DEPARTMENT OF THE INTERIOR

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Granitic rock modal data from the southern Sierra Nevada, California

by

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Granitic rock modal data from the southern Sierra Nevada, California

SUMMARY

Modal data have been determined on more than 1600 samples from sixty seven quartz-bearing granitic units delineated in the southern Sierra Nevada (fig. 1). The rock name of each body is based on average modal composition, although most bodies range in composition, and many bodies comprise more than a single rock type. The rock classification used throughout this report is that recommended by the IUGS Subcommission on the Systematics of Igneous Rocks (Streckeisen, and others, 1973). Using this classification, 27 granite, 21 granodiorite, 11 tonalite, and 8 quartz diorite units are present in the southern Sierra Nevada. In addition, a small body of unusual monzonite of unknown extent crops out near Erskine Creek. A generalized geologic map of the basement rocks of the southern Sierra Nevada at a scale of 1:250,000 locates and briefly describes 63 of these units (Ross, 1987b). This map, reduced to 1:1,000,000 scale, is used herein to show the extent of individual units and also in a summary figure to show the areal distribution of various rock types. Modal data for some of these bodies, or at least parts of them, have been reported in Ross (in press) along with petrographic descriptions. However, in the interest of standardized coverage, modal data are recorded here for the entire southern Sierra Nevada.

Most modal data were obtained from sawed slabs treated by

immersion in hydrofluoric acid and stained by sodium cobaltinitrite. This technique enables one to differentiate, on most slabs, white plagioclase, yellow K-feldspar, clear quartz, greenish biotite, and black hornblende. One of my colleagues (a highly-placed government official) refers to these stained slabs as "half-stained". My experience has shown that the common practice of further treating the slabs with amaranth to give plagioclase a red stain (Norman, 1974) is unnecessary as it is time consuming, messy, and tends to obscure the distinction between hornblende and biotite. The advantage of red amaranth-stained plagioclase is more than outweighed by the disadvantages, and point counting is not notably aided by this stain on most slabs.

Point-count mode determination of stained slabs is relatively easy and accurate using an even-gridded dot pattern on clear film that is taped to a glass plate and attached to the stained slab surface with masking tape. A binocular microscope (magnification fx30) is used for the point-counting. A slab about 30-45 cm^2 is generally used, but in a pinch slabs of only about 15 cm^2 (or even smaller) were counted. For the larger slabs dot spacings of 2.25 to 2.75 mm are used; for smaller slabs a spacing of 1.5 mm is used. Generally 500 to 1000 points were counted on each slab. As an experiment, on several slabs, I kept track of the total points counted for each mineral at each successive 100 total points counted. The percentages of each mineral varied widely early in a count, but after about 500 points the percentages stayed relatively constant, at least for quartz and

the two feldspars in a relatively homogeneous rock. Also replicate point-counts were made on several slabs and the amount of the major minerals were generally reproducible within two or three percent. Determination of the mafic minerals is somewhat less precise. For coarse-grained and/or porphyritic rocks the accuracy of a point count mode is of course less and averaging the results of several slab counts makes a more meaningful mode.

Some modal data were collected from point-counts of 1000 points on standard thin sections that had been stained to accentuate the K-feldspar. The identification of biotite and hornblende is more positive in thin section than on stained slabs. A comparison of amounts of biotite and hornblende between slabs and thin sections from the same body, and in some cases, from the same hand specimen, showed some expectable variation, but no great discrepancies. This gave more confidence to the mafic mineral determinations on stained slabs.

The precision with which a stained slab represents a hand specimen and with which the hand specimens represent a pluton have been much debated. Most samples collected in the southern Sierra Nevada are relatively homogeneous, and replicate modal counts indicate that major mineral percentages are reproducible within 2 or 3 percent. Determinations of mafic minerals are somewhat less precise. Most of the plutons in the map area, except for some of the small granite bodies, have considerable compositional variation that is readily observable in the field and confirmed by modal analysis.

I have assumed that the modal analysis of a large number of

small samples spread over the extent of a pluton will show a meaningful grouping of modal points that can then be averaged to provide the modal composition of the pluton. In a reconnaissance study it is difficult to evaluate whether the spread of the modal field is true compositional variation or the result of the vagaries of inadequate sampling, or both.

For each of the 67 granitic units the following modal and distribution data are given:

1) A table of modes listing the volume percentage of plagioclase, K-feldspar, quartz, biotite, hornblende, and also, for some samples, pyroxene and accessory minerals. Specific gravity is listed only for some modal samples, mostly for those collected early in the study, and from the area south of lat 35° 30' north. The determination of specific gravity in granitic rocks is essentially a measure of the total mafic mineral content. For that reason in later studies its determination for samples with modes seemed unnecessary.

2) Triangular plots of volume--percent plagioclase, K-feldspar, and quartz normalized to 100 percent. For most units the volume percentage of biotite, hornblende, and other minerals is plotted on an additional triangular diagram, and for some units total feldspar, total mafic minerals, and quartz are plotted on another triangular diagram.

3) Map showing location of modes. These location maps also show anorthite (An) content of plagioclase for selected samples. The determinations were made with index oils using crushed plagioclase grains. Only a relatively few suitably oriented grains were measured for each sample. Generally the recorded value is that of the most calcic plagioclase found. Zoning in the plagioclase is ubiquitous, and the anorthite content commonly varies by 10 to 20 percent. A number of units, particularly in the northwestern part of the study area, are only partially mapped as will be noted from the maps of modal sample locations.

4) Location of unit on a 1:1,000,000 scale geologic map of the southern Sierra Nevada reduced and somewhat generalized from a geologic map at a scale of 1:250,000 (Ross, 1987b).

These data sheets for each of the 67 granitic units are grouped after the body of the report into an APPENDIX that lists the granitic units alphabetically by rock type.

In addition, triangular modal plots summarize the sample data for each rock type (figs. 2 to 9). To summarize all the modal data, the modal average of each body was plotted on a triangular diagram (fig. 10). On each of these summary triangular diagrams, contours show the concentration and trend of

the modal fields. The contours, in a crude way, show the concentration of modal points relative to an even distribution of that many points over the entire triangle. As a comparison with the modal field of the southern Sierra Nevada granitic rocks (fig. 6), modal trends and general modal fields are shown for an area in the east-central Sierra Nevada, and two plots show similar data for the California Coast Ranges (fig. 11). The trends and fields are quite similar but the trends of the Coast Ranges slope somewhat more gently to the right (which reflects higher quartz content in the more calcic rocks) than is shown by the southern Sierra Nevada rocks. The east-central Sierra Nevada trend may in turn slope somewhat steeper to the right (lower quartz content of more calcic rocks) relative to the southern Sierra Nevada. The differences (?) between these four summary trends, however, are subtle at best, and should be used with caution in comparing or contrasting the granitic character of these areas.

The areas of the southern Sierra Nevada that are underlain by granite, granodiorite, tonalite, and quartz diorite are shown on figure 12. The modal average of each body is assumed to represent the entire body for the purposes of these figures. Probably this assumption is valid, but exceptions have been noted. For example, the Dunlap Meadow body is considered with the tonalites although its modal average is in the granodiorite field but near the tonalite boundary. Most samples, however, are in the tonalite field and are rather tightly bunched. The anomalously (?) felsic samples have pulled the average away from

the more typically tonalite samples. Other exceptions are the fine-grained and marginal facies of the granodiorite of Lebec. Both facies plot in the granite field, but as they underlie relatively small areas they are lumped with the related Lebec body.

