STATE OF ARKANSAS

ARKANSAS GEOLOGICAL COMMISSION
William V. Bush, State Geologist

INFORMATION CIRCULAR 34

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by

William D. Hanson

Little Rock, Arkansas
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HEAVY-MINERAL SANDS OF THE TOKIO FORMATION IN SOUTHWEST ARKANSAS

ABSTRACT

Heavy-mineral sands of the Tokio Formation, Late Cretaceous, were first discovered in 1938 by King Rankin northwest of Mineral Springs, Howard County, Arkansas. The first published report on the ilmenite-bearing sands of the Tokio Formation was by D. F. Holbrook (1948). Beginning in the summer of 1991, surface examination and sampling for heavy minerals were conducted over the outcropping Tokio Formation across southwest Arkansas. Other known heavy-mineral localities were also sampled at this time. These include the bauxite district of Pulaski and Saline Counties, high-level terraces along the Ouachita River in Hot Spring County, sandbars along the Arkansas River in the Arkansas Valley, and the Magnet Cove igneous complex in Hot Spring County. As a result of the regional study, a drilling project was conducted in the vicinity of Mineral Springs, where the highest heavy-mineral concentrations had been encountered. In a four-square-mile area, thirty-six holes were augered, some to a maximum depth of fifty feet. Representative samples of each two-foot interval were collected from the surface down. Chemical and petrographic analyses were made by E. I. DuPont De Nemours & Co., Inc. on the samples obtained from drilling. Results of the drilling project indicate the deposit of ilmenite-bearing sand northwest of Mineral Springs, Arkansas is too small to be considered economic at this time.

INTRODUCTION

The investigation was undertaken to explore the outcropping Tokio Formation for heavy-mineral sands and determine the size and composition of an ilmenite deposit near Mineral Springs, Arkansas. Heavy minerals, by definition, are detrital minerals of high specific gravity. In the laboratory, they can be separated from other minerals by use of liquids with high densities, such as bromoform and tetrabromoethane. Commercial separation methods include spiral concentrators and jig tables. The principal heavy mineral of economic interest in the study area is ilmenite.

Field work done in 1991-1992 and an evaluation of previous investigations revealed that a drilling project was needed to evaluate the heavy-mineral content of the deposit northwest of Mineral Springs, Howard County, Arkansas. The purposes of this investigation were to better define the deposit near Mineral Springs, sec. 12, T.10 S., R. 28 W., and further explore the outcropping Tokio Formation for additional heavy-mineral deposits in southwest Arkansas.

PREVIOUS INVESTIGATIONS

Carle H. Dane (1929) described the lithology and stratigraphy of the Tokio Formation. Dane states that "some small black grains, probably mostly magnetite" occur in the formation. He described the formation as being composed of gravel, sand, and clay and interpreted it as being a near-shore marine deposit which underwent periods with very little or no sedimentation. H. D. Miser and A. H. Purdue (1929) reported the heavy minerals augite, hornblende, zircon, and tourmaline in the Tokio Formation, but did not mention ilmenite or magnetite.

Titanium-bearing minerals were first discovered in the Mineral Springs area of Howard County in 1938 (unpublished letter from K. Rankin, Arkansas Geological Commission open-file data). Drew F. Holbrook (1948) reported on the Pink Green and Beulah Green ilmenite deposits in sec. 12, T. 10 S., R. 28 W. and sec. 23 and 24, T. 10 S., R. 28. W. respectively. Raymond B. Stroud and others (1969) give a brief description of the geology along with some chemical analyses. William D. Hanson (1991) also reported on the ilmenite-bearing sands in sec. 12, 13, 14, and 23, T. 10 S., R. 28 W.

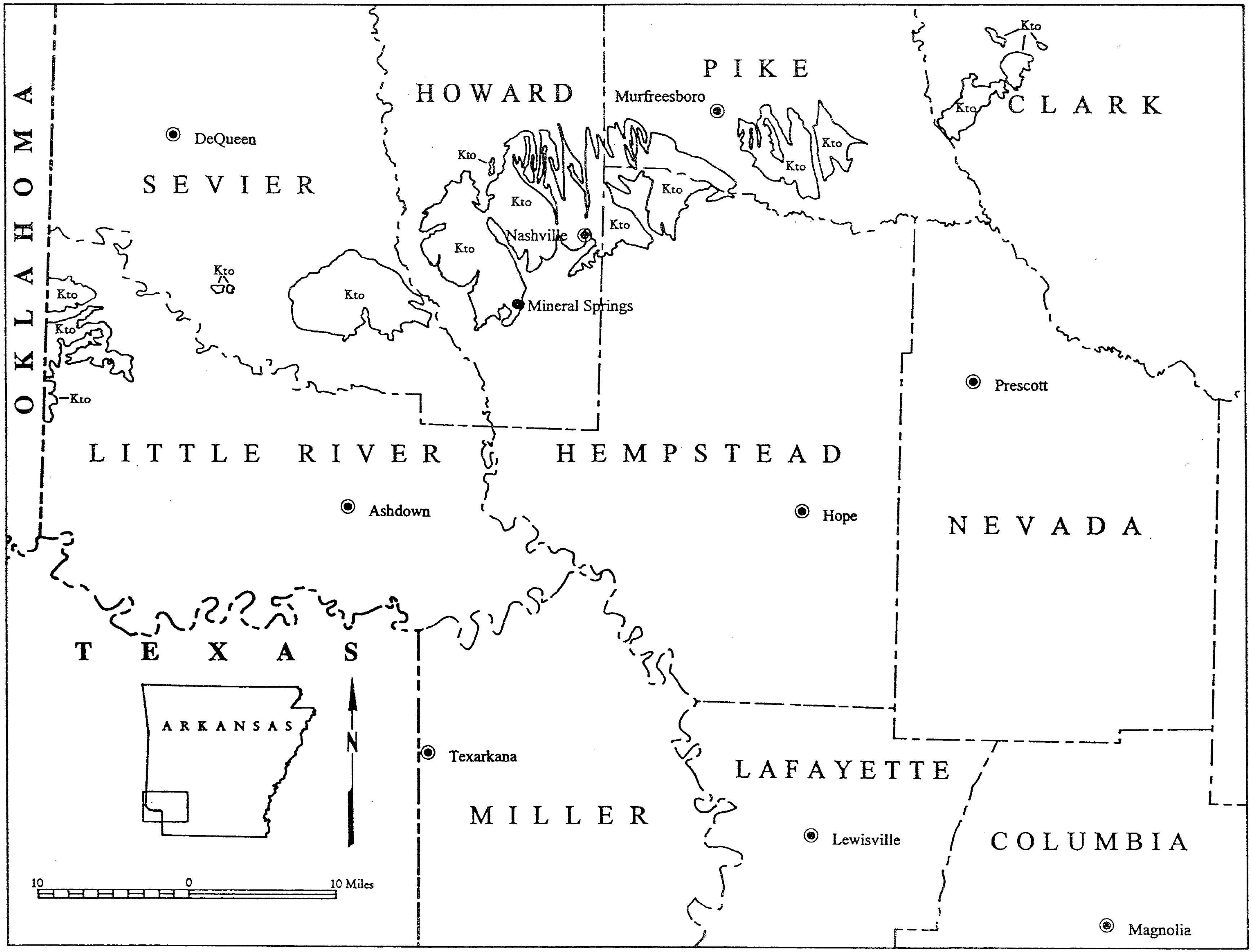

Figure 1. Map showing outcrop area of the Tokio Formation (Kto) in southwest Arkansas.

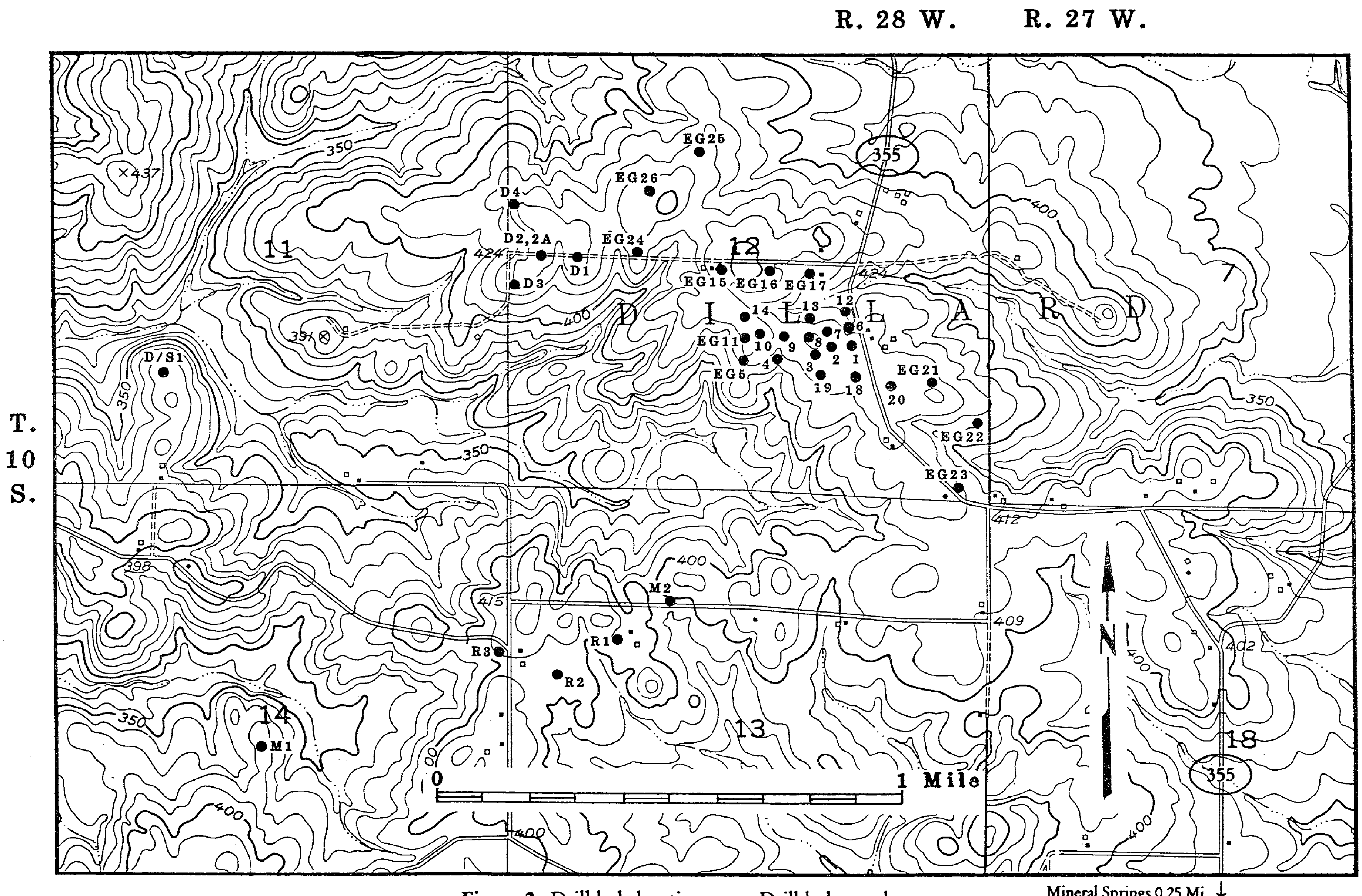

Figure 2. Drill hole location map. Drill hole numbers EG1 - EG26, D1 - D4, M1 - M2, and R1 - R3.

LOCATION

The outcropping Tokio Formation in southwest Arkansas extends from Hollywood, Clark County westward to the Arkansas-Oklahoma state line (fig. 1). The area tested by drilling is approximately two miles northwest of Mineral Springs, Arkansas. Drill hole sites are located in sec. 11, 12, 13, and 14, T. 10 S., R. 28 W., in Howard County (fig. 2). Thirty of the thirty-six holes were drilled in sec. 12, which displays the highest surface concentrations of heavy minerals.

METHODS

Grab and channel samples were collected while mapping the Tokio Formation prior to the drilling project in the summer of 1992. In addition, samples were collected from other possible heavy-mineral source areas within the State. Some of the additional areas sampled were the Magnet Cove igneous complex in Hot Spring County, the bauxite district in Pulaski and Saline Counties, and the Woodbine Formation in Pike, Howard, and Sevier Counties, Arkansas. A total of 83 samples were collected and examined by Arkansas Geological Commission (AGC) geologists for heavy minerals during the initial investigations.

An eight-inch hollow-stem auger was utilized for collecting samples. Thirty-six holes were augered, some to a maximum depth of 50 feet. Samples were obtained at two-foot intervals. To insure sample integrity, drilling was halted every two feet and a representative sample of that interval was collected. Cuts of the samples are stored at the AGC Well Sample Library.

Chemical and petrographic analyses were conducted by E. I. DuPont De Nemours & Co., Inc. on splits of the drilled samples. William C. Shelton, AGC chemist, performed heavy-mineral separations on selected samples obtained during the initial regional study. A total of 83 heavy-mineral separations were performed using tetrabromethane (specific gravity 2.96). The separates were examined by the writer using a binocular microscope to determine the heavy-mineral components.

GENERAL GEOLOGY

Cretaceous formations in southwest Arkansas are primarily shallow marine deposits. They were deposited on an unconformable surface of eroded upturned and deformed Paleozoic rocks. The Cretaceous units are composed of sand, clay, marl, gravel, limestone, volcanic sediments, chalk, and gypsum dipping approximately 80 feet per mile to the south/south-southeast. The source for the bulk of the clastics in the Cretaceous formations was the Ouachita Mountain region north of the present Cretaceous outcrop.

The Woodbine Formation is the oldest Late Cretaceous unit present in southwest Arkansas (fig. 3). It consists of bedded gravel, clay, volcanic sediments, and sand. It is overlain by the Tokio Formation, which consists of sand, clay, and gravel layers. In Howard County, the Tokio Formation is about 300 feet thick and dips at 80 feet per mile to the south/south-southeast (Dane, 1929). At the base of the formation is a 1- to 25-foot-thick gravel bed (Miser and Purdue, 1919). The gravels are composed of novaculite, quartz, quartzite, and sandstone. In places the gravels are cemented by ferruginous material to form discontinuous conglomerate layers.

Period	Epoch	Group	Formation
Cretaceous	Late Cretaceous	Taylor	Brownstown Marl
Cretaceous	Late Cretaceous	Austin	Tokio Formation
Cretaceous	Late Cretaceous	Woodbine	Woodbine Formation
Cretaceous	Early Cretaceous	Trinity	Trinity Formation

Figure 3. General geologic column in southwest Arkansas.

Several types of clay are present in the Tokio Formation. The most notable is a dark gray clay containing lignitic material, pyrite, and plant imprints as well as invertebrate fossils. Locally, it is sandy and/or glauconitic. Another abundant clay is light gray to white and occurs as clay balls and thin layers. This clay is kaolinitic and derived from volcanic ash (Ross, Miser, and Stephenson, 1929).

Sandy units of the Tokio Formation are composed primarily of quartz. Other components are novaculite, feldspar, chert, glauconite, and heavy minerals. Sand grains are coarse to fine, subangular to subrounded, and poorly sorted throughout most of the formation. Sandy units are predominantly unconsolidated; however, locally, calcareous and ferruginous cement forms some sandstones and iron balls.

In the vicinity of the area drilled, the upper Tokio Formation is composed of coarse to fine unconsolidated quartz sand, thin kaolinitic clay seams, clay clasts, heavy minerals, and gravel stringers. Outcrops show clearly defined crossbedding in yellow to red, white, and light-brown sands. Clay content averages about thirty percent. Heavy minerals on outcrop are generally stained red by iron oxides and may occur in thin layers ($<$0.25 in.). During drilling, a dark-gray, lignitic, pyritic clay was encountered. This clay served as a termination point for drilling operations. Lying unconformably above the Tokio Formation is the Brownstown Marl Formation, which consists of marl and sandy marl.

RESULTS OF THE FIELD INVESTIGATIONS

Field observations proved that heavy minerals are most abundant in the sandy upper part of the Tokio Formation across southwest Arkansas. Concentrations of heavy minerals are also present in high-level Quaternary terraces along the Ouachita River and in sand bars along the Arkansas River. Ilmenite from the Arkansas River is subrounded to well rounded and of medium grain size. Damming of the river has covered many of these deposits, but also has caused some concentration of heavy minerals below the dams. South of Magnet Cove in sec. 5, T. 4 S., R. 17 W., in Hot Spring County, rutile was surface-mined (Fryklund and Holbrook, 1950). Here, the rutile is subrounded to well rounded and ranges in size from sand to small gravel. Chemical analyses of the rutile here suggest that it was probably derived from the Magnet Cove igneous complex (J. M. Elder written commun., 1995).

