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FeR-1, FeR-2, FeR-3 and FeR-4 FOUR CANADIAN IRON-FORMATION SAMPLES PREPARED FOR USE AS REFERENCE MATERIALS

SYDNEY ABBEY
C.R. McLEOD
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Abstract

Analytical data received in the course of collaborative analyses of four samples of Canadian iron formation are presented. Most probable contents are derived from these data for most of the major and minor constituents as well as for some trace elements. These materials are suitable for use as reference samples in the analysis of similar materials.

Résumé

Les données analytiques reçues au cours d'analyses collaboratives de quatre échantillons de formations ferrifères canadiennes sont présentées. Les teneurs les plus probables pour la plupart des composants majeurs et mineurs ainsi que pour quelques éléments en trace sont dérivées à partir de ces données. Ces matériaux peuvent servir comme échantillons de référence dans l'analyse de matériaux similaires.

INTRODUCTION

A wide variety of reference samples of rocks is known to be available from geological institutions throughout the world. Our laboratories have participated in the collaborative analytical evaluation of many of them. Their compositions have ranged from granites and syenites through andesites, basalts, gabbros, etc., to serpentinites, peridotites and dunites, but none are available for iron formations. One reference sample of iron formation, collected by the Geological Survey of Greenland (Uitterdijk Appel, 1980) is known to be in preparation in France. However, a single sample is severely limited in application to a wide range of compositions, in minimizing the effects of uncertainties and possible interelement interferences and in detecting interlaboratory bias in collaborative analysis.

Many reference samples or iron ores are also available, but they have been evaluated only for constituents of direct interest to the iron and steel industry. Relatively little is known of their contents of components of geological interest – e.g. trace elements.

The Geological Survey of Canada's analytical chemistry laboratories have analyzed numerous samples of iron formation in recent years; the difficulties encountered in that work underlined the pressing need for reference samples of such materials.

GEOLOGICAL BACKGROUND

Description of Samples

Based on the composition of representative pieces from six bulk samples of Algoma-type iron formation, four were selected for additional treatment as reference samples. Descriptions of these four samples from examination of hand specimens and representative thin and polished sections were published earlier (McLeod et al., 1982), but are included here to provide information on the general geological setting and mineralogy.

FeR-1 Location: Austin Brook, 27 km south-southwest of Bathurst, New Brunswick

The iron formation at Austin Brook, within the Tetagouche Group of Middle Ordovician age, is underlain by quartz-feldspar augen schist and overlain by rhyolite and rhyolite tuff (Skinner, 1974). Selection of this sample locality, for high iron, manganese, phosphorus, barium and base metals, was based on the analyses of individual samples that were incorporated in a study by Saif (1980) of iron formation of the Bathurst district. The sample was obtained from a bed of magnetite-quartz iron formation about 15 cm thick consisting of magnetite bands with jasper laminae and lenses commonly 3 mm or less in thickness.

Magnetite and quartz are the main minerals present, constituting 55 and 30 per cent respectively of the total volume. Magnetite grains range in size from 0.1 mm in diameter in the iron-rich bands to 0.2 mm in the iron-poor laminae. Minor oxidation of magnetite to martite and goethite is evident. Quartz grains are finer, averaging 0.04 mm in diameter. Apatite, siderite, daphnite and clinochlore are minor constituents and occur in laminae with magnetite and quartz; light green clinochlore has replaced some iron-bearing daphnite that exhibits a brownish tint in thin sections. Apatite crystals are 0.03 to 0.15 mm in length and constitute nearly 5 per cent of the sample by volume. The hematite content is about 3 per cent; the grains are very fine blades (0.005 mm in length) and are arranged in a subparallel pattern. Trace constituents include pyrite, galena, sphalerite, chalcopyrite and bornite, commonly occurring as disseminated grains but with galena showing an affinity for the jasper laminae.

FeR-2 Location: North End of North Pit, Griffith Mine, Bruce Lake, Ontario

Magnetite-quartz iron formation occurring within greywacke of Archean age has been mined at this property since 1968. The geology of the deposits and area has been described by Shklanka (1970). The geological environment is typical of many metasediment-hosted Archean iron formation occurrences, and should be reflected in the aluminum, magnesium, potassium and titanium content of the bulk sample, which was acquired from a 40 cm bed of intensely folded, fine grained, laminated iron formation containing intercalated amphibolite and metagreywacke.

Magnetite makes up about 25 per cent of the sample by volume and occurs as subhedral to euhedral grains ranging in size from 0.03 to 0.15 mm and averaging 0.07 mm. It is concentrated in laminae that are commonly less than 1 mm thick, but which thicken at the crests of folds. Amphibole and quartz are the major gangue minerals, with both green hornblende and bluish green amphibole present as prismatic crystals up to 2 mm in length that in many places enclose fine grained magnetite and quartz. Parallel blades of biotite occur with almandine in magnetite-poor layers. Irregular almandine crystals intergrown with biotite, and chlorite pseudomorphs in biotite were observed. Accessory minerals present include apatite, hematite, pyrite, marcasite, pyrrhotite and chalcopyrite; no titanium-bearing minerals were identified in the thin or polished sections from the representative samples.

FeR-3, FeR-4 Location: Sherman Mine, Temagami, Ontario

The Sherman Mine property encompasses deposits on the north and south limbs of the Tetapaga syncline in a sequence containing metavolcanic and pyroclastic rocks. Bennett (1978) has described the geology of the area and the main mineral deposits. Sample FeR-3 was taken from the west pit in the north limb of the syncline and consisted of several large blocks of loose material obtained from the floor of the pit, composed chiefly of quartz and magnetite with a minimum of intercalated material. The chert bands in the bulk sample range from dark grey to maroon to the bright red jasper variety for which this mine is noted.

Quartz is the most abundant mineral present and occurs as microcrystalline grains of 0.02 to 0.08 mm diameter with 120° triple-point junctions. Subhedral to euhedral magnetite grains averaging 0.04 mm are concentrated in laminae or bands up to 2 cm in thickness with associated carbonate, stilpnomelane, chlorite and sericite. Stilpnomelane shows strong green pleochroism in thin section and in some places has micaceous habit with sheets up to 0.02 mm in length. Chlorite and sericite are disseminated or form irregular aggregates. Bladed hematite grains less than 0.01 mm in length occur as dusty inclusions, particularly in quartz; in jasper layers they tend to be oriented and form microlaminae. Trace amounts of apatite, pyrite and ilmenite were observed.

Sample FeR-4 was taken in the south pit from a 44 cm thick bed of cherty magnetite iron formation that contained interbanded chloritic tuff. Carbonate fracture fillings are apparently late and the distribution of much of the pyrite present seems to be related to them.

The mineral assemblage in this sample is similar to that in FeR-3, but the proportions of the minerals differ, and the texture is generally coarser. Grain size in the quartz bands ranges from 0.05 to 0.3 mm with veinlets containing crystals up to 2 mm in diameter. Magnetite is concentrated in laminae and bands up to 2 cm in thickness. It is commonly subhedral to euhedral with grains varying in size from 0.02 to 0.1 mm. The tuffaceous bands contain quartz, chlorite and carbonate. Siderite is present as thin layers on either side of magnetite bands with chlorite and sericite occurring within them. Minor amounts of pyrite, apatite and chalcopyrite were observed, but hematite is rare.

COLLABORATIVE ANALYSIS

A number of laboratories which had shown competence in the collaborative analysis of other reference rocks were invited to analyze FeR-1, -2, -3 and -4. Invitations were also extended to a number of Canadian Provincial institutions, to laboratories with experience in the analysis of iron-rich materials and to several others that indicated interest in participating in this work. In all, over 80 laboratories were approached, of which 54 agreed to provide data. This report is based on the work of 32 of those participating groups, those whose results were received within a year of the initial distribution of the samples. Some of those that have not reported to date have promised to send results in the near future; additional data may also be expected from some who have already reported. A later report, with possible additional and improved concentration values, may therefore be necessary.

It became clear very soon after the arrival of the first results that the analysis of these samples involved considerable difficulty. The very high iron contents were the main problem. Analysts with experience in iron ores were able to provide good results for the major and minor constituents, but their familiarity with trace-element analysis was generally severely limited. Similarly, experienced rock analysts were not used to handling such high iron contents, with their potential interference in the determination of other elements, again particularly the trace elements.

In view of the above, it is gratifying to note that the degree of dispersion of reported results appears to be no worse than has been observed in programs involving more familiar rock compositions.

Homogeneity

Before the samples were distributed, portions of each of the four samples, taken near the beginning, the middle and the end of the final bottling operations, were analyzed by a variety of techniques as a test of homogeneity. Two subsamples from each of the three bottles of each sample were analyzed in a randomized sequence, and the results subjected to analysis-of-variance computations. No significant evidence of inhomogeneity was observed.

Ideally, every participating laboratory would have been requested to use a similar replication scheme. However, it was decided not to do so, mainly because of the large numbers of constituents of interest. Multiplying the requirements by six might well have discouraged some laboratories from participating. All participants were therefore provided with only one bottle of each sample, except where more were specifically requested.

One laboratory reported evidence of inhomogeneity in two major constituents, silica and total iron, but not in ferrous iron. Careful study of their data, however, suggested that a misunderstanding may have occurred and that the observed variability could have been due to a failure to mix the contents of each bottle before taking a subsample, or to imprecision in instrumental measurements.

Another laboratory, working with only one bottle of each sample, reported evidence of within-bottle inhomogeneity in sample FeR-1, despite attempts at homogenization by prolonged mixing. At their request, they were provided with three additional bottles of each of the four samples, which they then analyzed by a replicate scheme similar to that described above. Again, no significant evidence of inhomogeneity was observed. It is noteworthy that the analysis done in that laboratory was mainly for trace elements, based on optical emission spectroscopy; those done in our own laboratories (mainly for major and minor constituents) were largely based on x-ray fluorescence and atomic absorption, yet all indicated adequate homogeneity in all four samples.

The Raw Data

Table 1* lists analytical results for samples FeR-1 and -2; Table 2** for FeR-3 and -4.

The "Code" listed in those tables is intended to indicate the source of each result and the analytical method by means of which it was obtained. The first two digits represent the laboratory number. The three letters that follow indicate the three "unit operations" of analysis as follows:

(1) *Sample Pretreatment*
- B pelletization
- F fusion, sintering
- H acid decomposition
- O none used or specified

(2) *Separations (if any)*
- C chromatography, ion exchange
- D fractional distillation
- P precipitation, leaching
- V bulk volatilization
- Y solvent extraction
- Z electrodeposition
- O none used or specified

* See p. 7-19
** See p. 21-31

(3) *Final Measurement*

A atomic absorption or fluorescence
E flame or plasma emission
G gravimetric
J absorptiometric, fluorimetric
K gas volumetric
L electrometric, ion-selective electrode, polarographic
M mass spectrometric
R radiometric, nuclear activation
S D.C. arc emission
T titrimetric, coulometric
X x-ray fluorescence
Dif by difference
O not specified

The above method code is intended to convey more information than the cryptic "AAS', 'XRF", etc. often found in other compilations of analytical data. It is, however, far from comprehensive. Thus there is nothing to indicate methods of calibration or of data reduction (e.g. matrix corrections). Further, the code is not finely resolved in terms of the various possibilities represented by each code letter – e.g. identity of flux or acid in a decomposition, reagents used in separations, conditions of activation and counting in nuclear methods, etc. Where two different procedures used in the same laboratory are represented by the same code, a numerical suffix has been added. Further details of the methods, where known, are given in the Appendix, with sufficiently fine resolution to distinguish them from one another.

The code should provide sufficient information in Tables 1 and 2 to indicate methodological bias, if any. Although individual laboratories are not identified with their code numbers, each should have little difficulty in recognizing its own results and in comparing them with those from other laboratories. To facilitate such comparisons, the data in Tables 1 and 2 are arranged in descending order of magnitude.

In a few cases, the figures in Tables 1 and 2 differ slightly from those originally reported. The discrepancies may be due to differences in rounding procedures, elimination of outliers, or even to simple error. Contributors are requested to point out such errors.

The figures in parentheses in Tables 1 and 2 show the number of separate determinations upon which the reported value is based. Absence of such a figure indicates that such information was not reported.

DERIVATION OF COMPOSITION VALUES

The analytical data reported on the four FeR samples exhibit the wide disparities that have come to be expected in collaborative work on rocks. Fortunately, two common sources of difficulty were practically absent in the case of these samples, namely the difference between "as received" and "as dried" results, and the difference between carbonate and noncarbonate carbon. Very few laboratories reported H_2O^- results, all of them very low – well under 0.1 per cent. Where such results were reported, and there was no indication that such a correction had already been made, all other results were corrected to the dry basis. The effects were essentially negligible. There was therefore no great risk in assuming that all other results were, in effect, on the dry basis. Similarly, no marked differences were observed, in apparent CO_2 contents, between data produced by acid evolution and those by combustion. In the only case where a laboratory used both approaches, a small but measurable difference was observed in FeR-4. However, that difference was not considered sufficient to justify assigning a separate value for noncarbonate carbon.

With ores and other materials where the constituents of interest are few in number and the participating analysts are thoroughly familiar with the type of material, such discrepancies are less pronounced; usable consensus values can readily be established by averaging the available data, after eliminating outliers.

Because of the large number of major, minor and trace constituents for which values are sought in rock analysis, a large number of laboratories must be involved in a collaborative program. Few, if any, laboratories are equipped to determine all the constituents required. As a result of varying competence between laboratories (and for various constituents within each laboratory), disparate data are quite common.

Many schemes have been proposed for resolving such disparities, involving the use of arithmetic means (with or without rejection of outliers), geometric means, medians, modes, etc. A comparison between those approaches has been described elsewhere (Abbey, 1983), where detailed information may also be found on the rationale behind the "select laboratories method" used in this work.

Briefly, the select laboratories method treats available data in two ways:

(a) Where fewer than 10 results are available for a particular constituent, the decision whether or not to assign a value is based on the number of reported results, their degree of concurrence and the variety of analytical methods used. The value assigned is generally based on the median, occasionally after the elimination of obvious outliers. Being based on two subjective choices, such values are highly uncertain and are therefore always listed with question marks.

(b) Where 10 or more results are available, the median (M), the mean ($\bar{x}$) and standard deviation (s) are computed. Individual results (x), where $x<(\bar{x}-s)$ or $x>(\bar{x}+s)$, are classified as "poor", and "poor" marks are scored for each laboratory that reported them.

Using values of x, where $(\bar{x}-s)<x<(\bar{x}+s)$, a new mean ($\bar{x}_1$) and standard deviation (s_1) are then computed. Individual results (x), where $x<(\bar{x}_1-s_1)$ or $x>(\bar{x}_1+s_1)$, are classified as "fair", and corresponding marks scored for the appropriate laboratories.

Values of x, where $(\bar{x}_1-s_1)<x<(\bar{x}_1+s_1)$ are considered "good", and appropriate marks scored for the contributing laboratories.

It should be recognized that the categorization of results as "good", "fair" or "poor" in this method does not necessarily reflect the quality of the results concerned, but merely their positions within the distribution of all available results.

For each participating laboratory, the total numbers of good (G), fair (F) and poor (P) results are used to calculate a "laboratory rating" (R), using the formula

$$R = \frac{G-P}{G+F+P} \times 100.$$

The laboratories are then listed in descending order of rating. Only results from laboratories with ratings above a specified level (see Abbey, 1983) are considered "select values". Medians (M_s) and means ($\bar{x}_s$) of the select values are computed for each constituent, occasionally after removal of outliers. A subjective choice between M_s and $\bar{x}_s$ is made on the basis of their effect on the summation and on the "mutual compatibility of iron oxides". The latter requirement is a measure of the closeness together of total iron values calculated from reported results for total iron (Fe_2O_3TR) and those calculated from reported results for ferrous and ferric iron (Fe_2O_3TC).

Again, it must be realized that the laboratory ratings do not necessarily reflect the quality of work done in particular laboratories. For example, among those using nuclear activation techniques, the majority of reported results were for those trace elements where fewer than 10 results were available and such results did not contribute to the laboratory ratings. The few results from those laboratories for constituents where 10 or more results were available were generally for major constituents, where activation-based methods are relatively imprecise. Such laboratories may well achieve very low ratings in terms of such constituents, but their results for the more poorly represented trace elements are highly valuable.

Tables 3 to 6* inclusive give the statistical parameters of the distributions of all available results,
where n = total number of results reported,
n_1 = number of results between $(\bar{x}+s)$ and $\bar{x}-s)$
and other symbols are as defined above.

Laboratory ratings are listed in Table 7**,
where G, F and P are as defined above,
N = G+F+P,
ΣN = cumulative sum of N values,
and R = laboratory rating.

Tables 8-11† inclusive list the additional measures used in determination of "usable values",
where n_s = number of select values
V_u = usable value
and other symbols are as defined above.

Confidence Limits

The assignment of confidence limits to the derived concentration values is not an easy task. A simple statement of "plus-or-minus one (or two) standard deviations" can result in unreasonably high uncertainties, even where outliers are rejected. Because of the highly unquantifiable systematic errors that lie behind the erratic distribution of the available data, one might well conclude that uncertainties are equally unquantifiable.

For the foregoing reasons, a different approach has been applied to results obtained by the select laboratories method.

Firstly, there is the use of the question mark where available data are insufficient to assign firm values. It will be observed that question marks have also been used for ferric and ferrous iron in Tables 8 and 10, even where the full select laboratories approach was used. That was done because the uncertainties computed as shown below were too high for the assigned values to be considered unquestionable. Similarly, the question mark would be used where $n_s<5$ and in other circumstances where it appeared to be indicated.

Where the complete select laboratories scheme is used, the assigned values are based entirely on the select values, so a case can be made for using statistical parameters of the distribution of those values to arrive at a measure of confidence. Because M_s is most frequently used as V_u, the confidence of the median is worthy of consideration. Dixon and Massey (1957, p. 294, 462) show that the 95 per cent confidence range of the median of eight or fewer measurements extends over the entire range of measurements. For nine to eleven, the range extends over all but the highest and the lowest values; for 12 to 14, over all but the two highest and two lowest values. Those rules have been applied in Tables 8 to 11 wherever M_s was taken as V_u.