Granite is rather widespread and generally in relatively small masses. It is noticeably sparse along the west side of the Sierra Nevada except in the Sierran tail. Granodiorite dominates throughout the southern Sierra Nevada in generally large masses. Tonalite forms a restricted belt along the west side of the batholith, with the notable exception of the Hoffman Canyon body. Sparse Rb/Sr data (Ross, in press) suggest that the Hoffman Canyon body may be a contaminated facies of the nearby granodiorites, rather than a primary tonalitic intrusive body. The modal average of the Hoffman Canyon body is also very close to the granodiorite field. Quartz diorite has a limited distribution, and is more common in the eastern part of the range. The larger eastern bodies are old Triassic remnants engulfed in much younger granites and granodiorites and the smaller bodies in the central and western part of the range, may be related to the gneissic complex in the Sierran tail (Ross, 1987b).

REFERENCES CITED

Bateman, P.C., 1965, Geology and tungsten mineralization of the Bishop district, California: U.S. Geological Survey Professional Paper 470, 208 p.

Bergquist, J.R., and Nitkeiwicz, A.M., 1982, Geologic map of the Domelands Wilderness and contiguous roadless areas, Kern and Tulare Counties, California: U.S. Geological Survey Miscellaneous Field studies Map MF-1395-A, scale 1:48,000/.

Fox, L.K., 1981, Compositional variations and implications of petrogenesis of the Kernville pluton, southern Sierra Nevada, California: Princeton, N.J., Princeton University, senior thesis, 77 p.

Norman, Meade, 1974, Improved techniques for selective staining of feldspar and other minerals using amaranth: U.S. Geological Survey Journal of Research, v. 2, no. 1, p. 73-79.

Ross, D.C., 1972, Petrographic and chemical reconnaissance study of some granitic and gneissic rocks near the San Andreas fault from Bodega Head to Cajon Pass, California: U.S. Geological Survey Professional Paper 698, 92 p.

----------, 1978, The Salinian block--A Mesozoic granitic orphan in the California Coast Ranges: in Howell, D. G., and

McDougall, K. A., eds., Mesozoic Paleogeography of the western United States; Soc. Econ. Paleontologists and Mineralogists, Pacific Sec., Pacific Coast Paleogeography Symposium 2, p. 509-522.

----------, 1987a, Mafic plutonic rocks of the southern Sierra Nevada, California: U.S. Geological Survey Open-file report 87-275, 42 p.

----------, 1987b, Generalized geologic map of the basement rocks of the southern Sierra Nevada, California: U. S. Geological Survey Open-File Report 87-276, scale 1:250,000, 28 p.

----------, (in press), Metamorphic and plutonic rocks of the southernmost Sierra Nevada, California and their tectonic framework: U. S. Geological Survey Professional Peper 1381, p.

Streckeisen, A. L., and others, 1973, Plutonic rocks. Classification and nomenclature recommended by the IUGS Subcommission on the systematics of igneous rocks: Geotimes, v. 18, no. 10, p. 26-30.

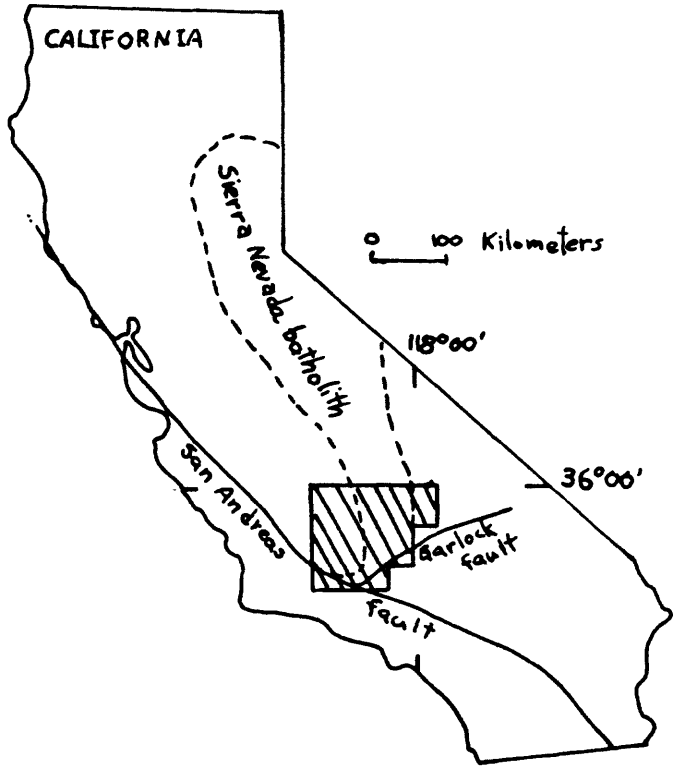


Figure 1 . Index map showing area sampled in the southern Sierra Nevada, California