Near the eastern end of the outcrop belt of the Tokio Formation at Clear Springs, Clark County, heavy minerals are fine grained and subangular to subrounded. The assemblage is composed primarily of rutile, ilmenite, and zircon. Heavy minerals present in the Tokio Formation near the Arkansas/Oklahoma state line are very fine grained and subrounded to well rounded. Glauconite is the major component of the assemblage; ilmenite and zircon are minor constituents. The highest surface concentrations of heavy minerals observed during this investigation are in an area about two miles northwest of Mineral Springs in Howard County. Consequently, the area was targeted for the drilling project.

RESULTS OF THE DRILLING PROJECT

The isopleth map (fig. 4) shows that the area of high heavy-mineral content is contained in part of the south half of sec. 12, T. 10 S., R. 28 W.. The heavy-mineral assemblage northwest of Mineral Springs consists of 66.1 percent ilmenite, 19.4 percent iron oxides, 2.5 percent leucoxene, 0.8 percent zircon, 0.3 percent staurolite, 0.2 percent pyroboles (pyroxene and amphibole undifferentiated), 0.2 percent tourmaline, 0.1 percent kyanite/sillimanite, 0.1 percent rutile, 8.9 percent others, and traces of monazite and corundum. There was 0.7 percent quartz in the samples as examined, probably as carry-over light-mineral contamination. The chemical and petrographic findings of E. I. Dupont De Nemours & Co., Inc. are tabulated in the Appendix A and Appendix B.

The titanium-bearing minerals average 47% TiO_2 and make up 68.7 percent of the heavy-mineral fraction. Ilmenite at 96.25 percent, leucoxene at 3.6 percent, and rutile at 0.14 percent constitute the titanium-bearing minerals. The highest two-foot concentration of heavy minerals recovered during drilling is 20.64 percent, present in hole EG 1 at 16-18 feet. Hole EG 1 also has the highest cumulative average heavy-mineral content at 8.77 percent. The area investigated by drilling is calculated to contain 225,542 tons of titanium-bearing minerals in reserve. Using titanium dioxide contents of 47 percent for ilmenite, 99 percent for rutile, (Hanson, 1991), and assuming 99 percent for leucoxene, and the above given reserve figure, there are 110,382 tons of titanium dioxide in reserve in the drilled area.

The heavy-mineral suite was derived from at least two sources. The suite consists predominantly of medium-grained sand-sized particles with some grains well worn and subrounded to well rounded, while a second grain population consists of angular to subangular grains exhibiting euhedral forms indicating little transport (fig. 5).

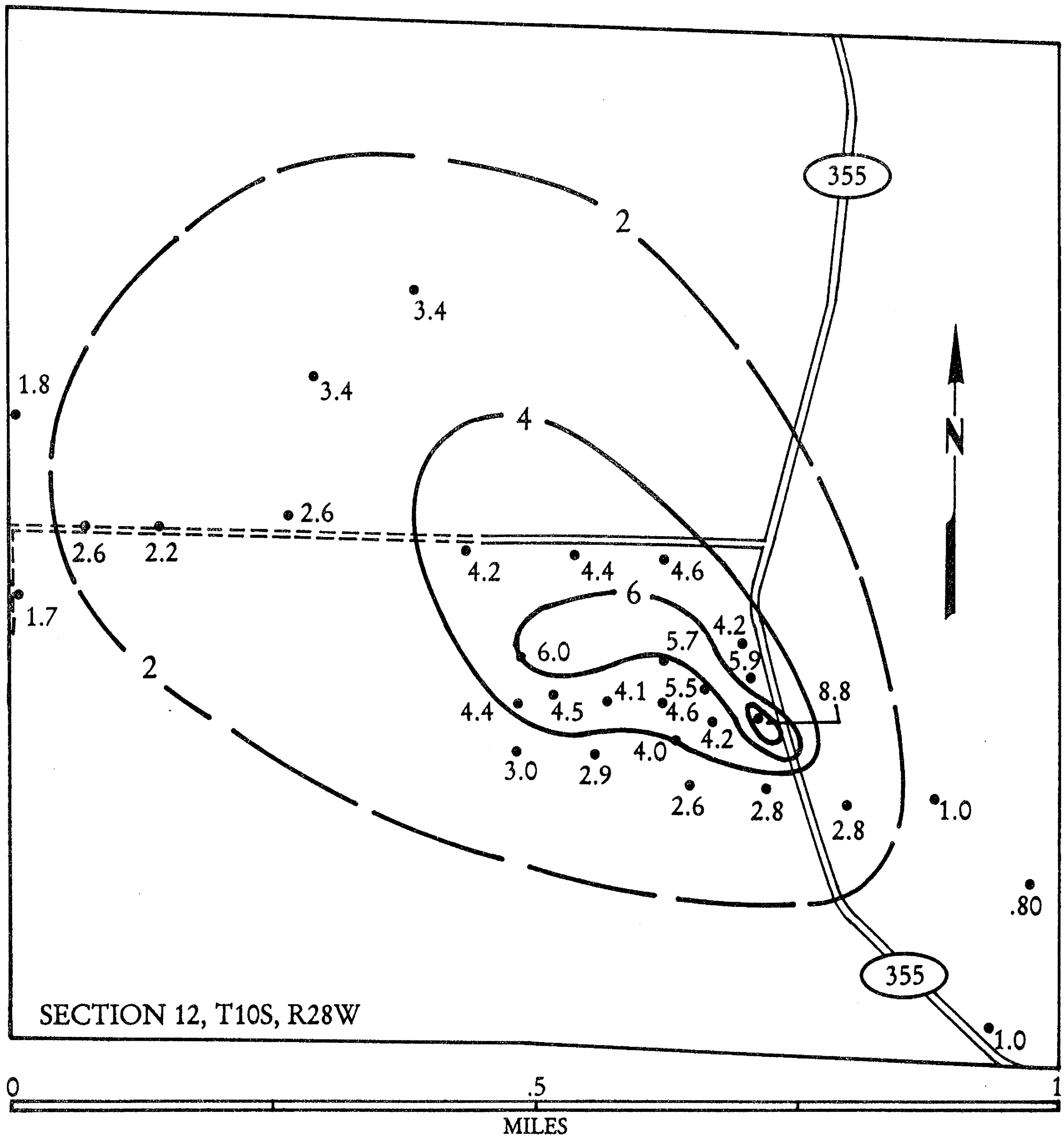

Figure 4. Isopleth map showing heavy - mineral cumulative average by percent. Contour interval is 2 percent.

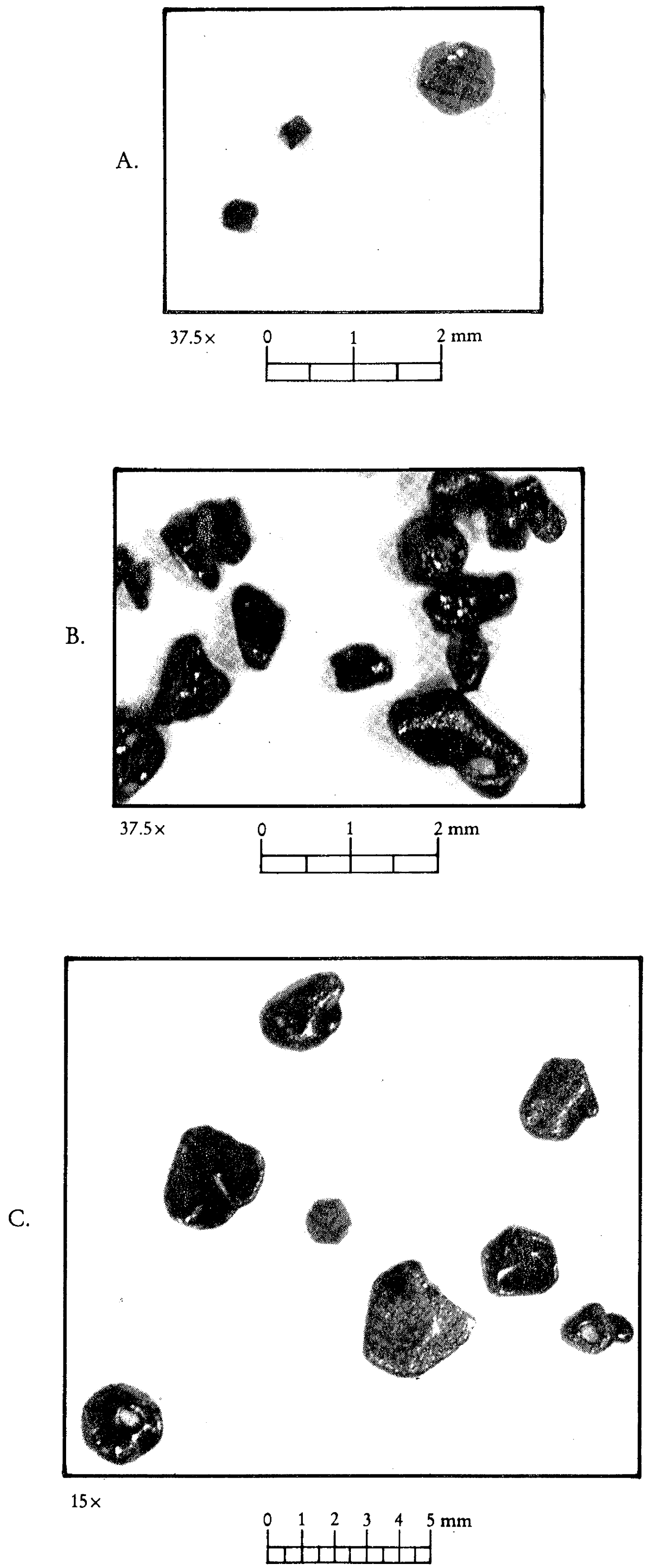

Figure 5. Photographs showing different grain morphologies. (A) Euhedral grains of iron oxide, magnetite, showing no signs of rounding. (B) Rounder heavy-mineral grains. (C) Euhedral platy hexagonal ilmenite grains.

ECONOMIC ASPECTS

Titanium is the ninth most abundant element in the earth's crust, calculated to be 0.6 percent by weight (Lynd, 1985). Presently, 95 percent of all titanium is used as pigments in various materials, including paint, paper, ceramics, rubber, and plastics. The remaining 5 percent is used as welding-rod coatings and metal alloys. Uses of the alloys include synthetic parts for human hearts and joints, and parts for golf clubs, aircraft, submarines, engines, and electric-generating plants. The high strength-to weight-ratio and high resistance to corrosion make titanium metals strategically important.

Production and consumption of titanium dioxide has increased over the last decade. In 1988 the United States imported about 75 percent of its needs. Principle producing countries of titanium-bearing raw materials are Australia, Norway, the former USSR (Russia), Canada, South Africa, India, and Brazil. Mineable deposits in the United States are located in Florida, Virginia, Oregon, North Carolina, South Carolina, New York, Minnesota, Wyoming, and California. Deposits in Florida, Virginia, the Carolinas, and Oregon are ancient beach deposits while those in New York, Minnesota, Wyoming, and California are hardrock deposits. Florida is the leading titanium-producing state in the United States and E. I. DuPont De Nemours Co., Inc. is the largest industrial consumer (Lynd and Hough, 1988).

Approximate minimum requirements for an economic deposit of titanium-rich sands in the southeastern United States are reserves of 1,000,000 tons of titanium dioxide in raw ore. The deposit must have an average grade of 3 to 4 percent heavy minerals to an average depth of 15 feet (Lynd, 1985). The chief method of mining beach-type deposits is by dredging. Primary separation is done by wet-gravity methods, namely by use of the Humphrey spiral.

CONCLUSIONS

The heavy-mineral deposit drilled and sampled northwest of Mineral Springs does not contain a sufficient tonnage of titanium dioxide to be economically viable at this time, at least to the sampled depth of fifty feet. However, deeper drilling in the Mineral Springs area may increase the titanium dioxide reserves since heavy minerals were still being encountered at 50 feet below the surface. Economic factors in favor of commercial development are the lack of radioactive heavy minerals, the relatively large grain size of the heavy minerals, and the high concentration of heavy-mineral sands in a relatively small area. Ample highway, railway, electric power, and water facilities are also present. Unfavorable economic factors are the small size of the deposit, the relatively low titanium dioxide content of the ilmenite, and the amount (approximately 30 percent) of clay in the heavy-mineral-bearing horizon.

Sources for the heavy minerals in the Tokio Formation are more difficult to define. Two separate sources must exist based on the different grain morphologies. Prime possibilities are the volcaniclastic sediments of the Woodbine Formation, the igneous complex at Magnet Cove, the igneous complex in Pulaski and Saline Counties, and the Paleozoic sedimentary rocks of the Ouachita Mountains. Other less likely sources of ilmenite are the Precambrian gabbroic rocks of the Wichita Mountains in southwestern Oklahoma (Chase, 1952) and finally, the buried volcanic vents postulated to be present in Howard County, AR (Miser and Purdue 1929; and Ross, Miser, and Stephenson, 1929). The presence of corundum and trace amounts only of monazite in the samples analyzed also need explaining in any source model.

ACKNOWLEDGMENTS

I would like to thank the private landowners Mr. E. Green, Mr. C. C. Rogers, Mr. N. Davis, and Masey Pulpwood Co. for access onto their property in the Mineral Springs, Arkansas area. I would also like to thank the staff of the Arkansas Geological Commission for their input and reviews.

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Appendix A
Chemical Analyses

Hole I.D.	Interval	% HM Total	% HM Cumulative Averages	% TiO_2 Cumulative Averages	Hole I.D.	Interval	% HM Total	% HM Cumulative Averages	% TiO_2 Cumulative Averages
EG-1	0-2'	0.26	0.26	0.18	EG-2	0-2'	0.41	0.41	0.28
	2-4'	0.23	0.24	0.20		2-4'	0.31	0.36	0.25
	4-6'	0.33	0.27	0.21		4-6'	0.31	0.35	0.25
	6-8'	0.29	0.28	0.21		6-8'	0.5	0.38	0.27
	8-10'	0.40	0.30	0.22		8-10'	2.69	0.85	0.51
	10-12'	0.87	0.39	0.27		10-12'	5.89	1.69	0.98
	12-14'	7.31	1.38	0.80		12-14'	11.55	3.10	1.14
	14-16'	11.40	2.64	1.40		14-16'	4.71	3.30	1.31
	16-18'	20.64	4.64	2.42		16-18'	5.54	3.55	1.31
	18-20'	15.41	5.71	3.02		18-20'	7.40	3.93	1.29
	20-22'	13.41	6.41	3.20		20-22'	1.59	3.72	1.24
	22-24'	16.40	7.24	3.65		22-24'	1.35	3.52	1.20
	24-26'	7.07	7.23	3.66		24-26'	5.72	3.69	1.35
	26-28'	14.52	7.75	3.95		26-28'	5.65	3.83	1.37
	28-30'	13.37	8.13	4.17		28-30'	6.33	4.00	1.58
	30-32'	14.54	8.53	4.39		30-32'	6.00	4.12	1.68
	32-34'	15.57	8.94	4.62		32-34'	9.44	4.44	1.80
	34-36'	10.29	9.02	4.69		34-36'	10.5	4.77	1.85
	36-38'	6.41	8.88	4.63		36-38'	2.39	4.65	1.80
	38-40'	6.67	8.77	4.56		38-40'	3.21	4.58	1.74
						40-42'	1.51	4.43	1.69
						42-44'	3.15	4.37	1.66
						44-46'	4.56	4.38	1.68
						46-48'	2.26	4.29	1.66
						48-50'	2.26	4.21	1.63

EG-3	0-2'	0.60	0.60	0.33	EG-4	0-2'	3.17	3.17	1.51
	2-4'	NA	NA	0.28		2-4'	1.83	2.50	1.30
	4-6'	0.49	0.36	0.28		4-6'	2.17	2.39	1.25
	6-8'	1.75	0.71	0.44		6-8'	4.42	2.90	1.54
	8-10'	1.06	0.78	0.50		8-10'	7.39	3.80	1.99
	10-12'	7.79	1.95	1.14		10-12'	7.86	4.47	2.38
	12-14'	1.41	1.87	1.09		12-14'	2.74	4.23	2.25
	14-16'	7.84	2.62	1.51		14-16'	2.27	3.98	2.13
	16-18'	4.44	2.82	1.61		16-18'	2.97	3.87	2.08
	18-20'	11.46	3.68	2.06		18-20'	5.20	4.00	2.16
	20-22'	13.60	4.58	2.42		20-22'	0.76	3.51	2.01
	22-24'	10.74	5.10	2.62		22-24'	1.21	3.50	1.91
	24-26'	3.72	4.99	2.55		24-26'	1.77	3.37	1.85
	26-28'	1.47	4.74	2.44		26-28'	0.55	3.17	1.75
	28-30'	0.80	4.48	2.31		28-30'	1.41	3.05	1.69
	30-32'	2.72	4.37	2.27		30-32'	1.43	2.95	1.64
	32-34'	2.37	4.25	2.21		32-34'	1.39	2.86	1.60
	34-36'	6.82	4.39	2.26		34-36'	1.74	2.79	1.56
	36-38'	6.78	4.52	2.31		36-38'	3.23	2.82	1.56
	38-40'	1.91	4.39	2.25		38-40'	4.19	2.89	1.61
	40-42'	2.84	4.31	2.21		40-42'	2.18	2.85	1.58
	42-44'	2.03	4.21	2.16		42-44'	2.64	2.84	1.57
	44-46'	2.42	4.13	2.13		44-46'	1.76	2.80	1.54
	46-48'	1.59	4.03	2.08		46-48'	3.75	2.83	1.56
	48-50'	2.37	3.96	2.03		48-50'	4.03	2.88	1.58