Where $\bar{x}_s$ was taken as V_u, the 95 per cent confidence of the mean was computed according to Dixon and Massey (1957, p. 127, 384), where the confidence range is expressed as a simple function of the number of data points, the standard deviation and the desired degree of confidence.

Where M_s is used as V_u, the upper and lower limits of confidence are actual reported values; the range is therefore not necessarily symmetrical about V_u. Where $\bar{x}_s$ is used, the upper and lower limits are, by definition, symmetrical about V_u. These differences are readily apparent in Tables 8 to 11, where separate values are listed for the portions of the confidence ranges below and above V_u. In cases where M_s and $\bar{x}_s$ are essentially identical, the confidence range of $\bar{x}_s$ was given precedence.

Once more, it must be emphasized that the confidence limits are based entirely on the Dixon and Massey rules as applied to the select values. They are not in accordance with rigorous statistical operations on all available data (whose results are not always in accord with one another), but merely a realistic attempt to assign meaningful limits in a highly unquantifiable situation.

Finally, the most probable compositions of the four samples, as derived by the select laboratories method, are listed in Table 12††.

CONCLUSION

As pointed out in the Introduction, no other established reference samples of iron formation, nor of iron ores with firm trace-element values, are available from other sources. At this writing, IF-G, the iron formation from Greenland, is undergoing collaborative analysis by an International Working Group; further information is expected to appear in Geostandards Newsletter late in 1983 or in 1984. Samples FeR-1 to -4 should therefore be of great use to geoanalysts concerned with iron-rich materials. Their usefulness will likely be greatly enhanced when applied together with IF-G.

On the other hand, certain aspects of the present work are disappointing. There are far too many question marks in Table 12, probably the result of the fact that fully 40 per cent of the laboratories that received the samples had provided no results by the end of 1982. Some of those who reported results did so for a very limited number of constituents. One hopes that additional data will be forthcoming from both groups in the near future. Also, as the samples become more widely distributed, analytical data on them will likely appear in the literature. Past experience suggests that sufficient additional data may become available in two or three years to justify a re-evaluation, in order to provide usable values for additional elements and to upgrade the values already established. This paper must therefore be considered as an interim report.

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* See p. 32, 34, 36, 38
** See p. 40
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NOTE

The set of four samples, with a copy of this paper (Geological Survey of Canada Paper 83-19), are available for $125. Purchase orders should be addressed to:

Co-ordinator
Canadian Certified Reference Materials Project
Canada Centre for Mineral and Energy Technology
555 Booth Street
Ottawa, Ontario, Canada
K1A 0G1
Phone: (613) 995-4738
Telex: 053-3395

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The original and one copy of the following documents will be furnished:

- commercial invoices
- packing list
- postal receipt for material shipped by international air parcel post
- airway bill

REFERENCES

Abbey, S.
1983: Studies in "standard samples" of silicate rocks and minerals, 1969-1982; Geological Survey of Canada, Paper 83-15.

Ayranci, B.
1977 The major-, minor- and trace-element analysis of silicate rocks and minerals from a single sample solution; Schweizerische Mineralogische und Petrographische Mitteilungen, v. 57, p. 299-312.

Bennett, G.
1978: Geology of the northeast Temagami area, Ontario; Ontario Geological Survey, Report 163, 128 p.

Dixon, W.J. and Massey, F.J., Jr.
1957: Introduction to Statistical Analysis, 2nd edition, McGraw-Hill.

Feather, C.E. and Willis, J.P.
1976: A simple method for background and matrix correction of spectral peaks in trace element determination by X-ray fluorescence spectrometry; X-ray Spectrometry, v. 5, p. 41-48.

Govindaraju, K., Mevelle, G. and Chouard, C.
1976: Automated optical emission spectrochemical bulk analysis of silicate rocks with microwave plasma excitation; Analytical Chemistry, v. 48, p. 1325-1331.

Hanna, A.G., Brugger, R.M. and Glascock, M.D.
1981: The prompt gamma neutron activation facility at M.U.R.R. (Missouri University Research Reactor); Nuclear Instrumentation Methods, v. 188, p. 619-627.

McLeod, C.R., Wan Liang-guo and Abbey, S.
1982: Mineralogy and petrology of four "standard" samples of iron formation; in Current Research, Part A, Geological Survey of Canada, Paper 82-1A, p. 435-437.

Norrish, K. and Hutton, J.T.
1969: An accurate x-ray spectrographic method for the analysis of a wide range of geological samples; Geochimica et Cosmochimica Acta, v. 33, p. 431-453.

Peck, L.C.
1964: Systematic analysis of silicates; U.S. Geological Survey Bulletin 1170, 89 p.

Saif, S.I.
1980: Petrographic and geochemical investigation of iron formation and other iron-rich rocks in Bathurst District, New Brunswick; in Current Research, Part A, Geological Survey of Canada, Paper 80-1A, p. 309-317.

Shklanka, R.
1970: Geology of the Bruce Lake area; Ontario Division of Mines, Geological Report 82, 27 p.

Skinner, R.
1974: Geology of Tetagouche Lakes, Bathurst, and Nepisiguit Falls map-areas, New Brunswick; Geological Survey of Canada, Memoir 371, 133 p.

Uitterdijk Appel, P.W.
1980: Need for an iron-formation reference sample; Geostandards Newsletter, v. 4, no. 1, p. 19.

Voldet, P. and Haerdi, W.
1976: Determination of europium and dysprosium in rocks by neutron activation and high-resolution X-ray spectrometry; Analytica Chimica Acta, v. 87, p. 227-231.

1978: Determination of rare-earth elements in rocks by neutron activation followed by high-resolution X-ray spectrometry or gamma spectrometry; Analytica Chimica Acta, v. 97, p. 185-189.

Table 1: Reported results, samples FeR-1 and FeR-2 (See "Raw Data", p. 2-3)

Constituent (units)	FeR-1 Code	FeR-1 Result	FeR-2 Code	FeR-2 Result
SiO_2 (pct)	74-HOE	20.9	45-FOA	52.3(3)
	45-FOA	18.64(3)	46-FOX	49.6(2)
	31-OOA	18.47(3)	60-FOX	49.6(3)
	31-HOA-1	17.84(3)	40-FOE	49.59(5)
	46-FOX	17.7(3)	53-FPG	49.56(2)
	40-FOE	17.68(5)	43-FPG	49.56
	43-FPG	17.32	18-FPG	49.51(3)
	31-HOA-1	17.29(3)	33-FOJ	49.32(3)
	55-FOE	17.23(2)	53-FOE	49.3(3)
	33-FOJ	17.13(3)	42-FPG	49.24(3)
	53-FOE	17.1(3)	15-FOX	49.09(3)
	05-OOR	17.1(2)	85-FPG-1	49.06(4)
	53-FPG	17.06(2)	55-FOE	48.99(2)
	18-FPG	17.03(3)	01-FOX	48.93(6)
	31-HOE-1	17.02(3)	84-FCX	48.92(2)
	85-FPG-1	16.99(4)	41-FPG	48.9(2)
	56-FOX	16.99(4)	70-FOE-1	48.80(2)
	70-FOE-1	16.93(2)	31-HOA-1	48.73(12)
	42-FPG	16.81(6)	61-FOX	48.7(6)
	41-FPG	16.8(2)	15-FPG	48.60(3)
	84-FCX	16.78(2)	56-FOX	48.50(4)
	61-FOX	16.7(6)	16-FPG	48.49(2)
	01-FOX	16.68(6)	51-FOX	48.3(2)
	60-FOX	16.6(3)	74-HOE	47.9
	15-FPG	16.38(3)	31-HOE-1	47.87(7)
	16-FPG	16.24(2)	07-OOR-3	47.5(4)
	51-FOX	16.2(2)	05-OOR	47.1(2)
	10-FOX	15.8	10-FOX	46.4
	07-OOR-3	15.2(4)	31-OOA	45.17(3)
TiO_2 (pct)	55-FOE	0.10(2)	10-FOX	0.25
	18-HOJ-1	.08(3)	53-OOJ	.22(2)
	33-HOJ-1	.08(3)	55-FOE	.21(2)
	31-OOA	.043(3)	31-OOA	.21(3)
	60-FOX	.04(3)	31-HOA-2	.20(8)
	01-FOX	.04(6)	31-HOE-1	.20(4)
	43-FPJ	.04	31-HOE-2	.20(4)
	46-FOX	.04(3)	15-FOX	.20(3)
	74-HOE	.033	60-FOX	.20(3)
	61-FOX	.03(6)	07-OOR-3	.20(4)
	84-FCX	.03(2)	46-FOX	.194(3)
	05-OOR	.030(2)	61-FOX	.19(6)
	16-FPJ-2	.03(2)	43-FPJ	.19
	31-HOA-1,-2	.03(3)	84-FCX	.19(2)
	70-FOE-2	.021(2)	26-HOA	.190
	42-FOA	.02(6)	33-HOJ-1	.19(3)
	85-HOJ-1	.02(4)	01-FOX	.19(6)
	40-FOE	.02(3)	05-BOX-2	.19
	70-HOE-2	.018(2)	85-HOJ-1	.18(4)
	56-FOX	.015(4)	53-HYE	.18(3)
	26-HOA	.014	70-HOE-2	.18(2)
	31-HOE-1	.01(3)	70-FOE-2	.18(2)
	41-HOJ	.003	40-FOE	.18(3)
			74-HOE	.178
			42-FOA	.17(6)
			51-FOX	.17(2)
			53-FOE	.17(3)
			56-FOX	.16(4)
			18-HOJ-1	.14(3)
			16-FPJ-2	.14(2)
			05-BOX-1	.10
			41-HOJ	.025

Table 1 (cont.)

Constituent (units)	FeR-1 Code	FeR-1 Result	FeR-2 Code	FeR-2 Result
Al_2O_3 (pct)	07-OOR-3	2.5(4)	07-OOR-3	7.6(4)
	51-FOX	1.16(2)	41-FPA	5.63
	55-FOE	0.64(2)	55-FOE	5.57(2)
	56-FOX	.56(4)	07-OOR-1	5.56(5)
	60-FOX	.55(3)	51-FOX	5.50(2)
	07-OOR-1	.542(5)	43-FPG	5.48
	42-FOA	.54(6)	06-OOR	5.43
	16-FPA-1	.54(2)	56-FOX	5.42(4)
	41-FPA	.53	45-FOA	5.31(3)
	06-OOR	.52	26-HOA	5.29
	33-HOA-2	.52(3)	18-FOA	5.25(3)
	40-FOE	.51(5)	31-OOA	5.22(3)
	85-FYT	.50(4)	31-HOE-2	5.20(2)
	18-FOA	.50(3)	61-FOX	5.2(6)
	61-FOX	.5(6)	19-OVS	5.2(6)
	31-HOE-1	.50(3)	60-FOX	5.2(3)
	84-FCX	.48(2)	31-HOE-1	5.18(4)
	31-HOA-2	.48(9)	84-FCX	5.17(2)
	31-OOA	.47(3)	01-FOX	5.16(6)
	10-FOX	.47	16-FPA-1	5.15(2)
	74-HOE	.468	53-FOE	5.15(3)
	70-FOE-2	.463(2)	85-FYT	5.12(4)
	19-OVS	.46(6)	33-HOA-2	5.12(3)
	46-HOE	.45(6)	05-OOR	5.1(2)
	26-HOA	.43	53-HYE	5.09(3)
	45-FOA	.41(3)	31-HOA-2	5.09(8)
	05-OOR	.38(2)	40-FOE	5.08(5)
	01-FOX	.36(6)	70-FOE-2	4.97(2)
	70-HOE-2	.22(2)	15-FOX	4.96(3)
			70-HOE-2	4.94(2)
			42-FOA	4.84(6)
			46-HOE	4.69(6)
			10-FOX	4.57
			46-FOX	4.56(3)
			74-HOE	4.40
Fe_2O_3 (pct)	56-Dif	55.5(4)	31-Dif	26.03(3)
	70-Dif	54.2	84-Dif	24.79(2)
	84-Dif	51.86(2)	31-Dif	24.52
	16-Dif	50.93	31-Dif	24.48
	16-Dif	50.65	70-Dif	24.0
	16-Dif	50.49	56-Dif	23.9(4)
	51-Dif	50.3	61-Dif	23.12(6)
	60-Dif	49.9	16-Dif	23.10
	61-Dif	49.89(6)	31-Dif	23.02
	85-Dif	49.86	51-Dif	23.0
	42-Dif	49.78(6)	16-Dif	22.67
	33-Dif	49.68	16-Dif	22.58
	53-Dif	49.64(3)	85-Dif	22.53
	43-Dif	49.32	60-Dif	22.5(3)
	15-Dif	49.10(5)	33-Dif	22.47
	18-Dif	48.97(3)	18-Dif	22.30(3)
	31-Dif	48.97	43-Dif	22.28
	41-Dif	48.96(2)	42-Dif	22.27(6)
	31-Dif	47.78(3)	41-Dif	22.05(2)
	31-Dif	47.77	15-Dif	21.95(5)
			31-Dif	21.90
			53-Dif	21.12(3)

Table 1 (cont.)

Constituent (units)	FeR-1 Code	FeR-1 Result	FeR-2 Code	FeR-2 Result
FeO (pct)	18-HOT-2	24.1(3)	53-HOT	16.04(3)
	56-HOT	23.99(4)	31-HOT	15.65(3)
	31-HOJ	23.97(3)	15-HOT	15.59(5)
	41-HOT-1	23.82(2)	31-HOJ	15.55(3)
	31-HOJ	23.82(12)	31-HOJ	15.54(12)
	15-HOT	23.75(5)	18-HOT-2	15.5(3)
	31-HOT	23.71(3)	51-HOT	15.4(3)
	33-HOT	23.55	33-HOT	15.40
	70-HOT	23.55(2)	41-HOT-1	15.37(2)
	60-HOT	23.4(3)	60-HOT	15.3(3)
	85-HOT-2	23.34(4)	70-HOT	15.3(3)
	43-HOT	23.33	85-HOT-2	15.28(4)
	42-HOT	23.31(6)	43-HOT	15.24
	53-HOT	23.25(3)	42-HOT	15.21(6)
	61-HOT-1	23.2(6)	16-HOT	14.78(2)
	51-HOT	23.1(3)	56-HOT	14.67(4)
	16-HOT	22.70(2)	61-HOT-1	14.6(6)
	84-000	21.89(2)	84-000	12.78(2)
MnO (pct)	07-OOR-1	0.31(5)	26-HOA	0.236
	60-FOX	.30(3)	05-BOX-2	.19
	05-BOX-2	.27	07-OOR-1	.17(5)
	61-FOX	.26(6)	60-FOX	.15(3)
	51-FOX	.26(2)	61-FOX	.14(6)
	55-FOE	.26(2)	53-FPJ-1	.14(2)
	84-FCX	.26(2)	07-OOR-3	.14(4)
	46-HOA	.248(3)	31-OOA	.14(3)
	53-FPJ-1	.24(2)	46-HOA	.132(3)
	01-FOX	.24(6)	55-HOE	.13(2)
	31-HOA-1	.24(3)	31-HOE-1	.13(4)
	31-HOE-1	.24(3)	70-FOE-2	.13(2)
	46-HOE	.236(6)	46-HOE	.128(6)
	74-HOE	.236	41-HOA-1	.125
	70-FOE-2	.234(2)	74-HOE	.123
	16-FPA-3	.23(2)	31-HOE-2	.122(4)
	56-FOX	.23(4)	85-HYA	.12(4)
	07-OOR-3	.23(4)	84-FCX	.12(2)
	31-OOA	.23(3)	70-HOE-2	.12(2)
	85-HYA	.23(4)	56-FOX	.12(4)
	41-HOA-1	.228	53-HYE	.12(3)
	31-HOA-2	.22(3)	53-FOE	.12(3)
	40-FOE	.22(3)	53-HYA	.12(3)
	18-HOA	.22(3)	51-FOX	.12(2)
	42-FOA	.22(6)	45-FOA	.12(3)
	53-HYE	.22(3)	43-HOJ	.12
	53-FOE	.22(3)	42-FOA	.12(6)
	52-HYA	.22(3)	40-FOE	.12(3)
	43-HOJ	.22	33-HOA-1	.12(3)
	70-HOE-2	.22(2)	31-HOA-1	.12(8)
	33-HOA-1	.21(3)	18-HOA	.12(3)
	45-FOA	.19(3)	16-FPA-3	.12(2)
	01-HOA-1	.18(5)	01-FOX	.12(6)
	19-OVS	.15(6)	15-FOX	.11(3)
	05-BOX-1	.14	01-HOA-1	.10(6)
	26-HOA	.124		

Table 1 (cont.)

