Appendix 6 Geological Logging of the Drill Hole "MJK-1"(1/200)

GEOLOGIC LOG (I)

MJK - I

AREA : ZHAMAN-AIBAT   INCLINATION : -90°   BEARING : —

ELEVATION : 357.04m   FINAL DEPTH : 650.50m

DEPTH (m)	DESCRIPTION	REMARKS	MINERALIZATION
1.20	Strongly weathered rock with fragments of red siltstone and fine-grained sandstone. Content of fragments is up to 50%.	Zhidelisai Formation (Gypsum - rich Red Siltstone)	
6.00	Reddish brown weathered siltstone with unclearly expressed bedded structure, partially fractured. Leached caverns are partly filled in by calcite. Interlayer : Grayish-red weathered, fine-grained, sandstone at the depth of 1.40 m with thickness, equal to 30 cm. (∠5°)		
17.00	Reddish brown siltstone with fine grained, partially porous sandstone. Lamination angle is equal to 5°. These rocks are strongly fractured. Fractures surface is coated by gypsum, traces of iron oxide and dendrite of manganese. Leached caverns are sizing up to 0.5x1.5 cm, filled in by calcite. (∠5°)		
21.40	Light reddish brown fine grained sandstone. Interlayers of red coarse-grained sandstone (5-20 cm thick) with clayey-carbonate-ferrous cement is strongly weathered. This sandstone is sometimes porous, unclearly expresses bedded structure. Gravels included in sandstone orient at 5°. (∠5°)		
39.05	Reddish brown, sandy siltstone, unclearly expressed bedded structure, strongly fractured. Traces of ferruginization, manganese dendrite and thin films of gypsum and chlorite at walls of fractures. Lamination angle is equal to 5°. Leached caverns filled in by calcite are described all through the horizon sizing up to 2.0 x 2.0 cm. Numerous layers of gypsum (selenite) are observed below 28.6 m with thickness 0.1-1.0 cm, oriented at 5-10° (partly 35-60°). (∠5°)		23.9-26.2m: weakly argillized
47.90	39.05-44.8m,46.1-47.9m: Light reddish brown fine-grained sandstone with carbonate-clayey cement. Including interlayers of kaolinized coarse-grained sandstone layers up to 6 cm, express lenticular and horizontally-bedded structure due to red fine-grained sandstone interlayers(0.2cm).There are numerous interlayers of fiber-like gypsum with thickness from 2 to 4, oriented at 5-0°. 44.8-46.1m:Granule - pebble conglomerates, composed by quartz, limestone, flintstone with fragments of red aleurosandstone from 0.5 x 2 cm to 2 x 4 cm in amount up to 30%. The gravels and flat fragments are shaped as lamination oriented at 5°. (∠5°)		
66.50	Reddish brown siltstone (or fine-grained muddy sandstone) with carbonate-ferrous cement. Partially brecciated, sliding surfaces and chlorite films are observed along the fractures. Muddy sandstone has an horizontally bedded structure at 5° due to interlayers of limy sandstone. The thickness of the limy sandstone layers is from 10 to 30 cm and maximum thickness is 1.0 m. rocks fractures are filled in by fiber-like gypsum with thickness from 1 to 3 cm, oriented mostly at 5°. 65.65-65.85m:Brecciated, chloritization weak (∠5°~10°, ∠5°, ∠5°, ∠70°)		65.65-65.85m: Brecciated, chloritization weak

Mineralization columns: SULFIDE, SILICA, CLAY, CARBONATE, SULFATE

SAMPLE No.

ROCK PROPERTY

Scale (m)	Angle of Fiss. (°)	No. of Fiss. (/m)	Core Rec. %
1			100
2	∠10-80°	10	100
3	〃	10	93
4	〃	10	93
5	〃	10	91
6			91
7			92
8			94
9			94
10	∠40°	1	94
11	∠25°	1	94
12			94
13			94
14	∠5°	1	94
15	〃	4	94
16	〃	4	94
17	〃	4	94
18	〃	4	95
19	∠80°	4	95
20	∠35°	4	95
21	〃	4	94
22	〃	4	94
23	〃	4	93
24	〃	3	93
25	〃	2	94
26	∠5°	4	94
27	〃	4	91
28	〃	4	91
29	〃	4	91
30	〃	4	90
31	〃	4	90
32	〃	4	90
33	〃	4	90
34	〃	4	91
35	〃	4	91
36	〃	4	91
37	〃	4	91
38	〃	4	92
39	〃	4	92
40	〃	4	92
41	〃	4	92
42	〃	4	92
43	〃	4	92
44	〃	4	92
45	〃	4	92
46	〃	4	92
47	〃	4	92
48	〃	4	92
49	〃	4	92
50	〃	4	93
51	∠5-10°	4	93
52	〃	4	93
53	〃	4	93
54	〃	4	94
55	〃	4	94
56	〃	4	94
57	〃	4	94
58	〃	4	94
59	〃	4	94
60	〃	4	94
61	〃	4	94
62	〃	4	94
63	〃	4	95
64	〃	4	95
65	∠30-60°	4	95
66	∠30-70°	4	95
67	∠10-30°	3	95
68	∠10°	2	95
69	∠5-10°	2	95
70	〃	2	95

GEOLOGIC LOG (2)

MJK - 1

AREA: ZHAMAN-AIBAT INCLINATION: -90° BEARING: — ELEVATION: 357.04 m FINAL DEPTH: 650.50 m

SCALE (m)	COLUMN	DEPTH (m)	DESCRIPTION	REMARKS	MINERALIZATION	SULFIDE	SILICA	CLAY	CARBONATE	SULFATE	SAMPLE No.	ROCK PROPERTY: Angle of Fiss. (°)	No. of Fiss. (/m)	Core Rec. %
			Red sandstone, including light-red limy sandstone layers (intervals: 10-30cm, thickness : 2-5mm). These rocks are medium-fractured; gypsum at fractures is oriented at 5°.	∠5°								∠5°	2	95
		74.55	Red sandstone, fine-grained with carbonate-ferrous cement, horizontally bedded structure due to fine lamination with siltstone. The rock is medium fractured. Rare veinlets of gypsum (5°) with thickness up to 2 cm. Contact with underlying horizon is clear, at 5°. Including rare fragments of brown colored siltstone.									〃	2	95
		77.90										〃	2	95
80			77.9-79.1m: Red siltstone with spotted structure due to spots of light-red colored limy sandstone. Rare interlayers of fiber-like gypsum (selenite) with thickness up to 0.5 cm, oriented at 5°. Contact with underlying horizon is gradual. 79.1-79.8m: Red sandstone, fine-grained, bedded due to interlayers of aleurosandstone 5° with gypsum veinlets 0.2-0.4 cm thick, oriented at 10-20°. 79.8-86.5m: Red siltstone with interlayers of fine-grained (83.9-84.15 m) gypsum and single gypsum veinlets 0.3-0.4 cm thick.									〃	2	95
		86.50										∠5-10°	4	95
			Light-red sandstone, fine grained with carbonate-ferrous cement; horizontally-bedded structure at 5°. Graded bedding and lamina structures are developed. The rock is medium fractured; veinlets of gypsum with thickness up to 1.5 cm. Carbonate-gypsum inclusions sizing up to 1.0 x 1.5 cm within the interval from 87.2 to 87.8 m. Contact with underlying horizon is clear, at 10°.	∠5-10°								〃	4	95
90		89.50										〃	4	95
		92.00										〃	4	96
		93.25	Red siltstone with unclearly expressed bedded structure. Including rare siliceous-carbonate accumulations, veinlets of gypsum with thickness 5 mm, interlayer of fine-grained grayish-red colored sandstone with thickness 20 cm. Contact with underlying horizon is at 0°.	∠5°								〃	4	96
			Reddish brown sandstone, fine-grained with carbonate-ferrous cement. Lenticular bedded structure at 10-15° due to interlaying with fine-grained siltstone. The rock is medium fractured with gypsum (up to 1.5 cm thick) filling in fractures. Contact with underlying horizon is at 0°.									〃	4	96
100												〃	4	96
												〃	4	96
												〃	4	96
												〃	4	96
												〃	4	96
												〃	2	96
												∠5°	4	96
												〃	4	97
												〃	4	97
												〃	4	97
110			Reddish brown siltstone with spotted or rarely horizontally-bedded (at 5°) structure due to interlaying with fine-grained sandstone. Interlayers of fine-grained sandstone with thickness up to 25 cm, maximum: 140cm. There is an interlayer of green colored siltstone at the depth 94.8m, 106.25m and 110.6m with thickness 10 - 30 cm. These rocks are medium fractured, fractures are filled in by gypsum with thickness from 1mm to 5 cm. Contact with underlying horizon is unclear and gradual.	∠5°								〃	4	97
												〃	4	97
												〃	4	97
												〃	4	97
												〃	4	97
												〃	4	97
												〃	4	97
												∠10°	2	97
												〃	2	97
												〃	2	97
												〃	2	97
120			Red colored laminated sandstone, fine-grained, with carbonate-ferrous cement. Banded structure at 5-15. The rock is medium fractured, gypsum (1mm to 4 cm thick) filling in fractures. Contact with underlying horizon is at 5°.	∠5°								〃	2	97
												〃	4	97
												〃	4	97
												〃	4	97
												〃	4	97
												〃	4	97
												〃	4	97
		127.20										〃	4	97
		128.30										〃	4	97
130			Reddish brown massive siltstone. The rock is medium fractured; gypsum veinlets at rare fractures (thickness up to 5 mm). There are numerous interlayers of fine-grained sandstone with thickness 7-10 cm. The layer is continued below.									〃	4	97
												〃	4	97
												〃	4	97
												〃	4	97
												〃	4	97
												∠10-15°	4	97
												∠5°	4	97
												〃	4	97
												〃	4	97
												〃	4	97
												〃	4	97
												〃	4	97
140												〃	4	97

Zhideli sai Formation (Gypsum - rich Red siltstone)

GEOLOGIC LOG (3)

MJK - 1

AREA: ZHAMAN-AIBAT INCLINATION: -90° BEARING: — ELEVATION: 357.04 m FINAL DEPTH: 650.50 m

SCALE (m)	COLUMN	DEPTH (m)	DESCRIPTION		REMARKS	MINERALIZATION	SULFIDE	SILICA	CLAY	CARBONATE	SULFATE	SAMPLE No.	ROCK PROPERTY: Angle of Fiss. (°)	No. of Fiss. (/m)	Core Rec. %
150			Reddish brown colored siltstone with banded and spotted structure due to the interlayers of limy sandstone. Partings with thickness from 1 to 3 cm and interlayers of fine-grained sandstone are described at intervals 145.40-145.70 m, 147.3-147.6, 148.2-148.6, 156.9-157.20 m. Graded bedding structure (inclination: 10-15°) is observed in the obove intervals. The rock is medium fractured, fractures are filled in by gypsum and are oriented at 5°, 45° and 15°; thickness of gypsum layers varying from1 mm to 2 cm. Contact with underlying horizon is gradual.	∠ 10° ~15°	(Gypsum — rich Red Siltstone)						∠ 5~10°	4	97
													//	4	97
													//	4	97
													//	4	97
													∠ 20°	4	97
													∠ 5~10°	4	97
													//	4	97
													//	4	97
													//	4	97
													//	4	97
													∠ 10~30°	3	97
													∠ 5~10°	3	97
													//	3	97
													//	3	93
													//	3	93
													//	3	93
						156.50-156.55m: weakly argillized							//	3	97
		159.00	Brown sandstone, fine grained, with carbonate-ferrous cement. Structure is horizontally bedded at 5° due to interlaying with red colored siltstone. The rock is medium fractured; fractures are filled in by gypsum. Contact with underlying horizon is gradual.	∠ 5°									//	3	97
160		160.50											//	3	97
			Reddish brown siltstone. Structure is basically horizontally-bedded at 5° due to partings of fine-grained sandstone with thickness up to 1 mm. Interlayers of red fine-grained sandstone with thickness 10-15 cm occur all through the layer. Interlayer of medium-grained sandstone with thickness 30 cm is described at the depth 165.0m and 169.9m	∠ 5°									∠ 5~20°	2	97
													//	2	97
													//	2	97
													//	2	97
													//	2	97
													//	2	97
													//	2	97
													//	2	97
													//	2	97
													//	2	97
													//	2	97
													//	2	97
													//	2	97
170													//	2	97
		174.20	Red sandstone, fine grained, with carbonate-ferrous cement. Structure is horizontally bedded at 5° due to the graded bedding structure. Interlayer of siltstone with thickness 33 cm. The rock is medium fractured; fractures are filled in by gypsum with thickness up to 2 cm. Contact with underlying horizon is at 0°.	∠ 5°									//	2	97
		176.10		∠ 0°									∠ 5~10°	3	97
													//	4	97
													//	4	97
													//	2	97
180			Brown massive siltstone. Unclearly expressed bedded structure. Rare partings of fine-grained sandstone with thickness up to 5 cm and interlayers up to 25 cm. The rock is medium fractured; fractures are filled in by gypsum with thickness up to 3 cm, oriented at 10° and 30°. The layer is continued below.										//	1	97
													//	2	97
													//	3	97
													//	4	97
													//	6	97
													//	2	97
													//	4	97
				∠ 10° ~30°									//	3	97
													//	1	97
													//	0	97
190													//	1	97
													//	0	97
													//	2	97
													//	4	97
			200.08-208.65m: Brown colored massive siltstone. Unclearly expressed bedded structure. The rock is medium fractured. Frequent veinlets of gypsum with thickness up to 1 cm. Fractures are oriented at 45°, 15° and 5°. Gypsum veinlets at the interval from to 207.5 to 208.65 m are oriented by two groups (at 15° and 5° and along core axis). Contact with underlying horizon is at 5°.										//	3	97
													//	4	97
													//	7	97
													//	7	97
													//	4	97
		200.80		∠ 5°									//	2	97
200													//	2	97
			208.70-209.15m: Grayish-green siltstone. Horizontally-bedded structure resulted from partings of red siltstone with thickness up to 1 cm. The rock is medium fractured; fractures are filled in by gypsum with thickness up to 2 cm. Contact with underlying horizon is at 10°.	∠ 10°									//	2	97
													//	1	97
													//	1	97
													//	4	97
			209.15-210.0m: Brown sandstone, fine-grained, with carbonate-ferrous cement. Structure is sometimes bedded at 10°, 5° due to fine lamination with siltstone. The rock is medium fractured; fractures are filled in by gypsum and are oriented at 30°, 10°; their thickness varies from 1 mm to 2 cm. Contact with underlying horizon is clear, at the angle 0°.										//	4	97
													//	4	97
													//	4	97
		208.70											//	3	97
		209.15		∠ 0°									//	2	97
210													//	2	97

Zhidelisol Formation

GEOLOGIC LOG (4)