Appendix A
Chemical Analyses

Hole I.D.	Interval	% HM Total	% HM Cumulative Averages	% TiO_2 Cumulative Averages	Hole I.D.	Interval	% HM Total	% HM Cumulative Averages	% TiO_2 Cumulative Averages
EG-5	0-2'	1.24	1.24	0.65	EG-6	0-2'	0.52	0.52	0.36
	2-4'	0.92	1.08	0.64		2-4'	0.28	0.40	0.29
	4-6'	2.21	1.45	0.85		4-6'	0.32	0.38	0.27
	6-8'	6.60	2.74	1.52		6-8'	0.29	0.36	0.26
	8-10'	10.10	4.21	2.34		8-10'	0.73	0.43	0.30
	10-12'	14.94	6.00	3.29		10-12'	4.50	1.11	0.68
	12-14'	4.21	5.74	3.18		12-14'	1.04	1.10	0.68
	14-16'	2.50	5.34	2.88		14-16'	4.23	1.49	0.89
	16-18'	3.83	5.17	2.77		16-18'	5.79	1.97	1.15
	18-20'	2.66	4.92	2.65		18-20'	16.00	3.37	1.92
	20-22'	1.12	4.57	2.48		20-22'	5.70	3.58	2.04
	22-24'	0.53	4.24	2.32		22-24'	8.16	3.96	2.25
	24-26'	1.04	3.99	2.19		24-26'	9.38	4.38	2.48
	26-28'	0.81	3.76	2.07		26-28'	6.69	4.54	2.58
	28-30'	0.48	3.55	1.96		28-30'	10.13	4.92	2.80
	30-32'	0.38	3.35	1.86		30-32'	9.20	5.18	2.94
	32-34'	1.70	3.25	1.81		32-34'	8.01	5.35	3.02
	34-36'	1.09	3.13	1.75		34-36'	4.86	5.32	3.00
	36-38'	2.10	3.08	1.72		36-38'	6.68	5.40	3.03
	38-40'	2.77	3.06	1.72		38-40'	5.59	5.40	3.03
	40-42'	3.52	3.08	1.73		40-42'	10.46	5.65	3.16
	42-44'	2.88	3.07	miss		42-44'	10.25	5.85	3.21
	44-46'	2.73	3.06	1.66		44-46'	7.58	5.93	3.23
	46-48'	1.39	2.99	1.93		46-48'	6.08	5.94	3.24
	48-50'	2.00	2.95	1.90					

EG-7	0-2'	0.57	0.57	0.41	EG-8	0-2'	0.47	0.47	0.21
	2-4'	0.34	0.46	0.33		2-4'	0.24	0.36	0.18
	4-6'	0.31	0.41	0.92		4-6'	0.36	0.36	0.93
	6-8'	0.54	0.44	1.54		6-8'	0.37	0.36	0.77
	8-10'	3.03	0.96	1.57		8-10'	1.53	0.60	0.78
	10-12'	8.19	2.16	2.08		10-12'	7.17	1.69	1.30
	12-14'	8.64	3.09	2.43		12-14'	10.13	2.90	1.87
	14-16'	12.03	4.21	2.83		14-16'	10.33	3.83	2.13
	16-18'	14.02	5.30	3.34		16-18'	8.65	4.36	2.30
	18-20'	19.81	6.75	3.93		18-20'	15.13	5.44	2.79
	20-22'	7.25	6.79	3.94		20-22'	2.18	5.14	2.64
	22-24'	4.33	6.59	3.82		22-24'	1.43	4.83	2.49
	24-26'	0.65	6.13	3.55		24-26'	2.42	4.65	2.37
	26-28'	10.24	6.43	3.72		26-28'	4.74	4.65	2.39
	28-30'	10.70	6.71	3.84		28-30'	2.39	4.50	2.32
	30-32'	9.41	6.88	3.91		30-32'	10.69	4.89	2.23
	32-34'	3.02	6.65	3.78		32-34'	2.76	4.76	2.16
	34-36'	3.79	6.49	3.69		34-36'	2.17	4.62	2.11
	36-38'	5.93	6.46	3.63		36-38'	5.11	4.65	2.14
	38-40'	1.91	6.24	3.47		38-40'	9.20	4.87	2.21
	40-42'	2.85	6.07	3.36		40-42'	7.40	4.99	2.26
	42-44'	1.58	5.87	3.25		42-44'	3.96	4.95	2.26
	44-46'	1.80	5.69	3.16		44-46'	1.51	4.80	2.19
	46-48'	2.20	5.55	3.08		46-48'	1.71	4.67	2.13
	48-50'	4.25	5.50	3.06		48-50'	2.04	4.56	2.09

Appendix A
Chemical Analyses

Hole I.D.	Interval	% HM Total	% HM Cumulative Averages	% TiO_2 Cumulative Averages	Hole I.D.	Interval	% HM Total	% HM Cumulative Averages	% TiO_2 Cumulative Averages
EG-9	0-2'	0.64	0.64		EG-10	0-2'	0.92	0.92	0.56
	2-4'	0.38	0.51			2-4'	1.02	0.97	0.57
	4-6'	0.98	0.67			4-6'	6.83	2.92	1.67
	6-8'	5.78	1.94			6-8'	3.65	3.11	1.80
	8-10'	9.38	3.43			8-10'	10.30	4.54	2.55
	10-12'	2.93	3.35			10-12'	4.55	4.55	
	12-14'	3.92	3.43			12-14'	3.26	4.36	
	14-16'	1.52	3.19			14-16'	3.02	4.19	
	16-18'	6.83	3.60			16-18'	3.97	4.17	
	18-20'	10.18	4.25			18-20'	8.44	4.60	
	20-22'	6.30	4.44			20-22'	10.66	5.15	
	22-24'	5.45	4.52			22-24'	3.18	4.98	
	24-26'	5.32	4.59			24-26'	5.32	5.01	
	26-28'	8.98	4.90			26-28'	2.01	4.80	
	28-30'	3.95	4.84			28-30'	1.50	4.58	
	30-32'	4.82	4.84			30-32'	0.94	4.35	
	32-34'	1.93	4.66			32-34'	3.11	4.28	
	34-36'	3.27	4.59			34-36'	11.53	4.68	
	36-38'	1.70	4.44			36-38'	2.71	4.57	
	38-40'	4.55	4.44			38-40'	3.77	4.53	
	40-42'	5.01	4.47			40-42'	3.16	4.47	
	42-44'	2.88	4.40			42-44'	3.57	4.43	
	44-46'	1.34	4.26			44-46'	0.88	4.27	
	46-48'	1.65	4.15			46-48'	1.93	4.18	
	48-50'	1.43	4.05						
EG-11	0-2'	0.62	0.62	0.40	EG-12	0-2'	0.67	0.67	0.36
	2-4'	0.40	0.51	0.32		2-4'	1.49	1.08	0.56
	4-6'	0.49	0.51	0.33		4-6'	5.76	2.64	1.42
	6-8'	16.66	4.54	2.45		6-8'	4.63	3.14	1.64
	8-10'	3.93	4.42	2.42		8-10'	9.71	4.45	2.36
	10-12'	3.09	4.20			10-12'	5.78	4.67	2.47
	12-14'	1.81	3.86			12-14'	3.89	4.56	2.43
	14-16'	2.91	3.74			14-16'	3.40	4.42	2.35
	16-18'	0.11	3.34			16-18'	7.64	4.77	2.54
	18-20'	7.85	3.79			18-20'	9.64	5.26	2.62
	20-22'	4.84	3.88			20-22'	7.57	5.47	2.65
	22-24'	9.78	4.38			22-24'	4.82	5.42	2.63
	24-26'	4.57	4.40			24-26'	2.50	5.19	2.54
	26-28'	2.03	4.23			26-28'	4.13	5.12	2.51
	28-30'	1.03	4.01			28-30'	1.99	4.91	2.38
	30-32'	3.13	3.96			30-32'	1.91	4.72	2.30
	32-34'	7.48	4.19			32-34'	4.65	4.72	2.32
	34-36'	7.67	4.38			34-36'	2.18	4.57	2.26
	36-38'	4.71	4.40			36-38'	1.59	4.42	2.20
	38-40'	3.29	4.34			38-40'	5.21	4.46	2.23
	40-42'	3.04	4.28			40-42'	4.78	4.47	2.21
	42-44'	1.65	4.16			42-44'	1.60	4.34	2.15
	44-46'	2.69	4.10			44-46'	0.77	4.19	2.08
	46-48'	3.47	4.07						
	48-50'	1.57	3.97						

Appendix A
Chemical Analyses

Hole I.D.	Interval	% HM Total	% HM Cumulative Averages	% TiO_2 Cumulative Averages	Hole I.D.	Interval	% HM Total	% HM Cumulative Averages	% TiO_2 Cumulative Averages
EG-13	0-2'	0.51	0.51	0.28	EG-14	0-2'	3.72	3.72	1.97
	2-4'	0.53	0.52	0.28		2-4'	6.64	5.18	2.76
	4-6'	2.24	1.09	0.58		4-6'	6.91	5.76	3.21
	6-8'	10.09	3.34	1.81		6-8'	13.65	7.73	3.72
	8-10'	6.67	4.01	2.17		8-10'	17.76	9.74	4.82
	10-12'	11.07	5.19	2.72		10-12'	4.62	8.88	4.46
	12-14'	13.04	6.31	3.23		12-14'	4.51	8.26	4.19
	14-16'	2.15	5.79	3.44		14-16'	6.30	8.01	4.11
	16-18'	11.42	6.41	3.74		16-18'	4.03	7.57	3.91
	18-20'	5.72	6.34	3.68		18-20'	3.11	7.12	3.69
	20-22'	7.15	6.42	3.70		20-22'	2.59	6.71	3.47
	22-24'	4.87	6.29	3.59		22-24'	8.92	6.90	3.58
	24-26'	9.34	6.52	3.68		24-26'	6.32	6.85	3.55
	26-28'	11.42	6.87	3.85		26-28'	7.59	6.90	3.53
	28-30'	7.84	6.94	3.88		28-30'	5.40	6.80	3.45
	30-32'	4.52	6.79	3.77		30-32'	0.83	6.43	3.26
	32-34'	6.12	6.75	3.69		32-34'	2.80	6.22	3.12
	34-36'	6.53	6.74	3.61		34-36'	7.79	6.31	3.16
	36-38'	1.77	6.47	3.46		36-38'	4.97	6.24	3.09
	38-40'	1.96	6.25	3.34		38-40'	1.14	5.98	2.96
	40-42'	1.85	6.04	3.23		40-42'	5.48	5.96	2.86
	42-44'	2.86	5.89	3.15					
	44-46'	4.24	5.82	3.08					
	46-48'	2.99	5.70	3.02					

EG-15	0-2'	1.39	1.39	0.30	EG-16	0-2'	1.42	1.42	0.32
	2-4'	0.88	1.14	0.28		2-4'	0.41	0.91	0.26
	4-6'	0.35	0.87	0.26		4-6'	0.43	0.75	0.25
	6-8'	0.57	0.80	0.27		6-8'	0.57	0.71	0.23
	8-10'	2.35	1.11	0.44		8-10'	2.59	1.08	0.45
	10-12'	6.46	2.00	0.57		10-12'	4.61	1.67	0.80
	12-14'	2.27	2.04	0.77		12-14'	3.55	1.94	0.98
	14-16'	4.05	2.29	0.96		14-16'	2.41	2.00	1.03
	16-18'	5.01	2.59	1.16		16-18'	1.21	1.91	1.00
	18-20'	2.24	2.56	1.17		18-20'	1.38	1.86	0.99
	20-22'	5.60	2.83	1.35		20-22'	0.13	1.70	0.98
	22-24'	3.82	2.92	1.41		22-24'	0.98	1.64	0.94
	24-26'	2.61	2.89	1.40		24-26'	1.67	1.64	0.93
	26-28'	5.51	3.08	1.49		26-28'	4.84	1.87	1.04
	28-30'	6.28	3.29	1.60		28-30'	7.47	2.24	1.22
	30-32'	9.85	3.70	1.82		30-32'	6.11	2.49	1.33
	32-34'	11.32	4.15	2.07		32-34'	6.00	2.69	1.40
	34-36'	6.15	4.26	2.13		34-36'	6.93	2.93	1.49
	36-38'	6.22	4.37	2.20		36-38'	2.98	2.93	1.47
	38-40'	4.28	4.36	2.20		38-40'	10.05	3.29	1.70
	40-42'	1.73	4.24	2.14		40-42'	6.39	3.43	1.78
	42-44'	2.75	4.17	2.11		42-44'	15.69	3.99	1.89
						44-46'	10.16	4.26	2.04
						46-48'	7.97	4.41	2.12

Appendix A
Chemical Analyses

Hole I.D.	Interval	% HM Total	% HM Cumulative Averages	% TiO_2 Cumulative Averages	Hole I.D.	Interval	% HM Total	% HM Cumulative Averages	% TiO_2 Cumulative Averages
EG-17	0-2'	0.80	0.80	0.41	EG-18	0-2'	1.08	1.08	0.65
	2-4'	0.63	0.72	0.34		2-4'	1.86	1.47	0.79
	4-6'	2.45	1.29	0.66		4-6'	0.80	1.24	0.74
	6-8'	3.06	1.74	0.94		6-8'	2.67	1.60	0.97
	8-10'	8.55	3.10	1.69		8-10'	2.24	1.73	1.06
	10-12'	5.35	3.47	1.93		10-12'	3.49	2.02	1.23
	12-14'	2.22	3.30	1.84		12-14'	2.66	2.11	1.25
	14-16'	2.82	3.24	1.81		14-16'	6.81	2.70	1.56
	16-18'	3.75	3.29	1.80		16-18'	3.13	2.75	1.74
	18-20'	6.23	3.59	1.95		18-20'	5.26	3.00	1.86
	20-22'	4.44	3.67	1.97		20-22'	6.18	3.29	1.99
	22-24'	9.01	4.11	2.13		22-24'	2.92	3.26	1.95
	24-26'	6.04	4.26	2.11		24-26'	2.17	3.17	1.89
	26-28'	5.08	4.32	2.15		26-28'	3.20	3.18	1.89
	28-30'	2.29	4.18	2.10		28-30'	2.50	3.13	1.76
	30-32'	3.70	4.15	2.09		30-32'	1.25	3.01	
	32-34'	7.54	4.35	2.21		32-34'	1.18	2.91	
	34-36'	9.24	4.62	2.37		34-36'	1.59	2.83	
	36-38'	4.58	4.62	2.38		36-38'	3.09	2.85	
	38-40'	3.13	4.55	2.30		38-40'	3.37	2.87	
	40-42'	2.71	4.46	2.26		40-42'	2.35	2.85	
	42-44'	2.56	4.37	2.22		42-44'	1.30	2.78	
	44-46'	3.16	4.32	2.19		44-46'	1.67	2.73	
	46-48'	1.12	4.19	2.12		46-48'	3.70	2.77	
	48-50	0.61	4.04						

EG-19	0-2'	0.28	0.28	0.19	EG-20	0-2'	0.42	0.42	0.28
	2-4'	1.25	0.77	0.42		2-4'	0.23	0.32	0.25
	4-6'	0.91	0.81	0.46		4-6'	0.26	0.30	0.23
	6-8'	0.94	0.85	0.50		6-8'	0.32	0.31	0.24
	8-10'	2.42	1.16	0.66		8-10'	0.53	0.35	0.26
	10-12'	2.02	1.30	0.75		10-12'	5.96	1.28	0.73
	12-14'	1.57	1.34	0.77		12-14'	1.34	1.29	0.76
	14-16'	14.59	3.00	1.58		14-16'	6.54	1.95	1.16
	16-18'	7.06	3.45	1.81		16-18'	13.76	3.26	1.83
	18-20'	5.02	3.61	1.91		18-20'	7.68	3.70	2.03
	20-22'	3.65	3.61	1.88		20-22'	2.24	3.57	1.95
	22-24'	2.72	3.54	1.82		22-24'	1.40	3.39	1.86
	24-26'	3.40	3.53	1.74		24-26'	1.38	3.23	1.78
	26-28'	1.63	3.39	1.69		26-28'	2.20	3.16	1.75
	28-30'	0.63	3.21	1.62		28-30'	1.26	3.03	1.67
	30-32'	1.17	3.08	1.56		30-32'	2.17	2.98	1.62
	32-34'	1.47	2.98	1.52		32-34'	2.54	2.95	1.58
	34-36'	0.92	2.87	1.47		34-36'	2.24	2.91	1.56
	36-38'	0.54	2.75	1.42		36-38'	2.28	2.88	1.54
	38-40'	0.50	2.63	1.37		38-40'	2.80	2.88	1.56
	40-42'	3.49	2.68	1.40		40-42'	2.29	2.85	1.54
	42-44'	1.98	2.64	1.39		42-44'	1.47	2.79	1.51
	44-46'	2.41	2.63	1.39		44-46'	3.56	2.82	1.47
	46-48'	1.85	2.60	1.37		46-48'	1.53	2.77	1.44
						48-50'	2.99	2.77	1.45

