235018	10	0	15	2	40	10	4	0

USGS F-190

Appendix 2.--Drill-core log sheet, Ishmas Kabir 1--continued.

KINGDOM OF SAUDI ARABIA
Ministry of Petroleum and Mineral Resources
Directorate General of Mineral Resources

Organization: USGS

Mineral Occurrence

Drill Hole Number: Ishmas Kabir 1

References

Logged by: Bruce Walker

Scale

Date Started:
Date Completed:
Driller: ADC

Hole Size: Nx - Bx - Ax -

Survey Data

Collar Coord: Lat. Long.
Grid Reference: Elevation:

Subsurface (Tropari or:)

Depth	Inclination	Azimuth	Depth	Inclination	Azimuth

Column headings: CORE RECOVERY (RQD, %); CORE BOX; VEIN STRUCTURE (Including water loss and cementation) >75% Quartz; >50<75% Quartz vn; <50% Quartz vn; Lithology; Oxidation; FAULTS + LITHOLOGY + ALTERATION; MINERALIZATION (L H Py Cp); SAMPLE DATA (LENGTH, INTERVAL, SAMPLE NUMBER, ANALYSES).

Core recovery (RQD) by depth (m)

Depth	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59
RQD	97	75	100	84	86	86	80	70	33	78	71	73	57	78	81

Depth	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74
RQD	92	70	28	89	72	91	85	96	65	88	100	72	73	82	84

Depth	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89
RQD	80	100	56	91	50	48	87	98	55	78	58	77	96	95	89

Core recovery %: 100 (45 m) ... 100 (89–90 m)

Vein structure

- 4cm, 52° (~56 m)
- 2cm, 45° (~59 m)
- 3.5cm, 78° (~75 m)
- 85° 1.0cm (~51 m)
- 1cm, 40° (~55 m)
- 46° 3.5cm (~54.5 m)
- 35 4cm (~66 m)
- 45° 5cm; 52° 5cm; 58° 3cm; 70° 3cm; 70° 3cm (~68–73 m)
- 88.7m: 4cm Chlorite-flooded zone.

Faults + Lithology + Alteration

- PG, 6cm at 85°CA.
- PG, 35°CA, 7mm-thick.
- PG, 22°CA, 6mm.
- 16.5cm Mafic Dike at 65°CA.
- 80°CA
- 78°CA
- 3cm GR at 20°CA.
- Quartz diorite
- 3cm, 2cm-thick GR dikes at 48°, 60°CA.
- 1.5cm Mafic dike at 40°CA
- Quartz diorite.

Mineralization

0.5 (~54 m); 1.0 (~60 m)

Sample data

Sample number	Au ppb	Ag ppm	Cu ppm	Pb ppm	Zn ppm	As ppm	Mo ppm	Te ppb
235019	4	0	25	1	35	10	6	0
235020	4	0	35	1	35	10	3	0
235021	4	0	30	3	54	10	0	0
235022	5	0.15	55	19	70	0	3	15
235023	7	0	25	3	50	10	0	35
235024	4	0	30	3	48	10	0	25
235025	4	0.1	80	4	45	10	0	0
235026	4	0.1	70	8	55	10	0	0
235027	4	0	20	4	55	10	4	0
235028	6	0.1	25	4	55	10	4	0
235029	18	0.1	65	3	55	10	2	0
235030	5	0.1	45	2	55	10	4	0
235031	6	0.1	25	3	45	10	4	0
235032	4	0	20	3	35	10	3	20
235033	4	0	40	2	33	10	4	0

Appendix 2.--Drill-core log sheet, Ishmas Kabir 1--continued.

KINGDOM OF SAUDI ARABIA
Ministry of Petroleum and Mineral Resources
Directorate General of Mineral Resources

Organization: USGS

Mineral Occurrence

Drill Hole Number: Ishmas Kabir 1

References

Logged by: Bruce Walker

Scale

Date Started: | Hole Size: Nx - | Bx - | Ax -
Date Completed:
Driller: ADC

Survey Data
Collar Coord: Lat. Long.
Grid Reference: Elevation:

Subsurface (Tropari or:)
Depth Inclination Azimuth | Depth Inclination Azimuth

CORE RECOVERY RQD	%	CORE BOX	VEIN STRUCTURE (including water loss and cementation) >75% Quartz	50<75% Quartz Vn.	<50% Quartz Vn.	Lithology	Oxidation	FAULTS + LITHOLOGY + ALTERATION	MINERALIZATION L H Py Cp

Depth (m): 90, 95, 100, 105, 110, 115, 120

RQD: 91, 42, 36, 67, 72, 80, 32, 79, 49, 89, 61, 88, 56, 72, 50, 90, 85, 55, 100, 100, 71, 70, 68, 71, 79, 28, 43, 100, 45, 100
Core recovery %: 100 ... 100

Vein structure: 3mm, 50°; 3mm, 65°; 6mm, 90°; 3mm, 52°; 6.5cm, 82°; 6cm, 80°; 1.5cm, 60°; 8cm, 50°; 7cm, 55°; 0.42m, 40°; 1.5cm, 65°; 1.5cm, 60°; 8cm, 52°; 3cm, 70°; 7cm, 75°; 2cm, 80°

Quartz veins: 5° 3cm; 50° 8mm; 45° 1cm; 15° 1.2mm; 60° 3mm; 7mm, 55°; 28° 5mm; 5mm; 6.5mm; 80° 7mm; 70° 9mm

Faults + Lithology + Alteration:

Quartz diorite

40°
Mafic dike; much carbonate alteration.
10°

Mylonite folia 50°→55° CA.
96.6—98.7 Rocks are highly sericitized.

Quartz diorite.

80° 35° 8cm Mafic dike

109—115m: Moderately-to-highly sericitized quartz diorite.

Mylonite folia: 10.3—112.3m, 20°–37° CA; 112.3—119 m, 45°–50° CA.; 119—122.5m, 35–42° CA.

Deformed quartz diorite.

60°
Carbonate-altered mafic dike.
55°

Moderately to highly sericitized quartz diorite/mylonite schist (after quartz diorite).

Mineralization: 0.1; 0.5; 3.0; 0.2; .5 .2; .2; 0.1; 0.2; 0.5 .3; .3 Tr; Tr; 0.2—5.0% Mostly in wallrock

SAMPLE DATA

Length (m)	Interval (m)	Sample number	Au ppb	Ag ppm	Cu ppm	Pb ppm	Zn ppm	As ppm	Mo ppm	Te ppb
		235034	4	0	40	2	35	10	2	15
		235035	4	0.1	30	3	50	10	1	25
		235036	220	0.52	30	6	70	10	1	50
		235037	[illegible]	1.3	45	15	70	40	3	165
		235038	[illegible]	2.7	25	7	50	40	6	105
		235039	26	0.6	50	6	60	0	1	65
		235040	8	0.47	30	10	70	0	1	50
		235041	7	0.1	30	4	60	0	2	50
		235042	7	0.1	35	7	65	0	0	60
		235043	7	0.1	50	8	60	0	0	55
		235044	7	0.1	30	5	60	0	1	55
		235045	9	0.14	35	8	60	0	1	35
		235046	11	0.1	40	6	65	0	2	25
		235047	18	0.1	45	6	50	0	4	20
		235048	11	0.11	60	10	60	0	6	25
		235049	8	0.05	25	8	60	0	4	25
		235050	26	0.12	40	5	60	0	6	25
		235051	11	0.05	7	10	45	0	4	25
		235052	40	0.11	35	6	50	0	4	20
		235053	20	0.11	35	4	60	0	3	10
		235054	62	0.25	110	7	50	0	2	10
		235055	1380	0.25	150	10	30	0	8	20
		235057	19	0.10	15	3	4	0	4	15
		235056	1420	0.12	45	3	40	15	5	5
		235058	440	0.12	65	5	50	10	3	5
		235059	28	0.10	40	10	60	0	3	5
		235060	112	1.20	60	12	10	20	30	35
		235061	53	0.10	15	5	35	0	5	0
		235062	179	0.10	5	4	8	0	30	0
		235063	7	0.18	12	3	55	0	5	0
		235064	11	0.18	10	0	7	10	15	0
		235065	26	0.10	6	3	40	0	12	45
		235066	6	0.10	25	6	50	0	3	40
		235067	63	0.10	10	12	35	25	3	70
		235068	23	0.10	15	7	40	0	3	25
		235069	14	0.10	7	7	50	0	3	0
		235070	1300	0.10	10	10	70	0	2	25
		235071	1700	0.10	10	7	50	0	2	25
		235072	1490	0.10	5	2	40	15	4	25
		235074	1150	0.10	30	15	70	10	20	30
		235073	162	0.90	310	8	50	5	5	35
		235075	118	0.20	55	4	40	5	4	35
		235076	31	.40	95	4	30	20	7	45
		235077	200	.05	15	8	20	5	15	45
		235078	90	0.05	5	7	3	0	7	30
		235079	40	0.30	90	6	30	5	2	45
		235080	12	0.20	90	6	50	0	2	30

Appendix 2.--Drill-core log sheet, Ishmas Kabir 1--continued.

KINGDOM OF SAUDI ARABIA
Ministry of Petroleum and Mineral Resources
Directorate General of Mineral Resources

Organization: USGS

Mineral Occurrence

Drill Hole Number: Ishmas Kabir 1

References

Logged by: Bruce Walker

Scale

Date Started:
Date Completed:
Driller: ADC

Hole Size: Nx - Bx - Ax -

Survey Data

Collar Coord: Lat. Long.
Grid Reference: Elevation:

Subsurface (Tropari or:)

Depth	Inclination	Azimuth	Depth	Inclination	Azimuth

Column headings: CORE RECOVERY (RQD, %); CORE BOX; VEIN STRUCTURE (including water loss and cementation); >75% Quartz; >50<75% Quartz Vn; <50% Quartz Vn; Lithology; Oxidation; FAULTS + LITHOLOGY + ALTERATION; MINERALIZATION (L H B Cp); SAMPLE DATA

Depth (m): 120, 125, 130, 135, 140, 145, 150

RQD: 74, 100, 70, 50, 87, 95, 67, 83, 38, 90, 95, 100, 95, 33, 71, 61, 59, 51, 82, 57, 81, 100, 95, 84, 58, 85, 80, 78, 91, 51

Core recovery: 100 ... 100

Vein structure: 5cm, 72°; 62°; 55°; 2.8cm; 4mm, 35°; 6mm, 25°; 3mm, 60°; 20°; 5mm; 30°; 7mm; 6mm, 24°; 7mm; 12°; 6mm; Boudinaged vns.; 3mm; 30°; 23°; 33°; Boudinaged vns; 22°; 2.5cm; 136–140m: Veins are deformed, pinched + boudined.; Bx'd HW {2a, 2a, 2a}; Carbonate + limonite stringers cut qtz. vn.; Bx'd FW {2a}

Faults + Lithology + Alteration:

120–131m: Highly sericitized zone

8cm Mafic dike at 24°CA

Quartz diorite

Mylonite

136.3–143.8m: Highly sericitized zone proximal to lower group of main vein zone quartz veins.