MJK - 1

AREA : ZHAMAN-AIBAT INCLINATION : -90° BEARING : — ELEVATION : 357.04 m FINAL DEPTH : 650.50 m

SCALE (m)	COLUMN	DEPTH (m)	DESCRIPTION	REMARKS	MINERALIZATION	SULFIDE	SILICA	CLAY	CARBONATE	SULFATE	SAMPLE No.	ROCK PROPERTY: Angle of Fiss. (°)	No. of Fiss. (/m)	Core Rec. %
220		212.80	210.00-211.15m: Brown sandstone, fine-grained, with carbonate-ferrous cement. Bedding Structure at the angle 10°, 5° due to fine lamination, alternation with siltstone. The rock is medium fractured; fractures are filled in by gypsum and are oriented at 30°, 20°; their thickness varies from 1 mm to 2 cm. Contact with underlying horizon is clear, at the angle 0°. 211.15-212.80m: Red sandstone, fine-grained, with carbonate-ferrous cement. Bedding Structure (resulted from partings of dark-red fine-grained sandstone; thickness of partings is up to 1 cm) at the angle 15-10°. The rock is medium fractured; fractures are filled in by gypsum, oriented at 0°, 15°. Contact with underlying horizon is clear, wavy, at the angle 0°.	∠5° ~15° / ∠5°	Zhidelisol Formation (Gypsum-rich Red Siltstone)							∠5~10°	2	97
		219.05	Brown siltstone, bedding structure (due to partings of greenish-gray siltstone with thickness up to 1 mm) at the angle 5°. The rock is medium fractured. Contact with underlying horizon is gradual.	∠5°								2	97
		223.00	219.05-219.55m: Brown colored fine-grained (muddy) sandstone with carbonate-ferrous cement, with graded bedding structure at the angle 5°. Contact with underlying horizon is sharp at the angle 5°. 219.55-223.00m: Brown siltstone with unclearly expressed bedded structure. Interlayers of dark-greenish-gray siltstone with thickness 13 cm and interlayers of red colored fine-grained sandstone with thickness 25 cm. The rock is medium fractured; fractures are filled in by gypsum, oriented at 5°. Contact with underlying horizon is clear, at the angle 10°.	∠10° / ∠5° ~15° / ∠10°								1	97
230		228.05	223.00-226.20m: Red sandstone, fine-grained, with carbonate-ferrous cement, with the bedding structure (due to partings of red fine-grained sandstone) at the angle 15°, 5°. Interlayers of siltstone with thickness from 6 to 25 cm are observed. The rock is medium fractured; fractures are filled in by gypsum, fractures oriented at 10°, thickness of gypsum veinlets is up to 5 cm. Contact with underlying horizon is at <10°. 226.20-227.10m: Brown siltstone with unclearly expressed bedded structure. The rock is medium fractured. Contact with underlying horizon is clear, at the angle 0°.	∠5° ~15° / ∠5°								1	97
			227.10-228.05m: Red sandstone, fine-grained, with carbonate-ferrous cement. Bedding structure due to partings of dark aleurolites is horizontal at the angle 5°. Interlayers of dark-red siltstone with thickness 10-15 cm are described there. Contact with underlying horizon is unclear and gradual.	∠5°	238.10-238.40m: weakly silicified zone with gypsum veinlets							1	97
240		242.30	Brown siltstone. Bedding structure (due to fine interlaying with fine-grained sandstone) is horizontal at the angle 5°. The rock is medium fractured; fractures are filled in by gypsum and oriented at 30°, 10°. Interlayer with calcite-gypsum-anhydrite aggregate with thickness 30 cm occurs at the depth 233.0 m; interlayer of fine-grained sandstone with thickness 35 cm described at 239.7 m. Contact with underlying horizon is gradual.	∠5° ~15°								2	97
250		252.40	242.30-242.75m: Light-brown colored, fine-grained sandstone with carbonate-ferrous cement. Bedding structure (due to partings of dark-brown siltstone with thickness 1mm) shows the angle 5-15°. Partings of dark brown colored siltstone with thickness up to 2 cm are observed as well. Contact with underlying horizon is clear, at 0°. 242.75-252.40m: Brown siltstone. Unclearly expressed bedded structure. Interlayers of fine-grained sandstone with thickness 5-7 and 10-25 cm. The rock is medium fractured; fractures are filled in by gypsum (sienite), oriented at 5°, sometimes at 45°. Contact with underlying horizon is gradual.	∠5° / ∠0° ~5°	Zhidelisol Formation (Red Siltstone)							∠10°	3	97
260		265.70	252.40-253.15m: Light-red colored fine-grained sandstone, with carbonate-ferrous cement. Bedding structure (due to fine interlaying with dark-red aleurolite, thickness of partings is up to 1 cm) is horizontal at the angle 5°. The rock is slightly fractured. Contact with underlying horizon is gradual. 253.15-258.00m: Brown siltstone with interlayers of fine-grained sandstone. 258.00-265.70m: Light-red colored, fine-grained sandstone with frequent interlayers of fine-grained sandstone (thickness is up to 20 cm). Bedding structure (due to partings of dark-red fine-grained sandstone) is horizontal at the angle 85°, lamination at the bottom of each layer at the angle 5-15°. Interlayer of brown siltstone(30 cm thick) is also observed. The rock is fractured; fractures are filled in by gypsum veinlets and films with thickness 5 mm. Contact with underlying horizon is gradual.	∠5° ~15° / ∠15°								∠5°	1	98
270		270.10										∠5~70°	3	98
		271.20	Light-red colored siltstone. Partings of fine-grained sandstone with thickness 3-5 cm are described through all the layer. The rock is slightly fractured; fractures contain films of gypsum.	∠5°								∠75°	1	98
			Light-red colored fine-grained sandstone with bedding structure (due to changing granulometric composition) at the angle 15°. The rock is slightly fractured; fractures contain films of gypsum oriented at the angle 5°. Contact with underlying horizon is at 5°.	∠15°								∠20°	1	98
			Brown, massive siltstone with unclearly bedded structure. Films of gypsum at fractures with thickness 1 mm, oriented at 55°, 45°. At the bottom of layer, the rock is strongly fractured (283.0-287.25 m). Contact is at 15°.									∠10°	1	98
280														

GEOLOGIC LOG (5)

MJK - 1

INCLINATION: -90°

AREA: ZHAMAN-AIBAT BEARING: —

ELEVATION: 357.04m FINAL DEPTH: 650.50m

SCALE (m)	COLUMN	DEPTH (m)	DESCRIPTION	REMARKS	MINERALIZATION	SULFIDE	SILICA	CLAY	CARBONATE	SULFATE	SAMPLE No.	ROCK PROPERTY: Angle of Fiss. (°)	No. of Fiss. (/m)	Core Rec. %
			Brown, massive siltstone with unclearly bedded structure. Films of gypsum at fractures with thickness 1 mm, oriented at 55°,45°. At the bottom of layer, the rock is strongly fractured (282.9-287.40 m). Contact is at 15°. Thin layers of green-dark green colored siltstone are observed within the interval from 286m to 287.20m										0	98
													0	98
												∠ 20°	3	98
												∠ 30°	4	98
												∠ 10°	10	98
												"	10	98
		287.40	Light-red colored, fine-grained sandstone, with carbonate-ferrous cement., cross-bedded at 5-15° due to partings of dark-red siltstone. Interlayers of dark-red siltstone with total thickness 0.6 m are observed as well. The rock is slightly fractured; fractures are filled in by gypsum. Contact with underlying horizon is at 0°.	∠15°								∠10-45°	10	98
				∠5°-15°									0	98
290												∠10-40°	2	98
												∠ 10°	2	98
		291.40		∠0°									0	98
												∠10-45°	2	98
												∠ 10°	1	98
													0	98
													0	98
													0	98
													0	98
													0	98
			Brown siltstone with unclearly bedded structure. Including the interlayers of fine-grained sandstone with thickness up to 30 cm, maximum thickness reaching 0.8 m. These rocks are fractured; fractures are filled in by gypsum (up to 1 mm thick). Contact with underlying horizon is at 0°. Thin layers of green-dark green colored siltstone are observed within the interval from 312.90m to 313.10m									∠ 10°	1	98
300				∠0°									0	98
													0	98
													0	98
													0	98
													0	98
													0	98
													0	98
													0	98
													0	98
													0	98
													0	98
													0	98
													0	98
													0	98
310													0	98
													0	98
													0	98
													0	98
													0	98
													0	98
													0	98
												∠ 20°	1	98
		316.60	Red colored fine-grained sandstone with carbonate-ferrous cement.. Structure is horizontally-bedded at the angle 5° due to partings of dark-red siltstone; thickness of partings reaching 1 cm. Contact with underlying horizon is at 0°.										0	98
		318.70		∠5°								∠ 5°	2	98
				∠0°									0	98
320		320.20	Light green colored siltstone										0	98
													0	98
													0	98
													0	98
													0	98
		323.90	Red, massive siltstone with unclearly bedded structure. Including interlayers of fine-grained sandstone. Contact with underlying horizon is gradual.										0	98
													0	98
													0	98
													0	98
													0	98
			Alternation of dark-red siltstone and fine-grained sandstone. Siltstone layers are dominant.. Fine-grained sandstone layers occur at the intervals 324.0-324.4, 325.3-325.55, 328.1-328.4, 329.3-329.6 m. Structure is horizontally-bedded at the angle 5°. Fractures are filled in by gypsum films.										0	98
				∠5°								∠ 10°	1	98
		329.90											0	98
330				∠5°									0	98
													0	98
		332.40	Alternation of dark-red siltstone and fine-grained sandstone. Sandstone layers are dominant. Sandstone layers are light-red colored, and matrix is composed of carbonate-ferrous cement.. Bedding structure (due to interlaying with siltstone) is horizontally-bedded at the angle 5°. Stretched-shaped fragments of red aleurolite 0.3 x 1.0 cm in size occur at the bottom of the Sandstone layer. Contact with underlying horizon is clear at 15° as to core axis.	∠15°									0	98
												∠ 25°	1	98
				∠10°-15°								∠ 5°	1	98
													0	98
													0	98
			Brown, sandy siltstone with frequent interlayers of fine-grained sandstone. with thickness 10-15 cm with lamination at 15-10°. The rock is medium fractured; fractures are filled in by gypsum, its thickness varying from fiber-like to 1 mm; they are oriented at 5-15°. Contact with underlying horizon is gradual.										0	98
340												∠ 10°	1	98
													0	98
													0	98
												∠ 20°	1	98
													0	97
													0	97
													0	97
			Light-red colored fine-grained sandstone with carbonate-ferrous cement. Sedimentary structure (due to partings of dark-red, fine-grained siltstone) is cross-bedded at 65°, 0°, 10°. The rock is slightly fractured. Interlayers of dark-red sandstone are also described there. Contact with underlying horizon is clear at 0°.									∠ 0°	1	97
				∠0°									0	97
		349.30											0	97
350													0	97

Zhidelisal Formation (Red Siltstone)

GEOLOGIC LOG (6)

MJK - 1

AREA : ZHAMAN-AIBAT INCLINATION : -90° BEARING : — ELEVATION : 357.04 m FINAL DEPTH : 650.50 m

DEPTH (m)	DESCRIPTION	Angle	REMARKS	MINERALIZATION
356.45	Dark-reddish brown, sandy siltstone with potted / bedded structure due to interlaying with fine-grained sandstone. Interlayers of fine-grained sandstone show cross-bedded structure (thickness 15-25 cm). The rock is slightly fractured, fractures contain gypsum with thickness 5 mm.		Zhidelisol Formation (Red Siltstone)	
358.70	Reddish brown, sandstone, medium-grained, sometimes coarse-grained, with carbonate-ferrous cement.. Graded bedding structure and cross-bedding structure are observed (at the angle 10-20°, 5°). Frequent accumulations of anhydrite / gypsum sizing up to 1.0 x 0.8 cm are described within the interval from 356.65 to 356.95 m. Fragments of red siltstone are described at the bottom of the layer with size up to 0.2 x 0.5 m. Contact with underlying horizon is clear at 5°. Gypsum interlayer (1 cm thick) is occurred at the contact.	∠5° ~20° ; ∠5°		
365.50	Dark-gray, sandy siltstone with potted and lenticular-bedded structure due to interlayers and spots of light fine-grained limy sandstone. Interlayers of fine-grained sandstone with thickness 18 cm are also observed. Contact with underlying horizon is gradual.			
369.95	Reddish brown, fine-grained sandstone with carbonate-ferrous cement. Structure is horizontally-bedded, sometimes cross-bedded at the angle 10-15° due to partings of fine-grained sandstone with darker shading with thickness of the partings equal to 0.1 mm. Partings of dark-red siltstone with thickness up to 3 cm. Accumulations of anhydrite (1.0 x 1.5 cm) are also observed there. The rock is slightly fractured; fractures are coated by gypsum film. Contact with underlying horizon is at 0°. Interlayer of intraformational conglomerate (8 cm thick) at the contact.	∠0° ; ∠5° ~10°		
379.70	Red, sandy siltstone, horizontal-bedding, including interlayers of limy fine-grained sandstone with thickness up to 10 cm. The rock is fractured. Contact with underlying horizon is at the angle 5°. 371.6-372.1m: Red, fine-grained sandstone with carbonate-ferrous cement including interlayers of siltstone. Cross-bedded structure at the angle 5-10°.	∠5°		
397.85	**Sandstone layers:** Reddish brown, fine-medium grained sandstone, with carbonate-ferrous cement., fine interlaying with fine-grained sandstone (0.2cm thick) , cross-bedded at the angle 15-10°. The rock is slightly fractured, filled in by gypsum films. Contact with underlying horizon is wavy. 397.15-397.85m: Grayish-red, fine-grained laminated sandstone with siliceous-carbonate-ferrous cement.. **Siltstone layers:** Reddish brown, sandy siltstone or aleurosandstone, including interlayers of light limy fine-grained sandstone with thickness 3-5 cm , horizontally-bedded . Contact with underlying horizon is sharp at the angle 0°.	∠10° ~15° ; ∠0°	Zhezkazgan Formation (Gray Sandstone)	397.15-397.85m: Weakly silicified
	Reddish brown, sandy siltstone including spots of light-red limy sandstone and rare spots of green aleurolite. Interlayer of greenish-gray fine-grained sandstone with thickness 25 cm occur at the depth 403.2 m; Thin interlayers of gray colored fine-grained sandstone with thickness 20 cm are observed at the interval from 413 to 419m. Contact with underlying horizon is gradual.			403.20m: Appearance of gray sandstone
415.75	Reddish-gray, fine-grained sandstone with siliceous-carbonate-ferrous cement, horizontally-bedded at 5°. Sometimes transforming into medium-coarse-grained sandstone. Partings of greenish-gray aleurolite with thickness 3-5 cm, interlayer of red aleurolite with thickness 20 cm are observed as well. Fragments of dark-red aleurolites. Contact is with underlying horizon is gradual.			
417.60	Reddish brown, sandy siltstone, spotted-bedded structure due to interlaying with fine-grained sandstone. Contact with underlying horizon is unclearly expressed, oriented at the angle 0°.	∠5° ; ∠0°		415.75-417.60m: Weakly disseminated by pyrite Weakly silicified 419.80m-420.80m: Weakly disseminated by pyrite Pyrite grains are very fine

Scale (m): 360, 370, 380, 390, 400, 410, 420

Mineralization columns: SULFIDE, SILICA, CLAY, CARBONATE, SULFATE

SAMPLE No.