Constituent (units)	FeR-1 Code	FeR-1 Result	FeR-2 Code	FeR-2 Result
MgO (pct)	56-FOX	0.52(4)	07-OOR-1	6.57(5)
	51-FOX	.49(2)	51-FOX	4.17(2)
	05-OOR	.36(2)	56-FOX	2.35(4)
	31-OOA	.35(3)	31-OOA	2.32(3)
	31-HOA-2	.35(6)	31-HOA-2	2.32(12)
	10-FOX	.35	19-OVS	2.3(6)
	16-FPA-2	.33	01-FOX	2.21(6)
	61-FOX	.32(6)	70-HOE-2	2.19(2)
	33-FOA	.32(3)	31-HOE-1	2.16(4)
	31-HOE-1	.32(3)	53-FOE	2.15(3)
	31-HOE-2	.32(3)	18-FOA	2.13(3)
	43-FPG	.31	16-FPA-2	2.12(2)
	60-FOX	.3(3)	61-FOX	2.12(6)
	40-FOE	.30(3)	42-FOA	2.11(6)
	74-HOE	.297	43-FPG	2.11
	85-HYA	.29(4)	85-HYA	2.10(4)
	18-FOA	.29(3)	60-FOX	2.1(3)
	53-FOE	.28(3)	33-FOA	2.10(3)
	53-HYA	.28(3)	45-FOA	2.1(3)
	41-HOA-2	.28	53-HYA	2.08(3)
	01-FOX	.28(6)	84-FCX	2.07(2)
	70-HOE-2	.28(2)	40-FOE	2.03(3)
	42-FOA	.27(6)	41-HOA	2.02
	84-FCX	.27(2)	55-FOE	2.02(2)
	70-FOE-2	.252(2)	70-FOE-2	2.02(3)
	47-HOE	.25(6)	15-FOX	1.99(3)
	53-HYE	.25(3)	74-HOE	1.95
	45-FOA	.24(3)	46-HOE	1.76(6)
	55-FOE	.17(2)	05-OOR	1.65(2)
			10-FOX	1.58
CaO (pct)	55-FOE	4.00(2)	51-FOX	2.62(2)
	31-OOA	4.0(3)	16-FPG	2.40(2)
	51-FOX	3.90(2)	31-OOA	2.35(3)
	10-FOX	3.62	10-FOX	2.32
	05-OOR	3.58(2)	19-OVS	2.3(6)
	45-FOA	3.53(3)	31-HOA-2	2.28(12)
	05-BOX-2	3.44	61-FOX	2.27(6)
	61-FOX	3.42(6)	18-FOA	2.22(3)
	05-BOX-1	3.41	43-FPG	2.20
	84-FCX	3.41(2)	84-FCX	2.20(2)
	18-FOA	3.38(3)	07-OOR-3	2.2(4)
	31-HOE-1	3.37(3)	45-FOA	2.2(3)
	43-FPG	3.34	15-FOX	2.20(3)
	01-FOX	3.33(6)	42-FOA	2.17(6)
	56-FOX	3.32(4)	60-FOX	2.17(3)
	46-HOE	3.32(6)	01-FOX	2.17(6)
	74-HOE	3.31	85-HYA	2.16(4)
	60-FOX	3.31(3)	46-HOE	2.16(6)
	16-FPG	3.29	56-FOX	2.14(4)
	33-FOA	3.29(3)	70-FOE-2	2.14(2)
	85-HYA	3.28(4)	55-FOE	2.13(2)
	70-FOE-2	3.25(2)	33-FOA	2.12(3)
	31-HOA-2	3.23(6)	31-HOE-1	2.12(4)
	31-HOE-2	3.23(3)	26-HOE	2.11
	07-OOR-3	3.2(4)	70-HOE-2	2.10(2)
	53-HYE	3.20(3)	40-FOE	2.08(3)
	40-FOE	3.19(3)	41-HOA-2	2.03
	42-FOA	3.15(6)	46-FOX	2.03(3)
	26-HOE	3.14	74-HOE	2.01
	53-FOE	3.14(3)	53-FOE	2.01(3)
	46-FOX	3.13(3)	53-HYE	1.98(3)
	41-HOA-2	3.10	05-BOX-1	1.86
	70-HOE-2	3.04(2)		

Table 1 (cont.)

Constituent (units)	FeR-1		FeR-2	
	Code	Result	Code	Result
Na_2O (pct)	46-HOE	0.42(6)	07-OOR-3	0.74(4)
	07-OOR-3	.34(4)	46-HOE	.69(6)
	01-FOX	.31(6)	01-FOX	.63(6)
	16-HOE	.16(2)	16-HOE	.57(2)
	18-HOE-1	.05(3)	26-HOE	.568(2)
	43-FOA	.05	18-HOE-1	.56(3)
	40-FOE	.04(3)	84-FOA	.55(2)
	84-FOA	.04(2)	42-FOA	.53(6)
	31-HOA-2	.023(6)	55-FOE	.53(2)
	42-FOA	.02(6)	40-FOE	.52(3)
	31-OOA	.02(3)	31-HOE-1	.52(4)
	55-FOE	.02(2)	06-OOR	.52(8)
	41-HOA-3	.012	31-HOA-2	.50(12)
	85-HOA	.01(4)	74-HOE	.500
	45-FOA	.01(3)	60-FOX	.5(3)
	31-HOE-1	.01(3)	19-OVS	.50(6)
	56-HOA	.009(4)	70-FOE-2	.50(2)
	20-OOR-2	.008(3)	85-HOA	.49(3)
	26-HOE	.007(2)	56-HOA	.48(4)
	74-HOE	.0053	20-OOR-2	.48(3)
			51-HOA	.473(3)
			33-FOA	.47(3)
			31-OOA	.47(3)
			43-FOA	.47
			70-HOE-2	.47(2)
			41-HOA-3	.462
			45-FOA	.44(3)
			61-FOX	.4(6)
K_2O (pct)	61-FOX	0.06(6)	05-BOX-1	1.78
	43-FOA	.06	55-FOE	1.45(2)
	16-HOE	.05(2)	16-HOE	1.44(2)
	01-FOX	.03(6)	61-FOX	1.39(6)
	85-HYA	.03(4)	01-FOX	1.38(6)
	31-OOA	.025(3)	18-HOE-1	1.37(3)
	40-FOE	.02(3)	07-OOR-1	1.35
	42-FOA	.02(6)	84-FCX	1.35(2)
	45-FOA	.02(3)	85-HYA	1.34(4)
	84-FCX	.02(2)	60-FOX	1.34(3)
	31-HOA-2	.018(12)	70-HOE-2	1.32(2)
	56-HOA	.015(4)	15-FOX	1.31(3)
	74-HOE	.012	56-HOA	1.31(4)
	26-FOE	.011(2)	43-FOA	1.30
	60-FOX	.01(3)	70-FOE-2	1.3(2)
	33-FOA	.01(3)	74-HOE	1.293
	70-HOE-2	.01(2)	42-FOA	1.29(6)
	55-FOE	.01(2)	33-FOA	1.28(3)
	41-HOA-4	.006	10-FOX	1.28
			26-FOE	1.272(2)
			40-FOE	1.26
			45-FOA	1.26(3)
			31-HOA-2	1.22(16)
			41-HOA-4	1.22
			46-FOX	1.20(3)
			31-OOA	1.13(3)
			05-BOX-2	0.78
			51-FOX	.77(2)
			01-HOA-2	.43

Table 1 (cont.)

Constituent (units)	FeR-1		FeR-2	
	Code	Result	Code	Result
H_2O^+ (pct)	53-OVG	0.74(4)	53-OVG	1.35(4)
	31-OOG	.67(3)	85-FVG	1.13(6)
	31-FVG	.65(3)	51-OVG	1.13(3)
	51-OVG	.50(3)	42-FVG	1.04(6)
	85-FVG	.49(6)	16-OVG	1.04(2)
	16-OVG	.45(3)	43-FVG	1.02
	18-FVG	.44(3)	56-OOT	0.97(4)
	42-FVG	.42(6)	18-FVG	.96(3)
	33-FVG	.42	33-FVG	.94
	43-FVG	.38	60-FVG	.8(3)
	56-OOT	.32(4)	61-FVJ	.8(6)
	60-FVG	.3(3)	31-OOG	.75(3)
	61-FVJ	.3(6)	31-FVG	.67(4)
CO_2 (pct)	53-OVG	1.80(4)	53-OVG	0.34(4)
	56-FVJ	1.53(4)	42-HVG	.09(6)
	60-FVL	1.47(3)	33-FVK	.09(2)
	31-FVT	1.43(3)	60-FVL	.08(3)
	33-FVK	1.41(2)	85-HVT	.08(4)
	43-HVT	1.41	31-FVT	.053(4)
	85-HVT	1.40(4)	61-FVJ	.05(6)
	61-FVJ	1.4(6)	31-OOT	.05(3)
	16-HVG	1.39(2)	18-FVJ-1	.04(3)
	51-HVG	1.38(3)	43-HVT	.03
	18-FVJ-1	1.37(3)	16-HVG	.02(2)
	42-HVG	1.30(6)		
	31-OOT	1.3(3)		
	61-FVJ	1.1(6)		
P_2O_5 (pct)	10-FOX	3.09	74-HOE	0.38
	01-FOX	2.69(6)	10-FOX	.34
	70-FOE-2	2.61(2)	55-HOJ	.30(2)
	19-OVS	2.6(6)	51-FOX	.29(2)
	31-HOE-1	2.54(3)	33-HOJ-2	.29(3)
	16-HOJ	2.48(2)	01-FOX	.29(6)
	18-HOJ-2	2.47(3)	16-HOJ	.28(2)
	56-FOX	2.47(4)	84-FCX	.28(2)
	46-FOX	2.44(3)	61-FOX	.28(6)
	31-HOJ-HOE?	2.44(3)	31-HOJ-2	.28(8)
	31-HOJ-2	2.44(3)	85-HOJ-3	.27(6)
	85-HOJ-3	2.44(6)	60-FOX	.27(3)
	74-HOE	2.43	70-FOE-2	.27(2)
	60-FOX	2.4(3)	40-FOE	.27(3)
	51-FOX	2.40(2)	46-HOE	.27(6)
	33-HOJ-2	2.40(3)	46-FOX	.26(3)
	61-FOX	2.38(6)	15-FOX	.26(3)
	46-HOE	2.36(6)	43-HOJ	.26
	42-HOJ	2.35(6)	31-HOE-2	.26(3)
	43-HOJ	2.35	18-HOJ-2	.25(3)
	84-FCX	2.35(2)	42-HOJ	.25(6)
	40-FOE	2.31(3)	56-FOX	.25(4)
	70-HOE-2	2.3(2)	53-FPJ-2	.25(3)
	53-FPJ-2	2.27(6)	70-HOE-2	.25(2)
			31-HOJ-HOE?	.17(3)

Table 1 (cont.)

Constituent (units)	FeR-1		FeR-2	
	Code	Result	Code	Result
F (pct)	61-FOL	0.08(6)	33-OOO	0.042
	33-OOO	.078	61-FOL	.04(6)
	18-FVJ-2	.061(3)	42-FOL	.04(6)
	60-FVL	.054(3)	18-FVJ-2	.039(3)
	42-FOL	.05(6)	60-FVL	.033(3)
	43-FOL	.05	43-FOL	.03
S (pct)	60-FOX	0.3(3)	60-FOX	0.2(3)
	42-FVJ	.28(6)	18-FVJ-1	.19(3)
	18-FVJ-1	.26(3)	42-FVJ	.18(6)
	53-FVT	.26(4)	53-FVT	.18(4)
	85-FPG-FVT-?	.26(4)	51-FVT	.17(3)
	51-FVT	.25(3)	33-FVT	.17(2)
	33-FVT	.25(2)	85-FPG-FVT-?	.17(4)
	56-FVJ	.245(4)	56-FVJ	.164(4)
	31-FVT	.243(3)	61-FVJ	.16(6)
	61-FVT	.24(6)	61-FVT	.16(6)
	43-FVJ	.22	43-FVJ	.16
	61-FVJ	.16(6)		
	46-FOX	.13(3)		
Fe_2O_3T (pct)	07-OOR-2	80.9(5)	31-HOT	43.34(3)
	70-FOE-2	80.6(2)	06-OOR	42.0
	70-FOA	80.4(2)	31-HOA	41.78(4)
	45-FOA	80.3(3)	31-HOE-1	41.74(4)
	06-OOR	80.0	70-FOE-2	41.3(2)
	05-OOR	79.86(2)	46-HOE	41.1(6)
	70-HOE-2	78.3(2)	70-HOE-2	41.0(2)
	05-BOX-2	77.9	70-FOA	41.0(2)
	46-HOE	77.1(6)	07-OOR-2	40.7(5)
	46-FOX	76.7(3)	46-FOX	40.5(3)
	33-HOA-1	76.68	10-FOX	40.5
	56-FOX	76.2(4)	31-HOJ-1	40.29(12)
	84-FOX	76.19(2)	56-FOX	40.2(4)
	16-FOT-1	76.16	51-FOX	40.1(2)
	40-FOE	76.02(5)	07-OOR-3	40.0(4)
	51-FOX	76.0(2)	15-FOX	39.92(3)
	55-FOE	75.98(2)	16-FOT-2	39.64(2)
	01-FOT	75.92(7)	45-FOA	39.6(3)
	60-FOX	75.9(3)	33-HOJ-3	39.58
	16-FOT-2	75.88(2)	85-HOT-1	39.51(6)
	33-HOJ-3	75.85	60-FOX	39.5(3)
	85-HOT-1	75.80(6)	18-HOT-1	39.48(3)
	61-HOT-2	75.74(4)	53-FOE	39.4(3)
	16-FPJ-1	75.72(2)	61-HOT-2	39.39(6)
	18-HOT-1	75.72(3)	61-HOT-2	39.31(6)
	07-OOR-3	75.7(4)	15-HPT	39.27(5)
	42-FOT	75.68(6)	01-FOT	39.24(7)
	61-HOT-2	75.60(4)	43-HOT	39.22
	15-HPT	75.49(5)	33-HOA-1	39.21
	53-FPT	75.48(3)	16-FOT-1	39.21
	41-HOT-2	75.46(2)	42-FOT	39.17(6)
	31-HOJ-2	75.44(6)	31-HOJ-1	39.16(4)
	53-FOE	75.4(3)	41-HOT-2	39.14(2)
	43-HOT	75.24	16-FPJ-1	39.12(2)
	01-FOX	74.90(6)	84-FOX	38.99(2)
	61-FOX	74.8(6)	53-FPT	38.95(3)
	74-HOE	74.4	01-FOX	38.85(6)
	31-HOT	74.27(3)	40-FOE	38.76(5)
	31-HOJ-1	74.24(9)	55-FOE	38.75(2)
	10-FOX	73.1	74-HOE	38.7
	10-HOA	73.1	61-FOX	38.6(6)
	20-OOR-2	72.1(3)	10-HOA	38.2
	05-BOX-1	60.8	20-OOR-2	38.0(3)
			05-OOR	37.40(2)
			05-BOX-2	35.9
			05-BOX-1	28.7

Table 1 (cont.)

Constituent (units)	FeR-1 Code	FeR-1 Result	FeR-2 Code	FeR-2 Result
Ag (ppm)	19-OVS	10(6)	19-OVS	0.2
	01-HOA-2	4.2		
As (ppm)	07-OOR-2	7.74(5)	50-FVJ	2.2(3)
	50-FVJ	6.9(3)	07-OOR-2	2.14(5)
	63-OVA-1	6.4(3)	18-FVA-1	2.0(3)
	18-FVA-1	5.2(3)	63-OVA-1	1.8(3)
	16-BOX	3	16-BOX	1
B (ppm)	07-OOR-3	0.3(4)	07-OOR-3	62(4)
			50-FYJ	60(3)
Ba (ppm)	70-HOE-2	1600(2)	70-HOE-2	360(2)
	05-OOR	1300(2)	06-OOR	350
	16-BOX	1240	16-BOX	290
	06-OOR	1170	42-OOX	280(2)
	74-HOE	1130	74-HOE	259
	33-OOO	1103(3)	33-OOO	250(3)
	40-FOE	1100(3)	18-HOA	230(3)
	53-HYA	1100(3)	43-HOE	230
	70-FOE-2	1050(2)	61-HOA	230
	18-HOA	1000(3)	70-FOE-2	229(2)
	42-OOX	1000(2)	20-OOR-2	220(3)
	07-OOR-2	990(5)	53-HYA	208(3)
	20-OOR-2	980(3)	19-OVS	190(6)
	43-HOE	930	07-OOR-2	180(5)
	61-HOA	870	40-FOE	100(3)
Be (ppm)	70-HOE-1	8.6(2)	70-HOE-1	6.6(2)
	33-OOO	2	33-OOO	4
	53-HYE	1.8(3)	53-HYE	3.2(3)
	46-HOE	1.5(6)	19-OVS	3(6)
	19-OVS	1(6)	43-HOE	3
	43-HOE	1	46-HOE	2.9(6)
			70-HOE-2	2.2(2)
Bi (ppm)	16-BOX	7	18-HVA-1	0.4(3)
	18-HVA-1	5.0(3)		
Cd (ppm)	70-HOE-1	17.5(2)	70-HOE-1	6.1(2)
	46-HOA	6.0(3)	46-HOA	0.35(3)
	46-HOE	6(6)		
	01-HOA-2	4		
Ce (ppm)	25-HCR	21.38(2)	25-HCR	32.12(2)
	43-HOE	11	43-HOE	27
			07-OOR-2	16.0(5)
			06-OOR	11
Cl (ppm)	61-FOJ	50(6)	61-FOJ	100(6)
			43-HOL	100

Table 1 (cont.)

Constituent (units)	FeR-1 Code	FeR-1 Result	FeR-2 Code	FeR-2 Result
Co (ppm)	06-00R	19	16-BOX	16
	16-BOX	17	06-00R	10.4
	43-HOE	13	33-000	8
	07-00R-2	12.4(5)	43-HOE	8
	33-000	12	19-OVS	8(6)
	20-00R-2	11.4(3)	46-HOM	7.1(3)
	42-HOA	11(6)	18-HOA	7(3)
	46-HOM	9.5(3)	42-HOA	7(6)
	18-HOA	9(3)	01-HOA-2	7
	19-OVS	8(6)	20-00R-2	6.7(3)
	01-HOA-2	6	07-00R-2	6.64(5)
Cr (ppm)	45-HOA	43(3)	74-HOE	91
	74-HOE	23.7	45-HOA	74(3)
	06-00R	13	18-HOA	66(3)
	46-HOM	10(3)	46-HOM	54(3)
	18-HOA	9(3)	46-HOA	54(3)
	42-HOA	9(6)	33-000	53(3)
	20-00R-2	7(3)	19-OVS	52(6)
	33-000	7(3)	07-00R-2	48.6(5)
	43-HOE	7	06-00R	46
	46-HOA	7(3)	46-HOA	46(3)
	61-HOA	6	42-HOA	45(6)
	46-HOA	5.6(3)	43-HOE	43
	19-OVS	5(6)	70-HOE-2	43(2)
	61-HOA	3(6)	20-00R-2	42(3)
	26-HOA	2.3	70-HOE	41.7(2)
			61-HOA	38(6)
			61-HOA	37
			16-BOX	30
			26-HOA	21
Cs (ppm)	33-000	4	61-BOA	7.6(6)
			33-000	6
			06-00R	5.0
			26-HOE	4.69(2)
			20-00R-2	4.5(3)
Cu (ppm)	01-BOX	132	56-HOA	53(4)
	56-HOA	120(4)	15-BOX	51
	15-BOX	117	16-BOX	51
	16-BOX	112	10-HOA	50
	10-HOA	111	01-BOX	48
	70-HOE-2	110(2)	70-HOE-1	47.8(2)
	42-HOA	107(6)	74-HOE	47.5
	53-HYA	107(3)	42-HOA	47(6)
	70-HOE-1	106(2)	45-HOA	47(3)
	74-HOE	106	33-000	46(3)
	61-HOA	105(6)	53-HYA	45(3)
	33-000	101(3)	61-HOA	44(6)
	45-HOA	101(3)	18-HOA	43(3)
	46-HOE	99(6)	46-HOE	43(6)
	31-000	96(3)	53-HYE	41(3)
	18-HOA	93(3)	01-HOA-2	41
	46-HOA	92(3)	43-HOE	39
	46-HOM	87(3)	46-HOM	37(3)
	53-HYE	86(3)	70-HOE-2	36(2)
	19-OVS	85(6)	46-HOA	36(3)
	01-HOA-2	82		
	43-HOE	81		
Dy (ppm)	25-HCR	1.76(2)	25-HCR	2.36(2)

Table 1 (cont.)

