CHAPTER 7 DRILLING SURVEY

7-1 Outline of Survey

7-1-1 Purpose and Location of Drilling Survey

On the basis of an integrated investigation on all survey results in the second year, La Concha-El Bramador area was selected as a target area for drilling survey. Seven drills aiming at exploration of Kuroko type deposits were conducted there. Location of drill holes is shown in Fig. III-12.

7-1-2 Period and Volume of Survey

Outline of the survey are shown in Table III-8. Total drilling depth was 2,296.20 meters (planned total depth: 2,200.00 meters).

Table III-8 Outline of Each Hole

Hole No.				Proposed	Drilled	Corelength	Period
	− X	Y	Above the Sea	Depth	Depth	recovery (%)	
MJM − 6	13,430	11,860	820 M	300 M	301.6 M	291.3 M 96.6 %	17. 6. 1986 −28. 6. 1986
MJM − 7	11,780	11,260	710	300	316.4	306.7 96.9	19. 7. 1986 − 7. 8. 1986
MJM − 8	9,690	9,410	410	300	301.6	274.9 91.2	29. 8. 1986 −15. 9. 1986
MJM − 9	11,180	9,780	470	300	307.6	277.3 90.2	26. 9. 1986 − 7. 10. 1986
MJM − 10	11,850	9,960	510	350	358.6	337.0 94.0	28. 10. 1986 −13. 11. 1986
MJM − 11	11,550	10,420	520	300	358.2	350.8 98.0	24. 11. 1986 − 6. 12. 1986
MJM − 12	12,600	11,400	670	350	352.2	329.1 93.4	18. 12. 1986 − 1. 1. 1987

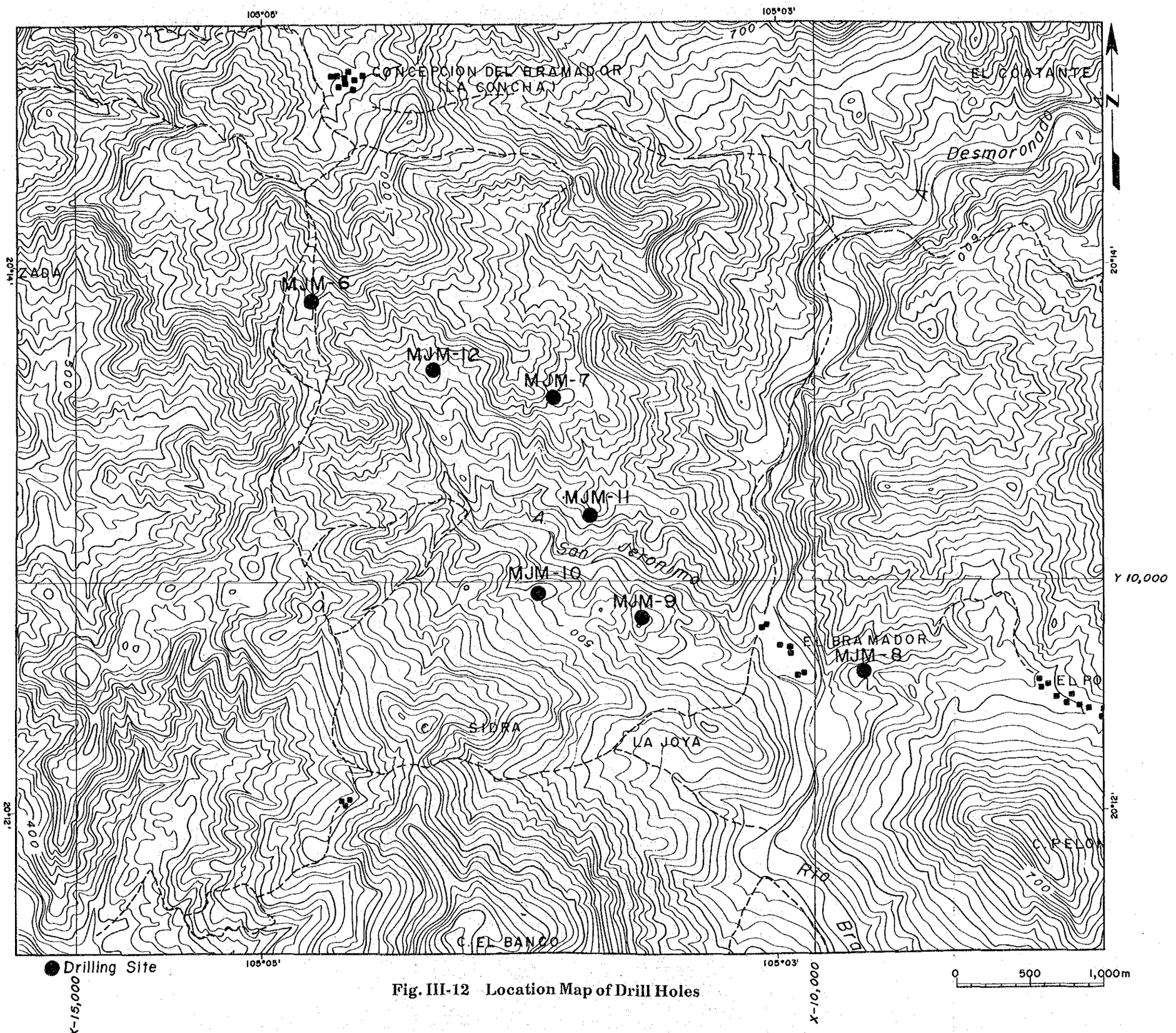


Fig. III-12 Location Map of Drill Holes

7-2 Geology

In the La Concha-El Bramador area for the drilling survey, there is the great difference in geological environment between the northwestern part (conducted MJM-6, MJM-7, MJM-11, and MJM-12) and southeastern part (conducted MJM-8, MJM-9, and MJM-10).

The former is chiefly composed of Cretaceous acidic and basic volcanics which are mutualy similar to each other. These volcanics are considered to be products of the same volcanic activities. However, since we cannot find, in each hole, a lens-shaped sedimentary layer, which is usually found in the central part of the sedimentary basin, each drilling hole was presumably located in the edge of the sedimentary basin.

Although we caught the dominant Kuroko type mineralization (disseminated zone), we could not catch up the massive Kuroko type deposit except MJM-9. One reason for this was that we were not able to trace sufficiently the location and scale of the sedimentary basin necessary for formation of the Kuroko type deposit.

On the other hand, the southeastern part greatly differs from the northwestern part in geological features, having a low ratio of volcanics to component rocks. In MJM-9, however, the black shale layer, which suggests existence of the sedimentary basin, is found just above the Kuroko ore horizon. This fact fulfills one of necessary conditions for existence of the Kuroko type deposit. Other drilling holes seem to be considerably for away from the center of Kuroko type mineralization and volcanic eruptive center, based on geological mode of occurrence (degree of the mineralization, alteration and variety of pyroclastic rocks in the Kuroko ore horizon).

Geological map and sections are shown in Fig. III-13 ~ Fig. III-21.