ROCK PROPERTY

Angle of Fiss. (°)	No. of Fiss. (/m)	Core Rec. %
∠10°	2	97
	0	97
	0	97
	0	97
	0	97
	0	97
∠20°	1	97
∠10°	2	97
"	1	97
	0	97
	0	97
	0	97
	0	97
	0	97
	0	97
	0	97
∠20°	1	97
	0	97
	0	97
	0	97
	0	97
	0	97
	0	97
	0	97
	0	97
	0	97
	0	97
	0	97
	0	97
	0	97
	0	97
	0	97
	0	97
∠10°	1	97
	0	97
	0	97
	0	97
	0	97
	0	97
	0	97
	0	97
∠10°	1	97
	0	97
	0	97
	0	97
	0	97
	0	97
	0	97
∠35°	4	97
"	1	97
	0	97
	0	97
	0	97
	0	97
	0	97
	0	97
	0	97
	0	97
	0	97
	0	97
	0	97
	0	97
	0	97
	0	97
	0	97
	0	97
	0	97
	0	97
	0	97
∠10°	3	97
	0	97

GEOLOGIC LOG (7)

MJK - 1

INCLINATION: -90°

AREA: ZHAMAN-AIBAT BEARING: —

ELEVATION: 357.04m FINAL DEPTH: 650.50m

SCALE(m)	DEPTH (m)	DESCRIPTION	REMARKS	MINERALIZATION	SAMPLE No.	ROCK PROPERTY: Angle of Fiss. (°)	No. of Fiss. (/m)	Core Rec. %
		Reddish brown, sandy siltstone, massive with lamination due to interlaying with gray fine-grained sandstone. Interlayer of reddish-gray fine-grained sandstone occurs at the interval 421.3-421.75. Contact with underlying horizon is clear at the angle 5°.					0	97
	426.65	Gray medium-fine-grained sandstone with siliceous-carbonate-ferrous cement.. Interlayer of gray aleurolite with thickness 10 cm, fragments of dark-gray aleurolite 0.5 x 1.0 cm are observed as well. Contact with underlying horizon is clear at the angle 0°.	∠5°	426.65-428.40m: Pyrite accumulations with size up to 0.4-0.8 cm, and weakly disseminated by pyrite through the layer. Weak silicification			0	97
	428.40		∠0°				0	97
430	430.00	Reddish brown siltstone with gray spots. with interlayers of fine-grained sandstone with thickness 20 cm. Bedding structure is horizontal. Contact with underlying layer is gradual.	∠0°	430.00-432.25m: Calcite films			0	97
	432.25	Gray sandstone with red spots, fine-grained, with siliceous-carbonate cement.. Bedding structure is horizontal, cross-bedded at the angle 5-10° The rock is slightly fractured, with films of calcite at fractures. Contact with underlying layer is unclear at the angle 0°.	∠0°~10°				0	97
					435.0m ~435.3m 44	∠80°	1	97
							0	97
	438.80	Reddish brown, sandy siltstone, including "sandstone balls(2-4cm)" and thin layers of sandstone. Interlayer of grayish-red fine-grained sandstone with thickness 16 cm occurs at the depth 437.55 m. Contact with underlying layer shows load casting structure(wavy).					0	97
440	440.70		∠5°	438.80-440.70m: Weakly disseminated by pyrite.	440.0m ~440.3m 45	∠45°	1	97
		Dark greenish gray, sandy siltstone, horizontally-bedded at the angle 5°. With lamination structure due to interlayers of sandstone. Contact with underlying layer is gradual.					0	97
				440.7-442.0m, 442.4-443.2m: Disseminated by pyrite Weak silicification		∠40°	1	97
	444.40		∠5°~10°				0	97
	445.50	Light-gray, coarse-fine-grained sandstone with siliceous-carbonate cement, with calcite films coating fractures .. Graded bedding structure is developed at the angles 5°, 10°. Contact with underlying layer is gradual. Frequent very fine grained pyrite crystals occurring at the rock mass.			445.0m ~445.3m 46		0	98
				445.50-451.90m; Disseminated by pyrite			0	98
		Reddish brown, sandy siltstone.		446.5-447.7m: weak			0	98
				447.7-448.2m: strong			0	98
450				448.2-451.9m; weak	450.0m ~450.3m 47		0	98
	451.90	445.50-449.00m: Dark-gray, laminated medium-grained sandstone with siliceous-carbonate cement., with siltstone thin layers. There are a lot of fragments of greenish-gray aleurolite with size up to 3 x 5 cm. Frequent small pyrite crystals occur in the rock mass. 449.00-451.90m: Black-dark gray, siltstone with the bedding structure due to the fine lamination of fine-grained sandstone layers. Joints are oriented at the angle 15-20, 80°. Contact with underlying layer is at the angle 0°. Frequent small pyrite crystals described in the rock mass.	∠0°	451.90-454.60m: Weakly disseminated by pyrite.			0	97
	454.60						0	97
							0	97
					455.0m ~455.3m 48		0	97
							0	97
							0	97
		Gray, medium grained sandstone with siliceous-carbonate cement., with partings of dark-gray aleurolite with thickness 1-3 cm, and with fragments of dark-gray aleurolite sizing from 0.5 x 1.5 cm to 3 x 4 cm.				∠10°~60°	2	97
460				454.60-464.80m: Weakly disseminated by pyrite 459.0-459.6m: Medium-strongly	460.0m ~460.3m 49	∠40°	1	97
		Dark gray-black, sandy siltstone, with the bedding structure at the angle 5° due to partings of fine-grained sandstone. Joints are coated with calcite films; joints are oriented at the angle 5°, sometimes at the angle 45°. Contact with underlying layer is gradual. 459.10-460.45m: Light-gray, fine-grained sandstone with siliceous-carbonate cement..	∠5°				0	97
							0	97
	464.80						0	97
					465.0m ~465.3m 50		0	97
				464.80-474.80m: Weakly disseminated by pyrite 473.7-475.0m: Strongly disseminated by pyrite.			0	97
		Gray-Light gray, coarse-medium grained laminated sandstone, with siliceous-carbonate cement., horizontally bedded, including a lot of thin interlayers of black siltstone with thickness up to 1 mm. The rock is slightly fractured with calcite films coating joints. Interlayer of greenish-gray aleurolite occurs in the interval 470.7-470-85. The rock is slightly fractured. Contact with underlying layer is at the angle 10°.	∠0°				0	97
470					470.0m ~470.3m 51		0	97
						∠10°~60°	3	97
							0	97
							0	97
	474.80		∠10°				0	97
					475.0m ~475.3m 52		0	97
		Greenish gray-dark gray, siltstone, including lenses of gray fine-grained sandstone. Joints oriented at the angle 60-55°, calcite films coating joints. Contact with underlying layer is gradual.		474.8-480m: Weak Chloritizatin 480-483.7m: Disseminated by pyrite			0	99
							0	99
							0	97
480					480.0m ~480.3m 53		0	97
							0	97
							0	97
	483.80					∠70°	1	97
							0	97
		Brown, Alternation beds of Bituminous sandstone(with siliceous-carbonate cement) and siltstone. Interlayer of greenish-gray colored fine-grained sandstone occurs in the interval 484.15-484.3m. A lot of oil saturation zones are described in the interval 484.0-491.0m.	∠0°	484.0-491.0m: Appear Bituminous sandstone 487.4-489.0m: weakly disseminated by pyrite	485.0m ~485.3m 54		0	97
							0	97
							0	97
							0	97
490							0	97

Zhezkazgan Formation (Gray Sandstone)

GEOLOGIC LOG (8)

MJK - 1

INCLINATION: -90°

AREA: ZHAMAN-AIBAT BEARING: —

ELEVATION: 357.04m FINAL DEPTH: 650.50m

SCALE(m)	DEPTH (m)	DESCRIPTION	REMARKS	MINERALIZATION	SULFIDE	SILICA	CLAY	CARBONATE	SULFATE	SAMPLE No.	ROCK PROPERTY: Angle of Fiss. (°)	No. of Fiss. (/m)	Core Rec. %
	491.90	Gray, fine-grained sandstone with siliceous-carbonate cement. Accumulation of pyrite crystals observed at the interval 490.35-490.4m. Oil saturation in the interval 490.2-490.9m. The rock is slightly fractured; calcite films at fractures. Contact with underlying layer is at the angle 5°.	∠5°	490.2-490.9m: Appear Bituminous sandstone						55 490.0m ~490.3m		0	97
	493.20			493.20-495.10m: Disseminated by pyrite								0	97
	495.10	Dark-gray, siltstone with laminated and thinly bedded sandstone.	∠15°									0	97
		Gray, fine-grained sandstone with siliceous-carbonate cement., cross-bedded at the angles 15. Spots with increased pyrite content are also described through the layer, with calcite films coating joints, joints.		495.10-499.45m: Weak Chloritization Very weak pyrite dissemination						495.0m ~495.3m 56		1	97
	499.45										∠70°	0	97
500		Dark-gray, siltstone, with thinly bedded sandstone, at the angle 5°, including spots of light-gray limy sandstone. Joints contain calcite films. Contact with underlying layer is gradual.	∠5°	499.45-502.90m: Weakly disseminated by pyrite Veinlets of calcite						500.0m ~500.3m 57		0	97
	502.90		∠0°									0	97
		Gray fine-grained sandstone with siliceous-carbonate cement., with thinly and horizontally bedded siltstone. Interlayer of intraformational conglomerate is observed within the interval 500.8-500.86. Calcite films coating joints and Veinlets of calcite 4 cm thick is observed at the bottom of the layer.		502.9-505.0m: Weakly disseminated by pyrite 502.9-506.1m: Weak Chloritization 505.0-505.3m: Cu, mineralization, Cu 12%, Ag 72.9 g/t						505.0m ~505.3m 58		0	97
	509.40	Greenish-gray-Dark-gray, fine-grained sandstone with siliceous-carbonate cement with horizontally and thinly bedded aleurosandstone. The rock is slightly fractured with calcite films coating joints. Contact with underlying layer is 0°.	∠0°									0	97
510										510.0m ~510.3m 59		0	97
		Greenish-gray - dark gray, sandy siltstone. Structure is bedded at the angle 0-5° due to fine lamination with dark-gray sandstone. Contact with underlying layer is gradual. Rare concretions of pyrite with size 1 x 1 - 1.5 - 2.0 cm are described through the layer.	∠0° 5°							515.0m ~515.3m 60		0	97
				515.6-516.2m, 519.3-525.0m; Weakly disseminated by pyrite								0	97
520										520.0m ~520.3m 61		0	97
	521.70	Gray-greenish gray, fine-medium grained sandstone with thinly and horizontally bedded red-green colored shade with siliceous-carbonate cement. Concretions of pyrite are observed within the layer. The rock is medium fractured with calcite films coating joints.	∠0°	521.70-524.60m: Disseminated by pyrite								0	97
	524.60									525.0m ~525.3m 62		0	97
		Gray, sandy siltstone. Interlayer of horizontal micro-crystalline limestone is observed within the interval 535.5-535.9 m and 528.2-528.4m. Frequent concretions of calcite sizing from 0.1 x 0.2 cm to 0.5 x 1.0 cm are described within the interval 527.4–527.8m and 531.7-534.8 m. Contact with underlying layer is at the angle 0°.		527.4-534.8m: concretions of calcite						530.0m ~530.3m 63		0	97
530												0	97
	535.45		∠0°							535.0m ~535.3m 64		0	97
		Dark gray-greenish gray, alternation beds of fine-grained sandstone and siltstone bedded at the angle 5° with calcite films and pyrite concretions at joints. Contact with underlying layer is at the angle 0°.		537.0-539.0m: Weakly disseminated by pyrite								0	97
540	540.75		∠0°							540.0m ~540.3m 65		0	97
		Pale gray-greenish gray, alternation beds of fine-grained sandstone (with siliceous cement and) siltstone bedded at the angle 0°. Lamination and graded bedding structure are developed. Weak pyrite dissemination is observed at the sandstone layers. Oil saturation in the interval 544.45-545.80m and 549.50-550.35m.		540.75-552.15m: Weak pyrite dissemination in the sandstone layers. 544.45-545.80m and 549.50-550.35m: Oil saturation						545.0m ~545.3m 66	∠5°	1	97
			∠0°									0	97
550										550.0m ~550.3m 67		0	97
	552.15											0	97
		Greenish-gray - dark gray, sandy siltstone. Structure is bedded at the angle 0-5° due to fine lamination with dark-gray sandstone. Contact with underlying layer is gradual. 556.8-557.15m: gray, medium grained sandstone with weak pyrite dissemination and with Oil saturation.	∠0° 5°	556.8-557.15m: weak pyrite dissemination and Oil saturation.						555.0m ~555.3m 68	∠10°	2	97
	559.00	Pale gray, Coarse-fine grained sandstone, with graded bedding and lamination structure, bedding structure at the angle 10°.	∠10°	559.00-560.00m: Weak pyrite dissemination								0	97
560												0	97

Zhetkazgan Formation (Gray Sandstone)

A - 21

GEOLOGIC LOG (9)

MJK - 1

AREA: ZHAMAN-AIBAT INCLINATION: -90° BEARING: — ELEVATION: 357.04m FINAL DEPTH: 650.50m

SCALE(m)	COLUMN	DEPTH (m)	DESCRIPTION	REMARKS	MINERALIZATION	SULFIDE	SILICA	CLAY	CARBONATE	SULFATE	SAMPLE No.	ROCK PROPERTY: Angle of Fiss. (°)	No. of Fiss. (/m)	Core Rec. %
		561.70	Gray, coarse-fine grained sandstone, with siliceous cement. Graded bedding structure is developed at the angle 5°. Calcite films and fine abundant pyrite impregnation filling joint are observed through the layer.	∠5°	560.00-561.70m: pyrite dissemination(medium) and calcite films (weak)						69 560.0m ~ 560.3m		0	97
		568.00	Gray-pale greenish gray, fine alternation beds of sandy siltstone and fine grained sandstone, at the angle 5°-15°. Sometimes it contains lsand-balls. Cristals and concretions of pyrite are observed at the interval from 564.6 to 565.0m. Contact with underlying layer is at the angle 0°.	∠5°~15° ∠0°	564.6-565.0m: Strongly disseminated by pyrite 565.0-568.0m: Weakly disseminated by pyrite						565.0m ~565.3m 70			
570		578.20	Pale gray, coarse-fine grained sandstone with siliceous-carbonaceous cement, graded bedding structure is developed. Weak pyrite dissemination is observed all through the layer. Partially including brecciated siltstone fragments at the interval from 573.4 to 574.1m and from 576.0 to 577.9m. Bedding structure is horizontal, sometimes cross-bedded at the angle 5°-15°. Joints are oriented at the angle 5°-35°. Contact with underlying layer is wavy and gradual.	∠5°~15°	568.00-578.20m: Weak pyrite dissemination						570.0m ~570.3m 71			
580		585.30	Alternation beds of Sandstone and siltstone, horizontalliy bedded. 583.0-585.3m: Weak pyrite dissemination **Sandstone layers:** Coarse-medium-fine grained sandstone layers showing graded bedding structure with Weak oil odor, Thickness: 0.9m-1.2m. Abundant fragments of greenish gray siltstone are observed in the layer. Contact with underlying layer is wavy (load cast ?). **Siltstone layers: Greenish gray,** Rare carbonaceous concretions with size up to 1.0 x 1.5cm and black mud ball are observed in the layer. Gray, fine garined laminated sandstone, horizontally bedded. Dark gray colored interlayers with abundant pyrite are observed through the sandstone layer. Contact with underlying layer is at the angle 10°.	∠0°	583.0-585.3m: Weak pyrite dissemination Sandstone layers: Weak oil odor						575.0m ~575.3m 72 580.0m ~580.3m 73 583.0m ~583.3m 74			
590		590.94	Gray-dark gray, laminated and thinly bedded sandstone including a small quantity of siltstone thin layers. Distinct graded bedding structure (bedding inclination; 0°-10°) is observed. Pyrite dissemination is observed all through the layers, strongly disseminated zones are distributed in the coarse grained sandstone layers.	∠0° ∠10°	585.30-590.94m: Thin layers with pyrite concentration						Sample No. 1 ~ 43 (591.0m ~610.0m)			
		597.60	Dark gray, alternating beds of fine grained sandstone(arenite) and siltstone, bedded at the angle 0°-5°. Chalcocite concentrated thin layers and weak pyrite dissemination (including a small amount of galena-chalcopyrite-bornite) are observed at the sandstone layers.	∠0°~10°	590.94-597.60m: Pyrite dissemination 590.94-592.72m: strrong 592.72-593.95m: weak 594.35-594.64m: strrong 594.64-595.80m: weak 595.80-597.60m: strrong						1 5 10 15 20 25 30 35 40 43	∠15° ∠5° ∠5° ∠10° ∠10°		
600		600.12	Light gray-brown, medium graind massive sandstone, containing a small amount of conglomerate and siltstone thin layers, bedded at the angle 3°-7°. Dissemination by chalcocite (>>galena,bornite,chalcopyrite>pyrite) are observed within the interval 599.0-605.78m.	∠0°~5°	599.00-600.12m: Chalcocite concentration layers and weak pyrite dissemination									
		608.27	Brownish light gray-greenish light gray, intraformational conglomerate (RAIMUNDO Conglomerate), consisting of angular fragments of white or pink-colored limestone and siltstone (sizing from 5 x 5mm to 15 x 30mm) and cement of green colored (caused by weak chloritization) muddy sandstone. At the bottom of the layer, cement is represented by red sandstone. No mineralization observed.	∠3°~7°	600.12-605.78m:Dissemination by chalcocite(>>galena,bornite, chalcopyrite >pyrite) 600.12-605.78m: strong 605.78-607.98m: very weak									
		609.30	Gray (partially brown), fine-medium grained sandstone(arenite) with siliceous-carbonaceous cement with horizontal graded bedding structure. Contact with underlying layer is wavy. Very weak pyrite dissemination is observed.	∠0°	609.30-610.75m: Very weak pyrite dissemination									
610		610.75	Reddish brown, siltstone with indistinct bedded structure. Calcite concretions with size 0.3 x 0.6cm and no mineralization observed.											
		614.35	Reddish light brown, laminated fine-medium grained sandstone, bedded at the angle 5°-10°. Reddish brown colored shale layer is observed within the interval 617.20-618.30m. Contact with underlying layer is wavy.	∠5°~10°	614.35-621.40m: Very weak pyrite dissemination							∠5° ∠10°		
620		621.40	Reddish brown, horizontally bedded siltstone, containing calcite concretions sizing from 0.3 x 0.5cm to 0.5 x 2.0cm. Brown colored laminated sandstone layer is observed within the interval 624.65-625.80m and 628.00-630.00m.	∠0°							621.0m ~621.3m 75			
630														