Constituent (units)	FeR-1 Code	FeR-1 Result	FeR-2 Code	FeR-2 Result
Eu (ppm)	06-OOR	3.1	06-OOR	1.32
	07-OOR-2	3.06(5)	07-OOR-2	1.13(5)
	25-HCR	0.76(2)	25-HCR	1.10(2)
Ga (ppm)	19-OVS	11(6)	19-OVS	14(6)
	43-HOE	5	43-HOE	8
Gd (ppm)	07-OOR-3	1.5(4)	07-OOR-3	2.0(4)
Ge (ppm)	19-OVS	3(6)	46-HOM	6.5(3)
	46-HOM	2.2(3)	19-OVS	5(6)
Hf (ppm)			06-OOR	1.0
			20-OOR-2	1.0
Hg (ppb)	63-OVA-2	200(3)	63-OVA-2	18(3)
			06-OOR	17
Ho (ppm)	25-HCR	0.33(2)	25-HCR	0.60(2)
In (ppm)	06-OOR	6.9		
La (ppm)	70-HOE-1	41(2)	70-HOE-1	26.4(2)
	70-HOE-2	26(2)	70-HOE-2	24(2)
	16-BOX	20	16-BOX	19
	25-OCR	11.91(2)	25-OCR	16.03(2)
	06-OOR	10.5	06-OOR	14.4
	20-OOR-2	10(3)	43-HOE	13
	43-HOE	7	20-OOR-2	12(3)
Li (ppm)	18-HOA	10(3)	61-BOA	32(6)
	61-BOA	9(6)	42-HOA	25(6)
	42-HOA	7(6)	70-HOE-1	22.4(2)
	61-HOA	7	18-HOA	22(3)
	26-HOE	5.4	26-HOE	21.9
	51-HOE	4(3)	43-HOE	21
	53-HYA	4(3)	51-HOE	20(3)
	43-HOE	4	33-000	20
	70-HOE-1	3.5(2)	70-HOE-2	20(2)
	33-000	3	61-HOA	20
	31-OOA	2.2(3)	53-HYA	19(3)
			01-HOA-2	14
			31-OOA	10(3)
Lu (ppm)	06-OOR	0.20	25-HCR	0.26(2)
	07-OOR-2	0.16(5)	07-OOR-2	0.23(5)
	25-HCR	0.12(2)		
Mo (ppm)	18-HOE-2	10(3)	16-BOX	7
	70-HOE-1	ca 6.2(2)	70-HYJ	4.6(2)
	16-BOX	6	26-HOA	3.1
	70-HYJ	1.7(2)	63-OYJ	3
	26-HOA	1.6	01-HOE	2

Table 1 (cont.)

Constituent (units)	FeR-1		FeR-2	
	Code	Result	Code	Result
Nb (ppm)	16-BOX	1	19-OVS	9
			16-BOX	3
Nd (ppm)			06-OOR	15
Ni (ppm)	70-HOE-1	45.2(2)	70-HOE-1	45.1(2)
	70-HOE-2	40(2)	45-HOA	44(3)
	45-HOA	37(3)	70-HOE-2	40(2)
	26-HOA	22.4	26-HOA	31.2
	74-HOE	14.8	46-HOA	30(3)
	46-HOM	14(3)	46-HOA	29(3)
	46-HOA	13(3)	74-HOE	28.3
	43-HOE	12	46-HOM	26(3)
	46-HOA	12(3)	53-HYE	25(3)
	53-HYE	11(3)	43-HOE	25
	53-HYA	10(3)	16-BOX	24
	16-BOX	10	19-OVS	23(6)
	42-HOA	8(6)	53-HYA	21(3)
	19-OVS	6(6)	42-HOA	20(6)
	18-HOA	5(3)	18-HOA	19(3)
	33-OOO	4(2)	33-OOO	18(3)
	01-HOA-2	3	01-HOA-2	16
Pb (ppm)	05-BOX-1	7600	43-HOE	15
	05-OOR	6000(2)	01-BOX	13
	61-HOA	5600(2)	42-HOA	13(6)
	46-HOM	5600(3)	46-HOA	11(3)
	51-HOA	5530(3)	46-HOM	9.6(3)
	74-HOE	5520	16-BOX	9
	43-HOA	5500	01-HOA-2	6
	46-HOE	5480(6)		
	61-HOA	5440(6)		
	56-HOA	5360(4)		
	10-HOA	5300		
	42-HOA	5200(6)		
	53-HYA	5200(3)		
	33-OOO	5200(3)		
	43-HOE	5200		
	70-HOE-2	5200(2)		
	46-HOA	5180(3)		
	01-BOX	5155		
	31-OOA	5110(3)		
	01-HOA-2	5092		
	18-HOA	5000(3)		
	61-OOX	4800(6)		
	05-BOX-2	4800		
	53-FOE	4700(3)		
	45-HOA	4600(3)		
	16-BOX	4436		
Rb (ppm)	16-BOX	6	61-HOA	75(2)
	61-HOA	2	06-OOR	74
	74-HOE	1.5	61-OOX	74(6)
	26-HOE	0.14(2)	01-BOX	70
			20-OOR-2	70
			26-HOE	67.1(2)
			42-OOX	67(2)
			74-HOE	65.4
			16-BOX	64
			33-OOO	64(3)
			53-HYA	61(3)
			61-HOA	60
			05-BOX-1	47
			18-BOX	40(3)

Table 1 (cont.)

Constituent (units)	FeR-1 Code	FeR-1 Result	FeR-2 Code	FeR-2 Result
Ru (ppm)	06-00R	2.7	06-00R	0.6
Sb (ppm)	06-00R	7.6	01-HOA-2	2
	16-BOX	6	16-BOX	1
	18-HVA-2	5.2(3)	18-HVA-2	0.7(3)
	63-OVA-1	4.8(3)	63-OVA-1	0.6(3)
	01-HOA-2	4	06-00R	0.6
Sc (ppm)	43-HOE	1	06-00R	6.7
	07-00R-2	0.755(5)	43-HOE	6
	06-00R	0.7	07-00R-2	5.35(5)
			19-OVS	4(6)
Se (ppm)	63-OVA-1	0.4(3)		
Sm (ppm)	25-HCR	1.85(2)	25-HCR	3.28(2)
	06-00R	1.74	06-00R	2.73
	07-00R-3	1.7(4)	07-00R-2	2.62(5)
	20-00R-2	1.7(3)	07-00R-3	2.5(4)
	07-00R-2	1.64(5)	20-00R-2	2.5(3)
Sn (ppm)	16-BOX	62	18-FVA-2	1.4(3)
	18-FVA-2	31.0(3)	16-BOX	1
	70-HOE-1	ca 6.4(2)		
Sr (ppm)	74-HOE	208	74-HOE	68.9
	05-BOX-2	124	33-000	64(3)
	53-HYA	105(3)	70-FOE-2	64(2)
	33-000	98(3)	15-BOX	62
	61-00X	96(6)	61-00X	62(6)
	70-FOE-2	93.3(2)	18-HOE-2	60(3)
	43-HOE	91	16-BOX	58
	18-HOE-2	90(3)	42-00X	58(2)
	05-BOX-1	90	43-HOE	58
	70-HOE-1	89(2)	70-HOE-2	58(2)
	61-HOA	85	61-HOA	58
	15-BOX	83	31-00A	51(3)
	42-00X	81(2)	05-BOX-1	44
	16-BOX	80	53-HYA	36(3)
	31-00A	64(3)	45-HOA	11(3)
	01-HOA-2	54		
	45-HOA	21(3)		
Ta (ppm)			20-00R-2	0.2(3)
Tb (ppm)	25-HCR	0.43(2)	25-HCR	0.49(2)
	07-00R-2	0.17(5)	07-00R-2	0.32(5)
Th (ppm)	20-00R-2	0.57(3)	06-00R	2.86
	06-00R	0.44	20-00R-2	2.6(3)
			16-BOX	2

Table 1 (cont.)

Constituent (units)	FeR-1 Code	FeR-1 Result	FeR-2 Code	FeR-2 Result
U (ppm)	07-00R-2	0.51(2)	20-00R-1	1.2(2)
	20-00R-1	0.1(2)	07-00R-2	0.45(5)
V (ppm)	07-00R-1	200(5)	07-00R-1	77.4(5)
	16-BOX	140	06-00R	44
	06-00R	119	26-HOA	43
	18-HOE-2	105(3)	70-HOE-1	40.8(2)
	70-HOE-1	98.4(2)	43-HOE	39
	46-HOA	98(3)	70-HOE-2	37(2)
	46-HOM	98(3)	01-HOE	36
	43-HOE	96	19-OVS	36(6)
	26-HOA	94	18-HOE-2	35(3)
	70-HOE-2	92(2)	46-HOA	35(3)
	01-HOE	72	46-HOM	31(3)
			16-BOX	20
Y (ppm)	61-00X	46(6)	18-HOE-2	19(3)
	18-HOE-2	25(3)	61-00X	16(6)
	43-HOE	18	16-BOX	16
	16-BOX	11	05-BOX-1	15
			42-00X	14(2)
			43-HOE	13
			16-BOX	12
Yb (ppm)	43-HOE	1.0	25-00R	1.70(2)
	25-00R	0.99(2)	06-00R	1.32
	06-00R	0.98	43-HOE	1.2
Zn (ppm)	15-BOX	4800	45-HOA	116(3)
	05-00R	4200(2)	56-HOA	65(4)
	42-HOA	3880(6)	70-FOE-2	51
	53-HYA	3800(3)	46-HOM	51(3)
	33-000	3800(3)	18-HOA	46(3)
	46-HOM	3790(3)	42-HOA	45(6)
	46-HOE	3720(6)	01-BOX	45
	70-FOE-2	3670(2)	46-HOA	45(3)
	61-HOA	3620(6)	33-000	44(3)
	56-HOA	3610(4)	70-HOE-1	44(2)
	45-HOA	3600(3)	31-00A	44(3)
	74-HOE	3570	61-HOA	43(6)
	10-HOA	3550	15-BOX	42
	51-HOA	3540(3)	53-HYE	42(3)
	43-HOA	3500	43-HOE	42
	18-HOA	3400(3)	70-HOE-2	41(2)
	70-HOE-1	3310(2)	46-HOE	40(6)
	01-HOA-2	3302	53-HYA	38(3)
	16-BOX	3302	16-BOX	38
	70-HOE-2	3300(2)	51-HOA	36(3)
	53-HYE	3200(3)	01-HOA-2	33
	05-BOX-2	3140	10-HOA	31
	43-HOE	3100	74-HOE	25
	31-00A	3070(3)		
	05-BOX-1	2500		
Zr (ppm)	15-BOX	39	15-BOX	68
	05-BOX-2	34	05-BOX-1	50
	18-HOE-2	30(3)	18-HOE-2	45(3)
	42-00X	26(2)	42-00X	44(2)
	70-FOE-2	13(2)	61-00X	43(6)
	16-BOX	8	70-FOE-2	40(2)
	19-OVS	7(5)	16-BOX	38
	61-00X	6(6)	43-HOE	32
	43-HOE	5	70-HOE	31
			19-OVS	24(6)
			70-HOE	20

Table 2: Reported results, samples FeR-3 and FeR-4 (See "Raw Data", p. 2-3)

Constituent (units)	FeR-3 Code	FeR-3 Result	FeR-4 Code	FeR-4 Result
SiO_2 (pct)	45-FOA	55.9(3)	45-FOA	51.7(3)
	53-FPG	54.63(2)	74-HOE	51.4
	40-FOE	54.37(5)	40-FOE	51.37(5)
	43-FPG	54.08	31-HOE-1	51.3(3)
	60-FOX	54.0(3)	43-FPG	50.62
	33-FOJ	53.79(3)	60-FOX	50.6(3)
	42-FPG	53.61(6)	01-FOX	50.57(6)
	70-FOE-1	53.59(2)	33-FOJ	50.54(3)
	18-FPG	53.57(3)	53-FOE	50.5(3)
	85-FPG-1	53.54(4)	53-FPG	50.28(2)
	01-FOX	53.38(6)	70-FOE-1	50.20(2)
	15-FOX	53.36(6)	15-FOX	50.13(3)
	61-FOX	53.2(6)	18-FPG	50.07(3)
	15-FPG	53.16(3)	85-FPG-1	50.03(4)
	46-FOX	53.1(3)	42-FPG	49.97(6)
	10-FOX	53.0	84-FCX	49.96(2)
	84-FCX	52.79(2)	61-FOX	49.8(6)
	16-FPG	52.74(2)	56-FOX	49.78
	56-FOX	52.57(4)	16-FPG	49.50(2)
	31-OOA	52.33(3)	46-FOX	49.5(3)
	55-FOE	52.27(2)	15-FPG	49.29(3)
	41-FPG	52.1(2)	31-HOA-1	49.20(9)
	07-OOR	52.0(4)	55-FOE	49.07(2)
	74-HOE	51.5	41-FPG	49.0(2)
	51-FOX	51.4(2)	10-FOX	48.9
	31-HOA-1	50.97(12)	07-OOR-3	48.8(4)
	31-HOE-1	50.61(3)	51-FOX	48.4(2)
			31-OOA	47.58(3)
TiO_2 (pct)	55-FOE	0.04(2)	55-FOE	0.18(2)
	46-FOX	.021(3)	31-HOA-2	.11(12)
	18-HOJ-1	.02(3)	46-FOX	.08(3)
	60-FOX	.02(3)	26-HOA	.071
	43-FPJ	.02	15-FOX	.07(3)
	31-HOA-1	.02(3)	18-HOJ-1	.07(3)
	31-OOA	.017(3)	60-FOX	.07(3)
	31-HOA-2	.01(3)	31-OOA	.07(3)
	31-HOE-1	.01(3)	01-FOX	.07(6)
	61-FOX	.01(6)	43-FPJ	.07
	33-HOJ-1	.01(3)	61-FOX	.07(6)
	01-FOX	.01(6)	84-FCX	.07(2)
	84-FCX	.01(2)	40-FOE	.07(3)
	16-FPJ-2	.01	70-HOE-2	.062(2)
	42-FOA	.007(6)	42-FOA	.06(6)
	26-HOA	.004	33-HOJ-1	.06(3)
	85-HOJ-1	.003(4)	16-FPJ-2	.06(2)
	70-HOE-2	.003(2)	70-FOE-2	.060(2)
	74-HOE	.001	85-HOJ-1	.06(4)
			74-HOE	.058
			56-FOX	.055(4)
			51-FOX	.05(2)
			31-HOE-1	.05(6)
			41-HOJ	.006

Table 2 (cont.)

Constituent (units)	FeR-3		FeR-4	
	Code	Result	Code	Result
Al_2O_3 (pct)	07-OOR-3	2.6(4)	07-OOR-3	4.0(4)
	51-FOX	1.09(2)	51-FOX	2.48(2)
	43-FPG	0.30	19-OVS	2.0(6)
	19-OVS	.29(6)	45-FOA	1.93(3)
	06-OOR	.24	43-FPG	1.90
	10-FOX	.23	06-OOR	1.82
	31-HOA-2	.18(9)	07-OOR-1	1.81(5)
	56-FOX	.16(4)	16-FPA-1	1.80(2)
	07-OOR-1	.15(5)	41-FPA	1.76
	31-OOA	.14(3)	55-FOE	1.76(2)
	31-HOE-1	.14(3)	56-FOX	1.75(4)
	16-FPA-1	.12(2)	31-HOE-2	1.74(3)
	31-HOA-1	.12(3)	42-FOA	1.71(6)
	55-FOE	.11(2)	18-FOA	1.70(3)
	42-FOA	.10(6)	60-FOX	1.7(3)
	61-FOX	.1(6)	31-OOA	1.68(3)
	41-FPA	.09	26-HOA	1.66
	45-FOA	.09(3)	10-FOX	1.66
	46-HOE	.08(6)	53-FOE	1.64(3)
	40-FOE	.08(5)	85-FYT	1.64(4)
	84-FCX	.08(2)	33-HOA-2	1.64(3)
	85-FYT-HOJ?	.08(6)	01-FOX	1.61(6)
	70-FOE-2	.074(2)	40-FOE	1.61(5)
	60-FOX	.07(5)	84-FCX	1.61(2)
	33-HOA-2	.07(3)	61-FOX	1.6(6)
	15-FOX	.07(3)	31-HOA-2	1.60(6)
	26-HOA	.054	53-HYE	1.60(3)
	74-HOE	.05	15-FOX	1.59(3)
	01-FOX	.02(6)	70-FOE-2	1.54(2)
			46-HOE	1.53(6)
			74-HOE	1.42
			70-HOE-2	1.39(2)
Fe_2O_3 (pct)	84-Dif	30.72(2)	31-Dif	24.63(3)
	31-Dif	30.64	84-Dif	24.35(2)
	56-Dif	30.2(4)	31-Dif	24.31
	70-Dif	30.2	70-Dif	24.2
	16-Dif	30.02	31-Dif	23.77
	16-Dif	30.01	51-Dif	23.4
	16-Dif	29.96	61-Dif	23.36
	51-Dif	29.9	56-Dif	23.3
	31-Dif	29.61	16-Dif	23.18
	61-Dif	29.49(6)	16-Dif	22.96
	33-Dif	29.40	60-Dif	22.8(3)
	85-Dif	29.39	85-Dif	22.77
	60-Dif	29.3(3)	41-Dif	22.65(2)
	42-Dif	29.28(6)	33-Dif	22.63
	41-Dif	29.18(2)	18-Dif	22.57(3)
	31-Dif	29.12(3)	42-Dif	22.48(6)
	18-Dif	29.10(3)	43-Dif	22.44
	43-Dif	29.04	16-Dif	21.90
	15-Dif	28.57(5)	15-Dif	21.88(5)
	53-Dif	27.85(3)	53-Dif	21.74(3)

Table 2 (cont.)