75°, 2cm mafic dike.

Mylonite

Sericite knots are augen-like.

136m: folia at 33°CA; 139m: folia steepen to 50°CA; 144m: folia flatten to 40°CA

Carbonate-altered mafic dike

Mafic dike

Mylonite after quartz diorite

33°, 2cm Mafic dike

Carbonate-altered mafic dike.

Mineralization: 0.5; Tr; 3.0; 0.5; 0.5; 1.5; 1.0 0.5; 3.0; 1.0 0.5; 0.5 0 3.0; 5.0; 0.5 0.5; 0.5; 0.7; 0.1 0.1 3.0

SAMPLE DATA

Sample number	Au ppb	Ag ppm	Cu ppm	Pb ppm	Zn ppm	As ppm	Mo ppm	Te ppb
235081	6	.05	5	5	40	0	2	25
235082	3	.05	5	5	4	0	3	20
235083	54	.10	50	5	35	0	3	35
235084	105	.15	70	5	40	0	3	15
235085	16	0.16	130	5	60	0	3	30
235086	13	0.23	30	4	55	0	0	30
235087	7	0.11	30	4	50	0	3	25
235088	12	0.05	70	4	50	0	2	30
235089	10	0.10	60	4	50	0	2	5
235090	6	0.15	60	6	50	0	0	0
235091	26	0.46	100	5	50	0	0	5
235092	58	0.2	40	4	40	0	0	0
235093	48	0.18	40	4	50	0	0	0
235094	36	0.05	45	4	70	0	0	0
235095	130	0.10	40	5	200	0	0	0
235096	130	0.05	50	3	60	0	0	0
235097	17	0.10	50	6	60	0	0	0
235098	18	0.10	60	6	60	0	1	5
235099	10	0.05	30	5	60	0	1	0
235100	8	0.05	30	4	55	0	1	20
235101	23	0.10	20	7	55	0	2	15
235102	11	0.05	20	4	50	0	1	15
235103	550	0.05	30	4	60	0	0	35
235104	51	0.10	8	5	50	0	0	10
235105	6000	0.05	5	4	45	20	0	10
235106	1500	0.16	6	6	10	30	3	50
235107	61	0.05	4	6	5	0	6	0
235108	3600	0.11	4	4	10	20	3	5
235109	55	0.14	2	10	25	12	2	20
235110	2200	0.05	5	3	8	10	7	20
235111	1800	0.12	20	7	55	5	0	5
235112	16	0.11	30	5	70	0	0	10
235113	4	0	40	4	60	10	3	0
235114	4	0	40	3	70	10	9	0
235115	4	0	45	4	70	10	10	40
235116	4	0	55	4	60	10	8	25

KINGDOM OF SAUDI ARABIA
Ministry of Petroleum and Mineral Resources
Directorate General of Mineral Resources

Organization: USGS

Mineral Occurrence

Drill Hole Number: Ishmas Kabir 1

References

Logged by: Bruce Walker

Scale

Date Started:
Date Completed:
Driller: ADC

Hole Size: Nx - Bx - Ax -

Survey Data
Collar Coord: Lat. Long.
Grid Reference: Elevation:

Subsurface (Tropari or:)

Depth	Inclination	Azimuth	Depth	Inclination	Azimuth

Depth (m)	RQD	Core recovery %
150	94	100
	83	
	72	
	79	
	88	
155	89	
	21	
	92	
	100	
	95	
160	80	
	84	
	84	
	100	
	78	
165	100	
	86	
	84	
	71	
	41	
170	68	
	69	
	78	
	88	
	58	
175	34	
	79	
	91	
	32	100
	0	70
180	18	100
	100	
	100	
	72	
	88	
185	72	
	89	
	90	
	93	
	90	
190	74	
	100	
	77	
	52	
	70	
195	67	
	100	
	100	100

VEIN STRUCTURE (Including water loss and cementation): >75% Quartz; >50 <75% Quartz Vn; <50% Quartz Vn

38° 4mm
23° 5mm
25° 5mm
22° 5mm
38° 3mm
7mm 1.5cm 33°
3mm, 30°
60° 3mm
55° 4mm

Lithology; Oxidation

FAULTS + LITHOLOGY + ALTERATION

} Moderate sericitization
Mylonite foliation at 50° CA. 62°
Mylonite foliation at 80° CA.
8 Carbonate-altered mafic dike.
Moderately-to-highly sericitized.

Quartz diorite

176.8–179.3m: Sericitized.

72° Carbonate-altered mafic dike 72°

Quartz diorite.

65° Mafic dike.

MINERALIZATION

L H Py Cp

SAMPLE DATA

Sample number	Au ppb	Ag ppm	Cu ppm	Pb ppm	Zn ppm	As ppm	Mo ppm	Te ppb
235117	13	0	60	5	60	10	4	0
235118	11	0	50	4	55	10	10	0
235119	14	0	105	5	120	10	9	0
235120	4	0	35	3	80	10	4	0
235121	4	0	40	5	80	10	4	0
235122	4	0	50	5	70	10	8	0
235123	4	0	40	5	55	10	3	0
235124	4	0	70	4	60	10	4	0
235125	5	0	70	5	75	10	7	25
235126	16	0	55	3	65	10	12	0
235127	4	0	55	4	65	10	4	0
235128	5	0	45	4	50	10	6	0
235129	5	10	100	3	50	12	10	0
235130	14	0	55	8	75	10	3	0
235131	6	0	60	55	60	10	7	0
235132	7	0	35	3	55	10	4	0
235133	15	0	50	2	50	10	4	0
235134	5	0	45	5	60	10	6	0
235135	6	0	75	2	55	10	3	0
235136	14	0	50	3	50	10	7	0
235137	17	0	60	5	65	10	12	0

Appendix 2.--Drill-core log sheet, Ishmas Kabir 1--continued.

KINGDOM OF SAUDI ARABIA
Ministry of Petroleum and Mineral Resources
Directorate General of Mineral Resources

Organization: USGS

Mineral Occurrence

Drill Hole Number: Ishmas Kabir 1

References

Logged by: Bruce Walker

Scale

Date Started:
Date Completed:
Driller: ADC

Hole Size: Nx - Bx - Ax -

Survey Data

Collar Coord: Lat. Long.
Grid Reference: Elevation:

Subsurface (Tropari or:)

Depth	Inclination	Azimuth	Depth	Inclination	Azimuth

Depth	Core recovery RQD	Core recovery %	Core box	Vein structure (including water loss and cementation) >75% Quartz	50<75% Quartz Vn	<50% Quartz Vn	Lithology	Oxidation	Faults + Lithology + Alteration	Mineralization L H Py Cp	Length (m)	Interval (m)	Sample number	Au ppb	Ag ppm	Cu ppm	Pb ppm	Zn ppm	As ppm	Mo ppm	Te ppm
198	54	100				5mm															
	64	100			55°								235138	4	0	35	4	65	10	7	0
	44	100																			
	44	100											235139	25	0	10	3	75	10	–	0

EOH: 202.15m

USGS F-190

Appendix 2.--Drill-core log sheet, Ishmas Kabir 2.

KINGDOM OF SAUDI ARABIA
Ministry of Petroleum and Mineral Resources
Directorate General of Mineral Resources

Organization: USGS

Mineral Occurrence: MODS 01458

Drill Hole Number: Ishmas Kabir 2

References

Logged by: Majed Ben Talib

Summary Log

x x = Quartz diorite
v v = Mafic dike
= Mylonite
= Fault
>50% quartz = Quartz vein
>50% carbonate = Carbonate vein
>50% chlorite = Chlorite vein

Scale

Date Started:
Date Completed:
Driller: ADC
Hole Size: Nx - Bx - Ax -

Survey Data

Collar Coord: Lat. 20°52′02″N/Long. 43°13′15″E
Grid Reference:
Elevation:

Subsurface (Tropari or:)

Depth	Inclination	Azimuth	Depth	Inclination	Azimuth
10.0 m	-61°	140°			
51.0 m	-61°	140°			
105.0 m	-61°	139°			
151.0 m	-59°	139°			
200.0 m	-59°	110°			
252.0 m	-57°	133°			
299.0 m	-57°	133°			

Core recovery

Depth (m)	RQD	%
0–3		
3–4	0	0
4–5	0	85
5–6	0	81
6–7	32	100
7–8	60	100
8–9	65	100
9–10	48	100
10–11	70	100
11–12	48	100
12–13	36	100
13–14	35	85
14–15	13	93
15–16	57	100
16–17	53	100
17–18	50	100
18–19	41	100
19–20	76	100
20–21	59	100
21–22	0	100
22–23	0	69
23–24	0	75
24–25	54	100
25–26	100	100
26–27	95	100
27–28	100	100
28–29	93	100
29–30	66	100
30–31	100	100
31–32	95	100
32–33	76	100
33–34	94	100
34–35	76	100
35–36	85	100
36–37	87	100
37–38	100	100
38–39	63	100
39–40	98	100
40–41	85	100
41–42	54	100
42–43	80	100
43–44	77	100
44–45	92	100
45–46	100	100
46–47	78	100

Vein structure (including water loss and cementation)

80°

35°

2mm, 65°

50°

5mm, 50°

30° 3mm

20° 3mm

Carbonate+chlorite veins at 10° CA. 10°

80° 4mm

Chlorite stringers at 45° CA.

40° 2cm

chlorite fragments in carbonate-flooded zone adjacent to chlorite flooded zone.

Faults + Lithology + Alteration

Mixed-layer silicates: 0.0–22.7 m

12.3–15.0 m: Mafic Dike

Foliation 50° to core axis, Mylonite schist

← 20cm Fault zone

← 40cm-thick fault zone

Less altered quartz diorite at 24.0 m

1–3 mm grain size quartz diorite.

42.10–42.50 m: Deformed quartz diorite w/ calcite veins; mylonite folia subparallel to quartz vein orientation; Folia at 30° C.A.

Mineralization

No sulfides in oxidized zone.

