Chapter 3 Laboratory Test

The collected core samples have been submitted to laboratory tests such as microscopic observation of rock thin sections and ore polished thin sections, chemical analysis of rocks and ores, and EPMA analysis for chromian spinel. The samples submitted to the laboratory tests are listed in Appendix 17.

3-1 Microscopic Observation

The ultrabasic rocks in the Project Area are more or less serpentinized in general. However, some are least affected by serpentinization and deformation, and preserve their original mineralogical nature. The result of the microscopic observation is tabulated in Appendix 20. Photo-micrographs are shown in Appendix 16.

(1) Harzburgite

Harzburgite comprises mainly olivine and orthopyroxene, containing small amounts of chromian spinel and clinopyroxene, and rarely minor tremolite. Its texture is protogranular in general, however, occasionally porphyroclastic with development of foliation. Minerals of olivine and pyroxene groups are often replaced by serpentine (chrysotile or lizardite) in part or entirely. Clinopyroxene altered to bastite is also observed occasionally.

(2) Dunite

Dunite comprises principally olivine, accompanying a minor amount of chromian spinel and occasionally very minor clinopyroxene or orthopyroxene. Its texture is protogranular in general. As is the case for harzburgite, the rock is often subjected to intense serpentinization. The chromian spinel content varies considerably, ranging from a minimal amount to a content comparable to that in chromitite.

(3) Chromitite

Chromitite consists principally of chromian spinel and olivine. Olivine group minerals are mostly altered to serpentine (chrysotile, lizardite or antigorite). The ratio olivine to chromian spinel varies considerably. Chromian spinel is deep reddish brown to opaque, and tends to be euhedral. Magnetite (ferritchromite in part) is often formed in the periphery or along fractures of chromian spinel. Inclusions are occasionally observed within chromian spinel crystals.

(4) Pyroxenite

Pyroxenite comprises mainly orthopyroxene and spinel, containing small amounts of olivine, clinopyroxene and hornblende. Orthopyroxene is altered to bastite and olivine, to serpentine.

3-2 Chemical Analysis

The cores of chromitite sections were longitudinally split in two halves, one of which was submitted to chemical analysis for 24 elements (Ag, Al, Ba, Be, Bi, Ca, Cd, Co, Cr, Cu, Fe, K, Mg, Mn, Mo, Na, Ni, P, Pb, Sr, Ti, V, W, Zn) and Cr_2O_3. The chromitite sections were divided into two or more sections for the chemical analysis according to the visual observation, where faults or other structural elements, possibly affecting textures of chromitite, were observed. In addition, representative rocks of 4 selected holes were also chemically analyzed for the same 24 elements. ICP-AES (Inductively-coupled plasma atomic emission spectroscopy) was adopted for elemental determination. The result of the chemical analysis is tabulated in Appendix 18.

Chromitite tends to be high in V content and low in Ni, Co, Fe and Mn contents, in comparison with dunite and harzburgite. Chromian spinel indicates the highest Cr content of all minerals, and therefore the Cr content of chromitite is much higher than those of dunite and harzburgite.

Comparing dunite with harzburgite, dunite is high in Ni content and low in Al, Ca, Mn, V and Cr contents. This is because Ni is partitioned more in olivine than in orthopyroxene and vice versa for the other elements.

In the correlation coefficients between Cr_2O_3 content of chromitite and the content of other 24 elements, Cr_2O_3 indicates a high positive correlation to Al, V and Zn and a high negative correlation to Ni, Mg, Co, Sr, Ca and Na.

Cr_2O_3 content of chromitite depends on the ratio of olivine to chromian spinel, ranging between 30 and 50% in massive ores and between 10 and 25% in disseminated ores. The ore section of MJAS-23 is composed of disseminated ores as a whole. However, the uppermost 0.60m and the lowermost 0.45m sections indicate Cr_2O_3 contents exceeding 30%. The olivine-chromian spinel ratio of disseminated ores is extremely variable, giving Cr_2O_3 content as high as that of massive ores in part where chromian spinel is highly concentrated.

The ratio Cr/Al of chromian spinel in chromitite ranges between 5.1 and 5.8 (ref. Appendix 18). This result is harmonious with the fact that the ratio Cr/Al in the eastern belt of Alban Inner Zone ranges between 5 and 6. The ratio Cr/Al in the western belt of Alban Inner Zone shows around 2. The chromitite in Shebenik area has the characteristic indicating the relatively high Cr/Al ratio of chromian spinel.

3-3 EPMA Analysis

The chemical composition of chromian spinel in the ultrabasic rocks and chromitite was examined by EPMA analysis with a purpose for the selection of promising area in the First and Second Year Campaign. In this Third Year Campaign, EPMA analysis with a systematical sampling is carried out in two holes (MJAS-26 and MJAS-36) which encountered chromitite, then the geochemical anomaly (EPMA anomaly) is confirmed and the exploratory guideline for the future is examined.

(1) Sampling

Of the eight holes in the three target areas, which intersected chromitite, two holes of the two target areas (MJAS-26 of Ahu i Vetem and MJAS-36 of Hija e Zeze) were selected for EPMA analysis in order to study geochemical characteristics of elements contained in ore zones. A systematic sampling was carried out according to the following procedure (Table 2-3-1);

- 3 chromitite samples each for the ore section: from the uppermost, the central and the lowermost parts
- 2 dunite samples each at the upper and lower contacts of the ore section
- 2 dunite or harzburgite samples each at the points 1m apart from the upper and lower contacts of the ore section
- 1 or 2 harzburgite samples at the contacts to dunite envelopes
- one set of dunite and harzburgite samples (1 sample each) at the points sufficiently far apart from the contacts to dunite envelopes
- 1 dunite or harzburgite sample at the bottoms of the drill holes.

(2) The Conditions of Analysis

The target mineral for the EPMA analysis was chromian spinel. Unaltered portions of chromian spinel crystals, near their cores, were carefully chosen for analysis, because magnetite (or ferritchromite) was often formed along peripheries or cracks of the crystals. The analytical result is tabulated in Appendix 19.

The conditions of analysis, the same as in the First and Second year Campaigns, are as follows;

• Instrument	: JEOL, JAX-733 (Wavelength Dispersion Type)
• Accelerating Voltage	: 15 kV
• X-ray Take-off Angle	: 40 degrees
• Probe Current	: 12 nA
• Probe Diameter	: 1 μm
• Element for Analysis	: Cr, Al, Fe, Mg, Ti, Mn, V

(3) Definition of EPMA Anomaly

The purpose of EPMA analysis is to appraise dunite or harzburgite containing

Table 2-3-1 EPMA anomaly

Drill hole No.	Sample No.	No. in figures	Rock type	Depth (m)	Results of EPMA analysis and EPMA anomaly							Note
					Cr#	V_2O_3 wt%	*1	Fe^{3+}#	*2	TiO_2 wt%	*3	
MJAS-26	26-E-1	1/1H	Hz	19.5	0.736	0.304	×	0.017	○	0.02	×	
	26-E-2	2/2D	Du	28.2	0.746	0.178	○	0.021	×	0.11	–	without Cr
	26-E-3	3/3H	Hz	55.3	0.669	0.257	×	0.013	×	0.02	×	
	26-E-4	4/4H	Hz	85.7	0.783	0.278	×	0.021	○	0.05	○	contact with Du
	26-E-5	5/5D	Du	85.9	0.771	0.217	×	0.015	×	0.05	–	
	26-E-6	6/6D	Du	113.0	0.755	0.135	○	0.019	×	0.12	–	1m apart from Cr
	26-E-7	7/7D	Du	113.9	0.769	0.081	○	0.041	○	0.16	–	contact with Cr
	26-E-8	8/8C	Cr	113.9	0.776	0.108	Cr	0.037	Cr	0.16	Cr	
	26-E-9	9/9C	Cr	117.9	0.796	0.059	Cr	0.043	Cr	0.13	Cr	
	26-E-10	10/10C	Cr	118.8	0.785	0.053	Cr	0.033	Cr	0.16	Cr	
	26-E-11	11/11D	Du	118.8	0.773	0.098	○	0.034	○	0.14	–	contact with Cr
	26-E-12	12/12D	Du	119.8	0.788	0.179	○	0.023	×	0.13	–	1m apart from Cr
	26-E-13	13/13D	Du	130.0	0.783	0.166	○	0.034	○	0.09	–	bottom of hole
MJAS-36	36-E-1	①/①H	Hz	4.6	0.719	0.267	×	0.015	○	0.03	×	
	36-E-2	②/②D	Du	5.9	0.834	0.233	×	0.020	×	0.05	–	without Cr
	36-E-3	③/③H	Hz	33.7	0.674	0.233	×	0.018	○	0.03	×	
	36-E-4	④/④H	Hz	42.0	0.702	0.287	×	0.019	○	0.02	×	1m apart from Cr
	36-E-5	⑤/⑤H	Hz	42.4	0.738	0.324	×	0.022	○	0.05	○	contact with Du
	36-E-6	⑥/⑥D	Du	43.0	0.777	0.213	×	0.027	×	0.08	–	contact with Cr
	36-E-7	⑦/⑦C	Cr	43.0	0.790	0.123	Cr	0.031	Cr	0.11	Cr	
	36-E-8	⑧/⑧C	Cr	43.5	0.791	0.132	Cr	0.030	Cr	0.12	Cr	
	36-E-9	⑨/⑨C	Cr	44.1	0.787	0.093	Cr	0.023	Cr	0.15	Cr	
	36-E-10	⑩/⑩D	Du	44.3	0.785	0.127	○	0.023	×	0.10	–	contact with Cr
	36-E-11	⑪/⑪D	Du	45.1	0.801	0.104	○	0.035	○	0.09	–	1m apart from Cr
	36-E-12	⑫/⑫H	Hz	46.1	0.692	0.258	×	0.017	○	0.03	×	contact with Du
	36-E-13	⑬/⑬H	Hz	48.5	0.736	0.251	×	0.019	○	0.03	×	

Judgement (○ means EPMA anomaly)

*1 : Cr#$\geqq$0.7, and V_2O_3 wt%$\leqq$0.2

*2 : Fe^{3+}# $\geqq$0.030 in dunite, Fe^{3+}# $\geqq$0.015 in harzburgite

*3 : TiO_2 wt% $\geqq$0.05 in harzburgite sizable chromium ore bodies, based on the chemical composition of chromian spinel. The four standards for the EPMA anomaly (Matsumoto 1996, others) are defined as follows (the figures indicated in parentheses are thresholds obtained in the Second Year Campaign and are adopted in the Third Year Campaign as well);

- harzburgite indicating relatively low Cr # (0.4~0.6)
- harzburgite indicating high TiO_2 wt% (0.05 or higher)
- dunite and harzburgite indicating high Fe^{3+}# (0.030 or higher for dunite and 0.15 or higher for harzburgite)
- dunite and harzburgite indicating high Cr # and low V_2O_3 wt% (0.7 or higher in Cr # and 0.2 or lower in V_2O_3 wt% for both dunite and harzburgite).

Note: Cr # = Cr / (Cr+Al), Mg # = Mg / ($Mg+Fe^{2+}$), Fe^{3+} # = Fe^{3+} / ($Cr+Al+Fe^{3+}$)

The EPMA anomalies are summarized in Table 2-3-1.

The chromian spinel indicating high Cr # and low V_2O_3 wt% is presumed to be a halo of chrome mineralization. Cr-rich melt is created as a result that Cr-rich orthopyroxene is selectively dissolved into melt by the alternative reaction between melt and wall rock (hartzburgite). Therefore, this alternative reaction is important for the creation of chromitite. As orthopyroxene does not include V_2O_3, the content of V_2O_3 in the melt after the reaction becomes less than that of the wall rock. The indication of high Cr # and low V_2O_3 wt% is presumed to reflect the composition of the melt which is created as a result of this alternative reaction (Matsumoto 1995, 1996).

(4) Classification according to the EPMA Analysis

It has become apparent by careful examination of the result of the EPMA analysis and the elemental ratios as shown in Appendix 19, that rocks can be classified into four groups according to the V_2O_3 wt% in chromian spinel contained as follows (ref. to Figure 2-3-3);

a) chromitite: equal to or less than 0.15 wt% V_2O_3

b) dunite close to chromitite (less than 1m from the contact): equal to or less than 0.15 wt% V_2O_3 — the same V_2O_3 wt% range as for chromitite (hereinafter called " low vanadium dunite ")

c) dunite other than the above b): V_2O_3 wt% ranging between 0.15 and 0.24 — the intermediate range between that for chromitite and harzburgite (hereinafter called " high vanadium dunite ")

d) harzburgite: equal to or higher than 0.23 wt% V_2O_3.

Note: The only exception is the sample No. 36-E-6 from MJAS-36, which has been sampled close to the contact to chromitite, is grouped to the above c) according to the analytical result (⑥ or ⑥D in Figure 2-3-3).

Each rock type grouped according to the above criteria indicates common nature in contents of some of other elements and in elemental ratios.

The low vanadium dunite tends to be high in TiO_2 wt% and low in Mg #, in comparison with the high vanadium dunite. There is observed no difference of any significance in Cr # and Fe^{3+} # between the two types of dunite. The characteristics of these kinds are summarized in Table 2-3-2 below and shown in Figures 2-3-1 through 2-3-8.

Table 2-3-2 Relationship between results of EPMA analysis and rock type

Group	TiO_2 wt%	V_2O_3 wt%	Cr #	Mg #	Fe^{3+} #
a) Chromitite	high	low	high	high	high~ moderate
b) Low vanadium dunite	high	low	moderate ~high	low	low~ high
c) High vanadium dunite	moderate	moderate	moderate ~high	rather high	high~ moderate
d) Harzburgite	low	high	low	moderate	low

(5) Result of EPMA Analysis for the Samples from MJAS-26

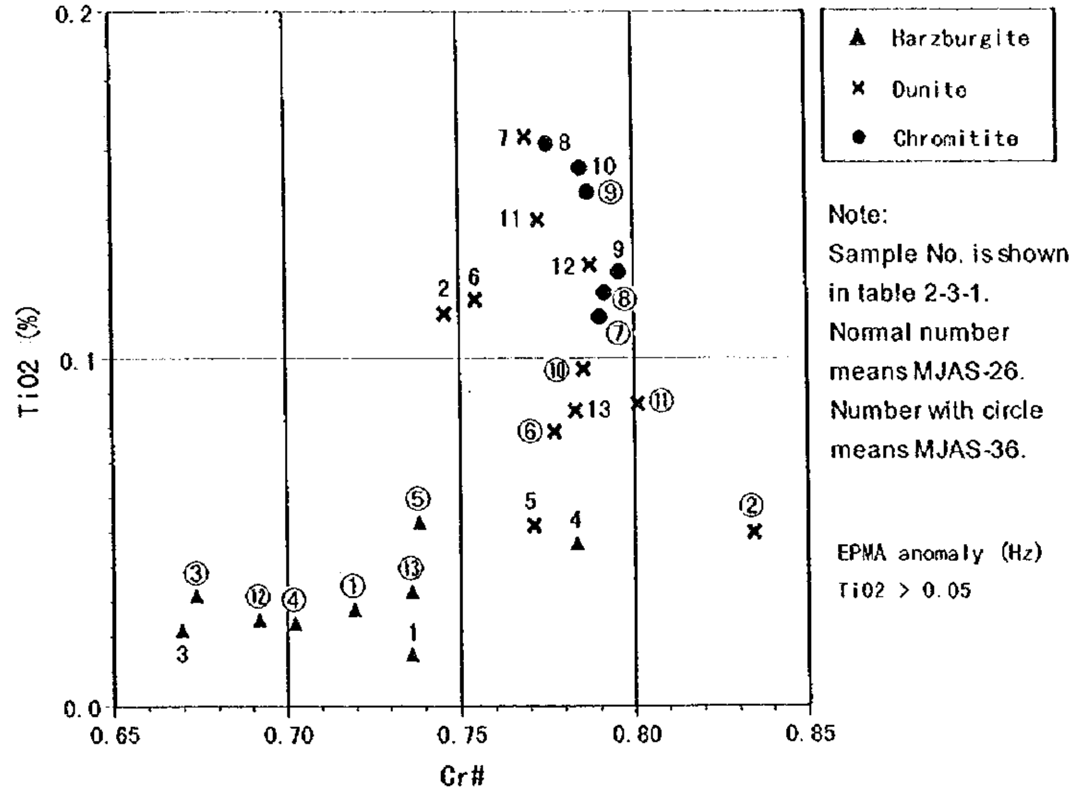
In the First and Second Year Campaign many analytical samples of dunite and hartzburgite indicating EPMA anomalies in V_2O_3-Cr # and Fe^{3+} # locate in Ahu i Vetem containing MJAS-26. In the Third Year Campaign dunite indicating V_2O_3-Cr # EPMA anomaly and dunite and hartzburgite indicating Fe^{3+} # anomaly are recognized in the core samples (Table 2-3-1).

a) Cr #

Cr # in hartzburgite ranges widely from 0.66 to 0.79, Cr # in dunite from 0.74 to 0.79, and in chromitite from 0.77 to 0.80 (Figure 2-3-1). Cr # tends to decrease in the order of chromitite, dunite and harzburgite, but with a very subtle decreasing rate. The Cr # for harzburgite considerably varies, while that for the other rock types is relatively stable. No EPMA anomaly in Cr # indicating from 0.4 to 0.6 have been detected in the harzburgite samples (Figure 2-3-3).

b) TiO_2 wt%

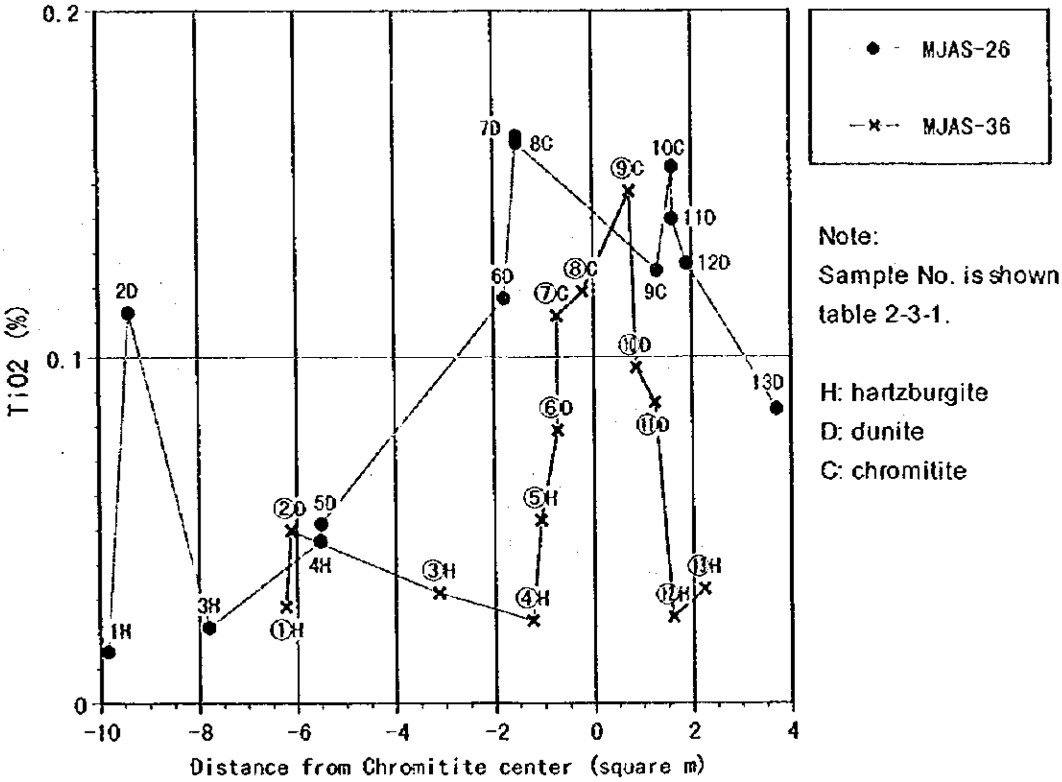
TiO_2 wt% is less than 0.20% in all samples. It is high (equal to or more than 0.05%) in dunite and chromitite and low (less than 0.05%) in hartzburgite (Figure 2-3-1). No EPMA anomaly in TiO_2 (not less than 0.05%) is detected in the harzburgite



Note:
Sample No. is shown in table 2-3-1.
Normal number means MJAS-26.
Number with circle means MJAS-36.

EPMA anomaly (Hz)
TiO2 > 0.05

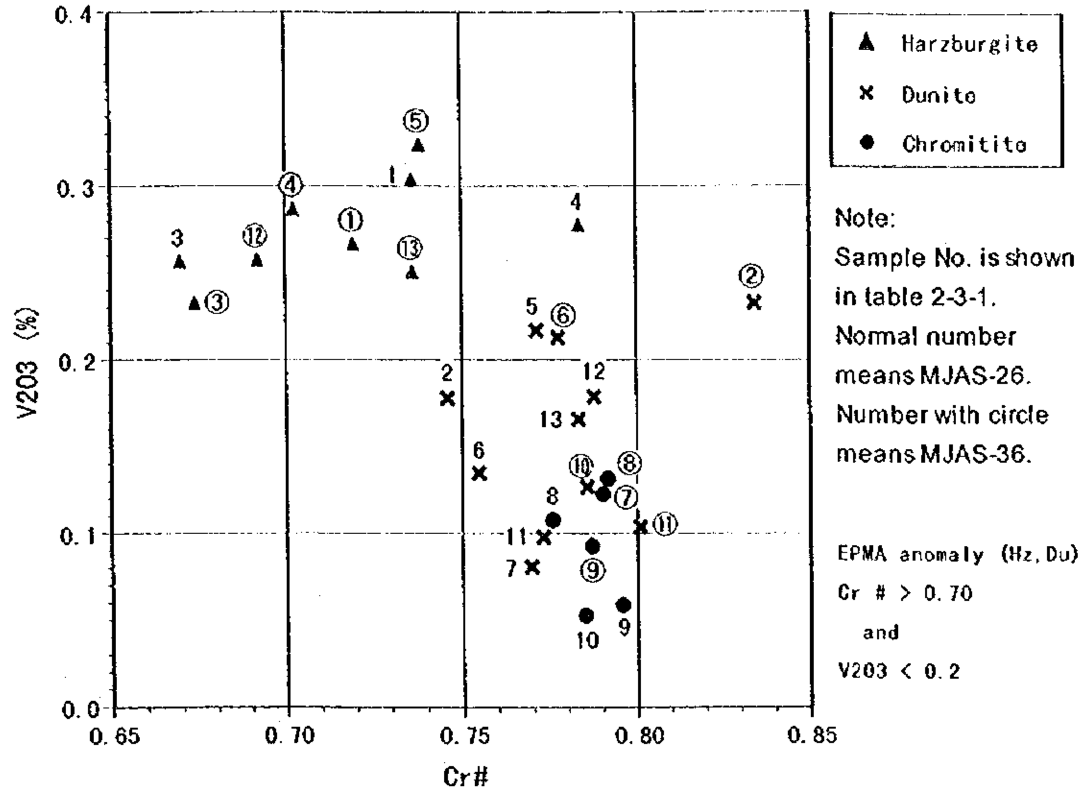
Figure 2-3-1 Correlation diagram of TiO_2 and Cr #



Note:
Sample No. is shown in table 2-3-1.

H: hartzburgite
D: dunite
C: chromitite

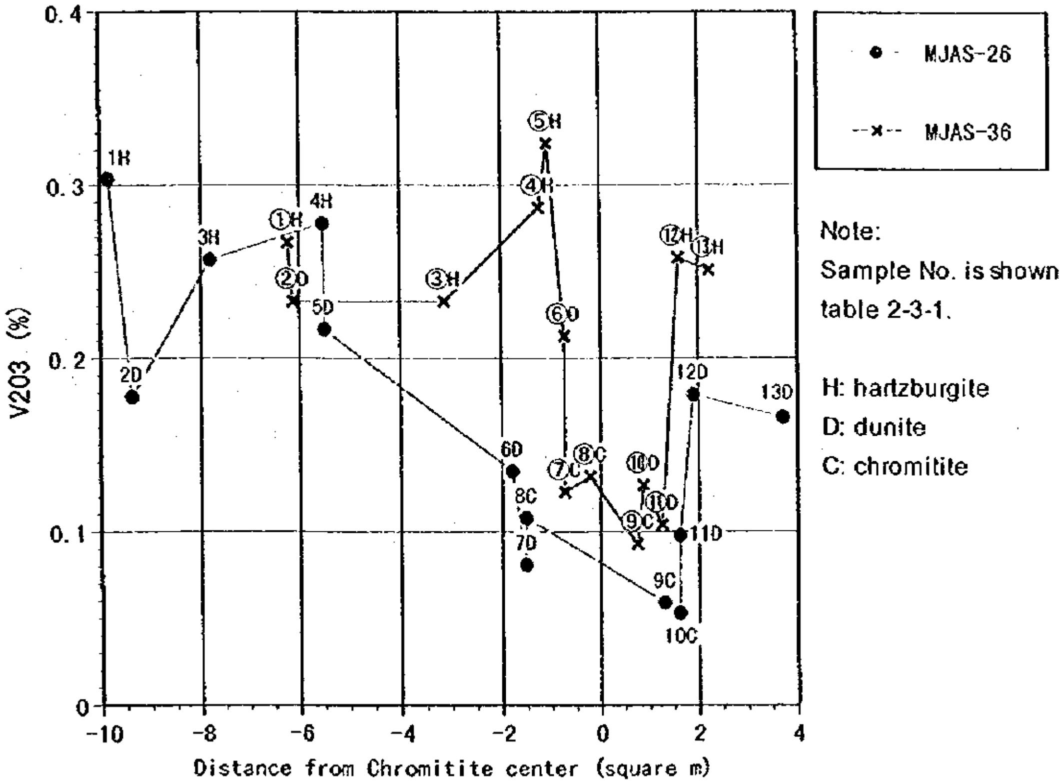
Figure 2-3-2 Relationship between TiO_2 and the distance from chromitite



Note:
Sample No. is shown in table 2-3-1.
Normal number means MJAS-26.
Number with circle means MJAS-36.

EPMA anomaly (Hz, Du)
Cr # > 0.70
and
V203 < 0.2

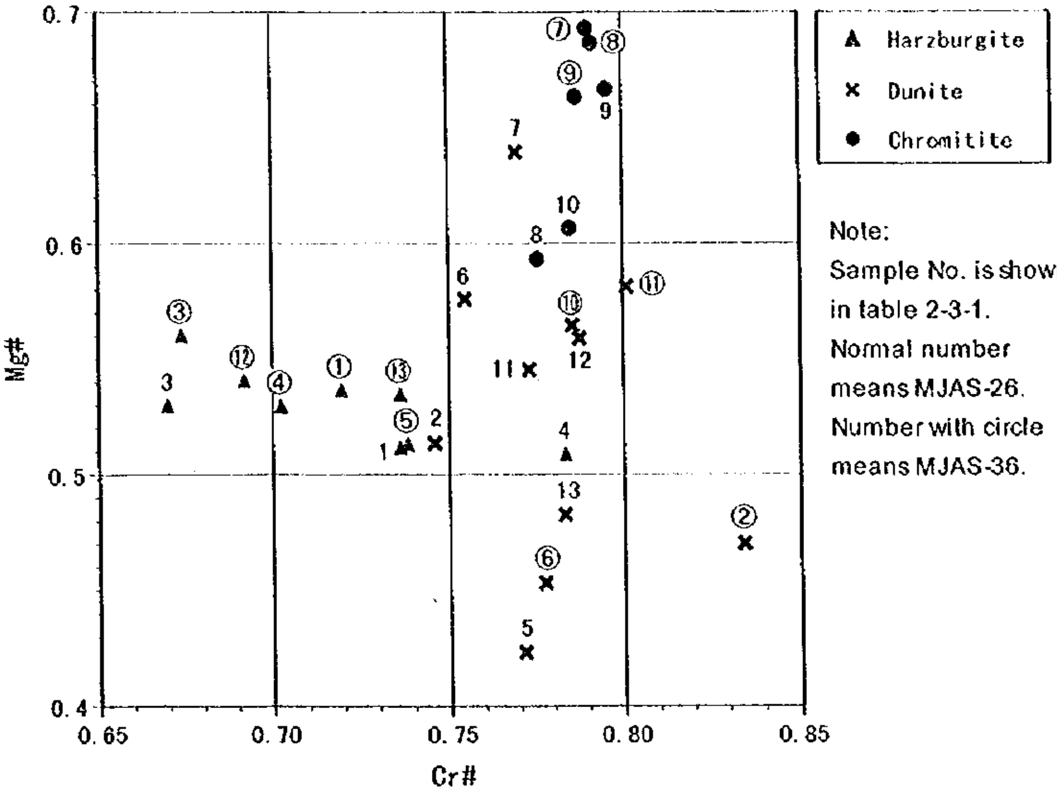
Figure 2-3-3 Correlation diagram of V_2O_3 and Cr #



Note:
Sample No. is shown in table 2-3-1.