Constituent (units)	FeR-3 Code	FeR-3 Result	FeR-4 Code	FeR-4 Result
FeO (pct)	53-HOT	14.82(3)	53-HOT	16.34(3)
	31-HOJ	14.00(3)	15-HOT	15.90(5)
	31-HOT	13.95(3)	18-HOT-2	15.8(3)
	18-HOT-2	13.9(3)	56-HOT	15.78(4)
	15-HOT	13.83(4)	31-HOT	15.78(3)
	31-HOJ	13.82(9)	31-HOJ	15.72(3)
	56-HOT	13.75(4)	70-HOT	15.7(3)
	33-HOT	13.74	33-HOT	15.68
	60-HOT	13.7(3)	31-HOT	15.64(3)
	70-HOT	13.7(3)	51-HOT	15.6(3)
	43-HOT	13.69	42-HOT	15.54(6)
	85-HOT-2	13.57(4)	43-HOT	15.54
	42-HOT	13.57(6)	60-HOT	15.5(3)
	41-HOT-1	13.55(2)	85-HOT-2	15.48(4)
	51-HOT	13.5(3)	41-HOT-1	15.43(2)
	61-HOT-1	13.3(6)	16-HOT	15.26(2)
	16-HOT	13.14(2)	61-HOT-1	14.9(6)
	84-000	12.52(2)	84-000	14.27(2)
MnO (pct)	60-FOX	0.15(3)	07-OOR-1	0.27(5)
	26-HOA	.125	53-FPJ-1	.24(2)
	07-OOR-1	.11(5)	46-HOA	.238(3)
	07-OOR-3	.10(4)	61-FOX	.22(6)
	61-FOX	.10(6)	51-FOX	.22(2)
	53-FPJ-1	.10(2)	46-HOE	.212(6)
	31-OOA	.09(3)	56-FOX	.21(4)
	46-HOA	.084(3)	07-OOR-3	.21(4)
	56-FOX	.083(4)	31-OOA	.21(3)
	41-HOA-1	.082	31-HOE-1	.21(3)
	70-HOE-2	.081(2)	70-FOE-2	.203(2)
	16-FPA-3	.08(2)	42-FOA	.20(6)
	31-HOE-1	.08(3)	60-FOX	.20(3)
	31-HOA-2	.08(6)	01-FOX	.20(6)
	74-HOE	.080	84-FCX	.20(2)
	18-HOA	.08(3)	41-HOA-1	.200
	42-FOA	.08(6)	74-HOE	.192
	53-HYE	.08(3)	15-FOX	.19(3)
	53-FOE	.08(3)	18-HOA	.19(3)
	53-HYA	.08(3)	53-FOE	.19(3)
	33-HOA-1	.08(3)	53-HYA	.19(3)
	01-FOX	.08(6)	40-FOE	.19(3)
	43-HOJ	.08	16-FPA-3	.19(2)
	84-FCX	.08(2)	33-HOA-1	.19(3)
	70-FOE-2	.080(2)	31-HOA-2	.19(9)
	19-OVS	.08(6)	45-FOA	.19(3)
	85-HYA	.08(4)	43-HOJ	.19
	40-FOE	.08(3)	70-HOE-2	.19(2)
	46-HOE	.079(6)	55-FOE	.19(2)
	45-FOA	.07(3)	85-HYA	.19(4)
	55-FOE	.07(2)	53-HYE	.18(3)
	01-HOA-1	.06(5)	01-HOA-1	.16(5)
	15-FOX	.06(3)	05-BOX-1	.10
			26-HOA	.082

Table 2 (cont.)

Constituent (units)	FeR-3 Code	FeR-3 Result	FeR-4 Code	FeR-4 Result
MgO (pct)	07-OOR-1	2.98(5)	07-OOR-1	4.54(5)
	51-FOX	1.91(2)	51-FOX	2.73(2)
	19-OVS	1.3(6)	19-OVS	1.8(6)
	31-OOA	1.28(3)	45-FOA	1.59(3)
	45-FOA	1.24(3)	31-OOA	1.55(3)
	56-FOX	1.21(4)	56-FOX	1.54(4)
	31-HOE-1	1.17(3)	16-FPA-2	1.52(2)
	70-HOE-2	1.09(2)	60-FOX	1.5(3)
	31-HOA-2	1.08(12)	01-FOX	1.48(6)
	61-FOX	1.08(6)	70-HOE-2	1.48(2)
	16-FPA-2	1.06(2)	31-HOA-2	1.48(6)
	42-FOA	1.04(6)	61-FOX	1.46(6)
	43-FPG	1.04	42-FOA	1.41(6)
	85-HYA	1.02(4)	43-FPG	1.41
	18-FOA	1.02(3)	85-HYA	1.40(4)
	53-FOE	1.02(3)	18-FOA	1.40(3)
	84-FCX	1.02(2)	53-FOE	1.40(3)
	01-FOX	1.01(6)	33-FOA	1.40(3)
	60-FOX	1.0(3)	55-FOE	1.38(2)
	33-FOA	0.99(3)	31-HOE-1	1.38(3)
	40-FOE	.97(3)	84-FCX	1.36(2)
	53-HYA	.97(3)	15-FOX	1.35(3)
	41-HOA-2	.97	41-HOA-2	1.35
	15-FOX	.96(3)	40-FOE	1.31(3)
	55-FOE	.96(2)	74-HOE	1.31
	74-HOE	.953	53-HYA	1.31(3)
	05-OOR	.95(2)	70-FOE-2	1.30(2)
	70-FOE-2	.909(2)	05-OOR	1.19(2)
	46-HOE	.88(6)	46-HOE	1.19(6)
	10-FOX	.75	10-FOX	0.99
CaO (pct)	10-FOX	1.02	51-FOX	2.65(2)
	51-FOX	1.02(2)	19-OVS	2.6(6)
	31-OOA	0.95(3)	05-BOX-1	2.46
	31-HOE-1	.95(6)	31-OOA	2.43(3)
	31-HOA-2	.94(9)	10-FOX	2.41
	16-FPG	.94(2)	61-FOX	2.34(6)
	05-BOX-1	.92	16-FPG	2.34
	61-FOX	.91(6)	84-FCX	2.30(2)
	45-FOA	.9(3)	43-FPG	2.28
	18-FOA	.90(3)	01-FOX	2.27(6)
	15-FOX	.88(3)	15-FOX	2.27(3)
	01-FOX	.88(6)	45-FOA	2.26(3)
	42-FOA	.87(6)	18-FOA	2.25(3)
	84-FCX	.86(2)	31-HOA-2	2.24(12)
	43-FPG	.84	31-HOE-1	2.24(6)
	74-HOE	.837	60-FOX	2.22(3)
	85-HYA	.83(4)	33-FOA	2.22(3)
	60-FOX	.83(3)	46-HOE	2.20(6)
	33-FOA	.83(3)	56-FOX	2.20(4)
	70-HOE-2	.81(2)	55-FOE	2.20(2)
	40-FOE	.81(3)	07-OOR-3	2.2(4)
	53-HYE	.79(3)	85-HYA	2.19(4)
	56-FOX	.78(4)	42-FOA	2.18(6)
	41-HOA-2	.78	70-FOE-2	2.17(2)
	26-HOE	.77	05-BOX-2	2.15
	46-FOX	.77(3)	70-HOE-2	2.15(2)
	70-FOE-2	.767(2)	41-HOA-2	2.13
	05-BOX-2	.76	53-HYE	2.12(3)
	53-FOE	.71(3)	40-FOE	2.12
	46-HOE	.71(6)	26-HOE	2.11
	07-OOR-3	.7(4)	46-FOX	2.09(3)
	55-FOE	.67(2)	53-FOE	2.06(3)
			74-HOE	1.97

Table 2 (cont.)

Constituent (units)	FeR-3 Code	FeR-3 Result	FeR-4 Code	FeR-4 Result
Na_2O (pct)	07-OOR-3	0.46(4)	07-OOR-3	0.47(4)
	46-HOE	.12(6)	18-HOE-1	.13(3)
	01-FOX	.11	46-HOE	.12(6)
	18-HOE-1	.08(3)	01-FOX	.12
	16-HOE	.06(2)	16-HOE	.08(2)
	84-FOA	.05(2)	84-FOA	.08(2)
	40-FOE	.05(3)	40-FOE	.06(3)
	31-OOA	.035(3)	42-FOA	.05(6)
	31-HOE-1	.02(3)	31-OOA	.04(3)
	41-HOA-3	.015	70-FOE-2	.033(2)
	31-HOA-2	.013(9)	31-HOA-2	.030(9)
	42-FOA	.01(6)	41-HOA-3	.030
	43-FOA	.01	85-HOA	.03(4)
	55-FOE	.01(2)	56-HOA	.028(4)
	56-HOA	.009(4)	26-HOE	.026(2)
	45-FOA	.006(3)	20-OOR-2	.026(3)
	20-OOR-2	.004(3)	45-FOA	.025(3)
	85-HOA	.003(4)	70-HOE-2	.024(2)
	26-HOE	.003(2)	74-HOE	.023
	74-HOE	.0024	51-HOA	.02(3)
			43-FOA	.02
			55-FOE	.02(2)
			31-HOE-1	.02(3)
			33-FOA	.01(3)
K_2O (pct)	61-FOX	0.06(6)	05-BOX-1	0.34
	18-HOE-1	.05(3)	31-HOE-3	.33(6)
	43-FOA	.05	61-FOX	.33
	40-FOE	.04(3)	31-OOA	.32(3)
	31-OOA	.032(3)	10-FOX	.31
	42-FOA	.03(6)	18-HOE-1	.31(3)
	60-FOX	.03(3)	01-FOX	.31(6)
	01-FOX	.03(6)	31-HOA-2	.31(6)
	31-HOA-2	.023(12)	55-FOE	.30(2)
	16-HOE	.02(2)	45-FOA	.3(3)
	56-HOA	.020(4)	07-OOR-3	.30(4)
	45-FOA	.02(3)	85-HYA	.29(4)
	70-HOE-2	.02(2)	42-FOA	.29(6)
	84-FCX	.02(2)	60-FOX	.29(3)
	85-HYA	.02(4)	84-FCX	.29(2)
	74-HOE	.019	43-FOA	.29
	70-FOE-2	.018(2)	70-HOE-2	.29(2)
	26-FOE	.017(2)	16-HOE	.28(2)
	41-HOA-4	.010	33-FOA	.28(3)
	55-FOE	.01(2)	15-FOX	.28(3)
	01-HOA-2	.004	74-HOE	.279
			56-HOA	.277(4)
			70-FOE-2	.276(2)
			40-FOE	.26(3)
			41-HOA-4	.25
			05-BOX-2	.25
			26-FOE	.246(2)
			51-FOX	.17(2)
			46-FOX	.17(3)
			01-HOA-2	.01
H_2O^+ (pct)	53-OVG	0.54(4)	31-FVG	1.22(6)
	31-OOG	.53(3)	31-OOG	1.15(3)
	31-FVG	.49(6)	85-FVG	0.82(6)
	85-FVG	.36(6)	16-OVG	.81(3)
	51-OVG	.29(3)	53-OVG	.80(4)
	18-FVG	.20(3)	51-OVG	.79(3)
	56-OOT	.20(4)	18-FVG	.72(3)
	33-FVG	.20	33-FVG	.71
	43-FVG	.20	42-FVG	.64(6)
	16-OVG	.18(4)	43-FVG	.64
	61-Dif	.08(6)	56-OOT	.62(4)
	42-FVG	.05(6)	61-Dif	.5(6)
			60-FVG	.4(3)

Table 2 (cont.)

Constituent (units)	FeR-3 Code	FeR-3 Result	FeR-4 Code	FeR-4 Result
CO_2 (pct)	53-OVG	1.44(4)	56-FVJ	5.02(4)
	56-FVJ	1.31(4)	60-FVL	5.00(3)
	42-HVG	1.26(6)	31-FVT	4.90(3)
	60-FVL	1.25(3)	42-HVG	4.90(6)
	31-FVT	1.21(3)	85-HVT	4.90(4)
	16-HVG	1.20(3)	43-HVT	4.85
	61-FVJ	1.2(6)	18-FVJ-1	4.85(3)
	33-FVK	1.19(2)	16-HVG	4.83(2)
	85-HVT	1.18(4)	53-OVG	4.81(4)
	51-HVG	1.17(3)	51-HVG	4.79(3)
	18-FVJ-1	1.16(3)	33-FVK	4.72(3)
	43-HVT	1.16	31-OOT	4.5
	61-FVJ	1.1(6)	61-FVJ	4.4(6)
	31-OOT	1.1(3)	61-FVJ	3.81(6)
P_2O_5 (pct)	46-HOE	0.14(6)	33-HOJ-2	0.15(3)
	33-HOJ-2	.10(3)	55-HOJ	.15(2)
	31-HOJ-HOE?	.10(3)	60-FOX	.14(3)
	16-HOJ	.09(2)	01-FOX	.14(6)
	55-HOJ	.09(2)	40-FOE	.13(3)
	31-HOE-1	.08(3)	85-HOJ-3	.13(6)
	40-FOE	.08(3)	61-FOX	.13(6)
	53-FPJ-2	.08(3)	18-HOJ-2	.13(3)
	31-HOJ-2	.08(3)	43-HOJ	.13
	61-FOX	.07(6)	46-FOX	.12(3)
	60-FOX	.07(3)	15-FOX	.12(3)
	01-FOX	.07(6)	42-HOJ	.12(6)
	43-HOJ	.07	56-FOX	.12(4)
	85-HOJ-3	.07(6)	51-FOX	.12(2)
	18-HOJ-2	.06(3)	53-FPJ-2	.12(3)
	42-HOJ	.06(6)	84-FCX	.12(2)
	84-FCX	.06(2)	70-FOE-2	.12(2)
	15-FOX	.06(3)	16-HOJ	.12(2)
	56-FOX	.056(4)	46-HOJ	.12(6)
	70-FOE-2	.055(2)	70-HOE-2	.11(2)
	70-HOE-2	.053(2)	74-HOE	.062
	46-FOX	.05(3)	31-HOJ-HOE?	.02(3)
	74-HOE	.018		
F (pct)	61-FOL	0.02(6)	61-FOL	0.03
	42-FOL	.02(6)	33-000	.022
	33-000	.018	42-FOL	.02(6)
	18-FVJ-2	.01(3)	18-FVJ-2	.02(3)
	60-FVL	.009(3)	60-FVL	.019(3)
			43-FOL	.01
S (pct)	42-FVJ	0.04(6)	42-FVJ	0.13(6)
	61-FVT	.04(6)	61-FVT	.12(6)
	56-FVJ	.030(4)	53-FVT	.12(4)
	53-FVT	.03(4)	85-FPG-FVT?	.12(4)
	85-FPG-FVT?	.03(4)	18-FVJ-1	.12(3)
	31-FVT	.03(4)	56-FVJ	.111(4)
	18-FVJ-1	.03(3)	51-FVT	.11(3)
	51-FVT	.03(3)	33-FVT	.11(2)
	33-FVT	.03(2)	31-FVT	.10(3)
	61-FVT	.015(6)	60-FOX	.1(3)
			43-FVJ	.09
			61-FVJ	.08(6)

Table 2 (cont.)

Constituent (units)	FeR-3 Code	FeR-3 Result	FeR-4 Code	FeR-4 Result
Fe_2O_3T (pct)	10-FOX	47.0	06-OOR	43.0
	07-OOR-2	46.8(5)	10-FOX	42.5
	45-FOA	46.6(3)	70-HOE-2	42.5(2)
	46-FOX	46.6(3)	31-HOT	42.13(3)
	70-FOE-2	46.5(2)	31-HOJ-1	41.70(15)
	46-HOE	46.2(6)	70-FOE-2	41.6(2)
	31-HOA-2	46.00(3)	70-FOA	41.6(2)
	15-FOX	45.62(3)	46-FOX	41.5(3)
	56-FOX	45.5(4)	46-HOE	41.5(6)
	70-FOA	45.5(2)	31-HOJ-2	41.46(3)
	06-OOR	45.3	07-OOR-2	41.3(5)
	55-FOE	45.07(2)	56-FOX	40.8(4)
	31-HOJ-1	44.97(9)	51-FOX	40.7(2)
	51-FOX	44.9(2)	45-FOA	40.6(3)
	07-OOR-3	44.9(4)	55-FOE	40.59(2)
	70-HOE-2	44.9(2)	01-FOX	40.30(6)
	33-HOJ-3	44.67	15-FOX	40.25(3)
	31-HOT	44.65(3)	84-FOX	40.21(2)
	01-FOT	44.65(7)	16-FOT-1	40.14
	84-FOX	44.63(2)	01-FOT	40.11(7)
	16-FOT-2	44.62(2)	18-HOT-1	40.09(3)
	16-FOT-1	44.61	33-HOJ-3	40.06
	01-FOX	44.57(6)	60-FOX	40.0(3)
	16-FPJ-1	44.56(2)	61-HOT-2	39.99(6)
	18-HOT-1	44.54(3)	85-HOT-1	39.97(6)
	60-FOX	44.5(3)	16-FOT-2	39.92(2)
	85-HOT-1	44.47(8)	53-FPT	39.90(3)
	33-HOA-1	44.40	07-OOR-3	39.9(4)
	42-FOT	44.36(6)	61-HOT-2	39.85(6)
	53-FPT	44.32(3)	53-FOE	39.8(3)
	61-HOT-2	44.31(6)	41-HOT-2	39.80(2)
	53-FOE	44.3(3)	42-FOT	39.75(6)
	43-HOT	44.25	43-HOT	39.71
	41-HOT-2	44.24(2)	61-FOX	39.7(6)
	61-HOT-2	44.24(6)	33-HOA-1	39.59
	74-HOE	44.2	15-HPT	39.55(5)
	15-HPT	43.94(5)	10-HOA	39.3
	40-FOE	43.82(5)	74-HOE	39.3
	61-FOX	43.8(6)	20-OOR-2	39.1
	05-BOX-2	43.6	16-FPJ-1	38.86(2)
	05-OOR	43.36(2)	40-FOE	38.54(5)
	10-HOA	43.3	05-OOR	37.34(2)
	20-OOR-2	43.0(3)	05-BOX-1	32.0
	05-BOX-1	34.0		
Ag (ppm)	19-OVS	0.3(6)		
As (ppm)	50-FVJ	1.3(3)	18-FVA-1	4.5(3)
	07-OOR-2	1.19(5)	07-OOR-2	3.99(5)
	63-OVA-1	1.1(3)	50-FVJ	3.6(3)
	18-FVA-1	0.8(3)	63-OVA-1	3.1(3)
			16-BOX	2
B (ppm)	07-OOR-3	0.5(4)	50-FYJ	2.5(3)
			07-OOR-3	2.3(4)

Table 2 (cont.)