Appendix A
Chemical Analyses

Hole I.D.	Interval	% HM Total	% HM Cumulative Averages	% TiO_2 Cumulative Averages	Hole I.D.	Interval	% HM Total	% HM Cumulative Averages	% TiO_2 Cumulative Averages
EG-21	0-2'	0.29	0.29	0.23	EG-22	0-2'	0.57	0.57	0.31
	2-4'	0.27	0.28	0.18		2-4'	0.66	0.62	0.35
	4-6'	0.27	0.28	0.16		4-6'	0.76	0.66	0.42
	6-8'	0.10	0.23	0.14		6-8'	1.42	0.85	0.43
	8-10'	1.15	0.42	0.14		8-10'	0.24	0.73	0.38
	10-12'	0.66	0.46	0.14		10-12'	0.49	0.69	0.38
	12-14'	0.04	0.40	0.14		12-14'	0.49	0.66	0.37
	14-16'	0.05	0.35	0.13		14-16'	0.40	0.63	0.36
	16-18'	0.27	0.35	0.14		16-18'	0.44	0.61	0.35
	18-20'	0.32	0.34	0.15		18-20'	3.84	0.93	0.52
	20-22'	0.19	0.33	0.15		20-22'	1.49	0.98	0.55
	22-24'	0.29	0.33	0.16		22-24'	0.54	0.95	
	24-26'	0.37	0.33	0.17		24-26'	0.73	0.93	
	26-28'	0.40	0.33	0.17		26-28'	0.99	0.93	
	28-30'	0.56	0.35	0.19		28-30'	0.53	0.91	
	30-32'	1.00	0.39	0.21		30-32'	0.30	0.87	
	32-34'	5.51	0.69	0.36		32-34'	0.33	0.84	
	34-36'	2.87	0.81	0.42		34-36'	0.45	0.82	
	36-38'	3.77	0.97	0.51		36-38'	0.17	0.78	
	38-40'	1.10	0.97	0.52		38-40'	0.20	0.75	
	40-42'	1.07	0.98	0.52					
	42-44'	0.66	0.96	0.51					
	44-46'	1.21	0.97	0.52					
	46-48'	1.29	0.99	0.52					
	48-50'	1.77	1.02	0.54					

EG-23	0-2'	1.69	1.69	0.67	EG-24	0-2'	14.51	14.51	1.05
	2-4'	1.33	1.51	0.57		2-4'	1.66	8.09	1.04
	4-6'	0.40	1.14	0.47		4-6'	2.28	6.15	1.00
	6-8'	0.52	0.99	0.45		6-8'	1.92	5.09	1.06
	8-10'	0.57	0.90	0.43		8-10'	2.70	4.62	1.12
	10-12'	0.57	0.85	0.44		10-12'	2.27	4.22	1.13
	12-14'	2.85	1.13	0.59		12-14'	2.53	3.98	1.15
	14-16'	3.37	1.41	0.57		14-16'	1.29	3.65	1.10
	16-18'	3.21	1.61	0.42		16-18'	2.39	3.51	1.11
	18-20'	0.39	1.49	0.49		18-20'	1.64	3.32	1.12
	20-22'	0.11	1.37	0.45		20-22'	1.87	3.19	1.13
	22-24'	0.18	1.27	0.41		22-24'	2.82	3.16	1.16
	24-26'	0.73	1.23	0.40		24-26'	2.57	3.11	1.17
	26-28'	0.40	1.17	0.39		26-28'	0.77	2.95	1.12
	28-30'	0.33	1.11			28-30'	4.60	3.06	1.20
	30-32'	0.29	1.06			30-32'	1.61	2.97	1.18
	32-34'	1.37	1.08			32-34'	4.04	3.03	1.22
	34-36'	0.67	1.05			34-36'	4.11	3.09	1.21
	36-38'	0.71	1.04			36-38'	3.64	3.12	1.19
	38-40'	0.47	1.01			38-40'	1.36	3.03	1.17
						40-42'	0.73	2.92	
						42-44'	0.48	2.81	
						44-46'	0.27	2.70	
						46-48'	0.40	2.60	

Appendix A
Chemical Analyses

Hole I.D.	Interval	% HM Total	% HM Cumulative Averages	% TiO_2 Cumulative Averages	Hole I.D.	Interval	% HM Total	% HM Cumulative Averages	% TiO_2 Cumulative Averages
EG-25	0-2'	2.82	2.82	1.39	EG-26	0-2'	1.45	1.45	0.78
	2-4'	2.33	2.57	1.30		2-4'	2.75	2.10	1.09
	4-6'	1.46	2.20	1.12		4-6'	2.89	2.36	1.24
	6-8'	2.32	2.23	1.13		6-8'	2.10	2.30	1.21
	8-10'	3.46	2.48	1.30		8-10'	4.85	2.81	1.31
	10-12'	5.95	3.06	1.60		10-12'	2.81	2.81	1.32
	12-14'	1.72	2.87	1.49		12-14'	1.91	2.68	1.27
	14-16'	8.71	3.60	1.88		14-16'	2.02	2.60	1.25
	16-18'	5.95	3.86	2.03		16-18'	3.01	2.64	1.29
	18-20'	3.23	3.80	2.01		18-20'	2.28	2.61	1.30
	20-22'	6.27	4.02	2.13		20-22'	1.90	2.54	1.27
	22-24'	3.91	4.01	2.13		22-24'	1.92	2.49	1.25
	24-26'	7.82	4.30	2.03		24-26'	4.86	2.67	1.35
	26-28'	1.82	4.13	1.95		26-28'	6.35	2.94	1.51
	28-30'	1.44	3.95	1.87		28-30'	6.39	3.17	1.64
	30-32'	1.29	3.78	1.79		30-32'	5.13	3.29	1.70
	32-34'	1.10	3.62			32-34'	3.88	3.32	1.72
	34-36'	0.52	3.45			34-36'	1.51	3.22	1.67
						36-38'	3.04	3.21	1.67
						38-40'	5.93	3.35	1.74

D-1	0-2'	2.14	2.14		D-2	0-2'	3.24	3.24	
	2-4'	1.65	1.90			2-4'	2.58	2.91	
	4-6'	2.51	2.10			4-6'	2.58	2.80	
	6-8'	1.20	1.88						
	8-10'	1.67	1.84						
	10-12'	0.80	1.66						
	12-14'	3.83	1.97						
	14-16'	3.07	1.11						
	16-18'	0.93	1.98						
	18-20'	0.83	1.87						
	20-22'	2.00	1.88						
	22-24'	2.97	1.97						
	24-26'	2.51	2.01						
	26-28'	1.72	1.99						
	28-30'	0.80	1.91						
	30-32'	1.30	1.87						
	32-34'	2.69	1.92						
	34-36'	3.33	2.00						
	36-38'	3.09	2.06						
	38-40'	4.35	2.17						
	40-42'	1.20	2.12						
	42-44'	3.48	2.19						

Appendix A
Chemical Analyses

Hole I.D.	Interval	% HM Total	%HM Cumulative Averages		Hole I.D.	Interval	% HM Total	%HM Cumulative Averages	
D-2a	0-2'	5.14	5.14		D-3	0-2'	1.89	1.89	
	2-4'	5	5.07			2-4'	5.24	3.57	
	4-6'	1.63	3.93			4-6'	1.17	2.77	
	6-8'	1.31	3.27			6-8'	0.95	2.31	
	8-10'	2.6	3.14			8-10'	3.6	2.57	
	10-12'	4.6	3.38			10-12'	2.08	2.49	
	12-14'	2.59	3.27			12-14'	0.88	2.26	
	14-16'	1.13	3.00			14-16'	0.78	2.07	
	16-18'	1.49	2.83			16-18'	0.73	1.93	
	18-20'	4.45	2.99			18-20'	0.44	1.78	
	20-22'	3.22	3.01			20-22'	0.96	1.70	
	22-24'	2.20	2.95			22-24'	1.77	1.71	
	24-26'	0.57	2.76			24-26'	0.78	1.64	
	26-28'	0.83	2.63			26-28'	2.45	1.70	
	28-30'	0.62	2.49			28-30'	1.76	1.70	
	30-32'	1.83	2.45			30-32'	1.13	1.66	
	32-34'	1.87	2.42			32-34'	1.86	1.68	
	34-36'	2.63	2.43			34-36'	1.51	1.67	
	36-38'	3.89	2.51			36-38'	2.02	1.69	
	38-40'	1.44	2.45			38-40'	1.84	1.69	
	40-42'	2.34	2.45			40-42'	4.60	1.83	
	42-44'	2.44	2.45			42-44'	2.97	1.88	
	44-46'	3.24	2.48			44-46'	0.21	1.81	
	46-48'	3.88	2.54			46-48'	0.37	1.75	
	48-50'	4.27	2.61			48-50'	0.70	1.71	

D-4	0-2'	4.04	4.04		M-1	0-2'	0.13	0.13	
	2-4'	8.38	6.21			2-4'	0.11	0.12	
	4-6'	2.03	4.82			4-6'	0.78	0.34	
	6-8'	0.14	3.65			6-8'	6.92	1.98	
	8-10'	1.10	3.14			8-10'	0.10	1.61	
	10-12'	2.96	3.11			10-12'	1.82	1.64	
	12-14'	2.30	2.99			12-14'	0.20	1.44	
	14-16'	3.53	3.06			14-16'	0.95	1.38	
	16-18'	5.76	3.36			16-18'	0.07	1.23	
	18-20'	0.37	3.06			18-20'	0.28	1.14	
	20-22'	0.23	2.80			20-22'	0.08	1.04	
	22-24'	0.14	2.58			22-24'	0.09	0.96	
	24-26'	0.15	2.39.			24-26'	0.06	0.89	
	26-28'	0.14	2.23			26-28'	0.04	0.83	
	28-30'	0.16	2.10			28-30'	0.13	0.78	
	30-32'	0.10	1.97			30-32'	0.45	0.76	
	32-34'	0.09	1.86			32-34'	0.18	0.73	
	34-36'	0.20	1.77			34-36'	0.11	0.69	

Appendix A
Chemical Analyses

Hole I.D.	Interval	% HM Total	%HM Cumulative Averages		Hole I.D.	Interval	% HM Total	%HM Cumulative Averages	
M-2	0-2'	0.26	0.26		R-1	0-2'	0.77	0.77	
	2-4'	0.18	0.22			2-4'	0.78	0.77	
	4-6'	0.22	0.22			4-6'	0.53	0.69	
	6-8'	0.23	0.22			6-8'	0.27	0.58	
	8-10'	0.23	0.22			8-10'	0.19	0.51	
	10-12'	0.36	0.24			10-12'	0.21	0.46	
	12-14'	0.47	0.28			12-14'	0.43	0.45	
	14-16'	0.34	0.29			14-16'	0.29	0.43	
	16-18'	0.51	0.31			16-18'	0.18	0.40	
	18-20'	0.58	0.34			18-20'	0.40	0.40	
	20-22'	0.41	0.35			20-22'	0.45	0.41	
	22-24'	0.16	0.33			22-24'	0.43	0.41	
	24-26'	0.09	0.31			24-26'	0.39	0.41	
	26-28'	0.05	0.29			26-28'	0.33	0.40	
	28-30'	0.06	0.28			28-30'	0.16	0.39	
						30-32'	0.19	0.37	
						32-34'	0.34	0.37	
						34-36'	0.16	0.36	
						36-38'	0.04	0.34	
						38-40'	0.07	0.33	

R-2	0-2'	1.02	1.02		R-3	0-2'	0.12	0.12	
	2-4'	0.38	0.70			2-4'	0.90	0.51	
	4-6'	0.25	0.55			4-6'	0.23	0.42	
	6-8'	0.25	0.47			6-8'	0.20	0.36	
	8-10'	0.26	0.43			8-10'	0.37	0.36	
	10-12'	0.21	0.39			10-12'	0.17	0.33	
	12-14'	0.18	0.36			12-14'	0.47	0.35	
	14-16'	0.15	0.34			14-16'	0.39	0.36	
	16-18'	0.22	0.32			16-18'	0.18	0.34	
	18-20'	0.32	0.32			18-20'	0.52	0.36	
	20-22'	0.23	0.31			20-22'	0.51	0.37	
	22-24'	0.15	0.30			22-24'	0.37	0.37	
	24-26'	0.11	0.29			24-26'	0.19	0.36	
	26-28'	0.07	0.27			26-28'	0.15	0.34	
	28-30'	0.09	0.26			28-30'	0.15	0.33	
	30-32'	0.07	0.25			30-32'	0.18	0.32	
	32-34'	0.14	0.24						

Appendix B
Petrographic Analyses
(by screen size)

EG-1, 12-14'

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	0.36	0.00	0.00	0.00	0.36
Staurolite	0.27	0.00	0.13	0.10	0.03
Ky/Sil	0.25	0.00	0.06	0.10	0.09
Corundum	0.03	0.00	0.00	0.00	0.03
Ilmenite	90.67	0.00	22.31	55.06	13.30
Leucoxene	0.44	0.00	0.13	0.19	0.12
Rutile	0.00	0.00	0.00	0.00	0.00
Quartz	0.00	0.00	0.00	0.00	0.00
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.17	0.00	0.06	0.09	0.03
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.00	0.00	0.00	0.00	0.00
Fe-Oxides	4.59	0.00	2.11	2.02	0.46
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	3.23	0.00	1.19	1.44	0.59
% of Fraction	100.00	0.00	26.00	59.00	15.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan	
Zircon	0.00	0.00	0.00	100.00	
Staurolite	0.00	50.00	38.30	11.70	
Ky/Sil	0.00	25.40	38.80	35.80	
Corundum	0.00	0.00	0.00	100.00	
Ilmenite	0.00	24.60	60.70	14.70	
Leucoxene	0.00	28.80	44.10	27.10	
Rutile	0.00	0.00	0.00	0.00	
Quartz	0.00	0.00	0.00	0.00	
Spinel	0.00	0.00	0.00	0.00	
Tourmaline	0.00	33.30	51.00	15.70	
Monazite	0.00	0.00	0.00	0.00	
Garnet	0.00	0.00	0.00	0.00	
Epidote	0.00	0.00	0.00	0.00	
Pyraboles	0.00	46.00	44.00	9.90	
Fe-Oxides	0.00	0.00	0.00	0.00	
Xenotime	0.00	0.00	0.00	0.00	
Sphene	0.00	0.00	0.00	0.00	
Ferro-Mag	0.00	0.00	0.00	0.00	
Apatite	0.00	0.00	0.00	0.00	
Muscovite	0.00	0.00	0.00	0.00	
Other	0.00	37.00	44.70	18.30	

EG-1, 22-24'

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	0.32	0.00	0.00	0.15	0.17
Staurolite	0.37	0.00	0.33	0.00	0.04
Ky/Sil	0.05	0.00	0.00	0.00	0.05
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	86.63	0.00	27.92	53.32	5.39
Leucoxene	0.57	0.00	0.32	0.23	0.02
Rutile	0.01	0.00	0.00	0.00	0.01
Quartz	0.00	0.00	0.00	0.00	0.00
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.01	0.00	0.00	0.00	0.01
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.00	0.00	0.00	0.00	0.00
Fe-Oxides	3.59	0.00	1.48	1.44	0.68
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	8.44	0.00	4.95	2.86	0.63
% of Fraction	100.00	0.00	35.00	58.00	7.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan	
Zircon		0.00	48.00	52.00	
Staurolite	0.00	89.50	0.00	10.50	
Ky/Sil	0.00	0.00	0.00	100.00	
Corundum	0.00	0.00	0.00	0.00	
Ilmenite	0.00	32.20	61.60	6.20	
Leucoxene	0.00	55.50	40.10	4.30	
Rutile	0.00	0.00	0.00	100.00	
Quartz	0.00	0.00	0.00	0.00	
Spinel	0.00	0.00	0.00	0.00	
Tourmaline	0.00	0.00	0.00	100.00	
Monazite	0.00	0.00	0.00	0.00	
Garnet	0.00	0.00	0.00	0.00	
Epidote	0.00	0.00	0.00	0.00	
Pyraboles	0.00	0.00	0.00	0.00	
Fe-Oxides	0.00	41.10	40.10	18.80	
Xenotime	0.00	0.00	0.00	0.00	
Sphene	0.00	0.00	0.00	0.00	
Ferro-Mag	0.00	0.00	0.00	0.00	
Apatite	0.00	0.00	0.00	0.00	
Muscovite	0.00	0.00	0.00	0.00	
Other	0.00	58.70	33.80	7.50	

