2-4 Results of Chemical Analyses of Ores

2-4-1 Sampling and chemical analysis

The 81 ore samples, intersected by diamond drill, were collected and were chemically analysed for the 8 REE of lanthanum (La), cerium (Ce), neodymium (Nd), samarium (Sm), europium (Eu), telbium (Tb), ytterbium (Yb) and lutecium (Lu), and the related 7 elements of phosphorus (P), barium (Ba), strontium (Sr), neobium (Nb), yttrium (Y), uranium (U) and thorium (Th), totally for 15 elements.

The methods of chemical analysis and analysis accuracy are identical with those for the samples of Buru Hill cores (Refer to 1-4-1).

2-4-2 Statistic values of analysis data and statistic interpretations

(1) Statistic values

The statistic values of the chemical analysis informations on 81 ore samples are shown in Table II-2-2.

The average values of the chemical contents of the elements show approximately a half of those of the mineralized zone in the Buru Hill body, supergene enriched, and approximately two third of those of the primary zone in the Buru Hill body (Refer to Section 1-4-2), estimated to be considerably low-graded. They are, however, fairly higher than those of ferrocarbonatite body samples collected by the ground surface geochemistry of the first-year work (Phase I), i.e., 1.35 times of LREE (La + Ce + Nd : 0.98 percent). It, consequently, shows that the average values of the chemical contents of the elements are higher in the occasions of drill core than those of ground surface specimen, however, is still on a considerably low-graded level.

(2) Interpretations of mutual correlations

The mutul correlation coefficients among the 15 elements are shown in Table II-2-3. Major relations are summarized below:

i) Ba: Highly correlated to REE, particularly to LREE.

ii) Nb: Weakly correlated to the other elements.

iii) Y: Highly correlated to REE, particularly to MREE and HREE.

iv) U and Th: Highly correlated to MREE.

v) LREE, MREE and HREE : Highly mutually correlated to the elements of the individual group, i.e., La is to Ce and Nd, and etc..

(3) Principal component analysis

The summarized results of the principal component analysis are shown in Table II-2-4. The contribution ratio of more than 5 percent is produced by from the 1st through 5th principal components, by what some 90 percent of the entire results of the chemical analyses are represented by the above five principal components.

Table II–2–2 Summary of Statistics of Analysis – Drill Core Samples –

Component	Unit	No. of sample	Maximum	Minimum	Mean(m)	Standard deviation	m − 2σ	m − σ	m + σ	m + 2σ
P	PPM	81	15850	732	3338.1	0.337	706.8	1536.0	7254.6	15766.0
BA	%	81	10.60	0.21	2.787	0.3374	0.589	1.281	6.062	13.184
SR	PPM	81	4010	675	1579.8	0.172	714.8	1062.6	2348.7	3491.9
NB	PPM	81	1500	78	454.4	0.238	151.9	262.7	785.8	1359.0
Y	PPM	81	1250	71	239.5	0.226	84.4	142.2	403.4	679.4
U	PPM	81	32.6	1.6	8.85	0.265	2.61	4.80	16.30	30.04
TH	PPM	81	2893.0	81.0	527.29	0.357	101.64	231.51	1200.98	2735.38
LA	%	81	2.460	0.008	0.2746	0.5819	0.0188	0.0719	1.0487	4.0045
CE	%	81	2.13	0.02	0.542	0.3811	0.094	0.225	1.303	3.133
ND	%	81	0.41	0.01	0.163	0.3222	0.037	0.077	0.342	0.717
SM	PPM	81	349.0	19.4	133.93	0.225	47.53	79.79	224.80	377.34
EU	PPM	81	91.6	6.6	39.49	0.218	14.45	23.89	65.28	107.92
TB	PPM	81	43.0	2.6	10.04	0.219	3.66	6.06	16.63	27.54
YB	PPM	81	65.5	3.3	11.56	0.272	3.30	6.18	21.66	40.55
LU	PPM	81	9.5	0.4	1.87	0.227	0.66	1.11	3.16	5.32

Table II–2–3 Correlation Coefficients – Drill Core Samples –

	P	BA	SR	NB	Y	U	TH	LA	CE	ND
P	1.0000	-0.1029	0.5450	0.2350	0.3672	0.2548	0.4061	-0.1382	-0.0902	0.0212
BA	-0.1029	1.0000	0.2862	0.0928	0.2504	0.3322	0.1596	0.6422	0.8207	0.8341
SR	0.5450	0.2862	1.0000	0.0413	0.0748	0.4445	0.1854	0.2272	0.2827	0.2971
NB	0.2350	0.0928	0.0413	1.0000	0.1771	0.0610	-0.0067	0.2137	0.2292	0.1697
Y	0.3672	0.2504	0.0748	0.1771	1.0000	0.2032	0.3546	0.1937	0.3146	0.3922
U	0.2548	0.3322	0.4445	0.0610	0.2032	1.0000	0.5642	0.0589	0.3176	0.5975
TH	0.4061	0.1596	0.1854	-0.0067	0.3546	0.5642	1.0000	-0.3085	0.0095	0.4648
LA	-0.1382	0.6422	0.2272	0.2137	0.1937	0.0589	-0.3085	1.0000	0.9070	0.5099
CE	-0.0902	0.8207	0.2827	0.2292	0.3146	0.3176	0.0095	0.9070	1.0000	0.8122
ND	0.0212	0.8341	0.2971	0.1697	0.3922	0.5975	0.4648	0.5099	0.8122	1.0000
SM	0.1812	0.4983	0.2362	0.0150	0.4872	0.7120	0.7779	0.0781	0.4293	0.8093
EU	0.2164	0.4741	0.2379	0.0200	0.5882	0.6693	0.6866	0.1347	0.4424	0.7503
TB	0.2598	0.3687	0.1528	0.1187	0.7623	0.4659	0.5913	0.1785	0.4097	0.6080
YB	0.2751	0.1479	0.0503	0.0436	0.8386	0.1860	0.3255	0.1481	0.2236	0.2724
LU	0.2627	0.2271	0.2748	0.1172	0.7433	0.2176	0.1866	0.3961	0.4051	0.2936

	SM	EU	TB	YB	LU
P	0.1812	0.2164	0.2598	0.2751	0.2627
BA	0.4983	0.4741	0.3687	0.1479	0.2271
SR	0.2362	0.2379	0.1528	0.0503	0.2748
NB	0.0150	0.0200	0.1187	0.0436	0.1172
Y	0.4872	0.5882	0.7623	0.8386	0.7433
U	0.7120	0.6693	0.4659	0.1860	0.2176
TH	0.7779	0.6866	0.5913	0.3255	0.1866
LA	0.0781	0.1347	0.1785	0.1481	0.3961
CE	0.4293	0.4424	0.4097	0.2236	0.4051
ND	0.8093	0.7503	0.6080	0.2724	0.2936
SM	1.0000	0.9464	0.7942	0.3949	0.2957
EU	0.9464	1.0000	0.8521	0.4345	0.3762
TB	0.7942	0.8521	1.0000	0.6005	0.5593
YB	0.3949	0.4345	0.6005	1.0000	0.8010
LU	0.2957	0.3762	0.5593	0.8010	1.0000

Table II–2–4 Summary of Principal Component Analysis – Drill Core Samples –

Prin. component	Eigen value	Contribution	Cum. contribution		P	BA	SR	NB	Y	U	TH	LA	CE	ND	SM	EU	TB	YB	LU
1	6.427	0.428	0.43	Eigen vector	0.121	0.256	0.153	0.068	0.283	0.260	0.241	0.161	0.267	0.338	0.344	0.350	0.338	0.241	0.247
				Factor loading	0.308	0.650	0.389	0.172	0.717	0.660	0.611	0.409	0.676	0.857	0.872	0.886	0.857	0.612	0.626
				Contribution	0.095	0.423	0.151	0.030	0.514	0.436	0.373	0.167	0.458	0.735	0.760	0.785	0.735	0.375	0.391
2	2.561	0.171	0.60	Eigen vector	-0.310	0.373	0.017	0.095	-0.152	-0.101	-0.361	0.516	0.447	0.208	-0.127	-0.124	-0.145	-0.171	-0.025
				Factor loading	-0.496	0.596	0.027	0.152	-0.242	-0.162	-0.578	0.826	0.715	0.334	-0.204	-0.199	-0.233	-0.274	-0.040
				Contribution	0.246	0.356	0.001	0.023	0.059	0.026	0.334	0.683	0.511	0.111	0.042	0.039	0.054	0.075	0.002
3	1.941	0.129	0.73	Eigen vector	0.116	-0.143	-0.097	0.154	0.401	-0.326	-0.253	0.180	0.020	-0.216	-0.262	-0.172	0.074	0.446	0.469
				Factor loading	0.161	-0.199	-0.135	0.214	0.559	-0.455	-0.352	0.250	0.028	-0.301	-0.364	-0.240	0.103	0.622	0.654
				Contribution	0.026	0.040	0.018	0.046	0.312	0.207	0.124	0.063	0.001	0.091	0.133	0.058	0.011	0.386	0.427
4	1.455	0.097	0.83	Eigen vector	0.577	-0.028	0.649	0.305	-0.115	0.164	-0.037	0.092	0.029	-0.058	-0.152	-0.148	-0.171	-0.148	0.042
				Factor loading	0.696	-0.034	0.782	0.368	-0.139	0.198	-0.044	0.111	0.035	-0.070	-0.183	-0.179	-0.206	-0.178	0.050
				Contribution	0.485	0.001	0.612	0.136	0.019	0.039	0.002	0.012	0.001	0.005	0.034	0.032	0.043	0.032	0.003
5	0.971	0.065	0.89	Eigen vector	0.039	-0.051	-0.377	0.868	0.053	-0.056	0.089	-0.067	0.003	0.082	0.045	0.023	0.088	-0.130	-0.218
				Factor loading	0.039	-0.050	-0.372	0.856	0.052	-0.055	0.088	-0.066	0.003	0.081	0.044	0.022	0.087	-0.128	-0.215
				Contribution	0.002	0.003	0.138	0.732	0.003	0.003	0.008	0.004	0.000	0.006	0.002	0.000	0.008	0.016	0.046
6	0.476	0.032	0.92	Eigen vector	-0.404	-0.349	0.004	0.190	-0.172	0.696	-0.174	0.022	-0.025	-0.097	-0.003	-0.014	-0.088	0.109	0.321
				Factor loading	-0.279	-0.241	0.003	0.131	-0.119	0.480	-0.120	0.015	-0.017	-0.067	-0.002	-0.009	-0.061	0.075	0.221
				Contribution	0.078	0.058	0.000	0.017	0.014	0.231	0.014	0.000	0.000	0.004	0.000	0.000	0.004	0.006	0.049
7	0.335	0.022	0.94	Eigen vector	-0.049	0.376	-0.089	0.079	-0.107	0.047	0.420	-0.189	-0.045	0.193	-0.050	-0.360	-0.520	0.393	0.144
				Factor loading	-0.029	0.218	-0.051	0.046	-0.062	0.027	0.243	-0.109	-0.026	0.111	-0.029	-0.208	-0.301	0.227	0.083
				Contribution	0.001	0.047	0.003	0.002	0.004	0.001	0.059	0.012	0.001	0.012	0.001	0.043	0.090	0.052	0.007

i) The 1st principal component: Factor loading values of the 12 elements, other than P, Sr and Nb, are high - 0.41 to 0.89. Show joint behaviours as the group of REE.

ii) The 2nd principal component: La and Ce particularly show high factor loading values. The values are estimated to be shown by a concentration of La and Ce, which are highly contained in ores in comparison with other REE.

iii) The 3rd principal component: Y, Yb and Lu show high factor loading values, which are probably caused by a similar concentration mechanism of Y and HREE.

iv) The 4th principal component: Phosphorus solely shows a high factor loading value, which is probably caused by an independent behaviour of cencentration of phosphorus of the other elements.

v) The 5th principal component: Nb solely shows a high factor loading value, which is probably caused by an independent behaviour of concentration of Nb of the other elements, similar to that of phosphorus.

2-4-3 Chemical contents of the element in ores by each drill hole

The weighted average values, [The sum of (Content × Width) / The sum of Width], of the chemical contents of the elements in ores by individual drill hole are shown in Table II -2-5. The 10 samples of low-graded section, deeper than 17.70 metres depth of the Hole KG-4, were omitted from the processing. Assay cross section through each drill hole is shown in Fig. II -2-7.

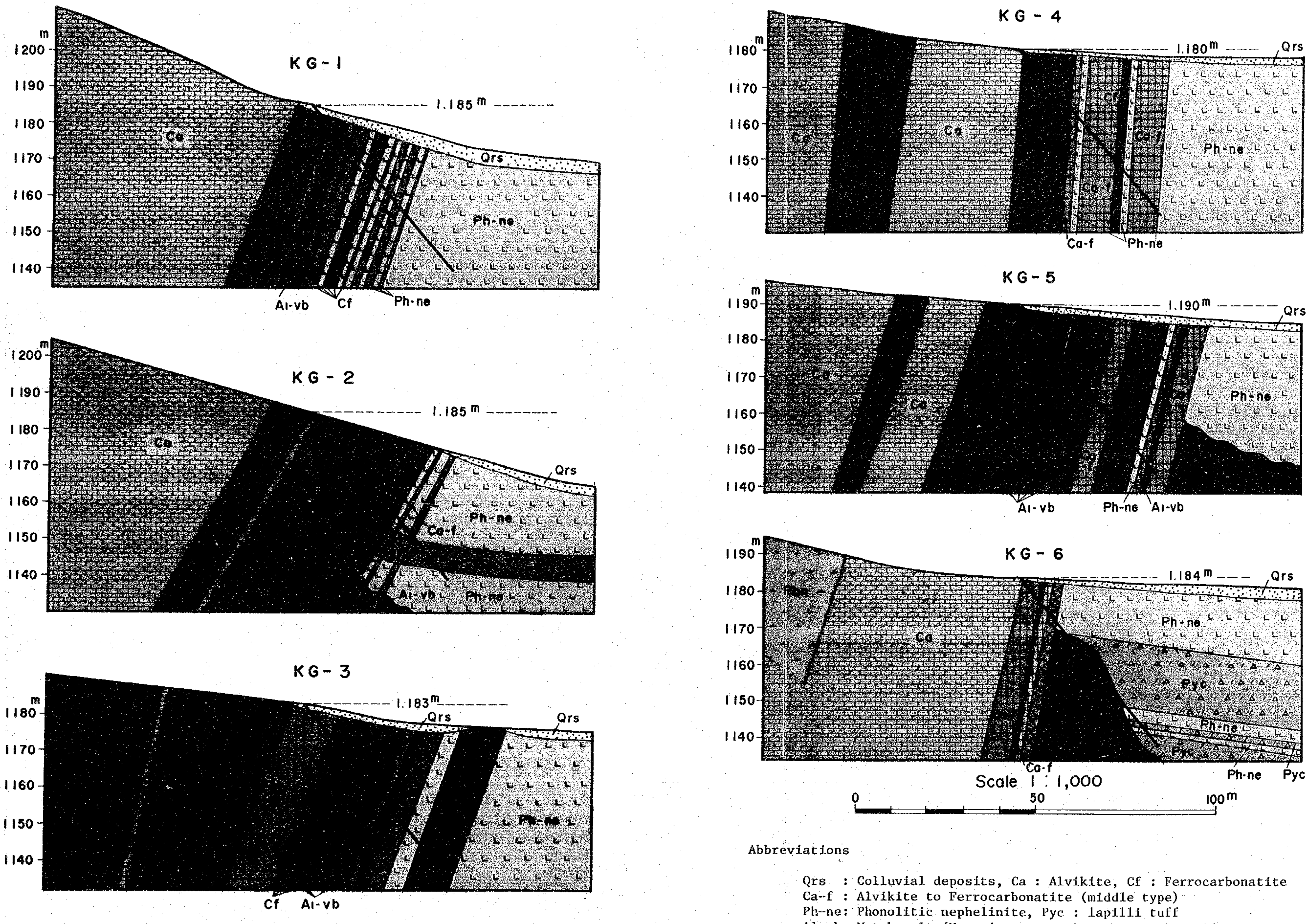
An obvious REE-mineralization in ferrocarbonatite dyke is observed in the continuous section of massive ferrocarbonatite of Hole KG-2, where mineralized zone is some 30 metres wide (an apparent width: 32.9 metres), chemical grades of which are La+Ce+Nd : 2.1 percent, Sm + En + Tb : 200 ppm and Yb + Lu : 15 ppm.

A notable mineralization of LREE is also observed in Holes KG-1 and KG-3, operated on both sides of Hole KG-2, where LREE content shows 1.6 percent, respectively. The mineralization in Hole KG-1 is hosted in a swarm of ferrocarbonatite dykelets, 15 metres apparently wide by a hole-intersection, meanwhile, the mineralization is laterally debilitated in short distance. In Hole KG-3, an interposition of unmineralized rock, basement rock or phonolite and etc., some 20 metres wide, is situated, so that an overall average grade of ferrocarbonatite dyke body is low-gradedly estimated to be of LREE: 1.16 percent, considerably low. In Hole KG-4, the mineralized zone, while a weak mineralization in lower section of the hole is excluded, shows LREE: 1.48 percent in the 18 metre-width. In Hole KG-5, a weak mineralization, LREE: 1.26 percent, is observed in a wide ferrocarbonatite dyke body, meanwhile, a similar grade of mineralization is also observed in Hole KG-6, where the width of ferrocarbonatite dyke body is of some 14 metres wide and the mineralization is considered to be likely terminated.

It is, therefore, summarized that the concentration grade of REE in the Kuge Hill area, which is to be compared with that in the oxydized zone of the Buru Hill area, is limitedly defined in narrow area in the vicinity of the hole site KG-2 and has a limited extension northerly and

Table II–2–5 Average Value of Elements and Component by Drill Hole

DDH No.	Number of Samples	Total length Analyzed (m)	P (ppm)	Ba (%)	Sr (ppm)	Nb (ppm)	Y (ppm)	U (ppm)	Th (ppm)	La (ppm)	Ce (ppm)	Nd (ppm)	Sm (ppm)	Eu (ppm)	Tb (ppm)	Yb (ppm)	Lu (ppm)	La+Ce+Nd (ppm)	Sm+Eu+Tb (ppm)	Yb+Lu (ppm)
KG-1	11	14.90	5191.1	3.747	2441.1	559.6	202.0	18.14	894.04	5961.7	7681.2	2361.1	194.15	58.25	11.86	7.39	1.76	16004.0	264.26	9.15
KG-2	13	32.90	4906.4	4.320	2108.4	410.4	331.6	11.49	476.71	8562.9	10507.3	2069.6	140.01	47.62	13.63	13.41	2.13	21139.8	201.26	15.54
KG-3	16	41.95	5471.4	3.618	1374.2	699.5	436.3	8.38	777.23	5480.1	8799.4	2319.9	179.50	56.73	17.38	21.30	3.10	16599,4	253.61	24.40
KG-4	6	18.10	6284.5	4.341	2093.5	546.1	241.0	8.90	841.91	5437.0	7561.9	1887.3	141.18	37.20	9.39	14.80	2.24	14886.2	187.77	17.04
KG-5	18	51.50	3511.3	3.458	1782.4	563.4	209.7	8.03	502.29	4462.6	6502.4	1680.8	113.58	29.20	8.36	12.09	2.05	12645.8	151.14	14.14
KG-6	7	14.40	1991.4	4.086	1306.6	476.5	241.1	6.75	248.68	4448.9	5968.4	1599.3	103.71	31.45	7.47	11.14	1.70	12016.6	142.63	12.84
Total	71	173.75	4555.7	3.828	1795.0	558.0	292.7	9.62	611.78	5713.6	7982.5	1977.8	143.47	42.85	11.87	14.36	2.28	15674.0	198.19	16.64



Abbreviations

Qrs : Colluvial deposits, Ca : Alvikite, Cf : Ferrocarbonatite
Ca-f : Alvikite to Ferrocarbonatite (middle type)
Ph-ne: Phonolitic nephelinite, Pyc : lapilli tuff
Al-vb: Metabasalt (Nyanzian System), Phn : Phonolite

Fig. II-2-6 Geological Cross Sections along Drill Holes, Kuge Hill

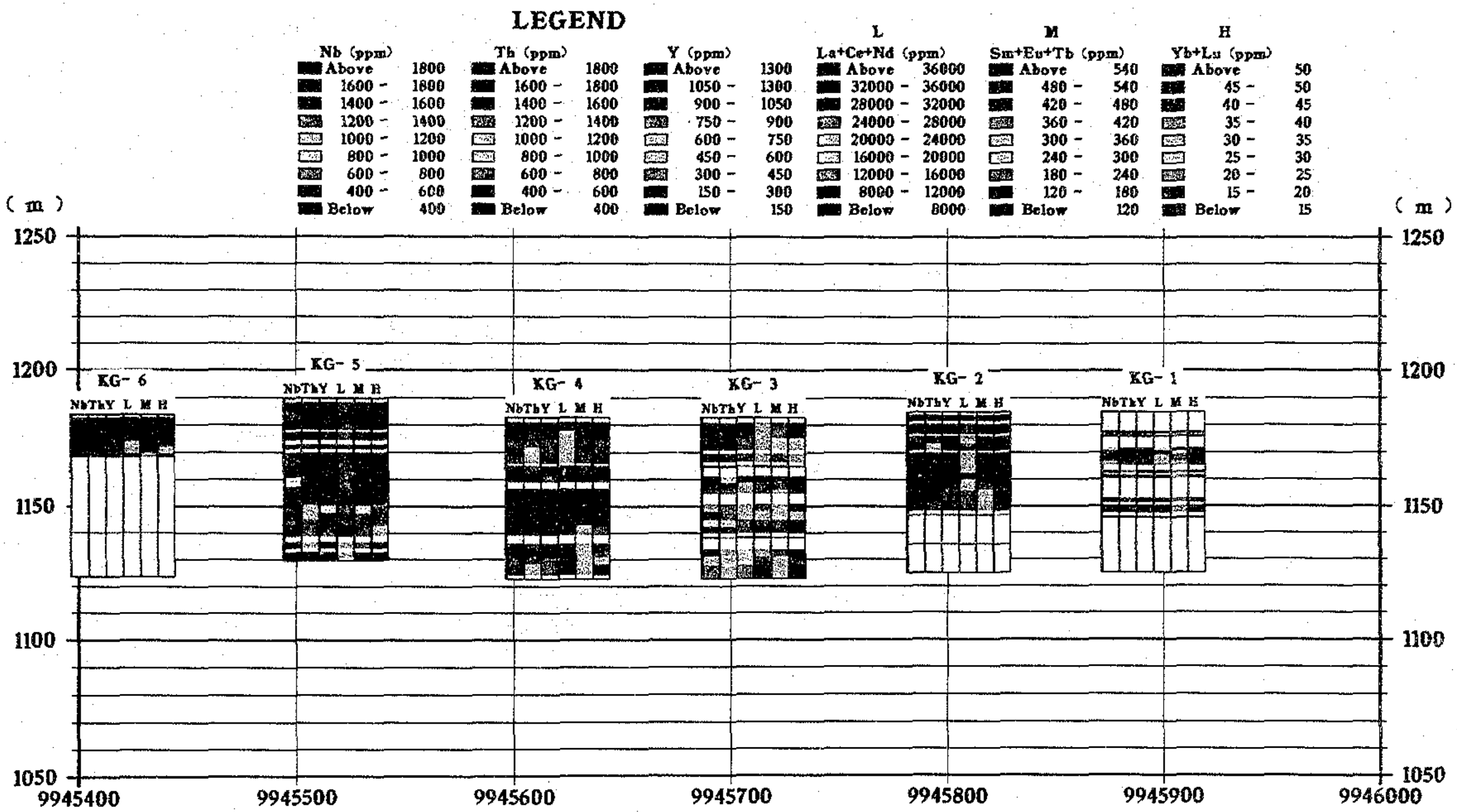


Fig. II–2–7 Assay Cross Sections along Drill Holes, Kuge Hill

southerly, respectively. The average ore grade of the Kuge Hill body is estimated to be lower-graded than that of the Buru Hill body in a whole.