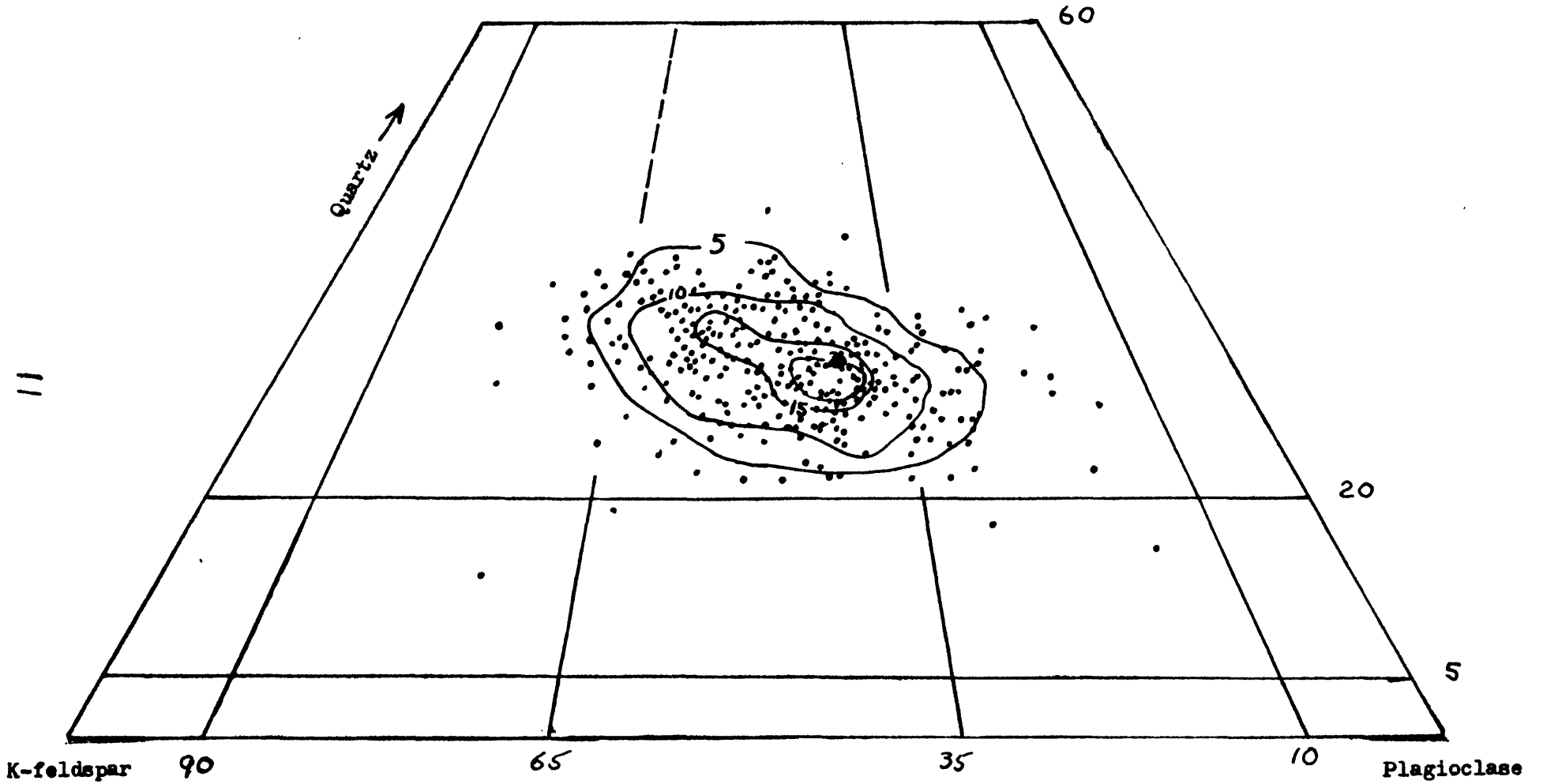


Figure 2. Modal plot of 316 granite samples

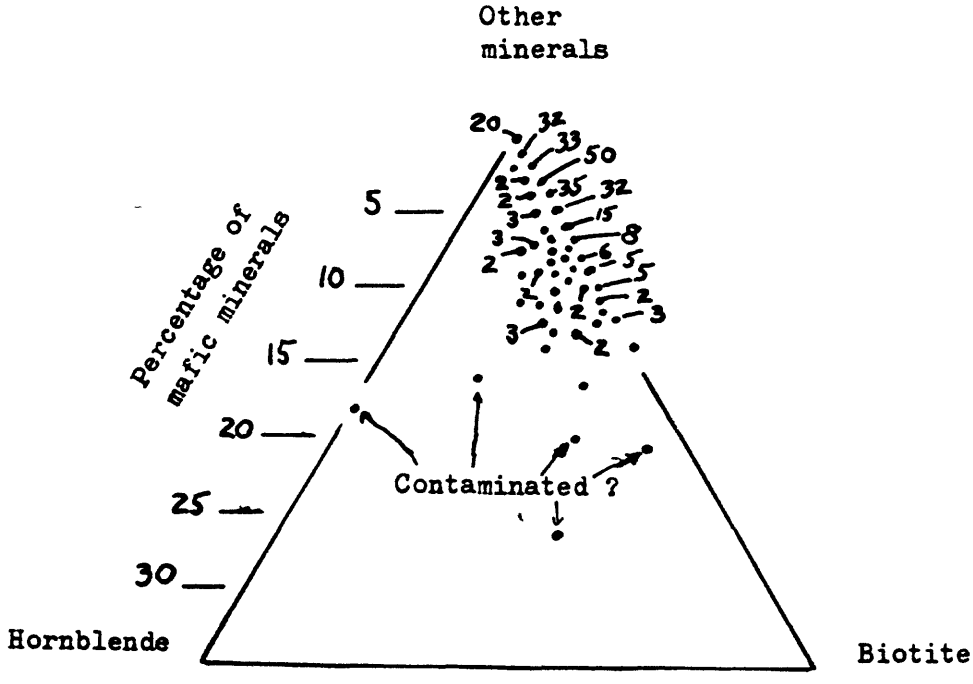


Figure 3 . Modal plot showing percentage of biotite and hornblende for granite samples. Number of superposed points shown.