Constituent (units)	FeR-3 Code	FeR-3 Result	FeR-4 Code	FeR-4 Result
Ba (ppm)	70-HOE-2	82(2)	06-OOR	140
	42-OOX	41(2)	61-HOA	63
	61-HOA	27	70-HOE-2	60(2)
	16-BOX	15	42-OOX	52(2)
	53-HYA	15(3)	33-000	50(3)
	33-000	13.3(3)	18-HOA	43(3)
	18-HOA	11(3)	53-HYA	43(3)
	19-OVS	11(6)	43-HOE	39
	43-HOE	9	70-FOE-2	39(2)
	70-FOE-2	7.4(2)	74-HOE	37.4
	74-HOE	4.2	16-BOX	35
Be (ppm)	70-HOE-1	4.0(2)	70-HOE-1	4.4(2)
	46-HOE	0.5(6)	46-HOE	1.1(6)
	53-HYE	.5(3)	19-OVS	1(5)
			53-HYE	1(3)
			33-000	1
			43-HOE	1
Bi (ppm)	18-HVA-1	0.3(3)	18-HVA-1	0.3(3)
Cd (ppm)	70-HOE-1	6.8(2)	70-HOE-1	6.1(2)
	46-HOA	0.27(3)	46-HOA	0.20(3)
Ce (ppm)	43-HOE	5	25-HCR	14.48(2)
			43-HOE	11
			07-OOR-2	7.33(5)
Cl (ppm)			61-FOJ	100(6)
			43-HOL	100
Co (ppm)	16-BOX	13	16-BOX	12
	06-OOR	2.3	06-OOR	2.9
	19-OVS	2(6)	46-HOM	2.0(3)
	33-000	2	19-OVS	2(6)
	43-HOE	2	33-000	2
	07-OOR-2	1.55(5)	43-HOE	2
	46-HOM	1.5(3)	07-OOR-2	1.96(5)
	20-OOR-2	1.4(3)	20-OOR-2	1.9(3)
Cr (ppm)	45-HOA	38(3)	45-HOA	46(3)
	74-HOE	16.4	06-OOR	11.7
	06-OOR	8.4	46-HOA	11(3)
	46-HOA	7(3)	46-HOM	11(3)
	46-HOM	7(3)	18-HOA	10(3)
	42-HOA	7(6)	33-000	10(3)
	33-000	7(2)	07-OOR-2	9.67(5)
	46-HOA	6.4(3)	46-HOA	9.2(3)
	20-OOR-2	6(3)	74-HOE	9.1
	18-HOA	6(3)	20-OOR-2	9(3)
	43-HOE	6	42-HOA	9(6)
	61-HOA	6	43-HOE	9
	19-OVS	5(6)	19-OVS	6(6)
	26-HOA	3	26-HOA	5.6
	70-HOE-2	3(2)	70-HOE-1	ca 5.6(2)
			61-HOA	4
			70-HOE-2	3(2)
			61-HOA	1(6)

Table 2 (cont.)

Constituent (units)	FeR-3 Code	FeR-3 Result	FeR-4 Code	FeR-4 Result
Cs	33-000	2	33-000	3
(ppm)	26-HOE	0.32(2)	06-OOR	1.0
			20-OOR-2	0.8(3)
			26-HOE	.70(2)
			61-BOA	.5(6)
Cu	56-HOA	25(4)	05-BOX-1	30
(ppm)	15-BOX	22	56-HOA	25(4)
	10-HOA	12	15-BOX	21
	19-OVS	11(6)	70-HOE-1	16.6(2)
	70-HOE-1	10.2(2)	10-HOA	15
	16-BOX	8	01-BOX	14
	42-HOA	7(6)	42-HOA	13(6)
	61-HOA	7(6)	33-000	13(3)
	18-HOA	6(3)	45-HOA	13(3)
	45-HOA	5(3)	16-BOX	12
	33-000	4(3)	18-HOA	12(3)
	01-BOX	4	61-HOA	12(6)
	46-HOM	3.6(3)	46-HOA	11(3)
	46-HOA	3(3)	46-HOM	10(3)
	01-HOA-2	2	01-HOA-2	10
	46-HOE	2.0(6)	46-HOE	9(6)
	74-HOE	0.8	74-HOE	7.3
			43-HOE	6
Dy	25-HCR	0.34(2)	25-HCR	1.05(2)
(ppm)				
Eu	06-OOR	0.24	06-OOR	0.77
(ppm)	07-OOR-2	.21(5)	25-HCR	.74(2)
	25-HCR	.18(2)	07-OOR-2	.61(5)
Ga	19-OVS	10(6)	19-OVS	9(6)
(ppm)	43-HOE	3	43-HOE	3
Gd	07-OOR-3	0.3(4)	07-OOR-3	1.1(4)
(ppm)				
Ge	19-OVS	4(5)	46-HOM	5.2(3)
(ppm)	46-HOM	3.7(3)	19-OVS	5(6)
Hf			20-OOR-2	0.6
(ppm)			06-OOR	.5
Hg	63-OVA-2	19(3)	63-OVA-2	18(3)
(ppb)				
Ho	25-HCR	0.08(2)	25-HCR	0.22(2)
(ppm)				
La	70-HOE-2	19(2)	70-HOE-1	25.6(2)
(ppm)	70-HOE-1	18(2)	70-HOE-2	23(2)
	16-BOX	4	06-OOR	9.5
	25-OCR	2.58(2)	25-OCR	8.67(2)
	06-OOR	2.14	20-OOR-2	8(3)
	33-HOE	2	33-HOE	8
	20-OOR-2	1.9(3)	16-BOX	5

Table 2 (cont.)

Constituent (units)	FeR-3		FeR-4	
	Code	Result	Code	Result
Li (ppm)	18-HOA	4(3)	61-BOA	12(6)
	61-HOA	2	18-HOA	10(3)
	61-BOA	1(6)	61-HOA	8
			42-HOA	7(6)
			26-HOE	7.0
			33-000	7
			70-HOE-2	7(2)
			70-HOE-1	6.9(2)
			51-HOE	6(3)
			53-HYA	6(3)
			43-HOE	6
			31-00A	3.6(3)
Lu (ppm)	06-00R	0.09	06-00R	0.141
	25-HCR	.06(2)	25-HCR	.11(2)
	07-00R-2	.06(3)	07-00R-2	.11(3)
Mo (ppm)	16-BOX	4	16-BOX	4
	70-HYJ	1.8(2)	70-HYJ	2.0
	26-HOA	1.0	26-HOA	1.3
Nb (ppm)	19-OVS	10(6)	19-OVS	7(5)
	16-BOX	1	16-BOX	3
Ni (ppm)	70-HOE-1	34.9(2)	70-HOE-1	27.9(2)
	70-HOE-2	30(2)	45-HOA	27(3)
	45-HOA	27(3)	70-HOE	20(2)
	26-HOA	15.4	26-HOA	11.9
	74-HOE	15.1	74-HOE	8.7
	43-HOE	15	43-HOE	8
	46-HOA	14(3)	46-HOM	8(3)
	46-HOA	14(3)	46-HOA	7(3)
	46-HOM	13(3)	46-HOA	6.4(3)
	53-HYE	12(3)	16-BOX	5
	16-BOX	11	19-OVS	5(6)
	53-HYA	11(3)	01-HOA-2	3
	42-HOA	9(6)	42-HOA	2(6)
	19-OVS	9(6)		
	18-HOA	8(3)		
	33-000	5(3)		
	01-HOA-2	3		
Pb (ppm)	43-HOE	13	01-BOX	16
	42-HOA	11(6)	42-HOA	12(6)
	16-BOX	9	43-HOE	11
	46-HOM	8.6(3)	46-HOA	8.5(3)
	46-HOA	7.2(3)	46-HOM	8(3)
	01-BOX	7	16-BOX	8
	01-HOA-2	5	01-HOA-2	7
Rb (ppm)	42-00X	5(2)	61-00X	27(6)
	26-HOE	0.50(2)	42-00X	22(2)
			61-HOA	20(2)
			33-000	17(3)
			26-HOE	16.1(2)
			01-BOX	16
			16-BOX	16
			74-HOE	15.6
			61-HOA	15
			53-HYA	13(3)

Table 2 (cont.)

Constituent (units)	FeR-3 Code	FeR-3 Result	FeR-4 Code	FeR-4 Result
Sb (ppm)	16-BOX	2	16-BOX	7
	06-OOR	1.4	01-HOA-2	4
	63-OVA-1	0.9(3)	06-OOR	3
	18-HVA-2	.8(3)	63-OVA-1	1.4(3)
			18-HVA-2	1.3(3)
Sc (ppm)	19-OVS	2(6)	43-HOE	2
	06-OOR	0.58	06-OOR	1.55
	07-OOR-2	.497(5)	07-OOR-2	1.29
Sm (ppm)	20-OOR-2	0.67(3)	06-OOR	2.32
	25-HCR	.64(2)	25-HCR	2.31(2)
	07-OOR-3	.6(4)	07-OOR-3	2.2(4)
	06-OOR	.59	07-OOR-2	2.16(5)
	07-OOR-2	.52(5)	20-OOR-2	2.1(3)
Sn (ppm)			18-FVA-2	1.5(3)
			16-BOX	1
Sr (ppm)	74-HOE	46.5	33-000	69(3)
	53-HYA	39(3)	70-HOE-1	67(2)
	05-BOX-2	37	18-HOE-2	65(3)
	33-000	35(3)	70-FOE-2	65(2)
	43-HOE	35	53-HYA	64(3)
	61-HOA	35	43-HOE	62
	70-HOE-2	34(2)	70-HOE-2	62(2)
	61-OOX	32(6)	61-HOA	62(6)
	16-BOX	31	61-OOX	62
	70-HOE-1	31(2)	15-BOX	61
	70-FOE-2	31(2)	74-HOE	60.1
	15-BOX	30	16-BOX	59
	18-HOE-2	30(3)	05-BOX-1	59
	42-OOX	30(2)	42-OOX	57(2)
	19-OVS	23(6)	19-OVS	42(6)
	31-OOA	17.4(3)	31-OOA	38(3)
	05-BOX-1	17	01-HOA-2	35
	01-HOA-2	13	45-HOA	13(3)
	45-HOA	10(3)		
Ta (ppm)	20-OOR-2	0.2(3)		
Tb (ppm)			25-HCR	0.35(2)
			07-OOR-2	.15(5)
Th (ppm)	20-OOR-2	0.26(3)	20-OOR-2	1.0
			16-BOX	1
			06-OOR	0.9
U (ppm)	16-BOX	1	06-OOR	0.5
	20-OOR-1	0.3(2)	20-OOR-1	.5
			07-OOR-2	.23(5)

Table 2 (cont.)

Constituent (units)	FeR-3 Code	FeR-3 Result	FeR-4 Code	FeR-4 Result
V (ppm)	07-OOR-1	15.0(5)	07-OOR-1	22.1(5)
	16-BOX	10	46-HOA	13(3)
	43-HOE	9	70-HOE-1	12.7(2)
	70-HOE-1	8.4(2)	43-HOE	12
	46-HOA	8.1(3)	26-HOA	11.6
	01-HOE	8	01-HOE	11
	06-OOR	7.9	46-HOM	10.3(3)
	19-OVS	7(6)	16-BOX	10
	46-HOM	6.9(3)	19-OVS	9(6)
	26-HOA	6.2	06-OOR	8.8
	18-HOE-2	1(3)	18-HOE-2	5(3)
Y (ppm)	61-OOX	6(6)	61-OOX	10(6)
	42-OOX	6(2)	01-BOX	9
	01-BOX	6	18-HOE-2	8(3)
	18-HOE-2	5(3)	42-OOX	8(2)
	16-BOX	4	16-BOX	7
	43-HOE	2	43-HOE	4
Yb (ppm)	25-OOR	0.36(2)	25-OOR	0.76(2)
	43-HOE	.2	06-OOR	.54
	06-OOR	.19	43-HOE	.3
Zn (ppm)	45-HOA	96(3)	45-HOA	90(3)
	56-HOA	42(4)	05-BOX-1	47
	70-FOE-2	40(2)	56-HOA	39(4)
	18-HOA	39(3)	18-HOA	33(3)
	70-HOE-1	38(2)	46-HOM	33(3)
	33-OOO	37(3)	31-OOA	32.5(3)
	42-HOA	36(6)	70-HOE-1	30(2)
	31-OOA	36(3)	33-OOO	29(3)
	46-HOM	35(3)	01-HOA-2	28
	43-HOE	35	70-FOE-2	28(2)
	70-HOE-2	34(2)	42-HOA	27(6)
	61-HOA	33(6)	43-HOE	26
	15-BOX	32	46-HOA	25(3)
	01-BOX	32	53-HYA	24(3)
	46-HOA	30(3)	70-HOE-2	24(2)
	53-HYA	29(3)	61-HOA	24(6)
	51-HOA	27(3)	15-BOX	23
	16-BOX	27	51-HOA	21(3)
	53-HYE	26(3)	46-HOE	21(6)
	46-HOE	24(6)	53-HYE	21(3)
	10-HOA	23	05-BOX-2	20
	01-HOA-2	23	01-BOX	20
	74-HOE	13	10-HOA	18
			16-BOX	18
			74-HOE	8
Zr (ppm)	15-BOX	42	06-OOR	190
	18-HOE-2	15(3)	15-BOX	57
	05-BOX-2	8	05-BOX-2	42
	61-OOX	2(6)	18-HOE-2	30(3)
	43-HOE	2	05-BOX-1	24
	16-BOX	1	61-OOX	22(6)
			16-BOX	19
			43-HOE	18
			19-OVS	18(6)
			42-OOX	17(2)
			70-FOE-2	16.7(2)

Table 3: Distribution of raw data, sample FeR-1 (See "Derivation...", p. 3-4)

pct	n	M	$\bar{x}$	s	n_1	$\bar{x}_1$	s_1
SiO_2	29	17.02	17.12	1.006	24	16.98	0.418
TiO_2	23	0.030	0.034	0.024	18	0.029	.010
Al_2O_3	29	.500	.574	.398	27	.481	.078
Fe_2O_3	20	49.82	50.18	1.878	16	49.89	.804
FeO	18	23.48	23.43	0.526	13	23.47	.245
MnO	36	0.230	0.227	.037	28	0.233	.014
MgO	29	.297	.308	.068	26	.298	.034
CaO	33	3.31	3.36	.236	27	3.30	.116
Na_2O	20	0.020	0.078	.126	17	0.029	.037
K_2O	19	.020	.023	.017	15	.017	.007
H_2O^+	13	.440	.468	.142	7	.443	.042
CO_2	14	1.400	1.406	.150	12	1.399	.063
P_2O_5	24	2.44	2.46	.168	21	2.43	.084
F	6	0.058					
S	13	.250	0.238	0.046	10	0.251	.016
Others		1.199	1.206			1.195	
Σ		100.51	101.17			100.50	
O/F,S,Cl		0.15	0.14			0.15	
Σ (corr.)		100.36	101.03			100.35	
Fe_2O_3TR	43	75.80	75.88	3.092	35	75.66	1.057
Fe_2O_3TC		75.91	76.22			75.97	
ppm							
Ag	2	7.1					
As	5	6.4					
B	1						
Ba	15	1100	1104	178	12	1066	90
Be	6	1.65					
Bi	2	6					
Cd	4	6					
Ce	2	16					
Cl	1						
Co	11	11.4	11.7	3.78	8	10.8	1.77
Cr	15	7	10.5	10.31	13	7	2.86
Cs	1						
Cu	22	103	101.6	13.13	14	103.3	6.45
Dy	1						
Eu	3	3.1					
Ga	2	8					
Gd	1						
Ge	2	2.6					
Hf	0						
Hg	1						
Ho	1						
In	1						

Table 3 (cont.)

ppm	n	M	$\bar{x}$	s	n_1	$\bar{x}_1$	s_1
La	7	11.9					
Li	11	4.0	5.4	2.54	8	4.7	1.55
Lu	3	0.16					
Mo	4	3.8					
Nb	1						
Nd	0						
Ni	17	12	15.7	12.87	14	10.4	5.11
Pb	26	5200	5300	580	21	5260	234
Rb	4	1.75					
Ru	1						
Sb	5	5.2					
Sc	3	0.76					
Se	1						
Sm	5	1.7					
Sn	3	31					
Sr	17	90	91.3	37.40	15	88.2	16.20
Ta	0						
Tb	2	0.3					
Th	2	0.5					
U	2	0.3					
V	11	98	110.2	34.28	9	104.5	23.24
Y	4	22					
Yb	3	0.99					
Zn	25	3550	3530	429	20	3530	217
Zr	9	13					