A remarkable mineralization of P, Nb, Y Ba and etc., associated with REE, is unobserved in Kuge Hill area.

2-5 Results of Petrological and Mineralogical Examinations

2-5-1 Microscopic examinations of thin sections

The eight (8) rock specimen were microscopically examined by thin sections. The summary of examination results and the related explanatory descriptions are shown in Apxs. 3 and 4.

(1) Phonolite and nephelinite

Phonolite and nephelinite are generally altered intensely and are fractured. The alteration is remarked to be of carbonate-mineralization, epidotization, smectitization, iron-mineralization and etc.. An appropriate petrological nomenclature of rock is mostly hardly made due to an intense alteration of phenocrysts, e.g., feldspars and feldspathoids.

(2) Metabasalt - basement rock

Metabasalt is of aphanitic altered rock, majorly composed of euhedral plagioclase, anhedral epidote, clotted chlorite and opaque minerals. Unaltered mafic minerals are unobserved. They are abundantly associated with fine veins of carbonate minerals.

(3) Carbonatite

Carbonatite is majorly composed of carbonate minerals and opaque minerals (goethitic in weathered rock), associated with biotite and etc.. It also occasionally includes altered phonolite breccias.

2-5-2 Microscopic examinations of polished thin sections

The five (5) carbonititic rock specimen, two of carbonatite and three of ferrocarbonatite, were examined by polished thin sections. The summary of examination results and the related explanatory descriptions are shown in Apxs. 5 and 6.

(1) Carbonatite

Carbonatite is majorly composed of carbonate minerals and opaque minerals, which are majorly of goethite, hematite, lepidochrocite, meanwhile, are associated with remnant magnetite in one specimen.

The specimen KG-2-2 contains carbonate minerals in the forms of replacement products of phenocrysts, of fine veins or networks or irregularly intersertal products, by what a possible occurrence of carbonatite body is to be of replacemental character. Pyrochlore and bastnaésite are unobserved under the microscope.

(2) Ferrocarbonatite

Ferrocarbonatite is majorly composed of carbonate minerals and opaque minerals. One of three specimen are rich in carbonate minerals, meanwhile, another two specimen are considerably rich in opaque minerals with a likely feature of iron ore. Opaque minerals are majorly composed of goethite, hematite, lepidochrocite, magnetite and etc., with pseudomorphs of pyrite in occasions of hematite and goethite. A productive sequence of iron minerals, observed in the specimen with pseudomorphs of pyrite, is estimated to be by preceding order of pyrite, followed by magnetite, hematite, goethite and latestly lepidochrosite. Pyrochlore, bastnaésite, biotite were identified in one of three specimen.

2-5-2 Results of whole rock chemical analysis

The whole rock chemical analysis was implemented for two specimen, i.e., for ferrocarbonatite and for a rock with intermediate features of ferrocarbonatite and alvikite by unaided eye. The results of whole rock chemical analysis are shown in Apx. 7.

The results provide little differences of chemical compositions between two specimen, even though making a trial petrological distinction by unaided eye.

The average chemical compositions of two specimen show 27.30 percent of Fe_2O_3, 25.58 percent of CaO, 4.76 percent of MnO, 4.07 percent of BaO and 4.27 percent of SiO_2. The Fe_2O_3 and CaO values correspond to those of intermediate-compositional rock of carbonatite and ferrocarbonatite in the Buru Hill area as shown in the Report, 2nd-year work. It is also noted that the values, the above, are rich in SiO_2 content, compared with that of carbonatite and ferrocarbonatite in Buru Hill area.

2-5-4 Quantitative analysis of ore minerals by electron probe microanalyser

Identifications and quantitative analyses of ore minerals on four (4) specimen of diamond drill cores were implemented by the current work. An outline of samples and mineral compositions are shown in Apx. 8, the results of quantitative analyses of ore minerals are in Apx. 9, the SEM images are in Apx. 10, respectively.

(1) Mineral Composition

Carbonatite is majorly composed of calcite, hematite and goethite and is associated with barite, bastnaésite and phlogopite, and minorly with rancieite.

Ferrocarbonatite is majorly composed of calcite, manganiferrous siderite, hematite, goethite and etc., and is associated with barite, rancieite, phlogopite and etc.. Bastnaesite and pyrochlore are discernible in one of four specimen.

(2) Quantitative analysis of ore mineral

The eight (8) ore mineral grains of four (4) mineral species in Kuga Hill carbonititic body were chemically analysed by using an electron probe microanalyser; those are 1) bastnaésite as the major REE mineral, 2) pyrochlore as the Nb-bearing mineral, 3) rancieite as the manganiferrous mineral and 4) barite, abundantly associated with various types of carbonatite.

Bastnaésite : Bastnaésite shows an occurrence of aggregates of acicular or tabular crystals. The total content values of the major REE - La_2O_3 + CeO_2 + Nd_2O_3 - show 46.3 percent in an acicular crystal and 59.42 percent in a tabular crystal. The former value is presumed to have been under an effect of background during the processing.

Pyrochlore : Pyrochlore is observed in a form of euhedral crystals. It shows 66.72 percent of Nd_2O_3, approximate to that in Buru Hill. It also shows a slightly low content of Ta_2O_5 and a considerably high content of TiO_2.

Rancieite : Rancieite shows an occurrence of aggregates of very fine acicular crystals or irregular intersertal minerals. The chemical compositions is approximate to that in Buru Hill, rich in barium content.

Barite : Barite shows an occurrence of granular euhedral crystals. The total value of BaO and SO_3 occupy some 99 percent of the total, considered to be of less impurity.

2-6 Discussion

2-6-1 Features of mineralization

The primary contents of REE, associated with ferrocarbonatite dykes in Kuga Hill, which were selected for one of the exploration targets by the current works, are fairly approximate to those of the primary body of Buru Hill carbonatite. However, the supergene enrichment of the REE are unobserved in Kuge Hill caused by that having a narrow width of mineralization zone, 60 metres wide in maximum, and that have been out of a geostructural shelter to sustain weathered earthy materials in-situ sites of the carbonatitic body. Consequently, the concentrations of REE in the Kuge Hill carbonititic dykes are estimated to be low-graded to be ranked to the level of industrial/economical standard, as the dykes have long been retained the primary ore grades unenriched.

2-6-2 Potential of mineralized zone

The industrial/economical potentials of the REE mineral development, associated with the carbonititic dykes in Kuge Hill area, are estimated to be likely low based on the current backgrounds of industry/economy, due to that the REE concentrations in the area are poor in world-wide comparisons with other carbonatite ore body and that having low contents of phosphorus, niobium, etc. The further exploration works for REE in the area are unlikely warranted under the current industrial/economical backgrounds.

PART III CONCLUSION AND RECOMMENDATION

CHAPTER 1 BURU HILL

1-1 Conclusion

Geological and geochemical research works, and diamond drill operations of thirty (30) holes, with total depths of 1,750 metres for a two-year programme, were implemented during the term from 1987 to 1989 as a part of the Homa Bay Project, Nyanza Province, Republic of Kenya.

In accordance with the results of the above works, the Buru Hill area is geologically elucidated to be majorly composed of massive intrusive carbonatite bodies, associated with the REE minerals, and is to be surrounded by granitoid gneiss of the basement rock in the area. The carbonatite itself is zonally divided to two zones; i.e., the upper zone of oxydized-weathered part and the lower zone of reduction part.

Concentrations of REE minerals by the supergene enrichment form an ore body in upper zone of the carbonatite body. Bastnaésite is the main REE mineral of the carbonatite ore body in the Buru Hill.

The inferred geological ore reserves are estimated to be of 10,700,000 tonnes of crude ore, the average grade is La + Ce + Nd: 2.07 percent, Sm + Eu + Tb: 370 parts per million, Yb + Lu: 38 parts per million, to be re-calculated to be of Total REO: 2.63 percent, and 280,000 tonnes of Total Rare Earths Oxides.

The mineral content in the Buru Hill ore body is inevitably estimated to be low-graded for the industrial/economical production under the current economical backgrounds in world-wide comparisons with other REE mines in operations. However, the Buru Hill ore body is with a favourable configuration for a facile applicability of open pit mining operation and with a favourable accessibility. It is presumed that the ore body should be warrantedly examined with some economical possibility in a future when ore reserves and ore-grade values for the mining operation will be satisfactorily ameliorated by additional exploration activities and when an industrially favourable extration technology of REE minerals will be developed.

1-2 Recommendation

It should be pointed out that the followings are the major factors to be examined in compliance with a future consideration to establish an industrial/economical estimation of economical possibility of the mining development of Buru Hill ore body, those are;

1) To establish a more reliable estimation of ore reserves and ore grade based on the results by sufficient quantities of diamond drills.
2) To establish a favourable extraction technology of REE minerals by feasible crushing and metallurgical tests.

3) To estimate reasonable capital and operation costs based on the programmes related to mine development, plant construction and mining/mineral processing operations.

4) To establish infrastructural and environmental researches related to the social impacts and associated terms.

For a further reliable establishment of the re-estimation of ore reserves and ore grade, the diamond drill operations on the modes of 50 metre-interval on grid-patterns covering the mineralized zone should be appropriately operated.

The Buru Hill mineralized zone has been intersected by twenty (20) diamond drill holes among thirty (30) on approximately 100 metres to 120 metres intervals by the current works. The drill exploration programme in future considerations, to be reached down to the lowermost elevation of the oxidized zone, some 1,295 metres high above sea level, are presumed to be fixed to an aim of an extent of some additional forty (40) holes, totaling 2,000 metres.

The recovered drill cores are to be quarter-splitted in every 2 metres to 3 metres section to produce the samples for tests as that the first quarter is to be for chemical assays, the second quarter is for a preservation for spare and a remaining half is for metallurgical test.

The chemical assay of ores and mineralized materials are to be made on 14 rare earths elements, such as, lanthanum, cerium, praseodymium, neodymium, samarium, europium, gadolinium, telbium, dysprosium, holmium, erbium, thulium, ytterbium and lutecium, and with yttrium and thorium. Neutron activation analysis, X-ray fluorescene analysis and Inductively coupled plazma are usually recommended for the analysis technology and further an application of Inductively coupled plazma-Mass spectrometry of high accuracy is to be examined.

The value of specific gravity of ore is to be determined by using the representative specimen of drill cores of the ore body itself. The value is to be determined under the air-dried, dried and wet conditions. The distribution frequency of cavities in the ore body is also to be estimated to make a correction of the specific gravity value of ore in over-whole, if it is required.

CHAPTER 2 KUGE-LWALA

2-1 Conclusion

Geological and geochemical research works, and diamond drill operations of six (6) holes, with total depths of 360 metres for a 1989-programme, were implemented during the term from 1987 to 1989 as a part of the Homa Bay Project, Nyanza Province, Republic of Kenya.

In accordance with the results of the above works, the Kuge Hill area is geologically elucidated to be majorly composed of the dykes of ferrocarbonatite and carbonatite, which has an intermediate petrological character of ferrocarbonatite and alvikite. The general occurrence of the dykes in the area is observed in an extension of 600 metres long, 30 metres to 40 metres wide in average, 60 metres in maximum, and is extended north-southerly, dips 60 degrees to 80 degrees westerly. The results of diamond drill works by the current programme show that the oxydation zone in Kuge Hill area is insufficiently developed, resultant in that the concentration of REE minerals, associated with carbonititic dykes, is very limitedly formed. In accordance with the chemical research works of drill cores by the current works, the average grade of ore in the area shows 1.57 percent of La + Ce + Nd, which is approximate to that of the primarily mineralized zone in Buru Hill, that is 1.5 percent. The Kuge Hill ore body is with a limited quantity and quality, which are with less extension and less high concentration of REE. Consequently, it is to be concluded that the REE mineralization in Kuge Hill area is less economical for a future consideration.

2-2 Recommendation

Future examinations of exploration programming for an industrial/economical development of the REE minerals in Kuge Hill area are to be unlikely warranted in accordance with the conclusion, the above.

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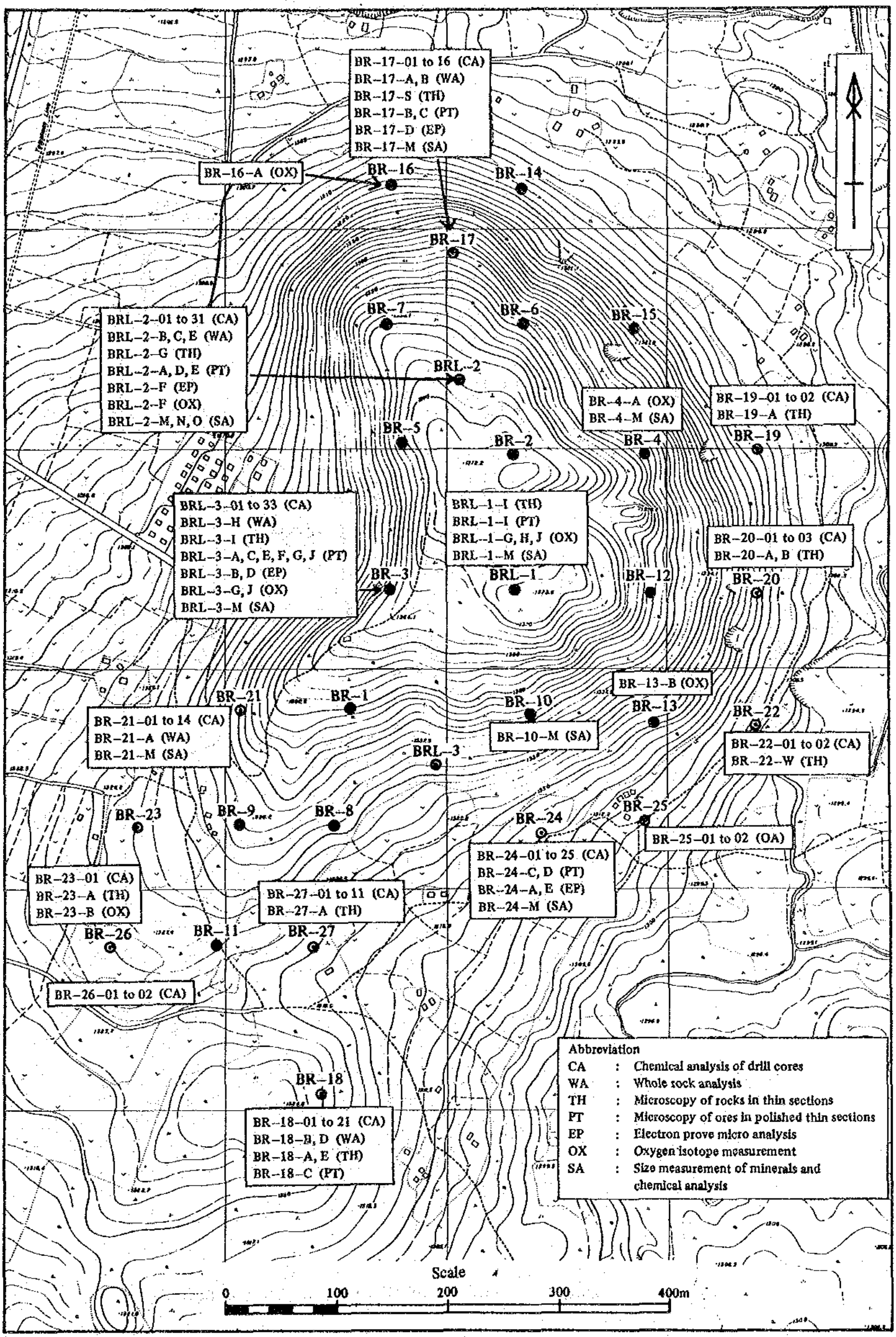
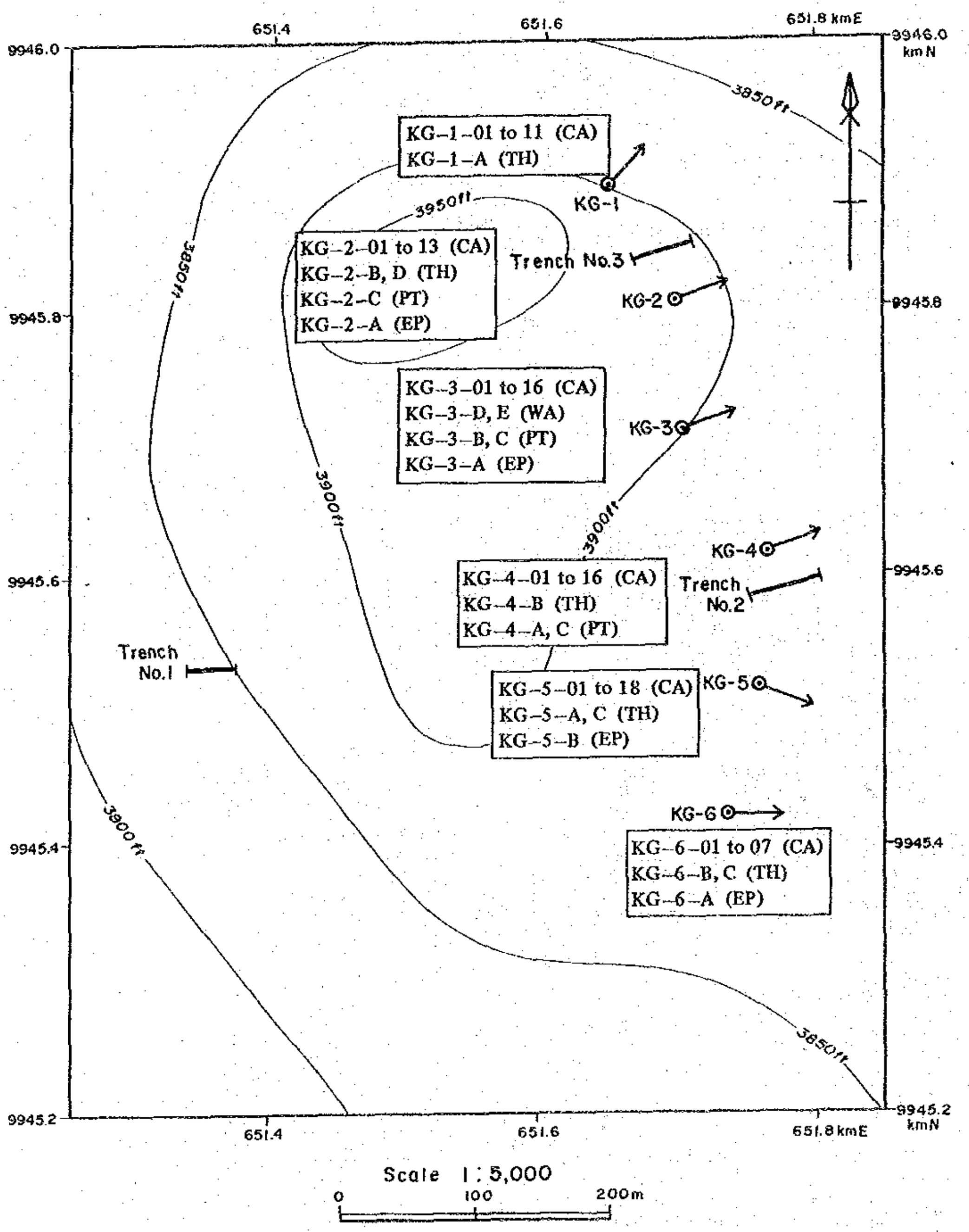
APPENDIXES



Apx. 1 Location Map of Tested Samples, Buru Hill Area



Apx. 2 Location Map of Tested Samples, Kuge–Lwala Area

Apx. 3 Summary of Microscopic Observation — Thin Sections —

Sample description			Minerals													
Number	Depth (m)	Type	Neph	Kf	Ser	Qtz	Carb	Pl	Biot	Flu	Epi	Chl	Amph	Px	Opaque	Others
BR-17-S	Surface	Brec. Gn		○	△	○									△	
BR-18-A	5.40	Frac. Gn		○	○	○									○	
BR-18-E	50.60	Frac. Gn		○	△	○							△		○	smectite
BR-19-A	31.00	Amph. Gn					△	○	△		○		actinolite ◎		△	
BR-20-A	25.20	Brec. Gn		○	△		○	○				○			△	
BR-20-B	34.00	carbonatite					◎			△	△				×	
BR-22-W	Surface	Frac. Gn		◎	△	○					○				×	
BR-23-A	18.30	Gneiss		○	△	○		○							△	
BR-27-A	14.30	Brec. Gn		○	△	◎									△	
BRL-1-I	148.00	Carbonatite					◎		○	△					△	pyrochlore
BRL-2-G	95.90	Phonolite		△	+		○								△	glass
BRL-3-I	67.30	Brec. Gn		◎	△	△	○	○		△					△	
KG-1-A	57.80	Nephelinite	○				◎						alkali amphibole ○		△	olivine, spinel(?)
KG-2-B	15.20	Carbonatite	△				◎								○	
KG-2-D	57.80	Brec. Phn	△				◎								○	
KG-4-B	26.10	Alt. Phn		○			◎								△	smectite
KG-5-A	21.10	Alt. Bst					△	◎			△	○			○	
KG-5-C	36.50	Carbonatite		Sanidine △			◎		△						○	
KG-6-B	48.70	Alt. phn	○				○							△	△	smectite
KG-6-C	Surface	Phonolite	○	△									alkali amph ○	△		smectite, sphene

◎ : abundant ○ : common △ : little × : rare

Abbreviations

Neph ; nepheline Kf ; k-feldspar Ser ; sericite Qtz ; quartz
Carb ; carbonate minerals Pl ; plagioclase Biot ; biotite
Flu ; fluorite Epi ; epidote Chl ; chlorite Amph ; amphibole
Px ; alkali pyroxene
Brec. Gn ; brecciated gneiss, Frac. Gn ; fractured gneiss, Amph. Gn ; amphibole gneiss
Brec. Phn ; brecciated phonolite, Alt. phn ; altered phonolite, Alt. Bst ; altered basalt

Apx. 4 Microscopic Observation of Rocks in Thin Sections

BR-17-S: brecciated gneiss

Breccias composed of anhedral K-feldspar grains (up to 0.8mm in size), aggregates of tiny quartz grains and film-like sericite (ca. 0.1 x 0.02mm in size) are present in a glassy matrix.