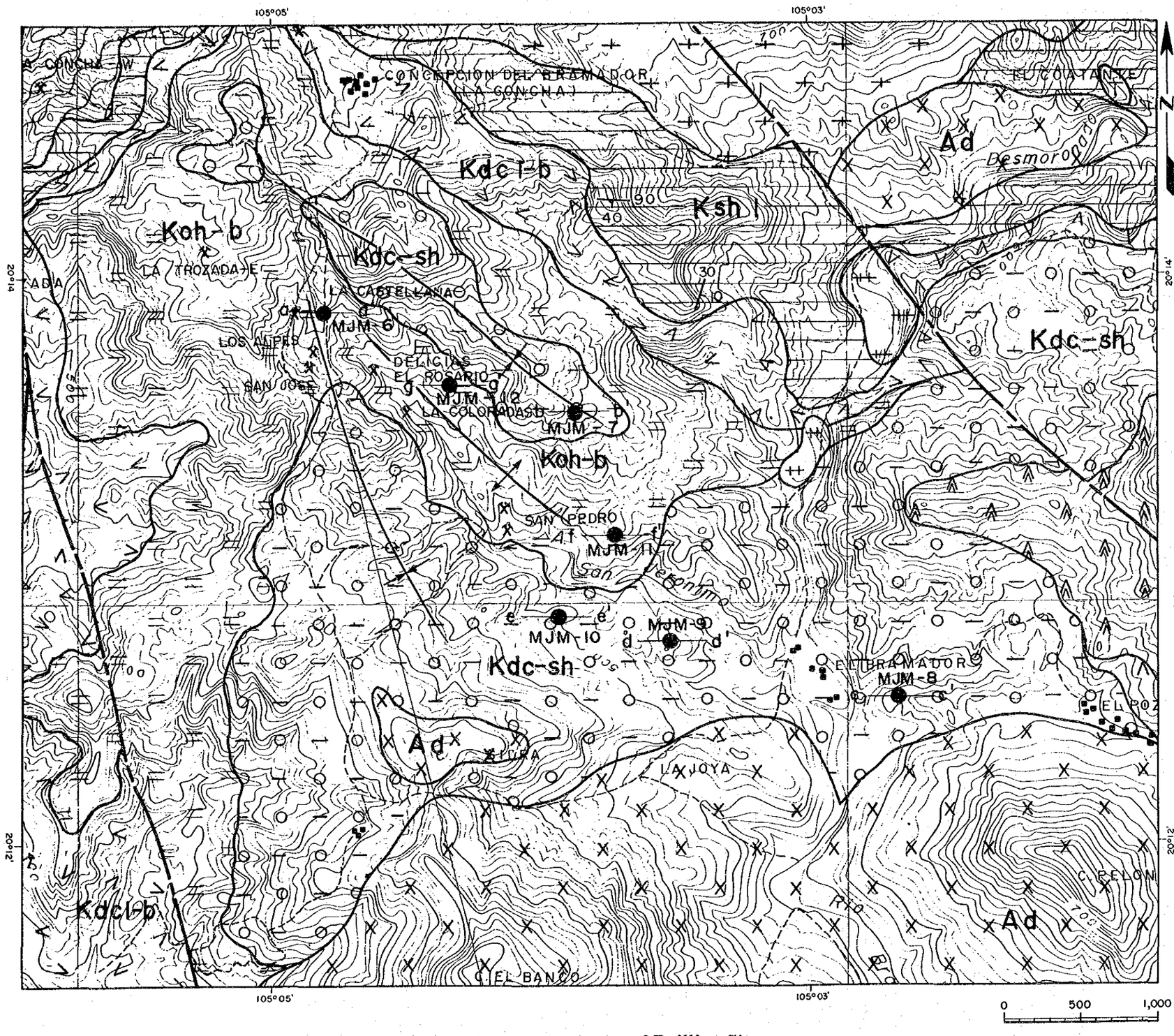


Fig. III-13 Geological Map around Drilling Sites

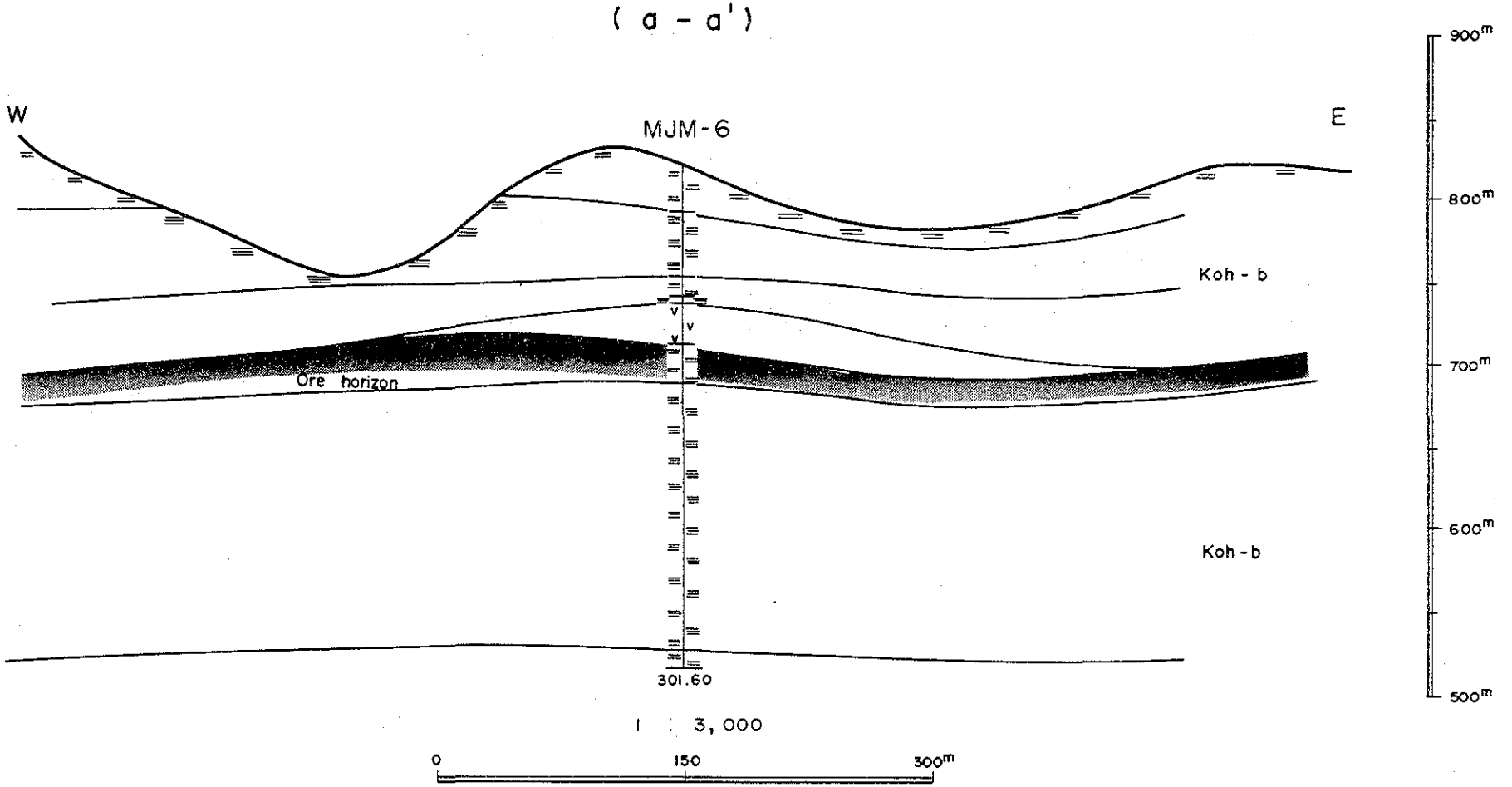


Fig. III-14 Geological Section of Drilling (MJM-6)