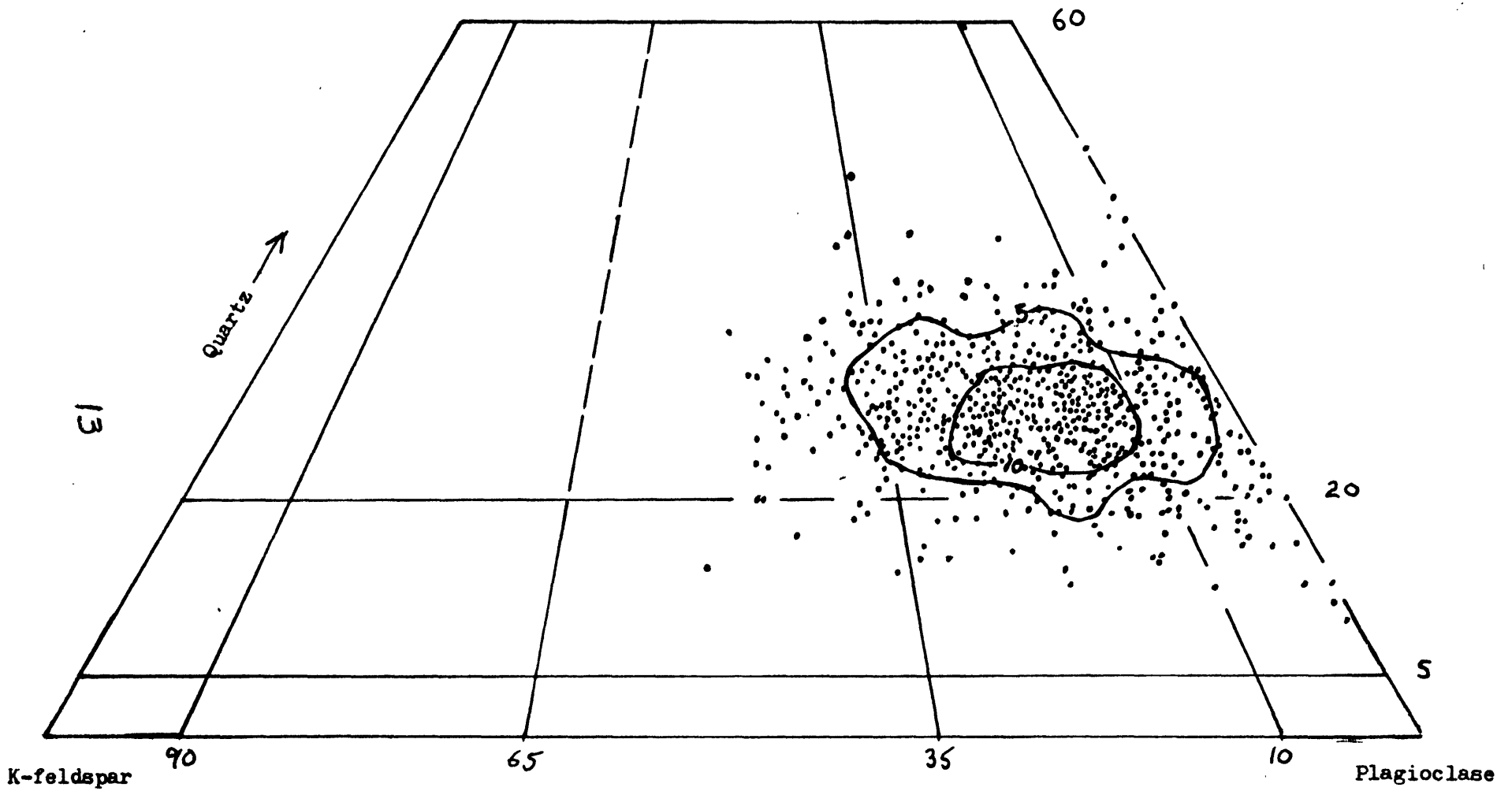


Figure 4. Modal plot of 774 granodiorite samples

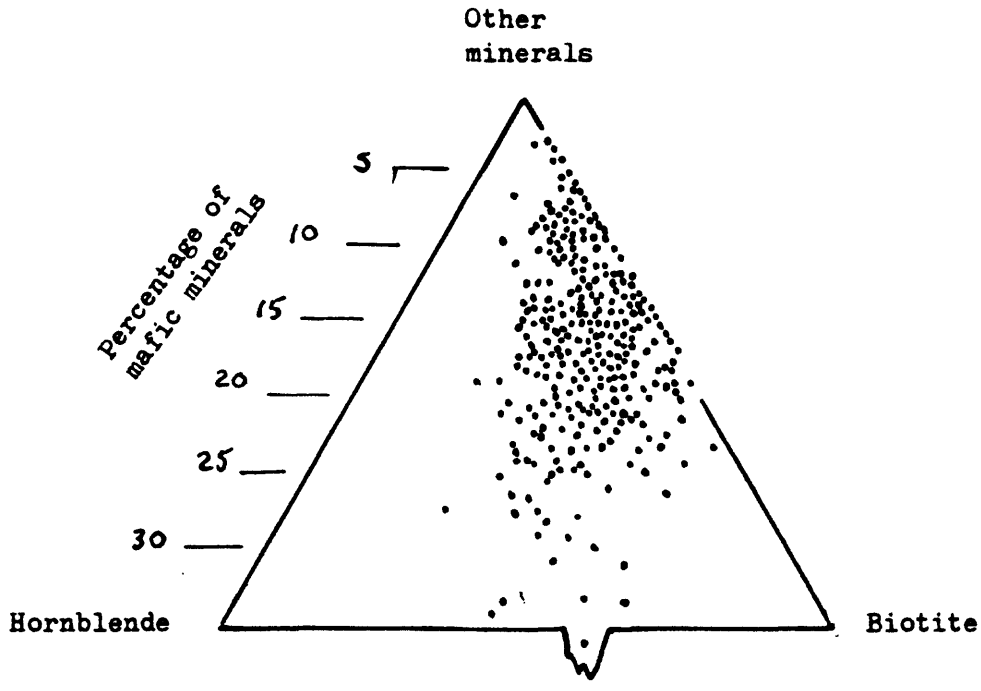


Figure 5. Modal plot showing percentage of biotite and hornblende for granodiorite samples.

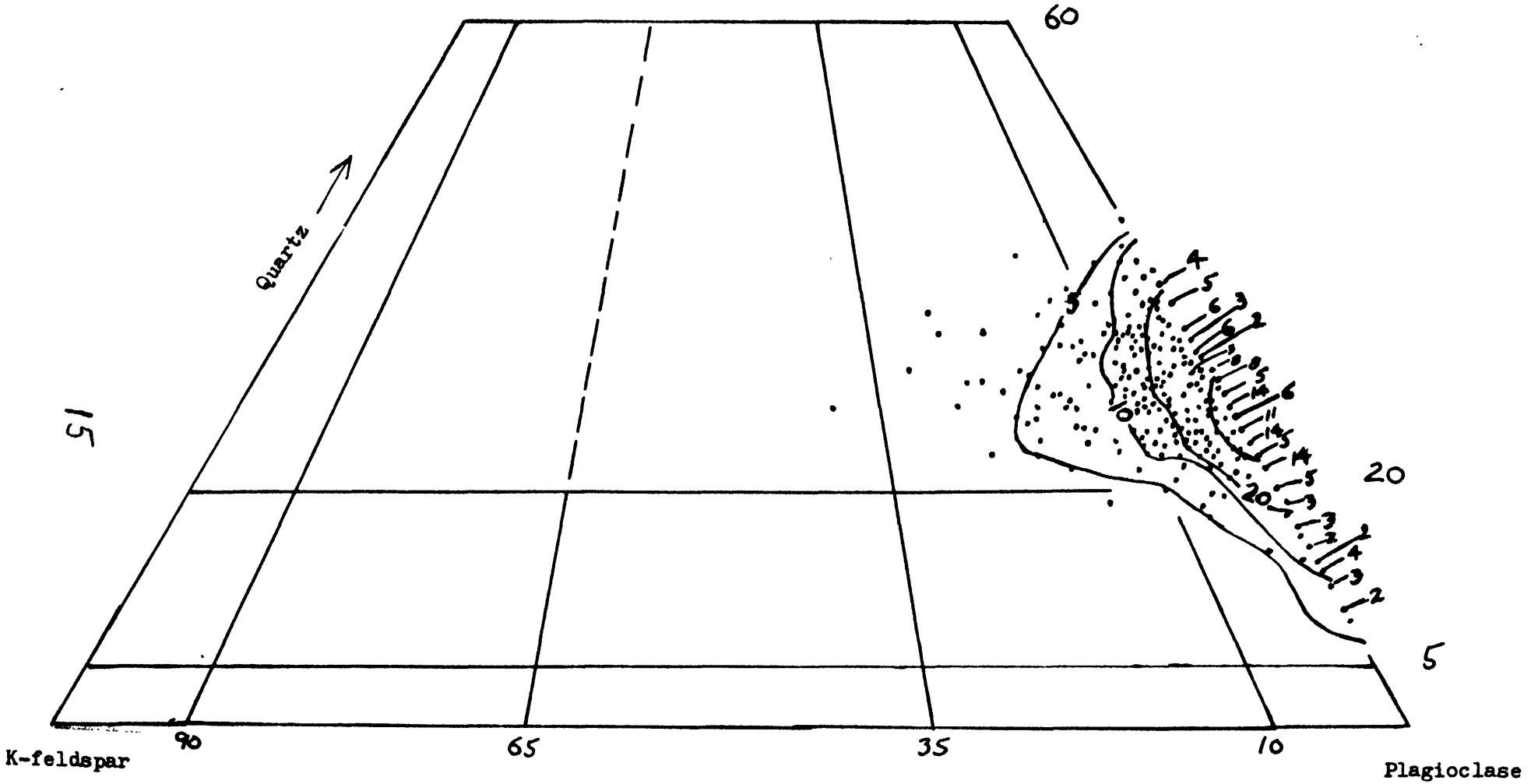


Figure 6. Modal plot of 366 tonalite samples. Number of superposed points shown along margin of triangle. Contour showing 30 times concentration is unlabelled to avoid clutter.