BR-18-A: fractured gneiss

Anhedral K-feldspar grains (up to 0.8 x 0.4mm in size), tiny quartz aggregates, and film - like sericite (up to 0.2 x 0.02mm in size) are cut by many veinlets of opaque minerals, probably goethite and hematite (up to 0.5mm in width).

BR-18-E: fractured gneiss

Anhedral K-feldspar grains (up to 2.0 x 1.5mm in size) and tiny quartz aggregates (which are very similar to texture of chert) are cut by networks of goethite - smectite - amphibole. Amphibole ruins are altered to goethite and smectite, probably nontronite.

BR-19-A: actinolite - epidote schist

Acicular crystals of amphibole, probably actinolite - tremolite series minerals (ca. 0.4 x 0.1mm in size), and anhedral to subhedral plagioclase grains (up to 1.0 x 0.4mm in size) show lepidoblastic texture. Short prismatic epidote (up to 0.3 x 0.2mm in size), euhedral biotite grains (up to 0.4 x 0.1mm in size) and carbonate minerals (probably calcite) veins (up to 0.2mm in width) are present.

BR-20-A: brecciated gneiss

Breccias composed of anhedral K-feldspar (up to 2.4 x 1.0mm in size) and plagioclase (up to 2.6 x 1.2mm in size) with sericite are cemented by carbonate minerals (up to 0.6 x 0.5mm in size), aggregates of fine - grained sericite along their rims and cracks.

BR-20-B: carbonatite (alvikite ?)

Carbonate minerals (up to 1.0 x 0.8mm in size, but most of them are very fine - grained) show a saccharoidal texture. Small amounts of euhedral to subhedral fluorite (up to 0.4 x 0.4mm in size), euhedral to subhedral epidote (up to 0.1 x 0.05mm in size) and opaque minerals are associated with carbonate minerals.

BR-22-W: altered, fractured gneiss

It is composed of anhedral K - feldspar (up to 2.0 x 1.5mm in size), euhedral to subhedral plagioclase (up to 1.0 x 1.0mm in size), and anhedral quartz grains. It is fractured and altered to form sericite (up to 0.2 x 0.05mm in size) and long prismatic epidote (up to 0.2 x 0.04mm in size).

BR-23-A: gneiss

Porphyroblastic plagioclase (up to 2.0 x 1.0mm in size) and K - feldspar (up to 1.6 x 1.0mm in size) are present in the groundmass of fine - grained plagioclase, K - feldspar, quartz, sericite and opaque minerals (mainly goethite).

BR-27-A: brecciated gneiss

Breccias composed of porphyroblastic K - feldspar (up to 1.2 x 1.2mm in size) and aggregates of tiny grains of sericite and quartz are cemented mainly by opaque minerals, probably goethite.

BRL-1-I: carbonatite (alvikite ?)

Carbonate minerals (ca. 0.2 x 0.2mm in size) with euhedral biotite grains (up to 0.4 x 0.4mm in size) show a saccharoidal texture. Small amounts of euhedral opaque minerals (pyrochlore up to 0.5 x 0.5mm in size, and probably pyrite etc.) and anhedral fluorite around the opaque minerals are present.

BRL-2-G: phonolitic fine tuff ? (welded tuff ?)

It consists of glassy fine - grained particles with lamination. Some of them are identified to K - feldspar (up to 0.1 x 0.1mm in size). Devitrified brownish glasses (up to 0.8 x 0.1mm in size) and carbonate mineral veinlets (0.2 - 0.3mm in width) are also present.

BRL-3-I: brecciated gneiss

Porphyroblastic K - feldspar (up to 3.2 x 2.0mm in size) and plagioclase (up to 1.0 x 0.5mm in size) with fine - grained quartz and sericite etc. are brecciated and altered to form cabonate minerals (up to 0.8 x 0.5mm in size), massive fluorite, and opaque minerals as networks. Carbonate minerals also occur as veinlets up to 0.8cm in width.

KG-1-A: altered porphyritic olivine nephelinite

Phenocrysts of nepheline (up to 1.8 x 1.8mm in size), alkali amphibole (up to 1.0 x 0.8mm in size), olivine (up to 1.2 x 0.6mm in size), spinel (?) (up to 0.8 x 0.8mm in size), are strongly altered to fine - grained carbonate minerals.

KG-2-B: carbonatite (ferrocarbonatite ?)

Carbonate minerals, probably siderite (ca. 0.4 - 0.5mm in size), euhedral nepheline crystals (up to 0.8 x 0.5mm in size) and anhedral opaque minerals, perhaps goethite are constituents.

KG-2-D: brecciated phonolite

Phenocrysts of sanidine (up to 1.6 x 0.2mm in size) and nepheline or leucite (up to 0.4 x 0.4mm in size) in a fine - grained groundmass are strongly altered to carbonate minerals. This phonolitic rock is brecciated and cemented by carbonate and opaque minerals. Veins of nepheline - carbonate minerals - opaque minerals - smectite (the width ranges from 0.5 to 1.5mm) are present.

KG-4-B: strongly altered phonolite ?

Phenocrysts (up to 1.6 x 1.2mm in size) and groundmass are strongly altered to carbonate minerals, smectite, and opaque minerals. Some of phenocrysts are identified to K - feldspar.

KG-5-A: altered aphyric basalt

It consists of euhedral plagioclase (ca. 0.6 x 0.1mm in size), anhedral epidote (probably clinozoisite, up to 0.8 x 0.1mm in size), massive chlorite and opaque minerals. Carbonate mineral veins (0.3 - 1.0 mm in width) are present.

KG-5-C: carbonatite (ferrocarbonatite ?)

Carbonate (ca. 0.4 x 0.4mm in size) and opaque minerals are predominant. Phonolitic breccias composed of phenocrysts of sanidine (ca. 2.0 x 0.6mm in size) and biotite (ca. 0.7 x 0.6mm in size) in a fine - grained groundmass are included and partly altered to carbonate minerals.

KG-6-B: altered phonolite

Phenocrysts of nepheline (up to 0.7 x 0.7mm in size) and alkali pyroxene (up to 0.3 x 0.2mm in size) and fine - grained groundmass are altered to carbonate minerals. Veinlets (up to 1.2mm in width) of carbonate minerals, smectite and opaque minerals are present.

KG-6-C: phonolite

Phenocrysts of nepheline (up to 4.5 x 2.5mm in size), partly altered to K - feldspar, alkali amphibole (up to 1.6 x 1.0mm in size) with alkali pyroxene relicts in the cores, isotropic brownish crystals (probably spinel up to 0.4 x 0.4mm in size), sphene (up to 1.0 x 0.6mm in size) and fine - grained and partly glassy groundmass show porphyritic texture. Some of alkali amphibole are altered to epidote.

Apx. 5 Summary of Microscopic Observation – Polished Thin Sections –

Sample description			Opaque minerals												Transparent minerals											Remarks
Number	Depth (m)	Type	Goe	Hem	Lep	Mag	Py	Mc	Ga	Go	Pyl	Psi	Man	Pyc	Carb	Flu	Qtz*	Kf	Biot	Mont	Ser	Cr	Bast	Bar	Neph	Qtz*
BR-17-B	25.50	Fe-Mn ore	◎	◎	△						△					△						×	×	×		
BR-17-C	44.10	Fe-Mn ore	○	◎	×						△		×			△							×	×		
BR-18-C	15.50	Brec. Gn	○								×				×		◎	○			×					quartz≫opal
BR-24-C	43.00	Carbonatite	△				△								◎	○						×	△			
BR-24-D	46.50	Carbonatite		△			△								◎	○				×		×	×			
BRL-1-I	155.00	Carbonatite	△	×			○			×				×	◎	△			△				×	×	△	
BRL-2-A	9.20	Fe ore	◎	○												△	△									opal
BRL-2-D	33.80	Fe-Mn ore	◎	○	△						○		△			△	×			○						quartz
BRL-2-E	42.00	Fe-Mn ore		◎								○				△	×							×		quartz
BRL-3-A	7.80	Fe-Carb	◎	○	△								○		◎	△			△			△				
BRL-3-C	27.60	Fe-Carb	◎	◎		△									◎	○				△						
BRL-3-E	41.70	Carbonatite	◎	○											◎		△			△						opal
BRL-3-F	56.10	Carbonatite				△					△	◎	○		◎	△		△								
BRL-3-G	57.40	Carbonatite	○	△			○	△	×					×	◎	△										
BRL-3-J	84.50	Brec. Carb					×								◎	△		△								
KG-2-C	45.30	Carbonatite	△	△	×	×									◎	△	○									opal
KG-3-B	14.80	Carbonatite	△	×	×	○									◎	○										
KG-3-C	37.80	Fe-Carb	○	△	×	△									◎	○	○									opal
KG-4-A	13.30	Fe-ore	◎	○	×	△								△	○	△			×				×			
KG-4-C	41.80	Fe-ore	◎	○	×										△	△										

◎ : abundant ○ : common △ : little × : rare

Abbreviations

Goe ; goethite Hem ; hematite Lep ; lepidocrocite
Mag ; magnetite Py ; pyrite Mc ; marcasite
Ga ; galena Go ; gold Pyl ; pyrolusite
Psi ; psilomelane Man ; manganite Pyc ; pyrochlore

Carb ; carbonate minerals (calcite, siderite, dolomite etc.)
Flu ; fluorite Qtz ; quartz Opal ; chalcedonic quartz
Kf ; K-feldspar Biot ; Biotite Ser ; sericite
Mont ; smectite group mineral, probably nontronite
Cr ; crandallite group mineral
Bast ; bastnaesite Bar ; barite Neph ; nepheline

Apx. 6 Microscopic Observation of Ores in Polished Thin Sections

BR-17-B: Fe - Mn ore

It is composed of aggregates (up to 5 x 5mm in size) of hematite, goethite, and lepidocrocite, radiated pyrolusite crystals (ca. 0.1mm in length), and a small amount of manganite. Some goethite and hematite show a dendritic texture. Anhedral fluorite, crandallite group minerals, bastnaesite (up to 0.04 x 0.02mm in size) and barite (up to 0.04 x 0.02mm in size) occupy irregular interspaces.

BR-17-C: Fe - Mn ore

Aggregates of fine - grained hematite, goethite, lepidocrocite, and pyrolusite and a less amount of anhedral manganite (up to 0.1 x 0.05mm in size) are predominant. These minerals seems to have replaced short prismatic crystals (ca. 0.2 x 0.1mm in size). Small amounts of fluorite, bastnaesite (up to 0.08 x 0.03mm in size), and barite (up to 0.05 x 0.02 mm in size) occur as irregular interspaces or are included in opaque minerals.

BR-18-C: brecciated gneiss

Gneiss composed mainly of massive quartz (partly chalcedonic) and K - feldspar (altered to sericite up to 0.06 x 0.03mm in size along the rims or cracks) are fractured, brecciated, and cemented by carbonate minerals, goethite (up to 0.1 x 0.04mm in size) and pyrolusite.

BT-24-C: carbonatite (alvikite ?)

Carbonate minerals (ca. 0.1 - 0.2mm in size) and massive fluorite are predominant. Aggregates of fine - grained bastnaesite, crandallite group minerals (up to 0.2 x 0.2mm in size), anhedral pyrite (up to 0.05 x 0.03mm in size) and fine - grained goethite around pyrite grains are also present.

BR-24-D: carbonatite (alvikite ?)

It is composed of carbonate minerals (ca. 0.1 - 0.2mm in size), fluorite (as cubes up to 0.5 x 0.5mm in size) or massive aggregates), and small amounts of crandallite group minerals (up to 0.2 x 0.1mm in size in massive fluorite) and subhedral aggregates of fine - grained bastnaesite, pyrite (up to 0.2 x 0.1mm in size) and hematite (up to 0.1 x 0.1mm in size).

BRL-1-1: weakly layered carbontite (alvikite ?)

It consists of carbonate minerals (up to 3.8 x 3.0mm in size, but most of them are fine - grained and anhedral), massive fluorite, euhedral biotite (up to 0.6 x 0.4mm in size), nepheline (ca. 0.2 x 0.2mm in size), bastnaesite (up to 4.0 x 3.5mm in size), barite veinlets (ca. 0.2mm in width) and pyrite (up to 0.6 x 0.5mm in size). Small amounts of goethite and hematite occur as replacement products of pyrite. Native gold (?) particles are included in anhedral pyrite grains. Euhedral pyrochlore crystals (ca. 0.15 x 0.15mm in size) are associated with euhedral pyrite grains.

BRL-2-A: Fe ore

Anhedral goethite and hematite are predominant. Small amounts of anhedral fluorite and chalcedonic quartz occur as irregular interspaces or as veinlets. Some of hematite grains show cubelike grains as pseudomorphs of pyrite (up to 0.1 x 0.1mm in size).

BRL-2-D: weakly layered Fe - Mn ore

It is composed mainly of massive aggregates of goethite, hematite and lepidocrocite, in which some layers of anhedral pyrolusite and manganite enriched, and interstitial fluorite and quartz are present.

BRL-2-E: Fe - Mn ore

Anhedral hematite, psilomelane and fluorite are predominant. Hematite and psilomelane sometimes show dendritic texture. Small amounts of euhedral barite grains (up to 0.3 x 0.2mm in size), quartz (ca. 0.05mm in size, 0001) and aggregates of tiny smectite grains are present.

BRL-3-A: weakly layered carbonatite (ferrocarbonatite ?)

Aggregates of goethite, hematite and lepidocrocite with long prismatic manganite grains (up to 0.8 x 0.1mm in size) indicate layered texture in carbonate minerals (ca. 0.1 - 0.2mm in size) - euhedral biotite (up to 0.3 x 0.2mm in size) - massive fluorite assemblage. Some of hematite and goethite show cubeshaped forms (up to 0.4 x 0.4mm in size) probably indicating pseudomorphs of pyrite.

BRL-3-C: carbonatite (ferrocarbonatite ?)

Anhedral carbonate minerals (ca. 0.3mm in size), fluorite, goethite and hematite are predominant. Anhedral magnetite grains (up to 0.04 x 0.02mm in size) occur in hematite. Hematite - goethite veins (ca. 0.4mm in width) are present.

BRL-3-E: carbonatite

Carbonate minerals (ca. 0.3 x 0.3mm in size) and aggregates of fine - grained goethite and hematite are predominant. Small amounts of massive smectite and chalcedonic quartz are also present.

BRL-3-F: carbonatite

Carbonate minerals (up to 0.4 x 0.3mm in size) and aggregates of psilomelane and manganite are predominant. Subhedral to anhedral pyrolusite grains (ca. 0.2 x 0.1mm in size), euhedral to subhedral magnetite grains (ca. 0.02 - 0.04mm in size), anhedral K - feldspar (up to 0.8 x 0.5mm in size) and fluorite are also constituents.

BRL-3-G: carbonatite (alvikite ?)

It consists mainly of carbonate minerals (ca. 0.4 x 0.4mm in size), fluorite, pyrite, hematite and goethite. Pyrite and marcasite occur as pseudomorphs of prismatic crystals (ca. 0.6 x 0.2mm in size). Aggregates of galena cubes (up to 0.15 x 0.15mm in size) are associated with hematite. Euhedral to subhedral pyrochlore grains (ca. 0.2 x 0.2mm in size) are present.

BRL-3-J: brecciated carbonatite (alvikite ?)

This rock is brecciated. Carbonate minerals (euhedral crystals up to 0.4 x 0.3mm in size, but fine - grained aggregates are predominant) and less amounts of smectite, K - feldspar and fluorite are main constituents. Isolated euhedral crystals of pyrite (up to 0.04 x 0.04mm in size) are rarely present.

KG-2-C: carbonatite (carbonatized phonolite ?)

It is composed of anhedral carbonate minerals, fluorite, massive smectite, chalcedonic quartz, cube - shaped hematite (up to 0.8 x 0.8mm in size, probably as pseudomorphs of pyrite), goethite, lepidocrocite and fine - grained magnetite (up to 0.01 x 0.01mm in size). Carbonate menerals occur as replacement products of phenocrysts, veinlets, networks and irregular interspaces.

KG-3-B: carbonatite (ferrocarbonatite ?)

Euhedral to subhedral magnetite (up to 0.4 x 0.3mm in size) are replaced by hematite along the rims and cracks. Carbonate minerals and fluorite occur as irregular interspaces of magnetite, hematite, goethite and lepidocrocite.

KG-3-C: carbonatite (ferrocarbonatite ?)

Magnetite occurs in cores of hematite grains (cube - shaped, up to 0.5 x 0.4mm in size). Aggregates of cube - shaped hematite and goethite are also present. These observations suggest that pyrite was originally formed, but replaced by magnetite, and magnetite was replaced by hematite, goethite and lepidocrocite.

Sequence of formation of these opaque minerals is estimated; pyrite → magnetite → hematite → goethite + lepidocrocite. Carbonate minerals, rounded fluorite grains (up to 0.2mm in diameter) and chalcedonic quartz occur as irregular interspaces.

KG-4-A: Fe ore

Aggregates of goethite, hematite and lepidocrocite and aggregates of fine - grained carbonate minerals are predominant. Magnetite (up to 0.5 x 0.5mm in size) occurs in cores of hematite. Euhedral pyrochlore (up to 0.5 x 0.5mm in size) is present. Aggregates of fine - grained bastnaesite, euhedral biotite grains (up to 0.4 x 0.2mm in size) and massive fluorite are also present.

KG-4-C: Fe ore

It is composed of aggregates of goethite, hematite and lepidocrocite (totally up to 0.6 x 0.6mm in size, but each grain size is ca. 0.08 - 0.1 mm), and interstitial carbonate minerals and fluorite.

Apx. 7 Results of Whole Rock Analysis of Carbonatites and Related Rocks

SAMPLE DESCRIPTION		SiO_2 %	Al_2O_3 %	Fe_2O_3 %	MgO %	CaO %	Na_2O %	K_2O %	TiO_2 %	P_2O_5 %	MnO %	BaO %	LOI %	TOTAL %	F %	CO_2 % inorg	FeO %
BR-17-A	16.10m	4.67	1.24	63.64	0.19	6.71	0.17	0.20	0.12	0.18	6.36	1.84	12.62	97.95	4.58	0.5	0.08
BR-17-B	25.50m	1.52	1.32	67.12	0.36	0.43	0.07	0.19	0.01	0.32	15.23	1.56	10.67	98.81	0.27	< 0.2	0.06
BR-18-B	6.60m	40.17	10.31	24.21	0.17	0.61	0.30	8.89	0.49	0.30	3.27	3.33	5.91	97.97	0.23	< 0.2	0.09
BR-18-D	29.90m	44.78	5.81	28.67	0.23	0.48	0.21	4.40	0.46	0.88	2.54	2.56	6.48	97.50	< 0.10	0.6	0.11
BR-21-A	25.30m	11.18	1.82	43.15	0.37	7.12	0.17	1.03	0.11	0.38	10.27	8.13	15.76	99.50	4.58	< 0.2	0.09
BR-24-B	36.70m	4.47	0.50	51.17	0.48	8.17	0.10	0.18	0.09	0.16	12.92	4.41	14.65	97.30	5.34	0.7	0.06
BRL-2-B	17.10m	4.05	1.09	44.26	0.16	17.02	0.13	0.34	0.66	0.35	3.54	6.18	13.71	91.47	10.90	< 0.2	0.08
BRL-2-C	22.10m	1.92	1.26	61.63	0.37	4.61	0.07	0.18	1.02	0.16	11.70	1.65	11.85	96.42	3.36	0.3	0.08
BRL-2-E	42.00m	2.50	0.93	51.98	0.47	5.98	0.09	0.36	0.66	0.61	12.11	6.70	11.60	93.97	4.58	0.5	0.06
BRL-3-H	66.40m	14.70	3.29	27.45	1.54	10.76	0.64	1.90	0.47	0.85	6.48	9.16	17.61	94.85	3.36	12.0	0.07
KG-3-D	8.00m	4.37	1.15	27.26	1.01	25.80	0.09	0.72	0.27	0.24	4.06	5.21	24.66	94.85	0.61	22.1	0.05
KG-3-E	24.60m	4.17	1.02	27.35	0.78	25.37	0.09	0.59	0.15	0.91	5.46	2.93	26.12	94.94	0.34	20.9	0.05

Description of samples

BR-17-A Weathered brown amorphous iron ore
BR-17-B Weathered black porous MN-FE ore
BR-18-B Weathered brecciated granitic gneiss cemented by goethite rich matrix
BR-18-D Strongly brecciated gneiss filled with khaki goethite rich matrix
BR-21-A Weathered brown iron ore (possibly ferrocarbonatite dyke)
BR-24-B Weathered dark brown porous ferrocarbonatite
BRL-2-B Laterite (weathered fine porous carbonatite)
BRL-2-C Weathered fine porous ore (MN FE ore)
BRL-2-E Weathered black porous MN-FE ore
BRL-3-H Fresh pale grey carbonatite breccia rich in chlorite matrix

KG-3-D Pale grey slightly banded carbonatite (transitional facies to ferrocarb.
KG-3-E Brown massive ferrocarbonatite

Apx. 8 Summary of EPMA Test−1, Mineral List Identified by Qualitative Analysis

Sample Number	Depth(m)	Rock Type	Constituents of Minerals		
			Major	Common	Rare
BRL-2-F	83.50	Carbonatite	Cal, Mn-Sid,	Ba,	Pyc, Py, Sp, Bst, Ap, Phl,
BRL-3-B	10.75	Carbonatite	Cal, Mn-Sid, Goe	Hem, Ba, Sd, Ap,	Pyc, Ply, Bst,
BRL-3-D	30.30	Carbonatite	Cal, Mn-Sid, Goe	Flu, Ba, Hem,	Ran, REE-Carb,
BR-17-D	50.00	Carbonatite	Flu, Goe,	Ba, Ap. Ran	
BR-24-A	34.50	Ferrocarbonatite	Hem, Mn-Sid, Cal, Goe,	Flu,	Pyc, Ran, Bst
BR-24-E	48.30	Carbonatite	Cal, Mn-Sid, Hem	Ba, Ank, Phl,	Ga
KG-2-A	5.00	Ferrocarbonatite	Mn-Sid, Hem,	Ran, Bar, Goe, Phl,	Pyc, Bst
KG-3-A	5.30	Carbonatite	Cal, Hem, Goe,	Ba, Bst, Phl,	Ran
KG-5-B	29.40	Ferrocarbonatite	Cal, Mn-Sid, Hem,	Goe, Ba, Ran,	Phl
KG-6-A	12.80	Ferrocarbonatite	Cal. Mn-Sid,Hem, Ap	Ba, Goe, Phl,	

Abbreviations

Cal; calcite, Mn-Sid; Mn-rich siderite, Ba; barite, Pyc; pyrochlore, Py; pyrite,
Sp; sphalerite, Bst; bastnaesite, Ap; apatite, Phl; phlogopite, Goe; goethite,
Hem; hematite, Mn-Sid; Mn rich siderite, Flue; flourite, Ran; rancieite (Ba-rich), REE-Carb;
Ree-rich carbonate, Ank; ankerite, Ga; galena,