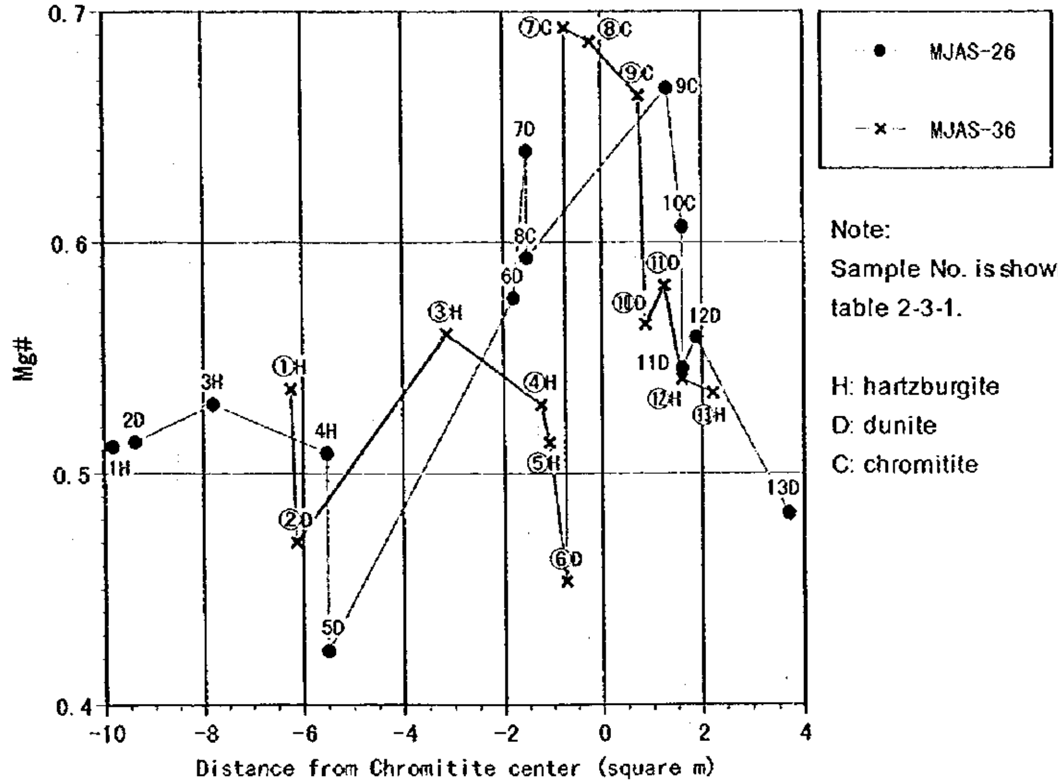
H: hartzburgite
D: dunite
C: chromitite

Figure 2-3-4 Relationship between V_2O_3 and the distance from chromitite



Note:
Sample No. is shown in table 2-3-1.
Normal number means MJAS-26.
Number with circle means MJAS-36.

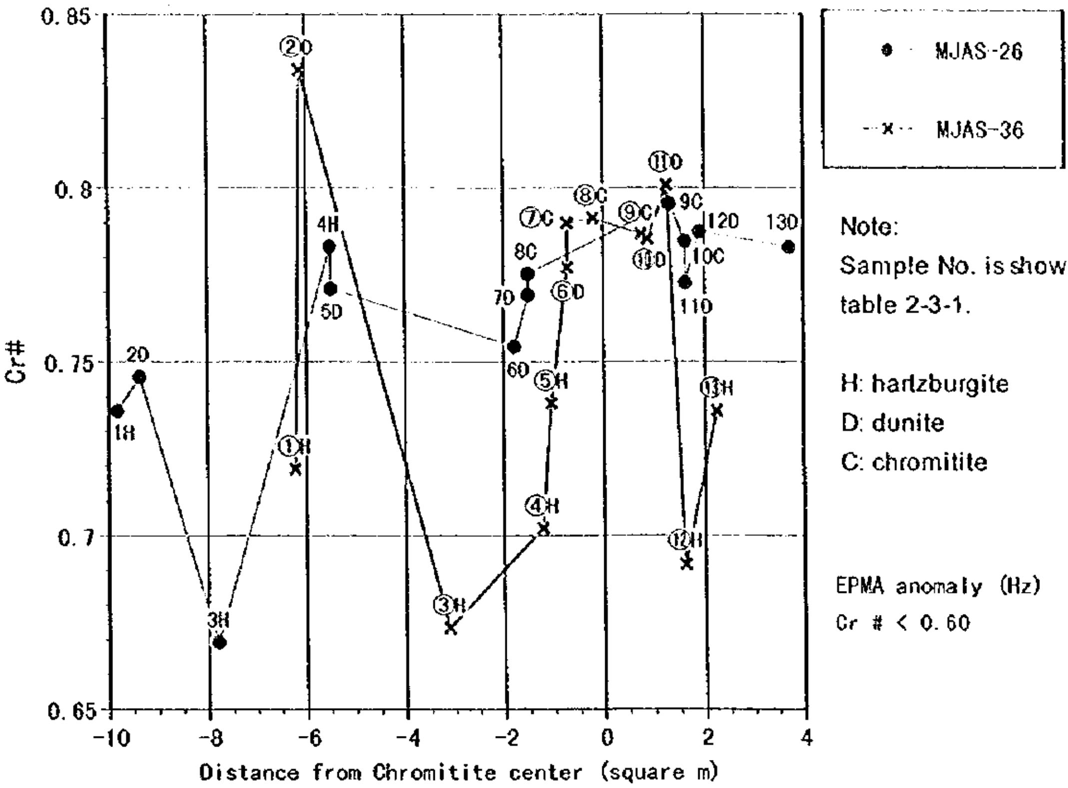
Figure 2-3-5　Correlation diagram of Mg # and Cr #



Note:
Sample No. is shown in table 2-3-1.

H: hartzburgite
D: dunite
C: chromitite

Figure 2-3-6　Relationship between Mg # and the distance from chromitite

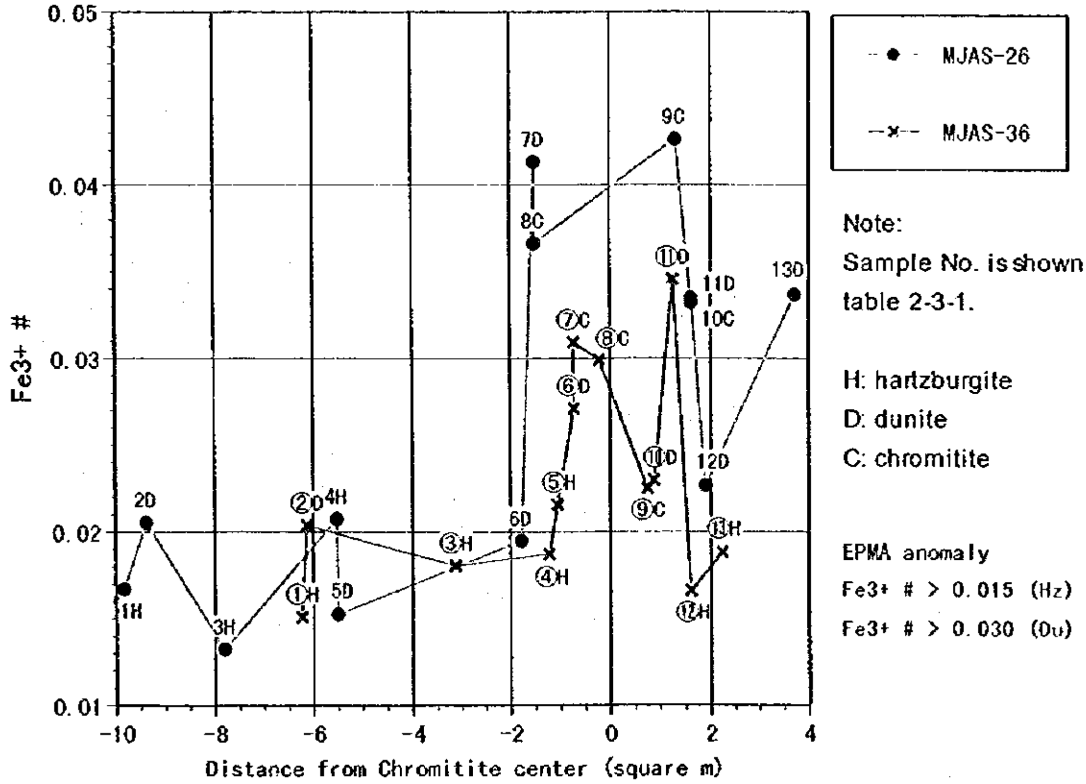


Note:
Sample No. is shown in table 2-3-1.

H: hartzburgite
D: dunite
C: chromitite

EPMA anomaly (Hz)
Cr # < 0.60

Figure 2-3-7 Relationship between Cr # and the distance from chromitite



Note:
Sample No. is shown in table 2-3-1.

H: hartzburgite
D: dunite
C: chromitite

EPMA anomaly
Fe3+ # > 0.015 (Hz)
Fe3+ # > 0.030 (Du)

Figure 2-3-8 Relationship between Fe^{3+} # and the distance from chromitite

samples.

c) Mg #

Mg # ranges highly from 0.59 to 0.67 in dunite, from 0.50 to 0.54 in harzburgite, and widely from 0.42 to 0.65 in dunite (Figure 2-3-5).

d) Fe^{3+} #

Fe^{3+} # ranges highly from 0.033 to 0.043 in chromitite, from 0.015 to 0.041 in dunite, and lowly from 0.013 to 0.021 in harzburgite, with its values of dunite ranging between those of chromitite and harzburgite. Two harzburgite and three dunite samples have indicated EPMA anomaly in Fe^{3+} # (Figure 2-3-8). In the Second Year Campaign the samples of massive dunite-harzburgite suite in Ahu i Vetem also indicated rather high value in Fe^{3+} #.

e) V_2O_3 wt%

V_2O_3 wt% ranges highly from 0.25 to 0.31 in hartzburgite, from 0.08 to 0.22 in chromitite, and lowly from 0.05 to 0.11 in chromitite. V_2O_3 wt% tends to increase in the order of chromitite, dunite and harzburgite, being highly variable in dunite and less variable in the other two rock types. Six out of seven dunite samples have indicated EPMA anomaly in $V_2O_3 - Cr$ #. No harzburgite sample has indicated EPMA anomaly in $V_2O_3 - Cr$ # (Figure 2-3-3).

The harzburgite samples have been collected only in the shallow part of the hole MJAS-26 and are limited in number, because the dunite, including chromitite, is very thick and continues to the bottom of the hole.

The harzburgite sample 26-E-4, collected close to the upper contact of the dunite including chromitite, has indicated EPMA anomaly in Fe^{3+} # and TiO_2 wt%. The sample 26-E-3, collected in the shallower part apart from the dunite contact, has indicated no EPMA anomaly in any of the four criteria.

EPMA anomaly in $V_2O_3 - Cr$ # and Fe^{3+} # is detected in the dunite samples, 26-E-7 and 26-E-11, collected close to the upper and lower contacts to the chromitite, while the those collected 1m apart from these contacts have indicated EPMA anomaly only in V_2O_3 but not in Fe^{3+} #.

The dunite and harzburgite samples, 26-E-2 and 26-E-1 respectively, were collected in the shallow part of the hole. The former has indicated EPMA anomaly in $V_2O_3 - Cr$ # and the latter, in Fe^{3+} #, which may reflect the shallow chromitite identified by surface outcrops and in the hole MJAS-25.

The following characteristics are observed in the figures (Figures 2-3-2, 2-3-4 and 2-3-6 through 2-3-8) that display the relationship between the sample locations (expressed in relative distance from the center of the chromitite) and the contents of various elements or the elemental ratios;

1) the relatively high values of TiO_2 wt%, Mg # and Fe^{3+} # in chromitite and dunite close to chromitite, form a chevron-like shape centering the chromitite and are distinguished from those in harzburgite and dunite apart from the chromitite,
2) on the contrary, the values of V_2O_3 wt% are low in chromitite and dunite close to the chromitite, and form a V-shape centering the chromitite, and
3) the values of Cr # are less prominent in terms of the relative distance from the chromitite, but are generally high in chromitite, gradually decreasing with increasing distance from the chromitite.

(6) Result of EPMA Analysis for The Samples from MJAS-36

EPMA analysis in Hija e Zeze had not been carried out in the previous survey. In this Third Year Campaign, dunite indicating EMPA anomaly in V_2O_3－Cr # and dunite and hartzburgite indicating EMPA anomaly in Fe^{3+} # were identified (Table 2-3-1).

a) Cr #

Cr # ranges lowly from 0.67 to 0.74, highly from 0.77 to 0.84, intensively around 0.79. The values of Cr # are high in chromitite and dunite, and low in harzburgite, being relatively variable in harzburgite. No EPMA anomaly in Cr # indicating from 0.4 to 0.6 is detected in the harzburgite samples (Figure 2-3-1).

b) TiO_2 wt%

TiO_2 wt% is less than 0.20% in all samples. It ranges highly from 0.11 to 0.17 in chromitite, from 0.05 to 0.10 in dunite and less than 0.06 in hartzburgite. TiO_2 wt% decreases in the order of chromitite, dunite and harzburgite. Only one harzburgite sample has indicated EPMA anomaly in TiO_2 wt% (Figure 2-3-1).

c) Mg #

Mg # ranges intensively and highly from 0.67 to 0.69 in chromitite, narrowly from 0.50 to 0.56 in hartzburgite, but widely 0.47 to 0.58 in dunite (Figure 2-3-5).

d) Fe^{3+} #

Fe^{3+} # ranges highly from 0.015 to 0.022 in hartzburgite, all of which indicate EPMA anomaly. It ranges from 0.020 to 0.035 in dunite and only one dunite sample indicates EPMA anomaly (Figure2-3-8).

e) V_2O_3 wt%

V_2O_3 wt% ranges highly from 0.23 to 0.32 in hartzburgite, lowly from 0.10 to 0.24 in dunite and also lowly from 0.09 to 0.13. V_2O_3 wt% increases in the order of chromitite, dunite and harzburgite, being relatively variable in dunite (Figure 2-3-3).

Two dunite samples have indicated EPMA anomaly in V_2O_3－Cr #.

The number of dunite samples collected from MJAS-36 is small, because the thickness of the dunite containing the chromitite is very limited. The sample, 36-E-4, collected 1m above the upper contact of the chromitite is not dunite but harzburgite, because the dunite is only 0.6m thick in this part (Table 2-3-1).

The sample, 36-E-5, collected from the harzburgite immediately above the dunite containing the chromitite, has indicated EPMA anomaly in Fe^{3+} # and TiO_2 wt%, while the harzburgite sample, 36-E-4, located above 36-E-5, is anomalous only in Fe^{3+} #, as well as two other shallower samples. The samples, 36-E-12 below the dunite and 36-E-13 at the bottom of hole, are also anomalous only in Fe^{3+} #.
No EPMA anomaly has been detected in the dunite sample, 36-E-7, immediately above the chromitite, while the sample, 36-E-10, immediately below, is anomalous in V_2O_3 − Cr #. The sample, 36-E-11, collected 1m below the contact, has indicated EPMA anomaly both in V_2O_3 − Cr # and Fe^{3+} #.

The following characteristics are observed in the figures (Figures 2-3-2, 2-3-4 and 2-3-6 through 2-3-8) that display the relationship between the sample locations (expressed in relative distance from the center of the chromitite) and the contents of various elements or the elemental ratios;

1) the relatively high values of TiO_2 wt%, Mg # and Fe^{3+} # in chromitite and dunite close to chromitite, form a chevron-like shape centering the chromitite and are distinguished from those in harzburgite and dunite apart from the chromitite,
2) on the contrary, the values of V_2O_3 wt% are low in chromitite and dunite close to the chromitite, and form a V-shape centering the chromitite, and
3) the values of TiO_2 wt% in the samples of MJAS-36 exhibit the most typical pattern in comparison with the other EPMA indices including those for the samples of MJAS-26 (Figure 2-3-2), decreasing with increasing distance from the chromitite or in the order of chromitite, dunite at the contact to the chromitite, dunite containing the chromitite, and harzburgite.

Chapter 4 Assessment of the Chromium Deposit

Drilling exploration was carried out in the six selected target areas in the general area from the central part of the Shebenik Ultrabasic Massif to the northern part of the Pogradec Ultrabasic Massif, in order to explore the lateral and down-dip extensions of the known ore bodies. The drill holes in the three target areas, Ahu i Vetem, Lugu i Batres and Hija e Zeze, intersected chromitite. The chromium deposit of each target area is assessed here-under, reviewing the drilling result.

(1) Ahu i Vetem

A low grade deep ore body, comprising mainly disseminated ores, and a high grade shallow ore body, comprising massive ores, have been identified in this target area. Five holes were drilled during the Third Year Campaign in order to verify the northern extensions of these ore bodies. All of the five holes intersected the deep ore body, however only two of these encountered chromitite correlated to the shallow ore body.

1) Deep Ore Body

The deep ore body is characterized by its appreciable thickness, being enveloped within a thick dunite, and by its relatively low Cr_2O_3 grade. The ores consist mainly of banded or disseminated chromitite, including high chromian spinel concentrations in part. It strikes in the NNE-SSW direction and dips westwards with 40 to 50 degrees, elongating to the north with a gentle plunge. Its dimension is more than 200m in length, more than 70m in width and 0.5 to 4m, averaging at 1.5 to 2.5m, in thickness. In the southeastern topographic depression, where a part of the deep ore body is exposed, the layered structure of ultrabasic rocks trends in the NNE-SSW direction and is conformable with the strike of the deep ore body. This trend is, however, oblique to the strike of the shallow ore deposit, which will be explained later in this section.

According to the existing data, the Cr_2O_3 grade of this ore body ranges from the maximum of 29.70% to the minimum of 14.55%, mostly between 19 and 24%. The average Cr_2O_3 grade of ore sections in the holes drilled in the current project ranges from the maximum of 26.10% to the minimum of 15.39%, with an arithmetic mean of 19.76%. The maximum and the minimum grades of single assay runs are 39.53 and 8.64% Cr_2O_3 respectively.

Assuming the average grade of 20% Cr_2O_3, the average thickness at 2m for the length of 200m and the width of 70m, and the average specific gravity of 2.5, the ore resources can be estimated at approximately 70,000 tons containing 9,600 tons of chrome in metal.

There will be a good possibility for the deep ore body to extend north-northeastwards and to widen its width towards the down-dip, because all the five hole have intersected the chromitite with the appreciable thickness exceeding some 2m.

Anomalous EPMA indices obtained in the samples from MJAS-26 are mostly associated with the dunite containing the chromitite or with the harzburgite in contact with this dunite envelope.

EPMA anomaly in V_2O_3-Cr # has been recognized in five of six samples of the dunite containing the chromitite and that in Fe^{3+} #, in three samples. The three dunite samples above the chromitite increase in V_2O_3 wt% and decrease in Fe^{3+} # with increasing distance from the chromitite. The number of anomalous EPMA indices also decreases from three in the sample close to the chromitite and to zero in the uppermost sample, while the number of anomalous indices in the three dunite samples collected below the chromitite is counted at two in the one sample near the contact, at one in the second 1m apart from the contact and at two in the third at the bottom of hole.

No EPMA anomaly in V_2O_3-Cr # has been detected in the three harzburgite samples. However, the uppermost sample has indicated EPMA anomaly in Fe^{3+} #, and the other close to the dunite contact, that in Fe^{3+} # and TiO_2 wt%.

As above described, the samples of dunite close to the chromitite and of harzburgite close to the dunite envelope are anomalous in two or more EPMA indices. A sample of dunite containing chromitite may show no EPMA anomaly in some cases, where it is located apart from the chromitite.

The present threshold for V_2O_3-Cr # is more sensitive to define EPMA anomaly than that of Fe^{3+} #, or, in other word, less specific to characterize dunite with respect to chromium mineralization. As for harzburgite, the thresholds for V_2O_3-Cr #, TiO_2 wt% and Fe^{3+} # become less specific in defining EPMA anomaly in this order.

The results of EPMA analysis indicate the existence of the interactive reaction between melt and wall rock (harzburgite). As the dunite confirmed by drilling survey is thick, a relatively large size of chrome deposit is expected to exist. The possibility, however, to occur the large scale ore deposit is low in this target area, because Cr # in harzburgite of the large ore deposit shows 0.4 to 0.5.

2) Shallow Ore Body

The shallow ore body is characterized by its thin thickness, being enveloped with in a thin dunite, and its appreciably high Cr_2O_3 grade, consisting of massive chromitite. Its continuation, however, is very limited. It strikes in the NNW-SSE direction and dips to the northeast with 20 to 30 degrees, elongating northwards with a gentle plunge. The dimension of the ore body is more than 80m in length and more than 30m in width, with thickness ranging from 0.5 to 1.0m. In the northwestern topographic high, the layered structure of ultrabasic rocks trends in the NW-SW direction and is conformable with the shallow ore body. This trend is, however, oblique to the strike of the deep ore body. The continuation of the shallow ore body north-northwestwards may be limited, because three out of five holes have failed to intersect the ore body and the ore sections in the two holes, MJAS-25 and MJAS-26, are very thin, having the thickness of 0.01 and 0.05m respectively.

According to the existing data, the Cr_2O_3 grade of ores ranges between the maximum of 51.94% and the minimum of 19.31%, with most of ore samples indicating around 50% Cr_2O_3. The analytical result of the ore section of MJAS-26, which is the only sample of the shallow ore body analyzed in the current Project, indicates the Cr_2O_3 grade of 35.41%. Assuming the average grade of 40% Cr_2O_3, the average thickness of 0.8m for the length of 80m and the width of 30m and the average specific gravity of 3.0, the ore resources can be estimated at approximately 5,700 tons containing 1,600 tons of chrome in metal.

3) Relationship between the Deep and Shallow Ore Bodies

The configurations of the deep and shallow ore bodies are conformable with the structure of the ultrabasic host for each of them but are disharmonious to each other. The host ultrabasics for the deep ore body, exposing in the southeastern part, show the layered structure trending in the NNE-SSW direction, which is disharmonious with the regional structure in the Central Shebenik District. On the other hand, those for the shallow ore body, exposing in the northwestern part, show the layered structure trending in the NW-SE direction, which is harmonious with the regional structure.

The structural difference between the ultrabasics hosting the deep and shallow ore bodies, whether related to the genesis of ultrabasic massif or caused by later tectonic movements, has not been well interpreted to date. Regardless of the causes of the structural difference, it would be inconceivable that the two ore bodies, showing different modes of occurrence, had originally formed one ore body and were later dislocated to the present positions by faulting and folding. The ore bodies may have formed through different mineralization processes, judging from their structures, modes of occurrence, locations and also the regional structure of the Shebenik ultrabasic massifs.

(2) Lugu i Batres

The ore body identified by outcrops and trenches strikes in the E-W to WNW-ESE direction and dips to the south with 40 to 70 degrees, elongating in the WNW-ESE direction with a gentle plunge to the west. It is gradually shifted by some minor crosscutting faults and is terminated by a fault at the east end, forming a hook shape. The geometrical relationship between the surface indications and the ore section in the hole, MJAS-28, suggests its overall inclination of 55 degrees to the south.

The ore body consists mainly of massive ores, containing chromitite bands or clots in part. Its size is rather small, with the strike length of 80m, the dip length exceeding 20m and the thickness ranging between 0.1 and 2.0m. The length of ore section in MJAS-28 is 0.3m.

The chemical analysis of five samples has returned 38.0 to 52.5% Cr_2O_3 and 28.0% Cr_2O_3 respectively for the massive and banded ores in surface indications, and 39.75% Cr_2O_3 for the massive ore section in the hole, MJAS-28. The arithmetic mean of the five samples is estimated at 41.49% Cr_2O_3.

No past exploration has confirmed the continuation of the ore body, neither to the east nor to the depth. This year's drilling intended to explore its continuation to the west and to the down-dip in its central and western parts. However, MJAS-29, which had been projected to pass through the down-dip continuation at the west end of the ore body, failed to intersect chromitite. In addition, the ore body tends to become less massive westwards and hence low in Cr_2O_3 grade. Therefore, its potential westwards is judged to be insignificant.

(3) Hija e Zeze

Two holes were drilled in order to explore the north-northwestern continuation of the ore body identified by the past exploration, and both intersected chromitite ores.

The ore body strikes in the NW-SE to NNW-SSE direction with a nearly vertical dip and elongates in the NNW-SSE direction with a plunge of about 10 degrees to the north-northwest. It is crosscut by some faults, some of which are observed in the drill holes as crushed zones, and, as a whole, extends in the NNW-SSE direction being crosscut by these faults.

The ore body, comprising mainly massive chromitite, is more than 100m in strike length and more than 15m in dip length (width) with thickness ranging between 0.7 and 2.2m. The average thickness may be estimated at around one meter, taking account of the ore sections in MJAS-36 and MJAS-37 which are measured at 1.1 and 0.2m respectively. The Cr_2O_3 grade ranges between 35.05 and 51.53% for the surface massive ore samples, and is averaged at 36.41 and 41.90% respectively for the massive ore sections in MJAS-36 and MJAS-37, with an arithmetic mean of 41.90% for the analyzed six samples.

Assuming the average grade of 42% Cr_2O_3, the average thickness of 1.0m for the length of 100m and the width of 20m and the average specific gravity of 3.0, the ore resources can be estimated at approximately 6,000 tons containing 1,700 tons of chrome in metal.

The drilling exploration in the current Project is the first instance carried out for this target area and has successfully confirmed the strike extension of the known ore body. The ore body, with an appreciable average thickness of about 1m and a relatively high average grade at around 42% Cr_2O_3, is still open for the strike and dip extensions and is expected to substantially increase its resources by further drilling exploration.

According to the result of the EPMA analysis for the samples of MJAS-36, a number of the dunite samples below the chromitite and the harzburgite samples near the contact to the dunite envelope have indicated EPMA anomaly in various indices.

Two of the three samples of the dunite containing the chromitite have indicated EPMA anomaly in V_2O_3－Cr # and one of the two is also anomalous in Fe^{3+} #. No EPMA anomaly in any indices is detected in the dunite sample immediately above the chromitite, though its value of V_2O_3－Cr # is close to the threshold. Of the two dunite samples below the chromitite, the one close to the contact to chromitite has indicated EPMA anomaly only in Fe^{3+} # and the other 1m apart from the contact is anomalous both in V_2O_3－Cr # and Fe^{3+} #.

No EPMA anomaly in V_2O_3－Cr # is detected in the six harzburgite samples, while that in Fe^{3+} # is observed in all the six samples. One harzburgite sample has indicated EPMA anomaly in TiO_2 wt%. The sample immediately above the dunite envelope is anomalous both in Fe^{3+} # and TiO_2 wt%, while the sample immediately below the dunite envelope has indicated EPMA anomaly only in TiO_2 wt%.

The results of EPMA analysis in MJAS-36 indicate the existence of the interactive reaction between melt and wall rock (harzburgite) similarly in MJAS-26. As the dunite confirmed by drilling survey is thin and Cr # in harzburgite indicates more than 0.6, the possibility to occur the large scale ore deposit is low in this target area.