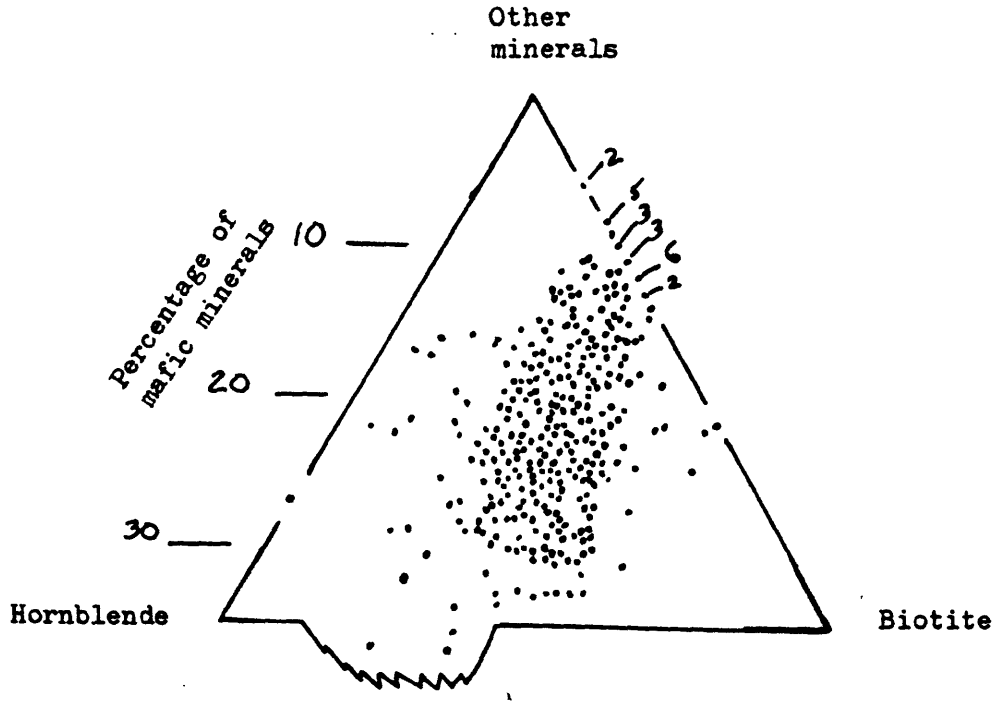


Figure 7. Modal plot showing percentage of biotite and hornblende for tonalite samples. Number of superposed points shown.

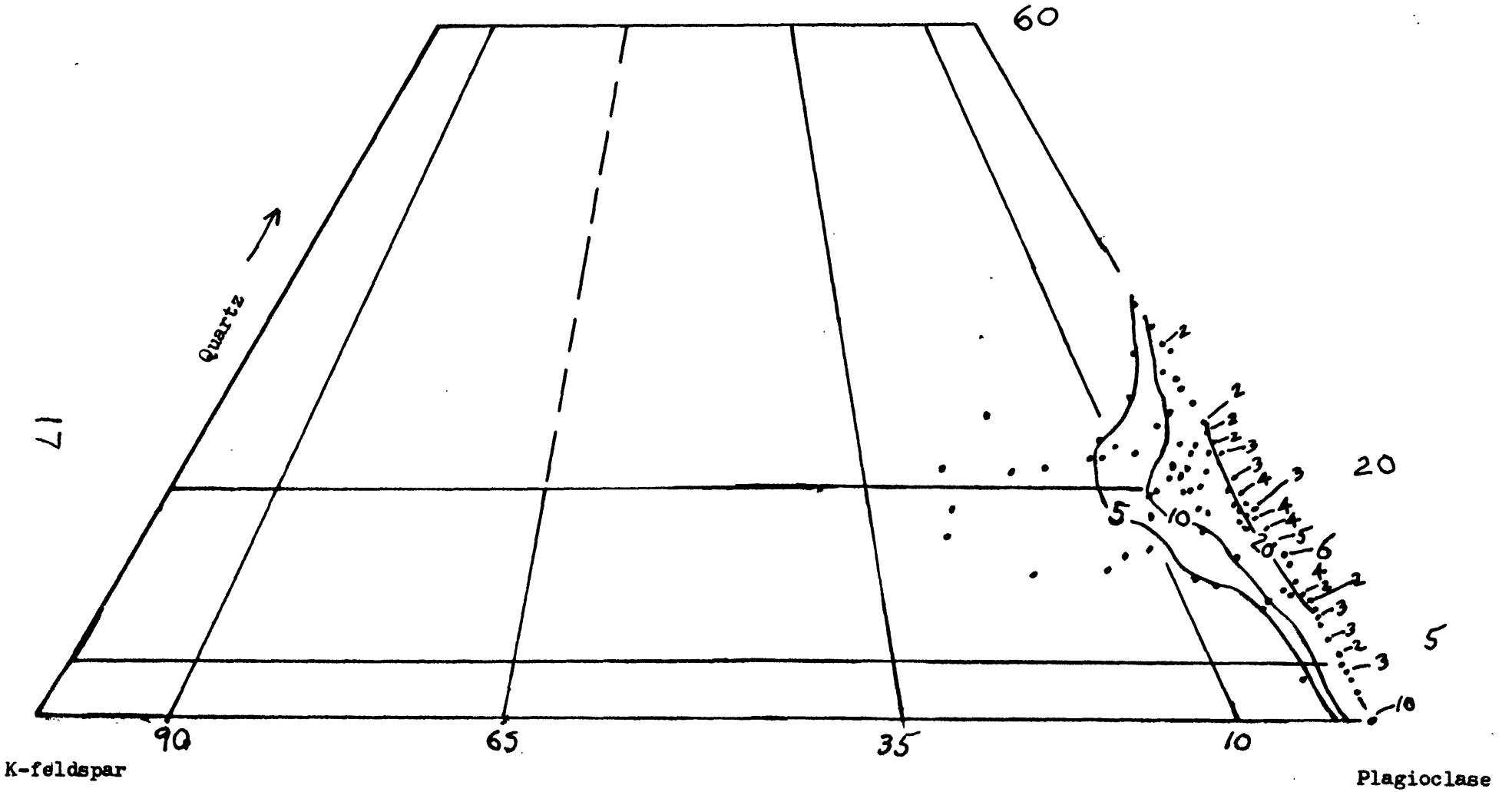


Figure 8. Modal plot of 154 quartz diorite samples. Number of superposed points shown.