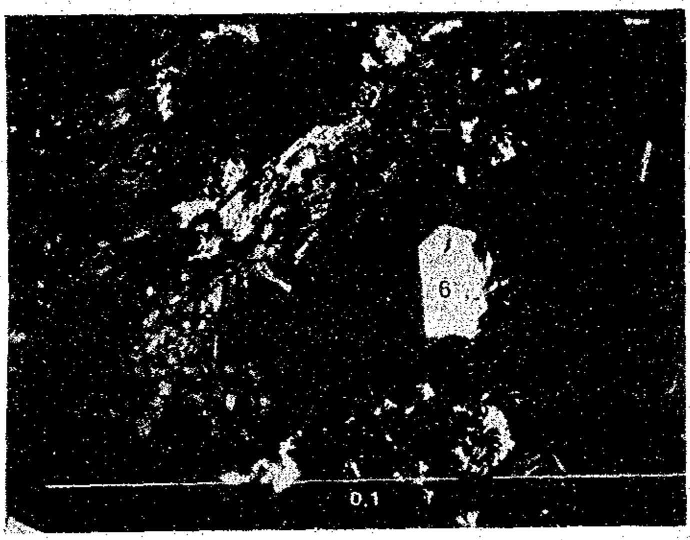
Apx. 9 Summary of EPMA Test–2, Quantitative Analysis of Minerals

Sample Number	Minerals	Components	Results(weight %)			Average
BRL-2-F	Barite		1	2	3	
		BaO	66.65	66.17	66.58	66.47
		SO_3	33.25	31.74	32.89	32.63
		CaO	0.24	0.18	0.18	0.20
		Fe_2O_3	0.02	0.10	0.18	0.10
		SrO	1.22	0.42	0.05	0.56
		Total	101.38	98.61	99.88	99.96
	Pyrochlore		4	5	6	
		Nb_2O_5	65.50	65.65	65.39	65.18
		Ta_2O_5	6.89	6.41	6.92	6.74
		TiO_2	2.91	2.72	2.67	2.77
		Fe_2O_3	1.95	1.39	1.00	1.45
		CaO	11.12	11.37	11.09	11.19
		Na_2O	11.36	11.10	11.86	11.44
		Total	98.73	98.64	98.93	98.77
	Bastnaesite		7	8	9	
		CeO_2	29.47	26.02	27.06	27.52
		La_2O_3	24.06	21.39	22.10	22.52
		Nd_2O_3	5.93	5.92	5.87	5.91
		SrO	2.55	1.86	2.56	2.31
		CaO	6.27	6.03	6.09	6.13
		Fe_2O_3	1.10	5.33	1.27	2.57
		MnO	0.12	0.31	0.10	0.18
		Total	69.50	66.86	65.05	67.14
BRL-3-B	Barite		1	2	3	
		BaO	67.05	65.55	65.51	66.04
		SO_3	34.65	33.74	33.10	33.83
		CaO	0.34	0.48	0.47	0.43
		Fe_2O_3	0.03	0.00	0.04	0.02
		SrO	0.31	0.29	0.25	0.28
		Total	102.38	100.06	99.37	100.60
	Pyrochlore		4	5	6	
		Nb_2O_5	65.17	66.03	64.82	65.34
		Ta_2O_5	7.30	6.63	7.52	7.15
		TiO_2	3.56	3.49	3.66	3.57
		Fe_2O_3	1.10	0.70	0.51	0.77
		MnO	0.43	0.60	0.16	0.40
		CaO	11.96	11.98	12.33	12.09
		Na_2O	9.48	8.94	9.10	9.17
		Total	99.00	98.37	98.10	98.47
BRL-3-D	Barite		1	2	3	
		BaO	67.04	65.90	66.50	66.48
		SO_3	32.96	33.76	33.23	33.32
		CaO	0.01	0.19	0.18	0.13
		Fe_2O_3	0.00	0.00	0.00	0.00
		SrO	0.20	1.40	0.74	0.78
		Total	100.23	101.25	100.65	100.71
	REE-rich Carbonate Mineral		4	5	6	
		CeO_2	11.76	12.70	11.29	11.92
		La_2O_3	6.15	7.07	6.47	6.56
		Nd_2O_3	7.51	6.61	6.27	6.80
		BaO	4.44	4.41	6.34	5.06
		SrO	0.95	1.21	1.16	1.11
		CaO	8.52	8.63	7.56	8.24
		Fe_2O_3	3.56	1.62	1.98	2.39
		MnO	25.70	25.05	20.23	23.66
		Total	68.59	67.30	61.30	65.73
BR-17-D	Rancieite		1	2	3	
		BaO	16.33	15.91	15.32	15.85
		SrO	0.06	0.44	0.26	0.25
		CaO	0.84	0.61	1.16	0.87
		Fe_2O_3	2.05	1.88	2.24	2.06
		MnO	59.21	59.85	58.53	59.20
		Total	78.49	78.69	77.51	78.23
	Barite		4	5	6	
		BaO	66.02	67.07	67.25	66.78
		SO_3	32.47	33.19	32.99	32.88
		CaO	0.02	0.40	0.25	0.67
		Fe_2O_3	0.00	0.21	0.00	0.22
		SrO	0.33	0.70	0.00	0.34
		Total	98.84	101.57	100.49	100.30
BR-24-A	Pyrochlore		1	2	3	
		Nb_2O_5	67.18	66.12	66.29	66.53
		Ta_2O_5	10.66	10.01	9.54	10.07
		TiO_2	4.85	4.16	4.40	4.47
		Fe_2O_3	1.84	1.86	1.19	1.63
		CaO	11.85	11.54	11.86	11.74
		Na_2O	3.39	1.86	2.26	2.50
		MnO	0.16	0.40	0.16	0.24
		Total	99.93	95.95	95.70	97.20
	Rancieite		4	5	6	
		BaO	15.64	15.52	16.03	15.73
		CaO	4.81	4.66	5.02	4.83
		Fe_2O_3	3.53	4.60	3.31	3.81
		SrO	0.50	0.40	0.55	0.48
		MnO	56.12	53.07	54.30	54.16
		Total	79.60	78.25	79.21	79.02
BR-24-A	Bastnaesite		7	8	9	
		CaO	9.73	7.79	7.21	8.24
		Fe_2O_3	0.21	3.48	2.52	2.07
		SrO	1.22	1.58	2.14	1.65
		CeO_2	26.33	28.51	29.36	28.07
		La_2O_3	4.23	5.36	6.10	5.23
		Nd_2O_3	16.15	14.02	15.44	15.20
		Total	57.87	60.73	62.77	60.46
BR-24-B	Barite		1	2	3	
		BaO	67.07	66.06	66.51	66.55
		SO_3	33.20	33.24	33.72	33.39
		CaO	0.47	0.23	0.08	0.26
		Fe_2O_3	0.34	0.51	0.69	0.51
		SrO	0.50	0.21	0.39	0.37
		Total	101.58	100.25	101.39	101.07
KO-2-A	Pyrochlore		1	2	3	
		Nb_2O_5	66.67	66.10	67.40	66.72
		Ta_2O_5	6.13	6.46	5.91	6.17
		TiO_2	3.92	4.08	4.25	4.08
		Fe_2O_3	0.57	0.78	0.57	0.64
		CaO	13.84	13.74	14.37	13.98
		Na_2O	6.97	8.01	7.80	7.59
		MnO	0.09	0.05	0.20	0.08
		Total	98.19	99.22	100.50	99.30
	Rancieite		4	5	6	
		BaO	15.91	16.35	16.70	16.32
		CaO	0.61	0.65	0.57	0.61
		Fe_2O_3	4.48	5.79	2.82	4.36
		MnO	59.11	57.15	61.01	59.09
		SrO	0.45	0.47	0.52	0.48
		Total	80.56	80.41	81.62	80.86
	Bastnaesite		7	8	9	
		BaO	3.62	2.71	3.74	3.36
		CaO	9.55	7.52	5.61	7.63
		SrO	2.67	2.21	2.40	2.43
		CeO_2	18.78	20.58	21.53	20.30
		La_2O_3	19.41	22.02	24.58	22.00
		Nd_2O_3	3.68	3.50	4.82	4.00
		Total	57.71	58.55	62.88	59.71
KG-3-A	Barite		1	2	3	
		BaO	65.95	65.49	64.68	65.37
		SO_3	33.24	33.48	32.85	33.19
		CaO	0.39	0.55	0.20	0.38
		Fe_2O_3	0.17	0.22	0.03	0.14
		MnO	0.08	0.10	0.15	0.11
		SrO	0.44	0.56	1.03	0.68
		Total	100.27	100.40	98.94	99.87
	Bastnaesite		4	5	6	
		CaO	4.92	4.64	3.49	4.35
		CeO_2	30.70	30.29	30.37	30.45
		La_2O_3	23.73	22.84	23.55	23.37
		Nd_2O_3	6.01	5.45	5.33	5.60
		Fe_2O_3	0.03	0.10	0.25	0.13
		MnO	0.42	0.22	0.00	0.21
		SrO	1.57	[illegible]	1.68	1.55
		Total	67.38	64.95	64.65	65.66
KO-5-B	Barite		1	2	3	
		BaO	66.10	66.50	65.15	65.92
		SO_3	33.48	33.31	32.76	33.18
		CaO	0.22	0.14	0.39	0.25
		Fe_2O_3	0.71	0.36	0.28	0.45
		MnO	0.20	0.12	0.03	0.12
		SrO	0.99	0.39	0.66	0.68
		Total	101.70	100.81	99.27	100.59
	Rancieite		4	5	6	
		MnO	58.74	58.64	58.64	58.01
		BaO	13.70	14.24	14.24	14.24
		Fe_2O_3	3.74	4.20	5.18	4.31
		CaO	0.78	0.69	1.01	0.83
		SrO	0.90	0.92	0.91	0.91
		Total	77.86	78.69	80.31	78.95
KO-6-A	Barite		1	2	3	
		BaO	66.83	65.95	66.29	66.36
		SO_3	33.54	33.39	33.57	33.50
		CaO	0.12	0.12	0.26	0.17
		Fe_2O_3	0.10	0.05	0.06	0.07
		MnO	0.08	0.05	0.08	0.07
		SrO	0.25	0.54	0.47	0.42
		Total	100.92	100.10	100.73	100.58

* Numbers on analytical results show analysed points in X-ray Images.

Apx. 10 SEM Images of Minerals (EPMA Test) (1)

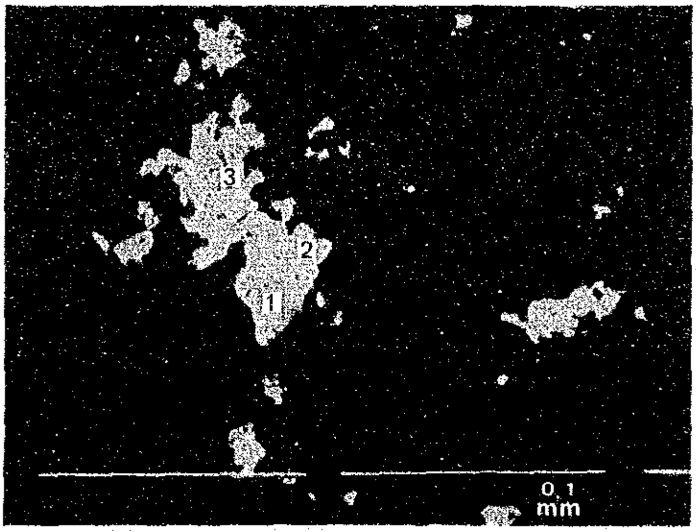
Sample No.; BRL-2-F
Depth; 83.50m
Rock type; Carbonatite
Mineral name;
Barite: 1.2.3
Pyrochlore: 4.5



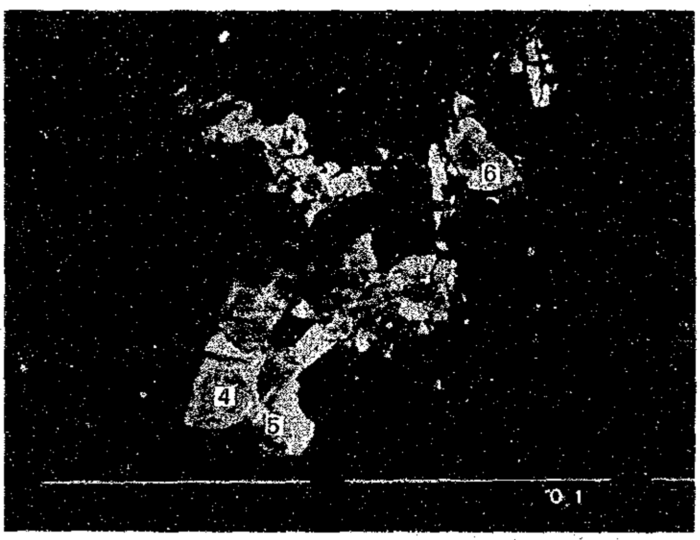
Sample No.; BRL-2-F
Depth; 83.50m
Rock type; Carbonatite
Mineral name;
Pyrochlore: 6

Sample No.; BRL-2-F
Depth; 83.50m
Rock type; Carbonatite
Mineral name;
Bastnaesite: 7.8.9

Apx. 10 SEM Images of Minerals (EPMA Test) (2)

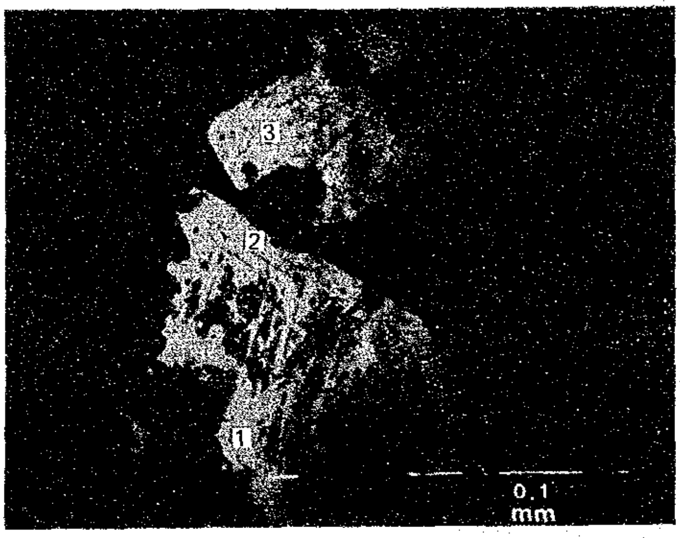


Sample No.; BRL-3-B
Depth; 10.75m
Rock type; Carbonatite
Mineral name;
Barite: 1.2.3

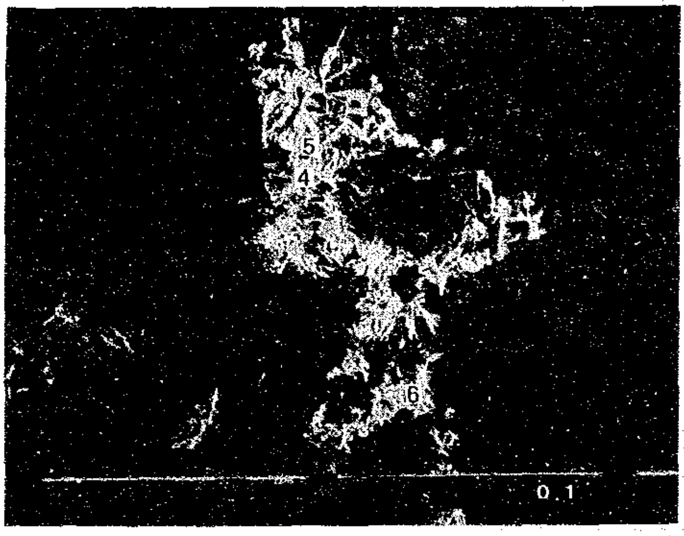


Sample No.; BRL-3-B
Depth; 10.75m
Rock type; Carbonatite
Mineral name;
Pyrochlore: 4.5.6

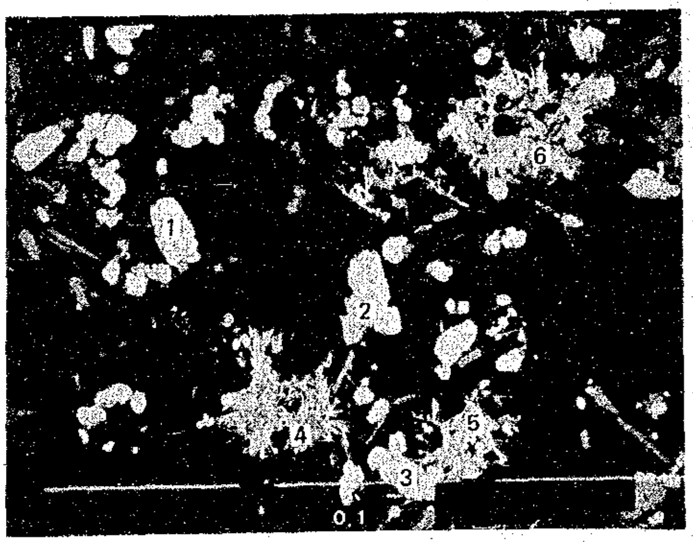
Apx. 10 SEM Images of Minerals (EPMA Test) (3)



Sample No.; BRL-3-D
Depth; 30.30m
Rock type; Carbonatite
Mineral name;
Barite: 1.2.3

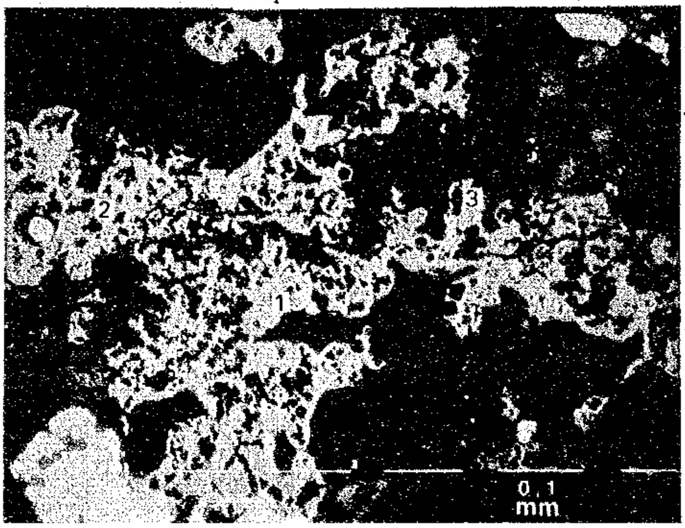


Sample No.; BRL-3-D
Depth; 30.30m
Rock type; Carbonatite
Mineral name;
REE-rich carbonate mineral: 4.5.6

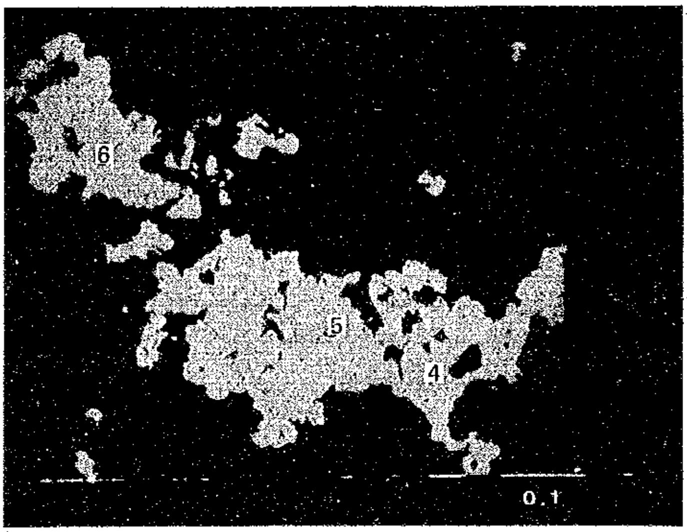


Sample No.; KG-3-A
Depth; 5.30m
Rock type; Carbonatite
Mineral name;
Barite: 1.2.3
Bastnaesite: 4.5.6

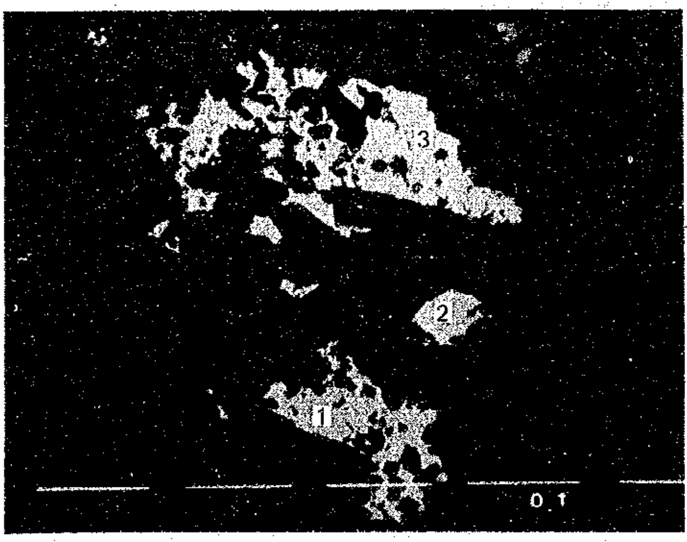
Apx. 10 SEM Images of Minerals (EPMA Test) (4)



Sample No.; BR-17-D
Depth; 50.00m
Rock type; Carbonatite
Mineral name;
Rancieite: 1.2.3

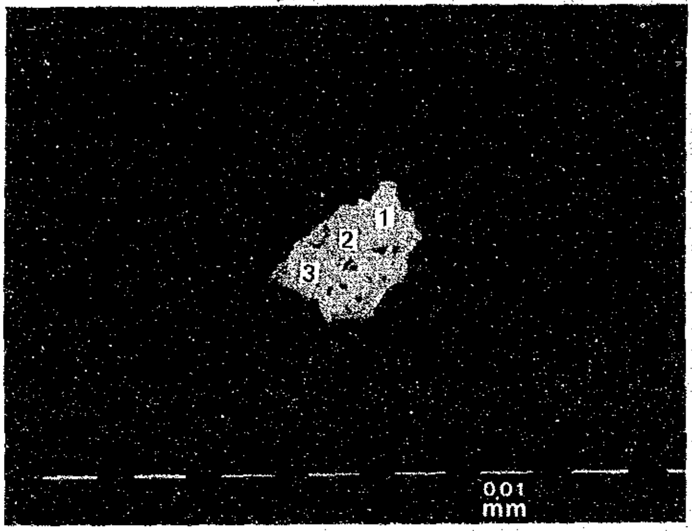


Sample No.; BR-17-D
Depth; 50.00m
Rock type; Carbonatite
Mineral name;
Barite: 4.5.6