PART III

Part Ⅲ Conclusion and Recommendation

Chapter 1 Conclusion

1-1 Result of Drilling Exploration

(1) Ahu i Vetem

There are two ore bodies, the shallow and the deep ore bodies, in this target area. The drilling exploration was carried out in order to investigate the northern extensions of both ore bodies and comprised a total of 5 holes (MJAS-23 through MJAS-27). All the drill holes intersected the deep ore body, while only two holes (MJAS-25 and MJAS-26) encountered the shallow ore body.

The deep ore body is rather thick within a very thick dunite envelope and consists of disseminated or banded chromitite ores with relatively low Cr_2O_3 grade. The shallow ore body is thin within a thin dunite envelope and consists mainly of massive chromitite ores with high Cr_2O_3 grade. The configurations of both ore bodies are conformable with the layering structures of their host ultrabasic rocks, which are oblique to each other trending in the NNE-SSW direction in the vicinity of the deep ore body and in the NW-SE direction in the vicinity of the shallow ore body. The latter trend is harmonious with the regional structure of the Shebenik ultrabasic massif.

The deep ore body is estimated to have a size of more than 200m in length and more than 70m in width with the average thickness of 2m and the average grade of 20% Cr_2O_3. It may be expected that the ore body continues laterally further to the north-northeast and also to the down-dip, because all the five holes have intersected chromitite with thickness exceeding 2m. Although the ore grade is generally low, this ore body will be a significant target for the future exploration because it has a sizable dimension and contains high grade portions partly.

The shallow ore body is estimated to have a size of more than 80m in length and more than 30m in width with the average thickness of 0.8m and the average grade of 40% Cr_2O_3. The lateral and down-dip continuity of this ore body may be doubtful, because only two holes have intersected a part of the down-dip extension in the north-northeastern part. However, the strike extension to the north-northwest has been unexplored and remains as a future exploration target.

(2) Lugu i Batres

The two holes, MJAS-28 and MJAS-29, were drilled to explore the down-dip extension of the known ore body in its central to western part. Although MJAS-28 intersected massive chromitite ores for a core length of 0.3m with Cr_2O_3 grade of

39.75%, MJAS-29 failed to intersect any chromitite.

The ore body strikes in the E-W to WNW-ESE direction with steep to moderate dip to the south and plunges to the WNW direction. The size of the ore body is rather small and estimated at about 80m in length and more than 20m in width with thickness ranging between 0.1 and 2m and with the average grade of about 40% Cr_2O_3.

No exploration result to date indicates the eastern and down-dip extensions of this ore body. In addition, MJAS-29 has not intersected any chromitite at the depth in the westernmost part. Accordingly, it is considered that the size of the ore body will be limited.

(3) Buzgare

The two holes, MJAS-30 and MJAS-31, were drilled to identify the down-dip and northwestern extensions of the known ore body, and both failed to intersect any chromitite.

The ore body may have been offset for a considerable distance at depth by a fault which dips with a gentle angle and has a thick crushed zone. Judging from the ragged topography in this area, it appears impractical to carry out drilling exploration looking for the offset part of the ore body.

(4) Pishkash-5

The two holes, MJAS-32 and MJAS-33, were drilled to identify the northern extension of the known ore body, and both failed to intersect any chromitite.

The ore body, striking in the NNW-SSE direction, must have been dislocated for a distance of several tens of meters by a fault running parallel to its strike. A number of drill holes have been put down in this target area and have failed to identify the offset portion of the ore body, which suggests that the dislocation may be considerably great beyond estimation.

(5) Bregu i Pishes

The two holes, MJAS-34 and MJAS-35, were drilled to explore the northwestern extension of the known ore body, and both failed to intersect any chromitite.

It is estimated that a number of faulted segments of the ore body are arranged an echelon westwards according to the exploration result to date. The reason why the two holes failed to intersect the ore body may be that one or more faults have dislocated the ore body for a great distance beyond estimation or that the extension of the ore body is limited. Follow-up exploration may be recommended to the west and at the depth of the two holes.

(6) Hija e Zeze

The two holes, MJAS-36 and MJAS-37, were drilled to explore the north northwestern extension of the known ore body identified by the past exploration, and both intersected chromitite comprising massive ores with thickness of 1.1m and Cr_2O_3 grade of 36.41% in the former hole and with thickness of 0.2m and Cr_2O_3 grade of 41.62% in the latter.

The ore body, as a whole, has an average thickness of 1m for a dimension of more than 100m in strike length and 20m in down-dip length with an average grade of 42% Cr_2O_3.

The drilling exploration of the current program is the first instance carried out for this target ore body and has successfully confirmed its continuations, which is still open to the north-northwest, being step-faulted by a number of cross-cutting faults. The target for the follow-up exploration will be the down-dip and north-northwestern extension of the mineralization identified by the two drill holes put down in the current program.

1-2 EPMA Analysis

An EPMA analysis was made for chromian spinel contained in the drill core samples systematically collected from MJAS-26 in Ahu i Vetem and from MJAS-36 in Hija e Zeze. The former drill hole intersected a sizable ore body with a relatively low Cr_2O_3 grade, and the latter, a relatively small ore body with a high Cr_2O_3 grade. The two groups of the samples are different from each other in some of mineralization characteristics but have common features in EPMA anomaly in various indices according to the result of EPMA analysis. Dunite containing chromitite has some kinds of EPMA anomalies and another dunite and hartzburgite have a few EPMA anomalies.

The V_2O_3 wt% of chromian spinel in dunite close to chromitite is apparently lower than that in dunite apart from chromitite, being nearly equal to that in chromitite. The low Vanadium dunite shows EPMA anomaly in V_2O_3-Cr # and is higher in TiO_2 wt% and lower in Mg # than the high Vanadium dunite.

Almost all harzburgite samples indicate EPMA anomaly in Fe^{3+} # but tend to decrease the value of Fe^{3+} # (or become less anomalous) with increasing distance from chromitite. No harzburgite sample indicates EPMA anomaly in Cr # with the value less than 0.6.

In general, the chemical composition of chromian spinel in chromitite is similar to that in the dunite close to the chromitite, which may suggest that the chromitite and the dunite have formed coevally under the same physico-chemical conditions. In some cases, however, chromian spinel contained in a single dunite envelope indicates different chemical compositions in accordance with distance from chromitite.

The result of the EPMA analysis for the drill core samples in the current Project has identified that chromium mineralization is associated with the dunite containing chromian spinel with V_2O_3 wt % lower than 0.150, and with harzburgite containing chromian spinel with the value of Fe^{3+} # higher than 0.020. Therefore, the chemical composition of chromian spinel contained will be effective to assess ultrabasics with respect to their potential for chromium mineralization.

The Cr # of chromian spinel in harzburgite indicates from 0.60 to 0.40 near the large scale chrome ore deposit of podiform type. The Cr # of chromian spinel in harzburgite in MJAS-26 and MJAS-36 is generally high and ranges from 0.66 to 0.79. Therefore, in both target areas of Ahu i Vetem and Hija e Zeze the possibility to locate large scale ore deposit comparable to those of the Bulqiza Mines appears to be rather limited based on the result of the EPMA analysis to date.

1-3 Consideration

EPMA anomalies of V_2O_3-Cr # and Fe^{3+} # remarkably observed indicate the existence of the interactive reaction between melt and wall rock (harzburgite) which is an important phenomenon on the forming process of the podiform type chrome deposit. Especially in Ahu i Vetem near MJAS-26, the massive dunite suite is widely distributed and the dunite confirmed by drilling survey is thick and large, therefore the potentiality of chrome ore deposit in this target area is estimated to be high. The possibility, however, to occur the large scale ore deposit is low in this target area, because the large ore deposit accompanied by high Cr # harzburgite as existing in the area is rare.

Chapter 2 Recommendations for Future

As the result of the Third Year Campaign of the Project, the following recommendations will be made for exploration targets to be followed up in a subsequent stage;

1) Drilling Exploration in Hija e Zeze
    - Down-dip Continuation of the Ore Body identified by the Holes, MJAS-36 and MJAS-37
    - The Northern Strike-extension of the Same Ore Body

2) Drilling Exploration in Ahu i Vetem
    - North Northeastern Extension of the Deep Ore Body (further to the north and the northeast of the hole, MJAS-27)
    - Northwestern Extension of the Shallow Ore Body (further to the west and the

northwest of the hole, MJAS-27)

3) Drilling Exploration in Bregu i Pishes
- Lower Section of the Part explored by the Holes, MJAS-34 and MJAS-35
- Western Side of the Part explored by the Holes, MJAS-34 and MJAS-35

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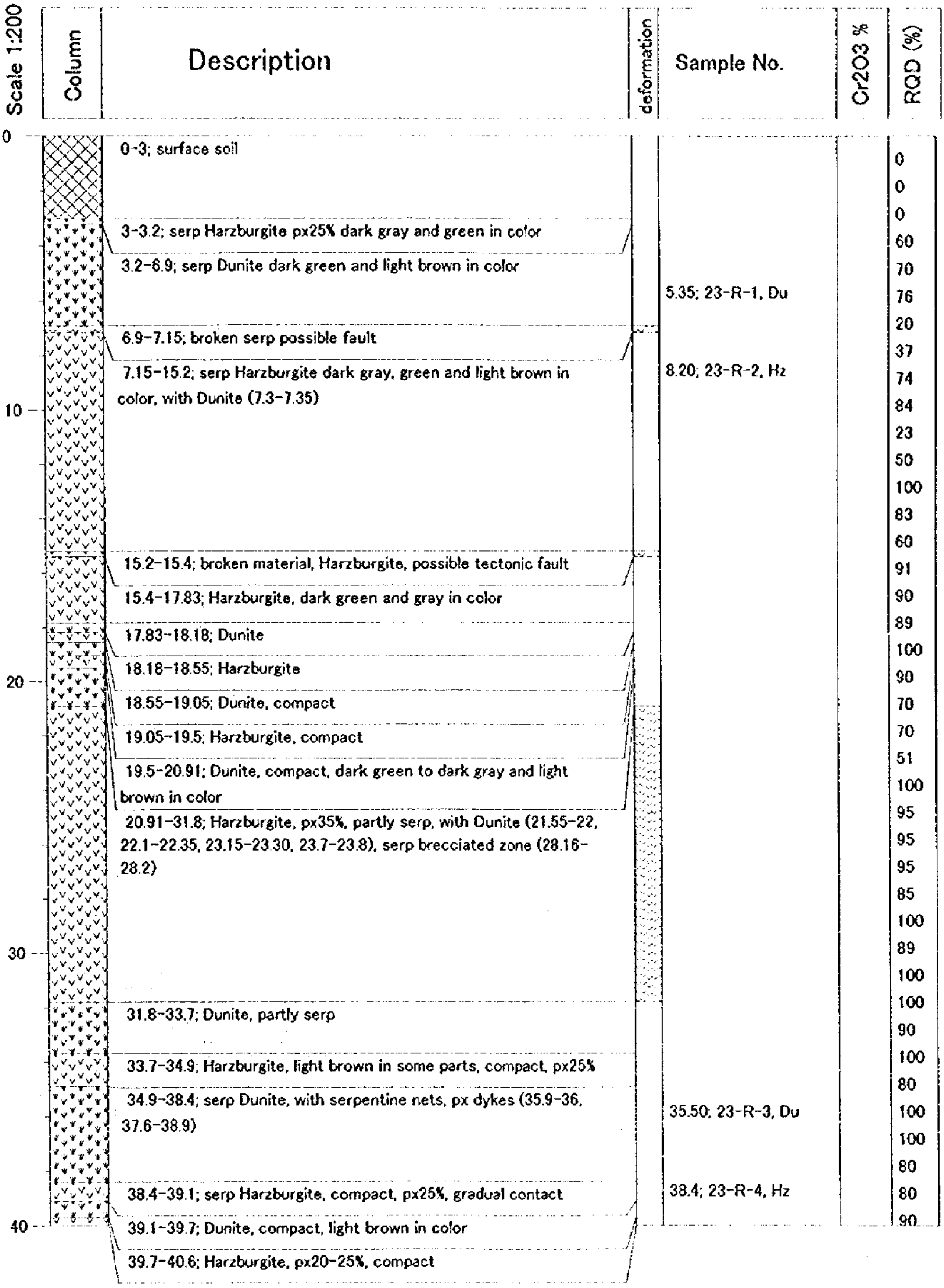
APPENDIXES

MJAS-23

AREA: Ahu i Vetem

INCLINATION: -71 DIRECTION: S78W ELEVATION: 1717.15m FINAL DEPTH: 140m



Description	Sample No.	Cr2O3 %
0-3; surface soil		
3-3.2; serp Harzburgite px25% dark gray and green in color		
3.2-6.9; serp Dunite dark green and light brown in color	5.35; 23-R-1, Du	
6.9-7.15; broken serp possible fault		
7.15-15.2; serp Harzburgite dark gray, green and light brown in color, with Dunite (7.3-7.35)	8.20; 23-R-2, Hz	
15.2-15.4; broken material, Harzburgite, possible tectonic fault		
15.4-17.83; Harzburgite, dark green and gray in color		
17.83-18.18; Dunite		
18.18-18.55; Harzburgite		
18.55-19.05; Dunite, compact		
19.05-19.5; Harzburgite, compact		
19.5-20.91; Dunite, compact, dark green to dark gray and light brown in color		
20.91-31.8; Harzburgite, px35%, partly serp, with Dunite (21.55-22, 22.1-22.35, 23.15-23.30, 23.7-23.8), serp brecciated zone (28.16-28.2)		
31.8-33.7; Dunite, partly serp		
33.7-34.9; Harzburgite, light brown in some parts, compact, px25%		
34.9-38.4; serp Dunite, with serpentine nets, px dykes (35.9-36, 37.6-38.9)	35.50; 23-R-3, Du	
38.4-39.1; serp Harzburgite, compact, px25%, gradual contact	38.4; 23-R-4, Hz	
39.1-39.7; Dunite, compact, light brown in color		
39.7-40.6; Harzburgite, px20-25%, compact		

RQD (%)
0
0
0
60
70
76
20
37
74
84
23
50
100
83
60
91
90
89
100
90
70
70
51
100
95
95
95
85
100
89
100
100
90
100
80
100
100
80
80
90

Appendix 1 (1) Geological logging (Ahu i Vetem: MJAS-23)

MJAS-23

AREA: Ahu i Vetem

INCLINATION: -71 DIRECTION: S78W ELEVATION: 1717.15m FINAL DEPTH: 140m

Scale 1:200	Column	Description	deformation	Sample No.	Cr2O3 %	RQD (%)
40		39.7-40.6; Harzburgite, px20-25%, compact				100
		40.6-42.8; Dunite, dark green and light brown in color with calcite nets				70
						65
		42.8-45.4; Harzburgite, px20-25%, with serpentine nets, some parts are light brown in color, medium hard				70
						60
		45.4-46; Dunite, light brown in color, with very rare chromite grains, lower contact is possible fault and is filled with calcite				80
						50
		46-50.2; Harzburgite, 20-25%, with serpentine nets, with calcite nets				90
						90
						100
50		50.2-50.9; Dunite, compact, with very rare chromite grains, dark green in color				70
						80
		50.9-63.4; Harzburgite, compact, very rare chromite grains, dark green in color, px35%				80
						70
						100
						90
						30
						30
						100
						100
60						95
						80
						95
		63.4-63.7; brecciated zone, Harzburgite, core angle is 40				90
		63.7-71.6; Dunite, dark green and partly brown, very rare chromite grains, with brecciated zone (64.85-64.9, with calcite, compact) and Pyroxenite dyke (70.2-70.3)				95
						100
						100
						100
						100
						100
70						90
		71.6-75.9; serp Harzburgite, px35%, some fractures are filled with calcite				90
						70
						100
						100
						60
		75.9-76.5; brecciated zone, green, Harzburgite, core angle is 30				50
		76.5-76.55; Harzburgite				100
		76.55-76.75; Dunite				70
						100
80		76.75-83.9; Harzburgite, px35-40%, weak foliation with core angle of 40, with Dunite (77-77.1) and broken Harzburgite (773.95-78.15)				

Appendix 1 (2) Geological logging (Ahu i Vetem: MJAS-23)

MJAS-23

AREA: Ahu i Votem

INCLINATION: -71 DIRECTION: S78W ELEVATION: 1717.15m FINAL DEPTH: 140m

Description
76.75-83.9; Harzburgite, px35-40%, weak foliation with core angle of 40, with Dunite (77-77.1) and broken Harzburgite (773.95-78.15)
83.9-116.3; Dunite, dark green, partly broken, with serpentine nets, with brecciated zones (84.3-84.6, 89.9-89.95, 90.25-90.7, 90.9-91.2, 100.45-101, 102.3-102.55, 111.35-112.05) and Pyroxenite dyke (95.65-95.85, 96.8-96.85, 106.45-106.75, 107.4-107.43, 109.9-110, 110.05-110.15, irregular contact)
116.3-118.3; Harzburgite, dark green in color, px25-30%, compact
118.3-119.3; Dunite, dark green in color, compact
119.3-119.9; Chromite, banded ore, 35%
119.9-120.55; Chromite, banded ore, 15-25%

Sample No.	Cr2O3 %
83.6; 23-R-5, Hz	
113.90; 23-R-6, Du	
118.60; 23-R-7, Hz	
119.10; 23-R-8, Du	
119.3-119.9; 23-C-1	30.38
119.9-120.55; 23-C-2	16.07

Scale 1:200	RQD (%)
80	
	100
	100
	100
	100
	90
	50
	65
	50
	80
90	100
	40
	70
	85
	100
	100
	62
	75
	85
	100
100	75
	15
	90
	70
	95
	100
	100
	100
	100
	100
110	70
	100
	30
	70
	100
	100
	70
	70
	60
	90
120	100

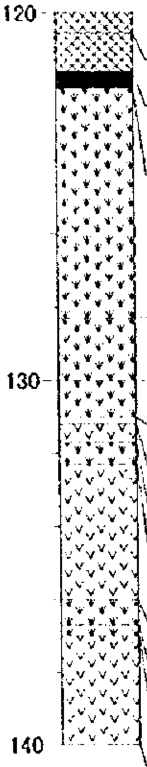
Appendix 1 (3) Geological logging (Ahu i Vetem: MJAS-23)

MJAS-23

AREA: Ahu i Vetem

INCLINATION: -71 DIRECTION: S78W ELEVATION: 1717.15m FINAL DEPTH: 140m

Scale 1:200 | Column | Description | deformation | Sample No. | Cr2O3 % | RQD (%)



119.9-120.55; Chromite, banded ore, 15-25%

120.55-121.6; Chromite, banded ore, 25%

121.6-122.05; Chromite, banded to massive ore, upper and lower contacts are very clear, core angle 30

122.05-128.3; Dunite, dark green in color, very rare chromite grains, with fractures (123.85-123.9; serpentine, green, 40 core angle, 127-127.5; serpentine, 70-80 core angle)

128.3-130; brecciated zone, Dunite, friable, partly serp.

130-131; Dunite, with broken part (130.35-130.55)

131-131.2; Pyroxenite dyke

131.2-131.7; Harzburgite

131.7-132.3; Dunite

132.3-136; Harzburgite, green in color, with Dunite (132.6-133.4, 134.2-134.4) and possible fault (135.2-135.3)

136-136.7; Dunite

136.7-137; fault, friable, Dunite

137-140; Harzburgite, with Dunite (137.5-137.7) and fault (138.5-138.7)

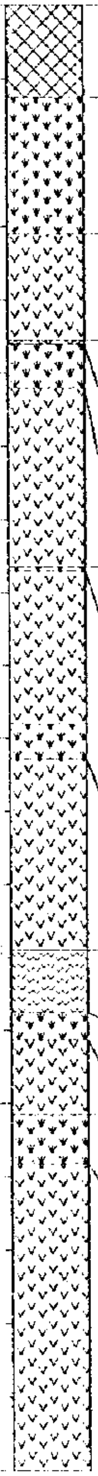
Sample No.	Cr2O3 %	RQD (%)
120.55-121.6; 23-C-3	24.10	100
		100
121.6-122.05; 23-C-4	39.53	90
		100
		80
		100
		60
		50
		40
		50
		70
		100
		90
		33
134.70; 23-R-9, Hz		100
		80
		40
		30
		50
		15

Appendix 1 (4) Geological logging (Ahu i Vetem: MJAS-23)

MJAS-24

AREA: Ahu i Vetem

INCLINATION: -73 DIRECTION: N78E ELEVATION: 1717.15m FINAL DEPTH: 130m



Description	Sample No.
0-2.5; surface soil	
2.5-6.2; Dunite, light brown in color, some parts dark green in color, medium hard, rare chromite grains, transmitted with Harzburgite, filled with red materials	
6.2-9.1; serp Harzburgite, light green in color, some parts light brown in color, px25-30%	
9.1-9.2; broken material and fault	
9.2-10.4; Dunite, light brown in color, many chromite grains, compact	10; 24-R-1, Du
10.4-15.3; serp Harzburgite, dark green to dark gray in color, px35% in color, compact	11.7; 24-R-2, Hz
15.3-15.4; Dunite, chromite grains	
15.4-19.6; Harzburgite, compact, px35%, dark green to dark gray in color, with Pyroxenite dyke (17.35-17.55)	
19.6-20.55; Dunite, compact, dark green in color, very rare chromite grains, serp net	
20.55-25.8; Harzburgite, medium hard with fracture, px25%, some parts broken	
25.8-27.5; Fault material, brecciated, made up from Dunite and Harzburgite	
27.5-28.25; Dunite, dark brown in color, chromite grains, broken	
28.25-30.3; Harzburgite, px20-25%	
30.3-31.65; Dunite, compact, very rare chromite grains, dark green in color	
31.65-47.4; Harzburgite, dark green in color, px30-35%, hard, compact with Dunite (41.1-41.4)	

deformation

Cr2O3 %

RQD (%)
0
0
0
60
45
80
100
95
70
55
100
100
100
100
80
100
100
100
100
100
90
85
45
0
0
0
30
20
70
95
100
100
100
100
80
90
100
95
100
100

Appendix 2 (1) Geological logging (Ahu i Vetem: MJAS-24)

MJAS-24

AREA: Ahu i Vetem

INCLINATION: -73 DIRECTION: N78E ELEVATION: 1717.15m FINAL DEPTH: 130m

Scale 1:200

Description	Sample No.
31.65-47.4; Harzburgite, dark green in color, px30-35%, hard, compact with Dunite (41.1-41.4)	45.9; 24-R-3, Hz
47.4-48; Dunite, compact, dark green color, very rare chromite grains	47.9; 24-R-4, Du
48-48.9; Harzburgite, compact	
48.9-50.1; Dunite, compact	
50.1-50.55; Harzburgite, compact	
50.55-51.4; Dunite, compact	
51.4-59.3; Harzburgite, compact, fracture, px25-30	
59.3-60.55; Dunite brecciated, filled with red materials	
60.55-68.00; serp Dunite, compact, px35-40%, the size of px grain is 3-4mm with Pyroxenite dyke (64.55-64.60)	
68-68.5; Fault, red material	
68.5-76.15; serp Dunite, compact, px35-40%, the size of px grain is 3-4mm	
76.15-81.7; Dunite, dark green in color, compact, chromite grains, serp net	76.1; 24-R-5, Hz

RQD (%)
100
100
100
100
100
100
100
100
100
100
80
100
100
100
100
100
80
90
100
100
50
100
95
85
100
100
100
100
100
100
90
70
100
100
90
100
90
100
90
100
100

Appendix 2 (2) Geological logging (Ahu i Vetem: MJAS-24)

MJAS-24

AREA: Ahu i Vetem

INCLINATION: -73 DIRECTION: N78E ELEVATION: 1717.15m FINAL DEPTH: 130m

Scale 1:200 | Column | Description | deformation | Sample No. | Cr2O3 % | RQD (%)

80

- 76.15-81.7; Dunite, dark green in color, compact, chromite grains, serp net
- 81.7-82.2; broken Dunite
- 82.2-88; Dunite, dark green in color, compact, chromite grains, serp net
- 88-92.75; serp Dunite, compact, dark green in color

90

- 92.75-95.5; Dunite, compact, dark green in color
- 95.5-96;Brecciated zone
- 96-100.2; Dunite, compact,dark green in color

100

- 100.2-100.55; Banded ore (45%)
- 100.55-101; Banded ore (10%)
- 101-101.3; Friable material, fault with chromite material, green and red in color
- 101.3-101.85; Banded ore (20%)
- 101.85-102.25; Banded ore (10%)
- 102.25-102.65; Banded ore (25%)
- 102.65-103; Banded ore (15%)

110

- 103-104; Broken materials
- 104-108.2; Dunite, compact, dark green in color, with chromite grains
- 108.2-109.2; Fault, friable material, red and green
- 109.2-113.2; Dunite, same above mentioned
- 113.2-114.15; serp Dunite
- 114.15-116.3; Dunite, compact, green in color, with chromite grains,
- 116.3-118.4; serp Dunite

120

- 118.4-119.4; Harzburgite, compact, px25-30%
- 119.4-119.6; Fault, green friable
- 119.6-120; Harzburgite, compact, px35%

Sample No.	Cr2O3 %
100.0; 24-R-6, Du	
100.20-100.55; 24-C-1	13.40
100.55-101.00; 24-C-2	16.16
101.30-101.85; 24-C-3	16.66
101.85-102.25; 24-C-4	14.16
102.25-102.65; 24-C-5	18.47
102.65-102.95; 24-C-6	11.82

RQD (%)
100
60
80
100
100
100
100
100
100
100
100
100
100
100
100
100
100
100
100
100
100
70
100
50
90
100
100
100
30
40
90
100
100
100
100
100
100
100
90
70

Appendix 2 (3) Geological logging (Ahu i Vetem: MJAS-24)

MJAS-24

AREA: Ahu i Vetem

INCLINATION: -73 DIRECTION: N78E ELEVATION: 1717.15m FINAL DEPTH: 130m

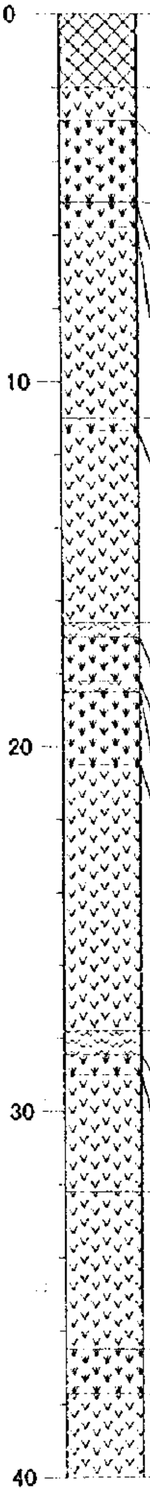
Scale 1:200	Column	Description	deformation	Sample No.	Cr2O3 %	RQD (%)
120		120-121; Dunite, compact, dark green in color, with chromite grains				100
		121-121.3; Friable material				80
		121.3-124.6; Dunite, compact, dark green in color, with chromite grains				100 100
		124.6-124.8; broken Harzburgite				80
		124.8-125.1; Harzburgite, dark green in color, compact, px25-30%, with Dunite (125.10-125.55)				100 90 100 90 90
130						

Appendix 2 (4) Geological logging (Ahu i Vetem: MJAS-24)

MJAS-25

AREA: Ahu i Vetem

INCLINATION: -61 DIRECTION: N78E ELEVATION: 1718.25m FINAL DEPTH: 130m



Description	deformation	Sample No.	Cr2O3 %
0-2; Dunite, light brown in color, very rare chromite grains, broken			
2-2.9; Harzburgite, compact, dark green in color, px25-30%			
2.9-5.1; Dunite, light brown and dark green in color, broken, compact			
5.1-5.11; two chromite bands, banded and disseminated ore		5.1; 25-R-1, Du 5.85; 25-R-2, Hz	
5.11-5.8; Dunite, light brown and dark green in color, broken, compact			
5.8-11; Harzburgite, compact, dark green in color, px30-35%			
11-11.35; Dunite, dark green in color, compact			
11.35-16.6; Harzburgite, compact, px30-35%, dark green in color			
16.6-17; broken material, green in color, possible tectonic fault			
17-18.2l; Dunite, light brown in color			
18.2-18.5; broken material, possible tectonic fault			
18.5-20.5; Dunite, light brown in color			
20.5-27.8; Harzburgite, compact, hard, dark green in color, px30-35%, with pyroxenite dyke (25.0-25.2)			
27.8-28.45; broken material, possible fault			
28.45-29; Dunite, compact, dark green in color			
29-32.2; Harzburgite, dark green in color, px35%			
32.2-36.5; Harzburgite dyke, px25-30%			
36.5-37.7; Dunite, compact, dark green in color			
37.7-43.2; Harzburgite, dark green in color, compact, px25-30%			