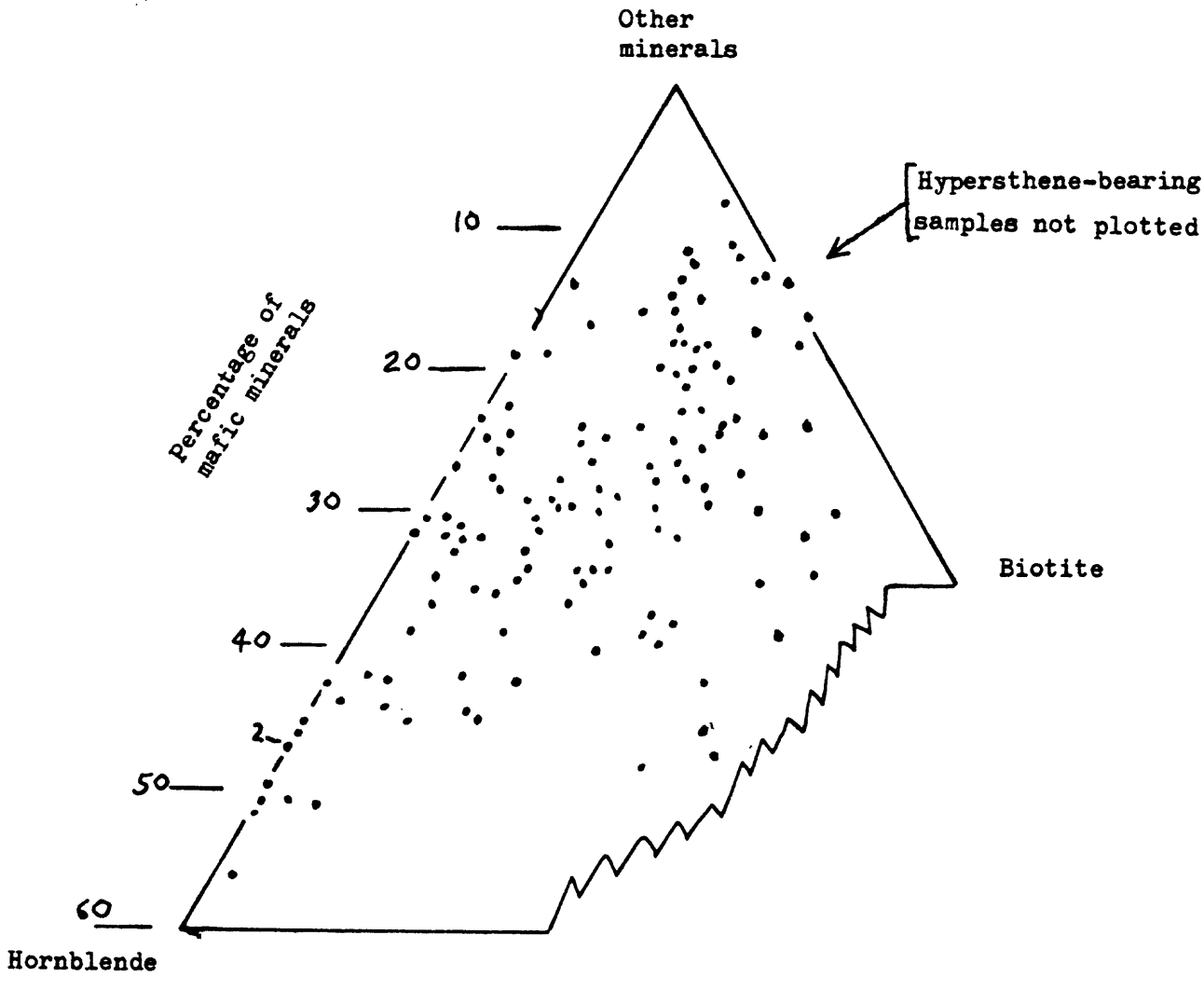


Figure 9. Modal plot showing percentage of biotite and hornblende for quartz diorite samples.

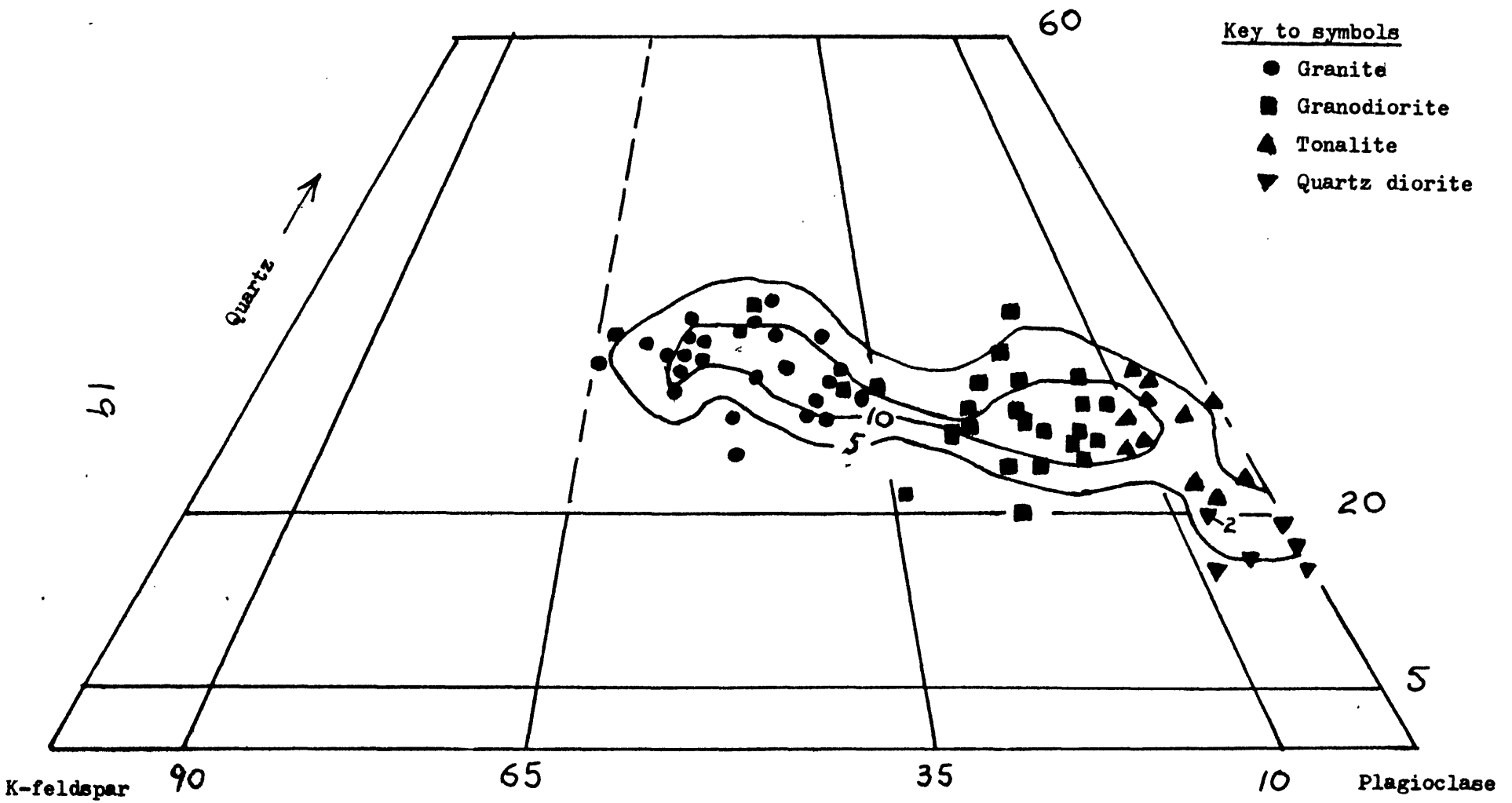
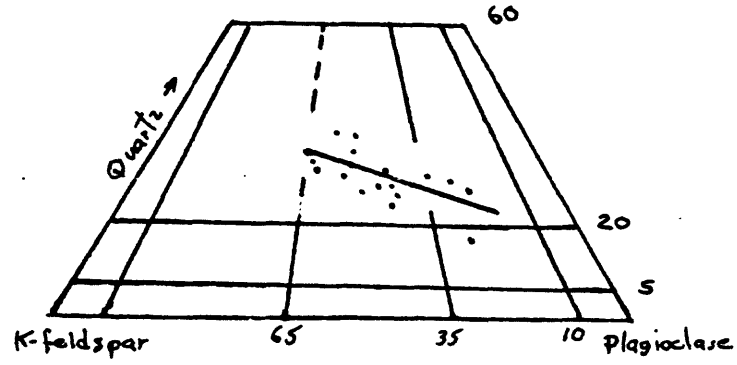
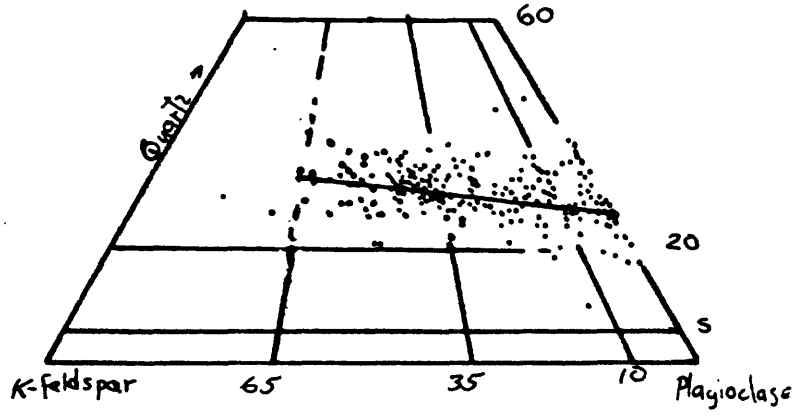