Appendix B
Petrographic Analyses
(by screen size)

EG-1, 38-40'

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	20.90	0.00	0.55	1.22	0.32
Staurolite	0.03	0.00	0.00	0.00	0.03
Ky/Sil	0.11	0.00	0.00	0.00	0.11
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	74.36	0.00	18.82	43.45	12.08
Leucoxene	1.30	0.00	0.21	0.78	0.32
Rutile	0.00	0.00	0.00	0.00	0.00
Quartz	0.00	0.00	0.00	0.00	0.00
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.02	0.00	0.00	0.00	0.02
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	4.10	0.00	2.53	1.35	0.22
Fe-Oxides	11.32	0.00	5.58	3.64	2.09
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	6.68	2.00	1.31	1.56	1.81
% of Fraction	100.00	2.00	29.00	52.00	17.00

Mineral size Distribution

Mineral	#50	#70	#120	Pan
Zircon	0.00	26.50	58.40	15.20
Staurolite	0.00	0.00	0.00	100.00
Ky/Sil	0.00	0.00	0.00	100.00
Corundum	0.00	0.00	0.00	0.00
Ilmenite	0.00	25.30	58.40	16.20
Leucoxene	0.00	15.80	59.90	24.20
Rutile	0.00	0.00	0.00	0.00
Quartz	0.00	0.00	0.00	0.00
Spinel	0.00	0.00	0.00	0.00
Tourmaline	0.00	0.00	0.00	100.00
Monazite	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00
Pyraboles	0.00	61.70	32.90	5.40
Fe-Oxides	0.00	49.30	32.20	18.50
Xenotime	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00
Other	30.00	19.60	23.40	27.10

EG-2 Comp

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	0.22	0.00	0.00	0.00	0.22
Staurolite	0.38	0.00	0.13	0.19	0.06
Ky/Sil	0.10	0.10	0.00	0.00	0.00
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	52.28	4.95	11.88	26.30	9.15
Leucoxene	0.95	0.00	0.08	0.55	0.32
Rutile	0.13	0.00	0.00	0.00	0.13
Quartz	4.47	0.85	1.43	1.76	0.44
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.05	0.00	0.00	0.00	0.05
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.22	0.00	0.00	0.17	0.05
Fe-Oxides	39.31	15.89	4.76	8.40	10.26
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	1.85	0.17	0.72	0.64	0.32
% of Fraction	100.00	22.00	19.00	38.00	21.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan
Zircon	0.00	0.00	0.00	100.00
Staurolite	0.00	33.70	51.10	15.20
Ky/Sil	100.00	0.00	0.00	0.00
Corundum	0.00	0.00	0.00	0.00
Ilmenite	9.50	22.70	50.30	17.50
Leucoxene	0.00	8.40	57.50	34.10
Rutile	0.00	0.00	0.00	100.00
Quartz	19.00	31.90	39.20	9.80
Spinel	0.00	0.00	0.00	0.00
Tourmaline	0.00	0.00	0.00	100.00
Monazite	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00
Pyraboles	0.00	0.00	77.10	22.90
Fe-Oxides	40.40	12.10	21.40	26.10
Xenotime	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00
Other	9.30	38.90	34.40	17.50

Appendix B
Petrographic Analyses
(by screen size)

EG-3, 6-8'

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	1.69	0.00	0.00	0.55	0.84
Staurolite	0.05	0.00	0.00	0.00	0.05
Ky/Sil	0.25	0.00	0.00	0.10	0.14
Corundum	0.06	0.00	0.00	0.00	0.06
Ilmenite	75.68	0.00	13.01	44.39	18.28
Leucoxene	0.84	0.00	0.11	0.21	0.53
Rutile	0.00	0.00	0.00	0.00	0.00
Quartz	0.00	0.00	0.00	0.00	0.00
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.14	0.00	0.09	0.00	0.04
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.23	0.00	0.00	0.10	0.14
Fe-Oxides	16.07	0.00	5.52	6.91	3.64
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	5.29	0.00	0.27	1.75	3.28
% of Fraction	100.00	0.00	19.00	54.00	27.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan	
Zircon	0.00	0.00	39.60	60.40	
Staurolite	0.00	0.00	0.00	100.00	
Ky/Sil	0.00	0.00	41.50	58.50	
Corundum	0.00	0.00	0.00	100.00	
Ilmenite	0.00	17.20	58.70	24.20	
Leucoxene	0.00	12.70	24.40	62.90	
Rutile	0.00	0.00	0.00	0.00	
Quartz	0.00	0.00	0.00	0.00	
Spinel	0.00	0.00	0.00	0.00	
Tourmaline	0.00	68.90	0.00	31.10	
Monazite	0.00	0.00	0.00	0.00	
Garnet	0.00	0.00	0.00	0.00	
Epidote	0.00	0.00	0.00	0.00	
Pyraboles	0.00	0.00	41.50	58.50	
Fe-Oxides	0.00	34.30	43.00	22.70	
Xenotime	0.00	0.00	0.00	0.00	
Sphene	0.00	0.00	0.00	0.00	
Ferro-Mag	0.00	0.00	0.00	0.00	
Apatite	0.00	0.00	0.00	0.00	
Muscovite	0.00	0.00	0.00	0.00	
Other	0.00	5.00	33.00	61.90	

EG-3, 20-22'

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	0.30	0.00	0.00	0.14	0.15
Staurolite	0.27	0.00	0.16	0.11	0.00
Ky/Sil	0.00	0.00	0.00	0.00	0.00
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	72.48	0.00	25.28	42.33	4.88
Leucoxene	0.86	0.00	0.38	0.43	0.06
Rutile	0.03	0.00	0.00	0.00	0.03
Quartz	0.00	0.00	0.00	0.00	0.00
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.23	0.00	0.20	0.00	0.03
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.03	0.00	0.00	0.00	0.03
Fe-Oxides	16.38	0.00	6.86	3.74	5.78
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	9.42	5.00	1.13	2.24	1.05
% of Fraction	100.00	5.00	34.00	49.00	12.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan	
Zircon	0.00	0.00	48.60	51.40	
Staurolite	0.00	58.50	41.50	0.00	
Ky/Sil	0.00	0.00	0.00	0.00	
Corundum	0.00	0.00	0.00	0.00	
Ilmenite	0.00	34.90	58.40	6.70	
Leucoxene	0.00	43.80	49.70	6.60	
Rutile	0.00	0.00	0.00	100.00	
Quartz	0.00	0.00	0.00	0.00	
Spinel	0.00	0.00	0.00	0.00	
Tourmaline	0.00	88.90	0.00	11.10	
Monazite	0.00	0.00	0.00	0.00	
Garnet	0.00	0.00	0.00	0.00	
Epidote	0.00	0.00	0.00	0.00	
Pyraboles	0.00	0.00	0.00	100.00	
Fe-Oxides	0.00	41.90	22.80	35.30	
Xenotime	0.00	0.00	0.00	0.00	
Sphene	0.00	0.00	0.00	0.00	
Ferro-Mag	0.00	0.00	0.00	0.00	
Apatite	0.00	0.00	0.00	0.00	
Muscovite	0.00	0.00	0.00	0.00	
Other	53.10	12.00	23.80	11.10	

Appendix B
Petrographic Analyses
(by screen size)

EG-3, 36-38'

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	0.37	0.00	0.00	0.15	0.22
Staurolite	0.21	0.00	0.09	0.12	0.00
Ky/Sil	0.11	0.00	0.00	0.11	0.00
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	71.55	0.00	27.92	38.58	5.04
Leucoxene	0.48	0.00	0.08	0.34	0.05
Rutile	0.14	0.00	0.00	0.14	0.00
Quartz	0.00	0.00	0.00	0.00	0.00
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.10	0.00	0.07	0.00	0.02
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.10	0.00	0.08	0.00	0.03
Fe-Oxides	16.24	0.00	8.59	3.70	3.95
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	10.69	6.00	0.17	1.84	2.69
% of Fraction	100.00	6.00	37.00	45.00	12.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan
Zircon	0.00	0.00	41.60	58.40
Staurolite	0.00	41.90	58.10	0.00
Ky/Sil	0.00	0.00	100.00	0.00
Corundum	0.00	0.00	0.00	0.00
Ilmenite	0.00	39.00	53.90	7.00
Leucoxene	0.00	17.20	71.60	11.20
Rutile	0.00	0.00	100.00	0.00
Quartz	0.00	0.00	0.00	0.00
Spinel	0.00	0.00	0.00	0.00
Tourmaline	0.00	75.50	0.00	24.50
Monazite	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00
Pyraboles	0.00	75.50	0.00	24.50
Fe-Oxides	0.00	52.90	22.80	24.30
Xenotime	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00
Other	56.10	1.60	17.20	25.10

EG-3, 48-50'

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	0.62	0.00	0.24	0.20	0.17
Staurolite	0.09	0.00	0.09	0.00	0.00
Ky/Sil	0.00	0.00	0.00	0.00	0.00
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	44.53	0.00	21.08	17.09	6.37
Leucoxene	0.65	0.00	0.36	0.23	0.07
Rutile	0.00	0.00	0.00	0.00	0.00
Quartz	0.63	0.00	0.00	0.00	0.63
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.30	0.00	0.24	0.00	0.06
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.20	0.00	0.17	0.00	0.03
Fe-Oxides	32.13	0.00	15.93	10.05	6.16
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	20.85	18.00	0.90	1.44	0.52
% of Fraction	100.00	18.00	39.00	29.00	14.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan
Zircon	0.00	38.90	32.80	28.30
Staurolite	0.00	100.00	0.00	0.00
Ky/Sil	0.00	0.00	0.00	0.00
Corundum	0.00	0.00	0.00	0.00
Ilmenite	0.00	47.30	38.40	14.30
Leucoxene	0.00	55.10	34.90	10.00
Rutile	0.00	0.00	0.00	0.00
Quartz	0.00	0.00	0.00	100.00
Spinel	0.00	0.00	0.00	0.00
Tourmaline	0.00	80.50	0.00	19.50
Monazite	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00
Pyraboles	0.00	84.60	0.00	15.40
Fe-Oxides	0.00	49.60	31.30	19.20
Xenotime	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00
Other	86.30	4.30	6.90	2.50

Appendix B
Petrographic Analyses
(by screen size)

EG-4, Comp

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	0.66	0.00	0.00	0.35	0.31
Staurolite	0.54	0.00	0.00	0.41	0.12
Ky/Sil	0.03	0.03	0.00	0.00	0.00
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	83.65	4.02	20.59	46.65	12.39
Leucoxene	2.80	0.12	0.91	1.31	0.47
Rutile	0.09	0.00	0.00	0.00	0.09
Quartz	0.28	0.09	0.04	0.00	0.14
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.29	0.03	0.00	0.23	0.03
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.06	0.00	0.06	0.00	0.00
Fe-Oxides	9.00	2.59	1.86	2.74	1.80
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	2.57	0.10	0.54	1.31	0.62
% of Fraction	100.00	7.00	24.00	53.00	16.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan
Zircon	0.00	0.00	52.70	47.30
Staurolite	0.00	0.00	77.00	23.00
Ky/Sil	100.00	0.00	0.00	0.00
Corundum	0.00	0.00	0.00	0.00
Ilmenite	4.80	24.60	55.80	14.80
Leucoxene	4.30	32.40	46.60	16.70
Rutile	0.00	0.00	0.00	100.00
Quartz	32.20	16.00	0.00	51.80
Spinel	0.00	0.00	0.00	0.00
Tourmaline	9.20	0.00	79.00	11.80
Monazite	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00
Pyraboles	0.00	100.00	0.00	0.00
Fe-Oxides	28.80	20.70	30.50	20.00
Xenotime	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00
Other	3.90	21.10	50.70	24.30

EG-5, Comp

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	0.40	0.00	0.00	0.00	0.40
Staurolite	0.46	0.02	0.06	0.33	0.05
Ky/Sil	0.08	0.00	0.03	0.00	0.05
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	88.23	1.91	10.61	57.90	17.81
Leucoxene	3.29	0.00	0.36	2.34	0.60
Rutile	0.06	0.00	0.00	0.00	0.06
Quartz	0.20	0.01	0.00	0.00	0.18
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.10	0.02	0.08	0.00	0.00
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.00	0.00	0.00	0.00	0.00
Fe-Oxides	6.40	3.03	0.80	1.96	0.35
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	1.04	0.01	0.06	0.47	0.50
% of Fraction	100.00	5.00	12.00	63.00	20.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan
Zircon	0.00	0.00	0.00	100.00
Staurolite	4.00	13.70	71.00	11.30
Ky/Sil	0.00	37.70	0.00	62.30
Corundum	0.00	0.00	0.00	0.00
Ilmenite	2.20	12.00	65.60	20.20
Leucoxene	0.00	10.90	71.00	18.10
Rutile	0.00	0.00	0.00	100.00
Quartz	6.60	0.00	0.00	93.40
Spinel	0.00	0.00	0.00	0.00
Tourmaline	16.20	83.80	0.00	0.00
Monazite	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00
Pyraboles	0.00	0.00	0.00	0.00
Fe-Oxides	49.30	13.00	32.00	5.70
Xenotime	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00
Other	1.40	5.80	45.00	47.80

Appendix B
Petrographic Analyses
(by screen size)

EG-6, Comp

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	1.11	0.00	0.13	0.54	0.45
Staurolite	0.19	0.00	0.05	0.14	0.00
Ky/Sil	0.19	0.03	0.00	0.13	0.03
Corundum	0.03	0.00	0.00	0.00	0.03
Ilmenite	80.05	3.93	16.80	49.15	10.17
Leucoxene	2.02	0.03	48.00	1.20	0.31
Rutile	0.03	0.00	0.00	0.00	0.03
Quartz	0.65	0.20	0.25	0.20	0.00
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.02	0.02	0.00	0.00	0.00
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.00	0.00	0.00	0.00	0.00
Fe-Oxides	14.50	3.72	2.09	3.37	5.32
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	1.19	0.07	0.19	0.27	0.66
% of Fraction	100.00	8.00	20.00	55.00	17.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan	
Zircon	0.00	11.60	48.40	40.00	
Staurolite	0.00	26.50	73.50	0.00	
Ky/Sil	14.30	0.00	72.00	13.70	
Corundum	0.00	0.00	0.00	100.00	
Ilmenite	4.90	21.00	61.40	12.70	
Leucoxene	1.30	23.90	59.60	15.20	
Rutile	0.00	0.00	0.00	100.00	
Quartz	30.50	38.80	30.70	0.00	
Spinel	0.00	0.00	0.00	0.00	
Tourmaline	100.00	0.00	0.00	0.00	
Monazite	0.00	0.00	0.00	0.00	
Garnet	0.00	0.00	0.00	0.00	
Epidote	0.00	0.00	0.00	0.00	
Pyraboles	0.00	0.00	0.00	0.00	
Fe-Oxides	25.60	14.40	23.20	36.70	
Xenotime	0.00	0.00	0.00	0.00	
Sphene	0.00	0.00	0.00	0.00	
Ferro-Mag	0.00	0.00	0.00	0.00	
Apatite	0.00	0.00	0.00	0.00	
Muscovite	0.00	0.00	0.00	0.00	
Other	5.50	16.20	22.50	55.80	

EG-7, Comp

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	0.91	0.00	0.38	0.30	0.23
Staurolite	0.12	0.00	12.00	0.00	0.00
Ky/Sil	0.00	0.00	0.00	0.00	0.00
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	82.54	6.79	22.99	45.76	7.00
Leucoxene	1.46	0.08	0.46	0.44	0.48
Rutile	0.17	0.00	0.00	0.13	0.03
Quartz	0.09	0.09	0.00	0.00	0.00
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.00	0.00	0.00	0.00	0.00
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	1.59	0.26	0.54	0.73	0.05
Fe-Oxides	10.99	4.50	1.28	1.40	3.81
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	2.08	0.23	0.23	1.22	0.40
% of Fraction	100.00	12.00	26.00	50.00	12.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan	
Zircon	0.00	42.10	32.80	25.10	
Staurolite	0.00	100.00	0.00	0.00	
Ky/Sil	0.00	0.00	0.00	0.00	
Corundum		0.00	0.00	0.00	
Ilmenite	8.20	27.90	55.40	8.50	
Leucoxene	5.40	31.20	30.40	32.90	
Rutile	0.00	0.00	79.70	20.30	
Quartz	100.00	0.00	0.00	0.00	
Spinel	0.00	0.00	0.00	0.00	
Tourmaline	0.00	0.00	0.00	0.00	
Monazite	0.00	0.00	0.00	0.00	
Garnet	0.00	0.00	0.00	0.00	
Epidote	0.00	0.00	0.00	0.00	
Pyraboles	16.50	33.90	46.20	3.40	
Fe-Oxides	41.00	11.60	12.70	34.70	
Xenotime	0.00	0.00	0.00	0.00	
Sphene	0.00	0.00	0.00	0.00	
Ferro-Mag	0.00	0.00	0.00	0.00	
Apatite	0.00	0.00	0.00	0.00	
Muscovite	0.00	0.00	0.00	0.00	
Other	11.00	11.00	58.80	19.10	