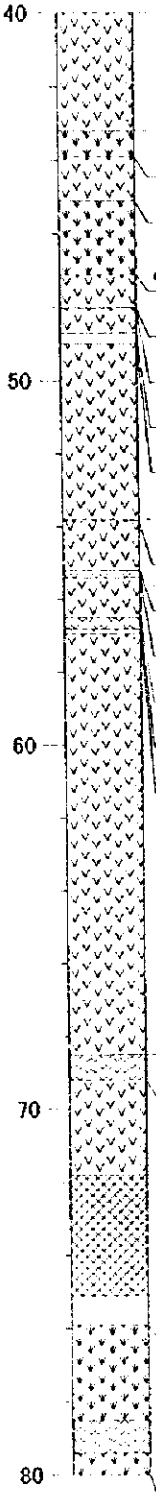
RQD (%)
0
0
55
80
80
100
100
100
100
100
100
100
100
100
95
95
60
60
50
100
100
100
80
95
100
100
100
60
95
100
100
80
80
100
100
100
75
100
100
100

Appendix 3 (1) Geological logging (Ahu i Vetem: MJAS-25)

MJAS-25

AREA: Ahu i Vetem

INCLINATION: -61 DIRECTION: N78E ELEVATION: 1718.25m FINAL DEPTH: 130m



Description	deformation	Sample No.	Cr2O3 %
37.7-43.2; Harzburgite, dark green in color, compact, px25-30%			
43.2-43.9; Dunite, compact			
43.9-45.1; Harzburgite, dark green in color, compact, px25-30%			
45.1-47.1; Dunite, dark green and brown in color, medium hard, rare chromite grains		45.3; 25-R-3, Du	
47.1-48; serp Harzburgite, medium hard, broken, px20-35%		47.35; 25-R-4, Hz	
48-48.02; Harzburgite, filled with calcite			
48.02-48.7; serp Harzburgite, medium hard, broken, px20-35%			
48.7-49; Pyroxenite bands			
49-53.8; serp Harzburgite, medium hard, broken, px20-35%			
53.8-53.85; broken material, possible tectonic fault			
53.85-55.2; serp Harzburgite, medium hard, broken, px20-35%			
55.2-55.4; broken rocks			
55.4-56.5; serp Harzburgite, medium hard, broken, px20-35%			
56.5-56.8; broken material, filled with calcite, possible tectonic fault			
56.8-56.95; serp Harzburgite, medium hard, broken, px20-35%			
56.95-68.5; serp Harzburgite, dark green in color, px20-25%, filled with calcite, with Dunite (60.9-61.2)			
68.5-69.2; broken material			
69.2-71.8; serp Harzburgite, dark green in color, px20-25%			
71.8-75.1; band with serpentine vein			
75.1-75.9; Pyroxenite dyke, compact, hard			
75.9-78.5; Dunite, dark and light green in color, medium hard, broken, filled with serpentine and calcite			
78.5-79.4; broken Dunite			
79.4-80.2; Dunite, with serpentine and calcite			

RQD (%)

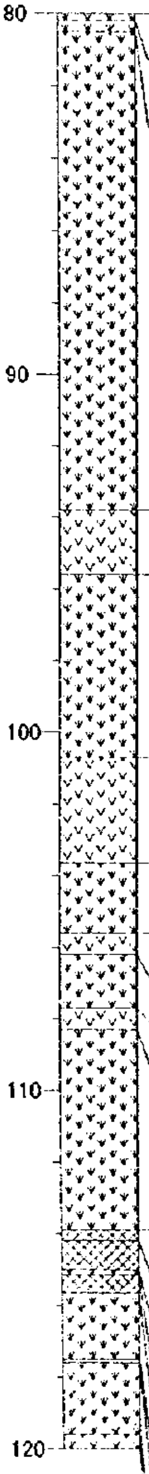
100
95
100
95
100
100
100
100
80
90
95
70
100
100
70
80
60
70
90
100
100
95
90
85
100
100
90
90
90
90
85
90
100
80
90
100
100
95
50
30

Appendix 3 (2) Geological logging (Ahu i Vetem: MJAS-25)

MJAS-25

AREA: Ahu i Vetem

INCLINATION: -61 DIRECTION: N78E ELEVATION: 1718.25m FINAL DEPTH: 130m



Description	deformation	Sample No.	Cr2O3 %
79.4-80.2; Dunite, with serpentine and calcite			
80.2-80.5; Dunite, dark and light green in color, medium hard, broken, filled with serpentine and calcite			
80.5-93.8; Dunite, dark green in color, compact, hard, very rare chromite grains, with Harzburgite(87.25-88.05)		92.7; 25-R-5, Du	
93.8-95.6; Harzburgite, dark green in color, compact, hard, px25%			
95.6-100.7; Dunite, dark green in color, compact, very rare chromite grains			
100.7-103.65; Harzburgite, dark green in color, compact, hard, px30-35%			
103.65-105.6; Dunite, dark green in color, very rare chromite grains, compact			
105.6-106.2; Harzburgite, compact			
106.2-107.7; Dunite, compact			
107.7-108.3; Harzburgite			
108.3-113.9; Dunite, with serpentine and calcite			
113.9-114.2; Bounded ore, 10-15% Cr2O3		113.9-114.2; 25-C-1	8.64
114.2-115; Bounded ore, 25-30% Cr2O3		114.2-115.0; 25-C-2	23.42
115-115.15; Dunite, compact			
115.15-115.65; Bounded ore, 20% Cr2O3		115.15-115.65; 25-C-3	16.21
115.65-117.5; Dunite, compact dyke			
117.5-117.6; Pyroxenite dyke, compact			
117.6-119.6; Dunite, compact dyke			
119.6-130; Dunite, dark green in color, compact, hard, filled with serpentine and calcite, very rare chromite grains			

RQD (%)
90
100
100
100
95
100
90
90
100
100
100
100
100
100
100
100
90
100
100
100
100
100
80
100
100
100
90
100
60
10
100
100
100
100
100
100
100
100
100
100

Appendix 3 (3) Geological logging (Ahu i Vetem: MJAS-25)

MJAS-25

AREA: Ahu i Vetem

INCLINATION: -61 DIRECTION: N78E ELEVATION: 1718.25m FINAL DEPTH: 130m

Scale 1:200	Column	Description	deformation	Sample No.	Cr2O3 %	RQD (%)
120	▨	119.6-130; Dunite, dark green in color, compact, hard, filled with serpentine and calcite, very rare chromite grains				100
						100
						100
						100
						100
						100
						100
						100
				128.3; 25-R-6, Du		100
130						100

Appendix 3 (4) Geological logging (Ahu i Vetem: MJAS-25)

MJAS-26

AREA: Ahu i Vetem

INCLINATION: -59 DIRECTION: N78E ELEVATION: 456m FINAL DEPTH: 130m

Description	deformation	Sample No.	Cr2O3 %
0-0.5; surface soil			
0.5-1; no core			
1-3.5; serp Harzburgite, dark green and gray in color, compact, px25-30%		2.1; 26-R-1; Hz	
3.5-4.5; Dunite, compact, dark green, with Chromite grains	▨		
4.5-5; no core	▨	5.5; 26-R-2; Du	
5-7.1; Dunite, olive and dark green in color, compact, with chromite grains, serp nets.			
7.1-10.8; Harzburgite, dark green in color, compact, px30%			
10.8-10.85; Dunite envelope, compact, gradual contact with Harzburgite		10.85-10.90; 26-C-1	35.41
10.85-10.9; Chromite, massive ore, 40%			
109-10.95; Dunite			
10.95-23.45; serp, Harzburgite, compact, hard, px dyke (-19.2, thickness 2cm, core angle 20-30)		19.5; 26-E-1; Hz	
23.45-26.75; Dunite, light brown and dark green in color, compact, medium hard, with chromite grains, gradual contact with Harzburgite. px dyke (-25, thickness 0.15, core angle 90)			
26.75-27; no core			
27-29.7; Dunite		28.2;26-E-2, Du	
29.7-30; Harzburgite, compact			
30-30.6; Dunite, compact, dark green in color			
30.6-31; no core			
31-36.9; Harzburgite, dark green in color, compact, py30-35%, with Dunite (31.85-31.95, 33-33.2, 34.2-34.85) and px dyke (33.7-34.4)			
36.9-37.6; Dunite, with fractures filled with serp and calcite	▨		
37.6-37.8; broken Dunite, possible tectonic fault			
37.8-38; no core			
38-44.4; Harzburgite, dark green in color, compact, px30-35%, with Dunite (40.5-40.8, 42.8-43) and px dyke (43.2-43.45)			

Scale 1:200	RQD (%)
0	
	20
	40
	90
	100
	100
	100
	100
	85
	80
10	100
	100
	100
	100
	100
	80
	30
	80
	95
	90
20	100
	100
	100
	100
	100
	100
	70
	60
	60
	80
30	90
	100
	100
	100
	100
	100
	100
	100
	75
	100
40	60

Appendix 4 (1) Geological logging (Ahu i Vetem: MJAS-26)

MJAS-26

AREA: Ahu i Vetem

INCLINATION: -59 DIRECTION: N78E ELEVATION: 456m FINAL DEPTH: 130m

Scale 1:200	Column	Description	deformation	Sample No.	Cr2O3 %
40		38-44.4; Harzburgite, dark green in color, compact, px30-35%, with Dunite (40.5-40.8, 42.8-43) and px dyke (43.2-43.45)			
		44.4-49.4; Dunite, compact, dark green in color, with chromite grains		44.51; 26-R-3; Hz 48.2; 26-R-4; Du	
50		49.4-55.4; Harzburgite, dark green in color, compact, px30-35%, with Dunite (50.6-51.3) and broken Harzburgite (53.8-54.3)			
		55.4-63.2; Dunite, dark green in color, compact, with chromite grains, some parts are light brown in color, with broken Dunite (57-57.3, 58-58.3)		55.3;26-E-3, Hz	
60					
		63.2-64.3; Harzburgite, px25-30%			
		64.3-65.2; Dunite, compact			
		65.2-70.5; Harzburgite, compact, dark green in color, py35%			
70		70.5-74; Dunite, compact, dark green with Chromite grains			
		74-79.85; Harzburgite, compact, dark green in color, py35%			
80		79.85-80.25; Dunite			

RQD (%)
90
95
100
95
100
100
95
95
100
100
100
100
90
80
60
100
100
70
90
100
100
100
100
75
75
100
100
95
100
60
100
100
100
100
100
100
90
100
80
90

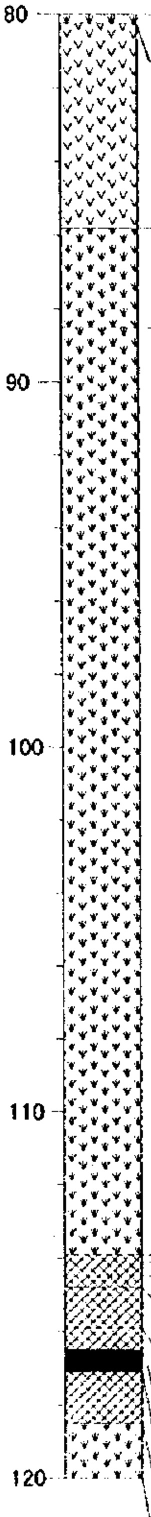
Appendix 4 (2) Geological logging (Ahu i Vetem: MJAS-26)

MJAS-26

AREA: Ahu i Vetem

INCLINATION: -59 DIRECTION: N78E ELEVATION: 456m FINAL DEPTH: 130m

Scale 1:200 | Column | Description | deformation | Sample No. | Cr2O3 % | RQD (%)



79.85-80.25; Dunite

80.25-85.8; Harzburgite, with Dunite (82.0-82.5), px dike (83.0-83.5; hard, compact), and broken part (82.4-82.7)

85.8-88.5; Dunite, light brown in color with serp nets

88.5-113.9; Dunite, dark green in color with Chromite grains, with broken Dunite (94-94.6), Harzburgite (103.1-103.2, friable), px dyke (104.8-105), broken material (106.55-106.65)

113.9-114.8; Chromite, banded and partly massive ore, 35-38%

114.8-115.9; Chromite, banded ore, 35%

115.9-116.5; Chromite, banded ore, 25-30%, friable, tectonic fault?

116.5-117.1; Chromite, banded and massive ore, 35%

117.1-118.5; Chromite, banded ore, 15-20%

118.5-130; Dunite, dark green in color with px dyke (124.3-125, 126.5-127), broken material (128.1-128.7 possible fault)

Sample No.	Cr2O3 %
85.7; 26-E-4, Hz	
85.9; 26-E-5, Du	
113; 26-E-6, Du	
113.9; 26-E-7, Du	
113.9; 26-E-8, Cr	
113.9-114.8; 26-C-2	18.78
114.8-115.9; 26-C-3	15.73
115.9-116.5; 26-C-4	15.41
116.5-117.1; 26-C-5	24.41
117.1-118.5; 26-C-6	15.73
117.9; 26-E-9, Cr	
118.8; 26-E-10, Cr	
118.8; 26-E-11, Du	
119.8;26-E-12, Hz	

RQD (%)
100
100
70
90
100
90
100
90
90
100
100
100
80
100
95
95
100
90
100
100
100
100
100
100
95
90
70
100
80
95
100
100
95
100
100
100
90
100
100
100

Appendix 4 (3) Geological logging (Ahu i Vetem: MJAS-26)

MJAS-26

AREA: Ahu i Vetem

INCLINATION: -59 DIRECTION: N78E ELEVATION: 456m FINAL DEPTH: 130m

Scale 1:200	Column	Description	deformation	Sample No.	Cr2O3 %	RQD (%)
120		118.5-130; Dunite, dark green in color with px dyke (124.3-125, 126.5-127), broken material (128.1-128.7 possible fault)				100
						100
						100
						100
						80
						90
						80
						100
						50
130				130; 26-E-13, Du		100

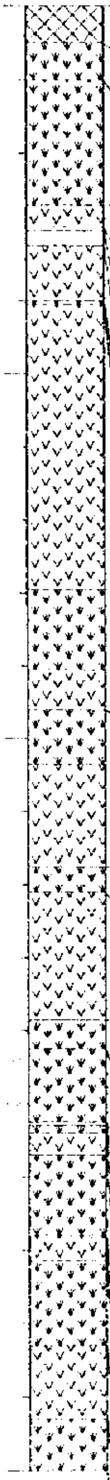
Appendix 4 (4) Geological logging (Ahu i Vetem: MJAS-26)

MJAS-27

AREA: Ahu i Vetem

INCLINATION: -74 DIRECTION: N78E ELEVATION: 1718.51m FINAL DEPTH: 150m

Scale 1:200	Column	Description	deformation	Sample No.	Cr2O3 %	RQD (%)



0-1; Harzburgite light brown in color, hard, py25%

1-2; Dunite, light brown in color, broken

2-5.4; Dunite, dark green in color, very rare chromite grains

5.4-6.0; Harzburgite dark green in color, compact, hard, px30%

6.0-6.1; Harzburgite

6.1-6.5; Pyroxenite dyke, broken, possible tectonic fault

6.5-8.0; Harzburgite, very hard, compact, px20-30%

8.0-8.1; Dunite

8.1-15.9; Harzburgite, very hard, compact, px20-30%, with Dunite (12.5-12.6, 12.7-12.8) and pyroxenite dyke (15.2-15.3)

15.9-18.1; serp Dunite, dark green in color, compact, medium hard, very rare chromite grains

18.1-19.2; Harzburgite, hard, compact, px20-30%,

19.2-20.7; serp Dunite

20.7-23.5; serp Harzburgite, compact, px35%

23.5-24.2; Dunite, light brown in color, medium hard

24.2-27.7; Harzburgite, compact, px30%

27.7-28.5; Dunite, dark green in color, compact, very rare chromite grains

28.5-30.5; serp Dunite, compact, dark green in color, very rare chromite grains

30.5-30.6; Pyroxenite dyke

30.6-30.8; serp Dunite, compact, dark green in color, very rare chromite grains

30.8-31.4; Harzburgite

31.4-33.6; Dunite, compact, dark green in color, with Harzburgite (32.0-32.2)

33.6-34.3; Harzburgite

34.3-36.6; Dunite, compact, with Harzburgite (35.8-35.9)

36.6-38.6; Harzburgite, compact, dark green in color, px35%

38.6-40.4; Dunite, light brown in color, medium hard, very rare chromite grains

Sample No.:

3.1; 27-R-1, Du

5.7; 27-R-2, Hz

38.2; 27-R-3, Hz

RQD (%):

25
30
100
95
90
100
40
100
100
100
100
100
100
90
100
90
95
100
60
70
100
95
70
100
90
100
80
85
90
100
100
100
100
100
100
95
100
100
100
70

Appendix 5 (1) Geological logging (Ahu i Vetem: MJAS-27)

MJAS-27

AREA: Ahu i Vetem

INCLINATION: -74 DIRECTION: N78E ELEVATION: 1718.51m FINAL DEPTH: 150m

Scale 1:200 (40 – 50 – 60 – 70 – 80)

Description	Sample No.
38.6-40.4; Dunite, light brown in color, medium hard, very rare chromite grains	40.2; 27-R-4, Du
40.4-40.5; broken material	
40.5-43.0; Harzburgite, dark green in color, px35%	43.1; 27-R-5, Hz
43.0-45.0; Dunite, dark green in color, compact, px30%	
45.0-45.5; serp Harzburgite, compact	
45.5-46.3; Dunite, dark green in color, compact, px30%	
46.3-49.2; Dunite, dark green in color, compact	
49.2-49.4; friable material, green, possible tectonic fault	
49.4-53.3; ser Dunite	
53.3-56.7; Dunite, dark green in color, compact	54.0; 27-R-6, Du
56.7-57.2; Harzburgite, compact, px35%	
57.2-59.2; Dunite, dark green in color, compact	
59.2-60.0; serp Dunite	
60.0-62.5; Dunite, dark green in color, compact	
62.5-70.3; Harzburgite, filled with serpentine and calcite	
70.3-70.8; Dunite, dark green and light brown in color	
70.8-76.2; Harzburgite, dark green in color, compact, hard, px35%	
76.2-81.5; Dunite, dark green in color, compact, hard, very rare chromite grains	

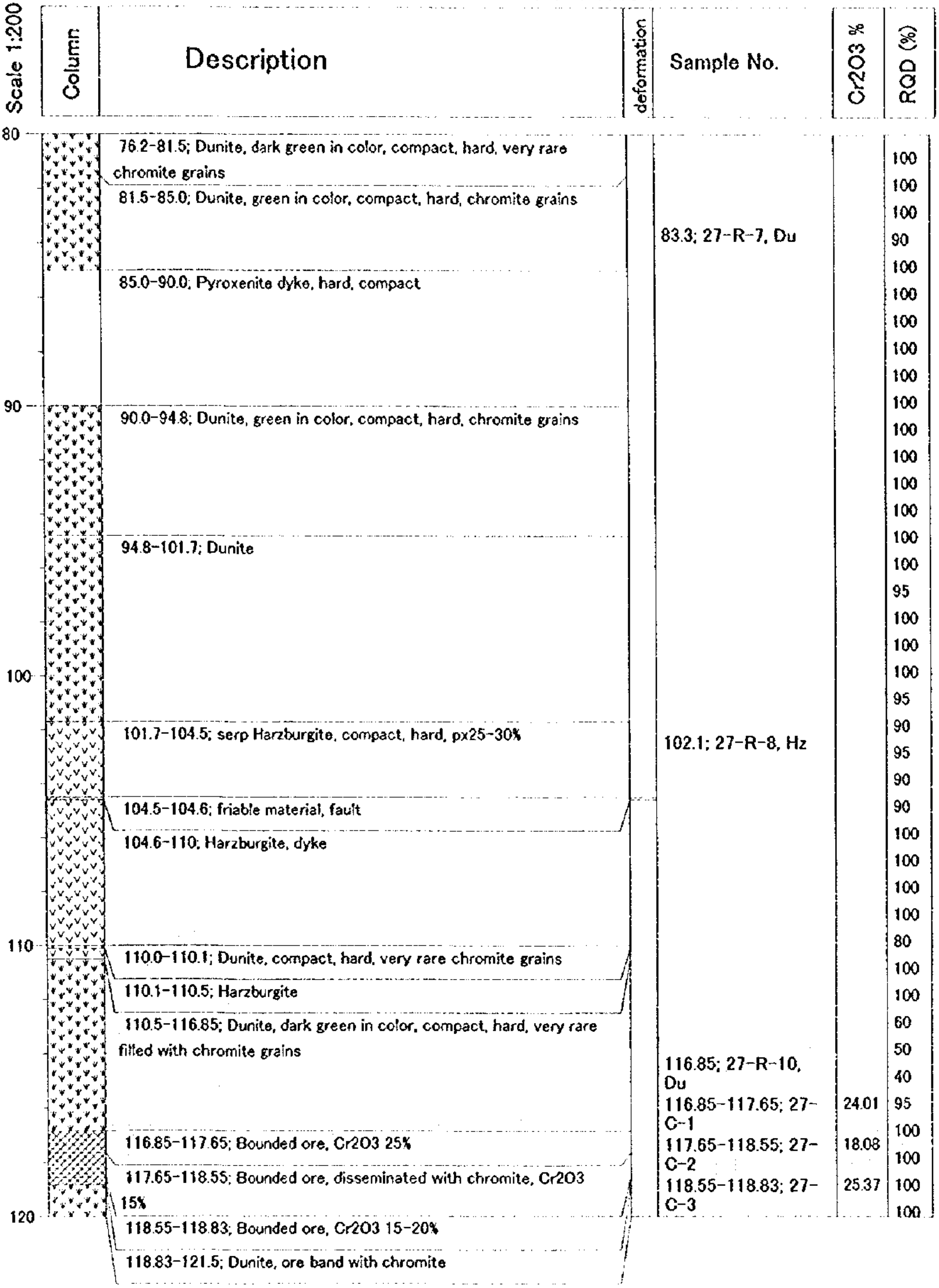
Cr2O3 %	RQD (%)
	50
	90
	100
	100
	100
	100
	100
	100
	100
	50
	100
	100
	100
	100
	100
	100
	90
	95
	90
	100
	90
	95
	100
	90
	70
	100
	100
	100
	90
	70
	95
	100
	100
	100
	100
	100
	100
	100
	100
	100

Appendix 5 (2) Geological logging (Ahu i Vetem: MJAS-27)

MJAS-27

AREA: Ahu i Vetem

INCLINATION: -74 DIRECTION: N78E ELEVATION: 1718.51m FINAL DEPTH: 150m



76.2-81.5; Dunite, dark green in color, compact, hard, very rare chromite grains

81.5-85.0; Dunite, green in color, compact, hard, chromite grains

85.0-90.0; Pyroxenite dyke, hard, compact

90.0-94.8; Dunite, green in color, compact, hard, chromite grains

94.8-101.7; Dunite

101.7-104.5; serp Harzburgite, compact, hard, px25-30%

104.5-104.6; friable material, fault

104.6-110; Harzburgite, dyke

110.0-110.1; Dunite, compact, hard, very rare chromite grains

110.1-110.5; Harzburgite

110.5-116.85; Dunite, dark green in color, compact, hard, very rare filled with chromite grains

116.85-117.65; Bounded ore, Cr2O3 25%

117.65-118.55; Bounded ore, disseminated with chromite, Cr2O3 15%

118.55-118.83; Bounded ore, Cr2O3 15-20%

118.83-121.5; Dunite, ore band with chromite

Sample No.	Cr2O3 %
83.3; 27-R-7, Du	
102.1; 27-R-8, Hz	
116.85; 27-R-10, Du	
116.85-117.65; 27-C-1	24.01
117.65-118.55; 27-C-2	18.08
118.55-118.83; 27-C-3	25.37

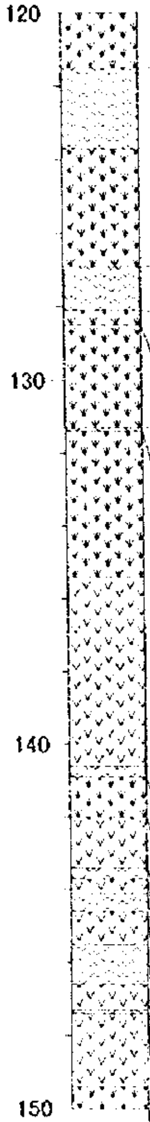
RQD (%): 100, 100, 100, 90, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 95, 100, 100, 100, 95, 90, 95, 90, 90, 100, 100, 100, 100, 80, 100, 100, 60, 50, 40, 95, 100, 100, 100, 100

Appendix 5 (3) Geological logging (Ahu i Vetem: MJAS-27)

MJAS-27

AREA: Ahu i Vetem

INCLINATION: -74 DIRECTION: N78E ELEVATION: 1718.51m FINAL DEPTH: 150m



Description	deformation	Sample No.	Cr2O3 %
118.83-121.5; Dunite, ore band with chromite			
121.5-123.7; broken Dunite and friable materials, possible tectonic fault			
123.7-126.9; serp Dunite, compact, possible tectonic fault			
126.9-128.1; Brecciated zone, friable, green, tectonic fault			
128.1-128.5; serp Dinite, green			
128.5-131.3; Dunite, compact, medium hard			
131.3-131.7; Fault, brecciated zone, green, friable			
131.4-135.4; Dunite, deep green in color, compact, hard, with chromite grains			
135.4-140.6; Harzburgite, dark green in color, compact, hard, px30-35%		135.5; 27-R-9,Hz	
140.6-140.9; fault			
140.9-142.0; broken Dunite			
142.0-143.4; Harzburgite, px35%			
143.4-143.7; fault, friable			
143.7-144.1; Harzburgite			
144.1-144.6; brecciated zone, friable, green			
144.6-145.5; Harzburgite, compact			
145.5-146.6; fault, brecciated zone			
146.6-147.3; Harzburgite, compact			
147.3-147.4; brecciated zone			
147.4-149.4; Harzburgite, dark green in color, compact, hard			
149.4-150.0; Dunite, dark green in color, compact, hard			

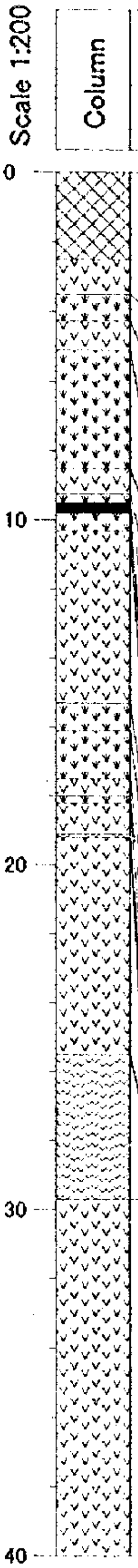
RQD (%)
100
50
0
0
20
60
40
50
80
70
70
70
100
95
100
85
100
90
90
70
50
40
40
20
60
60
60
90
100
100

Appendix 5 (4) Geological logging (Ahu i Vetem: MJAS-27)

MJAS-28

AREA: Lugu i Batres

INCLINATION: -40 DIRECTION: N16E ELEVATION: 1781.57m FINAL DEPTH: 60m



Description

0-2.5; surface soil

2.5-3.5; Harzburgite, broken, dark green and gray in color, px30%

3.5-4.25; Dunite, some parts are broken, light brown in color

4.25-5.1; serp Harzburgite, dark green in color, py30-35%, some parts are brecciated

5.1-8.5; Dunitenite, dark green to light brown in color, some parts are broken, very rare chromite grains, fractrues are filled with serpentine