Sample data

Sample number	Au ppb	Ag ppm	Cu ppm	Pb ppm	Zn ppm	As ppm	Mo ppm	Te ppb
235346	12	630	35	2	40	10	0	0
235347	10	0.2	40	2	50	10	2	0
235348	9	0.2	55	2	50	10	5	0
235349	10	0.1	25	4	50	10	3	0
235350	10	0.1	30	7	40	10	1	0
235351	12	0.1	30	60	35	0	3	0
235352	10	0.1	25	60	75	0	1	0
235353	11	0.1	55	40	65	0	1	0
235354	10	0.1	45	3	85	0	1	0
235355	4	0.1	50	3	50	0	3	0
235356	4	0.1	55	2	40	0	3	0
235357	0	0.1	40	3	40	0	3	0
235358	4	0.1	40	1	45	0	4	20
235359	4	0.1	45	2	50	0	3	15
235360	4	0.1	40	2	40	0	2	15
235361	4	0.1	35	3	55	0	1	20
235362	4	0.1	45	2	45	0	2	25
235363	4	0.1	45	2	50	0	2	20

KINGDOM OF SAUDI ARABIA
Ministry of Petroleum and Mineral Resources
Directorate General of Mineral Resources

Organization: USGS

Mineral Occurrence

Drill Hole Number: Ishmas Kabir 2

References

Logged by: Majed Ben Talib

Scale

Date Started:
Date Completed:
Driller: ADC

Hole Size: Nx - Bx - Ax -

Survey Data
Collar Coord: Lat. Long.
Grid Reference: Elevation:

Subsurface (Tropari or:)

Depth	Inclination	Azimuth	Depth	Inclination	Azimuth

Core recovery

Depth (m)	RQD	%
47	77	100
48	100	
49	100	
50	100	
51	90	
52	75	
53	59	
54	100	
55	100	
56	100	
57	100	
58	87	
59	97	
60	100	
61	100	
62	85	
63	91	
64	100	
65	100	
66	96	
67	100	
68	76	
69	47	
70	92	
71	94	
72	88	
73	81	
74	70	
75	77	
76	90	
77	91	
78	76	
79	95	
80	100	
81	76	
82	90	
83	90	
84	89	
85	88	
86	73	
87	70	
88	88	
89	90	
90	97	
91	82	
92	94	
93	85	
94	78	100

Vein structure (including water loss and cementation) — Quartz veins — Carbonate veins

- Chlorite stringers 50° and 40° CA.
- Chlorite + carbonate vn. at 60° CA.
- Carbonate vns. 12/m at 70° CA. (70°)
- Chlor. + carb. vns. 3/m. (55°)
- 0.15m-Thick qtz vn. at 55° CA; no sulfides. (4mm, 50°)
- Chlorite + carb. vns. 5/m, 70° CA (50°)
- 1cm, 2cm (50°, 50°)
- Chlorite vns. 8/m at 60°
- 4mm qtz. vns. w/ 0.1% pyr. (70°)
- Chl. vns. w/ pyrite at 55° CA. (30°)
- Chl. vns. 5/m at 50° CA
- Chl. vns. 6/m at 60° CA
- Chlorite veins 5/m at 55° CA
- Chl. vn. at 70° CA
- Carbonate + qtz vn., no sulfides (45°)

Faults + Lithology + Alteration

- Quartz diorite, 0.5-3.0mm grain size.
- Biotite folia are nearly parallel to vein orientation; 1 cm-thick mylonite schist in hanging wall; 0.15m-thick in footwall of vn.
- Mafic dike
- Quartz diorite

Mineralization

- Pyrite ± chalcopyrite in quartz veins
- 0.1% pyrite in chlorite veins.

SAMPLE DATA

Length (m)	Interval (m)	Sample number	Au ppb	Ag ppm	Cu ppm	Pb ppm	Zn ppm	As ppm	Mo ppm	Te ppb
		235364	4	0.1	40	1	35	0	2	15
		235365	4	0.1	45	2	80	0	2	15
		235366	4	0.1	50	0	35	10	8	0
		235367	4	0.1	45	0	40	10	4	0
		235368	4	0.1	40	0	35	10	3	0
		235369	4	0.1	50	0	45	10	5	0
		235370	4	0.1	40	0	45	0	7	0
		235371	4	0.1	55	1	45	0	5	25
		235372	4	0.1	50	0	50	0	10	25
		235373	6	0.1	65	1	60	10	9	15
		235374	4	0.1	10	0	45	0	10	10
		235375	7	0.1	40	2	55	0	5	10
		235376	4	0.1	50	2	50	0	2	10
		235377	4	0.1	45	2	50	0	2	0
		235378	4	0.1	50	2	50	0	7	0
		235379	6	0.1	55	3	55	0	1	0
		235380	4	0.1	45	1	40	0	5	0
		235381	4	0.1	45	1	45	10	2	0
		235382	4	0.1	50	3	45	10	3	0
		235383	4	0.1	50	1	45	10	4	0
		235384	4	0.1	50	1	40	0	4	5
		235385	4	0.1	40	0	40	0	2	5
		235386	4	0.1	40	4	60	0	6	0

Appendix 2.--Drill-core log sheet, Ishmas Kabir 2--continued.

KINGDOM OF SAUDI ARABIA
Ministry of Petroleum and Mineral Resources
Directorate General of Mineral Resources

Organization: USGS

Mineral Occurrence

Drill Hole Number: Ishmas Kabir 2

References

Logged by: Majed Ben Talib

Scale

Date Started:
Date Completed:
Driller: ADC

Hole Size: Nx - Bx - Ax -

Survey Data
Collar Coord: Lat. Long.
Grid Reference: Elevation:

Subsurface (Tropari or:)

Depth	Inclination	Azimuth	Depth	Inclination	Azimuth

Core recovery

Depth (m)	RQD	%
95	66	100
	71	100
	62	100
	64	100
	71	100
100	94	100
	45	65
	71	100
	76	
	74	
105	75	
	88	
	74	
	73	
	54	
110	87	
	66	
	62	
	47	
	69	
115	80	
	46	
	30	
	68	
	88	
120	78	
	88	
	50	
	81	
	86	
125	78	
	79	
	87	
	100	
	77	
130	85	
	85	
	80	
	82	
	89	
135	86	
	98	
	66	
	68	
	69	100
140		

Vein structure (including water loss and cementation)

- Chlorite+carb. vn. at 30° CA.
- Quartz+carb.+chl. vns., 3/m (30°)
- Carbonate vn. (50°)
- Carbonate veins, 5/m
- (60°)
- Carb. vns. 5/m (40°, 50°)
- Carb. vns. 8/m
- 4mm Qtz. vn. w/ Carb. at margins. (30°)
- 3.5 cm qtz. vn. at 60° CA.
- Carb. veins 12/m (60°, 80°, 60°)
- 3mm Qtz. vn. w/ pyr. (50°)
- 5mm Qtz. vn. at 30° CA. ~0.1% pyr. (40°, 30°)
- 3cm Qtz. vn. at 40° CA. (50°)
- 40 cm-thick Qtz vn. at 42° CA. (42°, 60°)
- Much carbonate veining, 15 vns./m.

Lithology

- 10 cm-thick mafic dike.
- Quartz diorite
- 109.30–109.70: Mafic dike.
- Quartz diorite
- 3cm-thick granite pegmatite dike; no sulfides.
- 126.85m–132.23m: Mafic dike w/ high percentage of carbonate alteration + much carb. veining up-hole.
- 132–135m: Mylonitization zone w/ biotite folia at 35° CA.
- 131.8–134.6 m: Sericitized quatz diorite, highly veined.
- 137–138m: Carb. altered mafic dike.

Mineralization

- Trace of chalcopyrite.
- Trace of pyrite enveloping quartz veins.
- ~1% pyrite in dike.
- 131.8–134.7m: 1–2% hematite+limonite in quartz vein zone. ~2% pyrite.
- Trace pyrite

Sample data

Sample number	Au ppb	Ag ppm	Cu ppm	Pb ppm	Zn ppm	As ppm	Mo ppm	Te ppb
235387	4	.01	40	3	40	0	7	10
235388	4	.01	60	3	50	0	4	10
235389	4	.01	110	2	35	0	2	5
235390	4	.01	55	3	40	0	5	10
235391	4	.01	50	1	45	0	2	0
235392	4	.02	45	6	60	0	6	0
235401	9	.001	35	2	50	0	5	0
235402	5	.001	20	1	55	0	5	0
235403	29	.001	45	2	45	0	5	0
235404	16	.035	40	1	50	0	5	0
235405	5	.01	35	2	50	0	8	0
235406	6	.01	50	2	50	0	8	0
235407	6	.01	35	1	50	0	7	0
235408	6	.01	35	1	60	0	3	0
235409	9	.01	45	1	60	0	3	0
235410	9	.01	40	1	60	0	2	0
235411	42	.01	45	2	50	0	4	0
235412	11	.01	25	1	55	0	4	0
235413	6	.01	30	2	60	0	2	0
235414	10	.01	35	3	60	0	1	0
235415	230	.01	8	4	75	0	1	0
235416	9	.01	30	4	65	0	1	0
235417	7	.01	15	2	85	10	2	0
235418	66	.06	8	8	60	20	2	0
235419	180	.07	6	7	40	40	9	0
235420	42	.01	30	2	30	0	5	5
235421	8	0	7	1	60	0	2	5
235422	19	0	40	2	55	0	2	0
235423	9	0	20	0	50	0	3	0
235424	6	0	50	1	50	0	5	0

Appendix 2.--Drill-core log sheet, Ishmas Kabir 2--continued.