REMARKS: Zhezkazgon Formation (Gray Sandstone) — Weakly Mineralized Zone; Cu-Mineralized; Weakly Mineralized; Toskuduk Formation

GEOLOGIC LOG (10)

MJK - 1

INCLINATION : - 90°

AREA : ZHAMAN-AIBAT BEARING : —

ELEVATION : 357.04 m FINAL DEPTH : 650.50 m

SCALE (m)	COLUMN	DEPTH (m)	DESCRIPTION	REMARKS	MINERALIZATION	SULFIDE	SILICA	CLAY	CARBONATE	SULFATE	SAMPLE No.	ROCK PROPERTY: Angle of Fiss. (°)	ROCK PROPERTY: No. of Fiss. (/m)	ROCK PROPERTY: Core Rec. %
			Reddish brown, siltstone with indistinct horizontal bedded structute, containing calcite concretions sizing from 0.5 x 1cm to 2 x 3cm. Interlayers of medium grained sandstone and intraformational conglomerate are observed at the middle of the layer. ∠ 0°	Taskuduk Formation									0 97
												∠ 10°	2 97
													0 97
													0 97
													0 97
													0 97
													0 97
													0 97
		639.80											0 97
640			Brownish gray, laminated medium grained sandstone, strongly fractured at the top of the layer. Contact with underlying layer is wavy.								642.0m ~ 642.3m 76		0 97
			Intraformational pebble conglomerate, consisting of red colored siltstone fragments and medium grained sandstone matrix. Contact with underlying layer is wavy. ∠ 5°										0 97
													0 97
													0 97
													0 97
		646.90											0 97
		647.80	Red colored siltstone with indistinct bedded structure. Calcite concretions 0.5 x 1cm in size occur at the top of the layer. Interlayer of fine grained sandstone is observed within the interval 648.80-649.20m.										0 97
													0 97
650		650.50											0 97
		(Final Depth)											

Appendix 7 Assay Results of core Samples from Drill Hole "MJK-1"

Sample No.	From m	To m	Length m	Au ppb	Ag g/t	Cu %	Pb %	Zn %	Fe tot %	Re ppm	S sulfide %	S sulfate %	S tot %	S elem %	FeO %
No.01	591.00	591.50	0.50	< 5	0.3	0.01	0.05	0.02	2.36	3	0.87	0.02	0.89	< 0.01	1.50
No.02	591.50	592.00	0.50	< 5	1.0	0.01	0.01	0.01	1.81	< 1	0.77	0.01	0.78	.....	.....
No.03	592.00	592.50	0.50	< 5	0.3	0.02	0.04	0.01	1.98	3	1.04	0.01	1.05	.....	.....
No.04	592.50	593.00	0.50	< 5	0.7	0.06	0.07	0.02	2.16	< 1	0.73	0.01	0.74	.....	.....
No.05	593.00	593.50	0.50	< 5	0.3	0.03	0.03	0.03	2.16	< 1	0.72	0.02	0.74	.....	.....
No.06	593.50	594.00	0.50	< 5	0.3	0.07	0.10	0.02	1.48	6	0.47	0.01	0.48	.....	.....
No.07	594.00	594.50	0.50	< 5	0.7	0.09	0.01	0.02	1.54	4	0.45	0.01	0.46	.....	.....
No.08	594.50	595.00	0.50	< 5	0.3	0.09	0.01	0.04	2.38	< 1	0.58	0.01	0.59	.....	.....
No.09	595.00	595.50	0.50	< 5	0.7	0.16	0.02	0.09	1.79	< 1	0.48	0.01	0.49	.....	.....
No.10	595.50	596.00	0.50	< 5	1.0	0.11	0.04	0.05	1.35	< 1	0.67	0.01	0.68	.....	.....
No.11	596.00	596.50	0.50	< 5	0.3	0.06	0.03	0.03	2.24	< 1	0.64	0.00	0.64	.....	.....
No.12	596.50	597.00	0.50	< 5	0.7	0.16	0.01	0.03	2.30	< 1	0.84	0.01	0.85	.....	.....
No.13	597.00	597.50	0.50	< 5	0.3	0.04	0.02	0.02	2.92	< 1	0.53	0.01	0.54	.....	.....
No.14	597.50	598.00	0.50	< 5	0.3	0.04	0.07	0.05	3.00	3	1.40	0.01	1.41	.....	.....
No.15	598.00	598.48	0.48	< 5	1.4	0.53	0.11	0.22	3.61	4	1.70	0.01	1.71	0.05	3.13
No.16	598.48	599.03	0.55	< 5	1.0	0.32	0.02	0.22	2.34	6	0.85	0.01	0.86	.....	.....
No.17	599.03	599.21	0.18	< 5	6.9	2.02	0.03	0.02	2.97	1	1.34	0.02	1.36	.....	.....
No.18	599.21	599.82	0.61	< 5	6.9	1.13	0.08	0.02	3.25	1	1.34	0.01	1.35	.....	.....
No.19	599.82	600.02	0.20	< 5	37.4	14.50	1.82	0.02	3.30	9	4.76	0.02	4.78	.....	.....
No.20	600.02	600.40	0.38	< 5	3.4	0.51	3.27	0.01	2.68	11	0.63	0.06	0.69	.....	.....
No.21	600.40	600.77	0.37	< 5	7.9	1.54	1.04	0.01	1.34	11	0.58	0.04	0.62	.....	.....
No.22	600.77	601.75	0.98	< 5	10.6	1.34	6.54	< 0.01	1.34	34	1.33	0.05	1.38	.....	.....
No.23	601.75	602.17	0.42	< 5	85.7	12.00	0.08	0.01	1.00	40	3.03	0.01	3.04	.....	.....
No.24	602.17	602.68	0.51	< 5	26.4	4.99	0.26	< 0.01	1.55	14	1.32	0.02	1.34	.....	.....
No.25	602.68	603.10	0.42	< 5	118.6	15.30	0.21	< 0.01	0.99	20	4.04	0.03	4.07	0.02	14.80
No.26	603.10	603.66	0.56	< 5	11.3	1.96	< 0.01	< 0.01	1.28	4	0.51	0.11	0.62	.....	.....
No.27	603.66	604.05	0.39	< 5	10.3	2.22	0.74	< 0.01	1.30	5	0.71	0.07	0.78	.....	.....
No.28	604.05	604.15	0.10	40	6.9	1.34	< 0.01	0.01	2.46	2	0.39	0.01	0.40	.....	.....
No.29	604.15	604.65	0.50	< 5	14.4	2.35	< 0.01	< 0.01	1.35	< 1	0.61	0.07	0.68	.....	.....
No.30	604.65	605.00	0.35	< 5	27.8	4.59	< 0.01	0.01	0.80	< 1	1.18	0.31	1.49	.....	.....
No.31	605.00	605.20	0.20	< 5	23.7	3.50	< 0.01	< 0.01	1.43	< 1	0.91	0.11	1.02	.....	.....
No.32	605.20	605.34	0.14	< 5	38.7	10.30	< 0.01	< 0.01	2.35	4	2.55	0.06	2.61	.....	.....
No.33	605.34	605.47	0.13	< 5	16.1	2.62	0.03	< 0.01	2.35	< 1	0.73	0.03	0.76	.....	.....
No.34	605.47	605.61	0.14	< 5	12.0	1.88	< 0.01	0.01	1.81	2	0.53	0.04	0.57	.....	.....
No.35	605.61	605.78	0.17	< 5	39.8	7.51	< 0.01	< 0.01	1.48	< 1	1.92	0.04	1.96	0.04	6.99
No.36	605.78	606.50	0.72	< 5	0.3	0.03	< 0.01	0.01	1.67	< 1	0.01	0.12	0.13	.....	.....
No.37	606.50	607.00	0.50	< 5	0.3	0.02	< 0.01	0.01	2.01	< 1	0.01	0.08	0.09	.....	.....
No.38	607.00	607.50	0.50	< 5	0.3	0.02	< 0.01	0.01	2.77	3	0.18	0.01	0.19	.....	.....
No.39	607.50	608.00	0.50	< 5	0.0	0.01	< 0.01	0.01	2.44	< 1	0.12	0.01	0.13	.....	.....
No.40	608.00	608.50	0.50	< 5	0.0	0.02	< 0.01	0.01	2.93	< 1	0.02	0.02	0.04	.....	.....

Sample No.	From m	To m	Length m	Au ppb	Ag g/t	Cu %	Pb %	Zn %	Fe tot %	Re ppm	S sulfide %	S sulfate %	S tot %	S elem %	FeO %
No.41	608.50	609.00	0.50	< 5	0.0	0.03	0.01	0.02	2.73	< 1	< 0.01	0.02	0.02	.....	.....
No.42	609.00	609.50	0.50	< 5	0.3	0.12	0.02	0.01	3.34	2	0.06	0.01	0.07	.....	.....
No.43	609.50	610.00	0.50	< 5	0.3	0.04	0.03	0.01	2.57	< 1	0.03	0.01	0.04	.....	.....
No.44	435.00	435.30	0.30	< 5	0.0	< 0.01	0.01	< 0.01	4.05	5	0.01	0.02	0.03	.....	.....
No.45	440.00	440.30	0.30	< 5	0.0	0.01	0.01	0.01	3.83	< 1	1.73	0.01	1.74	0.03	2.12
No.46	445.00	445.30	0.30	< 5	0.0	0.01	< 0.01	0.01	3.84	< 1	< 0.01	0.20	0.20	.....	.....
No.47	450.00	450.30	0.30	< 5	0.0	0.01	< 0.01	< 0.01	1.02	3	0.17	0.04	0.21	.....	.....
No.48	455.00	455.30	0.30	< 5	0.0	0.01	0.05	0.01	3.00	< 1	0.03	0.01	0.04	.....	.....
No.49	460.00	460.30	0.30	< 5	0.0	< 0.01	< 0.01	0.01	3.18	3	1.10	0.01	1.11	.....	.....
No.50	465.00	465.30	0.30	< 5	0.0	< 0.01	< 0.01	0.01	3.13	< 1	0.81	0.01	0.82	.....	.....
No.51	470.00	470.30	0.30	< 5	0.0	< 0.01	0.01	0.01	2.38	< 1	0.07	0.03	0.10	.....	.....
No.52	475.00	475.30	0.30	< 5	0.0	< 0.01	< 0.01	< 0.01	2.70	< 1	0.38	0.01	0.39	.....	.....
No.53	480.00	480.30	0.30	< 5	0.0	0.02	< 0.01	0.01	3.92	2	0.01	0.02	0.03	.....	.....
No.54	485.00	485.30	0.30	< 5	0.0	< 0.01	0.01	< 0.01	1.80	< 1	0.03	0.01	0.04	.....	.....
No.55	490.00	490.30	0.30	< 5	0.0	0.01	0.01	< 0.01	1.47	< 1	0.71	0.02	0.73	0.02	0.72
No.56	495.00	495.30	0.30	< 5	0.0	0.01	0.01	< 0.01	3.50	< 1	1.58	0.01	1.59	.....	.....
No.57	500.00	500.30	0.30	< 5	0.0	0.01	< 0.01	< 0.01	2.40	2	1.13	0.02	1.15	.....	.....
No.58	505.00	505.30	0.30	< 5	0.0	0.01	< 0.01	0.01	4.09	< 1	0.01	0.02	0.03	.....	.....
No.59	510.00	510.30	0.30	< 5	0.0	0.01	< 0.01	< 0.01	4.04	< 1	0.01	0.01	0.02	.....	.....
No.60	515.00	515.30	0.30	< 5	0.0	0.01	< 0.01	0.01	3.34	1	0.72	0.02	0.74	.....	.....
No.61	520.00	520.30	0.30	< 5	0.0	0.01	< 0.01	0.01	4.22	< 1	2.54	0.02	2.56	.....	.....
No.62	525.00	525.30	0.30	< 5	0.3	0.07	0.01	0.01	3.09	< 1	1.07	0.02	1.09	.....	.....
No.63	530.00	530.30	0.30	< 5	0.0	0.01	< 0.01	0.01	3.42	< 1	0.02	0.30	0.32	.....	.....
No.64	535.00	535.30	0.30	< 5	0.3	0.01	< 0.01	0.01	3.94	< 1	0.02	0.18	0.20	.....	.....
No.65	540.00	540.30	0.30	< 5	0.0	0.01	< 0.01	0.01	3.93	< 1	0.06	0.09	0.15	0.01	3.61
No.66	545.00	545.30	0.30	< 5	0.0	0.01	< 0.01	0.01	4.14	4	< 0.01	0.02	0.02	.....	.....
No.67	550.00	550.30	0.30	< 5	0.3	0.01	< 0.01	0.01	2.25	2	0.30	0.01	0.31	.....	.....
No.68	555.00	555.30	0.30	< 5	0.0	< 0.01	< 0.01	0.02	4.82	2	0.03	0.00	0.03	.....	.....
No.69	560.00	560.30	0.30	< 5	0.0	0.02	0.03	0.01	2.14	< 1	0.07	0.01	0.08	.....	.....
No.70	565.00	565.30	0.30	< 5	0.0	0.01	0.01	0.01	3.23	6	0.37	0.01	0.38	.....	.....
No.71	570.00	570.30	0.30	< 5	0.0	< 0.01	< 0.01	< 0.01	2.64	2	0.05	0.00	0.05	.....	.....
No.72	575.00	575.30	0.30	< 5	0.0	< 0.01	< 0.01	0.01	2.55	< 1	0.09	0.01	0.10	.....	.....
No.73	580.00	580.30	0.30	< 5	0.0	0.03	0.01	0.01	2.69	2	0.04	0.01	0.05	.....	.....
No.74	585.00	585.30	0.30	< 5	0.3	0.02	< 0.01	0.01	2.65	< 1	0.07	0.01	0.08	.....	.....
No.75	621.00	621.30	0.30	< 5	0.0	0.01	0.01	< 0.01	1.60	3	< 0.01	0.02	0.02	0.02	0.71
No.76	642.00	642.30	0.30	< 5	0.0	0.01	< 0.01	0.01	4.05	< 1	< 0.01	0.03	0.03	.....	.....
No.77	Zhezkazgan South Mine			65	798.8	31.90	0.08	< 0.01	3.97	29	10.42	0.00	10.42	.....	.....
No.78	Zhezkazgan South Mine			5	459.4	27.70	0.02	< 0.01	4.59	40	10.41	0.00	10.41	.....	.....
No.79	Zhezkazgan South Mine			< 5	778.3	29.90	0.01	< 0.01	3.80	48	9.94	0.00	9.94	.....	.....
No.80	Zhezkazgan South Mine			< 5	1028.6	30.90	0.01	< 0.01	1.85	17	8.73	0.00	8.73	.....	.....