8.5-9.25; serp Harzburgite, py30%

9.25-9.5; serp Dunite, dark green in color

9.5-9.8; Chromite massive ore to disseminated ore, 40%, core angle is 10-20, fracture are filled with material

9.8-10.3; Dunite, light brown in color

10.3-15.3; serp Harzburgite, dark green in color, px20-30%, with Dunite (12.1-12.2, 12.7-12.8), broken part (14-14.2, possible fault, some parts are friable, core angle is 80)

15.3-16.1; Dunite, light brown in color, broken, with serpentine nets

16.1-17.5; Dunite, broken, some parts are friable, green in color

17.5-18; Harzburgite

18-18.2; Dunite, broken

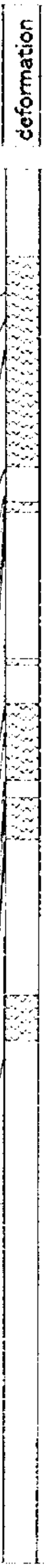
18.2-19.1; Harzburgite, broken

19.1-19.2; brecciated zone, green, friable

19.2-25.5; Harzburgite, dark green in color, py15-20%, fractures are filled with serpentine, with broken part (23.7-25)

25.5-29.7; friable material, green, some parts are Dunite, light brown in color

29.7-45.05; serp Harzburgite, dark green, py15-25%, with serpentine nets, Dunite (30.2-30.3, 36.5-37, 40.5-40.7)



Sample No.	Cr2O3 %
5;28-E-1, Hz	
8.65; 28-E-2, Hz	
9.2; 28-R-1, Hz	
9.3; 28-E-3, Hz	
9.4; 28-E-4, Du	
9.4; 28-R-2, Du	
9.5; 28-E-5, Cr	
9.5-9.8; 28-C-1	39.75
9.65; 28-E-6, Cr	
9.8; 28-E-7, Cr	
10; 28-E-8, Du	
10.4; 28-E-9, Hz	
10.8; 28-E-10, Hz	
14.25; 28-E-11, Hz	

RQD (%)

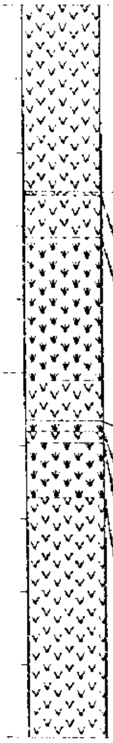
0
0
10
10
50
90
80
75
90
70
90
80
80
100
90
40
0
10
80
25
50
100
95
80
70
10
0
30
10
10
100
90
90
80
90
90
80
90
20
50

Appendix 6 (1) Geological logging (Lugu i Batres: MJAS-28)

MJAS-28

AREA: Lugu i Batros

INCLINATION: -40 DIRECTION: N16E ELEVATION: 1781.57m FINAL DEPTH: 60m



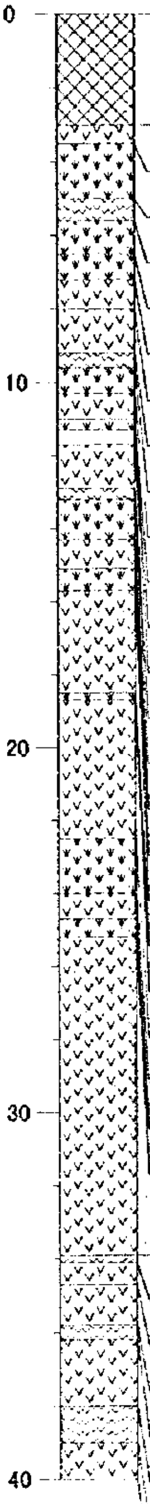
Scale 1:200	Column	Description	deformation	Sample No.	Cr2O3 %	RQD (%)
40		29.7-45.05; serp Harzburgite, dark green, px15-25%, with serpentine nets, Dunite (30.2-30.3, 36.5-37, 40.5-40.7)				40 70 40 45 100 90 100 90 10 0 30 80 80 70 100 90 100 90 90 90
		45.05-45.15; brecciated zone, green and red, core angle is 70				
		45.15-46.3; Harzburgite				
50		46.3-50.2; Dunite, dark green in color, very rare chromite grains, with brecciated zone (48.2-48.5, green, friable)				
		50.2-51.3; Harzburgite				
		51.3-51.6; Dunite		51.95; 28-R-3, Du		
		51.6-51.9; Harzburgite				
		51.9-53.4; Dunite, light brown and dark green in color, medium hard, very rare chromite grains		54.4; 28-R-4, Hz		
60		53.4-60; Harzburgite, dark green in color, hard, px30%				

Appendix 6 (2) Geological logging (Lugu i Batres: MJAS-28)

MJAS-29

AREA: Lugu i Batres

INCLINATION: -50 DIRECTION: N16E ELEVATION: 1776.68m FINAL DEPTH: 70m



Description	deformation	Sample No.	Cr2O3 %
0-3; surface soil			
3-3.5; serp Harzburgite, broken, px30-35%			
3.5-5.0; serp Dunite, light brown in color, many fracture			
5.0-5.6; brecciated zone			
5.6-6.5; serp Dunite, light brown in color, many fracture			
6.5-7.2; Dunite, light brown in color, compact			
7.2-8.0; Harzburgite, dark green in color, px35%, many fracture			
8.0-9.2; Harzburgite, many fracture, px25-30%			
9.2-9.6; Brecciated zone, green, friable			
9.6-10.3; Dunite, medium hard, many fracture, filled with serpentine			
10.3-11.0; Harzburgite			
11.0-11.3; Dunite			
11.3-11.7; Pyroxenite dyke, compact, hard			
11.7-12.9; Harzburgite, compact, hard, px35%			
12.9-13.2; Brecciated zone, green			
13.2-14.3; Dunite, light brown in color, medium hard		20.6; 29-R-1, Hz	
14.3-15.1; serp Harzburgite, hard, many fracture, px30%			
15.1-15.7; Dunite, light brown in color, very rare chromite grains			
15.7-18.5; serp Harzburgite, compact, hard,		23.9; 29-R-2, Du	
18.5-18.7; Dunite, light green in color, compact			
18.7-22.5; serp Harzburgite, dark green in color, px15-20%			
22.5-24.0; Dunite, dark green in color, some parts are broken			
24.0-24.7; Harzburgite, compact, hard, px30%			
24.7-25.2; Dunite, dark green in color			
25.2-33.9; Harzburgite, dark green in color, compact, hard, px30-35%			
33.9-34.1; brecciated zone with Harzburgite, green			
34.1-34.7; Harzburgite, compact, hard, px30-35%			
34.7-35.8; Harzburgite, broken			
35.8-36.2; broken zone, possible fault			
36.2-38.0; Harzburgite, compact, hard, px30-35%			
38.0-39.0; broken zone			
39.0-42.0; Harzburgite, compact, hard, px30-35%			

RQD (%)
0
0
0
20
20
40
40
70
80
30
40
80
30
30
20
70
85
100
70
60
100
30
80
100
80
100
90
100
100
90
60
100
80
60
50
35
100
60
0
100

Appendix 7 (1) Geological logging (Lugu i Batres: MJAS-29)

MJAS-29

AREA: Lugu i Batres

INCLINATION: -50 DIRECTION: N16E ELEVATION: 1776.68m FINAL DEPTH: 70m

Scale 1:200 (40–70)

Column

Description	deformation	Sample No.	Cr2O3 %
39.0-42.0; Harzburgite, compact, hard, px30-35%			
42.0-44.5; serp Dunite, dark green and light brown in color, compact, hard, very rare chromite grains			
44.5-48.0; serp Harzburgite, compact, px30-35%,		47.0; 29-R-3, Hz	
48.0-50.5; Dunite, dark green in color, some parts are broken	▨	50.15; 29-R-4, Du	
50.5-53.0; Dunite dyke			
53.0-54.0; Harzburgite			
54.0-54.1; brecciated zone, green, friable			
54.1-56.0; Dunite dyke			
56.0-56.7; Harzburgite	▨		
56.7-60.3; Dunite, dark green in color, some parts are broken	▨		
60.3-61.7; Harzburgite, compact, hard, px30%			
61.7-62.3; Dunite, compact, hard			
62.3-62.7; Harzburgite, compact			
62.7-65.0; Dunite			
65.0-65.3; Fault, green, friable material			
65.3-68.4; Dunite dyke			
68.4-70.0; Harzburgite, dark green in color, compact, px35%			

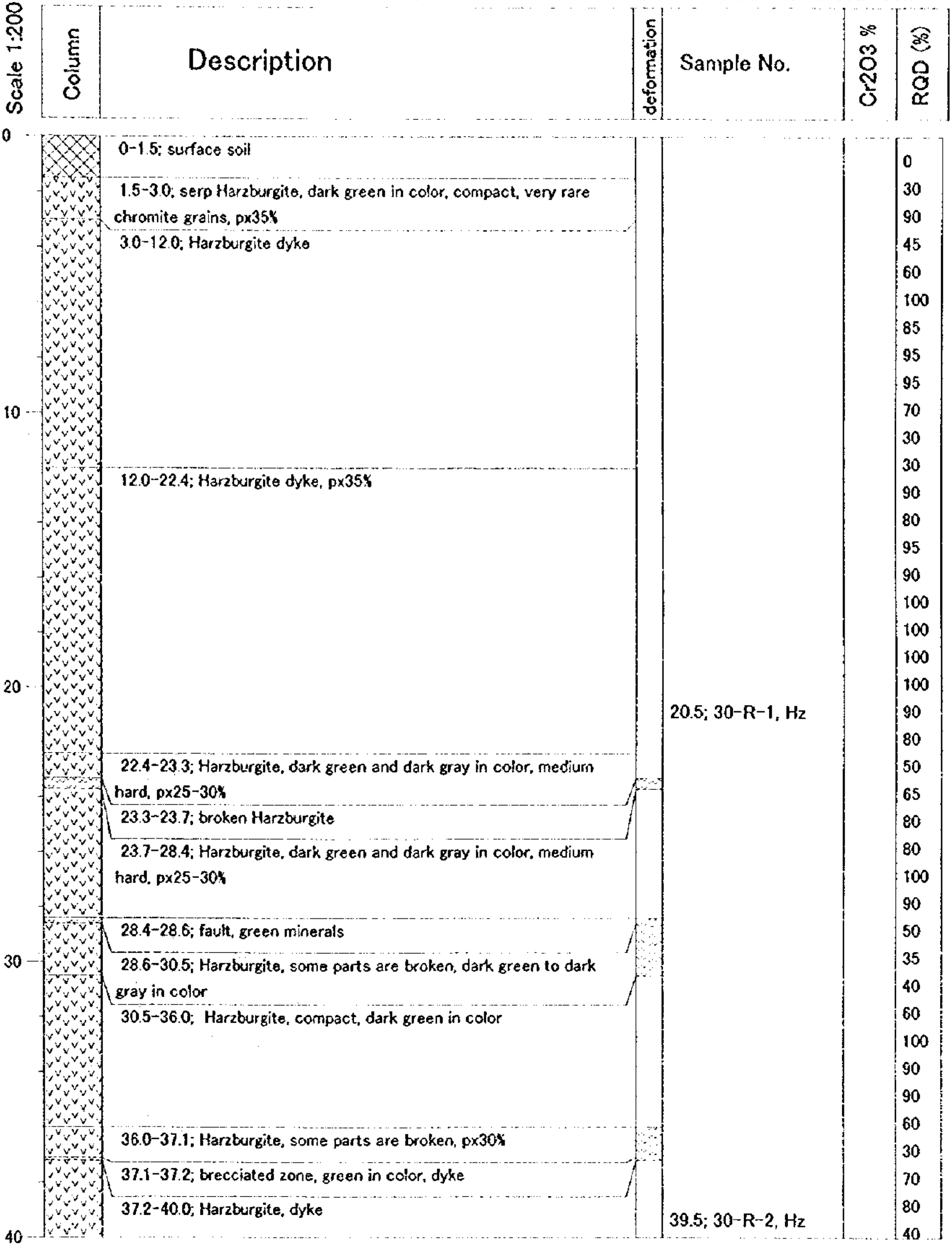
RQD (%)
60
80
100
100
60
30
60
60
30
10
100
100
90
30
60
90
20
60
70
100
100
100
100
50
70
60
100
90
100
90

Appendix 7 (2) Geological logging (Lugu i Batres: MJAS-29)

MJAS-30

AREA: Buzgare

INCLINATION: -40 DIRECTION: N45E ELEVATION: 1190.3m FINAL DEPTH: 40m



0-1.5; surface soil

1.5-3.0; serp Harzburgite, dark green in color, compact, very rare chromite grains, px35%

3.0-12.0; Harzburgite dyke

12.0-22.4; Harzburgite dyke, px35%

22.4-23.3; Harzburgite, dark green and dark gray in color, medium hard, px25-30%

23.3-23.7; broken Harzburgite

23.7-28.4; Harzburgite, dark green and dark gray in color, medium hard, px25-30%

28.4-28.6; fault, green minerals

28.6-30.5; Harzburgite, some parts are broken, dark green to dark gray in color

30.5-36.0; Harzburgite, compact, dark green in color

36.0-37.1; Harzburgite, some parts are broken, px30%

37.1-37.2; brecciated zone, green in color, dyke

37.2-40.0; Harzburgite, dyke

Sample No.:

20.5; 30-R-1, Hz

39.5; 30-R-2, Hz

RQD (%):

0
30
90
45
60
100
85
95
95
70
30
30
90
80
95
90
100
100
100
100
90
80
50
65
80
80
100
90
50
35
40
60
100
90
90
60
30
70
80
40

Appendix 8 Geological logging (Buzgare: MJAS-30)

MJAS-31

AREA: Buzgare

INCLINATION: -40 DIRECTION: N45E ELEVATION: 1187.21m FINAL DEPTH: 50m

Scale 1:200

Description	Sample No.	Cr2O3 %
0-1.5; surface soil		
1.5-3.0; broken zone, Harzburgite and Dunite, light brown in color		
3.0-6.9; serp Dunite, very hard, light brown in color, very rare chromite grains		
6.90-6.95; brecciated zone, green		
6.95-7.40; Dunite, dyke		
7.4-8.0; brecciated zone, fault		
8.0-9.1; Dunite, some parts are broken, many fracture		
9.1-9.5; brecciated zone, Dunite, green		
9.5-10.1; Dunite, some parts are broken, many fracture		
10.1-10.2; Harzburgite, px25-30%		
10.2-11.7; brecciated zone, Dunite and Harzburgite, green		
11.7-19.6; Dunite, dark green in color, serp Harzburgite, medium hard, very rare chromite grains	17.3; 31-R-1, Du	
19.6-23.6; Harzburgite, compact, hard, very rare chromite grains, px20-30%	19.7; 31-R-2, Hz	
23.6-24.7; Dunite, dark green in color, compact, very rare chromite grains		
24.7-31.1; Harzburgite, dark green in color, very rare chromite grains, px30-35%, with pyroxenite dyke (28.8-29.5)		
31.1-31.4; brecciated zone, compact		
31.4-32.7; Harzburgite, dark green in color, very rare chromite grains, px30-35%		
32.7-33.0; brecciated zone, green, compact		
33.0-35.7; Dunite dyke		
35.7-38.0; Harzburgite, dark green in color, medium hard, px20%		
38.0-38.5; brecciated zone, green in color, compact		
38.5-40.6; Harzburgite, dark green in color, medium hard, px20%		

RQD (%)
0
0
20
20
10
0
0
70
20
50
40
70
60
90
50
20
80
60
40
40
10
50
60
80
100
100
100
90
90
90
60
80
60
30
20
20
70
30
30
20

Appendix 9 (1) Geological logging (Buzgare: MJAS-31)

MJAS-31

AREA: Buzgare

INCLINATION: -40 DIRECTION: N45E ELEVATION: 1187.21m FINAL DEPTH: 50m

Scale 1:200	Column	Description	deformation	Sample No.	Cr2O3 %	RQD (%)
40		38.5-40.6; Harzburgite, dark green in color, medium hard, px20%				10
		40.60-41.15; Harzburgite, dark green in color, px30%, compact,				80
		41.15-41.45; brecciated zone, fault				100
		41.45-44.00; Harzburgite, dark green in color, px30%, compact,				100
		44.0-45.2; Dunite, compact, dark green in color, compact		44.4; 31-R-3, Du		100
		45.2-50.0; Harzburgite, compact, dark green in color, very rare chromite grains, px35%		46.0; 31-R-4, Hz		70
						90
						90
						80
50						40

Appendix 9 (2) Geological logging (Buzgare: MJAS-31)

MJAS-32

AREA: Pishkash-5

INCLINATION: -60 DIRECTION: S80W ELEVATION: 1243.5 FINAL DEPTH: 125m

Scale 1:200 | Column | Description | deformation | Sample No. | Cr2O3 % | RQD (%)

0-3; surface soil

3.0-8.2; serp Harzburgite, dark green in color, compact, hard, some parts are broken, px30%

8.7-11.1; broken zone, possible tectonic fault

11.1-11.4; serp Harzburgite, dark green in color, compact, hard, some parts are broken, px30%

11.4-14.2; broken zone, possible tectonic fault

14.2-19.4; serp Harzburgite, dark green in color, compact, hard, px35%

19.4-20.0; brecciated zone, green

20.0-21.2; Harzburgite, some parts are broken

21.2-25.5; Harzburgite, dark green in color, compact, very hard, px30-35%, with pyroxenite dyke (22.50-22.52)

25.5-26.1; broken Harzburgite

26.1-28.4; Harzburgite, compact, hard, very rare chromite grains, px30%

28.4-29.1; brecciated zone, compact

29.1-39.4; serp Harzburgite, compact, dark green in color, px35%

39.4-39.5; brecciated zone, green

39.5-40.9; Harzburgite, broken, many fracture

RQD (%)
0
0
0
60
50
50
80
40
60
0
0
10
60
50
100
100
100
90
100
40
30
100
100
90
80
20
90
100
30
90
100
100
100
100
100
100
100
100
100
70

Appendix 10 (1) Geological logging (Pishkash-5: MJAS-32)

MJAS-32

AREA: Pishkash-5

INCLINATION: -60　DIRECTION: S80W　ELEVATION: 1243.5　FINAL DEPTH: 125m

Scale 1:200	Column	Description	deformation	Sample No.	Cr2O3 %	RQD (%)
40		39.5-40.9; Harzburgite, broken, many fracture				90
		40.9-47.9; Harzburgite, compact, hard, dark green in color, px30%				100
						100
						100
						100
						90
						100
		47.9-48.0; brecciated zone				90
						100
50		48.0-53.8; serp Harzburgite, compact, dark green in color, px30%				100
						100
						100
						80
		53.8-54.5; brecciated zone				60
		54.5-61.4; Harzburgite dyke				90
						100
						100
						100
						100
60						90
						100
		61.4-63.1; Harzburgite, weak brecciated zone, some parts are brecciated zone				90
						80
		63.1-65.0; broken Harzburgite				50
						50
		65.0-71.0; Harzburgite, compact, hard, dark green in color, px30%, with pyroxenite dyke (67.85-67.90, 68.25-70.00)				70
						100
						100
						100
70						100
						90
		71.0-80.4; Harzburgite, compact, hard, dark green in color, very rare chromite grains, px25-30%, with pyroxenite dyke (72.20-72.22, 72.60-72.64, 76.9-77.0)				100
						100
						100
						100
						100
						100
				77.7; 32-R-1, Hz		100
						100
80						100

Appendix 10 (2)　Geological logging (Pishkash-5: MJAS-32)

MJAS-32

AREA: Pishkash-5

INCLINATION: -60 DIRECTION: S80W ELEVATION: 1243.5 FINAL DEPTH: 125m

Scale 1:200 | Column | Description | deformation | Sample No. | Cr2O3 % | RQD (%)

80

90

100

110

120

71.0-80.4; Harzburgite, compact, hard, dark green in color, very rare chromite grains, px25-30%, with pyroxenite dyke (72.20-72.22, 72.60-72.64, 76.9-77.0)

80.4-80.7; Dunite, dark green in color, very rare chromite grains,

80.7-99.7; Harzburgite, compact, hard, dark green in color, py30-35%, with pyroxenite dyke (84.20-84.23, 84.50-84.52, 87.70-87.74)

99.7-100.0; broken materials, tectonic fault

100-101; Harzburgite, compact, hard, dark green in color, px30-35%

101.00-102.05; broken Harzburgite, the fracture are filled with red minerals

102.05-106.00; Harzburgite, dark green in color, compact, px30-35%

106-109.1; serp Harzburgite, dark green in color, very rare chromite grains, px5-10%

109.1-112.7; Harzburgite, dark green in color, compact, very rare chromite grains, px30%

112.7-113.0; brecciated zone

113.0-118.7; serp Harzburgite, hard, compact, dark green in color, px30-35%

118.7-118.9; Pyroxenite dyke

118.9-125.0; serp Harzburgite, hard, compact, dark green in color, px30-35%

Sample No.: 80.6; 32-R-2, Du

RQD (%)
90
100
90
90
100
90
100
100
100
100
100
90
100
100
100
100
100
100
90
90
60
40
30
60
100
100
100
100
100
100
100
100
100
100
100
100
100
100
100
90

Appendix 10 (3) Geological logging (Pishkash-5: MJAS-32)

MJAS-32

AREA: Pishkash-5

INCLINATION: -60 DIRECTION: S80W ELEVATION: 1243.5 FINAL DEPTH: 125m

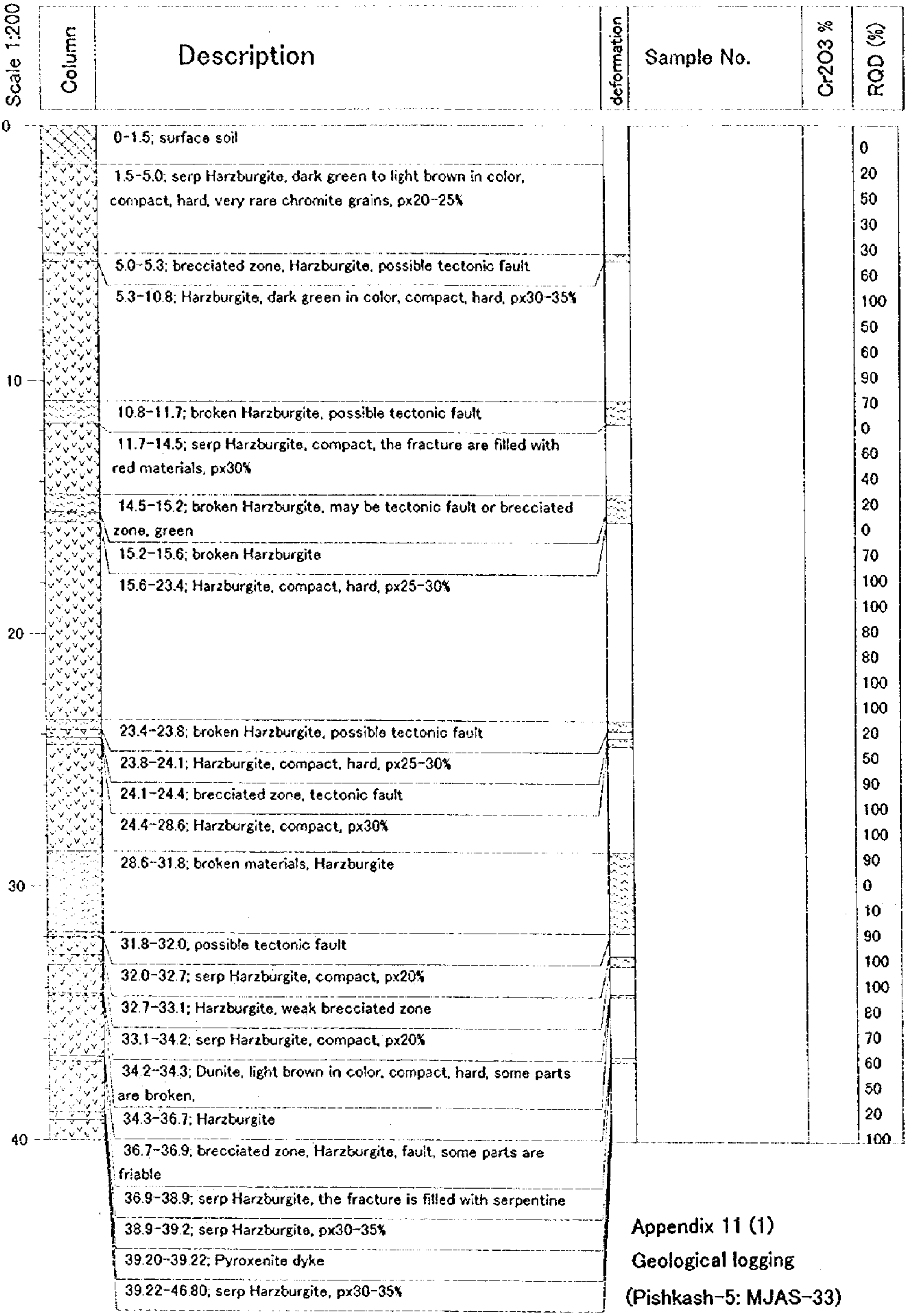
Scale 1:200	Column	Description	deformation	Sample No.	Cr2O3 %	RQD (%)
120	vvvv	118.9-125.0; serp Harzburgite, hard, compact, dark green in color, px30-35%				90 70 60 90 90

Appendix 10 (4) Geological logging (Pishkash-5: MJAS-32)

MJAS-33

AREA: Pishkash-5

INCLINATION: -68 DIRECTION: S80W ELEVATION: 1243.5m FINAL DEPTH: 110m



0-1.5; surface soil

1.5-5.0; serp Harzburgite, dark green to light brown in color, compact, hard, very rare chromite grains, px20-25%

5.0-5.3; brecciated zone, Harzburgite, possible tectonic fault

5.3-10.8; Harzburgite, dark green in color, compact, hard, px30-35%

10.8-11.7; broken Harzburgite, possible tectonic fault

11.7-14.5; serp Harzburgite, compact, the fracture are filled with red materials, px30%

14.5-15.2; broken Harzburgite, may be tectonic fault or brecciated zone, green

15.2-15.6; broken Harzburgite

15.6-23.4; Harzburgite, compact, hard, px25-30%

23.4-23.8; broken Harzburgite, possible tectonic fault

23.8-24.1; Harzburgite, compact, hard, px25-30%

24.1-24.4; brecciated zone, tectonic fault

24.4-28.6; Harzburgite, compact, px30%

28.6-31.8; broken materials, Harzburgite

31.8-32.0; possible tectonic fault

32.0-32.7; serp Harzburgite, compact, px20%

32.7-33.1; Harzburgite, weak brecciated zone

33.1-34.2; serp Harzburgite, compact, px20%

34.2-34.3; Dunite, light brown in color, compact, hard, some parts are broken,

34.3-36.7; Harzburgite

36.7-36.9; brecciated zone, Harzburgite, fault, some parts are friable

36.9-38.9; serp Harzburgite, the fracture is filled with serpentine

38.9-39.2; serp Harzburgite, px30-35%

39.20-39.22; Pyroxenite dyke

39.22-46.80; serp Harzburgite, px30-35%

RQD (%): 0, 20, 50, 30, 30, 60, 100, 50, 60, 90, 70, 0, 60, 40, 20, 0, 70, 100, 100, 80, 80, 100, 100, 20, 50, 90, 100, 100, 90, 0, 10, 90, 100, 100, 80, 70, 60, 50, 20, 100

Appendix 11 (1)
Geological logging
(Pishkash-5: MJAS-33)