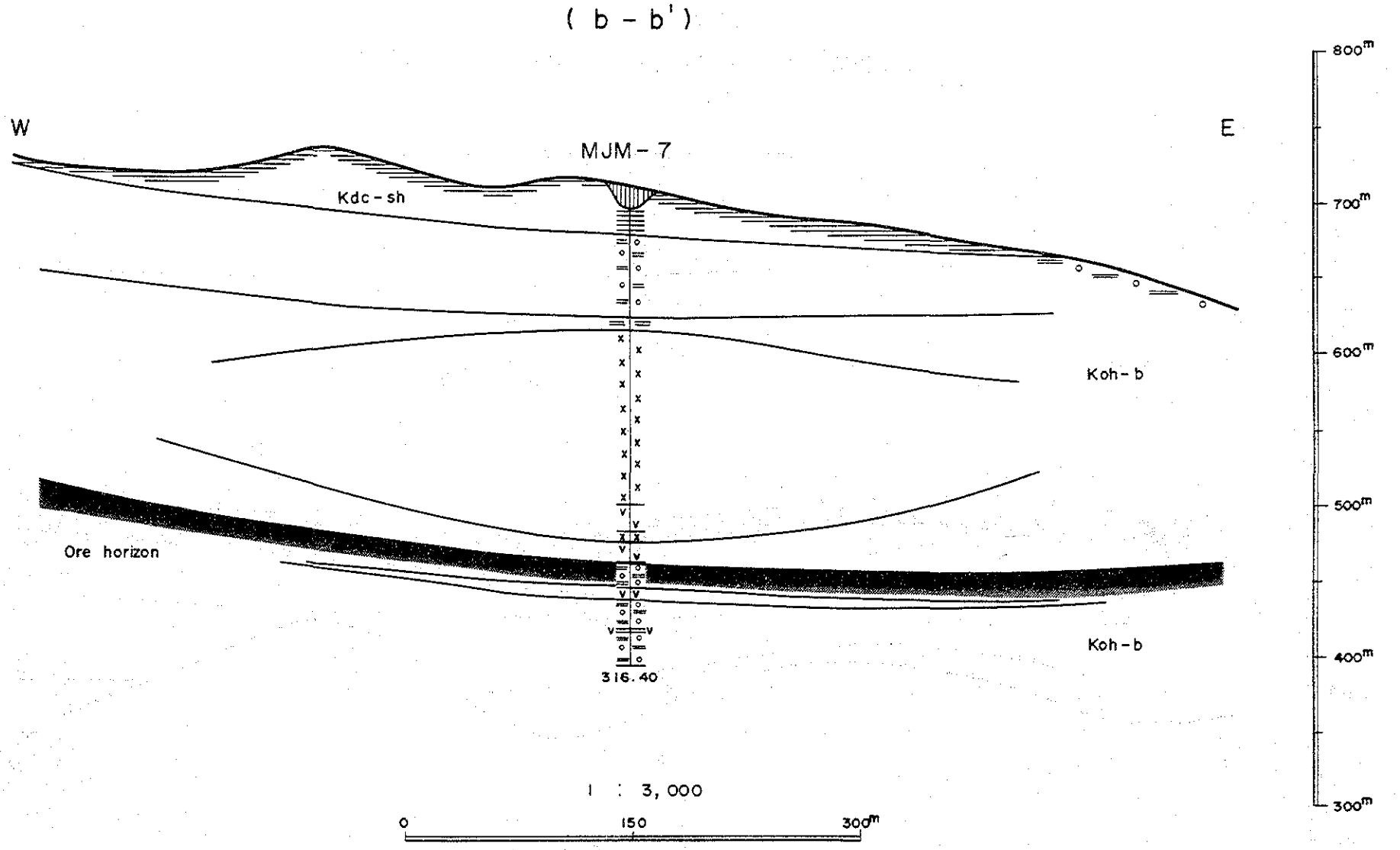


Fig. III-15 Geological Section of Drilling (MJM-7)

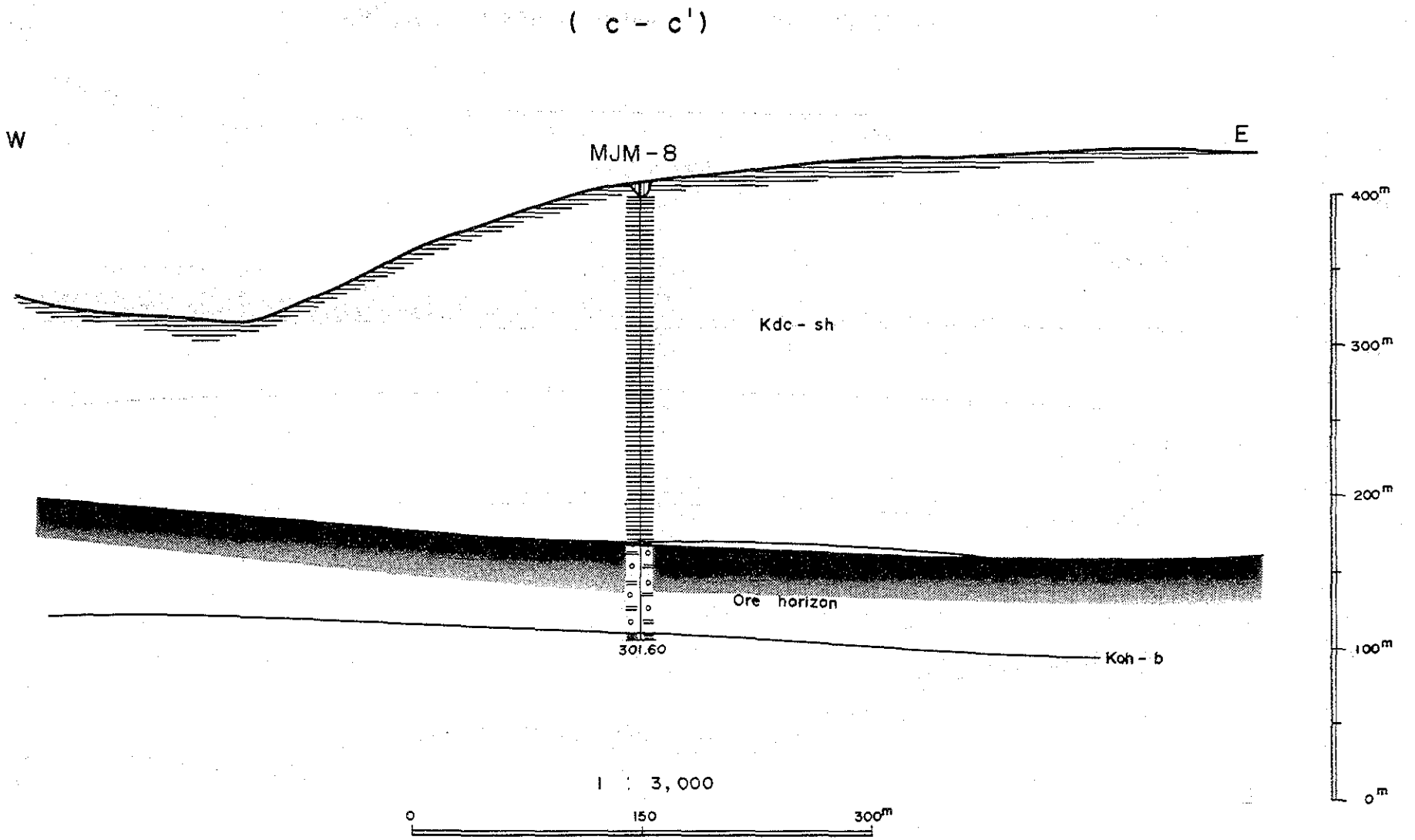


Fig. III-16 Geological Section of Drilling (MJM-8)