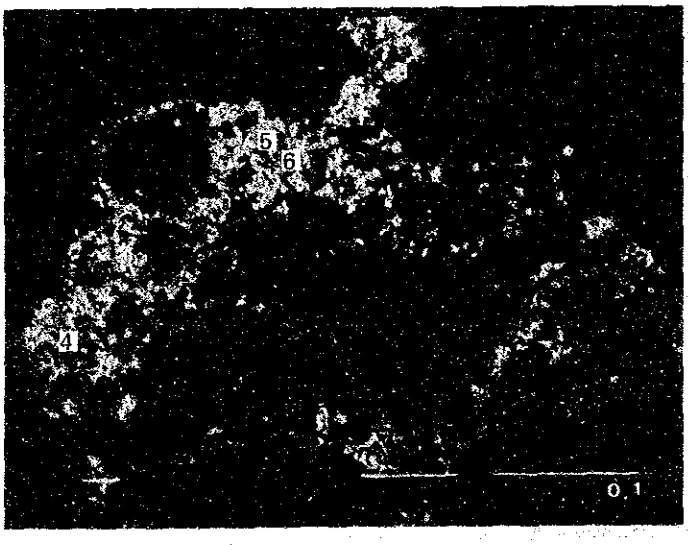


Sample No.; BR-24-E
Depth; 48.30m
Rock type; Carbonatite
Mineral name;
Barite: 1.2.3

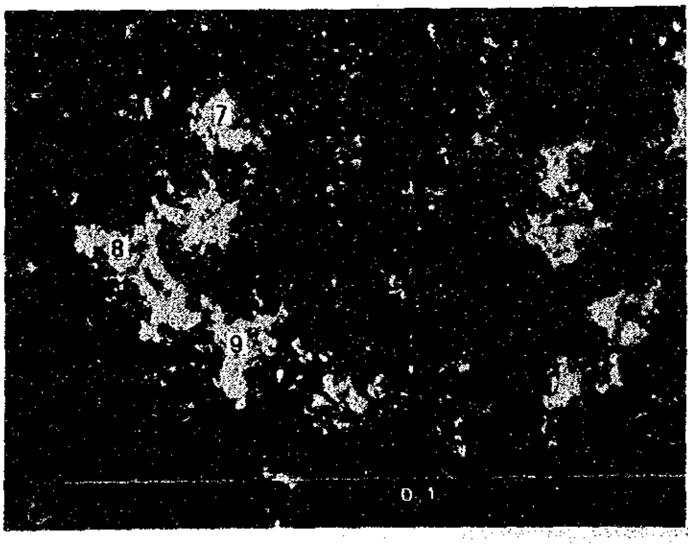
Apx. 10 SEM Images of Minerals (EPMA Test) (5)



Sample No.;BR-24-A
Depth; 34.50m
Rock type; Ferrocarbonatite
Mineral name;
Pyrochlore: 1.2.3

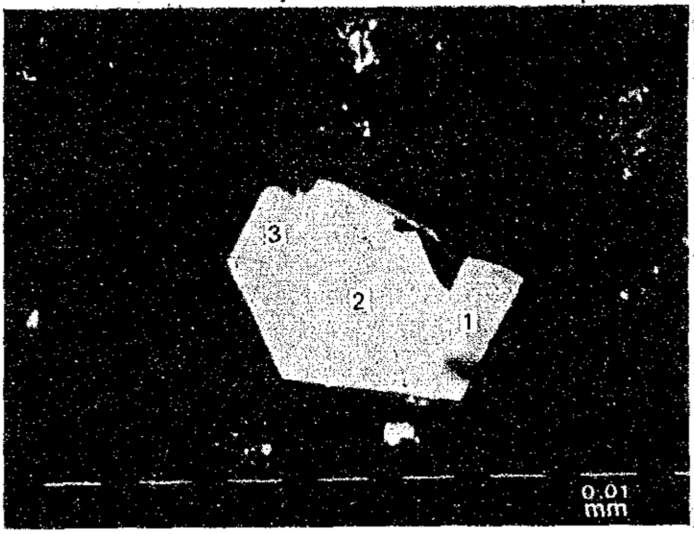


Sample No.; BR-24-A
Depth; 34.50m
Rock type; Ferrocarbonatite
Mineral name;
Rancieite: 4.5.6

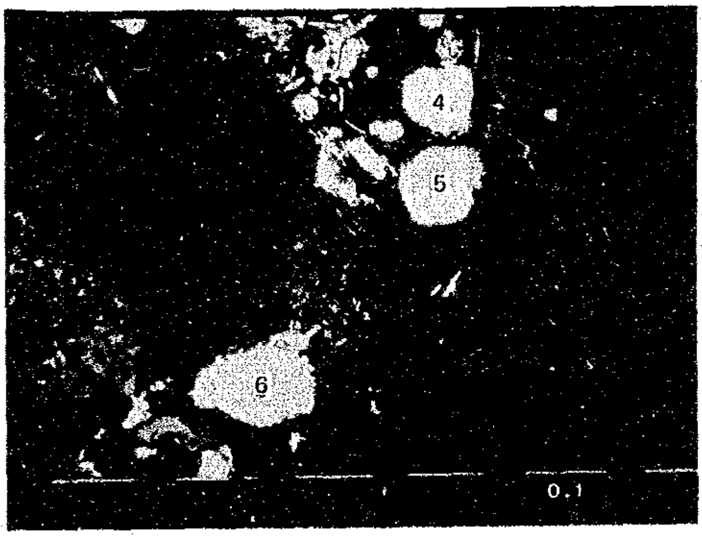


Sample No.; BR-24-A
Depth; 34.50m
Rock type; Ferrocarbonatite
Mineral name;
Bastnaesite: 7.8.9

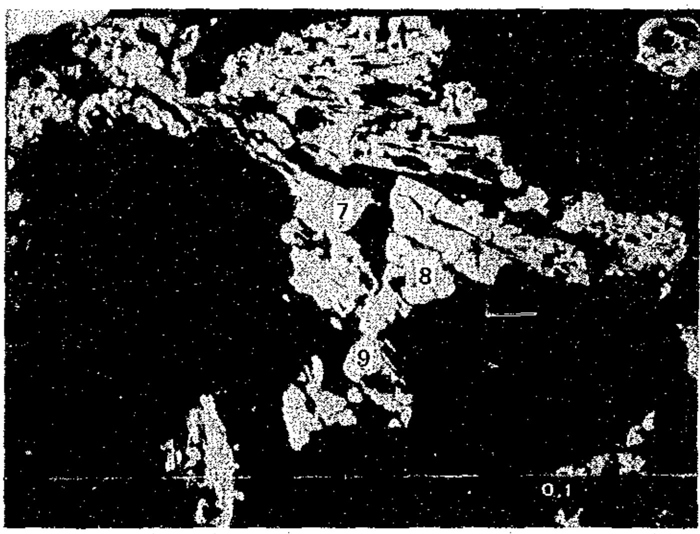
Apx. 10 SEM Images of Minerals (EPMA Test) (6)



Sample No.; KG-2-A
Depth; 5.00m
Rock type; Ferrocarbonatite
Mineral name;
Pyrochlore: 1.2.3

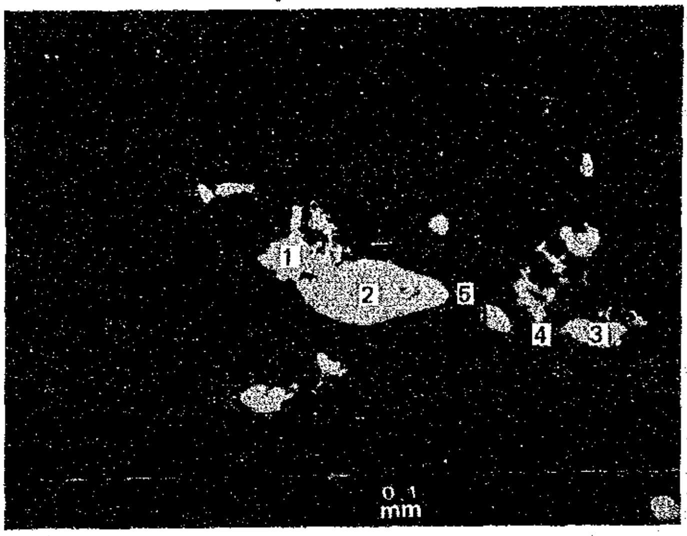


Sample No.; KG-2-A
Depth: 5.00m
Rock type; Ferrocarbonatite
Mineral name
Rancieite: 4.5.6

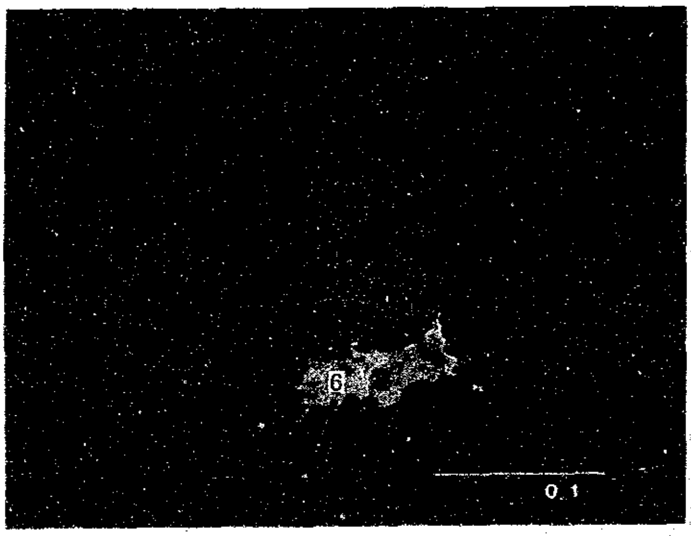


Sample No.; KG-2-A
Depth; 5.00m
Rock type; Ferrocarbonatite
Mineral name;
Bastnaesite; 7.8.9

Apx. 10 SEM Images of Minerals (EPMA Test) (7)



Sample No.; KG-5-B
Depth; 29.40m
Rock type;Ferrocarbonatite
Mineral name
Barite:1.2.3
Rancieite:4.5



Sample No.; KG-5-B
Depth; 29.40m
Rock type; Ferrocarbonatite
Mineral name;
Rancieite: 6

Sample No.; KG-6-A
Depth; 12.80m
Rock type; Ferrocarbonatite
Mineral name;
Barite: 1.2.3

Apx. 11 Results of Measurement of Size of Rare Earth Minerals

Sample description			Size of measured bastonasite*			
Sample No.	Depth(m)	Type of ore	Maximum (mm)	Minimum (mm)	Number of grains	Average size (mm)
BRL-1-M	198.0	Fe-carb	0.06	0.01	15	0.027
BRL-2-M	42.3	Mn-Fe ore	0.04	0.01	9	0.020
BRL-2-N	75.0	Carbonatite	0.20	0.01	22	0.053
BRL-2-O	83.5	Carbonatite	0.10	0.01	15	0.10
BRL-3-M	12.7	Fe-carb	0.04	0.005	19	0.025
BR-4-M	9.6	Silic ore	0.02	0.01	10	0.015
BR-10-M	31.8	Ca-Fe ore	0.04	0.01	9	0.022
BR-17-M	45.4	Mn-Fe ore	0.50	0.01	15	0.14
BR-21-M	13.0	Silic ore	0.20	0.01	20	0.046
BR-24-M	35.8	Ca-Fe ore	0.10	0.01	18	0.034

* Measurement: by microscopic observation

Abbreviations

Fe-carb : Ferrocarbonatite
Mn-Fe ore: Manganiferous iron ore
Silic ore: Siliceous ore
Ca-Fe ore: Calcareous iron ore

Apx. 12 Results of Analysis of Ore Minerals

Sample number	Depth	Type of ore	ThO2 NA %	P2O5 %	Ba NAA %	Sr %	Ce NAA %	La NAA %	Nd NAA %	Nb %	Y2O3 %	
BRL-1-M	198.0	Fe-carb	0.036	6.74	2.52	1.79	0.78	0.740	0.08	0.028	0.031	
BRL-2-M	42.3	Mn-Fe ore	0.084	0.24	2.16	0.18	0.23	0.091	0.10	0.026	0.022	
BRL-2-N	75.0	Carbonatite	0.060	0.30	7.54	0.35	0.59	0.390	0.08	0.170	0.018	
BRL-2-O	83.5	Carbonatite	0.023	0.09	2.03	0.08	0.10	0.090	0.01	0.040	0.003	
BRL-3-M	12.7	Fe-carb	0.073	1.29	3.63	0.20	0.88	0.490	0.13	0.096	0.035	
BR-4-M	9.6	Silic ore	0.028	0.52	5.18	0.10	0.55	0.490	0.12	0.046	0.036	
BR-10-M	31.8	Ca-Fe Ore	0.069	0.70	9.69	0.21	1.38	1.040	0.18	0.053	0.046	
BR-17-M	45.4	Mn-Fe ore	0.071	0.28	2.18	0.06	0.23	0.081	0.08	0.004	0.025	
BR-21-M	13.0	Silic ore	0.037	0.14	3.59	0.04	0.04	0.021	0.01	0.003	0.008	
BR-24-M	35.8	Ca-Fe ore	0.055	0.19	2.07	0.07	0.30	0.100	0.09	0.045	0.016	

Sample number	Depth	Type of ore	Sm NAA ppm	Lu NAA ppm	Eu NAA ppm	Yb NAA ppm	Tb NAA ppm	U NAA ppm				
BRL-1-M	198.0	Fe-carb	131.0	5.1	29.0	33.9	10.1	39.0				
BRL-2-M	42.3	Mn-Fe ore	221	3.5	48.5	23.5	11.0	28.0				
BRL-2-N	75.0	Carbonatite	112.0	2.0	29.0	9.4	13.2	23.0				
BRL-2-O	83.5	Carbonatite	15.7	0.2	6.2	1.1	1.1	3.0				
BRL-3-M	12.7	Fe-carb	191.0	4.2	48.0	26.4	14.0	24.0				
BR-4-M	9.6	Silic ore	169.0	2.4	43.0	23.5	16.4	23.0				
BR-10-M	31.8	Ca-Fe Ore	193.0	5.0	51.2	36.1	14.7	24.0				
BR-17-M	45.4	Mn-Fe ore	89.9	1.6	26.7	9.0	8.6	14.0				
BR-21-M	13.0	Silic ore	85.8	1.4	23.6	7.7	4.8	2.0				
BR-24-M	35.8	Ca-Fe ore	31.7	1.8	7.1	8.9	2.6	35.0				

Abbreviations

Fe-carb: Ferocarbonatite
Mn-Fe ore: Manganiferous iron ore
Silic ore: Siliceous ore
Ca-Fe ore: Calcareous iron ore

Apx. 13 Results of Chemical Analysis of Drill Core Samples, Buru Hill Area (1)

SAMPLE NUMBER	DEPTH OF SAMPLE (m)	WIDTH (m)	ROCK TYPE	Sm NAA ppm	Lu NAA ppm	Eu NAA ppm	Yb NAA ppm	Tb NAA ppm	Th NAA ppm	U NAA ppm	Ba NAA %	Ce NAA %	La NAA %	Nd NAA %	P ppm (ICP)	Sr ppm (ICP)	Nb-XRF ppm	Y (XRF) ppm
BRL-2-01	0.00 - 0.45	0.45	WETH MAT	235	5.0	81.5	29.8	25.1	834.0	15.4	3.65	0.83	0.550	0.26	1055	2080	650	750
BRL-2-02	0.45 - 4.50	4.05	WETH CB	190.0	1.6	61.7	14.7	13.7	644.0	10.4	3.01	0.51	0.200	0.20	1290	2340	400	350
BRL-2-03	4.50 - 9.00	4.50	WETH CB	215	2.8	75.4	18.2	20.6	848.0	10.2	4.75	0.58	0.340	0.23	1120	3250	600	430
BRL-2-04	9.00 - 11.25	2.25	SI ORE	248	2.6	83.5	20.9	26.8	989.0	11.5	3.28	0.66	0.310	0.24	1290	3890	785	570
BRL-2-05	11.25 - 16.20	4.95	WETH CB	233	3.3	94.1	24.1	29.1	1051.0	19.8	4.63	0.74	0.420	0.25	1395	2750	1340	690
BRL-2-06	16.20 - 19.70	3.50	WETH CB	263	3.3	102.5	24.3	34.0	1166.0	57.4	7.09	1.39	0.880	0.40	1360	2600	1490	710
BRL-2-07	19.70 - 23.40	3.70	MN-FE ORE	237	2.5	95.7	14.7	27.2	1103.0	172.5	4.10	1.06	0.640	0.32	1305	1160	1550	530
BRL-2-08	23.40 - 27.65	4.25	MN-FE ORE	260	2.3	93.4	11.4	18.2	1117.0	180.0	3.41	0.88	0.640	0.29	1175	883	595	330
BRL-2-09	27.65 - 28.90	1.25	SI-ORE	274	2.2	85.0	14.4	24.2	1061.0	147.0	1.91	0.76	0.480	0.27	1305	635	1360	480
BRL-2-10	28.90 - 30.40	1.50	WETH CB	221	3.2	81.2	20.5	35.6	961.0	171.0	3.84	0.75	0.490	0.24	1235	1540	875	600
BRL-2-11	30.40 - 32.70	2.30	WETH CB	236	3.7	80.7	14.6	28.9	1257.0	170.0	2.48	0.91	0.650	0.27	2030	1030	1460	390
BRL-2-12	32.70 - 35.50	2.80	WETH CB	295	3.6	95.3	19.6	24.0	1405.0	154.0	3.20	0.93	0.580	0.30	2270	2010	585	520
BRL-2-13	35.50 - 39.30	3.80	WETH CB	343	3.8	127.0	21.5	26.3	1439.0	119.5	2.23	0.82	0.410	0.30	3240	1225	475	770
BRL-2-14	39.30 - 43.50	4.20	MN-FE ORE	352	4.7	128.0	28.2	35.7	1749.0	71.7	3.10	0.89	0.450	0.35	1635	1165	310	750
BRL-2-15	43.50 - 47.60	4.10	WETH CB	265	2.9	86.6	21.7	16.9	1192.0	69.0	3.67	0.63	0.250	0.29	1270	1505	400	490
BRL-2-16	48.10 - 49.65	1.55	FE-CB	241	3.2	86.6	20.2	14.3	1004.0	88.0	6.17	0.93	0.500	0.32	1130	1755	745	410
BRL-2-17	49.65 - 51.00	1.35	MN-FE ORE	213	2.9	77.9	11.8	24.3	1011.0	73.0	5.35	1.06	0.550	0.32	1375	2090	395	400
BRL-2-18	51.00 - 53.75	2.75	WETH CB	252	4.0	106.0	11.2	29.4	1684.0	96.4	4.16	1.23	0.890	0.27	2610	2580	395	440
BRL-2-19	53.75 - 57.00	3.25	WETH CB	276	3.9	129.0	6.2	20.8	1413.0	170.0	5.82	2.24	2.04	0.39	4600	2810	810	410
BRL-2-20	57.00 - 60.70	3.70	WETH CB	205	4.1	97.9	20.9	25.1	1154.0	115.5	4.29	1.20	1.000	0.24	2750	2730	1900	640
BRL-2-21	60.70 - 64.50	3.80	WETH CB	232	4.4	93.3	21.5	25.2	1092.0	70.4	3.48	1.01	0.710	0.26	2130	1845	990	700
BRL-2-22	64.50 - 67.70	3.20	WETH CB	184.0	4.4	83.7	22.7	27.7	975.0	49.4	3.73	0.55	0.330	0.16	1870	2180	920	670
BRL-2-23	67.70 - 69.00	1.30	WETH CB	294	12.0	198.0	57.3	77.6	1699.0	114.5	2.15	0.85	0.500	0.27	4860	1365	4450	1650
BRL-2-24	69.00 - 73.30	4.30	CB-FRESH	195.0	3.4	86.6	22.7	28.9	810.0	31.2	2.13	0.65	0.490	0.17	630	1600	960	690
BRL-2-25	73.30 - 77.70	4.40	CB-FRESH	244	3.9	94.7	20.1	30.9	918.0	29.0	2.66	0.85	0.660	0.21	550	2370	1300	540
BRL-2-26	77.70 - 79.05	1.35	CB-FRESH	172.0	4.0	78.9	19.8	33.0	566.0	31.2	2.03	0.59	0.440	0.14	396	1965	1200	630
BRL-2-27	79.05 - 81.55	2.50	CB-FRESH	144.0	2.4	58.7	12.1	13.6	481.0	33.2	1.36	0.40	0.260	0.12	878	1455	1800	340
BRL-2-28	81.55 - 85.00	3.45	CB-FRESH	149.0	4.1	61.7	19.5	23.7	622.0	23.0	2.06	0.73	0.640	0.15	433	2070	700	520
BRL-2-29	85.00 - 89.50	4.50	CB-FRESH	97.0	2.7	41.7	18.8	16.8	373.0	19.5	1.00	0.33	0.300	0.07	592	2360	1000	500
BRL-2-30	91.40 - 95.30	3.90	CB-FRESH	150.0	5.3	57.4	29.0	17.7	509.0	17.6	2.56	0.85	0.580	0.19	1855	3330	730	630
BRL-2-31	98.30 - 98.55	0.25	CB-FRESH	161.0	3.2	35.3	13.9	3.2	452.0	13.8	1.74	0.86	0.540	0.20	733	3510	125	310
BRL-3-01	0.00 - 3.00	3.00	WETH MAT	213	6.4	77.8	35.8	25.5	651.0	30.8	5.81	1.35	1.330	0.26	21300	2780	1150	670
BRL-3-02	3.00 - 5.50	2.50	WETH CB	238	4.9	85.4	30.9	26.2	694.0	30.5	5.73	1.22	1.170	0.26	9060	1750	1200	680
BRL-3-03	5.50 - 7.00	1.50	WETH CB	179.0	5.6	67.6	32.3	23.1	607.0	21.9	3.18	0.79	0.660	0.18	20200	3260	1400	640
BRL-3-04	7.00 - 11.95	4.95	CB-FRESH	171.0	4.8	59.5	33.5	18.5	541.0	13.0	3.88	1.07	0.970	0.21	11370	2690	1500	520
BRL-3-05	11.95 - 15.30	3.35	FE-CB	177.0	3.4	58.5	20.6	12.5	741.0	13.4	3.13	0.94	0.730	0.21	5180	1640	830	440
BRL-3-06	15.30 - 18.80	3.50	CB-FRESH	191.0	6.4	72.3	36.9	20.1	794.0	16.8	4.57	1.06	0.980	0.22	9400	2190	740	630
BRL-3-07	18.80 - 22.40	3.60	CB-FRESH	177.0	5.5	58.4	30.6	17.3	765.0	19.3	3.61	1.21	1.210	0.22	7890	2770	960	540
BRL-3-08	22.40 - 23.50	1.10	FE-CB	196.0	6.0	78.9	25.8	4.1	649.0	23.6	5.66	2.04	2.26	0.31	11470	3800	540	540
BRL-3-09	23.50 - 25.50	2.20	CB-FRESH	163.0	4.7	51.4	28.5	13.2	471.0	20.2	5.30	1.53	1.660	0.25	12180	2930	425	480

Apx. 13 Results of Chemical Analysis of Drill Core Samples, Buru Hill Area (2)