KINGDOM OF SAUDI ARABIA
Ministry of Petroleum and Mineral Resources
Directorate General of Mineral Resources

Organization: USGS

Mineral Occurrence:

Drill Hole Number: Ishmas Kabir 2

References:

Logged by: Majed Ben Talib

Scale:

Date Started:
Date Completed:
Driller: ADC

Hole Size: Nx - Bx - Ax -

Survey Data
Collar Coord: Lat. Long.
Grid Reference: Elevation:

Subsurface (Tropari or:)

Depth	Inclination	Azimuth	Depth	Inclination	Azimuth

Depth (m)	Core recovery: RQD	Core recovery: %	Vein structure (including water loss and cementation)	Faults + Lithology + Alteration	Mineralization
140	90	100			140-144m: Trace pyrite
141	90				
142	86				
143	87		1cm Quartz vn. w/ carbonate 80°		
144	90				
145	63				
146	89			Carbonate-altered mafic dike	Pyrite ≈ 0.1 %
147	86				
148	74		1cm Qtz. vn. w/ carb. alteration 40°		
149	90				
150	98				
151	72				
152	89				
153	84			Quartz diorite	
154	70				
155	79				
156	80				
157	87				
158	85		1cm qtz. vn. 85°		
159	78				
160	87				
161	88				
162	78				
163	87				
164	79		Carb. vn. parallel to core axis.	164.0-167.82m: Carb. altered mafic dike w/ carbonate veins.	
165	90				
166	56				
167	83				
168	100				
169	70				
170	76				
171	87				
172	77				
173	84				
174	94				
175	61				
176	90				
177	100		60°		
178	91				
179	87				
180	71				
181	85				
182	72		Carb. veins 6/m 80°		
183	94		Carb. + chl. veins 4/m 80°		
184	60	100	Carb. vns. 7/m		

Sample Data

Sample number	Au ppb	Ag ppm	Cu ppm	Pb ppm	Zn ppm	As ppm	Mo ppm	Te ppb
235425	6	0	40	1	50	0	2	0
235426	5	0	60	2	40	0	4	10
235427	14	0.2	300	2	20	0	12	15
235428	10	0.1	60	1	40	0	4	0
235429	6	0.1	35	0	40	0	6	0
235430	6	0	70	0	40	0	4	0
235431	7	0	30	1	45	0	3	0
235432	9	0	30	2	40	0	2	0
235433	9	0	35	2	45	0	4	0
235434	9	0	25	3	40	0	4	0
235435	10	0	15	4	75	0	2	0
235436	9	0	30	5	70	0	1	0
235437	11	0	40	7	60	0	3	0
235438	11	0	30	4	65	0	1	0
235439	12	0	30	4	25	0	6	0
235440	10	0	20	2	45	0	2	0
235441	8	0.1	20	10	40	0	4	0
235442	11	0.1	50	10	45	0	2	0
235443	10	0.1	30	10	45	0	2	0
235444	9	0.1	20	10	45	0	6	0
235445	13	0	30	10	50	0	5	0
235416	12	0	30	11	55	0	3	0

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Appendix 2.--Drill-core log sheet, Ishmas Kabir 2--continued.

KINGDOM OF SAUDI ARABIA
Ministry of Petroleum and Mineral Resources
Directorate General of Mineral Resources

Organization: USGS

Mineral Occurrence

Drill Hole Number: Ishmas Kabir 2

References

Logged by: Majed Ben Talib

Scale

Date Started: | Hole Size: Nx - | Bx - | Ax -
Date Completed:
Driller: ADC

Survey Data
Collar Coord: Lat. Long.
Grid Reference: Elevation:

Subsurface (Tropari or:)
Depth Inclination Azimuth | Depth Inclination Azimuth

Depth (m)	Core recovery: RQD	Core recovery: %	Core box	Vein structure (including water loss and cementation)	Faults + Lithology + Alteration	Mineralization
185	89	100		Carb. vns. 7/m; Carb. vns. 6/m		
	84			5mm qtz. vn., no sulfides.		
	96			0.5m qtz. vn.; whole 0.2m is brecciated w/ carb.+chlor. matrix surrounding qtz. fragments.	187.3–187.7 m: Sericitized zone. Mylonite ~0.1m thick in 0.5m thick quartz vein (b'x'd) footwall, folia subparallel to qtz. vns.	187.3–187.85m: 0.1% Pyr.
	100					
	67			Carb. vn. parallel to core axis.	188.5–190.5m: Mylonite schist w/ folia at 10° CA.	
190	79					
	57			Carb. vns. 8/m		
	88					
	89			Carb. vns. 6/m.	Quartz diorite	
	100			Carb. vns. 10/m		
195	79					
	32					
	89			Carb. vns. 7/m.		
	51					
200	71			Carb. vns. 4/m.		
	82					
	83					
	77			Carb. vns. 6/m.		
	63			Carb. vns. 5/m.		
	62					
205	54					
	93			Carb. vns. 7/m.		
	98			Carb. vn. w/ trace pyrite+chalcopyr., 30/m.		Trace of pyrite in carbonate veins.
	100					
210	81			Carb. vns. 10/m		
	88					
	95					
	57					
	76					
215	81			0.5cm Qtz. vn.	Quartz diorite	
	74			Carb. vns. 5/m.		
	100					
	93					
	90					
	76					
220	79					
	99					
	100			0.5cm Qtz. vns. 5/m.		
	99				Carbonate-altered zone.	
	98			1.5cm Qtz. vns. w/ 2% pyr.		
225	92			Carb. vns. 20/m.	Mafic dike w/ sulfides.	~2% pyrite (+cp?) from 224.5–226.5m.
	68					
	61					
	99					
230	80	100			Quartz diorite	

SAMPLE DATA

Sample number	Au ppb	Ag ppm	Cu ppm	Pb ppm	Zn ppm	As ppm	Mo ppm	Te ppb
235447	8	0	50	11	55	0	1	0
235448	9	0	25	10	60	0	1	0
235449	17	0	30	8	50	0	6	65
235450	6	0	20	7	65	0	1	0
235451	6	0	10	10	60	0	2	0
235452	8	0	25	10	60	0	3	0
235453	15	0.1	90	9	60	0	2	0
235454	10	0.1	100	9	55	0	3	0
235455	10	0.12	300	9	55	0	3	0
235456	7	0	12	10	50	0	2	0
235457	6	0	25	10	55	0	2	0
235458	6	0.1	40	10	55	0	2	0
235459	6	0	30	10	60	0	3	0
235460	4	0	25	10	50	0	6	0
235461	5	0.1	60	10	45	0	6	0
235462	5	0.1	140	10	45	0	4	0
235463	7	0.12	150	15	40	0	3	0
235464	6	0	80	9	40	0	3	0
235465	9	0	140	10	45	0	5	0
235466	5	0	15	10	40	0	4	0
235467	34	0.11	30	10	35	0	3	0
235468	131	0	20	10	50	15	4	10
235469	7	0	10	9	50	0	3	0

Appendix 2.--Drill-core log sheet, Ishmas Kabir 2--continued.

KINGDOM OF SAUDI ARABIA
Ministry of Petroleum and Mineral Resources
Directorate General of Mineral Resources

Organization: USGS

Mineral Occurrence

Drill Hole Number: Ishmas Kabir 2

References

Logged by: Majed Ben Talib

Scale

Date Started:
Date Completed:
Driller: ADC

Hole Size: Nx - Bx - Ax -

Survey Data
Collar Coord: Lat. Long.
Grid Reference: Elevation:

Subsurface (Tropari or:)

Depth	Inclination	Azimuth	Depth	Inclination	Azimuth

Depth	Core recovery: RQD	%	Vein structure (including water loss and cementation)	Quartz veins	Carbonate veins	Faults + Lithology + Alteration	Mineralization
230	96	100					
	97						
	94						
	98						
	99						
235	83		1.5cm Carb. vn.		50°		
	92		Chlorite+carb. vns. at 60° and 0°.				
	87						
	100					Relatively unaltered quartz diorite.	
	100						
240	91						
	96		4mm Qtz vn.				
	83						
	85		Carb. vns. 16/m.		45°		
	49						Trace pyrite.
245	57					Carbonate-altered mafic dike.	
	92						
	98						
	87						
	73						
250	83						
	88						
	100						
	94						
	86						
255	89						
	92						
	87						
	94						
260	88		No veins				
	34						
	45						
	79	100					
265						Quartz diorite	
270							
275							

SAMPLE DATA

Sample number	Au ppb	Ag ppm	Cu ppm	Pb ppm	Zn ppm	As ppm	Mo ppm	Te ppb
235470	6	0	15	7	35	0	2	0
235471	6	0	50	8	40	0	6	0
235475	4	0	20	9	45	0	3	0
235476	4	0	15	9	45	0	2	0
235477	4	0	25	10	55	0	3	0
235478	4	0	30	9	60	0	4	0
235479	13	0	40	9	50	0	2	0
235480	10	0	250	9	45	0	6	0
235481	5	0	50	9	40	0	6	0
235482	6	0	25	8	30	0	2	0
235483	4	0	50	8	30	0	2	10
235484	4	0	25	7	30	0	7	5
235485	5	0	30	9	30	0	4	15
235486	4	0	35	8	25	0	2	10
235487	7	0	50	9	25	0	5	5
235488	4	0	35	8	35	0	5	10

Appendix 2.--Drill-core log sheet, Ishmas Kabir 2--continued.

KINGDOM OF SAUDI ARABIA
Ministry of Petroleum and Mineral Resources
Directorate General of Mineral Resources

Organization: USGS

Mineral Occurrence

Drill Hole Number: Ishmas Kabir 2

References

Logged by: Majed Ben Talib

Scale

Date Started:
Date Completed:
Driller: ADC

Hole Size: Nx -
Bx -
Ax -

Survey Data

Collar Coord: Lat. Long.
Grid Reference: Elevation:

Subsurface (Tropari or:)

Depth	Inclination	Azimuth	Depth	Inclination	Azimuth

Depth (m)	Core recovery	Core box	Vein structure (including water loss and cementation)	Quartz veins	Carbonate veins	Lithology	Oxidation	Faults + Lithology + Alteration	Mineralization
275									
280								Quartz diorite	
283–284					30°				
285									
287			Carb. vns. 10/m						
288								Mafic dike 287.75-288.92m.	
289								Mafic dike 289.15-289.45m.	
290									
292								Quartz diorite	
295			2cm-thick qtz. vn.	50°					
298			1.8cm qtz. vn.	40°					
300								E.O.H. 300.10m	

SAMPLE DATA

Length (m)	Interval (m)	Sample number	Au ppb	Ag ppm	Cu ppm	Pb ppm	Zn ppm	As ppm	Mo ppm	Te ppb
		235489	5	0	35	8	40	0	6	0
		235490	7	0	40	10	45	0	7	5
		235491	10							10
		235492	5	0	40	9	45	0	3	0
		235493	7	0	30	8	45	0	4	10
		235494	10	0	65	9	50	0	5	0
		235495	8	0	50	8	45	0	1	5
		235496	6	0	40	10	45	0	5	0
		235497	4	0	35	9	40	0	4	0
		235498	4	0	30	8	40	0	6	0
		235499	14	0	25	10	40	0	2	0

Appendix 2.--Drill-core log sheet, Ishmas Kabir 3.