MJAS-33

AREA: Pishkash-5

INCLINATION: -68 DIRECTION: S80W ELEVATION: 1243.5m FINAL DEPTH: 110m

Scale 1:200	Column	Description	deformation	Sample No.	Cr2O3 %	RQD (%)
40						
		39.22-46.80; serp Harzburgite, px30-35%				100
						60
						70
						70
						60
						80
		46.8-47.0; brecciated zone, friable, some parts are filled with calcite and red materials				70
						100
		47.0-50.7; serp Harzburgite, compact, hard, px25-30%				100
50						100
		50.7-51.2; brecciated zone, green, Harzburgite				80
						100
		51.2-51.7; Harzburgite, compact, hard, px30-35%				90
		51.7-57.0; Harzburgite, compact, hard, px35%				90
						100
						90
						100
		57.0-59.0; Harzburgite, compact, hard, px30-35%				40
						100
60		59-68; serp Harzburgite, compact, with Pyroxenite dyke (61.7-61.9, 62.55-62.65, 62.90-62.92, 63.1-63.5, 64.7-65.0)				50
						100
						100
						100
						100
				64.4; 33-R-1, Py		100
						100
						100
						80
		68.0-71.0; weak serp Harzburgite, with calcite				90
70						100
						100
		71.0-75.4; serp Harzburgite, compact, hard, dark green in color, px25-30%, with pyroxenite dyke (74.1-74.2, 74.3-74.8)				100
						100
						90
						100
		75.4-79.5; serp Harzburgite, green in color, compact, px35%				100
						100
						100
						90
80		79.5-79.7; Pyroxenite dyke				100
		79.7-92.6; serp Harzburgite, green in color, compact, px35%				

Appendix 11 (2) Geological logging (Pishkash-5: MJAS-33)

MJAS-33

AREA: Pishkash-5

INCLINATION: -68 DIRECTION: S80W ELEVATION: 1243.5m FINAL DEPTH: 110m

Description	deformation	Sample No.	Cr2O3 %
79.7-92.6; serp Harzburgite, green in color, compact, px35%			
92.6-95.4; serp Harzburgite, very rare chromite grains		92.5; 33-R-2, Hz	
95.4-95.6; brecciated zone			
95.6-96.5; Dunite, light brown in color		97.2; 33-R-3, Du	
96.5-100.8; Dunite, dark green in color, compact, very rare chromite grains			
100.8-100.9; Pyroxenite dyke			
100.9-101.4; Dunite, dark green in color, compact, very rare chromite grains			
101.4-106.2; Harzburgite			
106.2-107.8; Dunite, light brown in color, compact, very rare chromite grains			
107.8-110.0; Harzburgite, dark green in color, px30-35%		109.2; 33-R-4, Hz	

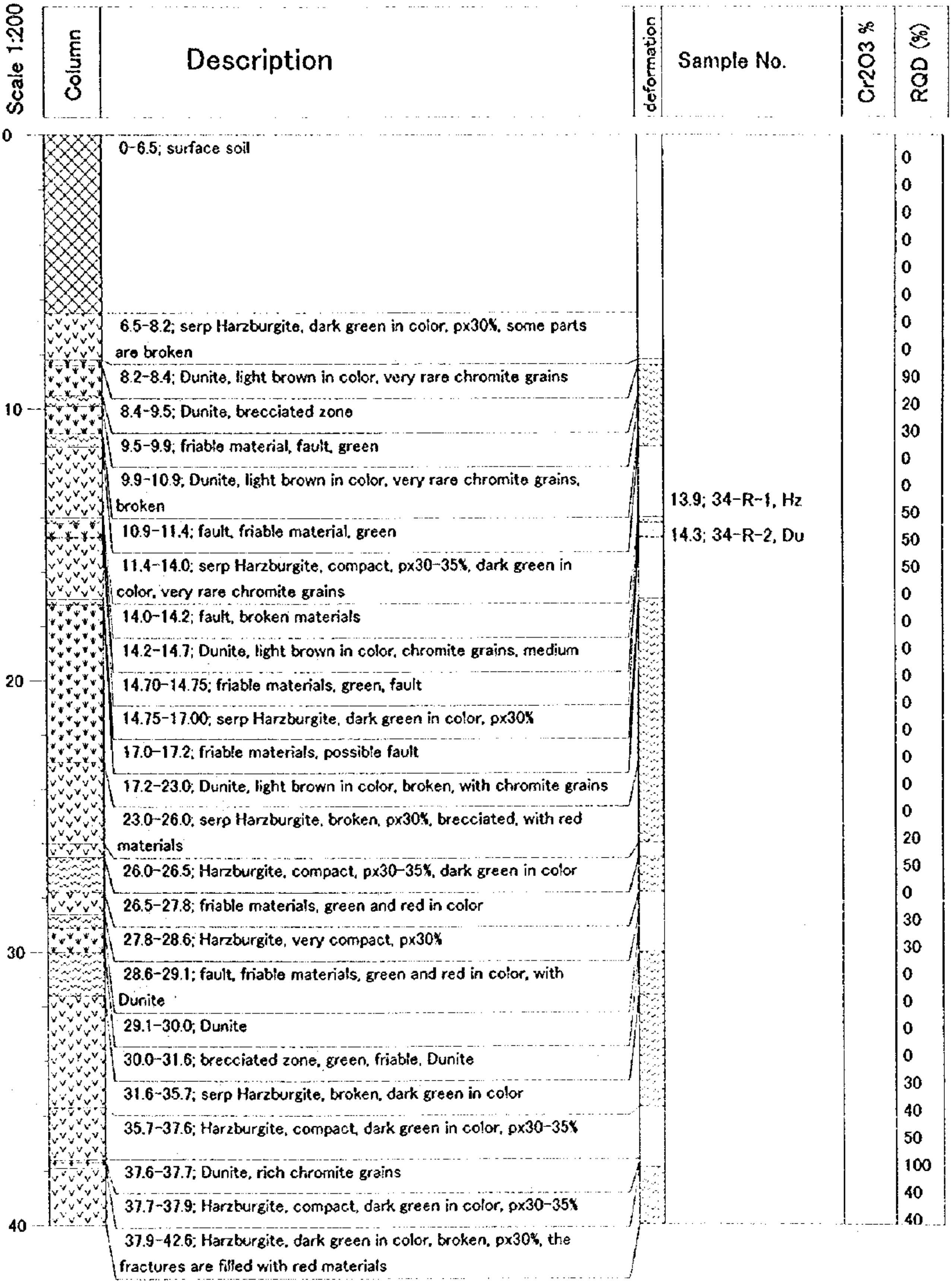
RQD (%)
100
100
100
100
100
100
60
80
100
100
100
100
100
100
90
100
100
100
100
100
100
90
80
90
100
90
90
80
80
100

Appendix 11 (3) Geological logging (Pishkash-5: MJAS-33)

MJAS-34

AREA: Bregu i Pishes

INCLINATION: -40 DIRECTION: S60W ELEVATION: 1139.25m FINAL DEPTH: 80m



Description

0-6.5; surface soil

6.5-8.2; serp Harzburgite, dark green in color, px30%, some parts are broken

8.2-8.4; Dunite, light brown in color, very rare chromite grains

8.4-9.5; Dunite, brecciated zone

9.5-9.9; friable material, fault, green

9.9-10.9; Dunite, light brown in color, very rare chromite grains, broken

10.9-11.4; fault, friable material, green

11.4-14.0; serp Harzburgite, compact, px30-35%, dark green in color, very rare chromite grains

14.0-14.2; fault, broken materials

14.2-14.7; Dunite, light brown in color, chromite grains, medium

14.70-14.75; friable materials, green, fault

14.75-17.00; serp Harzburgite, dark green in color, px30%

17.0-17.2; friable materials, possible fault

17.2-23.0; Dunite, light brown in color, broken, with chromite grains

23.0-26.0; serp Harzburgite, broken, px30%, brecciated, with red materials

26.0-26.5; Harzburgite, compact, px30-35%, dark green in color

26.5-27.8; friable materials, green and red in color

27.8-28.6; Harzburgite, very compact, px30%

28.6-29.1; fault, friable materials, green and red in color, with Dunite

29.1-30.0; Dunite

30.0-31.6; brecciated zone, green, friable, Dunite

31.6-35.7; serp Harzburgite, broken, dark green in color

35.7-37.6; Harzburgite, compact, dark green in color, px30-35%

37.6-37.7; Dunite, rich chromite grains

37.7-37.9; Harzburgite, compact, dark green in color, px30-35%

37.9-42.6; Harzburgite, dark green in color, broken, px30%, the fractures are filled with red materials

Sample No.

13.9; 34-R-1, Hz

14.3; 34-R-2, Du

Cr2O3 %

RQD (%)

0
0
0
0
0
0
0
0
90
20
30
0
0
50
50
50
0
0
0
0
0
0
0
0
0
20
50
0
30
30
0
0
0
0
30
40
50
100
40
40

Appendix 12 (1) Geological logging (Bregu i Pishes: MJAS-34)

MJAS-34

AREA: Bregu i Pishes

INCLINATION: -40　DIRECTION: S60W　ELEVATION: 1139.25m　FINAL DEPTH: 80m

Description	Sample No.	Cr2O3 %
37.9-42.6; Harzburgite, dark green in color, broken, px30%, the fractures are filled with red materials		
42.6-42.9; friable materials, green, tectonic fault, Harzburgite		
42.9-44.1; Harzburgite, dark green in color, px20-30%	43.6; 34-R-3, Hz	
44.1-44.9; Harzburgite, broken, dark green in color, px25%		
44.9-46.6; brecciated zone, green, serpentine	46.9; 34-R-4, Du	
46.6-47.2; Dunite, light brown in color, very rare chromite grains		
47.2-48.5; friable, green, serp Dunite		
48.5-48.8; Dunite, light brown in color, with chromite grains		
48.8-49.3; serp Harzburgite, broken, px30%		
49.3-58.3; fault, friable materials, green, Harzburgite and Dunite, some parts are filled with red material		
58.3-58.5; Harzburgite, dark green in color, px30%		
58.50-58.75; Dunite, light brown in color, very rare chromite grains		
58.75-60.70; friable, Harzburgite and dunite, fault, green material		
60.7-60.8; Harzburgite		
60.8-61.2; Dunite		
61.20-62.15; brecciated zone, green		
62.15-62.20; Harzburgite, dark green in color, px30%		
62.2-72.9; brecciated zone, green, friable, Harzburgite		
72.9-73.3; serp Harzburgite, dark brown in color, compact	73.4; 34-R-5, Hz	
73.3-80.0; Harzburgite, light green in color, hard, compact, with very rare chromite grains, the fractures are filled with calcite	75.2; 34-R-6, Hz 78.5; 34-R-7, Hz	

Scale 1:200: 40, 50, 60, 70, 80

RQD (%)
0
10
0
30
25
0
0
20
0
0
0
0
40
10
0
0
0
0
40
30
60
10
40
40
10
0
0
0
20
20
30
40
15
90
100
100
100
100
100
100

Appendix 12 (2)　Geological logging (Bregu i Pishes: MJAS-34)

MJAS-35

AREA: Bregu i Pishes

INCLINATION: -43 DIRECTION: S60W ELEVATION: 1137.72m FINAL DEPTH: 80m

Scale 1:200 | Column | Description | deformation | Sample No. | Cr2O3 % | RQD (%)

Description
0-6; surface soil
6.0-8.0; serp Harzburgite, broken, dark green in color, px30%, possible tectonic fault
8.0-8.4; friable materials
8.40-11.05; serp Harzburgite, dark green in color, px30-35%
11.05-11.20; Dunite, light brown in color, compact
11.2-12.1; serp Harzburgite, dark green in color, px30-35%
12.10-12.15; Dunite, light brown in color, compact
12.15-12.90; serp Harzburgite, dark green in color, px30-35%
12.90-12.95; Dunite, light brown in color, compact
12.95-13.80; serp Harzburgite, dark green in color, px30-35%
13.8-14.0; friable materials, green
14.0-16.5; Harzburgite, dyke, some parts are broken
16.5-22.3; brecciated zone, green, friable, compact
22.3-22.8; serp Harzburgite, px30%, light brown in color
22.8-27.0; brecciated zone, green, friable, Harzburgite, compact
27.0-27.2; serp Harzburgite, some parts are broken
27.20-27.75; Dunite, compact
27.75-28.00; brecciated zone, green, compact
28.0-30.5; serp Harzburgite, compact, some parts broken
30.5-30.9; broken Harzburgite
30.9-33.8; serp Harzburgite, some parts broken (31.7-32.9)
33.8-34.2; Dunite, light green in color, very rare chromite grains
34.2-35.6; serp Harzburgite, broken, px20%, with Dunite (35.45-35.48)
35.60-35.62; Dunite, compact, light brown in color
35.62-37.40; serp Harzburgite, compact, broken, px20%
37.4-38.0; Dunite, light brown in color, very rare chromite grains
38.0-40.0; Harzburgite, broken, the fractures are filled with calcite

Sample No.
30.5; 35-R-1, Hz
34.0; 35-R-2, Du
37.6; 35-R-3, Du

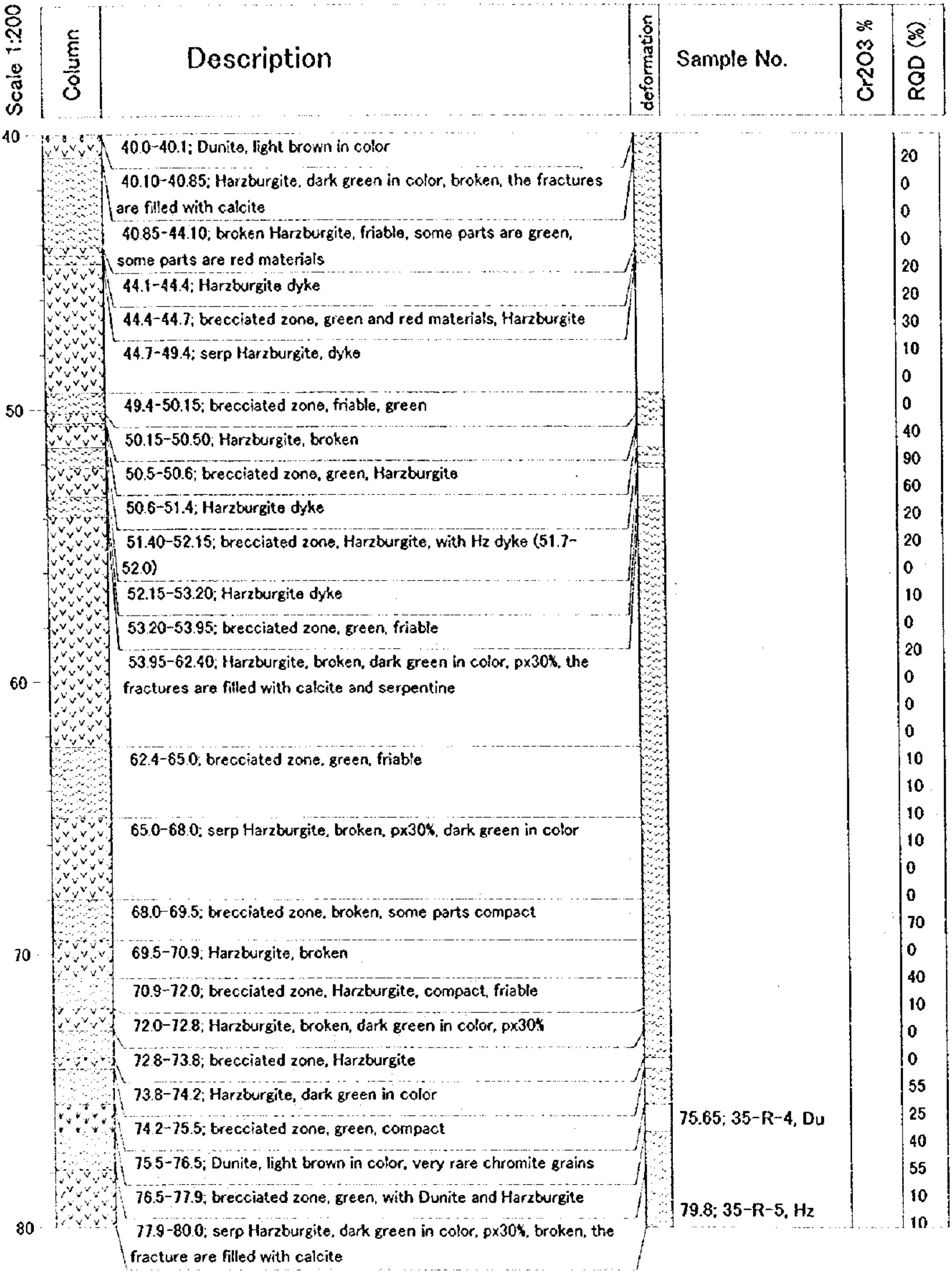
Scale 1:200	RQD (%)
0	0
	0
	0
	0
	0
	0
	0
	15
	30
10	30
	30
	100
	100
	100
	25
	25
	25
	20
	70
20	70
	20
	20
	20
	20
	20
	20
	50
	55
	40
30	40
	30
	30
	0
	40
	50
	40
	40
	40
	0
40	10

Appendix 13 (1) Geological logging (Bregu i Pishes: MJAS-35)

MJAS-35

AREA: Bregu i Pishes

INCLINATION: -43 DIRECTION: S60W ELEVATION: 1137.72m FINAL DEPTH: 80m



40.0-40.1; Dunite, light brown in color

40.10-40.85; Harzburgite, dark green in color, broken, the fractures are filled with calcite

40.85-44.10; broken Harzburgite, friable, some parts are green, some parts are red materials

44.1-44.4; Harzburgite dyke

44.4-44.7; brecciated zone, green and red materials, Harzburgite

44.7-49.4; serp Harzburgite, dyke

49.4-50.15; brecciated zone, friable, green

50.15-50.50; Harzburgite, broken

50.5-50.6; brecciated zone, green, Harzburgite

50.6-51.4; Harzburgite dyke

51.40-52.15; brecciated zone, Harzburgite, with Hz dyke (51.7-52.0)

52.15-53.20; Harzburgite dyke

53.20-53.95; brecciated zone, green, friable

53.95-62.40; Harzburgite, broken, dark green in color, px30%, the fractures are filled with calcite and serpentine

62.4-65.0; brecciated zone, green, friable

65.0-68.0; serp Harzburgite, broken, px30%, dark green in color

68.0-69.5; brecciated zone, broken, some parts compact

69.5-70.9; Harzburgite, broken

70.9-72.0; brecciated zone, Harzburgite, compact, friable

72.0-72.8; Harzburgite, broken, dark green in color, px30%

72.8-73.8; brecciated zone, Harzburgite

73.8-74.2; Harzburgite, dark green in color

74.2-75.5; brecciated zone, green, compact

75.5-76.5; Dunite, light brown in color, very rare chromite grains

76.5-77.9; brecciated zone, green, with Dunite and Harzburgite

77.9-80.0; serp Harzburgite, dark green in color, px30%, broken, the fracture are filled with calcite

Sample No.:

75.65; 35-R-4, Du

79.8; 35-R-5, Hz

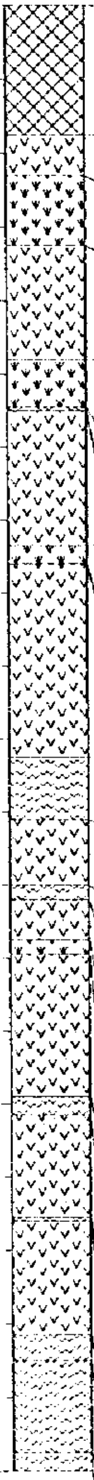
RQD (%): 20, 0, 0, 0, 20, 20, 30, 10, 0, 0, 40, 90, 60, 20, 20, 0, 10, 0, 20, 0, 0, 0, 10, 10, 10, 10, 0, 0, 70, 0, 40, 10, 0, 0, 55, 25, 40, 55, 10, 10

Appendix 13 (2) Geological logging (Bregu i Pishes: MJAS-35)

MJAS-36

AREA: Hija e Zeze

INCLINATION: -40 DIRECTION: N60W ELEVATION: 1185.64m FINAL DEPTH: 50m



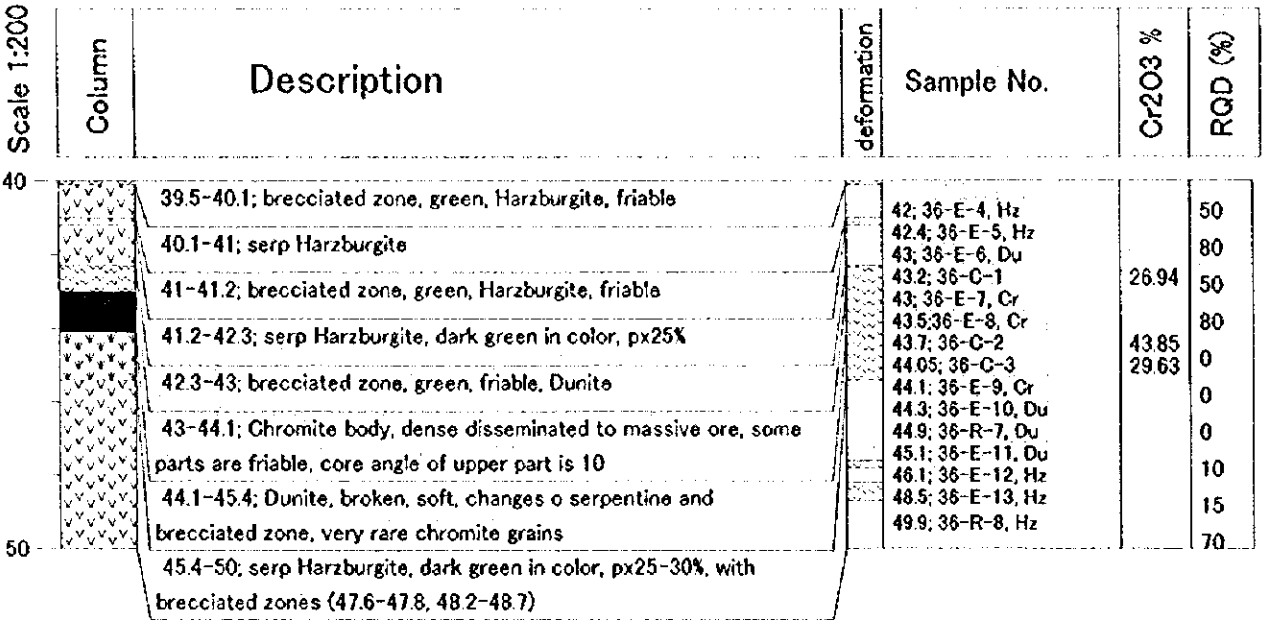
Scale 1:200	Description	Sample No.	Cr2O3 %	RQD (%)
0	0-3.5; surface soil			0 0 0
	3.5-4.6; serp Harzburgite, broken, dark green in color, px30%			0
	4.6-6.5; serp Dunite, light brown in color, broken, with very rare chromite grains	4.6; 36-E-1, Hz 5.9; 36-E-2, Du		10 15
	6.5-9.6; serp Harzburgite, px30%, dark green in color, with very rare chromite grains			15 70 15
10	9.6-10.9; Dunite, light brown in color, very rare chromite grains, some parts are broken			15 15
	10.9-11; brecciated zone, green, some parts are broken			10
	11-14.7; serp Harzburgite, some parts are compact, dark green in color, py30%	14.3; 36-R-3, Hz		10 10
	14.7-15.2; Dunite, light brown in color, broken, very rare chromite grains	15; 36-R-4, Du		40 30
20	15.2-20.5; serp Harzburgite, dark green in color, medium hard with Dunite (15.5-15.55, 15.9-15.95, 16.3-16.34, 17.5-17.53, 17.8-17.9)			60 70 30 30
	20.5-22.2; brecciated zone, green, Harzburgite, some parts are compact			10 30
	22.2-24; serp Harzburgite, some parts are broken, dark green in color, py15-20%			0 50
	24-24.4; broken material (Harzburgite?), possible tectonic fault			70
	24.4-25.5; serp Harzburgite, some parts are broken, dark green in color, px15-20%			90 30
	25.5-25.9; Dunite, light brown in color, compact, with chromite grains			20 40
30	25.9-29.8; serp Harzburgite, dark green in color, px30%, some parts are broken			20 70
	29.8-30.3; brecciated zone, Harzburgite?, green, friable, core angle is 10-20 in upper contact			100 100
	30.3-33.1; serp Harzburgite, dark green in color, px30%, some parts are broken	33.7; 36-R-5, Hz 33.7; 36-E-3, Hz		80 40
	33.1-33.2; brecciated zone, green, compact, Harzburgite?			0
	33.2-36.3; serp Harzburgite, some part are compact, dark green in color, px15-20%			0 60
	36.3-37; brecciated zone, green, Harzburgite	38; 36-R-6, Du		50
40	37-39.5; brecciated zone, green, Dunite, friable			80
	39.5-40.1; brecciated zone, green, Harzburgite, friable			

Appendix 14 (1) Geological logging (Hija e Zeze: MJAS-36)

MJAS-36

AREA: Hija e Zeze

INCLINATION: -40 DIRECTION: N60W ELEVATION: 1185.64m FINAL DEPTH: 50m



Description

- 39.5-40.1; brecciated zone, green, Harzburgite, friable
- 40.1-41; serp Harzburgite
- 41-41.2; brecciated zone, green, Harzburgite, friable
- 41.2-42.3; serp Harzburgite, dark green in color, px25%
- 42.3-43; brecciated zone, green, friable, Dunite
- 43-44.1; Chromite body, dense disseminated to massive ore, some parts are friable, core angle of upper part is 10
- 44.1-45.4; Dunite, broken, soft, changes o serpentine and brecciated zone, very rare chromite grains
- 45.4-50; serp Harzburgite, dark green in color, px25-30%, with brecciated zones (47.6-47.8, 48.2-48.7)

Sample No.	Cr2O3 %
42; 36-E-4, Hz	
42.4; 36-E-5, Hz	
43; 36-E-6, Du	
43.2; 36-C-1	26.94
43; 36-E-7, Cr	
43.5;36-E-8, Cr	
43.7; 36-C-2	43.85
44.05; 36-C-3	29.63
44.1; 36-E-9, Cr	
44.3; 36-E-10, Du	
44.9; 36-R-7, Du	
45.1; 36-E-11, Du	
46.1; 36-E-12, Hz	
48.5; 36-E-13, Hz	
49.9; 36-R-8, Hz	

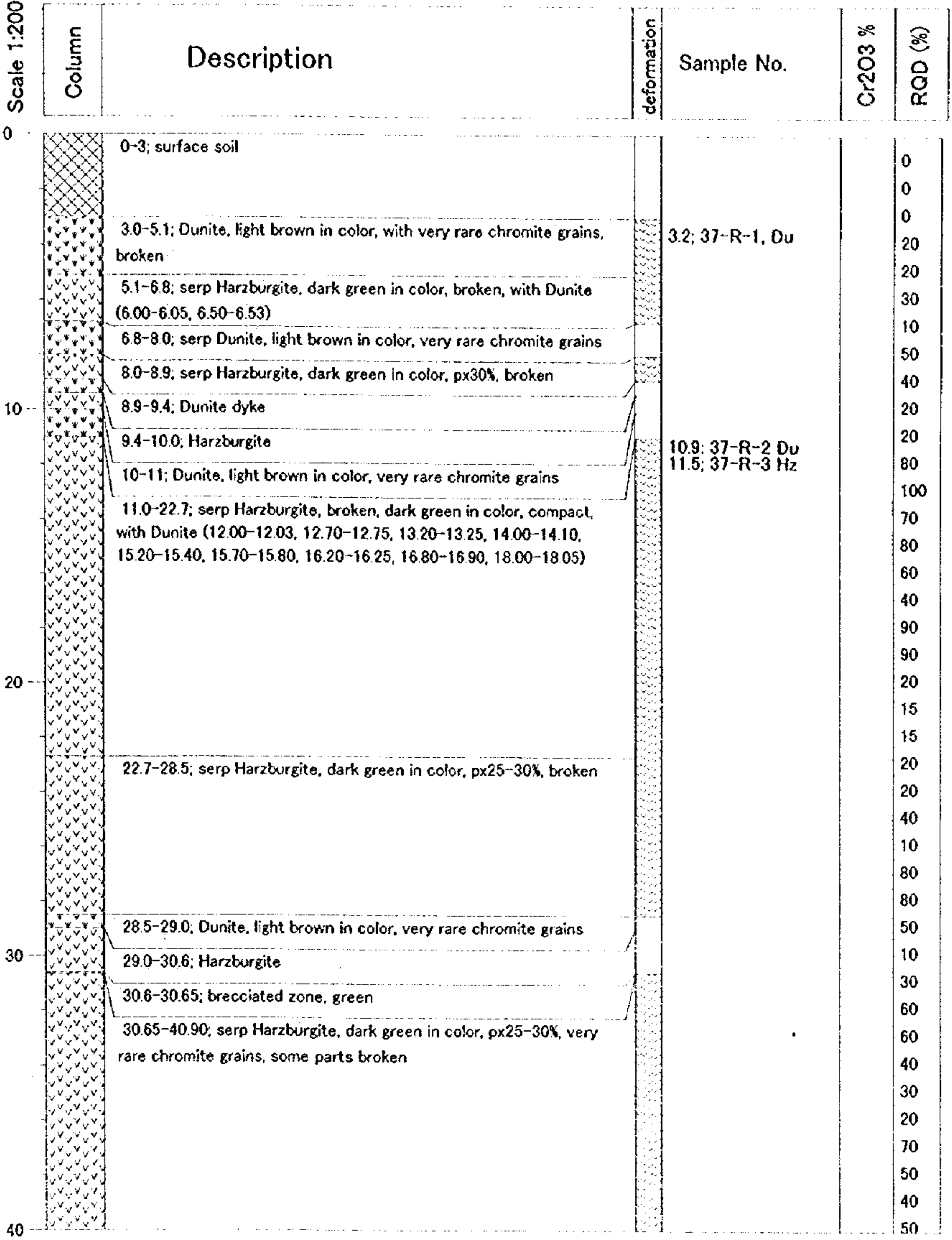
RQD (%)
50
80
50
80
0
0
0
10
15
70

Appendix 14 (2) Geological logging (Hija e Zeze: MJAS-36)