SAMPLE NUMBER	DEPTH OF SAMPLE (m)	WIDTH (m)	ROCK TYPE	Sm NAA ppm	Lu NAA ppm	Eu NAA ppm	Yb NAA ppm	Tb NAA ppm	Th NAA ppm	U NAA ppm	Ba NAA %	Ce NAA %	La NAA %	Nd NAA %	P ppm (ICP)	Sr ppm (ICP)	Nb-XRF ppm	Y (XRF) ppm
BRL-3-10	25.50 - 29.10	3.60	CB-FRESH	116.0	3.1	35.4	19.5	12.5	374.0	13.2	1.37	0.46	0.380	0.11	9090	2960	670	330
BRL-3-11	29.10 - 31.90	2.80	CB-FRESH	230	5.2	83.9	36.3	25.9	700.0	16.6	1.69	0.52	0.330	0.17	13180	2430	870	720
BRL-3-12	31.90 - 36.00	4.10	CB-FRESH	185.0	5.0	70.6	32.4	24.7	515.0	22.3	1.37	0.39	0.260	0.12	6940	2380	970	660
BRL-3-13	36.00 - 39.10	3.10	CB-FRESH	201	5.6	76.4	31.9	25.0	585.0	29.8	1.86	0.49	0.310	0.14	7340	2320	1200	700
BRL-3-14	39.10 - 40.70	1.60	FE-CB	370	5.1	123.0	30.9	38.2	988.0	23.5	7.27	1.02	0.720	0.35	8810	2330	660	920
BRL-3-15	40.70 - 45.20	4.50	CB-FRESH	250	4.3	77.3	25.7	22.0	823.0	14.9	4.30	0.94	0.810	0.25	7640	2270	395	640
BRL-3-16	45.20 - 49.40	4.20	CB-FRESH	232	4.3	77.8	28.7	22.9	709.0	10.8	3.25	0.72	0.520	0.21	4780	2140	405	630
BRL-3-17	49.40 - 53.80	4.40	CB-FRESH	190.0	4.2	58.2	28.0	14.4	550.0	10.1	2.58	0.51	0.380	0.16	7770	2340	375	570
BRL-3-18	53.80 - 58.80	5.00	CB-FRESH	158.0	5.3	54.8	34.5	16.2	566.0	8.7	2.62	0.34	0.200	0.12	11250	2450	350	670
BRL-3-19	58.80 - 62.00	3.20	CB-BRC	174.0	3.7	62.8	22.4	18.5	681.0	7.9	3.63	0.68	0.570	0.18	6190	9810	480	530
BRL-3-20	62.00 - 65.00	3.00	CB-BRC	199.0	4.9	78.1	25.6	20.0	949.0	11.2	5.23	1.06	0.890	0.24	6800	29600	410	590
BRL-3-21	65.00 - 68.00	3.00	CB-BRC	121.0	2.8	38.8	18.4	10.4	463.0	9.3	2.56	0.44	0.360	0.11	4100	7580	640	340
BRL-3-22	68.00 - 71.00	3.00	CB-BRC	129.0	3.2	43.7	19.7	15.3	445.0	9.4	3.14	0.45	0.340	0.12	6410	2400	540	370
BRL-3-23	71.00 - 72.40	1.40	GOSSAN	242	6.3	90.0	36.2	24.7	1202.0	27.1	7.01	1.09	0.980	0.27	15360	2670	940	720
BRL-3-24	72.40 - 76.20	3.80	WETH CB	210	6.2	72.9	38.4	17.7	864.0	26.0	5.06	0.71	0.580	0.18	11030	2870	960	720
BRL-3-25	76.20 - 77.10	0.90	CB-FRESH	157.0	3.9	46.9	24.0	11.2	704.0	13.1	3.11	0.62	0.490	0.16	6330	2330	620	450
BRL-3-26	77.10 - 81.60	4.70	CB-BRC	202	4.8	67.8	29.2	21.7	765.0	15.2	4.35	0.72	0.600	0.18	10690	2480	780	630
BRL-3-27	81.60 - 84.90	3.30	CB-BRC	217	4.0	73.2	23.9	21.1	836.0	18.8	5.41	0.85	0.630	0.24	4650	1795	750	540
BRL-3-28	84.90 - 87.00	2.10	CB-FRESH	241	5.9	84.4	37.7	19.2	942.0	26.8	4.60	0.70	0.570	0.20	11330	2510	540	740
BRL-3-29	87.00 - 90.00	3.00	GOSSAN	286	5.8	95.4	25.8	15.8	985.0	26.0	7.23	1.45	1.270	0.36	7270	4210	185	660
BRL-3-30	90.00 - 92.70	2.70	GOSSAN	193.0	6.4	73.0	40.9	15.8	676.0	31.0	3.64	[illegible]	0.380	0.15	16160	2900	820	710
BRL-3-31	92.70 - 97.60	4.90	WETH CB	230	5.7	86.3	41.1	27.7	588.0	36.2	4.56	0.57	0.280	0.23	8970	1945	1250	680
BRL-3-32	97.60 - 98.60	1.00	GOSSAN	262	6.2	94.1	40.2	31.5	724.0	40.7	8.27	1.10	0.610	0.37	7370	2130	750	730
BRL-3-33	98.60 -100.70	2.10	ALVIKITE	223	3.7	73.2	24.5	18.6	607.0	22.2	4.19	0.71	0.380	0.23	2330	1960	550	480
BR-17-01	15.95 - 16.50	0.55	SI ORE	427	7.4	135.0	57.2	39.7	1564.0	18.5	3.01	1.06	0.610	0.42	1525	1185	570	1950
BR-17-02	19.60 - 20.70	1.10	MN-FE ORE	265	3.5	75.4	23.3	34.0	879.0	26.6	1.88	0.64	0.220	0.29	993	526	135	580
BR-17-03	20.70 - 21.90	1.20	FE-CB	239	6.5	80.6	47.2	26.0	961.0	21.5	2.38	0.54	0.330	0.19	876	432	700	1050
BR-17-04	21.90 - 22.80	0.90	MN-FE ORE	352	4.5	94.8	25.6	22.3	944.0	26.4	1.37	0.48	0.190	0.28	1310	3100	99	550
BR-17-05	22.80 - 24.65	1.85	GNEISS	278	4.2	91.3	30.3	19.2	938.0	21.6	2.19	0.61	0.430	0.20	749	786	1450	610
BR-17-06	24.65 - 25.60	0.95	MN-FE ORE	142.0	5.4	47.4	37.8	26.5	528.0	19.7	2.24	0.40	0.150	0.17	1770	337	165	700
BR-17-07	29.80 - 32.05	2.25	FE-CB	184.0	3.8	61.2	28.1	27.5	594.0	30.2	2.13	0.81	0.400	0.25	2850	968	450	680
BR-17-08	32.05 - 34.50	2.45	MN-FE ORE	157.0	3.1	48.6	18.3	20.7	424.0	25.7	1.87	0.60	0.250	0.20	1630	2220	70	480
BR-17-09	34.50 - 36.70	2.20	WETH CB	188.0	4.0	73.2	30.2	25.2	715.0	24.8	3.61	0.88	0.660	0.23	1365	1835	1050	940
BR-17-10	36.70 - 39.50	2.80	WETH CB	181.0	3.8	61.7	27.1	17.0	720.0	21.7	2.41	0.66	0.380	0.20	1160	2230	940	810
BR-17-11	41.50 - 43.00	1.50	WETH CB	232	5.5	76.0	28.5	29.7	680.0	25.6	1.97	0.77	0.590	0.23	1365	1605	960	790
BR-17-12	43.00 - 45.00	2.00	MN-FE ORE	229	5.6	72.8	31.3	27.0	840.0	35.1	3.54	0.90	0.500	0.31	2010	2170	740	770
BR-17-13	45.00 - 47.10	2.10	MN-FE ORE	187.0	6.8	73.6	39.0	38.0	950.0	34.2	2.29	0.63	0.340	0.20	3150	1090	620	960
BR-17-14	47.10 - 47.50	0.40	WETH CB	249	12.2	109.0	59.8	46.4	2084	80.4	3.00	1.11	1.190	0.21	4820	7780	450	1450
BR-17-15	48.20 - 49.90	1.70	WETH CB	196.0	16.5	67.4	82.1	39.9	1338.0	86.5	5.35	1.26	1.470	0.19	11840	5420	650	1350
BR-17-16	49.90 - 50.20	0.30	WETH CB	174.0	7.9	93.5	57.9	43.9	1309.0	86.0	7.03	1.53	1.680	0.23	2770	5240	225	1400

Apx. 13 Results of Chemical Analysis of Drill Core Samples, Buru Hill Area (3)

SAMPLE NUMBER	DEPTH OF SAMPLE (m)	WIDTH (m)	ROCK TYPE	Sm NAA ppm	Lu NAA ppm	Eu NAA ppm	Yb NAA ppm	Tb NAA ppm	Th NAA ppm	U NAA ppm	Ba NAA %	Ce NAA %	La NAA %	Nd NAA %	P ppm (ICP)	Sr ppm (ICP)	Nb-XRF ppm	Y (XRF) ppm
BR-18-01	9.80 - 10.20	0.40	ORE	180.0	2.7	69.8	20.5	14.0	998.0	8.6	8.48	0.48	0.300	0.20	1950	660	1100	640
BR-18-02	13.75 - 16.70	2.95	ORE	260	4.4	84.4	30.5	33.8	1401.0	14.1	6.35	0.60	0.430	0.26	2630	828	820	770
BR-18-03	16.70 - 17.15	0.45	MN-FE ORE	151.0	3.1	20.3	19.1	18.0	1394.0	11.0	6.73	0.30	0.110	0.16	1250	577	770	400
BR-18-04	23.90 - 24.80	0.90	OX-MI GN	137.0	3.6	50.4	26.7	25.8	680.0	7.9	5.79	0.52	0.380	0.16	2020	585	980	540
BR-18-05	24.80 - 27.45	2.65	OX-MI GN	207	5.3	105.0	51.8	36.9	1301.0	15.6	11.10	1.39	1.270	0.34	4690	1080	1350	1000
BR-18-06	27.45 - 29.60	2.15	OX-MI GN	248	6.0	101.5	40.1	37.3	1235.0	18.8	3.71	0.81	0.560	0.24	3980	886	1550	880
BR-18-07	29.60 - 30.70	1.10	OX-MI GN	238	5.3	112.0	40.8	32.2	744.0	14.8	8.87	0.93	0.680	0.30	3520	899	1650	760
BR-18-08	30.70 - 32.30	1.60	WETH CB	183.0	4.2	61.6	23.8	20.8	899.0	14.4	5.20	0.78	0.520	0.22	3190	751	1150	540
BR-18-09	32.30 - 33.00	0.70	ORE	158.0	5.8	56.9	38.3	24.3	619.0	16.9	4.57	1.26	1.120	0.24	5400	1050	740	790
BR-18-10	33.00 - 35.50	2.50	WETH CB	223	4.7	83.5	33.5	27.2	703.0	12.5	3.46	0.56	0.330	0.23	4470	923	1450	640
BR-18-11	35.50 - 38.00	2.50	WETH CB	187.0	4.9	71.9	34.8	36.0	705.0	13.9	2.58	0.46	0.280	0.17	12130	1330	760	680
BR-18-12	38.00 - 39.00	1.00	GOSSAN	249	7.2	102.0	57.8	35.9	1299.0	24.4	5.06	1.29	0.990	0.32	7570	1040	910	1100
BR-18-13	39.00 - 39.90	0.90	GOSSAN	206	8.1	64.6	48.5	27.4	1035.0	22.6	3.84	1.43	1.030	0.32	5310	573	560	830
BR-18-14	39.90 - 42.15	2.25	WETH CB	123.0	6.5	45.7	43.1	17.9	658.0	19.5	4.60	0.81	0.540	0.15	8410	988	710	630
BR-18-15	42.15 - 42.70	0.55	FE-CB	187.0	5.0	72.1	30.8	10.8	764.0	16.9	4.61	0.79	0.520	0.20	4350	765	1100	630
BR-18-16	42.70 - 43.90	1.20	WETH CB	287	7.6	57.5	42.1	37.4	1113.0	19.8	3.44	0.80	0.610	0.24	5650	811	1000	990
BR-18-17	43.90 - 44.40	0.50	FE-CB	266	6.8	105.5	51.0	40.2	974.0	19.0	3.68	0.96	0.530	0.32	9880	1145	860	1050
BR-18-18	44.40 - 47.40	3.00	WETH CB	262	5.6	101.0	39.4	11.7	999.0	17.8	3.34	0.80	0.520	0.26	7740	1145	670	940
BR-18-19	47.40 - 47.70	0.30	FE-CB	231	6.0	81.3	37.4	10.0	1019.0	20.8	3.78	0.86	0.500	0.20	12950	1290	1300	780
BR-18-20	47.70 - 50.20	2.50	WETH CB	213	4.6	55.3	32.2	24.5	958.0	17.6	4.49	0.72	0.510	0.20	5860	950	850	700
BR-18-21	50.80 - 52.50	1.70	WETH CB	253	4.5	95.2	30.9	30.4	906.0	15.6	2.86	0.55	0.320	0.17	4230	952	990	750
BR-19-01	36.00 - 37.00	1.00	ORE	329	5.0	110.0	27.5	38.4	1460.0	36.8	1.19	0.72	0.470	0.22	774	4330	410	800
BR-19-02	37.40 - 37.95	0.55	ORE	230	3.2	93.1	17.8	31.5	1563.0	20.4	2.23	0.75	0.600	0.18	708	2770	195	510
BR-20-01	13.70 - 14.75	1.05	ORE	320	5.8	100.5	38.9	24.2	783.0	15.2	2.00	0.47	0.300	0.18	763	2160	740	790
BR-20-02	20.60 - 21.40	0.80	ORE	197.0	5.3	58.0	38.6	16.4	775.0	11.6	1.66	0.20	0.088	0.11	236	808	620	630
BR-21-01	11.45 - 15.50	4.05	MN-FE ORE	208	2.7	70.2	23.6	17.3	1023.0	18.3	4.92	0.60	0.300	0.22	679	702	120	520
BR-21-02	16.20 - 17.40	1.20	MN-FE ORE	234	2.5	69.3	15.2	17.8	710.0	19.3	3.35	0.35	0.140	0.19	2530	340	180	350
BR-21-03	22.60 - 22.75	0.15	ORE	224	5.5	103.5	40.3	29.6	1644.0	45.0	10.20	1.78	1.450	0.38	2660	2740	270	1250
BR-21-04	25.10 - 26.20	1.10	ORE	156.0	2.9	42.7	16.7	9.3	571.0	19.3	4.60	0.67	0.400	0.16	3860	695	305	380
BR-21-05	26.80 - 29.00	2.20	WETH CB	230	3.3	84.1	21.2	17.9	905.0	48.2	9.14	1.86	1.490	0.38	5550	1270	235	520
BR-21-06	29.00 - 32.70	3.70	WETH CB	237	3.7	71.8	26.4	16.0	783.0	37.6	7.91	1.32	0.820	0.34	5640	1255	1050	630
BR-21-07	32.70 - 33.80	1.10	MN-FE ORE	194.0	2.6	47.9	20.8	15.6	496.0	38.1	7.16	0.80	0.430	0.27	3330	892	180	380
BR-21-08	33.80 - 37.50	3.70	WETH CB	305	4.5	79.2	33.0	22.6	735.0	63.9	9.15	2.01	1.470	0.50	7240	1250	1050	680
BR-21-09	37.50 - 40.90	3.40	WETH CB	253	13.7	82.8	49.0	25.3	447.0	64.1	5.40	1.41	1.350	0.30	36500	3410	1600	730
BR-21-10	40.90 - 43.30	2.40	WETH CB	335	5.4	104.5	35.4	30.3	518.0	60.6	5.40	1.34	1.130	0.35	11400	1605	2900	690

Apx. 13 Results of Chemical Analysis of Drill Core Samples, Buru Hill Area (4)

SAMPLE NUMBER	DEPTH OF SAMPLE (m)	WIDTH (m)	ROCK TYPE	Sm NAA ppm	Lu NAA ppm	Eu NAA ppm	Yb NAA ppm	Tb NAA ppm	Th NAA ppm	U NAA ppm	Ba NAA %	Ce NAA %	La NAA %	Nd NAA %	P ppm (ICP)	Sr ppm (ICP)	Nb-XRF ppm	Y (XRF) ppm
BR-22-02	9.80 - 10.00	0.20	ORE	331	4.9	87.2	32.9	24.0	1048.0	121.5	5.31	0.87	0.460	0.32	1145	422	62	620
BR-23-01	18.45 - 18.75	0.30	ORE	271	7.0	88.9	45.9	40.6	850.0	86.5	2.66	0.45	0.280	0.17	608	733	500	1000
BR-24-01	0.00 - 1.00	1.00	WETH MAT	165.0	8.5	54.5	28.4	11.0	657.0	57.8	4.19	0.62	0.470	0.17	5830	1090	1250	550
BR-24-02	1.00 - 2.30	1.30	WETH CB	155.0	4.8	43.3	33.4	12.7	1462.0	21.2	4.23	0.80	0.630	0.20	5620	1235	1600	630
BR-24-03	2.30 - 3.80	1.50	WETH CB	100.0	3.0	31.2	4.8	5.6	404.0	13.7	2.25	0.25	0.160	0.09	1730	534	960	260
BR-24-04	3.80 - 4.10	0.30	GNEISS	42.0	1.1	10.9	6.7	2.6	197.0	5.5	1.09	0.10	0.061	0.04	728	226	360	105
BR-24-05	4.10 - 5.30	1.20	SI-ORE	129.0	3.5	38.1	23.8	16.2	403.0	10.7	5.21	0.23	0.140	0.09	3020	782	1250	380
BR-24-06	5.30 - 8.00	2.70	WETH CB	197.0	5.2	64.0	33.2	26.5	657.0	17.4	5.67	0.39	0.250	0.16	4940	982	2600	610
BR-24-07	8.00 - 10.70	2.70	SI-ORE	187.0	3.9	43.6	15.4	19.0	679.0	40.3	6.59	1.01	0.800	0.27	6300	1375	1900	410
BR-24-08	10.70 - 13.20	2.50	WETH CB	231	4.1	96.9	21.9	24.8	736.0	104.0	10.70	2.02	1.920	0.44	8680	2160	2850	720
BR-24-09	13.20 - 16.00	2.80	WETH CB	179.0	3.7	56.3	27.4	18.3	499.0	102.0	7.02	1.42	1.410	0.28	7080	1945	1950	530
BR-24-10	16.00 - 17.40	1.40	SI-ORE	164.0	3.6	36.3	11.1	11.4	368.0	80.0	4.38	1.52	1.650	0.26	8030	1585	900	420
BR-24-11	17.40 - 18.50	1.10	WETH CB	189.0	5.3	46.9	23.7	5.7	675.0	46.7	6.20	1.26	1.290	0.26	8800	1530	1750	540
BR-24-12	18.50 - 21.20	2.70	WETH CB	151.0	3.5	35.0	18.5	11.1	513.0	11.4	4.03	0.92	0.840	0.20	9870	1395	1950	420
BR-24-13	21.20 - 24.50	3.30	WETH CB	113.0	2.0	26.6	11.6	3.5	354.0	9.2	5.35	0.60	0.470	0.15	3240	823	1450	280
BR-24-14	24.50 - 27.60	3.10	WETH CB	181.0	4.4	36.5	27.0	11.2	612.0	16.5	6.49	1.22	1.230	0.25	8620	1560	1350	460
BR-24-15	27.60 - 28.20	0.60	OX-MI GN	85.9	2.2	23.3	21.6	8.2	371.0	18.2	3.00	0.58	0.480	0.12	4640	1195	1150	250
BR-24-16	28.20 - 31.00	2.80	WETH CB	167.0	4.1	38.7	25.1	14.4	563.0	58.5	2.47	0.94	0.750	0.20	4710	1960	990	450
BR-24-17	31.00 - 32.30	1.30	FE-CB	202	5.2	49.5	18.5	14.9	636.0	27.4	1.38	0.44	0.330	0.16	4610	1240	580	470
BR-24-18	32.30 - 34.20	1.90	FE-CB	312	9.9	68.0	34.2	18.9	1031.0	63.8	2.89	1.04	0.360	0.42	5580	3130	760	820
BR-24-19	34.20 - 37.45	3.25	FE-CB	356	4.7	107.5	31.5	29.5	930.0	55.6	2.90	0.56	0.170	0.33	2600	1310	700	600
BR-24-20	37.45 - 38.30	0.85	WETH CB	425	8.1	118.5	29.3	25.3	810.0	25.6	3.27	0.96	0.490	0.45	1205	593	790	630
BR-24-21	38.30 - 42.40	4.10	CB-FRESH	272	2.5	69.8	17.6	5.0	799.0	22.9	3.74	0.81	0.600	0.28	2710	964	285	420
BR-24-22	42.40 - 45.90	3.50	CB-FRESH	130.0	3.4	66.8	19.8	6.6	450.0	16.7	4.77	1.55	1.630	0.24	9740	3230	280	340
BR-24-23	45.90 - 48.10	2.20	CB-FRESH	205	2.7	44.0	6.3	7.1	417.0	25.1	4.83	1.67	1 170	0.38	12380	2760	455	260
BR-24-24	48.10 - 49.20	1.10	CB-FRESH	90.5	5.3	28.6	34.4	10.1	398.0	27.2	1.06	0.31	0.200	0.08	13580	2470	1320	480
BR-24-25	49.20 - 50.50	1.30	CB-FRESH	202	5.0	52.2	18.6	11.0	491.0	37.6	4.31	1.12	0.680	0.33	5980	1720	745	360
BR-25-01	27.35 - 27.50	0.15	ORE	414	4.2	131.0	24.1	32.8	1384.0	22.3	1.59	0.45	0.120	0.29	865	1475	200	600
BR-25-02	31.20 - 31.60	0.40	ORE	239	3.5	67.8	24.5	17.6	1045.0	17.1	1.70	0.39	0.120	0.22	595	1315	350	550
BR-26-01	17.40 - 17.65	0.25	ORE	150.0	3.5	40.6	24.5	14.3	813.0	8.8	1.05	0.37	0.150	0.11	269	248	500	410
BR-26-02	47.45 - 47.55	0.10	ORE	197.0	3.7	52.5	22.9	13.0	676.0	15.8	2.76	0.57	0.340	0.19	1315	754	725	480
BR-27-01	13.60 - 15.90	2.30	SI-ORE	109.0	1.5	29.8	10.0	7.8	547.0	5.4	1.99	0.23	0.140	0.07	293	313	580	240
BR-27-02	19.50 - 21.70	2.20	SI-ORE	168.0	3.4	53.0	25.3	10.7	864.0	8.4	3.86	0.64	0.500	0.18	4250	856	1090	500
BR-27-03	21.70 - 23.10	1.40	WETH CB	194.0	6.4	76.1	31.5	13.3	1471.0	39.6	11.80	1.37	1.470	0.34	3690	1095	1050	630
BR-27-04	23.10 - 25.20	2.10	MN-FE ORE	190.0	5.0	61.2	22.9	14.6	670.0	47.4	2.29	0.51	0.320	0.17	5390	731	1550	530
BR-27-05	25.20 - 28.00	2.80	WETH CB	265	4.3	95.5	20.1	29.1	935.0	74.8	3.45	0.67	0.410	0.23	4260	624	1060	640
BR-27-06	28.00 - 31.10	3.10	WETH CB	312	3.2	124.5	23.8	20.3	1209.0	57.2	4.40	0.85	0.590	0.27	3800	705	1030	790
BR-27-07	31.10 - 35.00	3.90	WETH CB	245	7.8	105.5	25.2	26.0	1253.0	81.5	6.87	1.80	1.890	0.37	6730	1920	2520	900
BR-27-08	35.00 - 39.00	4.00	WETH CB	234	4.1	79.9	29.4	21.8	862.0	72.9	5.91	1.40	1.330	0.32	6230	1370	1400	720
BR-27-09	39.00 - 40.10	1.10	WETH CB	194.0	4.8	68.1	33.3	29.0	791.0	53.3	5.65	1.10	0.950	0.29	11500	1655	1120	680
BR-27-10	44.50 - 47.50	2.00	ORE	170.0	3.6	56.9	23.1	13.6	681.0	26.3	4.59	0.51	0.320	0.17	2540	723	620	470
BR-27-11	49.50 - 50.50	1.00	WETH CB	138.0	3.3	53.5	22.1	10.2	651.0	29.5	5.53	0.43	0.300	0.12	2260	857	445	390