Appendix B
Petrographic Analyses
(by screen size)

EG-8, Comp

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	0.65	0.00	0.12	0.14	0.39
Staurolite	0.23	0.00	0.00	0.23	0.00
Ky/Sil	0.00	0.00	0.00	0.00	0.00
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	64.16	2.86	13.06	38.45	9.78
Leucoxene	1.79	0.00	0.30	0.96	0.53
Rutile	0.00	0.00	0.00	0.00	0.00
Quartz	2.82	0.61	0.96	0.79	0.47
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.18	0.00	0.04	0.09	0.04
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.22	0.07	0.00	1.00	0.05
Fe-Oxides	29.11	12.46	3.44	5.81	7.40
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	0.85	0.00	0.09	0.43	0.34
% of Fraction	100.00	16.00	18.00	47.00	19.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan
Zircon	0.00	17.80	22.00	60.20
Staurolite	0.00	0.00	100.00	0.00
Ky/Sil	0.00	0.00	0.00	0.00
Corundum	0.00	0.00	0.00	0.00
Ilmenite	4.50	20.40	59.90	15.20
Leucoxene	0.00	16.80	53.40	29.70
Rutile	0.00	0.00	0.00	0.00
Quartz	21.50	34.00	28.00	16.60
Spinel	0.00	0.00	0.00	0.00
Tourmaline	0.00	21.70	53.80	24.50
Monazite	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00
Pyraboles	32.40	0.00	46.50	21.20
Fe-Oxides	42.80	11.80	20.00	25.40
Xenotime	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00
Other	0.00	10.10	50.00	39.90

EG-9, Comp

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	0.06	0.00	0.00	0.00	0.06
Staurolite	0.43	0.00	0.05	0.33	0.05
Ky/Sil	0.15	0.00	0.00	0.10	0.04
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	62.41	3.34	14.78	35.64	8.66
Leucoxene	1.07	0.00	0.19	0.63	0.26
Rutile	0.15	0.00	0.00	0.00	0.15
Quartz	0.32	0.00	0.00	0.00	0.32
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.31	0.00	0.08	0.19	0.04
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.00	0.00	0.00	0.00	0.00
Fe-Oxides	34.07	14.66	3.86	5.59	9.96
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	1.04	0.00	0.05	0.52	0.47
% of Fraction	100.00	18.00	19.00	43.00	20.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan
Zircon	0.00	0.00	0.00	100.00
Staurolite	0.00	11.60	77.90	10.05
Ky/Sil	0.00	0.00	71.10	28.90
Corundum	0.00	0.00	0.00	0.00
Ilmenite	5.40	23.70	57.10	13.90
Leucoxene	0.00	17.40	58.70	23.80
Rutile	0.00	0.00	0.00	100.00
Quartz	0.00	0.00	0.00	100.00
Spinel	0.00	0.00	0.00	0.00
Tourmaline	0.00	27.00	60.70	12.30
Monazite	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00
Pyraboles	0.00	0.00	0.00	0.00
Fe-Oxides	43.00	11.30	16.40	29.20
Xenotime	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00
Other	0.00	4.50	50.50	45.10

Appendix B
Petrographic Analyses
(by screen size)

EG-10, Comp

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	0.52	0.00	0.00	0.00	0.52
Staurolite	0.31	0.00	0.05	0.22	0.05
Ky/Sil	0.00	0.00	0.00	0.00	0.00
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	72.63	2.39	13.02	43.30	13.05
Leucoxene	0.10	0.00	0.32	1.67	0.64
Rutile	0.99	0.00	0.00	0.00	0.10
Quartz	0.00	0.00	0.00	0.54	0.44
Spinel	0.13	0.00	0.00	0.00	0.00
Tourmaline	0.00	0.00	0.04	0.09	0.00
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.00	0.00	0.00	0.00	0.00
Fe-Oxides	22.52	10.61	4.39	4.54	2.99
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	1.02	0.00	0.18	0.63	0.21
% of Fraction	100.00	13.00	18.00	51.00	18.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan
Zircon	0.00	0.00	0.00	100.00
Staurolite	0.00	15.30	70.40	14.40
Ky/Sil	0.00	0.00	0.00	0.00
Corundum	0.00	0.00	0.00	0.00
Ilmenite	3.30	18.10	60.30	18.20
Leucoxene	0.00	12.10	63.60	24.30
Rutile	0.00	0.00	0.00	100.00
Quartz	0.00	0.00	55.10	44.90
Spinel	0.00	0.00	0.00	0.00
Tourmaline	0.00	30.30	69.70	0.00
Monazite	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00
Pyraboles	0.00	0.00	0.00	0.00
Fe-Oxides	47.10	19.50	20.20	13.30
Xenotime	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00
Other	0.00	17.80	61.40	20.90

EG-11, Comp

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	0.39	0.00	0.00	0.00	0.39
Staurolite	0.19	0.00	0.07	0.12	0.00
Ky/Sil	0.05	0.00	0.00	0.00	0.05
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	73.11	2.86	11.54	43.25	15.46
Leucoxene	2.73	0.00	0.42	1.73	0.58
Rutile	0.12	0.00	0.00	0.00	0.12
Quartz	0.25	0.00	0.00	0.00	0.25
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.03	0.00	0.03	0.00	0.00
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.00	0.00	0.00	0.00	0.00
Fe-Oxides	21.91	8.97	2.66	6.31	3.97
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	1.20	0.14	0.29	58.00	0.19
% of Fraction	100.00	12.00	15.00	52.00	21.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan
Zircon	0.00	0.00	0.00	100.00
Staurolite	0.00	35.80	64.20	0.00
Ky/Sil	0.00	0.00	0.00	100.00
Corundum	0.00	0.00	0.00	0.00
Ilmenite	3.90	15.80	59.20	21.10
Leucoxene	0.00	15.30	63.50	21.10
Rutile	0.00	0.00	0.00	100.00
Quartz	0.00	0.00	0.00	100.00
Spinel	0.00	0.00	0.00	0.00
Tourmaline	0.00	100.00	0.00	0.00
Monazite	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00
Pyraboles	0.00	0.00	0.00	0.00
Fe-Oxides	40.90	12.10	28.80	18.10
Xenotime	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00
Other	12.00	24.00	48.00	16.00

Appendix B
Petrographic Analyses
(by screen size)

EG-12, Comp

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	0.31	0.00	0.00	0.15	0.17
Staurolite	0.21	0.00	0.06	0.11	0.03
Ky/Sil	0.03	0.00	0.00	0.00	0.03
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	75.21	2.49	19.48	41.93	11.30
Leucoxene	2.79	0.00	0.78	1.63	0.38
Rutile	0.04	0.00	0.00	0.00	0.04
Quartz	0.10	0.10	0.00	0.00	0.00
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.03	0.00	0.00	0.00	0.03
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.00	0.00	0.00	0.00	0.00
Fe-Oxides	19.31	9.33	3.02	4.41	2.55
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	1.95	0.06	0.66	0.76	0.47
% of Fraction	100.00	12.00	24.00	49.00	15.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan
Zircon	0.00	0.00	46.40	53.60
Staurolite	0.00	29.90	54.40	15.70
Ky/Sil	0.00	0.00	0.00	100.00
Corundum	0.00	0.00	0.00	0.00
Ilmenite	3.30	25.90	55.80	15.00
Leucoxene	0.00	27.90	58.50	13.50
Rutile	0.00	0.00	0.00	100.00
Quartz	100.00	0.00	0.00	0.00
Spinel	0.00	0.00	0.00	0.00
Tourmaline	0.00	0.00	0.00	100.00
Monazite	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00
Pyraboles	0.00	0.00	0.00	0.00
Fe-Oxides	48.30	15.60	22.90	13.20
Xenotime	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00
Other	3.00	33.80	39.00	24.20

EG-13, Comp

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	0.27	0.00	0.00	0.15	0.12
Staurolite	0.53	0.11	0.12	0.24	0.06
Ky/Sil	0.14	0.00	0.00	0.11	0.03
Corundum	0.13	0.00	0.00	0.13	0.00
Ilmenite	76.43	5.88	19.37	42.37	8.81
Leucoxene	3.54	0.05	1.30	1.48	0.72
Rutile	0.00	0.00	0.00	0.00	0.00
Quartz	0.28	0.23	0.00	0.00	0.04
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.20	0.00	0.00	0.20	0.00
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.00	0.00	0.00	0.00	0.00
Fe-Oxides	16.51	5.46	2.37	5.09	3.59
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	1.91	0.22	0.85	0.23	0.63
% of Fraction	100.00	12.00	24.00	50.00	14.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan
Zircon	0.00	0.00	56.00	44.00
Staurolite	20.70	22.40	45.10	11.80
Ky/Sil	0.00	0.00	79.20	20.80
Corundum	0.00	0.00	100.00	0.00
Ilmenite	7.70	25.30	55.40	11.50
Leucoxene	1.50	36.60	41.70	20.20
Rutile	0.00	0.00	0.00	0.00
Quartz	84.00	0.00	0.00	16.00
Spinel	0.00	0.00	0.00	0.00
Tourmaline	0.00	0.00	100.00	0.00
Monazite	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00
Pyraboles	0.00	0.00	0.00	0.00
Fe-Oxides	33.10	14.40	30.80	21.70
Xenotime	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00
Other	11.30	44.20	11.90	32.70

Appendix B
Petrographic Analyses
(by screen size)

EG-14, Comp

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	0.39	0.00	0.06	0.17	0.17
Staurolite	0.36	0.13	0.09	0.13	0.00
Ky/Sil	0.08	0.00	0.04	0.00	0.03
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	69.67	2.43	14.56	41.99	10.68
Leucoxene	3.29	0.00	0.76	2.14	0.40
Rutile	0.04	0.00	0.00	0.00	0.04
Quartz	0.14	0.00	0.00	0.00	0.14
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.18	0.00	0.04	0.11	0.03
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.00	0.00	0.00	0.00	0.00
Fe-Oxides	25.31	13.38	3.36	6.33	2.24
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	0.54	0.05	0.09	0.13	0.28
% of Fraction	100.00	16.00	19.00	51.00	14.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan
Zircon	0.00	15.20	42.90	42.00
Staurolite	37.00	26.10	36.90	0.00
Ky/Sil	0.00	59.10	0.00	40.90
Corundum	0.00	0.00	0.00	0.00
Ilmenite	3.50	20.90	60.30	15.30
Leucoxene	0.00	22.90	64.90	12.20
Rutile	0.00	0.00	0.00	100.00
Quartz	0.00	0.00	0.00	100.00
Spinel	0.00	0.00	0.00	0.00
Tourmaline	0.00	22.10	62.60	15.30
Monazite	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00
Pyraboles	0.00	0.00	0.00	0.00
Fe-Oxides	52.90	13.30	25.00	8.90
Xenotime	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00
Other	9.60	16.30	23.10	51.00

EG-15, Comp

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	0.63	0.00	0.00	0.17	0.45
Staurolite	18.00	0.03	0.12	0.00	0.04
Ky/Sil	0.07	0.00	0.04	0.00	0.03
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	83.89	1.24	14.50	53.79	14.37
Leucoxene	2.92	0.00	0.42	1.54	0.95
Rutile	0.04	0.00	0.00	0.00	0.04
Quartz	0.13	0.00	0.00	0.00	0.13
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.11	0.02	0.00	0.00	0.09
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.07	0.00	0.07	0.00	0.00
Fe-Oxides	11.06	5.69	1.73	1.98	1.66
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	0.89	0.02	0.12	0.51	0.24
% of Fraction	100.00	7.00	17.00	58.00	18.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan
Zircon	0.00	0.00	27.50	72.50
Staurolite	13.80	66.70	0.00	19.50
Ky/Sil	0.00	53.30	0.00	46.70
Corundum	0.00	0.00	0.00	0.00
Ilmenite	1.50	17.30	64.10	17.70
Leucoxene	0.00	14.60	52.90	32.50
Rutile	0.00	0.00	0.00	100.00
Quartz	0.00	0.00	0.00	100.00
Spinel	0.00	0.00	0.00	0.00
Tourmaline	19.10	0.00	0.00	80.90
Monazite	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00
Pyraboles	0.00	100.00	0.00	0.00
Fe-Oxides	51.40	15.60	17.90	15.00
Xenotime	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00
Other	2.20	13.00	58.00	26.70

Appendix B
Petrographic Analyses
(by screen size)

EG-16, Comp

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	0.99	0.00	0.22	0.31	0.47
Staurolite	0.17	0.04	0.08	0.00	0.04
Ky/Sil	0.00	0.00	0.00	0.00	0.00
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	71.04	1.75	17.45	41.92	9.92
Leucoxene	2.26	0.00	0.44	1.40	0.42
Rutile	0.05	0.00	0.00	0.00	0.05
Quartz	0.00	0.00	0.00	0.00	0.00
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.11	0.00	0.11	0.00	0.00
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.66	0.00	0.00	0.44	0.22
Fe-Oxides	17.95	10.13	2.19	2.77	2.86
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	6.77	0.06	0.52	1.16	5.02
% of Fraction	100.00	12.00	21.00	48.00	19.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan	
Zircon	0.00	21.60	31.50	46.90	
Staurolite	24.70	50.80	0.00	24.50	
Ky/Sil	0.00	0.00	0.00	0.00	
Corundum	0.00	0.00	0.00	0.00	
Ilmenite	2.50	24.60	59.00	14.00	
Leucoxene	0.00	19.50	61.80	18.80	
Rutile	0.00	0.00	0.00	100.00	
Quartz	0.00	0.00	0.00	0.00	
Spinel	0.00	0.00	0.00	0.00	
Tourmaline	0.00	100.00	0.00	0.00	
Monazite	0.00	0.00	0.00	0.00	
Garnet	0.00	0.00	0.00	0.00	
Epidote	0.00	0.00	0.00	0.00	
Pyraboles	0.00	0.00	66.80	33.20	
Fe-Oxides	56.40	12.20	15.40	16.00	
Xenotime	0.00	0.00	0.00	0.00	
Sphene	0.00	0.00	0.00	0.00	
Ferro-Mag	0.00	0.00	0.00	0.00	
Apatite	0.00	0.00	0.00	0.00	
Muscovite	0.00	0.00	0.00	0.00	
Other	1.00	7.70	17.20	74.10	

EG-17, Comp

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	0.37	0.00	0.07	0.00	0.30
Staurolite	0.08	0.00	0.06	0.00	0.03
Ky/Sil	0.02	0.00	0.00	0.00	0.02
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	76.96	5.01	16.89	45.41	9.65
Leucoxene	1.99	0.00	0.69	0.76	0.54
Rutile	0.03	0.00	0.00	0.00	0.03
Quartz	0.11	0.00	0.00	0.00	0.11
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.18	0.00	0.05	0.11	0.02
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.00	0.00	0.00	0.00	0.00
Fe-Oxides	19.76	9.94	3.19	4.59	2.03
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	0.49	0.04	0.05	0.13	0.27
% of Fraction	100.00	15.00	21.00	51.00	13.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan	
Zircon	0.00	19.30	0.00	80.70	
Staurolite	0.00	68.30	0.00	31.70	
Ky/Sil	0.00	0.00	0.00	100.00	
Corundum	0.00	0.00	0.00	0.00	
Ilmenite	6.50	22.00	59.00	12.50	
Leucoxene	0.00	34.70	38.10	27.20	
Rutile	0.00	0.00	0.00	100.00	
Quartz	0.00	0.00	0.00	100.00	
Spinel	0.00	0.00	0.00	0.00	
Tourmaline	0.00	26.00	61.90	12.10	
Monazite	0.00	0.00	0.00	0.00	
Garnet	0.00	0.00	0.00	0.00	
Epidote	0.00	0.00	0.00	0.00	
Pyraboles	0.00	0.00	0.00	0.00	
Fe-Oxides	50.30	16.10	23.20	10.30	
Xenotime	0.00	0.00	0.00	0.00	
Sphene	0.00	0.00	0.00	0.00	
Ferro-Mag	0.00	0.00	0.00	0.00	
Apatite	0.00	0.00	0.00	0.00	
Muscovite	0.00	0.00	0.00	0.00	
Other	8.80	10.70	25.60	54.90	

Appendix B
Petrographic Analyses
(by screen size)