KINGDOM OF SAUDI ARABIA
Ministry of Petroleum and Mineral Resources
Directorate General of Mineral Resources

Organization: USGS

Mineral Occurrence

Drill Hole Number: ISHMAS KABIR 3

References

Logged by: MOHAMED. B. EL KOMI

SUMMARY LOG

x x x = Quartz diorite
v v v = Mafic dike
~ ~ ~ = Mylonite
>50% quartz = Quartz vein
>50% Carbonate = Carbonate vein
>50% chlorite = chlorite vein

L = Limonite
H = Hematite
Py = Pyrite
AP = Arsenopyrite

Scale

Date Started:
Date Completed:
Driller: ADC

Hole Size: Nx - Bx - Ax -

Survey Data

Collar Coord: Lat. Long.
Grid Reference: Elevation:

Subsurface (Tropari or:)

Depth	Inclination	Azimuth	Depth	Inclination	Azimuth
10.0m	-45°	132°			
50.0m	-46°	134°			
101.5m	-47°	136°			
150.0m	-48°	136°			
199.45m	-54°	143°			

CORE RECOVERY

RQD	%
0	65
0	100
0	100
0	100
0	100
0	100
0	100
15	100
14	100
0	100
.06	80
60	100
36	100
0	13
0	40
0	50
0	36
0	35
0	100
0	64
0	39
10	85
16	46
0	34
0	42
13	42
100	100
100	100
89	100
42	100
74	100
75	100
86	100
74	100
94	100
86	100
91	100
65	100
61	100
80	100
100	100
90	100
56	100
0	100
62	100

Columns: CORE BOX | VEIN STRUCTURE (Including water loss and cementation) | Quartz Vein | Carbonate veins | Lithology | Oxidation | Weathering | FAULTS + LITHOLOGY ALTERATION | MINERALIZATION | SAMPLE DATA

VEIN STRUCTURE

22-25.5m Extensive Carbonate veining 10-20-45° to C/A 1-3mm thick

2.5cm 90°

2cm 45°

FAULTS + LITHOLOGY ALTERATION

0-3.0m No Core Recovery - Soil & clay Sample.

3.0-15.0m highly altered Mixed Zone of Qz-diorite + Argillized materials

16.0-36.5m less altered to Fresh Qz-diorite-coars grain 2.5-4.5mm

36.50m-48.0m fine grain diorite .5-1.5mm brit grain ≃ 90° to C/A.

MINERALIZATION

Zone of oxidation no sulphide occurrences.

18.00 END OF THE OXIDIZED ZONE

Pyrite is the main sulphide tiny crystals disseminated in the Rk. (<1%)

Pyrite Concentrated on the edges of the Qz & Carb veins .2% average

SAMPLE DATA

Sample Number	Au ppb	Ag ppm	Cu ppm	Pb ppm	Zn ppm	As ppm	Averages
235393	70	.22	16	5	40	10	
235394	70	.10	40	4	55	10	
235395	60	.32	22	5	50	10	
235396	40	.17	30	7	60	10	
235397	5.0	.34	40	8	45	10	
235398	5.0	.30	40	7	45	10	
235399	100	.20	65	3	50	15	
235400	70	.10	35	4	50	15	
235472	60	.10	10	3	40	20	
235473	5.0	.10	15	3	40	20	
235474	40	.10	15	4	25	15	
235500	70	.10	20	22	36	0	
235501	50	.10	20	20	30	0	
235502	60	.10	30	23	40	0	
235503	70	.12	81	21	50	0	

Appendix 2.--Drill-core log sheet, Ishmas Kabir 3--continued.

KINGDOM OF SAUDI ARABIA
Ministry of Petroleum and Mineral Resources
Directorate General of Mineral Resources

Organization

Mineral Occurrence

Drill Hole Number:

References

Logged by:

Scale

Date Started: | Hole Size: Nx -
Date Completed: | Bx -
Driller: ADC | Ax -

Survey Data

Collar Coord: Lat. Long.
Grid Reference: Elevation:

Subsurface (Tropari or:)

Depth	Inclination	Azimuth	Depth	Inclination	Azimuth

Core recovery

Depth (m)	RQD	%
	17	100
50	70	100
	75	100
	84	100
	73	100
	58	100
55	69	100
	88	100
	97	100
	87	100
	92	100
	86	100
60	100	100
	100	100
	100	100
	69	100
65	54	100
	93	100
	100	100
	79	100
	97	100
70	90	100
	90	100
	89	100
	100	100
	69	100
75	100	100
	88	100
	100	100
	76	100
	30	100
80	83	100
	100	100
	62	100
	77	100
	100	100
85	72	100
	34	100
	94	100
	84	100
	85	100
90	86	100
	73	100
	92	100
	73	100
	95	100
95	82	100
	71	100

Vein structure (including water loss and cementation)

- 52.00 Q_z >2mm — Quartz veins: 45°
- 59.00 Carb vein 10° to c/A with chlorites — Carbonate vein: 10°
- Carb at 64.70m with Q_z gt in between — Carbonate vein: 41°
- 70.00m Carb filling 21°–40° to c/A <3mm thick — Carbonate vein: 21°, 40°, 35°
- 74.10m Q_z 4mm 0°
- 90.00m Q_z >3mm with Extenssive chl on edges 55° to c/A — Quartz veins: 55°

Faults + Lithology + Alteration

- 50.0m – 53.0m chl & Epid inclusions 3mm – 1cm can be seen
- 58.40 – 62.00 m Extenssive Zenolithes of chl + Epid (4mm – 2 cm) within the Coars grain diorite
- 77.50m Q_z diorite fin grain
- 80.00 – 81.60m mafic dyke with small Zenolith of chl & Epid + some brecciated grains.
- 86.0 – 86.50 Mafic dyke

Mineralization

- 78.50 m .01% of the sulphides is Arsenopy
- 94.50 m Extensive zone of Pyrite 9%

Sample data

Sample number	Au ppb	Ag ppb	Cu ppb	Pb ppb	Zn ppb	As ppb	Averages
235504	5	.12	50	22	50	0	
235505	6	.10	45	18	50	0	
235506	7	.10	100	20	55	0	
235507	7	.10	130	20	54	6	
235508	8	.10	110	20	30	0	
235509	6	.10	50	20	40	0	
235510	6	.10	50	23	20	0	
235511	6	.10	50	20	35	0	
235512	4	.10	45	20	45	0	
235513	8	.10	25	24	45	0	
235514	4	.10	40	20	50	0	
235515	6	.10	100	20	55	0	
235516	4	.10	20	18	50	0	
235517	5	.10	60	20	70	0	
235518	9	.10	100	20	60	0	
235519	5	.10	40	28	50	0	
235520	6	.10	20	22	60	0	
235521	7	.10	25	22	90	0	
235522	7	.13	22	22	50	0	
235523	7	.15	35	20	50	0	
235524	6	.10	45	21	50	0	
235525	40	.10	30	26	70	0	

KINGDOM OF SAUDI ARABIA
Ministry of Petroleum and Mineral Resources
Directorate General of Mineral Resources

Organization: USGS

Mineral Occurrence: ISHMAS KABIR

Drill Hole Number: # 3

References:

Logged by: EL-KOMI M B

Scale

Date Started:
Date Completed:
Driller: ADC

Hole Size: Nx - Bx - Ax -

Survey Data
Collar Coord: Lat. Long.
Grid Reference: Elevation:

Subsurface (Tropari or:)

Depth	Inclination	Azimuth	Depth	Inclination	Azimuth

Depth (m)	Core recovery RQD	Core recovery %	Vein structure (including water loss and cementation)	Faults / Lithology / Alteration	Mineralization (L, H, PY, AP)	Sample number	Au ppb	Ag ppm	Cu ppm	Pb ppm	Zn ppm	As ppm
96	65	80		2m of mafic dyke	9% Concentrated on the vein edges.	235526	9	.10	30	24	65	0
	74	100				235527	7	.10	60	30	50	0
	[illegible]	100				235528	7	.10	50	21	50	0
	62	100										
100	45	100				235529	5	.50	40	20	45	0
	67	100										
	82	100										
	80	100	104.0–106.0 m Qz veins average of 1-3 cm thick 20°–48° to C/A with Py on the Edges			235530	4	.10	30	20	45	0
	100	100										
105	94	100		98.0–126.0 m Fin grained diorite with chlorite & Serecite as the main alteration. Some chl and Epid inclusions of 5mm–3cm Long is present.								
	55	100			3%	235531	4	.10	30	19	40	0
	100	100										
	91	100	108.50 m Carb vein 45° to C/A									
	77	100				235532	5	.10	50	20	45	0
110	91	100										
	85	100										
	99	100				235533	5	.10	100	19	50	0
	51	100										
	84	100										
115	70	100				235534	5	.10	35	20	60	0
	100	100										
	100	100										
	81	100				235535	4	.10	30	19	45	0
120	63	100										
	93	100										
	100	100				235536	4	.10	6	18	30	0
	87	100										
	64	100	123.90 m 3 set of Carb veins 35° to C/A & Parallel to each other.									
125	92	100				235537	6	.10	20	20	50	0
	58	100		126.0 m Fairly Coars grain diorite with Carbonates filling fractures.								
	100	100										
	90	100				235538	4	.10	40	23	50	0
	93	100										
130	100	100										
	77	100				235539	4	.10	115	23	50	0
	54	100		at 132.0–134.0 m Large Zenolith of very fin gr. Chl with no sulphids.								
	61	100										
	41	100				235540	5	.10	60	20	60	0
135	60	100										
	56	100										
	80	100				235541	4	.10	30	17	45	0
	82	100		138.0 m Fin grain diorite (.5–1.5 mm) with Zenoliths Smaller in Size 2–4 mm + Sulphide Concentrates								
	60	100										
140	79	100	140.0 m Carb & Qz veins at 10° to C/A + Py in between Pyrite Crystals		on the RK Fract	235542	5	.10	110	18	45	0
	87	100										
	85	100										
	100	100				234543	8	.10	25	18	50	0
	66	100										

Appendix 2.--Drill-core log sheet, Ishmas Kabir 3--continued.