Apx. 14 Results of Chemical Analysis of Drill Core Samples, Kuge – Lwal Area (1)

SAMPLE NUMBER	DEPTH OF SAMPLE (m)	WIDTH (m)	ROCK TYPE	Sm NAA ppm	Lu NAA ppm	Eu NAA ppm	Yb NAA ppm	Tb NAA ppm	Th NAA ppm	U NAA ppm	Ba NAA %	Ce NAA %	La NAA %	Nd NAA %	P ppm (ICP)	Sr ppm (ICP)	Nb-XRF ppm	Y(XRF) ppm
KG- 1-01	7.30 - 8.20	0.90	CB-FECB	150.0	2.7	40.4	16.3	13.2	461.0	20.5	7.54	1.59	1.510	0.28	2290	2270	185	230
KG- 1-02	8.70 - 9.30	0.60	CB-FECB	155.0	2.2	50.0	13.7	13.4	219.0	10.6	1.83	0.73	0.570	0.17	2200	1595	250	280
KG- 1-03	13.50 - 14.40	0.90	CB-FECB	107.0	2.0	37.5	8.3	11.9	152.0	15.9	3.20	0.88	0.840	0.16	1615	1550	880	185
KG- 1-04	14.40 - 15.70	1.30	FE-CB	169.0	2.1	70.9	7.6	9.9	251.0	32.6	10.60	2.13	2.46	0.36	3200	3280	640	200
KG- 1-05	15.70 - 18.40	2.70	CB-FECB	141.0	2.4	51.1	7.8	9.3	211.0	27.9	2.32	0.99	0.820	0.19	7590	3050	510	180
KG- 1-06	18.40 - 19.70	1.50	FE-CB	190.0	2.1	52.7	7.3	9.7	723.0	14.4	4.43	0.92	0.500	0.28	15850	3290	1100	190
KG- 1-07	21.90 - 22.80	0.90	CB-FECB	198.0	0.9	51.4	6.8	11.2	1073.0	11.4	1.74	0.20	0.032	0.16	3670	2930	280	145
KG- 1-08	23.40 - 24.60	1.20	FE-CB	206	1.4	57.9	7.4	13.1	1245.0	11.3	3.23	0.27	0.044	0.20	4090	1405	590	195
KG- 1-09	32.10 - 33.60	1.50	CB-FECB	236	1.3	63.3	6.3	13.5	1347.0	10.8	1.62	0.34	0.055	0.23	5380	2250	510	180
KG- 1-10	34.80 - 37.60	2.80	CB-FECB	248	1.3	68.9	3.9	13.9	1660.0	14.4	1.92	0.27	0.032	0.23	2630	2220	550	260
KG- 1-11	39.00 - 39.60	0.60	FE-CB	349	0.4	91.6	4.1	14.3	2549	19.3	8.56	0.32	0.017	0.41	732	1050	175	125
KG- 2-01	1.20 - 2.60	1.40	CB-FECB	121.0	1.4	35.7	12.9	5.5	234.0	7.8	1.36	0.47	0.360	0.11	1305	1060	475	195
KG- 2-02	2.60 - 3.40	0.80	CB-FECB	121.0	2.2	39.9	14.3	10.8	155.0	9.0	1.28	0.60	0.530	0.13	1065	1285	530	230
KG- 2-03	4.50 - 8.20	3.70	FE-CB	116.0	1.3	28.4	4.8	7.5	331.0	11.4	6.46	1.15	1.060	0.20	1710	2130	130	130
KG- 2-04	9.10 - 11.80	2.70	FE-CB	106.0	2.3	33.4	6.1	8.7	296.0	12.3	2.52	1.12	1.070	0.17	2170	2360	660	155
KG- 2-05	11.80 - 14.30	2.50	CB-FECB	113.0	1.3	37.6	5.9	9.1	831.0	16.8	1.51	0.63	0.610	0.10	2110	1700	440	125
KG- 2-06	15.10 - 18.30	3.20	FE-CB	86.4	1.5	24.6	4.6	5.8	263.0	11.3	2.58	0.80	0.770	0.12	2050	1470	350	110
KG- 2-07	18.70 - 22.30	3.60	FE-CB	107.0	1.6	37.2	3.3	8.5	437.0	7.2	4.51	0.99	0.780	0.18	3360	1895	490	160
KG- 2-08	22.50 - 24.70	2.20	FE-CB	111.0	2.1	55.0	6.6	6.6	326.0	7.8	6.95	1.39	1.320	0.24	1810	2360	280	160
KG- 2-09	24.90 - 28.60	3.70	FE-CB	153.0	2.4	47.0	16.0	11.4	413.0	20.4	2.41	1.07	0.810	0.21	6970	3230	260	260
KG- 2-10	28.90 - 33.00	4.10	FE-CB	200	1.6	62.1	12.9	15.9	527.0	9.4	5.53	1.39	0.840	0.34	12310	2760	375	370
KG- 2-11	33.00 - 36.80	3.80	FE-CB	203	4.9	89.2	48.5	43.0	760.0	8.9	7.33	1.22	0.970	0.27	8760	1775	590	1250
KG- 2-12	37.90 - 38.80	0.90	CB-FECB	213	2.9	81.8	23.8	21.4	862.0	11.6	5.49	1.13	0.640	0.31	8570	1470	850	720
KG- 2-13	49.30 - 49.60	0.30	FE-CB	293	1.2	71.1	12.3	15.0	2154	17.0	1.87	0.28	0.093	0.22	4610	1000	150	280
KG- 3-01	2.10 - 3.30	1.20	CB-FECB	112.0	1.0	44.2	8.2	9.5	307.0	4.3	5.34	0.86	0.770	0.16	1340	752	400	165
KG- 3-02	3.30 - 7.70	4.40	CB-FECB	170.0	1.6	52.2	10.9	12.3	409.0	4.6	4.66	1.02	0.910	0.20	985	893	570	195
KG- 3-03	7.70 - 12.10	4.40	CBE-FECB	192.0	3.7	57.7	23.4	19.9	408.0	4.9	3.37	1.04	0.870	0.20	1400	1300	405	380
KG- 3-04	13.40 - 16.40	3.00	FE-CB	135.0	3.3	38.7	22.6	11.3	345.0	5.1	3.19	0.92	0.650	0.18	1505	1315	275	350
KG- 3-05	17.70 - 18.40	0.70	FE-CB	129.0	4.6	40.0	29.0	15.6	289.0	3.5	2.88	0.60	0.430	0.13	1050	872	160	500
KG- 3-06	21.70 - 24.00	2.30	FE-CB	248	9.5	87.3	65.5	32.3	817.0	9.2	5.62	1.54	1.180	0.31	2920	1675	185	1100
KG- 3-07	24.00 - 26.70	2.70	FE-CB	255	6.1	80.2	37.5	25.5	[illegible]	13.3	2.94	0.79	0.430	0.20	4160	1205	490	630
KG- 3-08	26.70 - 28.10	1.40	CB-FECB	190.0	3.0	70.0	18.6	20.4	1371.0	10.8	1.42	0.76	0.380	0.20	6480	1130	780	490
KG- 3-09	32.10 - 34.90	2.80	CB-FECB	180.0	3.0	71.6	16.3	28.3	661.0	6.5	1.22	0.69	0.340	0.19	8960	2090	1150	490
KG- 3-10	34.90 - 38.20	3.30	FE-CB	175.0	3.8	55.3	29.4	16.2	755.0	6.8	3.98	1.28	0.790	0.30	10810	2240	465	500
KG- 3-11	38.20 - 40.50	2.30	CB-FECB	155.0	2.7	48.2	15.6	13.9	873.0	8.9	3.66	0.87	0.460	0.23	9410	1860	800	300
KG- 3-12	40.80 - 43.15	2.35	CB-FECB	134.0	1.1	43.0	10.7	10.7	343.0	10.6	1.27	0.25	0.110	0.10	13680	1390	550	330
KG- 3-13	44.70 - 45.00	0.30	CB-FECB	159.0	1.1	43.9	5.6	6.3	1057.0	7.5	1.62	0.28	0.050	0.18	5470	1380	205	195
KG- 3-14	49.30 - 52.00	2.70	FE-CB	155.0	0.9	41.5	10.2	12.9	1030.0	7.9	4.72	1.20	0.520	0.39	9520	1580	1500	470
KG- 3-15	52.00 - 55.30	3.30	FE-CB	196.0	2.7	61.7	17.6	20.4	973.0	11.0	4.94	0.78	0.260	0.31	6650	824	920	520
KG- 3-16	55.30 - 60.10	4.80	FE-CB	191.0	1.8	54.2	15.8	13.7	1072.0	14.3	3.77	0.47	0.088	0.25	4440	1180	1200	360

Apx. 14 Results of Chemical Analysis of Drill Core Samples, Kuge – Lwal Area (2)

SAMPLE NUMBER	DEPTH OF SAMPLE (m)	WIDTH (m)	ROCK TYPE	Sm NAA ppm	Lu NAA ppm	Eu NAA ppm	Yb NAA ppm	Tb NAA ppm	Th NAA ppm	U NAA ppm	Ba NAA %	Ce NAA %	La NAA %	Nd NAA %	P ppm (ICP)	Sr ppm (ICP)	Nb-XRF ppm	Y(XRF) ppm
KG- 4-01	1.70 - 5.00	3.30	FE-CB	87.0	1.9	25.0	13.1	7.1	453.0	6.3	6.04	0.45	0.330	0.12	10820	3030	510	200
KG- 4-02	5.00 - 8.00	3.00	FE-CB	126.0	2.5	33.7	14.9	9.5	676.0	9.8	4.64	0.92	0.730	0.20	4910	2530	480	220
KG- 4-03	8.00 - 11.00	3.00	FE-CB	152.0	3.0	39.0	19.7	11.4	764.0	8.1	3.65	0.98	0.630	0.24	3650	1495	740	350
KG- 4-04	11.00 - 14.00	3.00	FE-CB	151.0	2.6	41.5	19.7	9.3	943.0	9.3	3.84	0.91	0.660	0.21	3920	1500	540	330
KG- 4-05	14.00 - 16.80	2.80	FE-CB	149.0	2.4	44.0	13.9	9.6	957.0	9.7	5.04	0.79	0.640	0.20	10280	2510	690	240
KG- 4-06	17.70 - 20.70	3.00	FE-CB	188.0	1.1	41.7	7.6	9.7	1305.0	10.5	2.71	0.52	0.300	0.17	3940	1430	330	110
KG- 4-07	20.70 - 23.70	3.00	CB-FECB	330	1.9	89.1	13.9	19.1	2893	23.9	2.81	0.21	0.041	0.18	7590	2080	210	300
KG- 4-08	26.15 - 30.00	3.85	CB-PYLC	19.4	0.9	6.6	6.0	3.2	120.0	1.6	0.23	0.04	0.015	0.01	4190	860	185	91
KG- 4-09	30.00 - 33.50	3.50	CB-PYLC	34.9	1.2	13.3	7.8	4.0	235.0	2.3	0.21	0.04	0.011	0.01	3260	675	305	165
KG- 4-10	33.50 - 37.00	3.50	CB-PYLC	28.0	1.7	11.9	11.0	4.1	170.0	2.7	0.21	0.03	0.012	0.01	6480	1625	375	210
KG- 4-11	37.00 - 39.90	2.90	CB-PYLC	53.2	1.7	20.1	13.1	5.3	385.0	3.9	0.37	0.03	0.008	0.01	11830	1625	415	270
KG- 4-12	39.90 - 43.60	3.70	FE-CB	248	1.5	68.8	21.4	13.3	1701.0	14.1	1.36	0.15	0.012	0.15	3700	1840	78	250
KG- 4-13	47.00 - 49.70	2.70	CB-FECB	201	1.9	52.3	17.9	8.0	1253.0	12.8	2.22	0.26	0.044	0.20	3160	1230	455	210
KG- 4-14	49.70 - 52.25	2.55	CB-FECB	235	1.4	54.4	21.1	9.6	1681.0	16.9	2.33	0.32	0.046	0.27	1865	873	350	195
KG- 4-15	52.25 - 54.70	2.45	CB-FECB	203	2.4	50.4	24.1	12.6	1206.0	16.8	4.85	0.46	0.075	0.30	3120	2090	730	390
KG- 4-16	54.70 - 58.50	3.80	CB-FECB	197.0	1.8	46.5	16.8	13.4	917.0	24.3	2.61	0.50	0.073	0.28	3820	1040	1400	330
KG- 5-01	1.40 - 4.80	3.40	FE-CB	86.5	0.9	21.9	5.2	4.0	191.0	8.9	3.28	0.75	0.590	0.16	1650	1260	500	160
KG- 5-02	4.80 - 8.00	3.20	FE-CB	89.7	1.0	22.4	4.3	7.2	248.0	4.9	2.69	0.59	0.430	0.13	1270	1095	620	120
KG- 5-03	8.00 - 11.50	3.50	FE-CB	91.9	1.1	22.2	3.9	6.0	221.0	3.0	4.05	0.64	0.460	0.15	972	1060	540	150
KG- 5-04	12.20 - 15.20	3.00	FE-CB	61.2	1.3	17.9	3.3	6.6	176.0	2.9	5.32	0.60	0.520	0.13	1395	1395	445	135
KG- 5-05	16.90 - 18.55	1.65	FE-CB	38.2	0.9	9.2	4.0	2.6	147.0	2.3	1.42	0.24	0.160	0.05	3340	1220	445	71
KG- 5-06	19.80 - 22.50	2.70	FE-CB	84.8	1.4	24.7	9.8	5.9	257.0	4.0	1.69	0.43	0.280	0.10	917	723	740	150
KG- 5-07	22.50 - 26.00	3.50	FE-CB	113.5	1.0	31.2	10.9	8.4	328.0	4.3	4.46	0.76	0.600	0.17	1165	1140	630	170
KG- 5-08	26.00 - 29.00	3.00	FE-CB	108.5	1.5	28.0	11.1	8.7	398.0	3.7	[illegible]	0.73	0.580	0.16	2180	1730	510	175
KG- 5-09	29.00 - 32.50	3.50	FE-CB	113.5	1.7	28.6	11.1	8.9	521.0	5.4	2.56	0.74	0.570	0.18	3130	1920	880	190
KG- 5-10	32.50 - 35.70	3.20	CB-FECB	118.5	1.9	30.5	15.2	8.9	527.0	7.4	2.06	0.72	0.560	0.16	4160	1880	520	220
KG- 5-11	35.70 - 38.90	3.20	CB-FECB	110.0	2.3	29.7	14.1	9.0	561.0	8.4	1.63	0.60	0.450	0.14	3710	1925	520	280
KG- 5-12	38.90 - 39.35	0.45	FE-CB	133.0	2.9	31.8	21.5	8.3	777.0	11.0	2.15	0.64	0.350	0.19	2890	1800	620	290
KG- 5-13	39.35 - 42.30	2.95	FE-CB	186.5	5.2	47.1	30.6	18.2	1158.0	15.4	2.63	0.75	0.360	0.24	4910	1365	700	460
KG- 5-14	42.30 - 44.70	2.40	FE-CB	169.0	2.8	40.4	14.5	10.7	1059.0	16.9	2.69	0.66	0.310	0.21	7680	2300	495	230
KG- 5-15	44.70 - 47.00	2.30	FE-CB	179.0	3.4	41.9	17.8	9.5	1349.0	18.3	3.42	0.68	0.310	0.24	9960	2650	600	250
KG- 5-16	47.00 - 51.05	4.05	FE-CB	157.0	4.2	38.1	22.6	10.9	673.0	13.5	3.98	0.40	0.120	0.18	6210	4010	560	320
KG- 5-17	53.20 - 55.60	2.40	CB-FECB	144.0	2.1	38.2	13.4	[illegible]	808.0	11.8	10.50	0.85	0.460	0.30	9120	3280	370	230
KG- 5-18	57.00 - 60.10	3.10	CB-FECB	67.3	1.8	21.3	10.1	5.9	150.0	7.1	3.04	0.80	0.670	0.15	1505	1130	375	185
KG- 6-01	1.00 - 4.00	3.00	CB-FECB	69.7	0.9	18.6	6.0	6.5	81.0	7.6	1.38	0.20	0.110	0.07	907	1040	760	125
KG- 6-02	4.00 - 7.60	3.60	CB-FECB	104.0	1.1	33.9	8.4	8.8	154.0	4.6	3.34	0.48	0.360	0.13	3450	1415	500	230
KG- 6-03	7.60 - 9.85	2.25	CB-FECB	82.8	1.2	26.2	8.3	3.2	155.0	5.9	3.39	0.68	0.590	0.14	2780	1615	310	185
KG- 6-04	9.85 - 11.60	1.75	CB-FECB	96.8	1.7	30.8	12.2	8.4	212.0	6.2	6.95	0.79	0.660	0.20	1245	1235	300	340
KG- 6-05	11.60 - 13.80	2.20	FE-CB	92.5	3.9	33.0	23.7	7.1	228.0	7.8	6.67	1.13	0.910	0.25	1135	1235	495	400
KG- 6-06	14.20 - 15.50	1.30	FE-CB	240	2.4	60.6	14.0	12.4	794.0	8.7	6.13	0.64	0.220	0.32	1360	1295	260	260
KG- 6-07	43.70 - 43.75	0.30	FE-CB	129.0	1.5	35.9	6.1	9.1	1767.0	17.5	0.82	0.12	0.033	0.08	2790	1350	440	130

Apx. 15 Geological Log of Diamond Drilling Hole, BRL–2 (1)

DDH No. BRL–2 0–50m

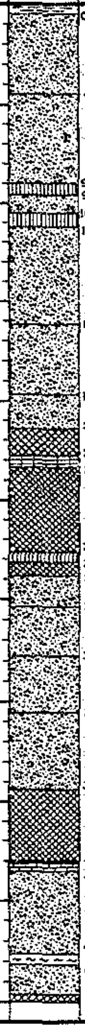
LOCATION (UTM GRID) X : 740.812mE, Y : 9,979.113mN

ELEVATION : 1,365.5 m

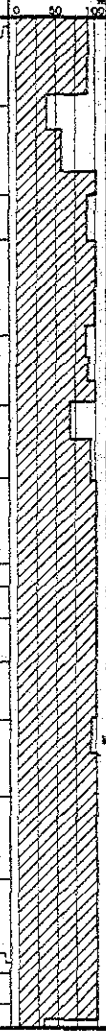
BEARING :

INCLINATION : –90°

LENGTH : 100.50 m



DEPTH (m) / BOUNDARY DEPTH (m) and CORE ANGLE (°)	GEOLOGICAL DESCRIPTION	WEATHERING	REACTION to HCl	MAGNETIC TEST	VEIN	POSITION of TESTED SAMPLES	SAMPLE No.	DEPTH and WIDTH (m)	P ppm	Ba (%)	Sr (ppm)	Nb (ppm)	Y (ppm)	U (ppm)	Th (ppm)	La (%)	Ce (%)	Nd (%)	Sm (ppm)	Eu (ppm)	Tb (ppm)	Yb (ppm)	Lu (ppm)	COMBINED and CONTENTS (%)
0–0.45	Reddish brown surface weathered rock	S	–	–			BRL–2–01	0.45	10.55	3.65	2080	650	730	15.4	834	0.550	0.83	0.26	235.0	81.5	25.1	29.8	5.0	1.640
4.50	Khaki lateritic rock very fine porous, consisting of goethite and secondary chalcedonic quartz	S	–	–	R		BRL–2–02	(4.05) 4.50	1290	3.01	2340	400	350	10.4	644	0.200	0.51	0.20	190.0	61.7	13.7	14.7	1.6	0.910
9.00	*Khaki laterite, partly earthy, partly hard*	S	–	–	R		BRL–2–03	(4.50) 9.00	1120	4.75	3250	600	430	10.2	846	0.340	0.58	0.23	215.0	75.4	20.6	18.2	2.8	1.150
9.50, 10.50, 11.25	Khaki to brown hard siliceous iron ore. 9.50–10.50m: Khaki earthy lateritic rock	S	–	+	R	← 9.20m BRL–2–A (P)	BRL–2–04	(2.25) 11.25	1290	3.26	3890	785	570	11.5	989	0.310	0.66	0.24	248.0	83.5	26.8	20.9	2.6	1.210
16.20	Khaki fine porous lateritic rock with black hematite *spots, original rock* : carbonatite	S	–	–	R		BRL–2–05	(4.95) 16.20	1395	4.63	2750	1340	690	19.8	1051	0.420	0.74	0.25	253.0	84.1	29.1	24.1	5.5	1.410
19.70	*Khaki fine* porous lateritic rock, partly siliceous. 16.20–16.70m: black oxidized iron network vein	S	–	–	C	← 17.10m BRL–2–B (WA)	BRL–2–06	(3.50) 19.70	1360	7.09	2600	1490	710	57.4	1166	0.880	1.39	0.40	263.0	102.3	34.0	24.3	3.3	2.670
21.50	Brown to purplish brown lateritic rock, goethite rich																							
22.80, 23.40	Black to dark grey porous rock (Mn-Fe ore origin) 22.80–23.40m: Purplish brown ferrocarbonatite	S	–	–	R	← 22.10m BRL–2–C (WA)	BRL–2–07	(3.70) 23.40	1305	4.10	1160	1550	530	172.4	1103	0.640	1.06	0.32	237.0	95.7	27.2	14.7	2.5	2.020
27.65	Dark grey to black hematite rich porous ore original rock : Mn-Fe ore 27.65–28.20m: Brown siliceous iron-oxide ore	S	–	–	R		BRL–2–08	(4.25) 27.65	1175	3.41	883	595	330	180.1	1117	0.640	0.88	0.29	260.0	93.4	18.2	11.4	2.3	1.810
28.20, 28.90 30°							BRL–2–09	(1.25) 28.90	1305	1.91	635	1360	480	147.2	1061	0.480	0.76	0.27	274.0	85.0	24.2	14.4	2.2	1.510
30.40	Grey porous leached out rock (carbonatite origin)	S	–	–	R		BRL–2–10	(1.50) 30.40	1235	3.84	1540	875	600	171.2	961	0.490	0.75	0.24	221.0	81.2	35.6	20.5	3.2	1.480
32.70 50°	Grey porous leached out rock (carbonatite origin) *30.40–30.70m, 31.30–32.00m: orange brown iron-oxide ore*	S	–	–	C		BRL–2–11	(2.30) 32.70	2030	2.48	1030	1460	390	170.2	1257	0.650	0.91	0.27	236.0	80.7	28.9	14.6	3.7	1.830
35.50	Khaki fine porous goethite rich rock (carbonatite origine) with black spots	S	–	–	R	← 33.80m BRL–2–D (P)	BRL–2–12	(2.80) 35.50	2270	1.20	2010	585	520	154.0	1405	0.580	0.93	0.30	295.0	95.3	24.0	19.6	3.6	1.810
39.30	Khaki to brown goethite rich rock, partly siliceous	S	–	–	R		BRL–2–13	(3.80) 39.30	3240	2.23	1225	475	770	119.3	1439	0.410	0.82	0.30	343.0	127.0	26.3	21.5	3.8	1.530
43.00	Dark grey to black, partly purplish red, fine porous Mn-Fe ore. 43.00–43.50m: banding structure (carbonatite)	S	–	–	V	(P) BRL–2–E ← 42.00m 42.30	BRL–2–14	(4.20) 43.50	1635	3.10	1165	310	750	71.7	1749	0.450	0.89	0.35	352.0	128.0	35.7	28.2	4.7	1.690
43.50 60°, 60°, 47.60	Dark grey fine porous leached out rock original rock : Calcareous Fe ore?	S	–	–	R	45.00m BRL–2–M (S)	BRL–2–15	(4.10) 47.60	1270	3.67	1505	400	490	69.0	1192	0.250	0.63	0.29	265.0	86.6	16.9	21.7	2.9	1.170
48.10	Brown to black hematite stained gneissosed rock	S	–	–	R			48.10																
49.65	Brown to dark brown porous rock (Ferrocarbonatite origin)	S	–	–	R		BRL–2–16	(1.55) 49.65	1130	6.17	1755	745	410	88.0	1004	0.500	0.93	0.32	241.0	86.6	14.3	20.2	3.2	1.750
50	Dark brown to black goethite rich rock (Mn-Fe ore)	S	–	–																				