MJAS-37

AREA: Hija e Zeze

INCLINATION: -40 DIRECTION: S60W ELEVATION: 1185.64m FINAL DEPTH: 60m



0-3; surface soil

3.0-5.1; Dunite, light brown in color, with very rare chromite grains, broken

5.1-6.8; serp Harzburgite, dark green in color, broken, with Dunite (6.00-6.05, 6.50-6.53)

6.8-8.0; serp Dunite, light brown in color, very rare chromite grains

8.0-8.9; serp Harzburgite, dark green in color, px30%, broken

8.9-9.4; Dunite dyke

9.4-10.0; Harzburgite

10-11; Dunite, light brown in color, very rare chromite grains

11.0-22.7; serp Harzburgite, broken, dark green in color, compact, with Dunite (12.00-12.03, 12.70-12.75, 13.20-13.25, 14.00-14.10, 15.20-15.40, 15.70-15.80, 16.20-16.25, 16.80-16.90, 18.00-18.05)

22.7-28.5; serp Harzburgite, dark green in color, px25-30%, broken

28.5-29.0; Dunite, light brown in color, very rare chromite grains

29.0-30.6; Harzburgite

30.6-30.65; brecciated zone, green

30.65-40.90; serp Harzburgite, dark green in color, px25-30%, very rare chromite grains, some parts broken

Sample No.:

3.2; 37-R-1, Du

10.9; 37-R-2 Du

11.5; 37-R-3 Hz

RQD (%):

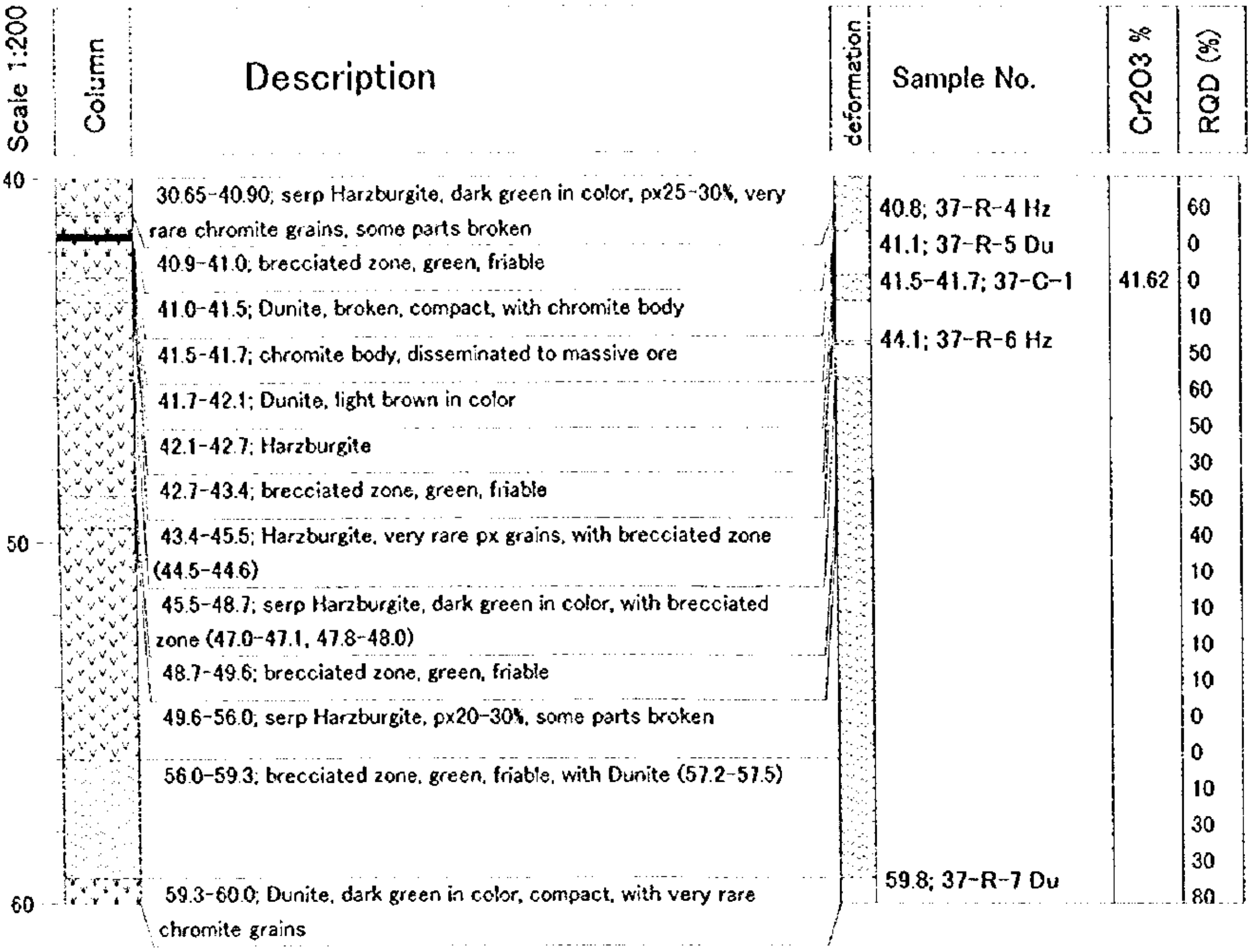
0
0
0
20
20
30
10
50
40
20
20
80
100
70
80
60
40
90
90
20
15
15
20
20
40
10
80
80
50
10
30
60
60
40
30
20
70
50
40
50

Appendix 15 (1) Geological logging (Hija e Zeze: MJAS-37)

MJAS-37

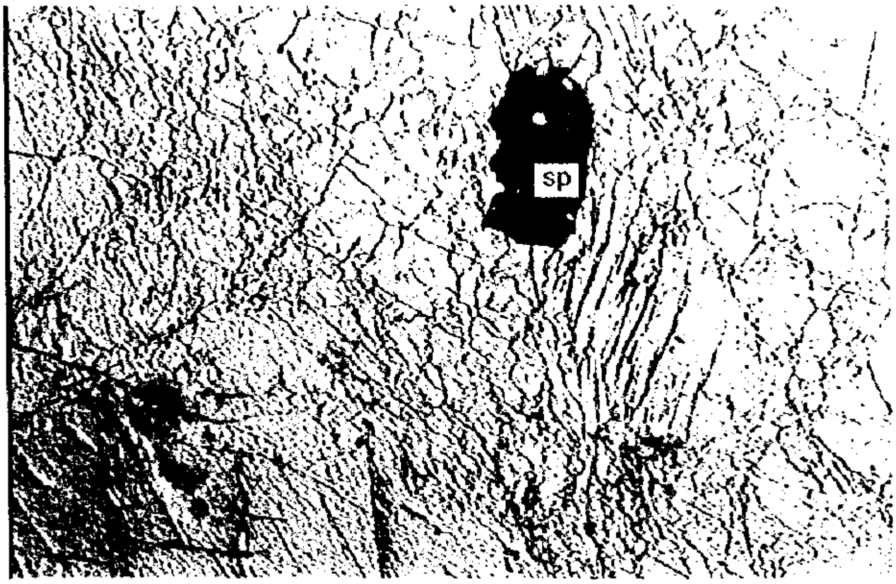
AREA: Hija e Zeze

INCLINATION: -40 DIRECTION: S60W ELEVATION: 1185.64m FINAL DEPTH: 60m

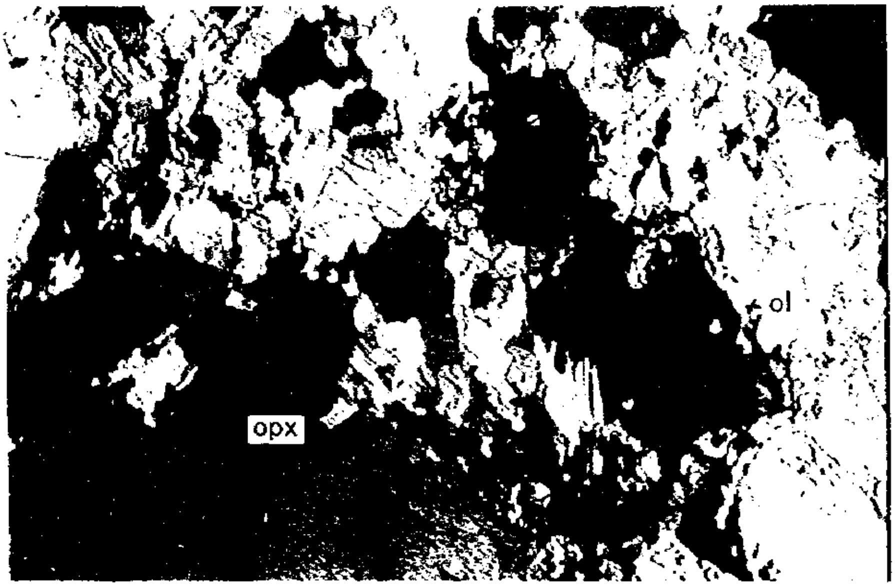


Description	Sample No.	Cr2O3 %	RQD (%)
30.65-40.90; serp Harzburgite, dark green in color, px25-30%, very rare chromite grains, some parts broken	40.8; 37-R-4 Hz		60
40.9-41.0; brecciated zone, green, friable	41.1; 37-R-5 Du		0
41.0-41.5; Dunite, broken, compact, with chromite body	41.5-41.7; 37-C-1	41.62	0
41.5-41.7; chromite body, disseminated to massive ore	44.1; 37-R-6 Hz		10
41.7-42.1; Dunite, light brown in color			50
42.1-42.7; Harzburgite			60
42.7-43.4; brecciated zone, green, friable			50
43.4-45.5; Harzburgite, very rare px grains, with brecciated zone (44.5-44.6)			30
45.5-48.7; serp Harzburgite, dark green in color, with brecciated zone (47.0-47.1, 47.8-48.0)			50
48.7-49.6; brecciated zone, green, friable			40
49.6-56.0; serp Harzburgite, px20-30%, some parts broken			10
56.0-59.3; brecciated zone, green, friable, with Dunite (57.2-57.5)			10
59.3-60.0; Dunite, dark green in color, compact, with very rare chromite grains	59.8; 37-R-7 Du		10
			10
			0
			0
			10
			30
			30
			80

Appendix 15 (2) Geological logging (Hija e Zeze: MJAS-37)



open nicol

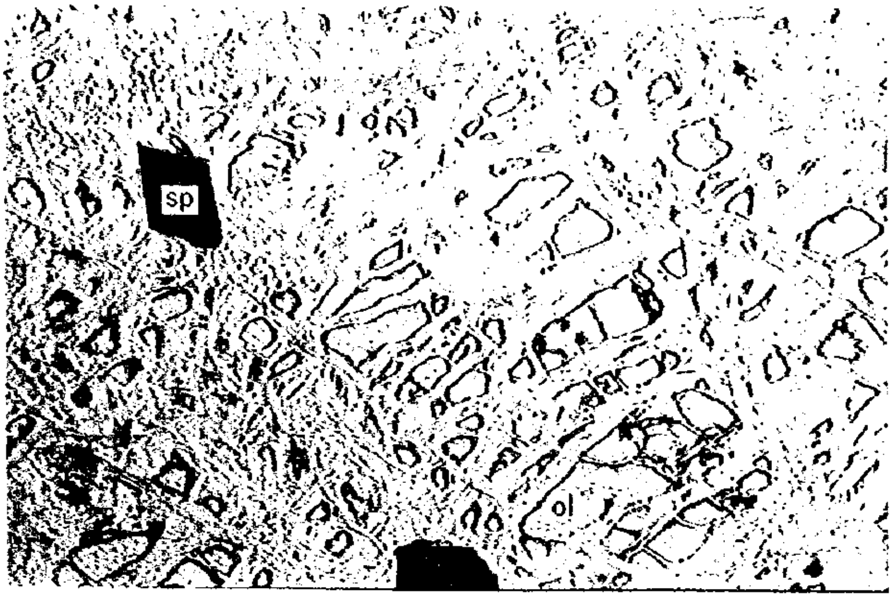


crossed nicols

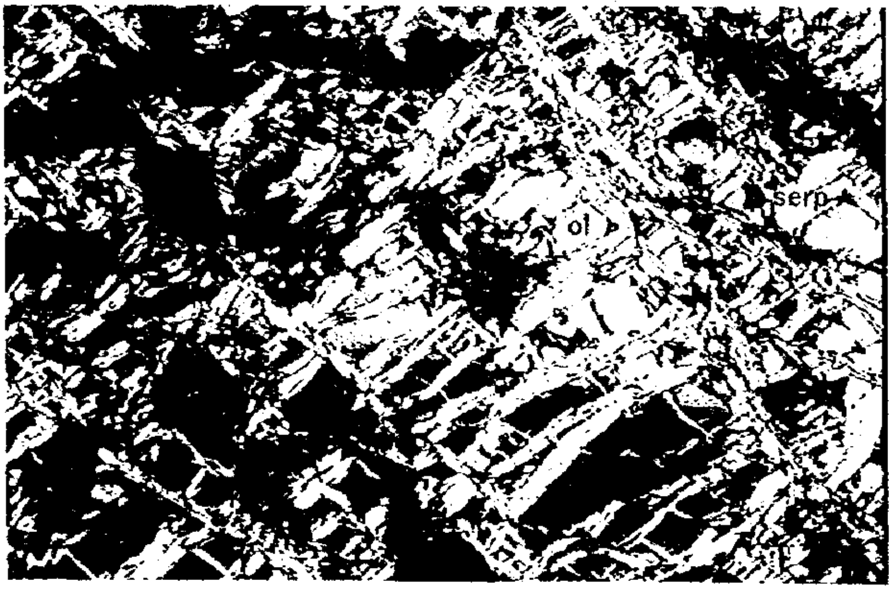
0.5mm

Drill No. ; MJAS-34
Sample No. ; 34-R-7 (78.5m)
Rock name ; Harzburgite
Note ; Olivine shows deformed lamellae.
Opx has cpx lamellae.

Appendix 16 (1) Microphotographs of thin sections and polished thin sections



open nicol

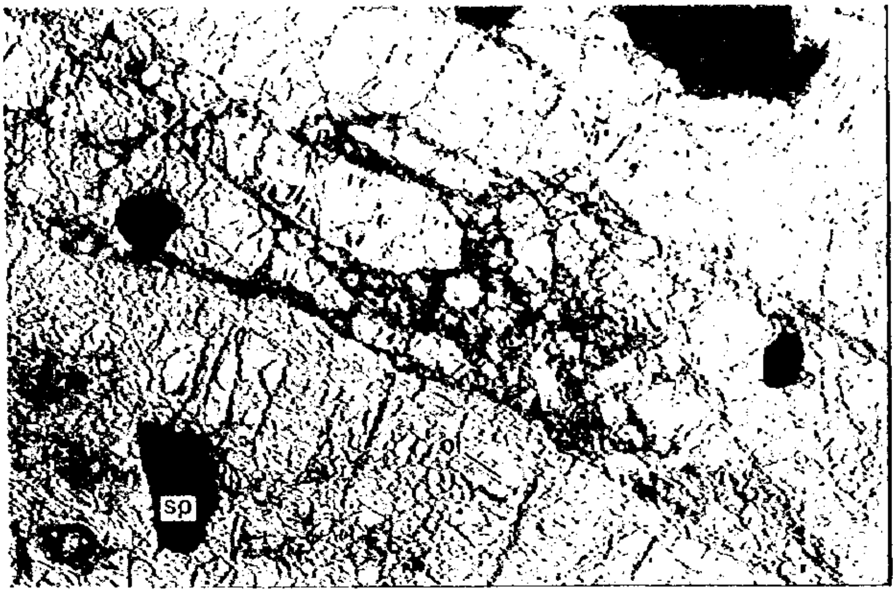


crossed nicols

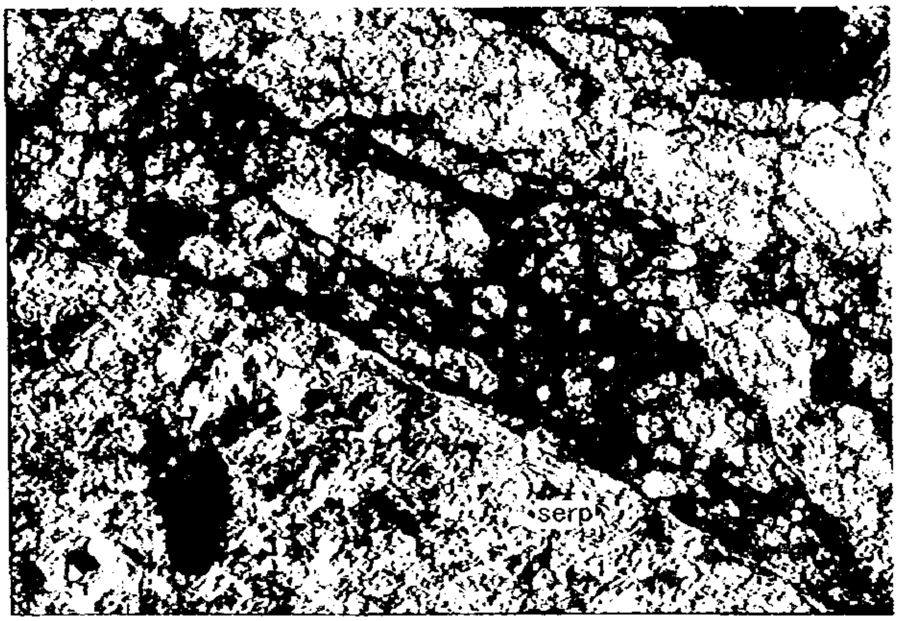
0.5mm

Drill No. ; MJAS-33
Sample No. ; 33-R-3 (97.2m)
Rock name ; Spinel Dunite
Note ; Olivine has deformation lamellae.
The olivine grains showing the similar birefringence was possibly a single grain.
Spinel is highly euhedral in shape.

Appendix 16 (2) Microphotographs of thin sections and polished thin sections



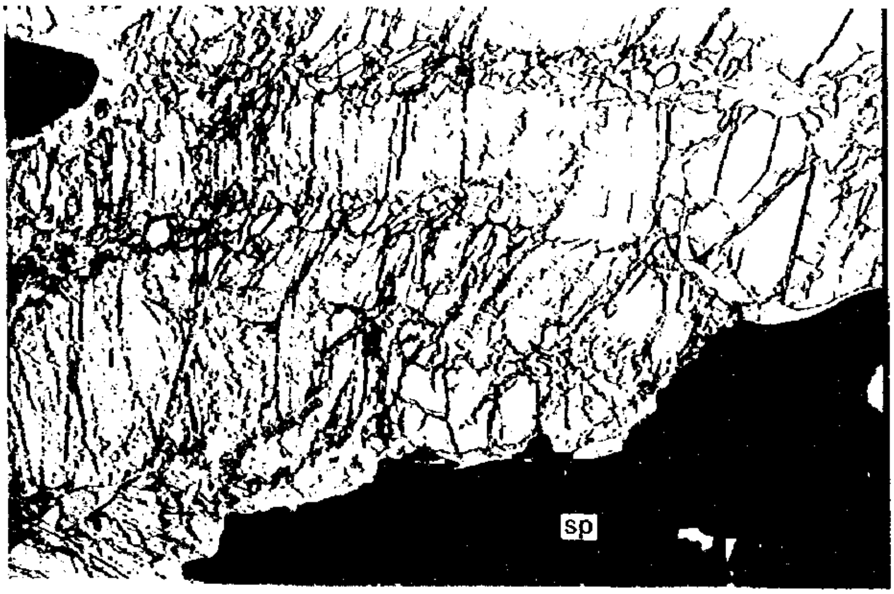
open nicol



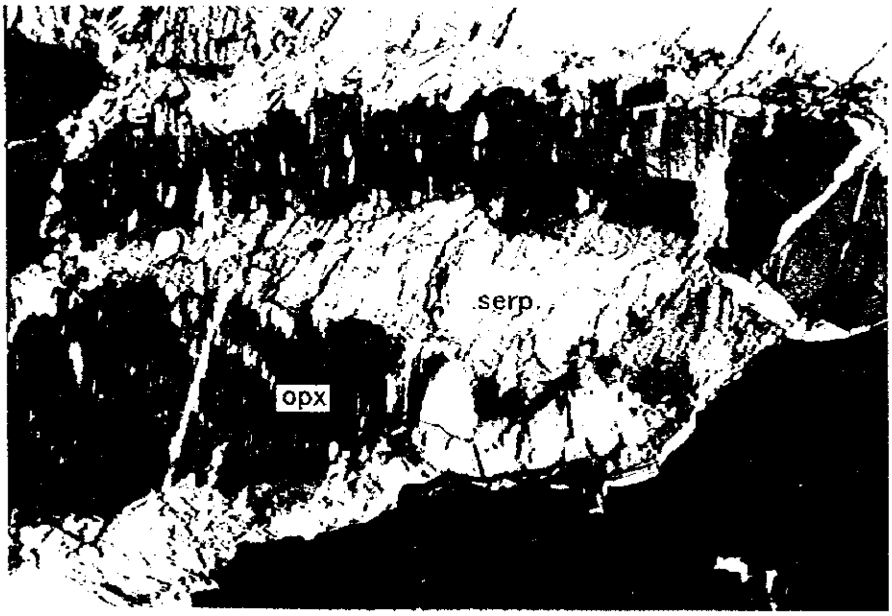
crossed nicols

Drill No. ; MJAS-26
Sample No. ; 26-E-10 (118.8m)
Rock name ; Spinel-rich Dunite (Cataclasite)
Note ; Olivine is intensively serpentinized.
Dunite partly undergoes cataclastic deformation.

Appendix 16 (3) Microphotographs of thin sections and polished thin sections



open nicol

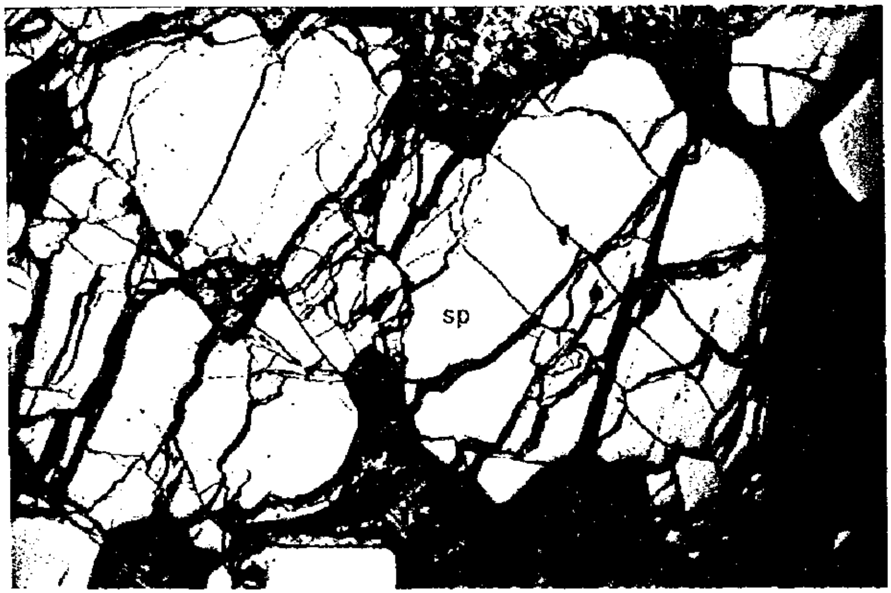


crossed nicols

Drill No. ; MJAS-33
Sample No. ; 33-R-1 (64.4m)
Rock name ; Spinel orthopyroxenite
Note ; Opx with cpx lamellae is deformed.

Appendix 16 (4) Microphotographs of thin sections and polished thin sections

open nicol

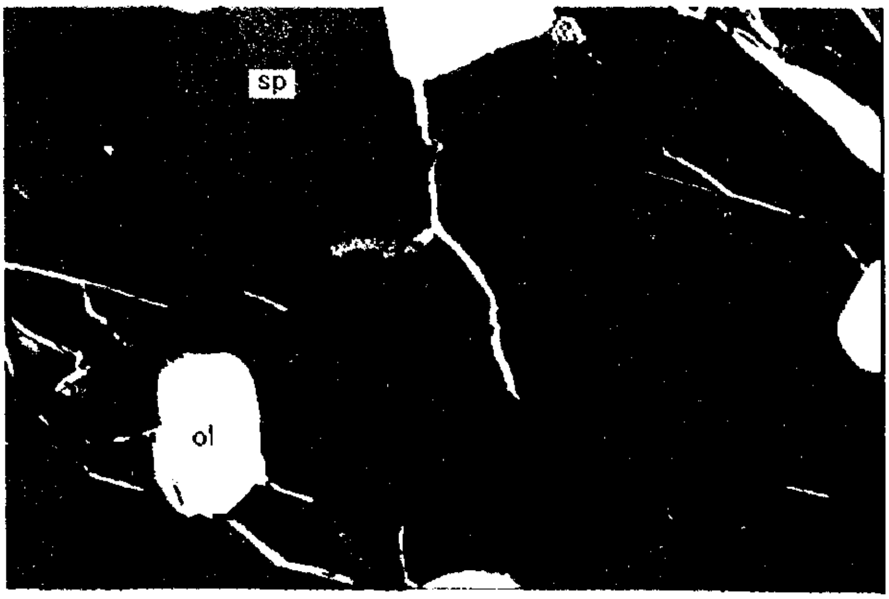


open nicol (reflection microscope)

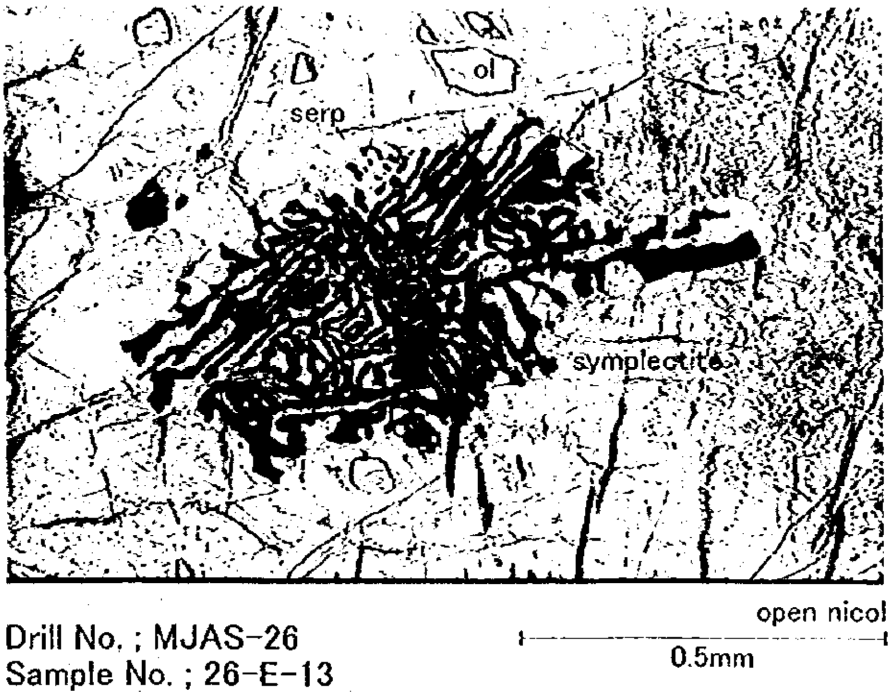
0.5mm

Drill No. ; MJAS-36
Sample No. ; 36-E-8 (43.5m)
Rock name ; Chromitite
Note ; Olivine is completely serpentinized.
Spinel is chemically homogeneous.