Appendix 8 Whole Rock Analysis of Samples from Drill Hole "MJK-1"

Sample No.	Depth m	Depth m	Formation	SiO_2 (%)	Al_2O_3 (%)	TiO_2 (%)	Fe_2O_3 (%)	FeO (%)	CaO (%)	MnO (%)	Na_2O (%)	MgO (%)	K_2O (%)	P_2O_5 (%)	LOI (%)	Total (%)
95-N45J3	440.00	440.30	C3dz	60.75	14.04	0.58	3.30	2.26	3.53	0.11	3.74	2.26	2.31	0.14	5.73	98.75
95-N55J3	490.00	490.30	C3dz	59.01	9.78	0.47	1.41	0.78	11.85	0.27	4.57	0.39	0.66	0.10	9.61	98.90
95-N65J3	540.00	540.30	C3dz	56.11	14.54	0.62	1.61	3.87	5.13	0.16	2.52	2.55	3.21	0.16	7.69	98.17
95-N22J3	600.77	601.75	C3dz	65.10	9.86	0.32	0.14	2.04	5.14	0.11	3.05	0.57	1.94	0.08	3.84	92.19
95-N26J3	603.10	603.66	C3dz	70.03	10.00	0.37	0.04	1.86	5.50	0.09	3.73	0.53	1.56	0.09	5.27	99.07

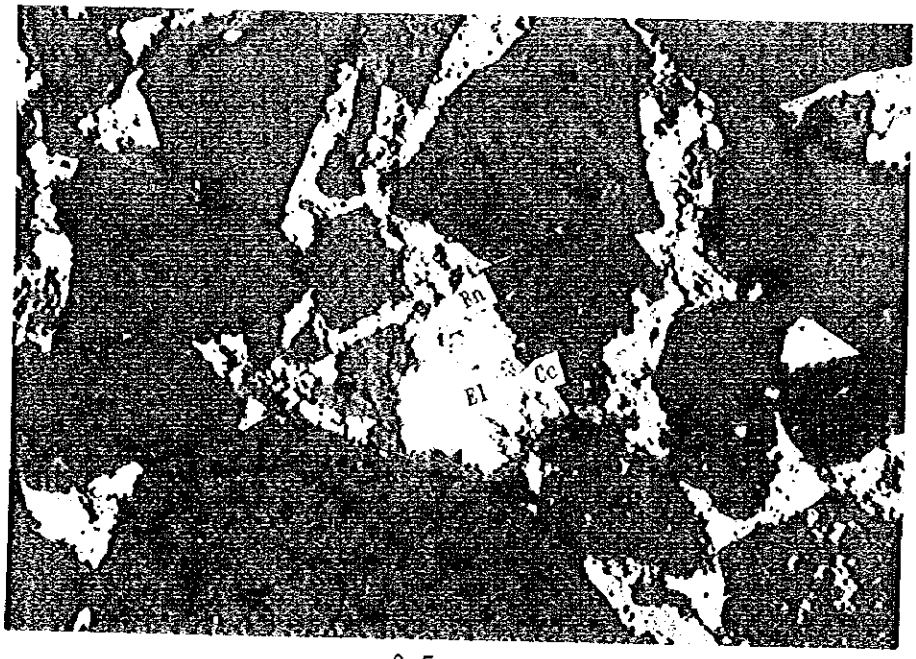
Appendix 9 Microscopic Observation of Ore Minerals in Polished Section

Sample No.	DDH No.	Depth from (m)	Depth to (m)	Orebody /Horizon	Ore Type	Observation	Mineral composition Cc	Bn	Cv	El	Dz	Gr-Cb	Go
95-PS-01	MJK-1	599.82	600.02	Eastern	Cu ore	Chalcocite-like minerals mainly chalcocite and small amounts of digenite and djurleite(60%), bornite (38%), electrum (1%), goethite(1%), and gangue minerals are constituent minerals. Chalcocite-like minerals and bornite occur as interstice -filling product among sedimentary particles and as veinlets in clay-rich parts of the rocks. Ag-rich electrum (max 0.1㎜ in size) occurs in veinlets of less than 2 ㎜ in width, which consist of chalcocite-like minerals (mainly chalcocite) and less bornite, in dark bluish green clay.	○	○		+			+
95-PS-02	MJK-1	600.40	600.77	Eastern	Cu ore	Chalcocite-like minerals mainly chalcocite (95%), goethite (4%), covellite (1%) and gangue minerals are constituent minerals. Chalcocite-like minerals are interstitial among sedimentary particles. Aggregates of goethite grains as secondary products probably after pyrite within some of sedimentary particles are also observed.	○		+				△
95-PS-03	MJK-1	600.77	601.75	Eastern	Cu ore	Chalcocite-like minerals (mainly chalcocite, less digenite and rare djurleite)(98%), goethite (2%) and gangue minerals are constituent minerals. Chalcocite-like minerals occur interstice-filling products among sedimentary particles, and also within some of the particles. Goethite occurs as secondary products after pyrite.	○						△
95-PS-04	MJK-1	601.75	602.17	Eastern	Cu ore	This constitutes chalcocite-like minerals (chalcocite > digenite > djurleite) (80%), bornite (19%), gersdorffite-cobaltite series mineral (1%) and gangue minerals. Chalcocite-like minerals occur as aggregates of small grains and dots and occasionally as patches up to 3 ㎜ × 5 ㎜ in size. Bornite occurs as small inclusions in chacocite-like minerals and as anhedral grains with chalcocite-like minerals up to 40 ㎛ in size. In such a case, these minerals tend to arrange linearly in the rock .Gersdorffite-cobaltite series mineral occurs as small euhedral crystals in chalcocite-like minerals generally with bornite inclusion, and might be misunderstood as skutterudite by Russian researcher.	○	○				+	
95-PS-05	MJK-1	602.17	602.68	Eastern	Cu ore	Chalcocite-like minerals (mainly chalcocite and less digenite) (97%), bornite (1%), covellite (1%) and gangue minerals are constituent minerals. Chalcocite-like minerals occur interstitially among sedimentary particles. Bornite rarely occurs as small inclusions in chalcocite-like minerals. In such a case, bornite is surrounded by secondary djurleite which is an alteration product after chalcocite. Covellite and goethite are also secondary products after chalcocite-like minerals and probably pyrite, respectively.	○	+	+				+
95-PS-06	MJK-1	602.68	603.10	Eastern	Cu ore	This polished section consist of chalcocite-like minerals (mainly chalcocite) (98%), bornite (1%), goethite (1%), and gangue minerals. Interstitial chalcocite-like minerals among sedimentary particles are predominant. Bornite occurs as small inclusion in chalcocite-like minerals. Goethite occurs as secondary products after pyrite in some of sedimentary particles.	○	+					+
95-PS-07	MJK-1	605.00	605.20	Eastern	Cu ore	This is also composed of chalcocite-like minerals (mainly chalcocite) (99%), goethite (1%) and gangue minerals. Chalcocite-like minerals occur as interstice-filling products among sedimentary particles. Goethite occurs in some of sedimentary particles as secondary products after pyrite.	○						+
95-PS-08	MJK-1	605.20	605.34	Eastern	Cu ore	This polished section consists of chalcocite-like minerals (mainly chalcocite and less digenite) (99%), goethite (1%) and gangue minerals. Chalcocite-like minerals occur as interstice-filling products among sedimentary particles. The sulphide minerals are generally more concentrated in sandy parts than silty parts.	○						+
95-PS-09	MJK-1	605.47	605.61	Eastern	Cu ore	Chalcocite-like minerals (mainly chalcocite) (97%), electrum (2%), goethite (1%) and gangue minerals are constituent minerals. Chalcocite-like minerals interstitially occur among sedimentary particles. Ag-rich electrum occurs as small inclusions up to 50 ㎛ in size in open spaces in chalcocite-like minerals and in direct contact with chalcocite-like minerals. Goethite occurs as secondary products after pyrite.	○			△			+
95-PS-10		Zhezkazgan Mine		South Mine	Cu ore (high grade ore)	Sulphide minerals is predominant. It is composed of chalcocite-like minerals (mainly chalcocite) (60%), bornite (39%), electrum (1%) and gangue minerals. All of these ore minerals occur as interstice-filling products among sedimentary particles with quartz and other gangue minerals which occur as euhedral crystals. Chalcocite-like minerals and bornite coexist with each other. Ag-rich electrum is included within both chalcocite-like minerals and bornite, and the former case is rather common. Rarely "dzhezkazganite"-like minerals (?) occurs in chalcocite-like minerals, but it is difficult to identify this phase because of its tiny size.	○	○		+	+?		

Cc : chalcocite-like minerals Bn : bornite Cv : covellite El : electrum Dz : zhezkazganite Gr-Cb : gersdorffite-cobaltite series mineral Go : goethite

Sample No. : 95-PS-01
DDH No. : MJK-1
Depth : 599.82m
Orebody : Eastern
Ore Horizon : 4-I
Ore Type : Cu-Ore

0.5mm

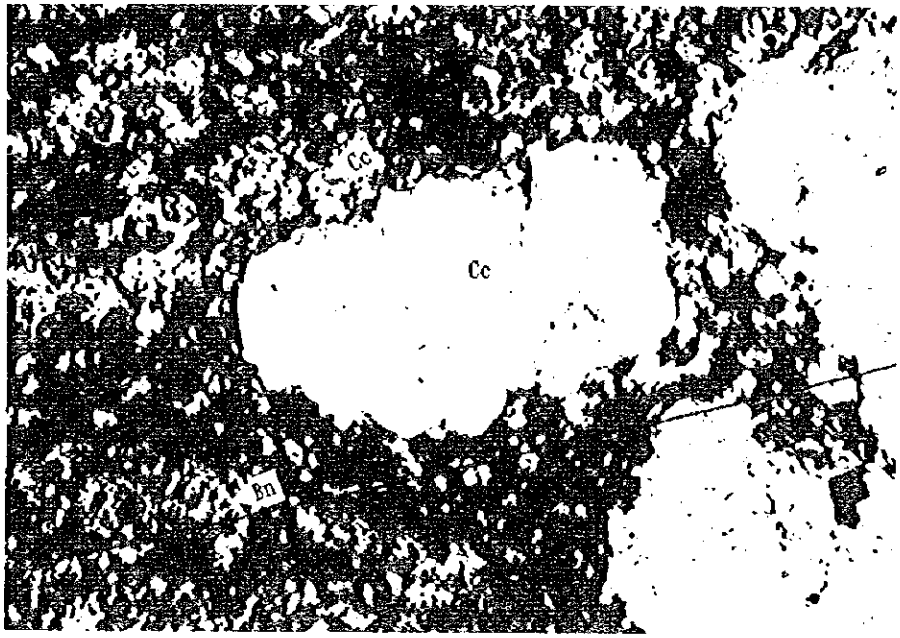


Sample No. : 95-PS-01
DDH No. : MJK-1
Depth : 599.82m
Orebody : Eastern
Ore Horizon : 4-I
Ore Type : Cu-Ore

0.5mm

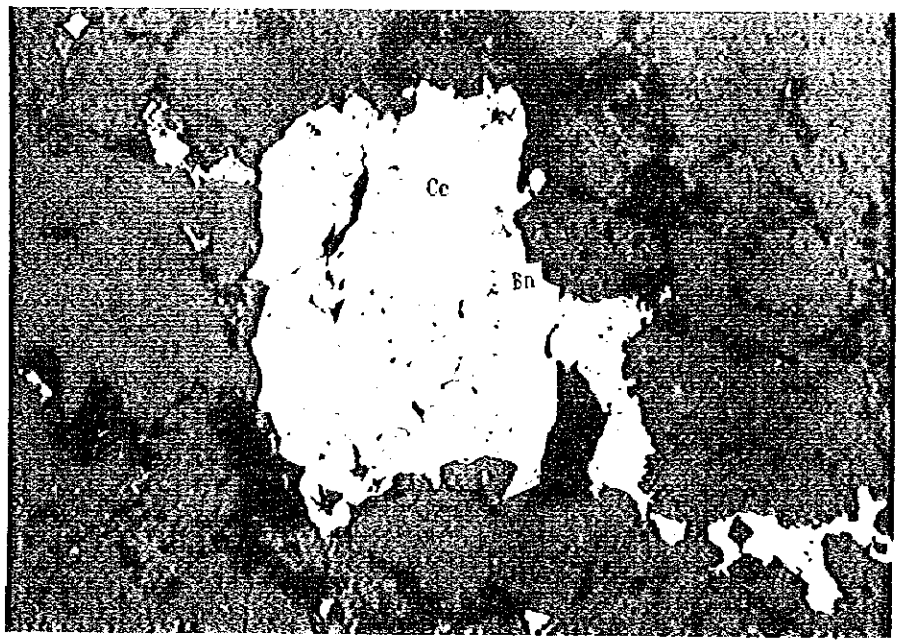
Cc : Chalcocite
Bn : Bornite
El : Electrum

Appendix 10 Photomicrographs of Ore Minerals in Polished Sections



Sample No. : 95-PS-04
DDH No. : MJK-1
Depth : 601.75m
Orebody : Eastern
Ore Horizon : 4-1
Ore Type : Cu-Ore