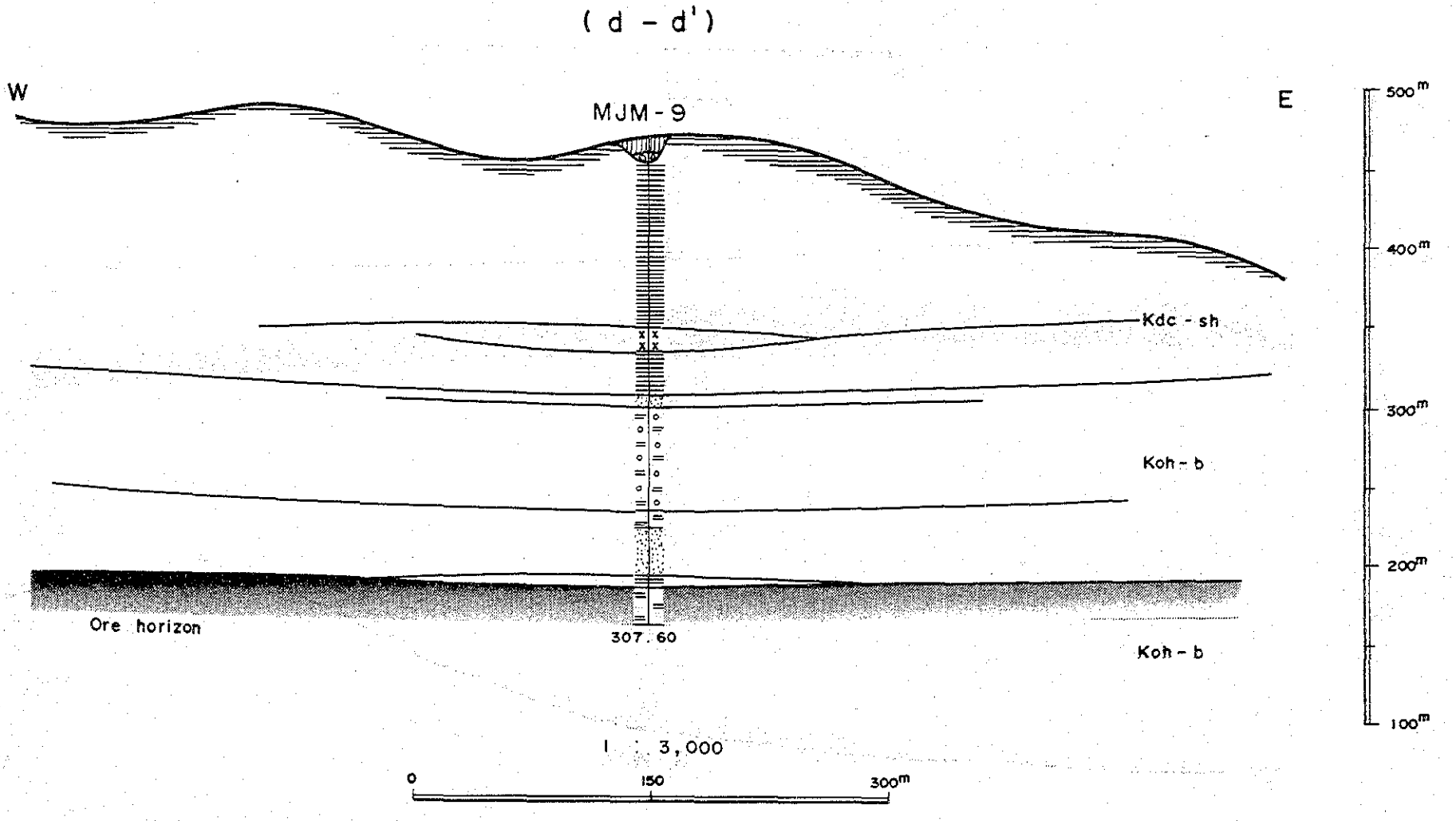


Fig. III-17 Geological Section of Drilling (MJM-9)

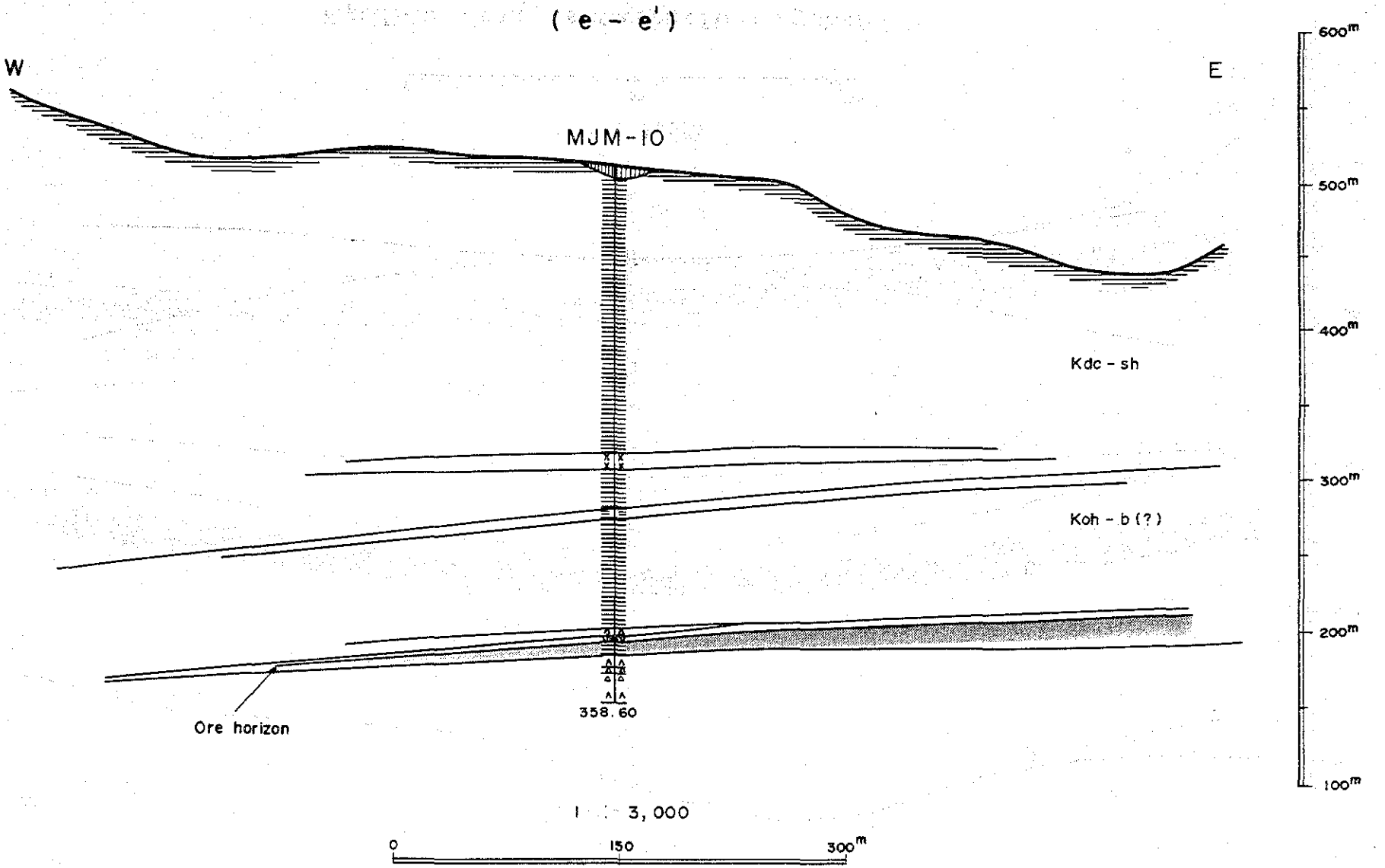


Fig. III-18 Geological Section of Drilling (MJM-10)