Key:

- Weathering: S:strong, M:moderate, W:weak, F:fresh
- Reaction to HCl: +:react, –:not react
- Magnetic test: +:magnetic, –:non magnetic
- Vein: V:vein part, A:abundant, C:common, R:rare, N:not veined
- Tested Samples: WA:whole rock analysis, T:thin section, P polished thin section, E EPMA test, O: oxygene isotopes, S: size measurement of minerals

Apx. 16 Geological Log of Diamond Drilling Hole, BRL–2 (2)

DDH No. BRL–2 50–100m

LOCATION (UTM GRID) { X : 740.812mE, Y : 9.979.113mN

ELEVATION : 1,365.5m

BEARING :

INCLINATION : –90°

LENGTH : 100.50m

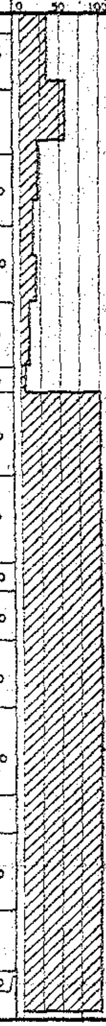
Geologic column (50–100 m):

BOUNDARY DEPTH (m) and CORE ANGLE (°)	GEOLOGICAL DESCRIPTION	WEATHERING	REACTION to HCl	MAGNETIC TEST	VEIN	POSITION of TESTED SAMPLES
50 – 51.00	Dark brown to black goethite rich ore (Mn-Fe ore)	S	–	–	V	
51.00 – 53.75	Brown porous fragile rock ; carbonatite origin	S	–	–	R	
53.75 – 57.00	Pale brown to brown very porous rock consisting of ferric-oxide and secondary quartz, i.e. leached out carbonatite	S	–	–	R	
57.00 – 64.50	Dark grey porous fragile rock Siliceous fragments occur in some part.	S	–	–	R	
64.50 – 67.70	Orange brown porous leached out rock, carbonatite origin	S	–	–	R	
67.70 – 69.00	Grey very porous rock fragments ; grey clay at the bottom	S	–	–	R	
69.00 – 77.70	69.00 m : Water Table Pale brown, partly stained black, weakly weathered massive carbonatite. Original colour : white. Veinlets of iron-oxide are common. Siliceous iron ore : 73.15–73.20m, 73.80–73.85m 74.45–74.50m	M	+	–	C	75.00 – 77.00m BRL–2–N (S)
77.70 – 79.05	Pale brown, partly stained black., weakly weathered	M	+	–	C	
79.05 – 81.55	Dark greenish grey chlorite rich carbonatite containing fragments of white fine-grained carbonatite	M	+	–	C	
81.55 – 85.00 (70°)	Pale grey, partly brown by oxidation of veinlets of iron ore, banded fine-grained carbonatite. Sporadic latest alvikite veinlets developed.	W	+	–	R	(O) BRL–2–F 83.50m
85.00 – 86.15	Grey brecciated fine-grained carbonatite with chlorite veinlets	F	+	–	N	83.50 – 85.00m BRL–2–0, O, (P,S)
86.15 – 89.50	Pale grey, partly greenish grey to dark grey, fine-grained banded carbonatite; chlorite irregularly developed in the section.	F	+	–	N	
89.50 – 91.40	Grey glassy brecciated phonolite with chlorite vein, alvikite veinlets and banded carbonatite vein	F	–	–	N	
91.40 – 95.30	Grey banded to heterogeneous fine-grained carbonatite, containing breccias of grey glassy phonolite. Chlorite rich zone exists in some part.	F	+	– (+)	N	
95.30 – 100.50 (98.30, 98.55)	Grey glassy thinly banded phonolite 98.30–98.55m: fine banded carbonatite dyke 100.40–100.50m: grey heterogeneous fine-grained carbonatite dyke	F	–	–	N	95.90m BRL–2–G (T)

ANALYTICAL RESULTS

SAMPLE No.	DEPTH and WIDTH (m)	P (ppm)	Ba (%)	Sr (ppm)	Nb (ppm)	Y (ppm)	U (ppm)	Th (ppm)	La (%)	Ce (%)	Nd (%)	Sm (ppm)	Eu (ppm)	Tb (ppm)	Yb (ppm)	Lu (ppm)	COMBINED La, Ce and Nd CONTENTS (%)
BRL–2–17	–51.00 (1.35)	1375	5.35	2090	395	400	73.0	1011	0.550	1.06	0.32	213.0	77.9	24.3	11.8	2.9	1.930
BRL–2–18	51.00–53.75 (2.75)	2610	4.16	2580	395	440	96.4	1684	0.890	1.23	0.27	252.0	106.0	29.4	11.2	4.0	2.390
BRL–2–19	53.75–57.00 (3.25)	4600	5.82	2810	810	410	170.1	1413	2.040	2.24	0.39	276.0	129.0	20.8	6.2	3.9	4.670
BRL–2–20	57.00–60.70 (3.70)	2750	4.29	2730	1900	640	115.4	1154	1.000	1.20	0.24	2050	979	25.1	20.9	4.1	2.440
BRL–2–21	60.70–64.50 (3.80)	2130	3.48	1845	990	700	70.4	1092	0.710	1.01	0.26	232.0	93.3	25.2	21.5	4.4	1.980
BRL–2–22	64.50–67.70 (3.20)	1870	3.73	2180	920	670	49.4	975	0.330	0.55	0.16	184.0	83.7	27.7	22.7	4.4	1.040
BRL–2–23	67.70–69.00 (1.30)	4860	2.15	1365	4450	1650	114.6	1699	0.500	0.85	0.27	294.0	198.0	77.6	57.3	12.0	1.620
BRL–2–24	69.00–73.30 (4.30)	650	2.13	1600	960	690	31.2	810	0.490	0.65	0.17	195.0	86.6	28.9	22.7	3.4	1.310
BRL–2–25	73.30–77.70 (4.40)	550	2.66	2370	1300	540	29.0	918	0.660	0.85	0.21	244.0	94.7	30.9	20.1	3.9	1.720
BRL–2–26	77.70–79.05 (1.35)	396	2.03	1965	1200	630	31.2	566	0.440	0.59	0.14	172.0	78.9	35.0	19.8	4.0	1.170
BRL–2–27	79.05–81.55 (2.50)	878	1.36	1455	1800	340	33.2	481	0.260	0.40	0.12	144.0	58.7	13.6	12.1	2.4	0.780
BRL–2–28	81.55–85.00 (3.45)	433	2.06	2070	700	520	23.0	622	0.640	0.73	0.15	149.0	61.7	23.7	19.5	4.1	1.520
BRL–2–29	85.00–89.50 (4.50)	592	1.00	2360	1000	500	19.5	373	0.300	0.33	0.06	97.0	41.7	16.8	16.8	2.7	0.690
BRL–2–30	91.40–95.30 (3.90)	1855	2.56	3330	730	630	17.6	509	0.580	0.85	0.19	150.0	57.4	17.7	29.0	5.3	1.620
BRL–2–31	98.30–98.55 (0.25)	733	17.4	3510	125	310	13.8	452	0.540	0.86	0.20	161.0	35.3	3.2	13.9	3.2	1.600

CORE RECOVERY (%):



Key:

Weathering — S: strong, M: moderate, W: weak, F: fresh

Reaction to HCl — +: react, –: not react

Magnetic test — +: magnetic, –: non magnetic

Vein — V: vein part, A: abundant, C: common, R: rare, N: not veined

Tested Samples — WA: whole rock analysis, T: thin section, P: polished thin section, E: EPMA test, O: oxygene isotopes, S: size measurement of minerals

Apx. 17 Geological Log of Diamond Drilling Hole, BRL–3 (1)

DDH No. BRL–3 0–50m

LOCATION (UTM GRID) X : 740.791mE, Y : 9,979.113mN

ELEVATION : 1,332.5m

BEARING :

INCLINATION : –90°

LENGTH : 100.70m

Depth (m)	Boundary depth (m) and core angle (°)	Geological description	Weathering	Reaction to HCl	Magnetic test	Vein	Position of tested samples
0–3.00	3.00	Reddish brown weathered earthy rock	S	–	–		
3.00–5.50	5.50	Purplish brown to olive brown weathered earthy rock	M	+	–	C	
5.50–7.00	7.00	Khaki to brown earthy rock or weathered porous rock	M	+	–	C	
7.00–11.95	70°; 11.95	Grey and variously stained banded carbonatite, moderately veind by orange brown Fe-oxide. 8.30–9.10m: magnetite remained as dissemination bands	M	+	– (+)	C	7.80m BRL–3–A (P); 10.75m BRL–3–B
11.95–15.30	15.30	Reddish brown massive ferrocarbonatite 14.50–14.85m: pale brown banded carbonatite	M	+	–	N	12.70–13.50m BRL–3–M (S)
15.30–22.40	60°; 22.40	Brown to khaki stained fine-grained banded carbonatite banded structure : disseminated bands of magnetite	M	+	–	C	
22.40–23.50	23.50	Brown porous banded ferrocarbonatite	S	–	–	N	
23.50–25.50	25.50	Brown hematite (after magnetite) rich banded carbonatite	W	+	–	N	
25.50–29.10	29.10; 20°	Pale grey to white fine-grained banded carbonatite, partly rich in magnetite bands	W	+	+ –	N	27.60m BRL–3–C (P)
29.10–31.90	31.90	Pale grey to white (stained brown) fine-grained banded carbonatite, veinlets of Fe-oxide developed	W	+	–	N	30.30m BRL–3–D (E)
31.90–36.00	70°; 36.00	Pale grey to white fine-grained banded carbonatite banded structure : hematite after magnetite	W	+	–	R	
36.00–39.10	70°; 39.10	Pale grey to white (staned brown) banded carbonatite, moderately veined by Fe-oxide o.5cm in width	W	+	–	C	
39.10–40.70	40.70	Dark grey to brown, porous leached out ferrocarbonatite	W	–	–	N	
40.70–45.20	45.20	Pale grey to brown (by stain) fine-grained banded carbonatite, Iron-oxide veinlets sporadically developed.	W	+	–	R	41.70m BRL–3–E (P)
45.20–49.40	80°; 49.00; 49.40	(45.20m : Water Table) Pale grey to white fresh carbonatite with clots and dissemination of magnetite. 49.00–49.40m: brown massive ferrocarbonatite	F	+	+	N	

ANALYTICAL RESULTS

Sample No.	Depth (m)	Width (m)	P (ppm)	Ba (%)	Sr (ppm)	Nb (ppm)	Y (ppm)	U (ppm)	Th (ppm)	La (%)	Ce (%)	Nd (%)	Sm (ppm)	Eu (ppm)	Tb (ppm)	Yb (ppm)	Lu (ppm)	Combined La, Ce and Nd contents (%)
BRL–3–01	0–3.00	(3.00)	21300	5.81	2780	1150	670	30.8	651	1.330	1.35	0.26	213.0	77.8	25.5	35.8	6.4	2.940
BRL–3–02	3.00–5.50	(2.50)	9060	5.73	1750	1200	680	30.5	694	1.170	1.22	0.26	258.0	85.4	26.2	30.9	4.9	2.650
BRL–3–03	5.50–7.00	(1.50)	20200	3.18	3260	1400	640	21.9	607	0.660	0.79	0.18	179.0	67.6	23.1	32.3	5.6	1.630
BRL–3–04	7.00–11.95	(4.95)	11370	3.88	2690	1500	520	13.0	541	0.970	1.07	0.21	171.0	59.5	18.5	33.5	4.8	2.250
BRL–3–05	11.95–15.30	(3.35)	5180	3.13	1640	830	440	13.4	741	0.730	0.94	0.21	177.0	58.5	12.5	20.6	3.4	1.880
BRL–3–06	15.30–18.80	(3.50)	9400	4.57	2190	740	630	16.8	794	0.980	1.06	0.22	191.0	72.3	20.1	36.9	6.4	2.260
BRL–3–07	18.80–22.40	(3.60)	7890	3.61	2770	960	540	19.3	765	1.210	1.21	0.22	177.0	58.4	17.3	30.6	5.5	2.640
BRL–3–08	22.40–23.50	(1.10)	11470	5.66	3800	540	540	23.6	649	2.260	2.04	0.31	196.0	78.9	4.1	25.8	6.0	4.610
BRL–3–09	23.50–25.50	(2.20)	12180	5.30	2930	425	480	20.2	471	1.660	1.53	0.25	163.0	51.4	13.2	28.5	4.7	3.440
BRL–3–10	25.50–29.10	(3.60)	9090	1.37	2960	670	330	13.2	374	0.380	0.46	0.11	116.0	35.4	12.5	19.5	3.1	0.950
BRL–3–11	29.10–31.90	(2.80)	13180	1.69	2430	870	720	16.6	700	0.330	0.52	0.17	230.0	83.9	25.9	36.3	5.2	1.020
BRL–3–12	31.90–36.00	(4.10)	6940	1.37	2380	970	660	22.3	515	0.280	0.39	0.12	185.0	70.6	24.7	32.4	5.0	0.770
BRL–3–13	36.00–39.10	(3.10)	7340	1.86	2320	1200	700	29.8	585	0.310	0.49	0.14	201.0	76.4	25.0	31.9	5.6	0.940
BRL–3–14	39.10–40.70	(1.60)	8810	7.27	2330	660	920	23.5	986	0.720	1.02	0.35	370.0	122.8	38.2	30.9	5.1	2.090
BRL–3–15	40.70–45.20	(4.50)	7640	4.30	2270	395	640	14.9	823	0.810	0.94	0.25	250.0	77.3	22.0	25.7	4.3	2.000
BRL–3–16	45.20–49.40	(4.20)	4780	3.25	2140	405	630	10.8	709	0.520	0.72	0.21	232.0	77.8	22.9	28.7	4.3	1.450

Core recovery (%): 100 throughout 0–50 m.

Key:

Weathering — S:strong, M:moderate, W:weak, F:fresh

Reaction to HCl — +:react, –:not react

Magnetic test — +:magnetic, –:non magnetic

Vein — V:vein part, A:abundant, C:common, R:rare, N:not veined

Tested Samples — WA:whole rock analysis, T :thin section, P:polished thin section, E:EPMA test, O: oxygene isotopes, S: size measurement of minerals

Apx. 18 Geological Log of Diamond Drilling Hole, BRL–3 (2)

DDH No. BRL–3 50–100m

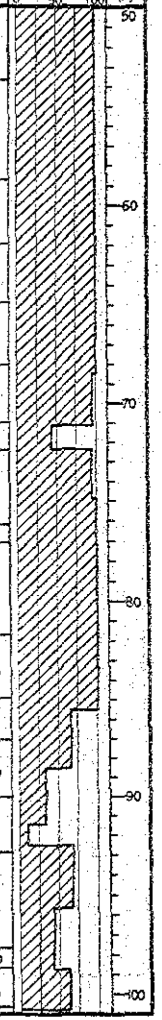
LOCATION (UTM GRID) X : 740,791mE, Y : 9,979,113mN
ELEVATION : 1,332.5m

BEARING :
INCLINATION : –90°
LENGTH : 100.70m

BOUNDARY DEPTH (m) and CORE ANGLE (°)	GEOLOGICAL DESCRIPTION	WEATHERING	REACTION to HCl	MAGNETIC TEST	VEIN	POSITION of TESTED SAMPLES
70° ; 53.80, 53.90	Pale grey to white fresh banded fine-grained carbonatite, partly brecciated 53.80–53.90m : fractured zone	F	+	+	N	
80° ; 56.80	Carbonatite same as above Magnetite bands and disseminated zones occur throughout the section.	F	+	+	N	(P) BRL–3–F ← 56.10m; ← 57.40m BRL–3–G (O)
40° ; 71.00	Carbonatite breccia with green chlorite matrix. Facies of intrusive breccia; original rock is pale grey to white fluorite bearing fine-grained carbonatite with very fine magnetite. Beige alvikite veinlets of latest stage occur throughout the section.	F	+	+	N	(WA) BRL–3–H ← 66.40m; ← 67.30m BRL–3–I (T)
72.40	Brown to orange brown porous gossan	S	–	–	V	
76.20	Brownish grey to brown earthy material. Strongly weathered zone of carbonatite along a fault.	S	–	–		
77.10	Pale grey to white banded carbonatite rich in magnetite	F	+	+	–	
81.60	Pale grey, partly dark greenish grey (chlorite) finely brecciated heterogeneous carbonatite. Intruded by beige alvikite veinlets.	F	+	+	R	
84.90	Pale grey brecciated carbonatite with irregular chlorite veinlets.	F	+	+	R	← 84.50m
85.70	Pale grey to white banded carbonatite	F	+	+	N	BRL–3–J (P,O)
87.00	Pale grey brecciated carbonatite with chlorite veinlets					
92.70 (90.00)	Brown to orange brown porous gossan consisting of goethite and chalcednic quartz	S	–	–	V	
97.60	Dark brown earthy material consisting of fine fragments of hematite and brown powder; possibly cave filling material or weathered carbonatite	S	–	–		
98.60	Orange brown to brown gossan or earthy material	S	–	–	V	
100.70	Pale grey very fine-grained alvikite of the latest stage	F	+	–	N	

ANALYTICAL RESULTS

SAMPLE No.	DEPTH and WIDTH (m)	P (ppm)	Ba (%)	Sr (ppm)	Nb (ppm)	Y (ppm)	U (ppm)	Th (ppm)	La (%)	Ce (%)	Nd (%)	Sm (ppm)	Eu (ppm)	Tb (ppm)	Yb (ppm)	Lu (ppm)	COMBINED La, Ce and Nd CONTENTS (%)
BRL–3–17	(4.40) –53.80	7770	2.58	2340	375	570	10.1	550	0.380	0.51	0.16	190.0	58.2	14.4	26.0	4.2	1.050
BRL–3–18	(5.00) –58.80	11250	2.62	2450	350	670	8.7	566	0.200	0.34	0.12	158.0	54.8	16.2	34.5	5.3	0.660
BRL–3–19	(3.20) –62.00	6190	3.63	9810	480	530	7.9	681	0.570	0.68	0.18	174.0	62.8	18.5	22.4	3.7	1.430
BRL–3–20	(3.00) –65.00	6800	5.23	29600	410	590	11.2	949	0.890	1.06	0.24	199.0	78.1	20.0	25.6	4.9	2.190
BRL–3–21	(3.00) –68.00	4100	2.56	7580	640	340	9.3	463	0.360	0.44	0.11	121.0	38.8	10.4	18.4	2.8	0.910
BRL–3–22	(3.00) –71.00	6410	3.14	2400	540	370	9.4	445	0.340	0.45	0.12	129.0	43.7	15.3	19.7	3.2	0.910
BRL–3–23	(1.40) –72.40	15360	7.01	2670	940	720	27.1	1202	0.980	1.09	0.27	242.0	90.0	24.7	36.2	6.3	2.340
BRL–3–24	(3.80) –76.20	11030	5.06	2870	960	720	26.0	864	0.580	0.71	0.18	210.0	72.9	17.7	38.4	6.2	1.470
BRL–3–25	(0.90) –77.10	6330	3.11	2330	620	450	13.1	704	0.490	0.62	0.16	157.0	46.9	11.2	24.0	3.9	1.270
BRL–3–26	(4.70) –81.60	10690	4.35	2480	780	630	15.2	765	0.600	0.72	0.18	202.0	67.8	21.7	29.2	4.8	1.500
BRL–3–27	(3.30) –84.90	4650	5.41	1795	750	540	18.8	836	0.630	0.85	0.24	217.0	73.2	21.1	23.9	4.0	1.720
BRL–3–28	(2.10) –87.00	11330	4.60	2510	540	740	26.8	942	0.570	0.70	0.20	241.0	84.4	19.2	37.7	5.9	1.470
BRL–3–29	(3.00) –90.00	7270	7.23	4210	185	660	26.0	985	1.270	1.45	0.36	286.0	95.4	15.8	25.8	5.8	3.080
BRL–3–30	(2.70) –92.70	16160	3.64	2900	820	710	31.0	676	0.380	0.49	0.15	193.0	73.0	15.8	40.9	6.4	1.020
BRL–3–31	(4.90) –97.60	8970	4.56	1945	1250	680	36.2	588	0.280	0.57	0.23	230.0	86.3	27.7	41.1	5.7	1.080
BRL–3–32	(1.00) –98.60	7370	8.27	2130	750	730	40.7	724	0.610	1.10	0.37	262.0	94.1	31.5	40.2	6.2	2.080
BRL–3–33	(2.10) –100.70	2330	4.19	1960	550	480	22.2	607	0.380	0.71	0.23	223.0	73.2	18.6	24.5	3.7	1.320



Key:
Weathering — S:strong, M:moderate, W:weak, F:fresh
Reaction to HCl — +:react, –:not react
Magnetic test — +:magnetic, –:non magnetic
Vein — V:vein part, A:abundant, C:common, R:rare, N:not veined
Tested Samples — WA:whole rock analysis, T:thin section, P:polished thin section, E:EPMA test, O: oxygene isotopes, S: size measurement of minerals