Table 4: Distribution of raw data, sample FeR-2 (See "Derivation...", p. 3-4)

pct	n	M	$\bar{x}$	s	n_1	$\bar{x}_1$	s_1
SiO_2	29	48.92	48.74	1.230	24	48.96	0.513
TiO_2	32	0.190	0.180	0.038	26	0.188	.013
Al_2O_3	35	5.17	5.21	.502	30	5.22	.196
Fe_2O_3	22	22.62	23.03	1.155	17	22.68	.609
FeO	18	15.34	15.18	0.694	16	15.27	.321
MnO	35	0.120	0.131	.024	31	0.125	.009
MgO	30	2.10	2.30	.909	28	2.08	.179
CaO	31	2.17	2.17	.142	23	2.16	.070
Na_2O	28	0.500	0.519	.072	23	0.506	.033
K_2O	29	1.300	1.256	.240	25	1.306	.072
H_2O^+	13	0.970	0.969	.184	10	0.983	.116
CO_2	11	.053	.084	.088	9	.058	.025
P_2O_5	25	.270	.273	.036	22	.270	.015
F	6	.040					
S	11	.170	0.173	0.013	9	0.168	0.008
Others		.12	.124			.123	
Σ		100.05	100.38			100.14	
O/F,S,Cl		0.10	0.11			0.10	
Σ (corr.)		99.95	100.27			100.04	
Fe_2O_3TR	46	39.40	39.42	2.050	40	39.50	0.855
Fe_2O_3TC		39.67	39.90			39.65	
ppm							
Ag	1						
As	5	2					
B	2	61					
Ba	15	230	240	64.7	12	233	32.9
Be	7	3					
Bi	1						
Cd	2	3					
Ce	4	22					
Cl	2	100					
Co	11	7.1	8.4	2.75	10	7.6	1.12
Cr	19	46	48.7	15.58	14	46	5.67
Cs	5	5					
Cu	20	45.5	44.7	5.10	12	45	2.58
Dy	1						
Eu	3	1.1					
Ga	2	11					
Gd	1						
Ge	2	5.8					
Hf	2	1.0					
Hg	2	0.018					
Ho	1						
In	0						
La	7	16					
Li	13	20	20.6	5.13	10	21.1	1.75
Lu	2	0.24					
Mo	5	3					

Table 4 (cont.)

ppm	n	M	$\bar{x}$	s	n_1	$\bar{x}_1$	s_1
Nb	2	6					
Nd	1						
Ni	17	25	27.3	8.66	12	25.1	3.97
Pb	7	11					
Rb	14	66.2	64.2	10.01	11	67.0	4.71
Ru	1						
Sb	5	0.7					
Sc	4	5.7					
Se	0						
Sm	5	2.6					
Sn	2	1.2					
Sr	15	58	54.2	14.51	12	58.1	5.66
Ta	1						
Tb	2						
Th	3	2.6					
U	2	0.8					
V	12	36.5	39.5	13.47	10	37.7	4.01
Y	7	15					
Yb	3	1.3					
Zn	23	43	45.5	17.19	20	42.0	5.09
Zr	11	40	39.5	13.18	8	40.4	6.52

Table 5: Distribution of raw data, sample FeR-3 (See "Derivation...", p. 3-4)

pct	n	M	$\bar{x}$	s	n_1	$\bar{x}_1$	s_1
SiO_2	27	53.16	53.02	1.163	20	53.11	0.621
TiO_2	19	0.01	0.013	0.009	15	0.013	.006
Al_2O_3	29	.10	.241	.493	27	.122	.071
Fe_2O_3	20	29.44	29.55	.686	16	29.55	.411
FeO	18	13.70	13.67	.449	15	13.70	.186
MnO	33	0.08	0.085	.017	28	0.082	.007
MgO	30	1.02	1.13	.402	28	1.03	.121
CaO	32	0.834	0.842	.089	22	0.833	.051
Na_2O	21	.013	.051	.100	20	.03	.037
K_2O	21	.02	.026	.014	15	.024	.007
H_2O^+	12	.20	.277	.168	7	.233	.067
CO_2	14	1.195	1.209	.087	10	1.198	.035
P_2O_5	23	0.07	0.072	.023	19	0.069	.012
F	5	.01					
S	10	.03	0.031	0.007	7	0.03	.000
Others		.03	.032			.031	
Σ		100.01	100.26			100.06	
O/F,S,Cl		0.02	0.02			.02	
Σ (corr.)		99.99	100.24			100.04	
Fe_2O_3TR	44	44.59	44.55	1.881	38	44.55	0.690
Fe_2O_3TC		44.67	44.74			44.78	
ppm							
Ag	1						
As	4	1.1					
B	1						
Ba	11	13.3	21.4	22.58	10	17.9	13.13
Be	3	0.5					
Bi	1						
Cd	2	3.5					
Ce	1						
Cl	0						
Co	8	2					
Cr	15	6.4	8.8	8.63	14	6.7	3.16
Cs	2	1.2					
Cu	17	6	7.8	6.75	14	6.1	3.29
Dy	1						
Eu	3	0.21					
Ga	2	6					
Gd	1						
Ge	2	3.8					
Hf	0						
Hg	1						
Ho	1						
In	0						
La	7	2.6					
Li	3	2					
Lu	3	0.06					
Mo	3	1.8					

Table 5 (cont.)

ppm	n	M	$\bar{x}$	s	n_1	$\bar{x}_1$	s_1
Nb	2	6					
Nd	0						
Ni	17	13	14.5	8.56	12	12.2	2.60
Pb	7	8.6					
Rb	2	2.8					
Ru	0						
Sb	4	1.2					
Sc	3	0.6					
Se	0						
Sm	5	0.6					
Sn	0						
Sr	19	31	29.3	9.30	13	31.8	3.55
Ta	1						
Tb	0						
Th	1						
U	2	0.6					
V	11	8	7.96	3.30	9	7.94	1.15
Y	6	5.5					
Yb	3	0.2					
Zn	23	33	34.2	15.07	21	32.3	5.71
Zr	6	5					

Table 6: Distribution of raw data, sample FeR-4 (See "Derivation...", p. 3-4)

pct	n	M	$\bar{x}$	s	n_1	$\bar{x}_1$	s_1
SiO_2	28	50.00	49.93	0.956	20	49.93	0.526
TiO_2	24	0.07	0.069	.029	21	0.065	.008
Al_2O_3	32	1.67	1.78	.449	30	1.68	.135
Fe_2O_3	20	22.88	23.07	.850	13	22.95	.417
FeO	18	15.62	15.55	.431	15	15.62	.168
MnO	34	0.191	0.195	.033	28	0.198	.010
MgO	30	1.40	1.55	.631	28	1.40	.147
CaO	33	2.22	2.24	.143	25	2.21	.065
Na_2O	24	0.03	0.063	.093	23	0.045	.036
K_2O	30	.29	.274	.063	26	.29	.023
H_2O^+	13	.72	.755	.228	9	.728	.080
CO_2	14	4.84	4.73	.316	12	4.84	.136
P_2O_5	22	0.12	0.119	.028	18	0.124	.008
F	6	.02					
S	12	.111	0.109	0.014	9	0.112	.008
Others		.046	.051			.047	
Σ		100.23	100.51			100.26	
O/F,S,Cl		0.07	0.07			0.07	
Σ (corr.)		100.16	100.44			100.19	
Fe_2O_3TR	43	40.06	40.15	1.694	37	40.19	0.800
Fe_2O_3TC		40.24	40.35			40.31	
ppm							
Ag	0						
As	5	3.6					
B	2	2.4					
Ba	11	43	54.7	29.76	10	46.1	9.70
Be	6	1					
Bi	1						
Cd	2	3.2					
Ce	3	11					
Cl	2	100					
Co	8	2					
Cr	17	9.1	10.3	9.70	16	8.0	3.14
Cs	5	0.8					
Cu	18	12.5	13.9	6.06	13	12.4	2.11
Dy	1						
Eu	3	0.74					
Ga	2	6					
Gd	1						
Ge	2	5.1					
Hf	2	0.6					
Hg	1						
Ho	1						
In	0						
La	7	8.7					
Li	12	7	7.2	2.11	9	6.8	0.66
Lu	3	0.11					
Mo	3	2.0					

Table 6 (cont.)

ppm	n	M	$\bar{x}$	s	n_1	$\bar{x}_1$	s_1
Nb	2	4.5					
Nd	0						
Ni	13	8	10.8	8.66	9	7	2.58
Pb	7	8.5					
Rb	10	16.0	17.8	4.12	7	16.5	1.64
Ru	0						
Sb	5	3					
Sc	3	1.6					
Se	0						
Sm	5	2.2					
Sn	2	1.2					
Sr	18	61.5	55.7	14.41	15	16.1	6.16
Ta	0						
Tb	2	0.25					
Th	3	1					
U	3	0.5					
V	11	11	11.4	4.20	9	10.9	1.52
Y	6	8					
Yb	3	0.5					
Zn	25	25	28.3	14.94	22	25.7	5.51
Zr	11	22	41.2	50.93	10	26.4	13.32

Table 7: Derivation of laboratory ratings (See p. 4)

Lab.	G	F	P	N	ΣN	R
25	2	0	0	2	2	100.0
85	54	5	1	60	62	83.3
33	75	13	5	93	155	75.3
20	13	3	1	17	172	70.6
42	70	19	5	94	266	69.2
40	29	9	3	41	307	63.4
84	37	4	7	48	355	62.5
43	64	24	7	95	450	60.0
18	63	21	10	94	544	56.4
60	36	12	6	54	598	55.6
16	69	22	13	104	702	53.8
15	37	9	9	55	757	50.9
70	83	41	21	145	902	42.8
41	24	13	6	43	945	41.9
46	61	40	14	115	1060	40.9
56	37	20	10	67	1127	40.3
53	67	20	25	112	1239	37.5
26	20	16	5	41	1280	36.6
61	63	32	21	116	1396	36.2
55	20	11	8	39	1435	30.8
01	44	21	19	84	1519	29.8
19	15	14	5	34	1553	29.4
74	38	9	20	67	1620	26.9
31	91	48	45	184	1804	25.0
51	28	16	15	59	1863	22.0
50	0	1	0	1	1864	0.0
45	22	7	24	53	1917	-3.8
06	6	11	7	24	1941	-4.2
07	17	8	25	50	1991	-16.0
10	7	17	14	38	2029	-18.4
05	10	21	27	58	2087	-29.3

Table 8: Derivation of usable values, sample FeR-1 (See p. 4)

pct	M	n_s	M_s	$\bar{x}_s$	V_u	Confidence +	Confidence -
SiO_2	17.02	9	16.99	16.95	16.95	0.31	0.31
TiO_2	0.030	9	0.030	0.040	0.03	.05	.03
Al_2O_3	.500	8	.515	.518	.52	.03	.04
Fe_2O_3	49.82	10	49.88	50.14	49.88?		
FeO	23.48	8	23.34	23.20	23.34?		
MnO	0.230	9	0.220	0.234	0.22	0.04	0.00
MgO	.297	9	.300	.298	.30	.02	.03
CaO	3.31	9	3.29	3.29	3.29	.09	.10
Na_2O	0.020	7	0.040	0.031	0.03	.02	.02
K_2O	.020	8	.020	.028	.02	.04	.01
H_2O^+	.440	6	.420	.408	.41	.06	.06
CO_2	1.400	7	1.400	1.393	1.39	.05	.05
P_2O_5	2.44	9	2.40	2.39	2.39	.04	.04
F	0.058				0.06?		
S	.250	6	0.260	0.262	.26	0.03	0.03
Others	1.199		1.176	1.189	1.18?		
Σ	100.51		100.34	100.43	100.27?		
O/F,S,Cl	0.15		0.16	0.16	0.16?		
Σ (corr.)	100.36		100.18	100.27	100.11?		
Fe_2O_3TR	75.80	12	75.86	75.90	75.86	0.22	0.22
Fe_2O_3TC	75.91		75.82	75.92	75.82?		
ppm							
As	6.4				6?		
Ba	1100	7	1000	1050	1000	240	70
Be	1.65				1.5?		
Bi	6				6?		
Co	11.4	5	12	12.0	12	1	1
Cr	7	5	7	7.8	7	2	0
Cu	103	5	101	98.8	100	12	19
Ge	2.6				3?		
La	11.9				12?		
Li	4.0	4	5.5		5?		
Lu	0.16				0.2?		
Ni	12	5	8	7.8	8		
Pb	5200	5	5200	5220	5200	300	200
Sb	5.2				5?		
Sc	0.76				0.8?		
Sm	1.7				1.7?		
Sr	90	5	90	88	90	8	10
V	98	3	105		100?		
Yb	0.99				1?		
Zn	3550	6	3450	3500	3500	300	300
Zr	13				13?		

Table 9: Derivation of usable values, sample FeR-2 (See p. 4)

pct	M	n_s	M_s	$\bar{x}_s$	V_u	Confidence +	Confidence -
SiO_2	48.92	8	49.28	49.21	49.21	0.31	.31
TiO_2	0.190	9	0.180	0.176	0.18	.03	.03
Al_2O_3	5.17	9	5.15	5.16	5.16	.13	.13
Fe_2O_3	22.62	9	22.50	22.52	22.50	.17	.22
FeO	15.34	7	15.28	15.24	15.24	.20	.20
MnO	0.120	8	0.120	0.120	0.12	.00	.00
MgO	2.10	9	2.10	2.10	2.10	.02	.02
CaO	2.17	8	2.17	2.16	2.17	.05	.09
Na_2O	0.500	10	0.510	0.514	0.51	.03	.03
K_2O	1.300	9	1.340	1.330	1.33	.04	.04
H_2O^+	0.970	6	0.990	0.982	0.98	.11	.11
CO_2	.053	5	.080	.066	.07	.03	.03
P_2O_5	.270	9	.270	.269	.27	.01	.01
F	.040				.04?		
S	.170	5	0.170	0.174	.17	0.01	.01
Others	.12		.12	.12	.12?		
Σ	100.05		100.30	100.18	100.17?		
O/F,S,Cl	0.10		0.10	0.11	0.10?		
Σ (corr.)	99.95		100.20	100.07	100.07?		
Fe_2O_3TR	39.40	12	39.21	39.18	39.21	0.30	0.22
Fe_2O_3TC	39.67		39.48	39.46	39.44		
ppm							
As	2.0				2.0?		
B	61				61?		
Ba	230	6	240	250	240	50	20
Be	3.0				3?		
Cd	3				3?		
Cl	100				100?		
Co	7.1	5	7	7.3	7	1	0.5
Cr	46	5	45	47	47	6	6
Cs	5.0				5?		
Cu	20	5	46	45.2	45	5	5
Ge	5.8				6?		
Hg	0.018				0.02?		
La	16				14?		
Li	20	5	22	22.1	22	2	2
Mo	3				3?		
Ni	25	5	20	21.2	21	4	4
Pb	11				11?		
Rb	66.2	4	65.5		66?		
Sb	0.7				0.7?		
Sc	5.7				6?		
Sm	2.6				2.6?		
Sn	1.2				1?		
Sr	58	5	58	58.4	58	1	1
Th	2.6				3?		
V	36.5	4	38		37?		
Y	15				15?		
Yb	1.3				1.3?		
Zn	43	5	44	43	43	4	4
Zr	40	6	39	38.3	39	6	8

Table 10: Derivation of usable values, sample FeR-3 (See p. 4)

pct	M	n_s	M_s	$\bar{x}_s$	V_u	Confidence +	Confidence −
SiO_2	53.16	9	53.61	53.61	53.61	0.41	0.41
TiO_2	0.01	8	0.01	0.013	0.01	.01	.01
Al_2O_3	.10	7	.08	.086	.09	.02	.02
Fe_2O_3	29.44	10	29.40	29.62	29.40?		
FeO	13.70	8	13.63	13.48	13.63?		
MnO	0.08	8	0.08	0.08	0.08	0.00	0.00
MgO	1.02	9	1.02	1.02	1.02	.02	.02
CaO	0.834	9	0.84	0.857	0.84	.06	.01
Na_2O	.013	8	.03	.033	.03	.03	.03
K_2O	.02	8	.03	.033	.03	.01	.01
H_2O^+	.20	4	.20		.20?		
CO_2	1.195	7	1.19	1.20	1.20	.04	.04
P_2O_5	0.07	9	0.07	0.073	0.07	.01	.01
F	.01				.01?		
S	.03	4	0.03		.03?		
Others	.03		.03	0.03	.03?		
Σ	100.01		100.26	100.35	100.28?		
O/F,S,Cl	0.02		0.02	0.02	0.02?		
Σ (corr.)	99.99		100.24	100.33	100.26?		
Fe_2O_3TR	44.59	13	44.50	44.34	44.50	0.12	0.25
Fe_2O_3TC	44.67		44.55	44.60	44.55?		
ppm							
As	1.1				1.1?		
Ba	13.3	5	11	11.1	11	4	4
Co	2				2?		
Cr	6.4	5	6	6.4	6	1	0
Cu	6	4	6.5		6?		
Ge	3.8				4?		
La	2.6				2?		
Ni	13	5	9	9.6	10	4	4
Pb	8.6				9?		
Sb	1.2				1?		
Sm	0.6				0.6?		
Sr	31	5	31	32.2	31	4	1
V	8	3	9		8?		
Y	5.5				6?		
Yb	0.2				0.2?		
Zn	33	5	36	35.8	36	3	3
Zr	5				2?		