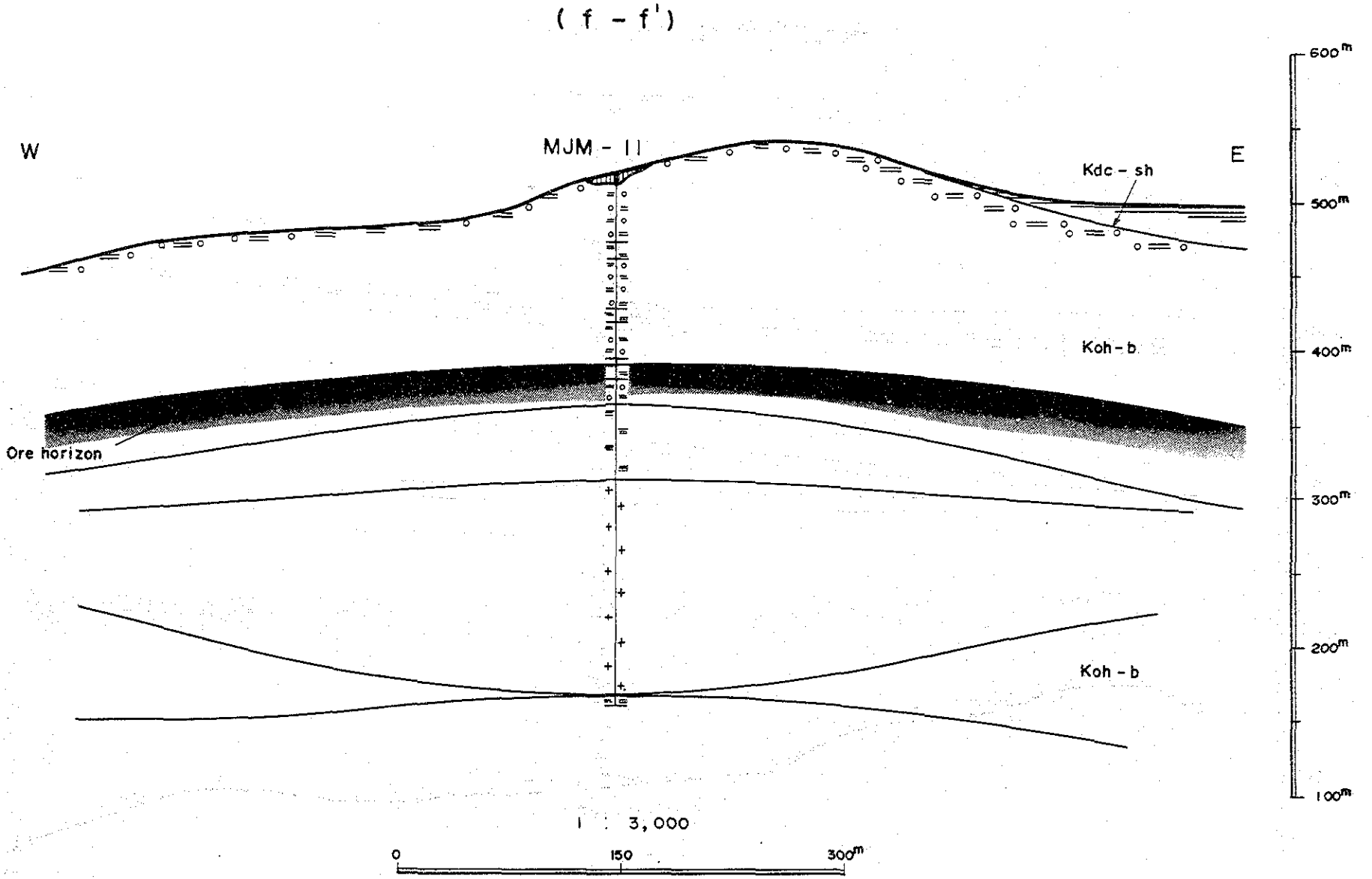


Fig. III-19 Geological Section of Drilling (MJM-11)