Appendix 16 (5) Microphotographs of thin sections and polished thin sections



Drill No. ; -
Sample No. ; BZM-3
Rock name ; Chromitite
Note ; Spinel including olivine shows tiny inclusion trails.



Drill No. ; MJAS-26
Sample No. ; 26-E-13
Rock name ; Symplectite-bearing dunite
Note ; Symplectite comprises spinel and olivine.

Appendix 16 (6) Microphotographs of thin sections and polished thin sections

Appendix 17 Sample list of laboratory tests

				The number of sample	26	30	33	13	13
Area	Hole No.	Sample No.	Rock type	Depth	EPMA	Analysis-ore	Polish	Analysis-rock	Thinsection
Ahu i Vetem	MJAS-23	23-R-3	Du	35.50				○	○
		23-R-4	Hz	38.40				○	○
		23-R-7	Hz	118.60				○	○
		23-R-8	Du	119.10				○	○
		23-C-1	Cr	119.30-119.90		○			
		23-C-2	Cr	119.90-120.55		○			
		23-C-3	Cr	120.55-121.60		○			
		23-C-4	Cr	121.60-122.05		○	○		
	MJAS-24	24-C-1	Cr	100.20-100.55		○			
		24-C-2	Cr	100.55-101.00		○			
		24-C-3	Cr	101.30-101.85		○	○		
		24-C-4	Cr	101.85-102.25		○			
		24-C-5	Cr	102.25-102.65		○			
		24-C-6	Cr	102.65-102.95		○			
	MJAS-25	25-C-1	Cr	113.90-114.20		○			
		25-C-2	Cr	114.20-115.00		○	○		
		25-C-3	Cr	115.15-115.65		○			
	MJAS-26	26-E-1	Hz	19.50	○		○		
		26-E-2	Du	28.20	○		○		
		26-E-3	Hz	55.30	○		○		
		26-E-4	Hz	85.70	○		○		
		26-E-5	Du	85.90	○		○		
		26-E-6	Du	113.00	○		○		
		26-E-7	Du	113.90	○		○		
		26-E-8	Cr	113.90	○		○		
		26-E-9	Cr	117.90	○		○		
		26-E-10	Cr	118.80	○		○		
		26-E-11	Du	118.80	○		○		
		26-E-12	Du	119.80	○		○		
		26-E-13	Du	130.00	○		○		
		26-C-1	Cr	10.85-10.90		○			
		26-C-2	Cr	113.90-114.80		○			
		26-C-3	Cr	114.80-115.90		○			
		26-C-4	Cr	115.90-116.50		○			
		26-C-5	Cr	116.50-117.10		○			
		26-C-6	Cr	117.10-118.50		○			
	MJAS-27	27-C-1	Cr	116.85-117.65		○			
		27-C-2	Cr	117.65-118.55		○	○		
		27-C-3	Cr	118.55-118.83		○			
Lugu i Batres	MJAS-28	28-C-1	Cr	9.50-9.80		○	○		
Pishkash-5	MJAS-33	33-R-1	Px	64.40				○	○
		33-R-2	Hz	92.50				○	○
		33-R-3	Du	97.20				○	○
Bregu i Pishes	MJAS-34	34-R-4	Du	46.90				○	○
		34-R-7	Hz(f)	78.50				○	○
Hija e Zeze	MJAS-36	36-E-1	Hz	4.60	○		○		
		36-E-2	Du	5.90	○		○		
		36-E-3	Hz	33.70	○		○		
		36-E-4	Hz	42.00	○		○		
		36-E-5	Hz	42.40	○		○		
		36-E-6	Du	43.00	○		○		
		36-E-7	Cr	43.00	○		○		
		36-E-8	Cr	43.50	○		○		
		36-E-9	Cr	44.10	○		○		
		36-E-10	Du	44.30	○		○		
		36-E-11	Du	45.10	○		○		
		36-E-12	Hz	46.10	○		○		
		36-E-13	Hz	43.50	○		○		
		35-C-1	Cr	43.00-43.40		○			
		36-C-2	Cr	43.40-44.00		○			
		36-C-3	Cr	44.00-44.10		○			
	MJAS-37	37-R-2	Du	10.90				○	○
		37-R-3	Hz	11.50				○	○
		37-R-4	Hz	40.80				○	○
		37-R-5	Du	41.40				○	○
		37-C-1	Cr	41.50-41.70		○	○		
Buzgare	Outcrop	BZM-1	Cr			○			
		BZM-2	Cr			○			
		BZM-3	Cr			○	○		

Appendix 18 (1) Results of chemical analysis on rock and ore

Drilling Hole No.	Sample No.	Rock type	Ag	Al	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe	K	Mg	Mn	Mo	Na	Ni	P	Pb	Sr	Ti	V	W	Zn	Cr_2O_3
			ppm	%	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	%	%	ppm	ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	%
MJAS-23	23-R-3	Du	0.2	0.12	<10	<0.5	Intf	0.08	<0.5	111	462	<1	4.61	0.03	>15.0	720	<1	0.10	2430	Intf	14	15	<0.01	6	<10	58	—
	23-R-4	Hz	<0.2	0.18	<10	<0.5	Intf	0.24	<0.5	101	1040	<1	4.59	0.04	>15.0	785	<1	0.08	2180	Intf	8	10	<0.01	20	<10	54	—
	23-R-7	Hz	<0.2	0.15	<10	<0.5	Intf	0.16	<0.5	100	668	<1	4.45	0.04	>15.0	765	<1	0.10	2250	Intf	4	10	<0.01	12	<10	44	—
	23-R-8	Du	<0.2	0.08	<10	<0.5	Intf	0.06	<0.5	97	251	<1	4.07	0.01	>15.0	665	<1	0.08	2610	Intf	2	11	<0.01	2	<10	32	—
	23-C-1	Cr	0.4	0.15	<10	<0.5	<2	0.01	<0.5	29	—	3	1.15	<0.01	11.25	245	<1	0.05	1570	<10	2	3	<0.01	10	<10	42	30.38
	23-C-2	Cr	<0.2	0.11	<10	<0.5	Intf	0.03	<0.5	45	—	<1	2.15	0.01	>15.0	330	<1	0.03	2140	Intf	<2	1	<0.01	5	<10	18	16.07
	23-C-3	Cr	<0.2	0.13	<10	<0.5	Intf	0.01	<0.5	38	—	<1	1.81	0.01	>15.0	290	<1	0.04	1950	Intf	<2	7	<0.01	6	<10	16	24.10
	23-C-4	Cr	<0.2	0.21	<10	<0.5	<2	0.01	<0.5	26	—	<1	1.24	<0.01	9.92	230	<1	<0.01	1375	<10	<2	<1	<0.01	15	<10	20	39.53
MJAS-24	24-C-1	Cr	<0.2	0.12	<10	<0.5	Intf	0.08	<0.5	64	—	<1	2.62	0.01	>15.0	420	<1	0.05	2350	Intf	<2	5	<0.01	7	<10	22	13.40
	24-C-2	Cr	0.2	0.11	<10	<0.5	Intf	0.05	<0.5	52	—	<1	2.25	<0.01	>15.0	380	<1	0.01	2380	Intf	<2	2	<0.01	7	<10	18	16.16
	24-C-3	Cr	<0.2	0.13	<10	<0.5	Intf	0.06	<0.5	52	—	<1	2.27	0.04	>15.0	385	<1	0.10	2350	Intf	<2	6	<0.01	5	<10	18	16.66
	24-C-4	Cr	<0.2	0.14	<10	<0.5	Intf	0.09	<0.5	54	—	1	2.45	0.04	>15.0	395	<1	0.09	2240	Intf	<2	13	0.08	5	<10	16	14.16
	24-C-5	Cr	<0.2	0.10	<10	<0.5	Intf	0.03	<0.5	46	—	<1	2.46	<0.01	>15.0	385	<1	<0.01	2250	Intf	<2	7	<0.01	12	<10	16	18.47
	24-C-6	Cr	<0.2	0.11	<10	<0.5	Intf	0.07	<0.5	63	—	<1	2.55	0.03	>15.0	440	<1	0.06	2700	Intf	<2	11	<0.01	4	<10	18	11.82
MJAS-25	25-C-1	Cr	<0.2	0.11	<10	<0.5	Intf	0.04	<0.5	65	—	10	2.84	<0.01	>15.0	455	<1	0.05	2630	Intf	<2	8	<0.01	6	<10	18	8.64
	25-C-2	Cr	<0.2	0.11	<10	<0.5	Intf	0.08	<0.5	40	—	<1	1.90	<0.01	>15.0	320	<1	<0.01	2060	Intf	<2	7	<0.01	8	<10	40	23.42
	25-C-3	Cr	<0.2	0.16	<10	<0.5	Intf	0.05	<0.5	46	—	<1	2.15	<0.01	>15.0	375	<1	<0.01	2370	Intf	<2	7	<0.01	11	<10	18	16.21
MJAS-26	26-C-1	Cr	0.2	0.26	<10	<0.5	2	0.01	<0.5	38	—	7	2.14	<0.01	10.50	330	<1	<0.01	1140	<10	<2	6	<0.01	28	<10	32	35.41
	26-C-2	Cr	<0.2	0.20	<10	<0.5	Intf	0.09	<0.5	48	—	<1	2.36	0.01	>15.0	390	<1	0.06	2240	Intf	<2	9	<0.01	13	<10	22	18.78
	26-C-3	Cr	<0.2	0.18	<10	<0.5	Intf	0.01	<0.5	52	—	<1	2.48	<0.01	>15.0	380	<1	<0.01	2250	Intf	<2	6	<0.01	14	<10	22	15.73
	26-C-4	Cr	<0.2	0.18	<10	<0.5	Intf	0.02	<0.5	50	—	<1	2.67	<0.01	>15.0	420	<1	0.03	2230	Intf	<2	8	<0.01	15	<10	18	15.41
	26-C-5	Cr	<0.2	0.19	<10	<0.5	Intf	<0.01	<0.5	39	—	<1	2.08	<0.01	>15.0	330	<1	<0.01	1850	Intf	<2	3	<0.01	15	<10	20	24.41
	26-C-6	Cr	<0.2	0.11	<10	<0.5	Intf	0.04	<0.5	50	—	<1	2.27	<0.01	>15.0	350	<1	0.01	2340	Intf	<2	9	<0.01	6	<10	16	15.73

Note : Intf represents high Mg contents interfere Bi and P contents.

Appendix 18 (2) Results of chemical analysis on rock and ore

Drilling No.	Sample No.	Rock type	Ag	Al	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe	K	Mg	Mn	Mo	Na	Ni	P	Pb	Sr	Ti	V	W	Zn	Cr_2O_3
			ppm	%	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	%	%	ppm	ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	%
MJAS-27	27-C-1	Cr	<0.2	0.11	<10	<0.5	Intf	0.04	<0.5	41	–	1	1.93	<0.01	>15.0	320	<1	<0.01	1955	Intf	<2	5	<0.01	12	<10	16	24.01
	27-C-2	Cr	<0.2	0.12	<10	<0.5	Intf	0.06	<0.5	47	–	<1	2.14	0.01	>15.0	350	<1	0.02	2090	Intf	<2	8	<0.01	7	<10	14	18.08
	27-C-3	Cr	<0.2	0.14	<10	<0.5	Intf	0.03	<0.5	39	–	<1	1.76	<0.01	>15.0	310	<1	<0.01	2240	Intf	<2	2	<0.01	9	<10	18	25.37
MJAS-28	28-C-1	Cr	<0.2	0.40	<10	<0.5	<2	<0.01	<0.5	30	–	<1	2.08	<0.01	8.96	345	<1	<0.01	1260	<10	<2	5	<0.01	57	<10	36	39.75
MJAS-33	33-R-1	Px	<0.2	0.31	<10	<0.5	Intf	0.69	<0.5	65	5650	<1	3.58	0.01	>15.0	825	<1	0.04	1050	Intf	<2	37	<0.01	37	<10	38	–
	33-R-2	Hz	0.2	0.16	<10	<0.5	Intf	0.33	<0.5	95	751	<1	4.43	0.01	>15.0	790	<1	0.05	2120	Intf	<2	17	<0.01	17	<10	36	–
	33-R-3	Du	0.2	0.10	<10	<0.5	Intf	0.07	<0.5	108	330	<1	4.71	0.05	>15.0	735	<1	0.12	2440	Intf	<2	17	<0.01	1	<10	36	–
MJAS-34	34-R-4	Du	<0.2	0.07	<10	<0.5	Intf	0.02	<0.5	111	464	<1	4.10	0.02	>15.0	650	<1	0.11	2830	Intf	<2	10	<0.01	1	<10	38	–
	34-R-7	Hz	0.8	0.21	<10	<0.5	Intf	0.16	<0.5	123	694	<1	5.30	0.04	>15.0	910	<1	0.23	2770	Intf	<2	11	<0.01	9	<10	50	–
MJAS-36	36-C-1	Cr	<0.2	0.17	<10	<0.5	<2	0.07	<0.5	39	–	<1	2.17	<0.01	14.15	345	<1	<0.01	2060	<10	<2	12	<0.01	15	<10	20	26.94
	36-C-2	Cr	<0.2	0.72	<10	<0.5	10	0.04	<0.5	33	–	4	2.30	<0.01	8.10	320	<1	<0.01	1515	90	2	5	0.01	61	<10	30	43.85
	36-C-3	Cr	<0.2	0.18	<10	<0.5	2	0.01	<0.5	33	–	<1	2.35	<0.01	13.25	305	<1	<0.01	1925	<10	<2	3	<0.01	16	<10	16	29.63
MJAS-37	37-R-2	Du	<0.2	0.05	<10	<0.5	Intf	0.05	<0.5	111	255	<1	4.70	0.01	>15.0	775	<1	0.05	2620	Intf	<2	9	<0.01	1	<10	42	–
	37-R-3	Hz	<0.2	0.09	<10	<0.5	Intf	0.11	<0.5	103	366	<1	4.35	0.01	>15.0	710	<1	0.07	2360	Intf	<2	8	<0.01	7	<10	34	–
	37-R-4	Hz	<0.2	0.11	<10	<0.5	Intf	0.08	<0.5	104	415	<1	4.65	0.01	>15.0	735	<1	0.06	2260	Intf	<2	6	<0.01	9	<10	34	–
	37-R-5	Du	0.2	0.08	<10	<0.5	Intf	0.03	<0.5	101	307	<1	4.23	0.01	>15.0	665	<1	0.09	2590	Intf	<2	13	<0.01	2	<10	36	–
	37-C-1	Cr	<0.2	0.43	<10	<0.5	10	0.01	<0.5	34	–	<1	2.71	<0.01	9.52	390	1	<0.01	1170	60	2	<1	<0.01	86	<10	44	41.62
Buzgare	BZM-1	Cr	<0.2	0.38	<10	<0.5	<2	0.01	<0.5	21	–	<1	1.68	<0.01	5.19	300	<1	<0.01	683	<10	<2	1	<0.01	41	<10	26	48.08
	BZM-2	Cr	<0.2	0.79	<10	<0.5	2	<0.01	<0.5	43	–	<1	2.51	<0.01	6.70	425	<1	<0.01	732	<10	<2	<1	<0.01	101	<10	52	44.79
	BZM-3	Cr	<0.2	1.18	<10	<0.5	12	<0.01	<0.5	50	–	<1	3.25	<0.01	6.08	505	1	<0.01	644	<10	2	<1	<0.01	227	<10	82	47.79

Note 1 : Buzgare is outcrop sample.

Note 2 : Intf represents high Mg contents interfere Bi and P contents.

Appendix 19 Results of EPMA analysis

Sample No.	Rock type	TiO_2	Al_2O_3	Cr_2O_3	V_2O_3	FeO*	MnO	MgO	Total	Ti	Al	Cr	V	Fe*	Mn	Mg	Total	Fe^{2+}	Fe^{3+}	Cr#	Mg#	Fe^{3+}#
		%	%	%	%	%	%	%	%													
26-E-1	Hz	0.02	13.57	56.38	0.30	19.12	0.34	10.53	100.39	0.000	0.517	1.441	0.008	0.519	0.009	0.507	3.000	0.484	0.033	0.736	0.512	0.017
26-E-2	Du	0.11	12.99	56.81	0.18	19.36	0.34	10.58	100.54	0.003	0.495	1.454	0.005	0.527	0.009	0.510	3.000	0.483	0.041	0.746	0.514	0.021
26-E-3	Hz	0.02	17.46	52.70	0.26	18.64	0.31	11.18	100.68	0.001	0.650	1.316	0.007	0.494	0.008	0.526	3.000	0.466	0.026	0.669	0.530	0.013
26-E-4	Hz	0.05	10.91	58.79	0.28	19.23	0.34	10.32	100.08	0.001	0.422	1.527	0.007	0.531	0.009	0.505	3.000	0.487	0.041	0.783	0.509	0.021
26-E-5	Du	0.05	11.42	57.35	0.22	21.56	0.40	8.43	99.55	0.001	0.449	1.512	0.006	0.604	0.011	0.419	3.000	0.571	0.030	0.771	0.423	0.015
26-E-6	Du	0.12	12.67	58.05	0.14	17.16	0.30	11.98	100.57	0.003	0.479	1.473	0.004	0.463	0.008	0.573	3.000	0.422	0.039	0.755	0.576	0.019
26-E-7	Du	0.16	11.71	58.24	0.08	16.56	0.27	13.42	100.78	0.004	0.440	1.468	0.002	0.446	0.007	0.638	3.000	0.359	0.082	0.769	0.640	0.041
26-E-8	Cr	0.16	11.34	58.40	0.11	17.74	0.32	12.31	100.69	0.004	0.430	1.486	0.003	0.482	0.009	0.591	3.000	0.405	0.073	0.776	0.593	0.037
26-E-9	Cr	0.13	10.35	60.04	0.06	15.59	0.27	13.93	100.72	0.003	0.390	1.518	0.002	0.421	0.007	0.664	3.000	0.332	0.085	0.796	0.667	0.043
26-E-10	Cr	0.16	10.86	59.08	0.05	16.92	0.29	12.54	100.16	0.004	0.414	1.511	0.001	0.462	0.008	0.604	3.000	0.392	0.066	0.785	0.607	0.033
26-E-11	Du	0.14	11.41	57.90	0.10	19.08	0.35	11.20	100.45	0.003	0.437	1.487	0.003	0.523	0.010	0.542	3.000	0.452	0.067	0.773	0.546	0.034
26-E-12	Du	0.13	10.81	59.77	0.18	17.84	0.34	11.50	100.75	0.003	0.413	1.531	0.005	0.486	0.009	0.556	3.000	0.438	0.045	0.788	0.559	0.023
26-E-13	Du	0.09	10.56	56.84	0.17	20.70	0.35	9.59	98.55	0.002	0.417	1.507	0.005	0.585	0.010	0.479	3.000	0.513	0.067	0.783	0.483	0.034
36-E-1	Hz	0.03	14.49	55.37	0.27	18.18	0.29	11.09	99.84	0.001	0.551	1.411	0.007	0.492	0.008	0.533	3.000	0.460	0.030	0.719	0.537	0.015
36-E-2	Du	0.05	8.17	61.28	0.23	20.13	0.37	9.31	99.70	0.001	0.323	1.627	0.006	0.568	0.011	0.466	3.000	0.525	0.041	0.834	0.470	0.020
36-E-3	Hz	0.03	16.95	52.13	0.23	17.66	0.31	11.67	99.14	0.001	0.639	1.318	0.006	0.474	0.009	0.556	3.000	0.436	0.036	0.674	0.561	0.018
36-E-4	Hz	0.02	15.46	54.36	0.29	18.87	0.29	11.05	100.51	0.001	0.582	1.372	0.007	0.506	0.008	0.526	3.000	0.467	0.037	0.702	0.530	0.019
36-E-5	Hz	0.05	13.36	56.14	0.32	19.42	0.33	10.56	100.36	0.001	0.510	1.437	0.008	0.529	0.009	0.510	3.000	0.483	0.043	0.738	0.513	0.022
36-E-6	Du	0.08	11.07	57.58	0.21	21.54	0.40	9.12	100.21	0.002	0.431	1.505	0.006	0.600	0.011	0.449	3.000	0.542	0.054	0.777	0.453	0.027
36-E-7	Cr	0.11	10.88	61.01	0.12	13.91	0.21	14.66	101.16	0.003	0.405	1.525	0.003	0.371	0.006	0.691	3.000	0.306	0.062	0.790	0.693	0.031
36-E-8	Cr	0.12	10.75	60.83	0.13	13.99	0.24	14.45	100.75	0.003	0.403	1.529	0.003	0.375	0.006	0.684	3.000	0.312	0.060	0.791	0.687	0.030
36-E-9	Cr	0.15	11.04	60.76	0.09	14.27	0.25	13.92	100.66	0.004	0.415	1.531	0.002	0.382	0.007	0.661	3.000	0.335	0.045	0.787	0.664	0.023
36-E-10	Du	0.10	10.96	59.83	0.13	17.72	0.28	11.66	100.85	0.002	0.418	1.529	0.003	0.482	0.008	0.562	3.000	0.433	0.046	0.785	0.565	0.023
36-E-11	Du	0.09	10.01	60.03	0.10	17.85	0.32	11.93	100.61	0.002	0.383	1.541	0.003	0.489	0.009	0.577	3.000	0.416	0.069	0.801	0.581	0.035
36-E-12	Hz	0.03	16.14	54.01	0.26	18.41	0.31	11.34	100.63	0.001	0.604	1.355	0.007	0.491	0.008	0.537	3.000	0.456	0.033	0.692	0.541	0.017
36-E-13	Hz	0.03	13.51	56.16	0.25	18.41	0.32	10.99	99.83	0.001	0.516	1.439	0.007	0.501	0.009	0.531	3.000	0.461	0.038	0.736	0.535	0.019

Appendix 20 Microscopic observation of thin section and polished thin section

Sample No.	Rock type	Rock-forming minerals						Alteration minerals					Remarks
		olivine	opx	cpx	serpentine	hornblende	opq	serpentine	chlorite	quartz	talc	cm	
23-R-3	Spinel Dunite	◎			△		+	◎			+		Equigranular texture
23-R-4	Spinel Harzburgite	◎	○	+	△	+	△	◎			+		Plagioclase is changed to bastite
23-R-7	Spinel Harzburgite	◎	○	+	△	+	+	◎			+		Part of plagioclase is changed to bastite
23-R-8	Spinel Dunite	◎			△		+	◎			+	+	Serpentine vein, carbonate minerals vein
23-C-4	Spinel-rich Dunite chromitite	△			◎		+	◎			+		Most part of olivine is serpentinized
24-C-3	Spinel-rich Dunite	○			○		+	◎			+	+	Most part of olivine is serpentinized
25-C-2	Chromitite	△			◎		+	◎			+		Most part of olivine is serpentinized
26-E-1	Spinel Harzburgite	◎	○	+	△	+	△	◎	△		△		Equigranular texture, part of orthopyroxene is changed to bastite
26-E-2	Spinel Dunite	○			△		△	◎				+	Equigranular texture
26-E-3	Spinel Harzburgite～Lherzolite	◎	○	△	△		+	◎	+				Extension of olivine make foliation texture
26-E-4	Spinel Harzburgite	◎	△	+	△		+	◎		△	○	△	Equigranular texture, carbonate minerals and quartz vein
26-E-5	Spinel Harzburgite	◎	○	+	△	+	+	◎	+		+	△	Equigranular texture, most part of orthopyroxene is changed to bastite
26-E-6	Spinel Dunite	○			○		△	◎			+		Equigranular texture,spinel is fine-grained
26-E-7	Spinel-rich Dunite	◎			○		+	◎			△		Equigranular texture
26-E-8	Spinel-rich Dunite	○			△		+	◎			+		Equigranular texture
26-E-9	Spinel-rich Dunite～Chromitite	△			◎		+	◎			○		Partly friable zone
26-E-10	Spinel-rich Dunite	△			○		+	◎			△		Partly friable zone
26-E-11	Spinel-rich Dunite	○			△		+	◎			+		Equigranular texture
26-E-12	Spinel-rich Dunite	◎			○		+	◎					Equigranular texture, olivine is coarse-grained, spinel is fine-grained
26-E-13	Monocrystalline olivine	◎			○		+	◎					Many fluid inclusions, some symplectite
27-C-2	Chromitite	△			◎		+	◎			+		Most part of olivine is serpentinized
28-C-1	Chromitite				◎			◎			+		Most part of olivine is serpentinized
33-R-1	Spinel orthopyroxenite	△	◎	+	◎	△	+	◎			+	+	Part of orthopyroxe is changed to bastite
33-R-2	Spinel Harzburgite	◎	△	+	+		+	◎				+	Part of orthopyroxe is changed to bastite
33-R-3	Spinel Dunite	◎			△		+	◎				+	Equigranular texture
34-R-4	Serpentinite				△		+	◎			△	+	Original rock is Spinel Dunite
34-R-7	Spinel Harzburgite	◎	△		+		+	+					Porphyroclastic texture
36-E-1	Spinel Harzburgite	○	△		△		+	◎			+		Most part of orthopyroxe is changed to bastite
36-E-2	Serpentinite	△			△		+	◎			+		Original rock is Spinel Dunite
36-E-3	Spinel Harzburgite	△	△	+	△		+	◎	+		+		Most part of orthopyroxe is changed to bastite
36-E-4	Spinel Harzburgite～Lherzolite	◎	○	△	△		+	◎	+		+		Most part of orthopyroxe is changed to bastite
36-E-5	Serpentinite	△		+	△		+	◎	+		△		Original rock is Spinel Harzburgite
36-E-6	Serpentinite				△		+	◎			△		Original rock is Spinel Dunite
36-E-7	Chromitite				◎		+	◎			○		Spinel has inclusions
36-E-8	Chromitite	+			◎		+	◎	+		△		Olivine is inclusion of spinel
36-E-9	Chromitite	+			◎		+	◎	+		+		Spinel has friable texture
36-E-10	Serpentinite Cataclasite				△		+	◎			△		Only spinel is primary
36-E-11	Serpentinite	△			△		+	◎			+		Spinel is fine-grained
36-E-12	Serpentinite	△			△		△	◎	△		+		Original rock is Spinel Harzburgite
36-E-13	Spinel Harzburgite	◎	○	+	△		+	◎			+		Most part of orthopyroxe is changed to bastite
37-R-2	Serpentinite				△		+	◎			△		Original rock is Spinel Dunite
37-R-3	Spinel Harzburgite	◎	△	+	+		+	◎				+	Most part of orthopyroxe is changed to bastite
37-R-4	Spinel Harzburgite	◎	△	+	+		+	◎			△	+	Most part of orthopyroxe is changed to bastite
37-R-5	Serpentinite				△		+	◎			+	+	Original rock is Spinel Dunite
37-C-1	Chromitite				◎		+	◎			+		Strongly altered except chromian spinel
BZM-3	Chromitite				◎			◎			+		Strongly altered except chromian spinel

Legend : opx; orthopyroxene, cpx; clinopyroxene, opq; opaque minerals, cm; carbonate minerals ◎; abundant, ○; moderate, △; a few, +; rare

JICA