KINGDOM OF SAUDI ARABIA
Ministry of Petroleum and Mineral Resources
Directorate General of Mineral Resources

Organization: USGS

Mineral Occurrence: ISHMAS KABIR

Drill Hole Number: #3

References

Logged by: EL-KOMI M B

Scale

Date Started:
Date Completed:
Driller: ADC

Hole Size: Nx - Bx - Ax -

Survey Data
Collar Coord: Lat. Long.
Grid Reference: Elevation:

Subsurface (Tropari or:)

Depth	Inclination	Azimuth	Depth	Inclination	Azimuth

Depth	Core recovery RQD	Core recovery %	Core box	Vein structure (including water loss and cementation)	Faults + Lithology + Alterations	Mineralization L, H, Py, AP.	Sample number	Au ppb	Ag ppm	Cu ppm	Pb ppm	Zn ppm	Cd ppm	Averages
144														
145	100	100			144.0–154.0 m Fairly Coars grain diorite									
	70	100					235540	5	.10	30	20	50	0	
	[illegible]	100												
	71	100												
	100	100					235545	5	.10	50	17	50	0	
150	98	100												
	78	100					235546	5	.10	55	17	50	0	
	42	100												
	80	100												
	95	100		154.0–157.0 m Carb veins within the mafic unit 30°–41° to C/A	154.0–157.0 m Mafic dyke Mixed with dioritic unit + Biotite foliated ≃ 90° to C/A		235547	5	.10	60	20	55	0	
155	50	100												
	53	100					235548	5	.10	35	23	70	0	
	07	100												
	71	100												
	70	100			Fairly fine grain diorite at 159.0 m Rich in felsic materials		235549	4	.10	60	20	50	0	
160	49	100				8% Py disemnated in the RK. Concent on Px Fractures	235550	17	.12	55	20	85	0	
	17	100					235551	6	.10	85	24	55	0	
	02	100					235552	7	.10	40	26	80	0	
	34	100												
	46	100					235553	7	.10	40	23	75	0	
165	38	100		165.0 m–169.0 m Extenssive Zone of Carbonate veinig range from 10–50° to C/A with (Py) Association										
	49	100			165.50–168.0 m Mixed Unit diorit + Mafic Materials									
	84	100					235554	5	.10	40	20	70	0	
	75	100												
	97	100												
170	58	100					235555	4	.10	50	17	50	0	
	85	85												
	100	100												
	62	100					235556	5	.10	50	17	55	0	
	83	100												
175	61	100												
	76	100			177.0 m inclusions of chlorite & Epid ≃ 2 cm long.		235557	5	.10	50	19	55	0	
	84	100												
	32	100			178.0–180.0 m Mafic unite.		235558	5	.10	50	22	65	0	
	98	100					235559	7	.10	40	17	70	0	
180	100	100												
	100	100												
	92	100		182.0–184.50 m Qz veins of 2 cm thick & 30° to C/A + (Py)			235560	7	.10	20	2	70	0	
	88	100												
	71	100												
185	59	100					235561	39	.10	25	2	50	0	
	63	100			diorite & mafic dyke at 186–186.50 m + Pyrite desemnation in a very tiny Crystals									
	64	100												
	61	100					235562	9	.10	20	2	60	0	
	95	100												
190	91	100					235563	14	.10	30	1	50	0	
	52	100												
	100	100					235564	14	.10	50	2	60	0	

Appendix 2.--Drill-core log sheet, Ishmas Kabir 3--continued.

KINGDOM OF SAUDI ARABIA
Ministry of Petroleum and Mineral Resources
Directorate General of Mineral Resources

Organization: USGS

Mineral Occurrence: ISHMAS KABIR

Drill Hole Number: #3

References

Logged by: EL-KOMI M B

Scale

Date Started:
Date Completed:
Driller: ADC

Hole Size: Nx - Bx - Ax -

Survey Data

Collar Coord: Lat. Long.

Grid Reference: Elevation:

Subsurface (Tropari or:)

Depth	Inclination	Azimuth	Depth	Inclination	Azimuth

Depth	Core recovery: RQD	Core recovery: %	Core box	Vein structure (including water loss and cementation)	Quartz veins	Carbonate veins	Lithology	Faults + Lithology + Alteration	Mineralization: L, H, PY, AP	Length (m)	Interval (m)	Sample number	Au ppb	Ag ppm	Cu ppm	Pb ppm	Zn ppm	As ppm	Averages
192	100	100		192 m - 199.65 m			x	192 m - 199.65 m Fairly Coars											
	100	100		mainly Qz & Carb	30	45	x	grain diorite grain size				235565	7	1/10	55	2	60	0	
195	100	100		veins Qz veins			x	increas down hole											
	100	100		of 1-1.5 cm thick	60	30	x	Alteration of											
	100	100		at 20-35% c/A	45	30	x	serecite is present.				235566	6	1/10	55	2	60	0	
	87	100		Carb >2 mm			x												
	37	100		of 30-50 to	55	45	x					235567	7	1/10	55	3	65	0	
199.65	15	100		c/A.			x												
200								E.O.H											

Appendix 2.--Drill-core log sheet, Ishmas Kabir 4.

KINGDOM OF SAUDI ARABIA
Ministry of Petroleum and Mineral Resources
Directorate General of Mineral Resources

Organization: USGS

Mineral Occurrence: MODS 01458

Drill Hole Number: Ishmas Kabir 4

References

Logged by: Majed Ben Talib

SUMMARY LOG

- x x Quartz diorite
- v v Mafic dike
- + + Granitic pegmatite dike
- △ △ Autoclastic hydrothermal breccia
- —·— Fault
- >50 % Quartz vein
- ≤50 % Quartz vein (≥50 % Carbonate ± chlorite)

Date Started:
Date Completed:
Driller: ADC
Hole Size: Nx - Bx - Ax -

Survey Data
Collar Coord: Lat. Long.
Grid Reference:
Elevation:

Subsurface (Tropari or:)

Depth	Inclination	Azimuth
50.0m	-60°	139°
108.0m	-62°	139°
149.25m	-62°	120°
200.0m	-62°	135°
251.0m	-62°	136°
321.0m	-62°	130°

Depth	Inclination	Azimuth

Core recovery

Depth (m)	RQD	%
0–2	No core recovery	
2–3	0	50
3–4	0	50
4–5	0	70
5–6	0	90
6–7	0	90
7–8	0	100
8–9	0	95
9–10	0	95
10–11	62	100
11–12	68	100
12–13	47	100
13–14	40	100
14–15	89	95
15–16	0	30
16–17	0	30
17–18	15	30
18–19	20	100
19–20	30	90
20–21	15	100
21–22	0	
22–23	60	
23–24	0	
24–25	59	
25–26	24	
26–27	0	
27–28	42	
28–29	75	
29–30	60	
30–31	0	
31–32	21	
32–33	54	
33–34	48	
34–35	93	
35–36	94	
36–37	39	
37–38	71	
38–39	45	
39–40	95	
40–41	67	
41–42	60	
42–43	0	
43–44	79	
44–45	94	100

Columns: Core Box; Vein Structure (Including water loss and cementation); >50% Quartz Vn; <50% Quartz Vn; Lithology; Oxidation/Weathering; Scale; Faults + Lithology + Alteration; Mineralization (L H R).

Vein structure, faults, lithology and alteration (by depth)

- 0–2 m: No Core Recovery
- 0–26m: Zone of mixed-layer silicates/oxidation
- ~11 m: 83° 2mm
- ~12 m: Quartz diorite
- ~19 m: GR PEGMATITE
- ~30 m: GR. PEG.
- ~33–36 m: Carb. + chl. ± qtz veins {44° 3mm; 42° 5mm; 36° 3mm; 44° 2mm}
- 36.5–40.5m: No veins
- ~36.5 m: 15cm GR. PEG.
- ~40 m: Quartz diorite
- ~41 m: 4mm 33°
- ~45 m: 34°

SAMPLE DATA

Sample number	Au ppb	Ag ppm	Cu ppm	Pb ppm	Zn ppm	As ppm	Mo ppm	Te ppb
235140	4	0	30	2	48	10	1	0
235141	4	0	35	2	39	10	2	0
235142	4	0	40	3	46	10	0	0
235143	4	0	35	2	41	10	3	0
235144	4	0	35	1	42	10	2	0
235145	4	0	40	2	55	10	2	0
235146	4	0	35	3	45	10	1	0
235147	5	01	50	2	45	10	3	0
235148	4	0	25	1	28	10	2	0
235149	4	0	30	3	55	15	5	0
235150	4	0	50	2	60	10	4	0
235151	16	0	20	2	32	10	4	0
235152	4	0	25	2	28	10	0	0
235153	6	01	35	3	43	0	2	10
235154	4	01	15	4	44	0	4	10

Appendix 2.--Drill-core log sheet, Ishmas Kabir 4--continued.

KINGDOM OF SAUDI ARABIA
Ministry of Petroleum and Mineral Resources
Directorate General of Mineral Resources

Organization: USGS

Mineral Occurrence

Drill Hole Number: Ishmas Kabir 4

References

Logged by: Majed Ben Talib

Scale

Date Started:
Date Completed:
Driller: ADC

Hole Size: Nx - Bx - Ax -

Survey Date

Collar Coord: Lat. Long.
Grid Reference: Elevation:

Subsurface (Tropari or:)

Depth	Inclination	Azimuth	Depth	Inclination	Azimuth

Depth (m)	Core recovery RQD	Core recovery %	Core box	Vein structure (including water loss and cementation)	>50% Quartz	<50% Quartz	Faults + Lithology + Alteration	Mineralization (L H Br.)	Length (m)	Interval (m)	Sample number	Au ppb	Ag ppm	Cu ppm	Pb ppm	Zn ppm	As ppm	Mo ppm	Te ppb
45	55	100																	
	65						Mafic dike				235155	4	0.1	40	2	42	0	4	15
	86																		
	97			3mm, 32°CA															
	98										235156	6	0.1	30	0	55	0	4	20
50	98						51°, 8cm GR. PEG. Dike												
	71																		
	70										235157	7	0.1	22	0	50	0	3	20
	82						Mafic dike												
	56																		
55	72										235158	8	0.1	40	0	60	0	1	10
	64																		
	87			2mm, 90°CA			Mafic dike				235159	6	0.1	22	0	75	0	5	15
	90						85°CA				235160	6	0.1	55	0	70	0	16	0
	63										235161	8	0.1	90	0	60	0	8	0
60	55																		
	80										235162	7	0.1	30	0	40	0	5	0
	100						Quartz diorite.												
	100																		
	100										235163	7	0.1	30	0	40	0	1	0
65	67																		
	51																		
	91										235164	8	0.1	25	0	40	0	1	0
	100						3cm GR. PEG. at 28°CA CUT BY CARBONATE VEIN AT 82°CA.												
	93						5° Mafic dike.												
70	82			4mm, 57°CA							235165	6	0.1	60	0	75	0	7	35
	76																		
	91										235166	5	0.1	80	2	65	0	3	15
	80										235167	6	0.1	55	2	55	0	3	15
	89			3mm, 60°CA			Quartz diorite				235168	5	0.1	40	3	55	0	8	15
75	100										235169	4	0.1	10	2	65	0	1	25
	88			5mm, 75°CA				0.2			235170	6	0.1	95	3	60	0	2	30
	85			5mm, 35°CA		1.5cm 90°					235171	5	0.1	30	4	60	0	4	25
	80				45°	1.2cm		1.5			235172	8	0.1	65	3	60	0	2	30
	67			3mm, 58°CA; 4cm, 55°CA							235173	10	0.1	50	2	60	0	5	35
80	82				55°	0.5cm	79.9–85.3m: Beginning of autoclastic hydrothermal breccia zone – slightly disrupted, angular breccia fragments in veined sequence.	0.4			235174	9	0.1	20	2	60	0	3	25
	76				50°	0.5cm					235175	5	0.1	5	3	50	0	4	25
	100			Carb.+chl. vns	60°; 55°	2mm; 1cm					235176	13	0.1	13	2	80	0	1	15
	100				50°	4mm	2cm 10° GR dike (though going, not brecciated, does not cut matrix).	7.0			235177	14	0.1	42	3	75	0	1	15
	93			14mm, 88°CA				Pyrite in stringers & alteration.			235178	15	0.1	55	2	45	0	6	10
85	93										235179	19	0.1	25	1	50	0	1	15
	100							Py. in clasts as dissem- inations & in matrix as crystals (equal proportions).			235180	15	0.1	27	2	45	0	4	20
	88						(see description on next page).				235181	15	0.1	52	5	45	10	5	30
	85										235182	24	0.1	25	2	45	0	6	20
	92	100						7.0			235183	31	0.1	20	4	40	0	6	20
90																			

Appendix 2.--Drill-core log sheet, Ishmas Kabir 4--continued.