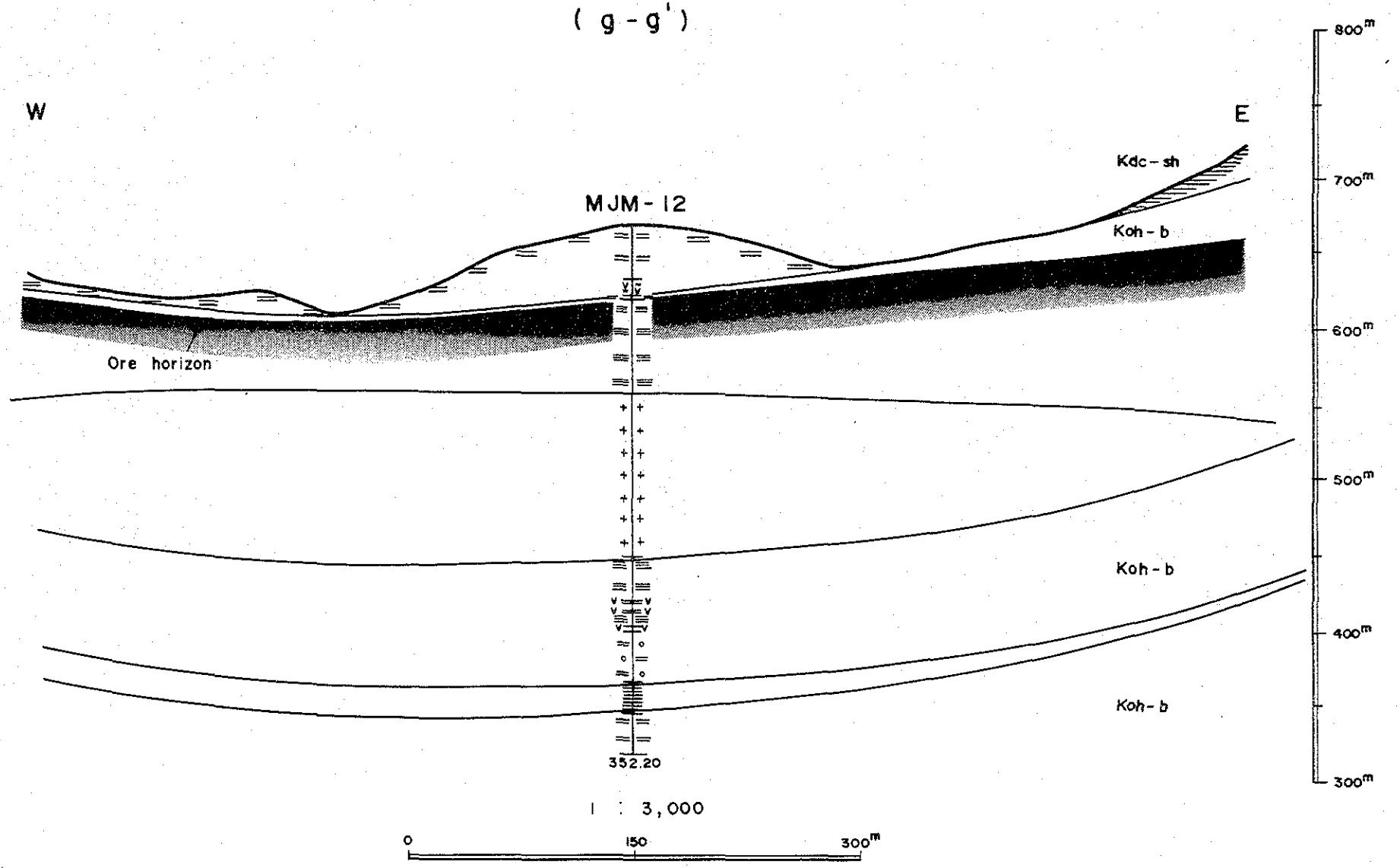


Fig. III-20 Geological Section of Drilling (MJM-12)

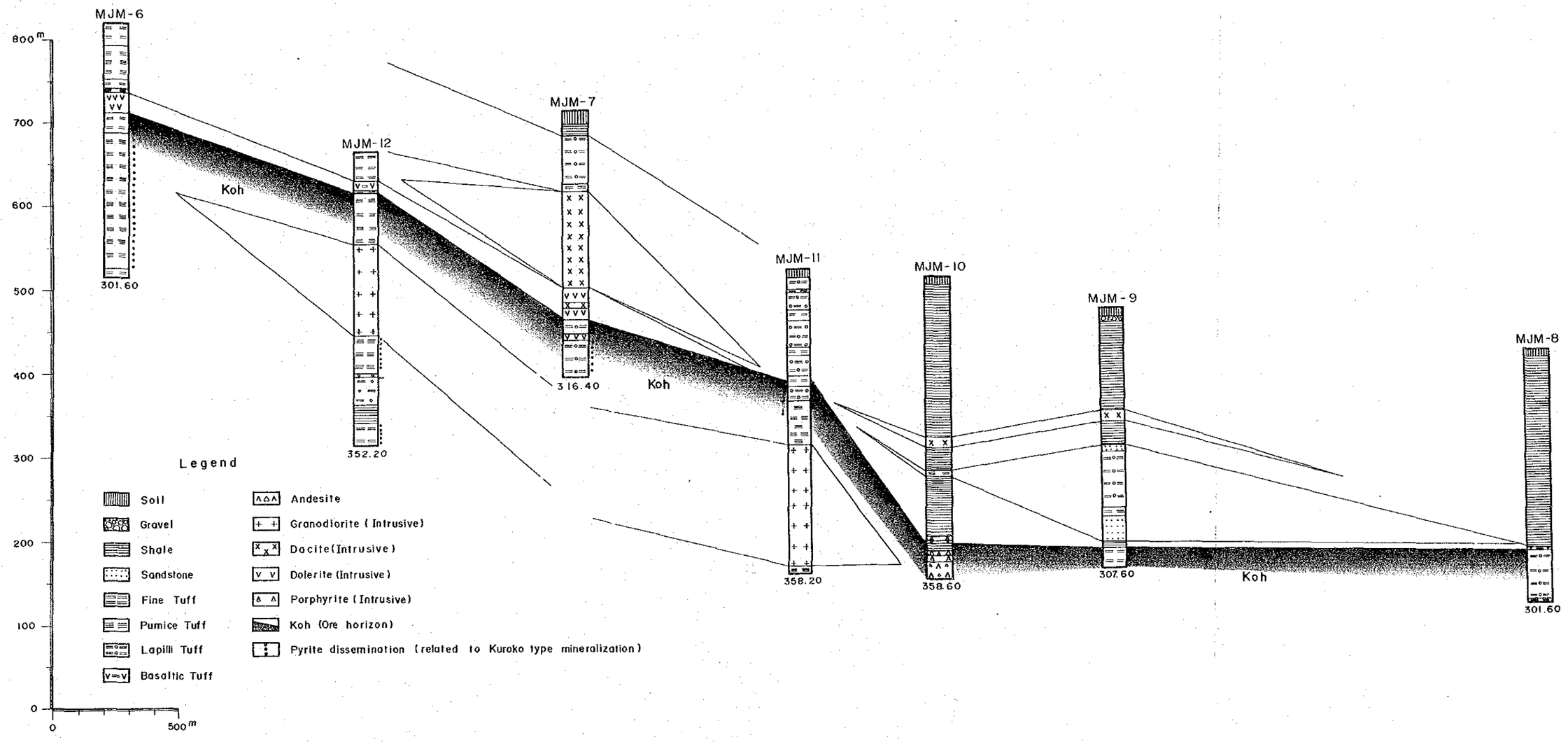


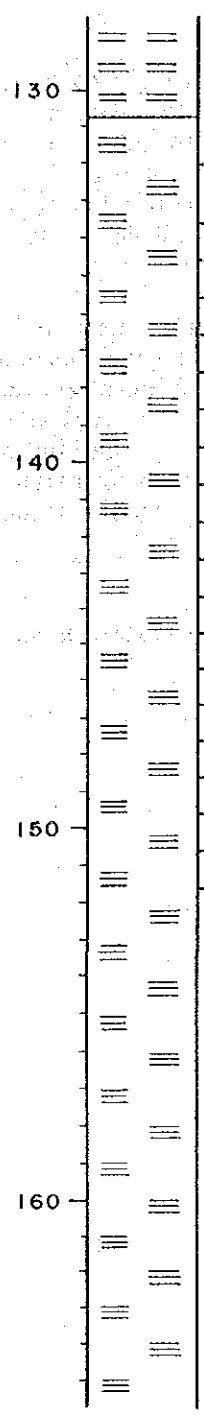
Fig. III-21 Correlation of Geological Succession of Each Hole

7-3 Mineralized Zone

As the result of the drilling survey (seven holes, total length of drilling: 2,296.20m) in the Western Area, we could catch the Kuroko type mineralization in MJM-6, MJM-7, and MJM-9. Especially in MJM-9, we caught the massive and high grade Kuroko (thickness: 15 cm, grade: Au 7.8 g/t, Ag 1,108 g/t, Cu 1.15%, Pb 16.2%, and Zn 32.3%). In this hole, in addition to the Kuroko ore we also caught the gold mineralized zone with average gold grade of 4.2 g/t in the fine pyrite disseminated zone in the range of 8 m from the top of the Kuroko ore horizon.