EG-18, Comp

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	1.65	0.00	0.06	0.56	1.02
Staurolite	0.53	0.09	0.15	0.22	0.07
Ky/Sil	0.06	0.00	0.00	0.00	0.06
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	77.76	5.23	12.60	37.90	22.04
Leucoxene	2.73	0.04	0.41	1.25	1.02
Rutile	0.20	0.00	0.00	0.13	0.08
Quartz	0.00	0.00	0.00	0.00	0.00
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.17	0.04	0.04	0.09	0.00
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.04	0.00	0.04	0.00	0.00
Fe-Oxides	15.73	7.55	2.56	3.22	2.40
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	1.12	0.04	0.14	0.63	0.32
% of Fraction	100.00	13.00	16.00	44.00	27.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan
Zircon	0.00	3.70	34.10	62.20
Staurolite	17.70	27.60	42.00	12.70
Ky/Sil	0.00	0.00	0.00	100.00
Corundum	0.00	0.00	0.00	0.00
Ilmenite	6.70	16.20	48.70	28.30
Leucoxene	1.60	15.10	46.00	37.30
Rutile	0.00	0.00	62.20	37.80
Quartz	0.00	0.00	0.00	0.00
Spinel	0.00	0.00	0.00	0.00
Tourmaline	22.70	23.50	53.70	0.00
Monazite	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00
Pyraboles	0.00	100.00	0.00	0.00
Fe-Oxides	48.00	16.30	20.50	15.30
Xenotime	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00
Other	3.30	12.30	56.10	28.40

EG-19, Comp

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	0.59	0.00	0.00	0.12	0.46
Staurolite	0.61	0.03	0.16	0.29	0.12
Ky/Sil	0.04	0.00	0.04	0.00	0.00
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	83.72	5.53	14.34	43.23	20.62
Leucoxene	2.53	0.06	0.46	1.37	0.63
Rutile	0.07	0.00	0.00	0.00	0.07
Quartz	0.00	0.00	0.00	0.00	0.00
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.45	0.00	0.21	0.24	0.00
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.00	0.00	0.00	0.00	0.00
Fe-Oxides	10.99	4.26	2.48	2.56	1.69
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	1.00	0.10	0.31	0.18	0.40
% of Fraction	100.00	10.00	18.00	48.00	24.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan
Zircon	0.00	0.00	20.90	79.10
Staurolite	5.30	26.90	47.70	20.00
Ky/Sil	0.00	100.00	0.00	0.00
Corundum	0.00	0.00	0.00	0.00
Ilmenite	6.60	17.10	51.60	24.60
Leucoxene	2.40	18.30	54.20	25.00
Rutile	0.00	0.00	0.00	100.00
Quartz	0.00	0.00	0.00	0.00
Spinel	0.00	0.00	0.00	0.00
Tourmaline	0.00	45.80	54.20	0.00
Monazite	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00
Pyraboles	0.00	0.00	0.00	0.00
Fe-Oxides	38.70	22.60	23.30	15.40
Xenotime	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00
Other	10.20	31.00	18.40	40.40

Appendix B
Petrographic Analyses
(by screen size)

EG-20, Comp

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	0.77	0.00	0.00	0.14	0.63
Staurolite	0.10	0.00	0.05	0.00	0.06
Ky/Sil	0.10	0.00	0.00	0.00	0.10
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	79.15	4.02	14.54	41.16	19.43
Leucoxene	2.76	0.10	0.57	1.31	0.78
Rutile	0.18	0.00	0.00	0.12	0.06
Quartz	0.00	0.00	0.00	0.00	0.00
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.14	0.00	0.00	0.09	0.05
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.22	0.05	0.08	0.10	0.00
Fe-Oxides	15.47	7.74	2.63	2.69	2.42
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	1.09	0.08	0.13	0.40	0.47
% of Fraction	100.00	12.00	18.00	46.00	24.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan
Zircon	0.00	0.00	17.70	82.30
Staurolite	0.00	45.50	0.00	54.50
Ky/Sil	0.00	0.00	0.00	100.00
Corundum	0.00	0.00	0.00	0.00
Ilmenite	5.10	18.40	52.00	24.50
Leucoxene	3.50	20.60	47.50	28.40
Rutile	0.00	0.00	65.90	34.10
Quartz	0.00	0.00	0.00	0.00
Spinel	0.00	0.00	0.00	0.00
Tourmaline	0.00	0.00	65.90	34.10
Monazite	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00
Pyraboles	20.60	36.80	42.40	0.00
Fe-Oxides	50.00	17.00	17.40	15.60
Xenotime	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00
Other	7.50	12.00	37.20	43.30

EG-21, Comp

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	0.81	0.00	0.00	0.00	0.81
Staurolite	0.57	0.00	0.03	0.22	0.32
Ky/Sil	0.00	0.00	0.00	0.00	0.00
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	60.61	1.66	6.38	26.73	25.85
Leucoxene	4.00	0.04	0.08	1.46	2.41
Rutile	0.24	0.00	0.00	0.00	0.00
Quartz	0.00	0.00	0.00	0.00	0.00
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.70	0.00	0.02	0.06	0.09
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.14	0.00	0.08	0.07	0.00
Fe-Oxides	30.91	15.27	4.33	6.25	5.07
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	2.53	0.03	0.08	0.21	2.21
% of Fraction	100.00	17.00	11.00	35.00	37.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan
Zircon	0.00	0.00	0.00	100.00
Staurolite	0.00	5.00	38.90	56.10
Ky/Sil	0.00	0.00	0.00	0.00
Corundum	0.00	0.00	0.00	0.00
Ilmenite	2.70	10.50	44.10	42.60
Leucoxene	0.09	2.00	36.70	60.40
Rutile	0.00	0.00	0.00	100.00
Quartz	0.00	0.00	0.00	0.00
Spinel	0.00	0.00	0.00	0.00
Tourmaline	0.00	13.70	35.30	50.90
Monazite	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00
Pyraboles	0.00	53.80	46.20	0.00
Fe-Oxides	49.40	14.00	20.20	16.40
Xenotime	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00
Other	1.20	3.20	8.30	87.30

Appendix B
Petrographic Analyses
(by screen size)

EG-22, Comp

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	0.82	0.00	0.00	0.00	0.82
Staurolite	0.69	0.00	0.04	0.09	0.55
Ky/Sil	0.28	0.00	0.02	0.00	0.26
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	67.28	0.62	5.69	28.26	32.71
Leucoxene	5.61	0.00	0.20	2.27	3.14
Rutile	0.21	0.00	0.00	0.00	0.21
Quartz	0.00	0.00	0.00	0.00	0.00
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.31	0.00	0.00	0.15	0.15
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.08	0.00	0.00	0.08	0.00
Fe-Oxides	19.78	8.36	3.00	5.01	3.42
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	4.94	0.02	0.04	1.13	3.75
% of Fraction	100.00	9.00	9.00	37.00	45.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan	
Zircon	0.00	0.00	0.00	100.00	
Staurolite	0.00	6.20	13.40	80.40	
Ky/Sil	0.00	7.20	0.00	92.80	
Corundum	0.00	0.00	0.00	0.00	
Ilmenite	0.09	8.50	42.00	48.60	
Leucoxene	0.00	3.60	40.50	55.90	
Rutile	0.00	0.00	0.00	100.00	
Quartz	0.00	0.00	0.00	0.00	
Spinel	0.00	0.00	0.00	0.00	
Tourmaline	0.00	0.00	50.00	50.00	
Monazite	0.00	0.00	0.00	0.00	
Garnet	0.00	0.00	0.00	0.00	
Epidote	0.00	0.00	0.00	0.00	
Pyraboles	0.00	0.00	100.00	0.00	
Fe-Oxides	42.30	15.20	25.30	17.30	
Xenotime	0.00	0.00	0.00	0.00	
Sphene	0.00	0.00	0.00	0.00	
Ferro-Mag	0.00	0.00	0.00	0.00	
Apatite	0.00	0.00	0.00	0.00	
Muscovite	0.00	0.00	0.00	0.00	
Other	0.40	0.80	23.00	75.80	

EG-23, Comp

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	0.93	0.00	0.08	0.07	0.78
Staurolite	0.17	0.00	0.00	0.05	0.11
Ky/Sil	0.16	0.00	0.00	0.05	0.11
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	24.59	0.00	2.79	11.59	10.21
Leucoxene	1.10	0.00	0.00	0.20	0.90
Rutile	0.13	0.00	0.00	0.00	0.13
Quartz	0.24	0.00	0.00	0.00	0.24
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.18	0.00	0.00	0.18	0.00
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.00	0.00	0.00	0.00	0.00
Fe-Oxides	24.61	0.00	7.97	9.75	6.89
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	47.90	46.00	0.15	1.00	1.64
% of Fraction	100.00	46.00	11.00	22.00	21.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan	
Zircon	0.00	8.80	7.40	83.80	
Staurolite	0.00	0.00	32.60	67.40	
Ky/Sil	0.00	0.00	32.60	67.40	
Corundum	0.00	0.00	0.00	0.00	
Ilmenite	0.00	11.40	47.10	41.50	
Leucoxene	0.00	0.00	18.50	81.50	
Rutile	0.00	0.00	0.00	100.00	
Quartz	0.00	0.00	0.00	100.00	
Spinel	0.00	0.00	0.00	0.00	
Tourmaline	0.00	0.00	100.00	0.00	
Monazite	0.00	0.00	0.00	0.00	
Garnet	0.00	0.00	0.00	0.00	
Epidote	0.00	0.00	0.00	0.00	
Pyraboles	0.00	0.00	0.00	0.00	
Fe-Oxides	0.00	32.40	39.60	28.00	
Xenotime	0.00	0.00	0.00	0.00	
Sphene	0.00	0.00	0.00	0.00	
Ferro-Mag	0.00	0.00	0.00	0.00	
Apatite	0.00	0.00	0.00	0.00	
Muscovite	0.00	0.00	0.00	0.00	
Other	96.00	0.03	0.20	3.40	

Appendix B
Petrographic Analyses
(by screen size)

EG-24, Comp

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	0.83	0.00	0.00	0.42	0.41
Staurolite	0.05	0.00	0.00	0.00	0.05
Ky/Sil	0.19	0.06	0.00	0.00	0.13
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	69.99	3.86	15.70	36.96	13.47
Leucoxene	2.19	0.06	0.43	1.14	0.57
Rutile	0.05	0.00	0.00	0.00	0.05
Quartz	0.00	0.00	0.00	0.00	0.00
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.24	0.10	0.04	0.09	0.00
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.00	0.00	0.00	0.00	0.00
Fe-Oxides	25.53	12.86	4.84	4.78	3.06
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	0.93	0.05	0.00	0.62	0.26
% of Fraction	100.00	17.00	21.00	44.00	18.00

Mineral Size Distribution

Mineral	#50	#70	Pan	#120	
Zircon	0.00	0.00	49.60	50.40	
Staurolite	0.00	0.00	100.00	0.00	
Ky/Sil	31.00	0.00	69.00	0.00	
Corundum	0.00	0.00	0.00	0.00	
Ilmenite	5.50	22.40	19.30	52.80	
Leucoxene	2.70	19.40	25.90	51.90	
Rutile	0.00	0.00	100.00	0.00	
Quartz	0.00	0.00	0.00	0.00	
Spinel	0.00	0.00	0.00	0.00	
Tourmaline	43.90	17.60	0.00	38.50	
Monazite	0.00	0.00	0.00	0.00	
Garnet	0.00	0.00	0.00	0.00	
Epidote	0.00	0.00	0.00	0.00	
Pyraboles	0.00	0.00	0.00	0.00	
Fe-Oxides	50.40	18.90	12.00	18.70	
Xenotime	0.00	0.00	0.00	0.00	
Sphene	0.00	0.00	0.00	0.00	
Ferro-Mag	0.00	0.00	0.00	0.00	
Apatite	0.00	0.00	0.00	0.00	
Muscovite	0.00	0.00	0.00	0.00	
Other	5.20	0.00	28.10	66.60	

EG-25, Comp

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	0.64	0.00	0.00	0.16	0.48
Staurolite	0.38	0.00	0.00	0.25	0.13
Ky/Sil	0.72	0.00	0.00	0.12	0.60
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	71.95	0.46	9.54	51.96	9.99
Leucoxene	2.10	0.00	0.31	1.07	0.72
Rutile	0.04	0.00	0.00	0.00	0.04
Quartz	0.00	0.00	0.00	0.00	0.00
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.24	0.00	0.00	0.21	0.03
Monazite	0.04	0.00	0.00	0.00	0.04
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.06	0.00	0.00	0.00	0.06
Fe-Oxides	23.32	13.54	3.07	3.99	2.72
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	0.53	0.00	0.08	0.24	0.21
% of Fraction	100.00	14.00	13.00	58.00	15.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan	
Zircon	0.00	0.00	24.90	75.10	
Staurolite	0.00	0.00	66.50	33.50	
Ky/Sil	0.00	0.00	16.60	83.40	
Corundum	0.00	0.00	0.00	0.00	
Ilmenite	0.06	13.30	72.20	13.90	
Leucoxene	0.00	14.70	51.00	34.20	
Rutile	0.00	0.00	0.00	100.00	
Quartz	0.00	0.00	0.00	0.00	
Spinel	0.00	0.00	0.00	0.00	
Tourmaline	0.00	0.00	88.80	11.20	
Monazite	0.00	0.00	0.00	100.00	
Garnet	0.00	0.00	0.00	0.00	
Epidote	0.00	0.00	0.00	0.00	
Pyraboles	0.00	0.00	0.00	100.00	
Fe-Oxides	58.10	13.20	17.70	11.70	
Xenotime	0.00	0.00	0.00	0.00	
Sphene	0.00	0.00	0.00	0.00	
Ferro-Mag	0.00	0.00	0.00	0.00	
Apatite	0.00	0.00	0.00	0.00	
Muscovite	0.00	0.00	0.00	0.00	
Other	0.00	15.90	44.80	39.40	

Appendix B
Petrographic Analyses
(by screen size)

EG-26, Comp

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	0.50	0.00	0.00	0.70	0.32
Staurolite	0.57	0.00	0.12	0.41	0.04
Ky/Sil	0.00	0.00	0.00	0.00	0.00
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	83.64	1.62	7.47	57.61	16.95
Leucoxene	2.75	0.00	0.24	1.82	0.69
Rutile	0.05	0.00	0.00	0.00	0.05
Quartz	0.00	0.00	0.00	0.00	0.00
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.00	0.00	0.00	0.00	0.00
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.00	0.00	0.08	0.00	0.00
Fe-Oxides	11.53	5.36	1.98	2.73	1.47
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	0.87	0.02	0.11	0.26	0.48
% of Fraction	100.00	7.00	10.00	63.00	20.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan
Zircon	0.00	0.00	34.90	65.10
Staurolite	0.00	20.40	72.10	7.50
Ky/Sil	0.00	0.00	0.00	0.00
Corundum	0.00	0.00	0.00	0.00
Ilmenite	1.90	8.90	68.90	20.30
Leucoxene	0.00	8.80	66.20	25.00
Rutile	0.00	0.00	0.00	100.00
Quartz	0.00	0.00	0.00	0.00
Spinel	0.00	0.00	0.00	0.00
Tourmaline	0.00	0.00	0.00	0.00
Monazite	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00
Pyraboles	0.00	100.00	0.00	0.00
Fe-Oxides	46.50	17.20	23.70	12.70
Xenotime	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00
Other	2.30	12.60	29.70	55.40

D-1, Comp

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	0.38	0.00	0.00	0.00	0.38
Staurolite	0.38	0.00	0.11	0.21	0.06
Ky/Sil	0.09	0.00	0.03	0.00	0.06
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	66.06	0.98	10.93	38.85	15.31
Leucoxene	3.06	0.00	0.21	1.78	1.08
Rutile	0.07	0.00	0.00	0.00	0.07
Quartz	0.00	0.00	0.00	0.00	0.00
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.26	0.00	0.00	0.26	0.00
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.00	0.00	0.00	0.00	0.00
Fe-Oxides	28.76	13.97	4.61	5.81	4.37
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	0.93	0.04	0.10	0.10	0.68
% of Fraction	100.00	15.00	16.00	47.00	22.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan
Zircon	0.00	0.00	0.00	100.00
Staurolite	0.00	29.10	55.10	15.80
Ky/Sil	0.00	38.00	0.00	62.00
Corundum	0.00	0.00	0.00	0.00
Ilmenite	1.50	16.50	58.80	23.20
Leucoxene	0.00	6.80	58.00	35.20
Rutile	0.00	0.00	0.00	100.00
Quartz	0.00	0.00	0.00	0.00
Spinel	0.00	0.00	0.00	0.00
Tourmaline	0.00	0.00	100.00	0.00
Monazite	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00
Pyraboles	0.00	0.00	0.00	0.00
Fe-Oxides	48.60	16.00	20.20	15.20
Xenotime	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00
Apatite	0.00		0.00	0.00
Muscovite	0.00	0.00	0.00	0.00
Other	4.50	11.20	10.70	73.50