Table 11: Derivation of usable values, sample FeR-4 (See p. 4)

pct	M	n_s	M_s	$\bar{x}_s$	V_u	Confidence +	Confidence -
SiO_2	50.00	9	50.07	50.30	50.07	0.55	0.11
TiO_2	0.07	9	0.07	0.066	0.07	.00	.00
Al_2O_3	1.67	9	1.70	1.70	1.70	.07	.07
Fe_2O_3	22.88	10	22.70	22.81	22.70	.48	.26
FeO	15.62	7	15.54	15.54	15.54	.15	.15
MnO	0.191	9	0.19	0.193	0.19	.00	.00
MgO	1.40	9	1.40	1.41	1.41	.05	.05
CaO	2.22	9	2.22	2.23	2.23	.05	.05
Na_2O	0.03	9	0.05	0.054	0.05	.03	.03
K_2O	.29	9	.29	.287	.29	.01	.01
H_2O^+	.72	6	.715	.723	.72	.08	.08
CO_2	4.84	7	4.85	4.86	4.86	.08	.08
P_2O_5	0.12	9	0.13	0.13	0.13	.01	.01
F	.02				.02?		
S	.111	6	0.115	0.112	.11	0.01	0.01
Others	.046		.046	.046	.05?		
Σ	100.23		100.11	100.48	100.14?		
O/F,S,Cl	0.07		0.07	0.07	0.07?		
Σ (corr.)	100.16		100.04	100.41	100.07?		
Fe_2O_3TR	40.06	13	39.92	39.69	39.92	0.17	0.82
Fe_2O_3TC	40.24		39.97	40.08	39.97		
ppm							
As	3.6				3.6?		
B	2.4				2.4?		
Ba	43	5	43	43.8	43	9	8
Be	1				1?		
Cl	100				100?		
Co	2				2?		
Cr	9.1	5	9	9.4	9	1	1
Cs	0.8				0.8?		
Cu	12.5	5	13	13.3	13	2	2
Ge	5.1				5?		
La	8.7				8?		
Li	7	5	7	6.8	7	1	1
Ni	8	3	5		6?		
Pb	8.5				8?		
Rb	16.0	3	17		16?		
Sb	3				3?		
Sc	1.6				1.5?		
Sm	2.2				2.2?		
Sr	61.5	5	62	62.4	62	5	5
Th	1				1?		
V	11	3	10		11?		
Y	8				8?		
Yb	0.5				0.5?		
Zn	25	5	27	27.6	27	6	4
Zr	22	4	17.5		18?		

Table 12: Probable compositions* (See p. 4)

Constituent		FeR-1	FeR-2	FeR-3	FeR-4
SiO_2	pct	16.95	49.21	53.61	50.07
TiO_2		0.03	0.18	0.01	0.07
Al_2O_3		.52	5.16	.09	1.70
Fe_2O_3		49.88?	22.50	29.40?	22.70
FeO		23.34?	15.24	13.63?	15.54
MnO		0.22	0.12	0.08	0.19
MgO		.30	2.10	1.02	1.41
CaO		3.29	2.17	0.84	2.23
Na_2O		0.03	0.51	.03	0.05
K_2O		.02	1.33	.03	.29
H_2O^+		.41	0.98	.20?	.72
CO_2		1.39	.07	1.20	4.86
P_2O_5		2.39	.27	0.07	0.13
F		0.06?	.04?	.01?	.02?
S		.26	.17	.03?	.11
Fe_2O_3T		75.86	39.21	44.50	39.92
As	ppm	6?	2?	1?	3.6?
B			61?		2?
Ba		1000	240	11	43
Be		1.5?	3?		1?
Bi		6?			
Cd			3?		
Cl			100?		100?
Co		12	7	2?	2?
Cr		7	47	6	9
Cs			5?		0.8?
Cu		100	45	6?	13
Ge		3?	6?	4?	5?
Hg			0.02?		
La		12?	14?	2?	8?
Li		5?	22		7
Lu		0.2?			
Mo			3?		
Ni		8	21	10	6?
Pb		5200	11?	9?	8?
Rb			66?		16?
Sb		5?	0.7?	1?	3?
Sc		0.8?	6?		1.5?
Sm		1.7?	2.6?	0.6?	2.2?
Sn			1?		
Sr		90	58	31	62
Th			3?		
V		100?	37?	8?	11?
Y			15?	6?	8?
Yb		1?	1.3?	0.2?	0.5?
Zn		3500	43	36	27
Zr		13?	39	2?	18?

* Readers are referred to Tables 8-11 for estimates of confidence limits on these values, as well as to that part of the text entitled "Confidence Limits".

APPENDIX
Description of analytical methods

Laboratory 01

01-BOX	Pressed briquette (sample plus binder). XRF measurement refined from Feather and Willis (1976)
01-FOT	Pyrosulphate fusion, dissolved in HCl, stannous reduction, dichromate titration
01-FOX	Ignited sample fused with Li tetraborate, La absorber. XRF measurement and matrix correction like Norrish and Hutton (1969)
01-HOA-1	HCl-stannous digestion, AAS flame measurement
01-HOA-2	Perchloric-nitric digestion, dissolved in HCl, AAS flame measurement; La, Cs added where required
01-HOE	Decomposition as in 01-HOA-2, ICP measurement; no additives

Laboratory 05

05-BOX-1	Pressed cylinder (sample plus "X-ray Mix Powder"), XRF measurements compared to standards
05-BOX-2	Pressed disks (standard additions?) excited by 125-I isotope; resulting X-rays measured as above
05-OOR	Fast neutron activation; iron determined first, others by reference to iron

Laboratory 06

06-OOR	Instrumental neutron activation, with appropriately varied irradiation and decay times before counting

Laboratory 07

07-OOR-1	Short irradiation INAA-gamma ray spectroscopy
07-OOR-2	Long irradiation with appropriately varied decay times before counting
07-OOR-3	Prompt gamma-ray neutron activation. See Hanna et al. (1981)

Laboratory 10

10-FOX	Li-tetraborate fusion, La absorber; glass ground, pressed to pellet with Somar; XRF measurement
10-HOA	HF-aqua regia decomposition; boric acid added; flame AAS

Laboratory 15

15-BOX	Sample-wax pellet; XRF with matrix correction
15-FOX	Li-tetraborate fusion; XRF measurement
15-FPG	Classical fusion-gravimetric
15-HOT	HF-sulphuric decomposition, dichromate titration
15-HPT	HF-nitric-sulphuric decomposition, interferences removed with H_2S

Laboratory 16

16-BOX	Sample pelletized with methacrylate polymer; XRF measurement
16-FOT-1	Peroxide fusion dissolved in HCl; stannous reduction, dichromate titration
16-FOT-2	As above, but silver reduction
16-FPA-1	Bisulphate fusion of classical R_2O_3 group; flame AAS
16-FPA-2	Classical separations; flame AAS instead of precipitation
16-FPG	Classical gravimetric
16-FPJ-1	As in 16-FPA-1, but phenanthroline photometric finish
16-FPJ-2	As above, but peroxide photometry
16-HOE	HF-HCl-perchloric attack, flame emission measurement
16-HOJ	As above, but molybdovanadate photometric finish
16-HOT	Classical decomposition, titration
16-HVG	Phosphoric acid evolution, absorption on soda-lime
16-OVG	Closed-circuit heating, absorption on magnesium perchlorate

Laboratory 18

18-BOX	XRF on powder pellets
18-FOA	$LiBO_2$ fusion; dissolved in HF-boric; flame AAS
18-FPG	Classical gravimetric
18-FVA-1	NaOH fusion, hydride evolution; flameless AAS
18-FVA-2	As above, but $LiBO_2$ fusion
18-FVG	PbO fusion, volatilization, gravimetric
18-FVJ-1	Combustion, IR absorption measurement
18-FVJ-2	NaOH fusion, acid distillation, automated colorimetry
18-HOA	HF-HCl-nitric decomposition, La-Na-K additives where required; flame AAS
18-HOE-1	HF-HCl-sulphuric-perchloric decomposition; flame emission measurement
18-HOE-2	HF-nitric-perchloric decomposition; ICP measurement with inter-element and matrix corrections
18-HOJ-1	HF-HCl-nitric-sulphuric decomposition; colorimetric finish
18-HOJ-2	As above, but using only HF-sulphuric
18-HOT-1	HF-HCl decomposition, pyrosulphate fusion on residue; permanganate titration
18-HOT-2	HF-sulphuric decomposition; titration as above
18-HVA-1	HF-perchloric decomposition, hydride evolution; flameless AAS
18-HVA-2	As above, but HF-sulphuric decomposition

Laboratory 19

19-OVS	Automated D.C.-arc optical emission; photographic recording

Laboratory 20

20-OOR-1	Delayed neutron assay
20-OOR-2	Instrumental thermal neutron activation

Laboratory 25

25-HCR	Chemical preconcentration, modified from Voldet and Haerdi (1976, 1978); neutron activation

Laboratory 26

26-HOA	Acid decomposition, Na added, flame AAS
26-HOE	Acid decomposition, standard addition, flame emission

Laboratory 31

31-FVG	Classical Penfield method
31-FVT	Combustion and coulometric titration
31-HOA-1	HF-sulphuric-boric decomposition; flame AAS
31-HOA-2	Decomposition as above; silica, fluoride and borate fumed off; flame AAS
31-HOA-1,2?	Both methods indicated without identification of each replicate with either
31-HOE-1	Decomposition as in 31-HOA-1; ICP
31-HOE-2	Decomposition as in 31-HOA-2; ICP
31-HOE-3	Decomposition as in 31-HOA-2; flame emission
31-HOJ-1	Decomposition as in 31-HOA-1; colorimetric finish (reaction not reported; see Ayranci, 1977)
31-HOJ-2	Decomposition as in 31-HOA-2, finish as in 31-HOJ-1
31-HOJ-HOE?	See 31-HOA-1,2?
31-HOT	Classical Pratt method
31-OOA, 31-OOG, 31-OOT	Chemical pretreatment not described

Laboratory 33

33-FOA	Fusion with mixed Li borates; AAS with La buffer
33-FOJ	Decomposition as above; Mo-blue colorimetry
33-FVG	Classical Penfield method
33-FVK	Combustion and gas-volume measurement
33-FVT	Combustion and automatic iodate titration
33-HOA-1	HF-perchloric decomposition; AAS
33-HOA-2	As above, but with K and Fe additives before AAS
33-HOJ-1	Decomposition as in 33-HOA-1; Tiron colorimetry
33-HOJ-2	Decomposition as above; molybdovanadate colorimetry
33-HOJ-3	As above, but phenanthroline colorimetry
33-HOT	Classical Pratt method
33-OOO	No information on trace-element methods

Laboratory 40

40-FOE	Li tetraborate fusion; ICP

Laboratory 41

41-FPA	Filtrates from silica separation (see 41-FPG) analyzed by flame AAS
41-FPG	Peroxide fusion, perchloric digestion, conventional gravimetric
41-HOA-1	HF-HCl-nitric-perchloric decomposition; AAS (no additives)
41-HOA-2	As above, but with La buffer
41-HOA-3	As above, but with K buffer
41-HOA-4	As above, but with Na buffer
41-HOJ	As above, but peroxide colorimetric finish
41-HOT-1	Classical Pratt method
41-HOT-2	HCl-nitric-perchloric decomposition; dichromate titration

Laboratory 42

42-FOA	$LiBO_2$ fusion dissolved in HCl; flame AAS
42-FOL	Carbonate fusion; selective ion electrode measurement
42-FOT	Carbonate fusion dissolved in HCl; titrant not specified
42-FPG	Classical gravimetric
42-FVG	Classical Penfield method
42-FVJ	Combustion and IR absorption measurement
42-HOA	HF-perchloric decomposition, flame AAS
42-HOJ	Decomposition as above; colorimetric reaction not specified
42-HOT	Classical Pratt method
42-HVG	HCl evolution; gravimetric finish
42-OOX	Sample powder compared with similar standards by XRF

Laboratory 43

43-FOE	$LiBO_2$ fusion, flame emission (Li internal standard)
43-FOL	NaOH fusion, dissolved in citrate, selective ion electrode
43-FPG	Classical gravimetric (Peck, 1964); sulphide precipitation before R_2O_3
43-FPJ	Peroxide colorimetry (Peck, 1964)
43-FPT	Jones reductor, dichromate titration (Peck, 1964)
43-FVG	Classical Penfield method
43-FVJ	Combustion and IR absorption measurement
43-HOE	HF-aqua regia in Teflon bomb; ICP measurement with La as internal standard

43-HOL	Conway diffusion cell; selective ion electrode
43-HOT	Classical titration, but automatic potentiometric end-point
43-HVT	Perchloric evolution; coulometric titration in nonaqueous medium

Laboratory 45

45-FOA	Li tetraborate fusion; AAS
45-HOA	HF-nitric-perchloric decomposition; AAS

Laboratory 46

46-FOX	Na-Li tetraborate fusion; XRF
46-HOA	Nitric-perchloric decomposition in Teflon bomb, HF removal of silica; AAS (graphite furnace)
46-HOE	Decomposition as above; ICP
46-HOM	Nitric digestion with spike; evaporated residue measured by spark-source mass spectrometry

Laboratory 50

50-FVJ	Peroxide sinter dissolved in HCl, As (III) chloride distilled; Mo-blue colorimetry
50-FYJ	Decomposition as above, B extracted with ethyl hexanediol ester; curcumin colorimetry

Laboratory 51

51-FOX	Li tetraborate fusion; XRF (Norrish and Hutton, 1969)
51-FVT	Combustion and iodate titration
51-HOA	HF-perchloric decomposition; AAS (K additive or background correction where necessary)
51-HOE	As above, but flame emission
51-HOT	HF-sulphuric decomposition in sealed plastic; dichromate titration
51-HVG	HCl evolution, soda-asbestos absorption, gravimetric
51-OVG	High-temperature evolution, Mg-perchlorate absorption, gravimetric

Laboratory 53

53-FOE	$LiBO_2$-B_2O_3-Li nitrate fusion dissolved in HCl; ICP with Sc as internal standard
53-FPG	NaOH-peroxide fusion, gravimetric (unprecipitated silica determined as Mo-blue)
53-FPJ-1	Periodate-persulphate colorimetry on part of filtrate from above
53-FPJ-2	Na carbonate-peroxide fusion, P coprecipitated on Fe; molybdovanadate complex extracted by MIBK; colorimetry
53-FPT	Decomposition as above; dichromate titration
53-FVT	"Leco determinator" (not clear whether titrimetric or IR finish; former assumed)
53-HOT	Classical Pratt method
53-HYA	HF-perchloric-nitric decomposition (prolonged to near-completion), Fe (III) chloride extracted with MIBK; AAS with additives where required
53-HYE	HF-nitric-perchloric attack, residue fused; ICP as in 53-FOE
53-OVG	High-temperature heating; water absorbed on Mg perchlorate, CO_2 on ascarite; gravimetric

Laboratory 55

53-FOE	Li-borate fusion; plasma emission (based on Govindaraju et al., 1976)
55-FOJ	Colorimetric on above solution

Laboratory 56

56-FOX	Li-tetraborate fusion; XRF
56-FVJ	Combustion and IR
56-HOA	HF-HCl attack; flame AAS
56-HOT	HCl decomposition, dichromate titration
56-OOT	Karl Fischer titration (pretreatment not specified)

Laboratory 60

60-FOX	Borate fusion (based on Norrish and Hutton, 1969); XRF with matrix corrections based on alpha coefficients
60-FVG	High-temperature evolution, absorption in Mg perchlorate; gravimetric
60-FVL-1	Combustion; measurement by thermal conductivity
60-FVL-2	Pyrohydrolysis and ion-selective electrode
60-HOT	HF-sulphuric decomposition in sealed plastic; dichromate titration

Laboratory 61

61-BOA	Buffered solid sample in AAS flame
61-FOJ	$LiBO_2$ fusion; Fe-CNS colorimetry
61-FOL	As above but selective ion electrode
61-FOX	Li-tetraborate fusion; XRF with matrix corrections based on alpha coefficients
61-FVJ	Combustion and IR absorption
61-HOA	HF-HCl (or nitric) decomposition; flame AAS
61-HOT-1	Classical Pratt method, but potentiometric end-point
61-HOT-2	HF-HCl-perchloric attack, Sn (II) reduction, dichromate titration
61-OOX	Energy-dispersive XRF on loose powder; peak-stripping; corrections based on Compton effect

Laboratory 63

63-OVA-1	Hydride volatilization, AAS in silica tube (sample decomposition not specified)
63-OVA-2	As above, but no hydride formation
63-OYJ	Iso-amyl acetate extraction, dithiol colorimetry (sample decomposition not specified)

Laboratory 70

70-FOA	Li-tetraborate fusion dissolved in HCl; AAS
70-FOE-1	Fusion as above, dissolved in nitric; ICP
70-FOE-2	Fusion, solution as in 70-FOA; ICP
70-HOE-1	Sulphuric-nitric attack, residue dissolved in HF-nitric; ICP
70-HOE-2	HF-HCl-nitric attack; ICP
70-HOT	HF-vanadate decomposition; excess vanadate titrated with Fe (II)
70-HYJ	Decomposition as in 70-HOE-2; amyl-acetate extraction of dithiol complex, colorimetry

Laboratory 74

74-HOA	HF-HCl-nitric attack under pressure, Li additive (no borate); plasma emission

Laboratory 84

84-HCX	Li carbonate-boric acid fusion, adsorption on ion-exchange resins, XRF on thin layer of resin beads
84-OOO	Fe (II) method not specified

Laboratory 85

85-FPG-1	HCl attack, residue fused with NaOH, perchloric dehydration; unprecipitated silica determined by Mo-blue colorimetry
85-FPG-2	Na carbonate-ZnO sinter, precipitation of Ba sulphate, gravimetric
85-FPG-FVT?	Both methods described, but no result identified with either
85-FVG	Fusion with Pb chromate; evolved water absorbed in sulphuric acid, gravimetric
85-FVT	Combustion and iodate titration
85-FYT	MIBK extraction of Fe from filtrate from 85-FPG-1; R_2O_3 group precipitated, others separated by NaOH precipitation; Al titrated with Zn acetate-fluoride
85-FYT-HOJ?	Uncertain which method used
85-HOA	HF-HCl-perchloric decomposition; AAS with standard addition to overcome effect of Fe
85-HOJ-1	HF-HCl-sulphuric decomposition, pyrosulphate fusion of residue; diantipyrine methane colorimetry
85-HOJ-2	Acid attack as above, carbonate fusion of residue; chrome azurol S colorimetry
85-HOJ-3	HF-sulphuric decomposition; Mo-blue colorimetry
85-HOT-1	HCl attack, residue treated with HF-sulphuric and pyrosulphate fusion; Sn (II) reduction, dichromate titration
85-HOT-2	Classical Pratt method, with added bicarbonate tablet to maintain inert atmosphere
85-HYA	Decomposition as in 85-HOA, Fe separated as in 85-FYT; flame AAS