On the other hand, in MJM-6 and MJM-7, we caught the fine pyrite disseminated zone, which is peculiar to the Kuroko type mineralization, in the acidic pyroclastics in the Kuroko ore horizon. In this disseminated zone, we also found silver mineralized zone (MJM-6, thickness: 8 m, Ag average grade: 145 g/t; MJM-7, thickness: 5 m, Ag average grade: 100 g/t). This suggests that the Kuroko type mineralization in this area may also be accompanied by the precious metal mineralization. Accordingly, the exploration for Kuroko type deposit in this area has a possibility of catching the precious metal mineralized zone, as well, in addition to the Kuroko type deposit itself.

Relation between geology and assay results of MJM-6, MJM-7, and MJM-9 is shown in Fig. III-22, Fig. III-23, and Fig. III-24.

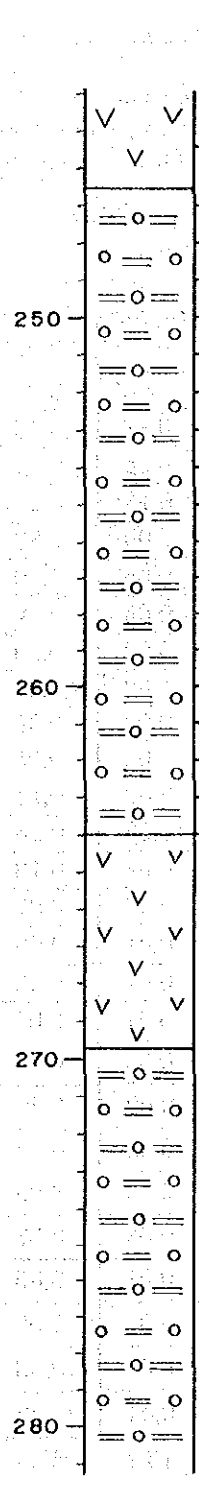


Fine Tuff

Pumice Tuff

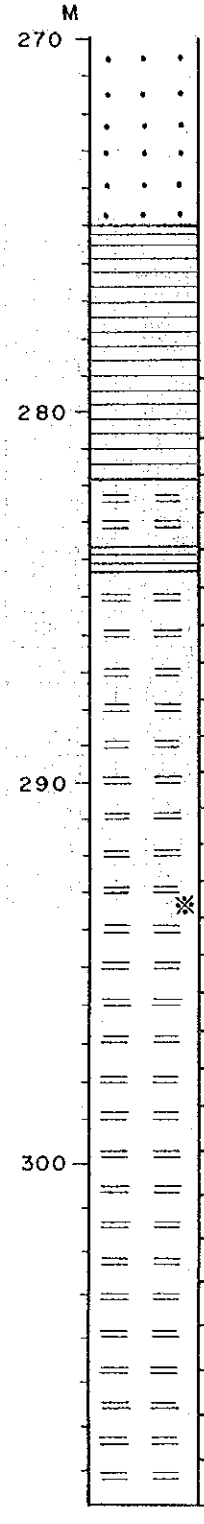
	Depth (m)	Au g/t	Ag g/t	Cu %	Pb %	Zn %
	133.60M－134.60 M	0.10	38.00	0.12	0.10	0.26
	－135.60	Tr	46.80	0.27	0.03	0.36
	－136.60	0.20	75.00	0.26	0.20	0.35
	－137.60	Tr	8.60	0.20	0.02	0.09
	－138.60	1.60	367.40	0.69	0.35	0.38
	－139.60	0.10	71.30	0.23	0.20	0.39
	－140.60	0.20	107.60	0.37	0.38	0.39
	－141.60	0.10	162.50	0.65	0.34	0.38
	－142.60	Tr	150.80	0.56	0.57	0.35
	－143.60	Tr	33.60	0.10	0.17	0.39
	－144.60	Tr	221.80	0.20	0.35	0.26
	－145.60	Tr	46.80	0.69	0.37	0.10
	－146.60	Tr	36.50	0.11	0.19	0.38
	－147.60	Tr	10.00	0.02	0.05	0.39
	－148.60	0.10	93.30	0.25	0.38	0.37
	－149.60	Tr	43.90	0.17	0.15	0.38
	－150.60	0.10	100.20	0.34	0.05	0.12
	－151.60	Tr	8.70	0.02	0.06	0.32

Fig. III-22 Geology and Assay Results of MJM-6



Depth (m)	Au g/t	Ag g/t	Cu %	Pb %	Zn %
247.00M–248.00 M	0.10	31.50	0.14	0.19	0.36
–249.00	0.70	46.60	0.20	0.32	0.24
–250.00	0.10	52.50	0.18	0.28	0.36
–251.00	0.10	60.40	0.21	0.33	0.32
–252.00	Tr	50.70	0.19	0.31	0.37
–253.00	1.10	44.20	0.15	0.25	0.34
–254.00	0.10	63.70	0.28	0.38	0.08
–255.00	Tr	46.60	0.17	0.29	0.38
–256.00	Tr	7.10	0.01	0.06	0.37
–257.00	Tr	102.90	0.32	0.41	0.38
–258.00	Tr	108.90	0.38	0.25	0.37
–259.00	Tr	83.90	0.30	0.39	0.37
–260.00	0.10	63.20	0.20	0.34	0.35
–261.00	0.10	143.70	0.62	0.39	0.39
–262.00	Tr	17.60	0.01	0.02	0.11
–263.00	Tr	93.50	0.04	0.09	0.13
–264.00	Tr	6.40	0.32	0.23	0.37

Fig. III-23 Geology and Assay Results of MJM-7



Sandstone

Shale (intercalated sandstone layers)

Fine Tuff (Ore horizon)

	Depth (m)	Au g/t	Ag g/t	Cu %	Pb %	Zn %
	280.70M−281.70M (1.00)	2.50	18.80	0.01	0.06	0.26
	−282.70	14.30	44.90	0.02	0.72	0.40
	−283.70	2.80	40.40	0.01	0.06	0.32
	−284.70	5.60	244.70	0.02	0.17	0.38
	−285.70	1.20	23.60	0.03	0.08	0.39
	−286.70	2.80	23.10	0.00	0.05	0.19
	−287.70	2.00	9.70	0.00	0.03	0.12
	−288.70	2.10	10.80	0.01	0.02	0.09
	−289.70	1.20	9.20	0.01	0.02	0.07
	−290.70	1.40	10.20	0.01	0.02	0.08
	−291.70	0.80	6.30	0.01	0.02	0.08
	−292.70	0.90	16.10	0.01	0.02	0.11
	−293.70	2.50	41.70	0.01	0.03	0.16
	−294.70	1.10	5.10	0.01	0.02	0.13
	−295.70	1.20	3.80	0.01	0.02	0.01
	−296.70	1.00	3.40	0.01	0.01	0.08
	−297.70	0.20	2.20	0.01	0.01	0.06
	−298.70	Tr	2.20	0.01	0.01	0.07
	−299.70	0.10	0.50	0.01	0.02	0.13
	−300.70	0.10	1.40	0.01	0.02	0.20
	−301.70	Tr	0.80	0.01	0.02	0.13
	−302.70	Tr	0.90	0.01	0.16	0.08
	−303.70	Tr	0.70	0.01	0.02	0.07
	−304.70	Tr	0.50	0.01	0.01	0.06
	−305.70	0.10	1.20	0.01	0.01	0.05
	−306.70	Tr	1.70	0.01	0.01	0.08
	−306.60 (0.90)	0.10	1.50	0.01	0.01	0.25
※	293.45−293.60 (Massive sulphide ore)	7.8	1.108	1.15	16.2	32.3

Fig. III-24 Geology and Assay Results of MJM-9

7-4 Comparison Between Drilling Survey and Geophysical Survey Results

Among seven holes of the drilling carried out in this area, we decided locations of four holes (MJM-6, MJM-7, MJM-8, and MJM-9) by even taking the results of geophysical survey (CSAMT method) into consideration.