KINGDOM OF SAUDI ARABIA
Ministry of Petroleum and Mineral Resources
Directorate General of Mineral Resources

Organization: USGS

Mineral Occurrence

Drill Hole Number: Ishmas Kabir 4

References

Logged by: Majed Ben Talib

Scale

Date Started:
Date Completed:
Driller: ADC

Hole Size: Nx - Bx - Ax -

Survey Data
Collar Coord: Lat. Long.
Grid Reference: Elevation:

Subsurface (Tropari or:)

Depth	Inclination	Azimuth	Depth	Inclination	Azimuth

Depth (m)	Core recovery RQD	Core recovery %	Vein structure (including water loss and cementation)	>50% Quartz	<50% Quartz	Faults + Lithology + Alteration	Mineralization (Py)	Sample number	Au PPb	Ag PPm	Cu PPm	Pb PPm	Zn PPm	As PPm	Mo PPm	Te PPb
90	66	100	8mm, 50°	—		7cm-sized fragment of mafic dike.		235184	16	0.1	22	3	45	0	8	10
	89						7.0	235185	33	0.1	27	2	40	10	5	10
	76							235186	15	0.1	20	2	65	10	3	10
	100						10.0 / 2.0	235187	11	0.1	12	2	65	10	2	0
	84		4mm, 24°		—		0 / 2.0	235188	24	0.1	10	5	65	10	1	10
95	98						5.0	235189	26	0.1	15	0	50	10	5	0
	85					85.3-113.3m: Auto-clastic, hydrothermal breccia consisting of angular clasts >1.0cm sized. No comminution of fragments noted. Matrix (15-20% by volume) is vein-like w/ varying proportions of carbonate minerals (dominant phase), quartz crystals and significant chlorite. Pyrite crystals are present in matrix (to ~3.0mm, maximum). Clasts typically are quartz diorite containing sericite cores and carbonate-chlorite rims; all clasts are altered. Two 1cm-sized quartz vein fragments were noted. Pyrite disseminations in clasts are <1.0mm in size. Pyrite is equally distributed between matrix and clasts.	7.0	235190	35	0.1	35	0	45	10	5	0
	85							235191	36	0.1	66	2	55	10	1	15
	100							235192	27	0.2	122	3	70	10	5	50
	100						5.0	235193	19	0.1	40	2	60	10	1	25
100	89							235194	84	0.1	35	2	55	15	4	20
	97							235195	22	0.1	40	2	60	10	6	40
	85						2.0	235196	18	0.1	70	8	60	10	4	35
	77						5.0	235197	7	0.1	7	2	75	0	4	10
	53							235198	7	0.1	7	2	85	0	3	20
105	56						2.0	235199	10	0.1	10	2	75	0	2	25
	91							235200	16	0.12	100	1	60	0	5	35
	100						5.0	235201	10	0.1	45	2	60	0	5	10
	80							235202	9	0.1	40	1	55	0	5	20
	84							235203	19	0.1	22	1	50	0	5	20
110	71						2.0%	235204	8	0.1	10	2	65	0	3	25
	100							235205	16	0.1	12	2	45	0	4	20
	95		Possible through-going chlorite + pyrite stringers in breccia.					235206	23	0.14	50	2	40	0	3	15
	100						7.0	235207	25	0.1	50	1	40	0	4	30
	76						1.0	235208	54	0.42	300	2	50	0	3	30
115	96						0.1	235209	15	0.26	220	2	70	0	2	30
	79							235210	4	0.1	15	4	60	0	4	30
	82							235211	4	0.1	50	4	60	0	3	30
	85		4mm, 55°CA	—				235212	4	0.1	20	2	50	0	2	30
	82		8mm, 65°CA		—			235213	4	0.1	13	2	50	0	2	40
120	95		1cm	—				235214	4	0.1	10	2	50	0	4	35
	100		4mm, 33° CA; 3mm, 33°		—			235215	4	0.1	7	2	50	0	6	30
	89		9mm, 65° CA; 4mm, 55°		—	Quartz diorite		235216	5	0.1	6	2	45	0	5	30
	68							235217	4	0.1	8	3	50	0	9	35
	92							235218	4	0.1	25	2	50	0	2	45
125	75		3.5cm, 25°	—				235219	4	0.1	30	2	45	0	3	40
	100		2cm, 30° CA	—	90°			235220	4	0.1	30	2	35	0	4	35
	96															
	100		3mm, 70°CA		—											
	79															
130	25							235221	4	0.1	30	2	35	0	2	40
	51															
	74															
	75							235222	4	0.1	35	2	30	0	1	45
135	94	100														

Appendix 2.--Drill-core log sheet, Ishmas Kabir 4--continued.

KINGDOM OF SAUDI ARABIA
Ministry of Petroleum and Mineral Resources
Directorate General of Mineral Resources

Organization

Mineral Occurrence

Drill Hole Number:

References

Logged by:

Scale

Date Started: | Hole Size: Nx -
Date Completed: | Bx -
Driller: ADC | Ax -

Survey Data

Collar Coord: Lat. Long.

Grid Reference: Elevation:

Subsurface (Tropari or:)

Depth	Inclination	Azimuth	Depth	Inclination	Azimuth

Depth (m)	Core recovery: RQD	Core recovery: %	Vein structure (including water loss and cementation)	Faults + Lithology + Alteration
135	94	100		
136	92			
137	90			
138	93			
139	73			
140	56			
141	90		3mm, 86°CA	
142	85			
143	66			
144	34			Granite pegmatite dike
145	88			
146	84			Mafic dike
147	75			Pegmatite dike
148	98			
149	82			Mafic dike
150	86			
151	95			
152	100			
153	91			
154	89			
155	76			
156	56		No veins	Quartz diorite, 2–3mm grain size.
157	71			
158	67			
159	81			
160	22			
161	64			
162	72			
163	85			
164	67			
165	57			
166	67			
167	55			Mafic dike
168	66			
169	64			Mafic dike
170	60			
171	66			
172	56		No veins	
173	76			
174	55			
175	98			Quartz diorite
176	89			
177	30			
178	57			
179	53	100		
180				

>50% Quartz | <50% Quartz | Lithology | Oxidation

MINERALIZATION: L H Py

SAMPLE DATA

Sample number	Au ppb	Ag ppm	Cu ppm	Pb ppm	Zn ppm	As ppm	Mo ppm	Te ppb
235223	4	0.1	25	2	25	0		40
235224	4	0.1	13 5	2	30	0		35
235225	4	0.1	13	2	40	0		30
235226	4	0.1	14	3	5	0		25
235227	4	0.1	4	3	35	0		65
235228	4	0.1	25	4	50	0		0
235229	4	0.1	10	3	20	0		0
235230	4	0.1	10	2	30	0		0
235231	4	0.1	15	3	40	0		0
235232	6	0.1	20	4	50	0		10
235233	4	0.1	22	3	40	0		10
235234	4	0.1	35	2	35	0		3
235235	4	0.1	45	2	30	0		10
235236	4	0.1	35	2	35	0		0
235237	4	0.1	30	2	30	0		10
235238	4	0.1	30	2	30	0		10
235239	4	0.1	30	2	30	0		20
235240	4	0.1	45	3	40	0		10
235241	4	0.1	50	3	40	0		10
235242	4	0.1	35	3	70	0		20
235243	4	0.1	55	3	40	0		15
235244	4	0.1	40	3	40	0		20
235245	4	0.1	45	3	45	0		20
235246	4	0.1	45	3	45	0		25

Appendix 2.--Drill-core log sheet, Ishmas Kabir 4--continued.