0.5mm

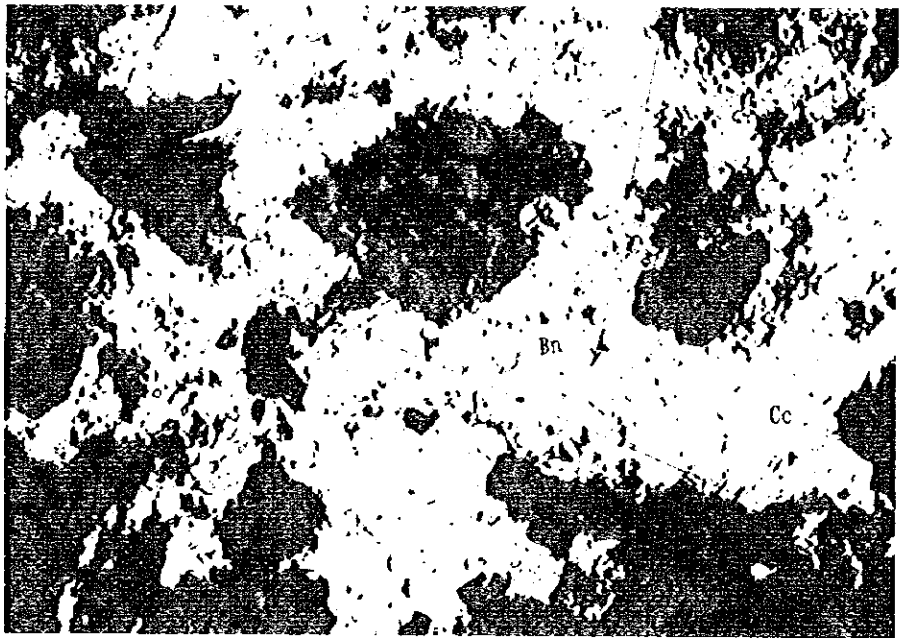


Sample No. : 95-PS-05
DDH No. : MJK-1
Depth : 602.10m
Orebody : Eastern
Ore Horizon : 4-1
Ore Type : Cu-Ore

0.5mm

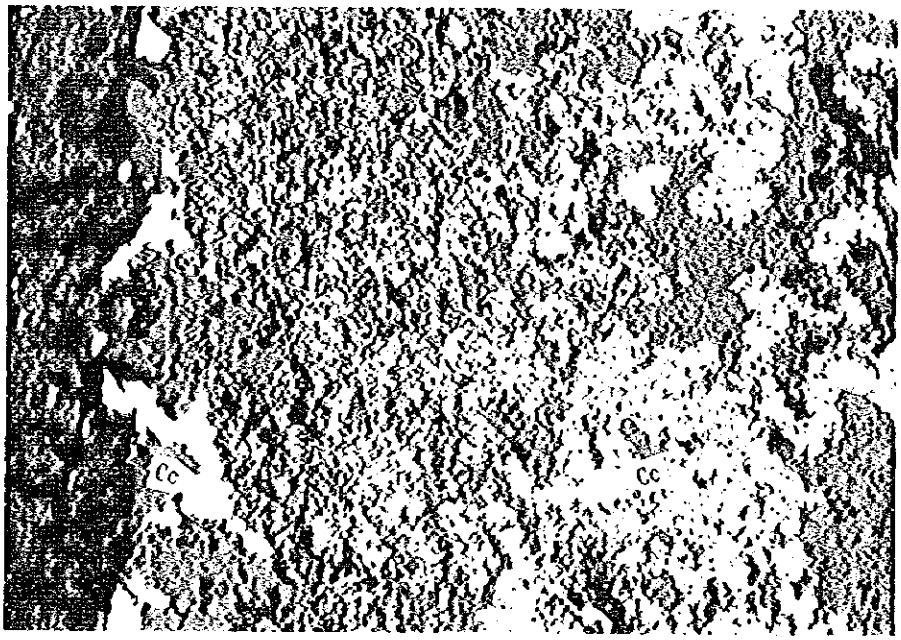
Cc : Chalcocite
Bn : Bornite

Appendix 10 Photomicrographs of Ore Minerals in Polished Sections



Sample No. : 95-PS-06
DDH No. : MJK-1
Depth : 602.68m
Orebody : Eastern
Ore Horizon : 4-I
Ore Type : Cu-Ore

0.5mm



Sample No. : 95-PS-08
DDH No. : MJK-1
Depth : 605.20m
Orebody : Eastern
Ore Horizon : 4-I
Ore Type : Cu-Ore

0.5mm

Cc : Chalcocite
Bn : Bornite

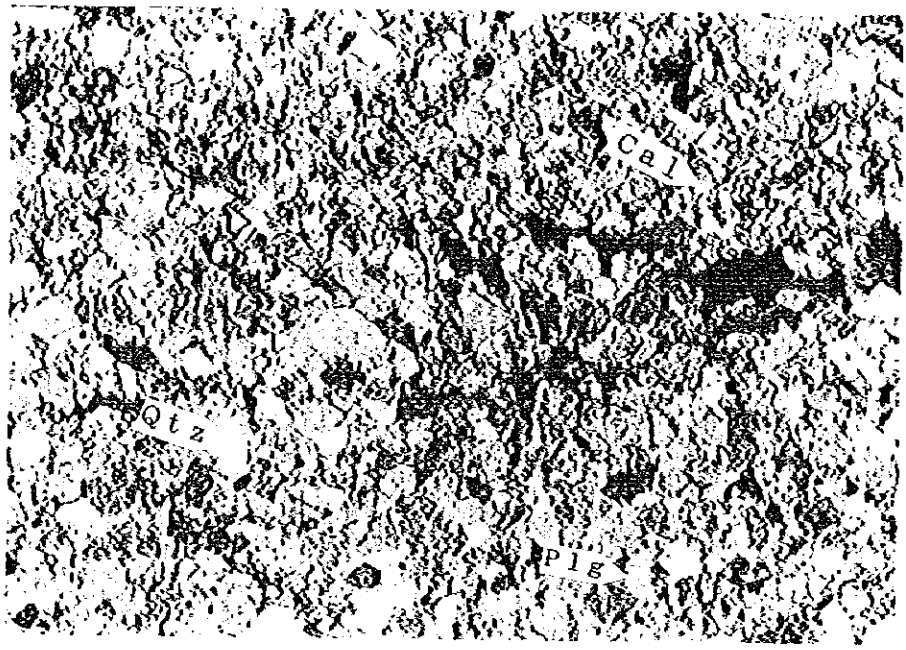
Appendix 10 Photomicrographs of Ore Minerals in Polished Sections

Appendix 11 Results of EPMA Semi-Quantitative Analysis of Ores from MJK-1 and the Zhezkazgan Deposit

No.	Fe (wt %)	Cu (wt %)	Ag (wt %)	Pb (wt %)	S (wt %)	Total (wt %)	Minerals
95-EP-01	10.63	66.656	0	0	23.801	101.087	bornite
(field code : No.23)	11.451	65.623	0.009	0	23.854	100.937	bornite
	11.28	64.029	0.032	0	23.692	99.033	bornite
	0.055	82.068	0	0	19.361	101.484	chalcocite
	0.076	82.192	0.04	0	18.951	101.259	chalcocite
	0.158	47.695	23.994	0	15.925	87.772	stromeyerite
	0.322	78.741	1.608	0	20.199	100.87	chalcocite
95-EP-02	0	0.185	0	86.638	13.505	100.328	galena
(field code : No.19)	0	0.037	0	86.392	13.211	99.64	galena
	10.69	64.588	0.014	0	23.929	99.221	bornite
	10.866	64.723	0	0	23.85	99.439	bornite
	0.041	82.831	0.026	0	19.497	102.395	chalcocite
	0.029	82.263	0	0	19.495	101.787	chalcocite
95-EP-03	11.292	64.929	0.297	0	24.042	100.56	bornite
(field code : No.80)	11.286	64.956	0.212	0	23.835	100.289	bornite
	0.022	82.186	0.395	0	19.038	101.641	chalcocite
	0.023	83.572	0.353	0	19.054	103.002	chalcocite

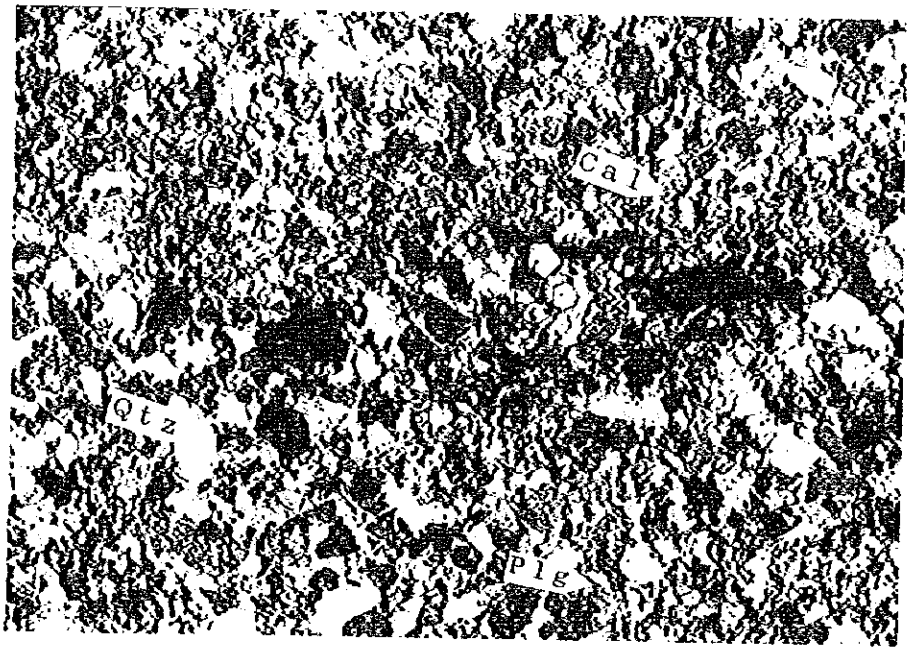
Appendix 12 Microscopic Observation of Rock on Thin Sections

Sample No.	DDH No.	Depth m	Depth m	Formaton	Rock Name	Description	Identified Minerals
95-TS-01	MJK-1	203.5		P1Zd	Laminated siltstone (red aleurolite)	average diameter : 0.02~0.05mm ϕ matrix : carbonitization (weak)	quartz, plagioclase, K-feldspar, sericite, chlorite, smectite, goethite(?)
95-TS-02	MJK-1	329.4		P1Zd	Calcareous sandstone (red sandstone)	average diameter : 0.15mm ϕ matrix : carbonitization	quartz, carbonate minerals (mostly calcite), plogioclase, K-feldspar, opeque minerals, chlorite
95-TS-03	MJK-1	458.9	459.0	C3Dz	Thin laminated siltstone	average diameter : 0.02~0.05mm ϕ matrix : carbonitization	quartz, plagioclase, K-feldspar, opeque-minerals, carbonate minerals (mostly calcite), smectite
95-TS-04	MJK-1	539.9	540.0	C3Dz	Thin laminated siltstone	average diameter : 0.15~0.05mm ϕ matrix : carbonitization	quartz, plagioclase, K-feldspar, opeque minerals, carbonate minerals (mainly calcite), chlorite
95-TS-05	MJK-1	586.2	586.3	C3Dz	Calcareous fine-grained laminated sandstone	average diameter : 0.15mm ϕ matrix : carbonitization	quartz, plagioclase, K-feldspar, opeque minerals, carbonate minerals (mainly calcite),
95-TS-06	MJK-1	601.5		C3Dz	Thin bedded (or laminated) sandstone	average diameter : 0.4mm ϕ matrix : carbonitization, copper minerals	quartz, plagioclase, K-feldspar, opeque minerals, carbonate minerals (mainly calcite), tourmaline
95-TS-07	MJK-1	644.2	644.25	C2tz	Calcareous sandstone	average diameter : 0.2mm ϕ matrix : carbonitization	quartz, plagioclase, K-feldspar, opeque minerals, carbonate minerals (mainly calcite), sericite, chlorite, smectite



Open Polar

4 mm

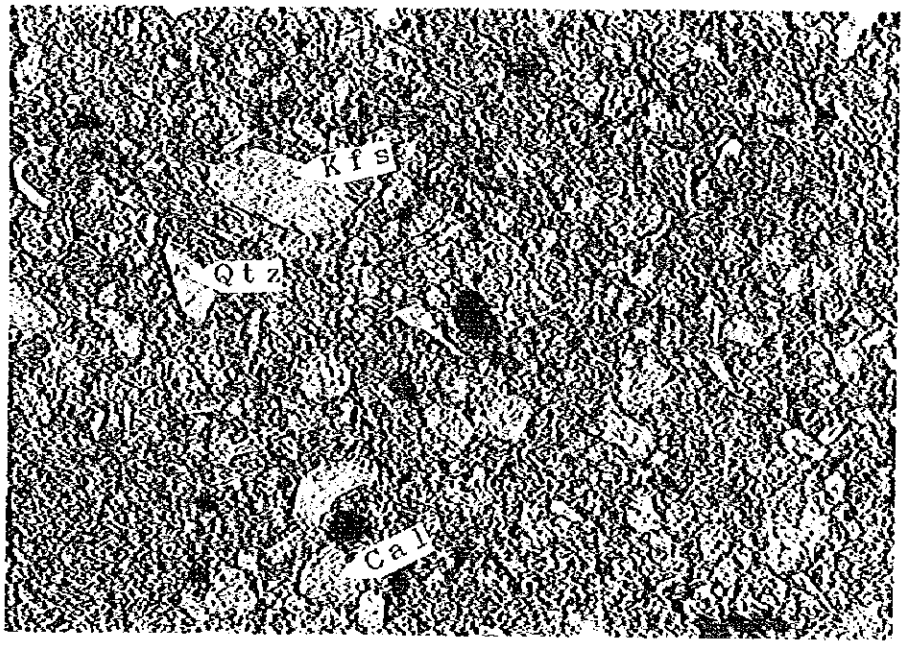


Crossed Polars

4 mm

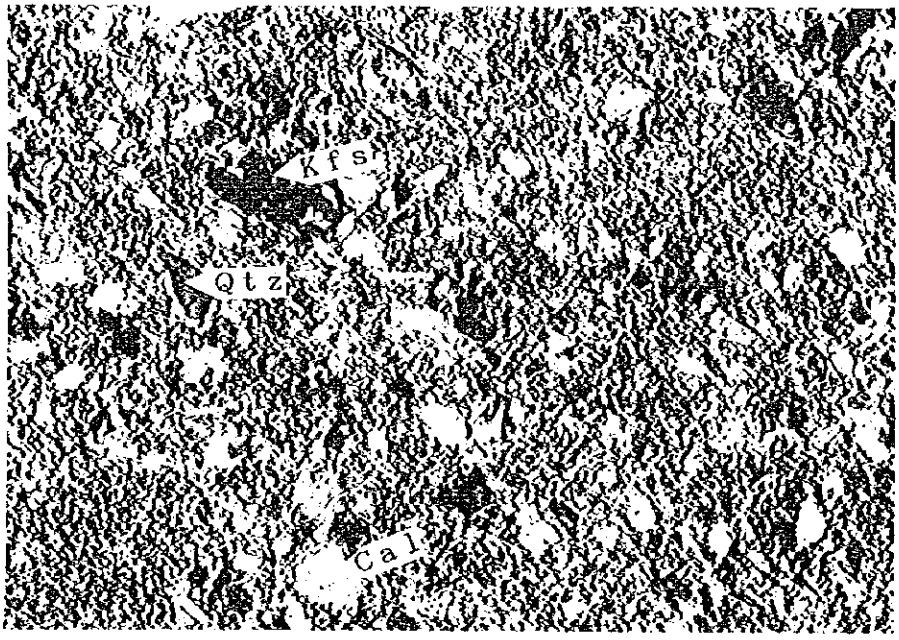
Cal : Calcite
Qtz : Quartz
Plg : Plagioclase

Sample No. : 95-TS-02
DDH No. : MJK-1
Depth : 329.40m
Formation : Zhidelisai
Rock Name : Calcareous Sandstone