Appendix B
Petrographic Analyses
(by screen size)

D-2, Comp

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	1.77	0.00	0.16	1.61	0.00
Staurolite	0.42	0.09	0.25	0.08	0.00
Ky/Sil	0.32	0.00	0.24	0.08	0.00
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	90.86	22.93	42.24	25.69	0.00
Leucoxene	3.96	0.41	2.03	1.52	0.00
Rutile	0.10	0.00	0.00	0.10	0.00
Quartz	0.00	0.00	0.00	0.00	0.00
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.18	0.00	0.11	0.07	0.00
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.11	0.00	0.11	0.00	0.00
Fe-Oxides	1.52	0.58	5.00	0.45	0.00
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	0.76	0.00	0.36	0.40	0.00
% of Fraction	100.00	24.00	46.00	30.00	0.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan	
Zircon	0.00	0.00	9.10	90.90	
Staurolite	0.00	20.50	59.60	19.90	
Ky/Sil	0.00	0.00	74.90	25.10	
Corundum	0.00	0.00	0.00	0.00	
Ilmenite	0.00	25.20	46.50	28.30	
Leucoxene	0.00	10.40	51.30	38.30	
Rutile	0.00	0.00	0.00	100.00	
Quartz	0.00	0.00	0.00	0.00	
Spinel	0.00	0.00	0.00	0.00	
Tourmaline	0.00	0.00	59.90	40.10	
Monazite	0.00	0.00	0.00	0.00	
Garnet	0.00	0.00	0.00	0.00	
Epidote	0.00	0.00	0.00	0.00	
Pyraboles	0.00	0.00	100.00	0.00	
Fe-Oxides	0.00	37.70	32.90	29.40	
Xenotime	0.00	0.00	0.00	0.00	
Sphene	0.00	0.00	0.00	0.00	
Ferro-Mag	0.00	0.00	0.00	0.00	
Apatite	0.00	0.00	0.00	0.00	
Muscovite	0.00	0.00	0.00	0.00	
Other	0.00	0.00	47.30	52.70	

D-2a, Comp

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	1.16	0.00	0.00	0.42	0.74
Staurolite	0.72	0.00	0.10	0.33	0.29
Ky/Sil	0.33	0.00	0.06	0.16	0.11
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	88.39	0.00	11.55	58.38	18.46
Leucoxene	4.68	0.00	0.58	3.11	0.99
Rutile	0.07	0.00	0.00	0.00	0.07
Quartz	0.16	0.00	0.00	0.00	0.16
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.11	0.00	0.11	0.00	0.00
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.27	0.00	0.12	0.15	0.00
Fe-Oxides	3.66	0.00	1.35	1.31	1.01
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	0.45	0.00	0.13	0.16	0.17
% of Fraction	100.00	0.00	14.00	64.00	22.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan	
Zircon	0.00	0.00	36.00	64.00	
Staurolite	0.00	14.10	45.50	40.40	
Ky/Sil	0.00	19.40	47.10	33.50	
Corundum	0.00	0.00	0.00	0.00	
Ilmenite	0.00	13.10	66.00	20.90	
Leucoxene	0.00	12.30	66.40	21.20	
Rutile	0.00	0.00	0.00	100.00	
Quartz	0.00	0.00	0.00	100.00	
Spinel	0.00	0.00	0.00	0.00	
Tourmaline	0.00	100.00	0.00	0.00	
Monazite	0.00	0.00	0.00	0.00	
Garnet	0.00	0.00	0.00	0.00	
Epidote	0.00	0.00	0.00	0.00	
Pyraboles	0.00	45.20	54.80	0.00	
Fe-Oxides	0.00	36.80	35.70	27.50	
Xenotime	0.00	0.00	0.00	0.00	
Sphene	0.00	0.00	0.00	0.00	
Ferro-Mag	0.00	0.00	0.00	0.00	
Apatite	0.00	0.00	0.00	0.00	
Muscovite	0.00	0.00	0.00	0.00	
Other	0.00	28.50	34.60	36.90	

Appendix B
Petrographic Analyses
(by screen size)

D-3, Comp

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	1.70	0.00	0.35	1.35	0.00
Staurolite	0.80	0.03	0.69	0.08	0.00
Ky/Sil	0.21	0.00	0.00	0.21	0.00
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	83.78	2.40	49.60	31.78	0.00
Leucoxene	4.40	0.34	2.48	1.58	0.00
Rutile	0.17	0.00	0.00	0.17	0.00
Quartz	0.96	0.05	0.49	0.43	0.00
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.50	0.04	0.46	0.00	0.00
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.52	0.03	0.49	0.00	0.00
Fe-Oxides	5.56	2.00	1.65	1.91	0.00
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	1.39	0.11	0.78	0.50	0.00
% of Fraction	100.00	5.00	57.00	38.00	0.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan	
Zircon	0.00	0.00	20.70	79.30	
Staurolite	0.00	4.20	86.30	9.50	
Ky/Sil	0.00	0.00	0.00	100.00	
Corundum	0.00	0.00	0.00	0.00	
Ilmenite	0.00	2.90	59.20	37.90	
Leucoxene	0.00	7.80	56.40	35.80	
Rutile	0.00	0.00	0.00	100.00	
Quartz	0.00	5.00	50.60	44.40	
Spinel	0.00	0.00	0.00	0.00	
Tourmaline	0.00	7.50	92.50	0.00	
Monazite	0.00	0.00	0.00	0.00	
Garnet	0.00	0.00	0.00	0.00	
Epidote	0.00	0.00	0.00	0.00	
Pyraboles	0.00	5.80	94.20	0.00	
Fe-Oxides	0.00	36.00	29.70	34.30	
Xenotime	0.00	0.00	0.00	0.00	
Sphene	0.00	0.00	0.00	0.00	
Ferro-Mag	0.00	0.00	0.00	0.00	
Apatite	0.00	0.00	0.00	0.00	
Muscovite	0.00	0.00	0.00	0.00	
Other	0.00	7.70	56.30	36.00	

D-4, Comp

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	0.28	0.00	0.00	0.00	0.28
Staurolite	0.20	0.00	0.16	0.00	0.03
Ky/Sil	0.03	0.00	0.00	0.00	0.03
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	39.29	0.00	23.67	14.04	1.58
Leucoxene	1.34	0.00	0.77	0.42	0.15
Rutile	0.04	0.00	0.00	0.00	0.04
Quartz	3.97	0.00	1.15	1.30	1.52
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.12	0.00	0.00	0.12	0.00
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.00	0.00	0.00	0.00	0.00
Fe-Oxides	54.01	0.00	33.78	10.98	9.25
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	0.72	0.00	0.46	0.14	0.12
% of Fraction	100.00	0.00	60.00	27.00	13.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan	
Zircon	0.00	0.00	0.00	100.00	
Staurolite	0.00	83.70	0.00	16.30	
Ky/Sil	0.00	0.00	0.00	100.00	
Corundum	0.00	0.00	0.00	0.00	
Ilmenite	0.00	60.20	35.70	4.00	
Leucoxene	0.00	57.60	31.30	11.20	
Rutile	0.00	0.00	0.00	100.00	
Quartz	0.00	29.00	32.80	38.20	
Spinel	0.00	0.00	0.00	0.00	
Tourmaline	0.00	0.00	100.00	0.00	
Monazite	0.00	0.00	0.00	0.00	
Garnet	0.00	0.00	0.00	0.00	
Epidote	0.00	0.00	0.00	0.00	
Pyraboles	0.00	0.00	0.00	0.00	
Fe-Oxides	0.00	62.60	20.30	17.10	
Xenotime	0.00	0.00	0.00	0.00	
Sphene	0.00	0.00	0.00	0.00	
Ferro-Mag	0.00	0.00	0.00	0.00	
Apatite	0.00	0.00	0.00	0.00	
Muscovite	0.00	0.00	0.00	0.00	
Other	0.00	64.10	19.30	16.60	

Appendix B
Petrographic Analyses
(by screen size)

R-1, Comp

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	1.27	0.00	0.00	1.27	0.00
Staurolite	0.63	0.00	0.00	0.45	0.00
Ky/Sil	0.23	0.00	0.00	0.17	0.00
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	34.04	0.00	0.00	21.77	0.00
Leucoxene	5.90	0.00	0.00	5.24	0.00
Rutile	0.62	0.00	0.00	0.62	0.00
Quartz	2.31	0.00	0.00	1.98	0.00
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.66	0.00	0.00	0.61	0.00
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.30	0.00	0.00	0.24	0.00
Fe-Oxides	24.50	0.00	0.00	12.75	0.00
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	29.60	27.00	0.00	1.89	0.00
% of Fraction	100.00	27.00	0.00	47.00	0.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan
Zircon	0.00	0.00	0.00	100.00
Staurolite	0.00	0.00	27.80	72.20
Ky/Sil	0.00	0.00	24.30	75.70
Corundum	0.00	0.00	0.00	0.00
Ilmenite	0.00	0.00	36.10	63.90
Leucoxene	0.00	0.00	11.20	88.80
Rutile	0.00	0.00	0.00	100.00
Quartz	0.00	0.00	14.20	85.80
Spinel	0.00	0.00	0.00	0.00
Tourmaline	0.00	0.00	7.40	92.60
Monazite	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00
Pyraboles	0.00	0.00	17.60	82.40
Fe-Oxides	0.00	0.00	47.90	52.10
Xenotime	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00
Other	91.40	0.00	2.20	6.40

R-2, Comp

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	2.76	0.00	0.00	0.08	2.68
Staurolite	0.77	0.00	0.00	0.19	0.59
Ky/Sil	0.56	0.00	0.00	0.12	0.44
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	43.96	0.00	0.00	13.61	30.35
Leucoxene	6.69	0.00	0.00	1.71	4.99
Rutile	0.67	0.00	0.00	0.00	0.67
Quartz	4.14	0.00	0.00	1.09	3.05
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.35	0.00	0.00	0.16	0.20
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.00	0.00	0.00	0.00	0.00
Fe-Oxides	13.82	0.00	0.00	7.00	6.83
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	26.30	23.00	0.00	1.06	2.22
% of Fraction	100.00	23.00	0.00	25.00	52.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan
Zircon	0.00	0.00	2.90	97.10
Staurolite	0.00	0.00	24.10	75.90
Ky/Sil	0.00	0.00	21.00	79.00
Corundum	0.00	0.00	0.00	0.00
Ilmenite	0.00	0.00	31.00	69.00
Leucoxene	0.00	0.00	25.50	74.50
Rutile	0.00	0.00	0.00	100.00
Quartz	0.00	0.00	26.40	73.60
Spinel	0.00	0.00	0.00	0.00
Tourmaline	0.00	0.00	44.30	55.70
Monazite	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00
Pyraboles	0.00	0.00	0.00	0.00
Fe-Oxides	0.00	0.00	50.60	49.40
Xenotime	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00
Other	87.50	0.00	4.00	8.40

Appendix B
Petrographic Analyses
(by screen size)

M-1, Comp

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	0.16	0.00	0.00	0.00	0.16
Staurolite	0.00	0.00	0.00	0.00	0.00
Ky/Sil	0.02	0.00	0.00	0.00	0.02
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	2.29	0.00	0.11	0.62	1.56
Leucoxene	0.47	0.00	0.00	0.00	0.47
Rutile	0.06	0.00	0.00	0.00	0.06
Quartz	2.19	0.00	0.10	0.10	1.99
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.04	0.00	0.00	0.00	0.04
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.03	0.00	0.00	0.03	0.00
Fe-Oxides	32.41	0.00	11.73	12.20	8.48
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	62.30	62.00	0.06	0.05	0.23
% of Fraction	100.00	62.00	12.00	13.00	13.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan
Zircon	0.00	0.00	0.00	100.00
Staurolite	0.00	0.00	0.00	0.00
Ky/Sil	0.00	0.00	0.00	100.00
Corundum	0.00	0.00	0.00	0.00
Ilmenite	0.00	4.70	27.10	68.10
Leucoxene	0.00	0.00	0.00	100.00
Rutile	0.00	0.00	0.00	100.00
Quartz	0.00	4.70	4.50	90.70
Spinel	0.00	0.00	0.00	0.00
Tourmaline	0.00	0.00	0.00	100.00
Monazite	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00
Pyraboles	0.00	0.00	100.00	0.00
Fe-Oxides	0.00	36.20	37.60	26.20
Xenotime	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00
Other	99.50	0.10	0.10	0.40

M-2, Comp

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	1.12	0.00	0.00	0.10	1.02
Staurolite	0.23	0.00	0.00	0.08	0.15
Ky/Sil	0.50	0.00	0.00	0.15	0.35
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	34.39	0.00	0.00	12.72	21.66
Leucoxene	3.74	0.00	0.00	0.97	2.77
Rutile	0.42	0.00	0.00	0.00	42.00
Quartz	0.88	0.00	0.00	0.00	0.88
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.26	0.00	0.00	0.20	0.06
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.27	0.00	0.00	0.14	0.13
Fe-Oxides	29.60	0.00	0.00	16.98	12.62
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	28.60	26.00	0.00	0.67	1.94
% of Fraction	100.00	26.00	0.00	32.00	42.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan
Zircon	0.00	0.00	8.90	91.90
Staurolite	0.00	0.00	34.90	65.10
Ky/Sil	0.00	0.00	30.00	70.00
Corundum	0.00	0.00	0.00	0.00
Ilmenite	0.00	0.00	37.00	63.00
Leucoxene	0.00	0.00	25.90	74.10
Rutile	0.00	0.00	0.00	100.00
Quartz	0.00	0.00	0.00	100.00
Spinel	0.00	0.00	0.00	0.00
Tourmaline	0.00	0.00	76.30	23.70
Monazite	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00
Pyraboles	0.00	0.00	51.80	48.20
Fe-Oxides	0.00	0.00	57.40	42.60
Xenotime	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00
Other	90.90	0.00	2.30	6.80

Appendix B
Petrographic Analyses
(by screen size)

D/S - 1, Comp

Mineral in each fraction as percent of total sample

Mineral	Total	#50	#70	#120	Pan
Zircon	0.70	0.00	0.00	0.04	0.66
Staurolite	0.06	0.00	0.00	0.00	0.06
Ky/Sil	0.16	0.00	0.00	0.03	0.12
Corundum	0.00	0.00	0.00	0.00	0.00
Ilmenite	8.99	0.00	0.87	3.86	4.26
Leucoxene	1.44	0.00	0.08	0.13	1.23
Rutile	0.07	0.00	0.00	0.00	0.07
Quartz	1.88	0.00	0.06	0.22	1.60
Spinel	0.00	0.00	0.00	0.00	0.00
Tourmaline	0.11	0.00	0.00	0.00	0.11
Monazite	0.00	0.00	0.00	0.00	0.00
Garnet	0.00	0.00	0.00	0.00	0.00
Epidote	0.00	0.00	0.00	0.00	0.00
Pyraboles	0.09	0.00	0.00	0.00	0.09
Fe-Oxides	25.85	0.00	10.97	9.55	5.33
Xenotime	0.00	0.00	0.00	0.00	0.00
Sphene	0.00	0.00	0.00	0.00	0.00
Ferro-Mag	0.00	0.00	0.00	0.00	0.00
Apatite	0.00	0.00	0.00	0.00	0.00
Muscovite	0.00	0.00	0.00	0.00	0.00
Other	60.70	60.00	0.03	0.16	0.46
% of Fraction	100.00	60.00	12.00	14.00	14.00

Mineral Size Distribution

Mineral	#50	#70	#120	Pan	
Zircon	0.00	0.00	6.30	93.70	
Staurolite	0.00	0.00	0.00	100.00	
Ky/Sil	0.00	0.00	21.20	78.80	
Corundum	0.00	0.00	0.00	0.00	
Ilmenite	0.00	9.60	42.90	47.50	
Leucoxene	0.00	5.60	9.10	85.20	
Rutile	0.00	0.00	0.00	100.00	
Quartz	0.00	3.20	11.70	85.10	
Spinel	0.00	0.00	0.00	0.00	
Tourmaline	0.00	0.00	0.00	100.00	
Monazite	0.00	0.00	0.00	0.00	
Garnet	0.00	0.00	0.00	0.00	
Epidote	0.00	0.00	0.00	0.00	
Pyraboles	0.00	0.00	0.00	100.00	
Fe-Oxides	0.00	42.40	36.90	20.60	
Xenotime	0.00	0.00	0.00	0.00	
Sphene	0.00	0.00	0.00	0.00	
Ferro-Mag	0.00	0.00	0.00	0.00	
Apatite	0.00	0.00	0.00	0.00	
Muscovite	0.00	0.00	0.00	0.00	
Other	98.90	0.00	0.03	0.08	

* No chemical analyses was performed on D/S - 1.