As a result of comparison between geological features of each hole and distribution of the resistivity, the relation between the two can be summarized as follows:

When we examine results of the actual measurement in the field referring to results of the resistivity measurement of hand specimen, it is clear that actual measurements in the field tends to be deviated to the lower value of resistivity. This can be the case with both the sedimentary rock (shale and sandstone) and pyroclastic rock. Especially, in the relation between resistivity value and geological features in MJM-8, this tendency is remarkable in this hole, the upper part is dominated with the sedimentary rock and the lower part, with the pyroclastic rock, and no strong zone of alteration and sheared is found. Despite this fact, a very low value of 20 Ω·m or less has been obtained in measurement of the resistivity throughout the hole. From characteristics of rocks which form this hole, it is difficult to explain why such a low value is obtained.

This problem will remain to be investigation in future.

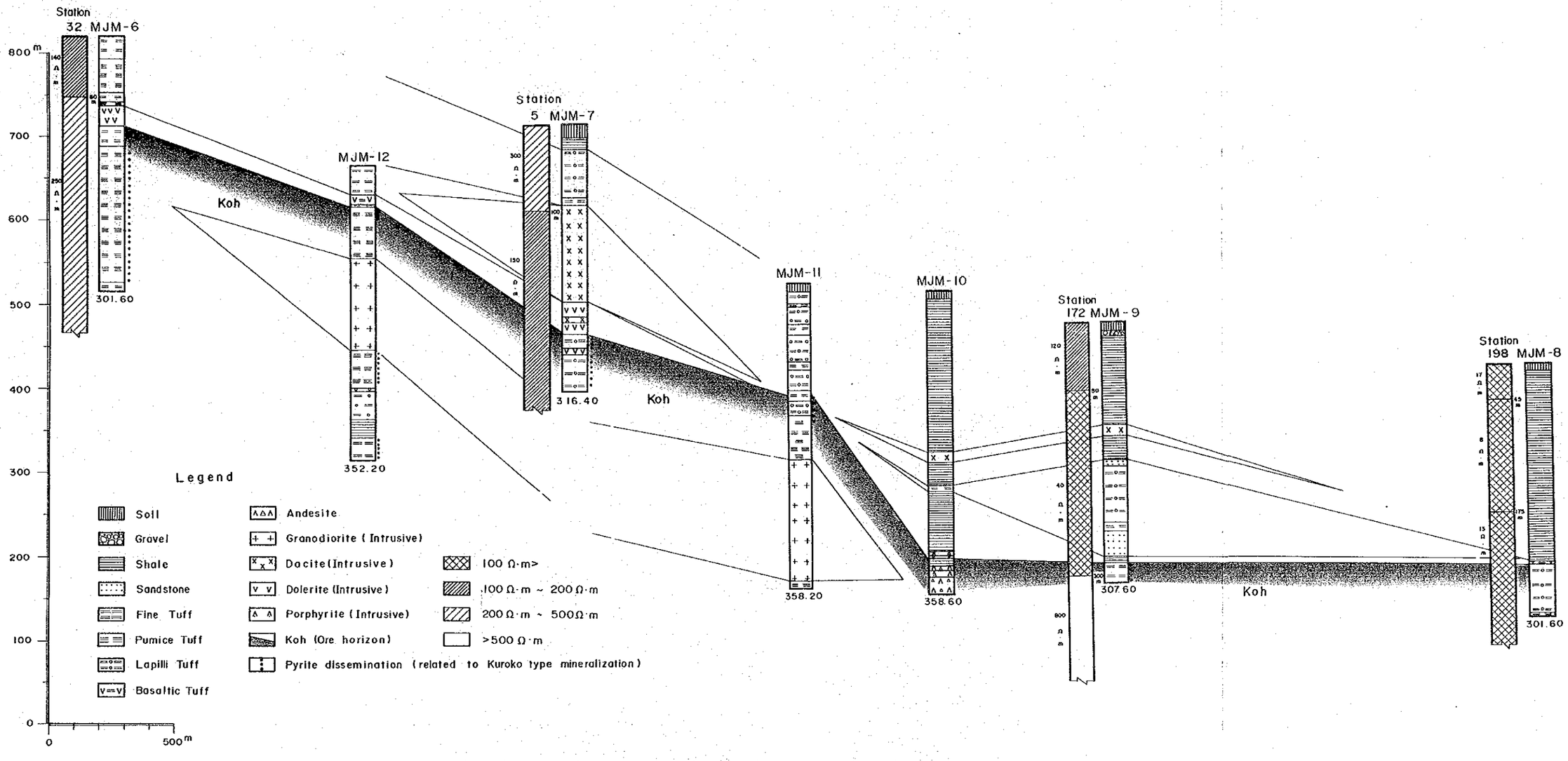


Fig. III-25 Comparison between Geology and Resistivity Distribution of Each Hole

PART IV CONCLUSION AND RECOMMENDATION

CHAPTER 1 CONCLUSION

The Jalisco area of the United Mexican Sates has been surveyed for three years. This survey, which included geological, geochemical, geophysical and drilling survey, was done systematically from phase I in 1984 to phase III in 1986. Every year the results of each survey were satisfactory. Most importantly, we found evidence of mineralization in three of seven holes in the drilling survey which was done in phase III. This should establish the legitimacy of the surveys which we have carried out.

Still more, we believe this will present us with valuable evidence for further exploration in this area. This results for the survey for each area are as follows:

Eastern Area

After examination of the geologic modes of occurence found in MJM-2 and MJM-5 from the La America - Descubridora area, we have found that these two holes are located in a sedimentary basin which is an important metallogenic province for kuroko type ore deposits. The kuroko ore horizon is found in these holes accompanied by fine disseminated pyrite, so we expect that there is a high probability for the existance of a Kuroko type ore deposit on this ore horizon.

Western Area

We found evidence of mineralization in MJM-6, MJM-7, and MJM-9, which were done in the La Concha - El Bramador area. Moreover, in MJM-9 we discovered a gold mineralized zone and high grade kuroko ore in the kuroko ore horizon. We also found a zone of abundant pyrite dissemination in the ore hoirzons of MJM-6 and MJM-7. This indicates that the kuroko type ore deposit in this area is accompanied by precious metal mineralization as well. These results give us a valuable clue for the further drilling survey to do in this area from now on.

CHAPTER 2 RECOMMENDATION

Based upon the results of Phase I and Phase II surveys and these studies, we recommend the following surveys be done in the future.

Eastern Area

We understand that MJM-2 and MJM-5 are located in the same sedimentary basin. This basin holds a high possibility for the existence of a kuroko type ore deposit. Accordingly, we recommend doing a drilling survey around these holes to grasp the degree of enrichment of mineralized zone in ore horizon, and doing geophysical survey as well.

Western Area

It would be better to do a drilling survey in order to check the grade and scale of the kuroko ore and gold mineralized zone which was encountered in MJM-9.

We would also like to propose doing an additional drilling survey in order to examine the development of silver mineralization that was found in MJM-6 and MJM-7. If possible, it is desirable to perform the geophysical logging (IP method) and to add other drills referring to results of the logging.

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