Open Polar

0.5mm

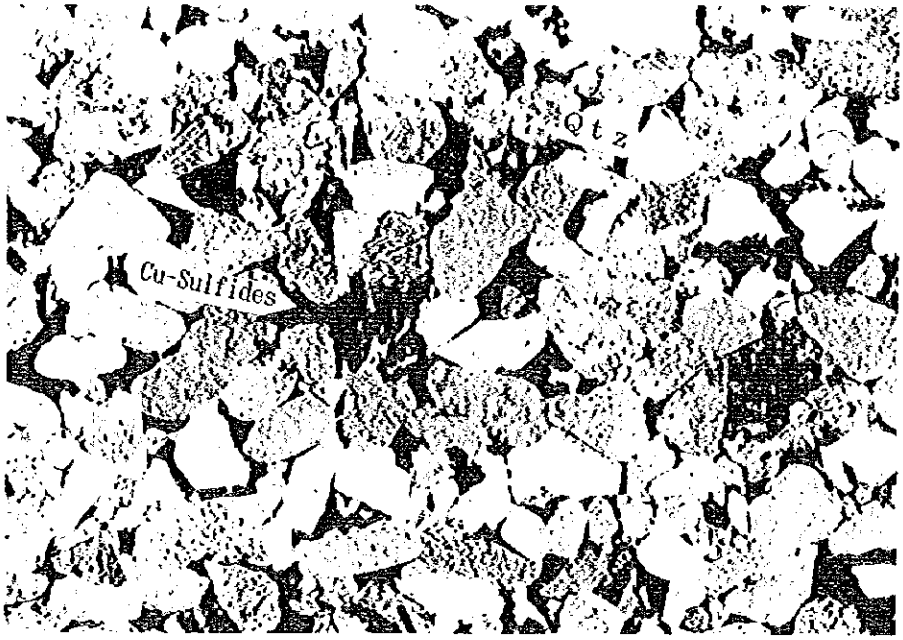


Crossed Polars

0.5mm

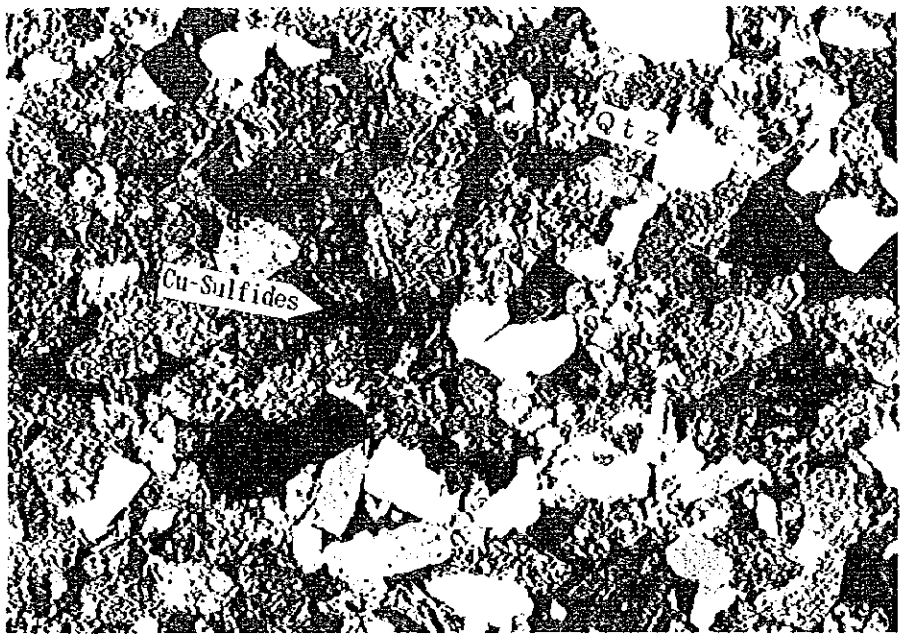
Cal : Calcite
Qtz : Quartz
Kfs : K-feldspar

Sample No. : 95-TS-04
DDH No. : MJK-1
Depth : 539.90m
Formation : Zhezkazgan
Rock Name : Thin Laminated Siltstone



Open Polar

4 mm



Crossed Polars

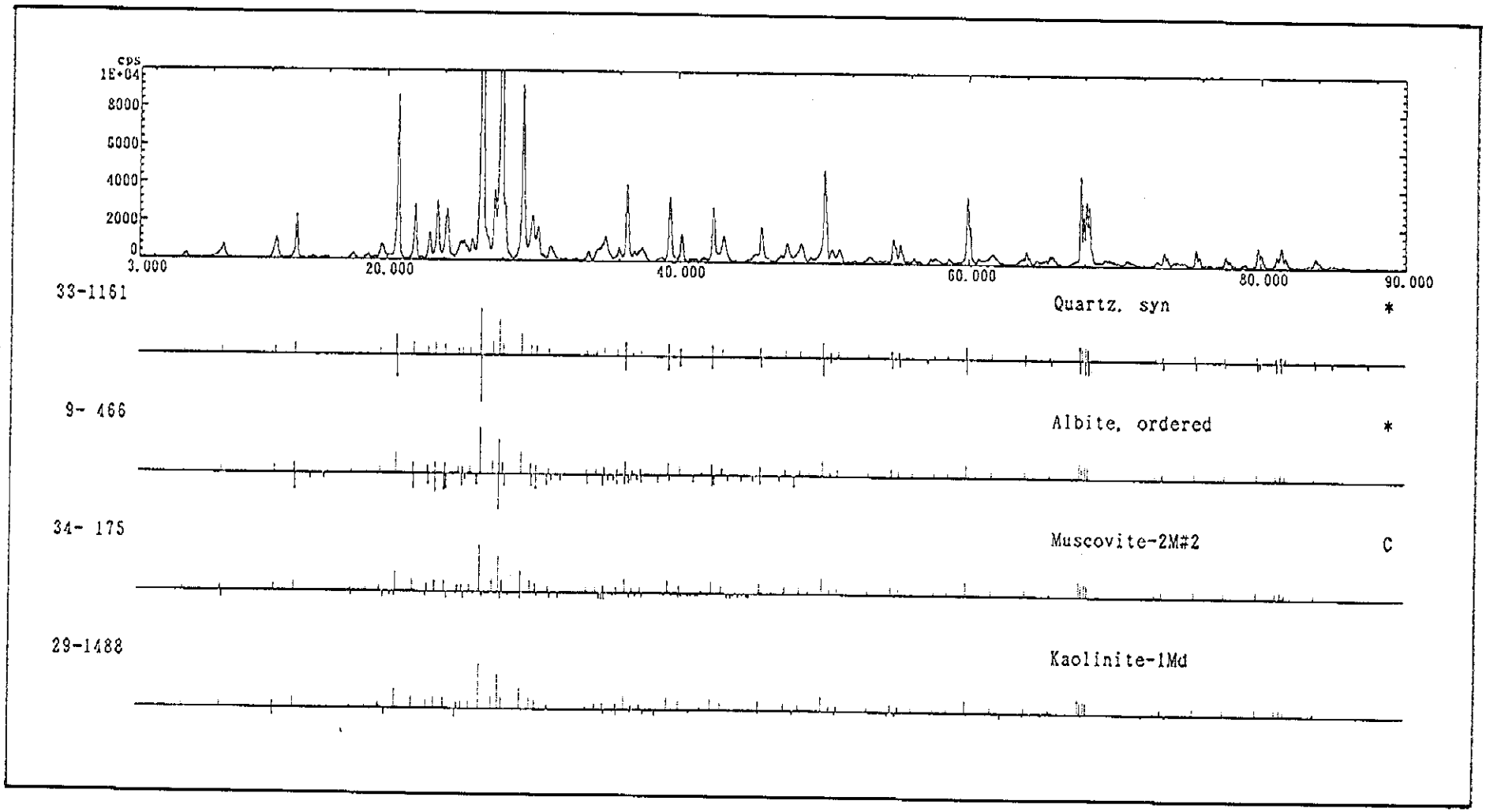
4 mm

Qtz : Quartz
Cu-Sulfides : Chalcocite, Bornite

Sample No. : 95-TS-06
DDH No. : MJK-1
Depth : 601.50m
Formation : Zhezkazgan
Rock Name : Thin Bedded or Laminated Sandstone (Cu-Ore)

Appendix 13 Photomicrographs of Rocks in Thin Sections

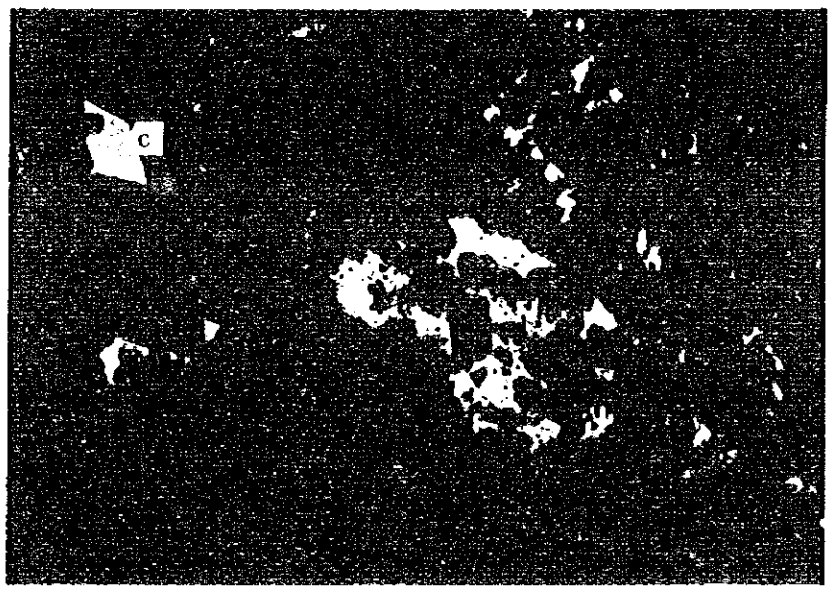
Appendix 14 Results of X-ray Diffration Analysis of Feed Ore



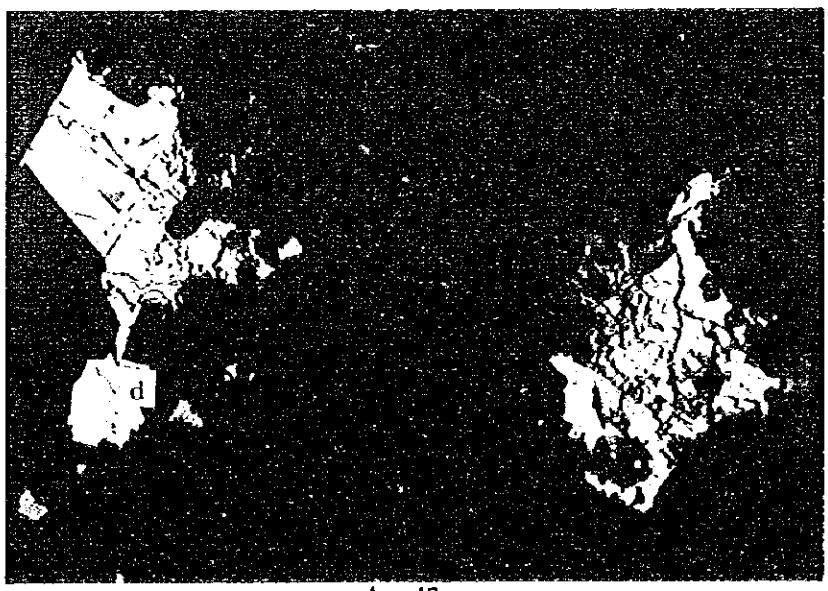
Appendix 15(1) Photomicrographs of Ore Minerals in Polished Sections
(Feed Ore of Ore Dressing Test)

Feed Ore

25μm
360×



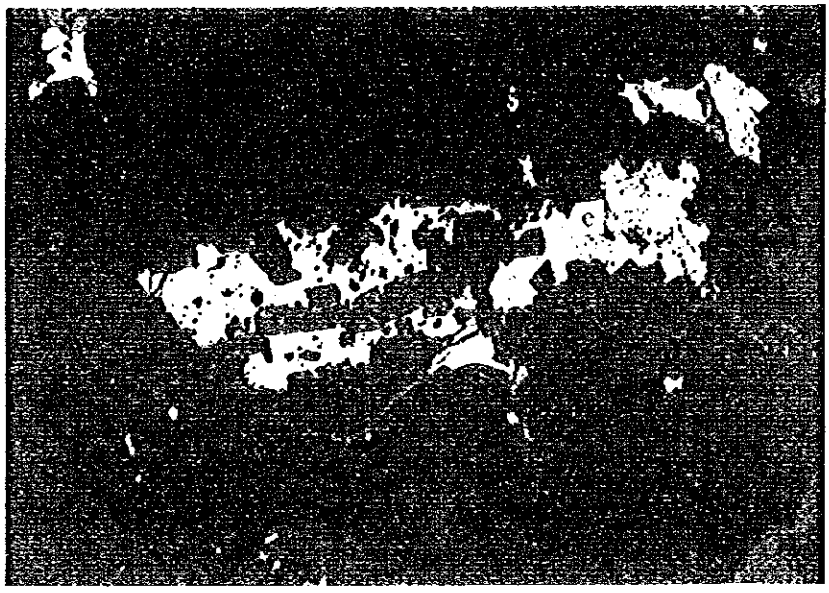
25μm
360×



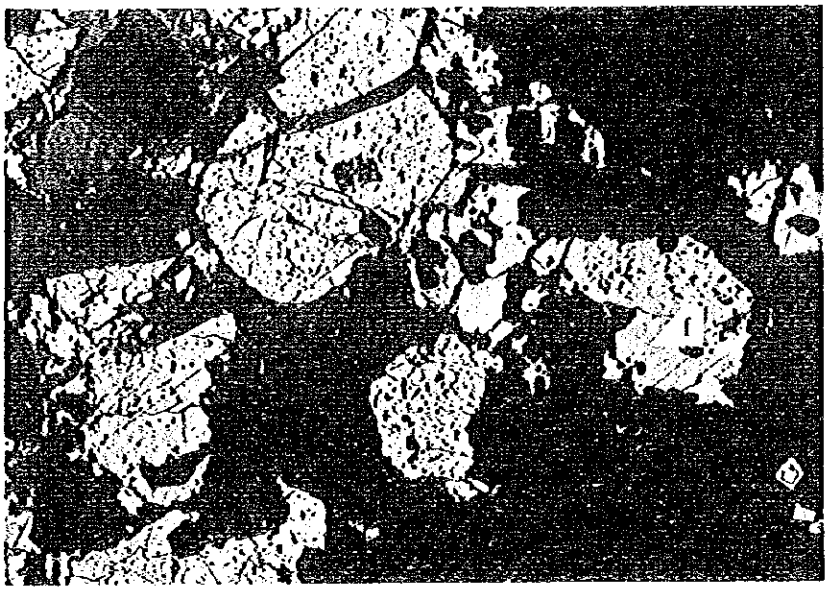
25μm
360×

Appendix 15(2) Photomicrographs of Ore Minerals in Polished Sections
(Feed Ore of Ore Dressing Test)