KINGDOM OF SAUDI ARABIA
Ministry of Petroleum and Mineral Resources
Directorate General of Mineral Resources

Organization: USGS

Mineral Occurrence

Drill Hole Number: Ishmas Kabir 4

References

Logged by: Majed Ben Talib

Scale

Date Started:
Date Completed:
Driller: ADC

Hole Size: Nx - Bx - Ax -

Survey Data
Collar Coord: Lat. Long.
Grid Reference: Elevation:

Subsurface (Tropari or:)

Depth	Inclination	Azimuth	Depth	Inclination	Azimuth

Depth (m)	RQD	Core recovery %	Structure	Lithology	Faults + Lithology + Alteration	Mineralization (L H Py)
180	74	100		X, V		
	68			V	Mafic dike	
	79		88°	V	Mafic dike	
	45			V		
	10			V	Mafic dike	
185	17			X		
	55			X		
	58			X		
	28			X		
	53			X		
190	75			X	Quartz diorite	
	96		No veins present	X		
	73			X		
	51			X		
	79			X		
195	87			X		
	94			X		
	80			X		
	95			V	Mafic dike	Trace sulfides
	85			X		
200	85			X		
	37			X		
	79			X		
	74			X		
	68			X		
205	40			X		
	67			X		
	33			X	Quartz diorite	
	60			X		
	32			X		
210	57			X		
	73			X		
	58			X		
	88			X		
	79		3mm, 20°	X		
215	80			X		
	56			X		
	48			X		
	64		3mm, 70°	V	Mafic dike.	
	64			X		
220	0			V	Mafic dike.	
	23			X		
	93			X		
	50			X		
	51	100		X		
225						

SAMPLE DATA

Sample number	Au ppb	Ag ppm	Cu ppm	Pb ppm	Zn ppm	As ppm	Mo ppm	Te ppb
235247	4	0.1	40	4	45	0	4	20
235248	4	0.1	25	3	50	0	3	35
235249	4	0.1	60	2	50	0	2	35
235250	4	0.1	30	4	15	0	3	35
235251	4	0.1	40	3	40	0	2	40
235252	4	0.1	25	5	20	0	2	40
235253	4	0.1	20	4	50	0	1	45
235254	4	0.1	30	3	25	0	2	50
235255	4	0.1	20	3	40	0	2	55
235256	4	0.1	20	1	50	0	2	55
235257	4	0.1	35	2	35	0	1	50
235258	4	0.1	70	2	50	0	2	45
235259	4	0.22	15	2	60	0	4	20
235260	4	0.12	90	2	40	0	2	10
235261	4	0.1	25	2	35	0	4	15
235262	4	0.1	45	2	40	0	4	10
235263	4	0.1	50	2	40	0	2	10
235264	5	0.1	45	3	50	0	2	10
235265	4	0.1	70	2	40	0	2	25
235266	4	0.1	15	2	30	0	2	10
235267	4	0.1	30	2	30	0	3	15
235268	4	0.1	25	2	35	0	3	25
235269	4	0.1	30	2	50	0	2	25
235270	4	0.1	20	2	30	0	2	0
235271	4	0.1	30	2	50	0	3	0
235272	4	0.1	30	2	50	0	2	0
235273	4	0.1	30	2	40	0	2	20
235274	4	0.1	25	2	90	0	3	30
235275	4	0.1	35	2	95	0	4	15
235276	4	0.1	22	2	35	0	2	20
235277	4	0.1	25	2	30	0	2	15
235278	4	0.1	20	2	35	0	2	10
235279	4	0.1	16	2	35	0	3	0
235280	4	0.12	35	5	50	0	4	0
235281	4	0.1	32	3	50	0	3	0
235282	4	0.1	40	6	50	0	3	10

Appendix 2.--Drill-core log sheet, Ishmas Kabir 4--continued.

KINGDOM OF SAUDI ARABIA
Ministry of Petroleum and Mineral Resources
Directorate General of Mineral Resources

Organization: USGS

Mineral Occurrence

Drill Hole Number: Ishmas Kabir 4

References

Logged by: Majed Ben Talib

Scale

Date Started:
Date Completed:
Driller: ADC
Hole Size: Nx - Bx - Ax -

Survey Data
Collar Coord: Lat. Long.
Grid Reference: Elevation:

Subsurface (Tropari or:)
Depth Inclination Azimuth | Depth Inclination Azimuth

Columns: Core Recovery (RQD, %) | Core Box | Vein Structure (including water loss and cementation) | >50% Quartz | <50% Quartz | Lithology | Oxidation | Faults + Lithology + Alteration | Mineralization (L H Py) | Sample Data

Depth (m)	RQD	%
225	71	100
	40	
	74	
	71	
	56	
230	89	
	68	
	0	
	14	
	43	
235	96	
	63	
	93	
	37	
	57	
240	40	
	79	
	58	
	62	
	92	
245	74	
	99	
	57	
	34	
	100	
250	100	
	73	
	75	
	67	
	89	
255	52	
	76	
	73	
	75	
	73	
260	48	
	81	
	44	
	0	
	41	
265	33	
	81	
	67	
	88	
	92	100
270		

Vein structure (about 243–246 m): Carbonate veins: 3mm, 40°; 4mm, 30°; 3mm, 42

Faults + Lithology + Alteration:
- Mafic dike (about 231–234 m)
- Quartz diorite (about 234–241 m)
- Mafic dike (about 241–243 m)
- Carbonate-altered mafic dike. (about 246 m)
- 15cm-thick fault zone. (about 248 m)
- Relatively unaltered Quartz diorite (about 254–255 m)
- Mafic dike-carbonate altered (about 265–266 m)
- Mafic dike (about 269–270 m), 65°

Mineralization: Trace sulfides (pyrite) (about 242–244 m)

SAMPLE DATA — ANALYSES

Sample number	Au ppb	Ag ppm	Cu ppm	Pb ppm	Zn ppm	As ppm	Mo ppm	Te ppb
235283	5	0.1	75	3	55	0	3	10
235284	4	0.1	45	4	60	0	5	10
235285	5	0.1	45	5	50	0	2	10
235286	4	0.1	30	4	60	0	4	10
235287	6	0.1	50	4	50	0	6	10
235288	5	0.1	25	3	40	0	2	10
235289	5	0.1	20	3	45	0	2	10
235290	5	0.1	50	4	55	0	3	10
235291	5	0.1	45	10	55	0	3	10
235292	4	0.1	40	5	55	0	5	0
235293	6	0.12	150	4	60	0	1	10
235294	4	0.1	45	2	60	0	1	10
235295	6	0.1	50	3	55	0	2	10
235296	4	0.1	100	4	65	0	4	10
235297	6	0.12	80	3	65	0	2	10
235298	5	0.11	45	3	60	0	3	0
235299	6	0.1	85	4	60	0	3	0
235300	8	0.1	80	6	65	0	6	0
235301	5	0.1	45	2	55	0	3	0
235302	4	0.2	25	2	70	0	2	0
235303	5	0.1	15	2	80	0	2	0
235304	4	0.1	55	3	65	0	3	10
235305	5	0.1	40	2	60	0	3	0
235306	5	0.1	45	4	60	0	4	10
235307	4	0.14	45	4	50	0	3	0
235308	6	0.1	45	4	55	0	4	10
235309	6	0.1	45	3	50	0	6	0
235310	4	0.1	40	4	45	0	5	0
235311	4	0.1	45	3	55	0	5	0
235312	4	0.1	30	3	45	0	2	0
235313	4	0.1	45	4	50	0	7	0
235314	3	0.1	45	4	50	0	6	0

Appendix 2.--Drill-core log sheet, Ishmas Kabir 4--continued.

KINGDOM OF SAUDI ARABIA
Ministry of Petroleum and Mineral Resources
Directorate General of Mineral Resources

Organization: USGS

Mineral Occurrence

Drill Hole Number: Ishmas Kabir 4

References

Logged by: Majed Ben Talib

Scale

Date Started:
Date Completed:
Driller: ADC

Hole Size: Nx - Bx - Ax -

Survey Data

Collar Coord: Lat. Long.
Grid Reference: Elevation:

Subsurface (Tropari or:)
Depth Inclination Azimuth | Depth Inclination Azimuth

Core recovery	Core box	Structure (including water loss and cementation)	>50% Quartz	<50% Quartz	Lithology	Oxidation	Faults + Lithology + Alteration	Mineralization	Sample data
RQD	%							L H B	

Depth markers: 270, 275, 280, 285, 290, 295, 300, 305, 310, 315

RQD (270–315): 61, 64, 24, 55, 45, 66, 89, 90, 61, 83, 89, 95, 73, 67, 55, 67, 40, 21, 72, 44, 35, 89, 63, 58, 71, 77, 73, 53, 62, 62, 42, 22, 42, 50, 89, 64, 81, 75, 89, 89, 61, 67, 100, 66, 76

Core recovery %: 100 (at 270) … 100 (at 315)

Structure: No veins present. Quartz vein (about 295–296).

Faults + Lithology + Alteration:
- Mafic dike (about 273–275)
- Relatively fresh quartz diorite (about 278–280)
- Relatively 'fresh' quartz diorite (about 290–293)
- Quartz diorite (about 307)

Mineralization: Trace amounts of pyrite. (about 295)

SAMPLE DATA

Sample number	Au ppb	Ag ppm	Cu ppm	Pb ppm	Zn ppm	As ppm	Mo ppm	Te ppb
235315	3	0.1	50	4	45	0	5	0
235316	4	0.1	50	3		0	3	0
235317	4	0.1	50	4	60	0	5	0
235318	3	0.1	30	2	60	0	5	10
235319	4	0.1	35	3	60	0	5	10
235320	4	0.1	30	3	60	0	3	10
235321	6	0.1	25	2	60	0	3	10
235322	4	0.1	20	2	45	0	6	10
235323	5	0.1	10	5	45	0	4	15
235324	23	0.1	40	3	60	0	5	10
235325	15	0.1	8	5	65	0	4	10
235326	13	0.1	20	2	5	0	4	0
235327	10	0.1	40	2	60	0	3	3
235328	6	0.1	10	4	65	0	3	10
235329	4	0.1	7	4	50	0	3	3
235330	5	0.1	120	3	65	0	7	10
235331	5	0.2	90	3	75	0	3	25
235332	4	0.1	30	2	85	0	2	0
235333	6	0.1	95	3	55	0	7	0
235334	4	0.1	6	2	55	0	4	0
235335	4	0.1	10	2	45	0	6	0
235336	4	0.1	25	3	40	0	3	0
235337	5	0.1	6	3	45	0	6	0
235338	4	0.1	20	4	55	0	6	0
235339	4	0.1	15	3	65	0	6	0
235340	8	0.1	60	2	70	0	5	0
235341	4	0.1	22	2	55	0	3	0
235342	4	0.1	35	3	55	0	3	0
235343	4	0.1	50	3	53	0	2	10

Appendix 2.--Drill-core log sheet, Ishmas Kabir 4--continued.

KINGDOM OF SAUDI ARABIA
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Organization: USGS

Mineral Occurrence

Drill Hole Number: Ishmas Kabir 4

References

Logged by: Majed Ben Talib

Scale

Date Started:
Date Completed:
Driller: ADC
Hole Size: Nx - Bx - Ax -

Survey Data
Collar Coord: Lat. Long.
Grid Reference: Elevation:

Subsurface (Tropari or:)

Depth	Inclination	Azimuth	Depth	Inclination	Azimuth

Depth	Core recovery RQD	Core recovery %	Core box	Structure (including water loss and cementation)	>50% Quartz	<50% Quartz	Lithology	Oxidation	Faults + Lithology + Alteration	Mineralization L H Py	Length (m)	Interval (m)	Sample number	Au PPb	Ag PPm	Cu PPm	Pb PPm	Zn PPm	As PPm	Mo PPm	Te PPb
315	34	100																			
	58	100											235344	4	0·1	45	4	64	0	7	10
	[illegible]	100		No veins					Quartz diorite												
	61	100							Relatively unaltered												
	66	100											235345	6	0·1	45	3	53	0	3	10
320	80	100																			
									EOH. 321.3m												