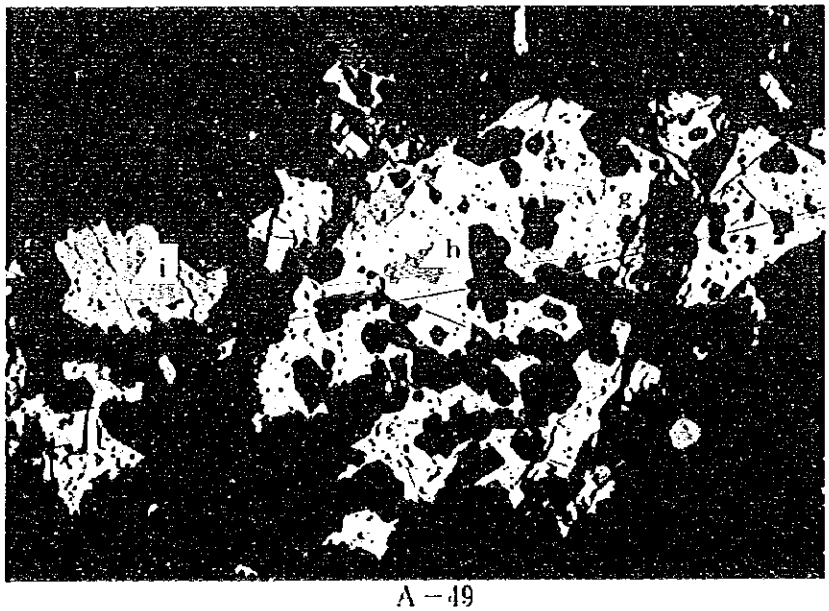
Feed Ore



50μm
180×



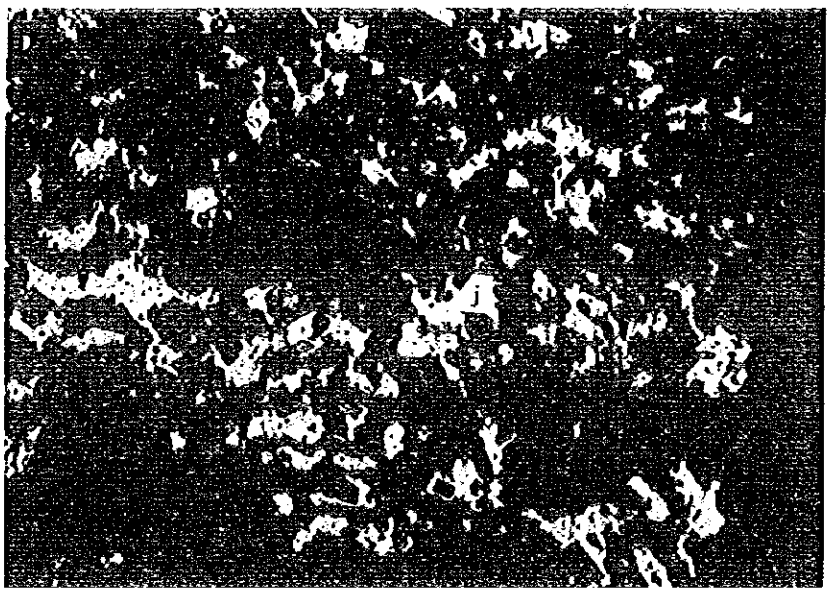
50μm
180×



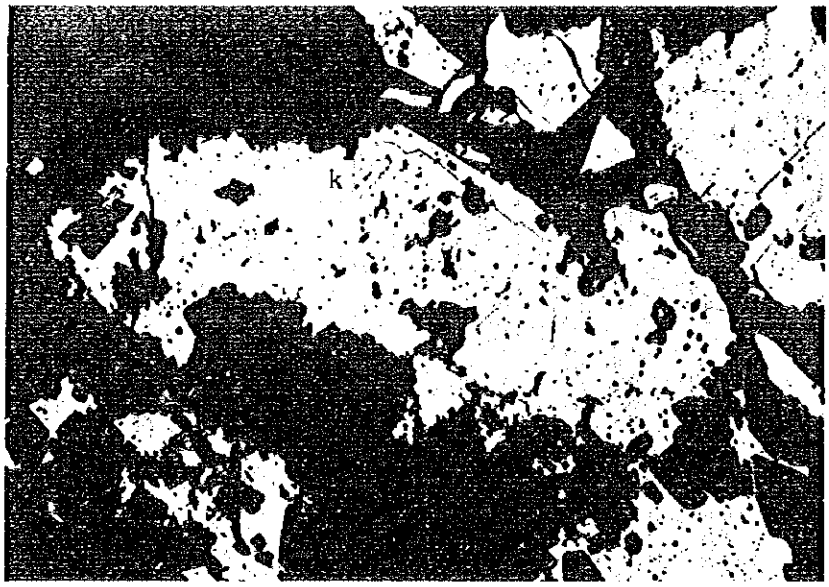
50μm
180×

Appendix 15(3) Photomicrographs of Ore Minerals in Polished Sections
(Feed Ore of Ore Dressing Test)

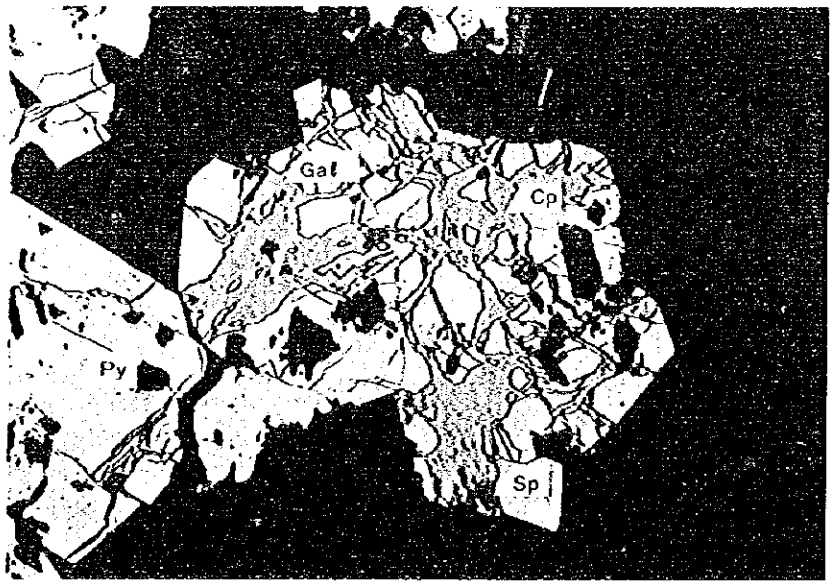
Feed Ore



25μm
360×

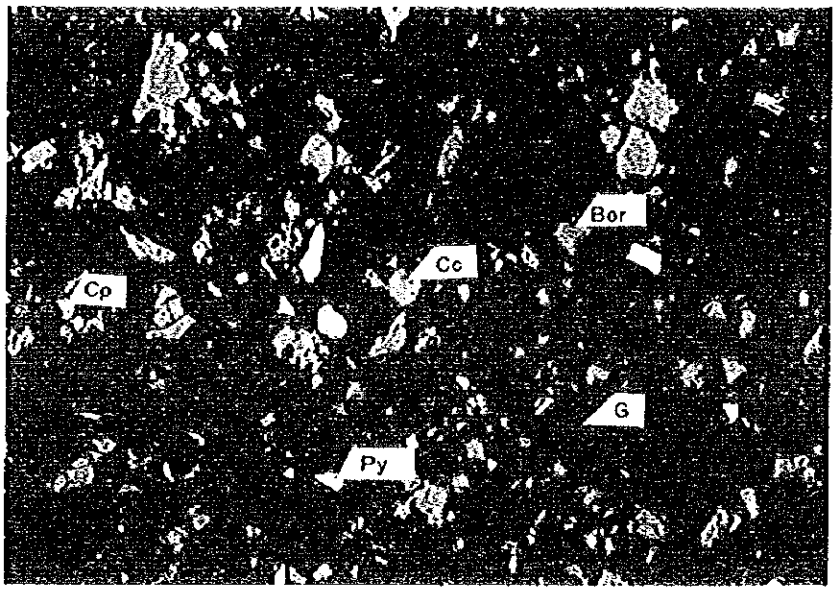


50μm
180×



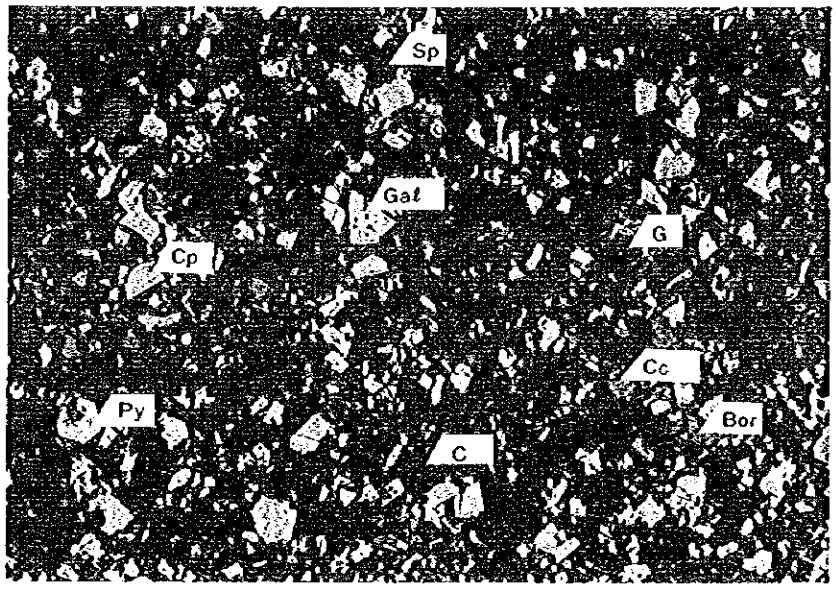
25μm
360×

Appendix 15(4) Photomicrographs of Ore Minerals in Polished Sections
(Concentrates and Tailing)



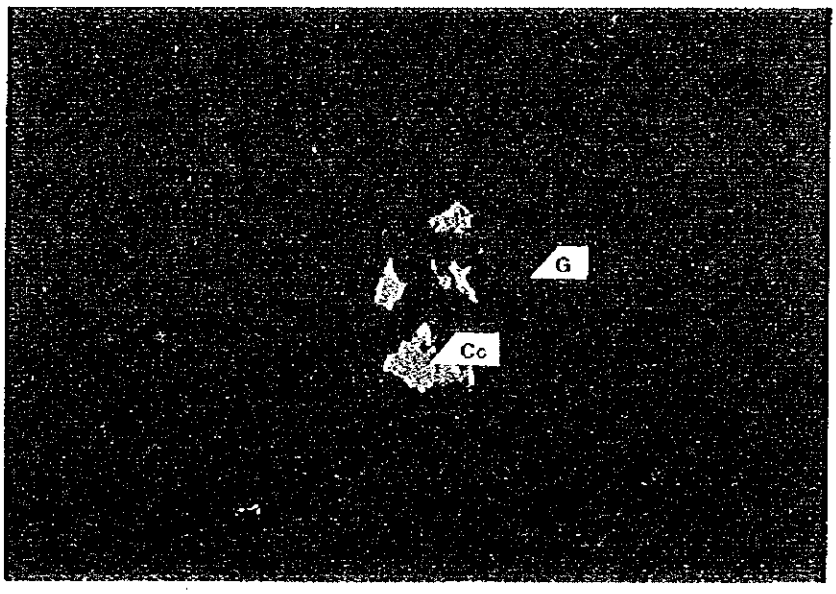
Copper Concentrate

50μm
180×



Lead Concentrate

50μm
180×



Tailing

20μm
450×

Appendix 16 Results of Griding Tests

Test No. 5+5 Grind

	Products	Weight (g)	Weight (%)	Assay (%) Cu	Pb	S	Distribution (%) Cu	Pb	S
	Feed	494.2	100.00	1.72	0.52	1.01	100.00	100.00	100.00
1	+149μm	71.9	14.55	1.08	0.21	0.58	9.14	5.89	8.34
2	+105μm	104.4	21.13	1.20	0.25	0.72	14.75	10.19	15.03
3	+ 75μm	82.1	16.61	1.69	0.36	0.98	16.33	11.53	16.09
4	+ 45μm	64.2	12.99	2.22	0.54	1.19	16.78	13.53	15.28
5	+ 20μm	63.8	12.91	2.92	0.86	1.62	21.93	21.41	20.67
6	- 20μm	107.8	21.81	1.66	0.89	1.14	21.07	37.45	24.59
	1+2	176.3	35.68	1.15	0.23	0.66	23.89	16.08	23.37
	1+2+3	258.4	52.29	1.32	0.27	0.76	40.22	27.61	39.46
	1+2+3+4	322.6	65.28	1.50	0.33	0.85	57.00	41.14	54.74
	1+2+3+4+5	386.4	78.19	1.74	0.41	0.98	78.93	62.55	75.41
	5+6	171.6	34.72	2.13	0.88	1.32	43.00	58.86	45.26
	4+5+6	235.8	47.71	2.15	0.79	1.28	59.78	72.39	60.54
	3+4+5+6	317.9	64.32	2.03	0.68	1.21	76.11	83.92	76.63
	2+3+4+5+6	422.3	85.45	1.83	0.57	1.09	90.86	94.11	91.66

Test No. 7.5+7.5 Grind

	Products	Weight (g)	Weight (%)	Assay (%) Cu	Pb	S	Distribution (%) Cu	Pb	S
	Feed	464.1	100.00	1.70	0.52	1.04	100.00	100.00	100.00
1	+149μm	18.0	3.88	0.68	0.15	0.40	1.55	1.11	1.50
2	+105μm	63.3	13.64	0.77	0.18	0.48	6.17	4.69	6.32
3	+ 75μm	94.8	20.43	1.26	0.30	0.84	15.12	11.71	16.58
4	+ 45μm	89.9	19.37	1.89	0.45	1.15	21.50	16.66	21.52
5	+ 20μm	90.3	19.46	2.71	0.72	1.54	30.97	26.77	28.95
6	- 20μm	107.8	23.22	1.81	0.88	1.12	24.69	39.06	25.13
	1+2	81.3	17.52	0.75	0.17	0.46	7.72	5.80	7.82
	1+2+3	176.1	37.95	1.02	0.24	0.67	22.84	17.51	24.40
	1+2+3+4	266.0	57.32	1.32	0.31	0.83	44.34	34.17	45.92
	1+2+3+4+5	356.3	76.78	1.67	0.42	1.01	75.31	60.94	74.87
	5+6	198.1	42.68	2.22	0.81	1.31	55.66	65.83	54.08
	4+5+6	288.0	62.05	2.12	0.70	1.26	77.16	82.49	75.60
	3+4+5+6	382.8	82.48	1.90	0.60	1.16	92.28	94.20	92.18
	2+3+4+5+6	446.1	96.12	1.74	0.54	1.06	98.45	98.89	98.50

Test No. 10+10 Grind

	Products	Weight (g)	Weight (%)	Assay (%) Cu	Pb	S	Distribution (%) Cu	Pb	S
	Feed	495.3	100.00	1.74	0.54	0.98	100.00	100.00	100.00
1	+105μm	32.8	6.62	0.57	0.12	0.38	2.16	1.48	2.57
2	+ 75μm	68.7	13.87	0.90	0.19	0.56	7.16	4.90	7.93
3	+ 45μm	116.6	23.54	1.57	0.34	0.88	21.19	14.87	21.16
4	+ 20μm	114.6	23.14	2.60	0.64	1.36	34.49	27.51	32.13
5	- 20μm	162.6	32.83	1.86	0.84	1.08	35.00	51.24	36.21
	1+2	101.5	20.49	0.79	0.17	0.50	9.32	6.38	10.50
	1+2+3	218.1	44.03	1.21	0.26	0.70	30.51	21.25	31.66
	1+2+3+4	332.7	67.17	1.69	0.39	0.93	65.00	48.76	63.79
	4+5	277.2	55.97	2.17	0.76	1.20	69.49	78.75	68.34
	3+4+5	393.8	79.51	1.99	0.63	1.10	90.68	93.62	89.50
	2+3+4+5	462.5	93.38	1.83	0.57	1.02	97.84	98.52	97.43