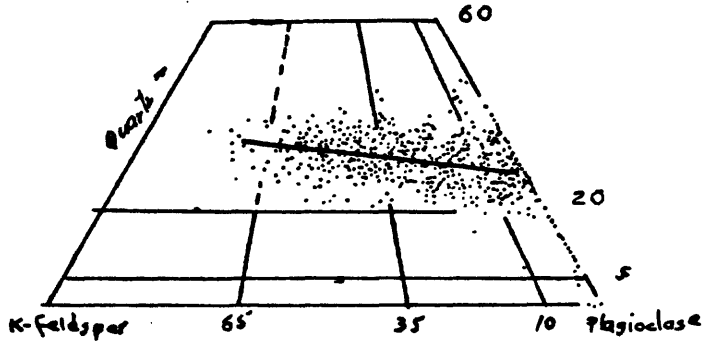
Figure 10. Modal plot of average of each of 67 granitic bodies



Modal averages of granitic bodies, Bishop district, east-central Sierra Nevada (Bateman, 1965)



Composite modal plots of granitic rocks Coast Ranges, California (Ross, 1972)



Modal plots of granitic rocks, central block, Salinian block, California (Ross, 1978)

Figure 11. Comparative modal data for the east-central Sierra Nevada and the Coast Ranges, California

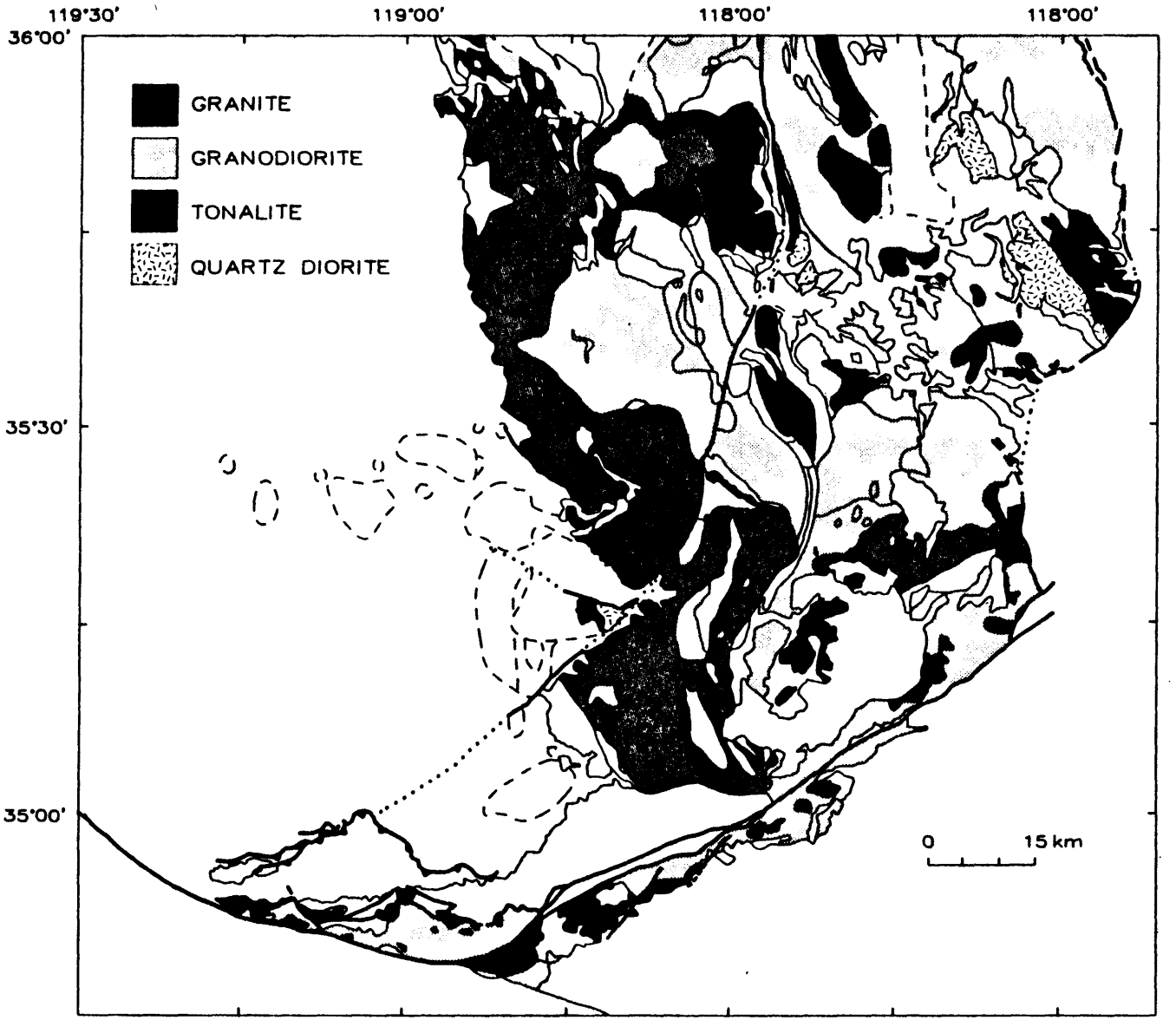


Figure 12. Areas underlain predominantly by granite (approximately 1050 km^2), granodiorite (approximately 2700 km^2), tonalite (approximately 1600 km^2), and quartz diorite (approximately 175 km^2) in the southern Sierra Nevada

APPENDIX

Modes, modal plots, location of modal samples, and index map of;

GRANITE of:

- Arrastre Creek
- Baker Point
- Big Blue mine area
- Bishop Ranch
- Black Mountain
- Bob Rabbit Canyon
- Bodfish Canyon
- Brush Mountain
- Cannell Creek
- Five Fingers
- Kern River
- Lone Tree Canyon
- Long Meadow
- Old Hot Springs Road
- Onyx
- Portuguese Pass
- Robbers Roost
- Saddle Spring Road
- Sherman Pass
- Tehachapi Airport
- Tejon Lookout and Bean Canyon
- Miscellaneous bodies, east side of the Sierra Nevada
- Miscellaneous, mostly dikes

GRANODIORITE of:

- Alder Creek
- Alta Sierra
- Brush Creek
- Cameron
- Castle Rock
- Deer Creek
- Democrat Springs
- Evans Flat
- Gato-Montes
- Hatchet Peak
- Keene
- Lebec
- Lime Point
- Peppermint Meadow
- Pine Flat
- Poso Flat
- Rabbit Island
- Sacatar
- Sorrell Peak
- Wagy Flat
- Whiterock

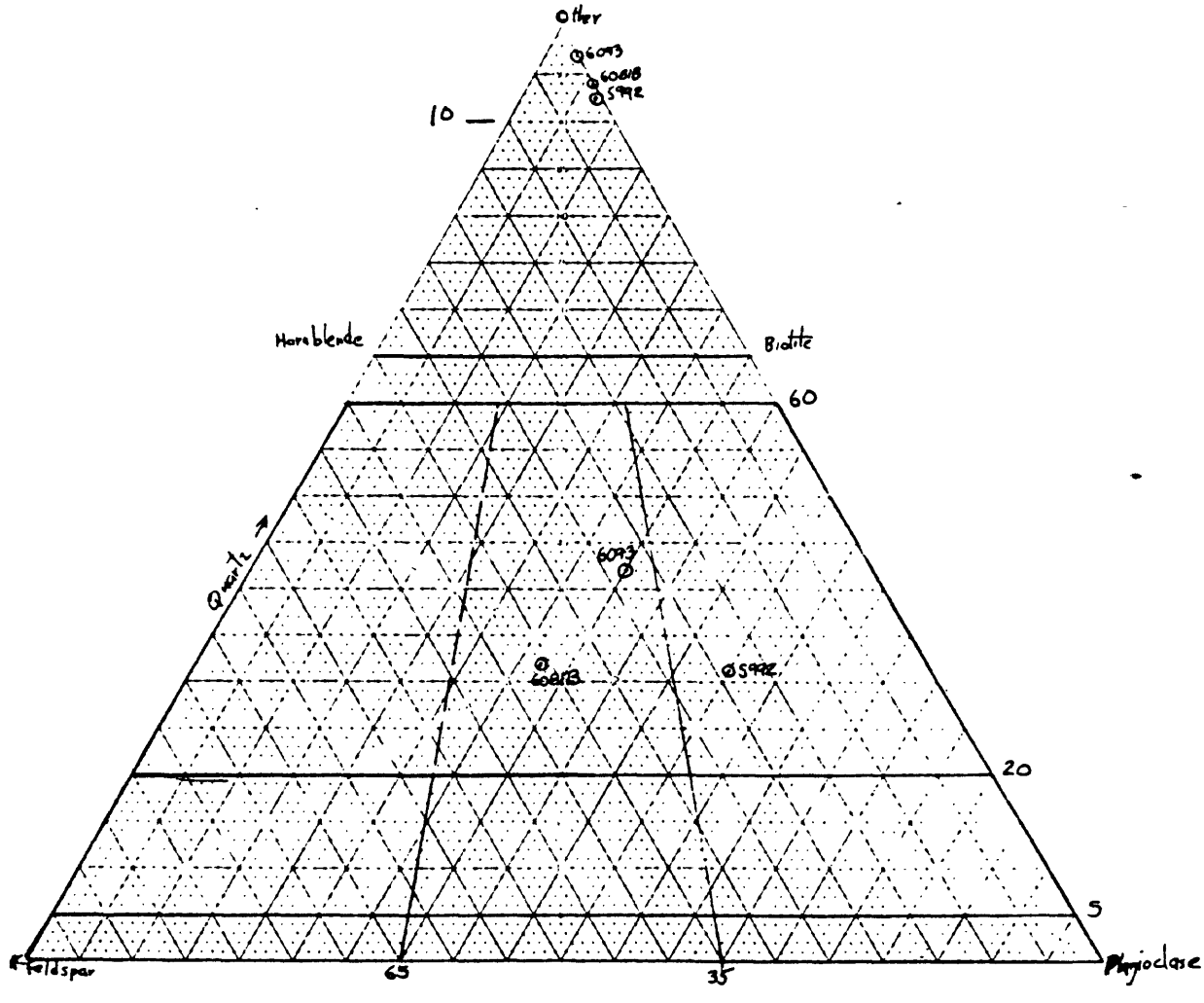
TONALITE of:
- Antimony Peak
- Bear Valley Springs
- Carver-Bowen Ranch
- Dunlap Meadow
- Fountain Springs
- Hoffman Canyon
- Mount Adelaide
- Walt Klein Ranch
- Wofford Heights
- Woody
- Zumwalt Ranch

QUARTZ DIORITE
- Caliente
- Cyrus Flat
- Freeman Junction
- Long Valley
- Rhymes Campground
- Tehachapi Mountains
- Walker Pass
- Miscellaneous hypersthene-bearing rocks

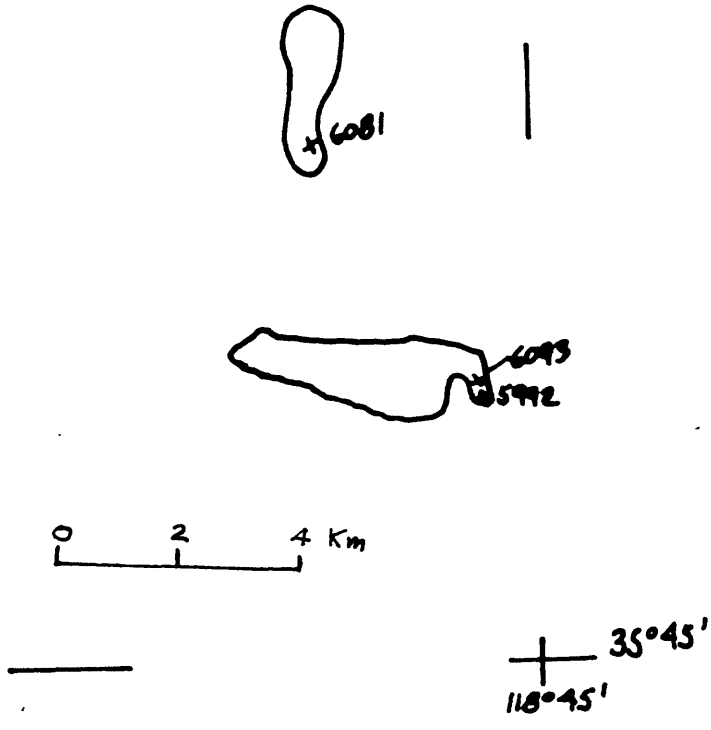
MONZONITE
- Erskine Creek

MODES OF GRANITE OF ARRASTRE CREEK

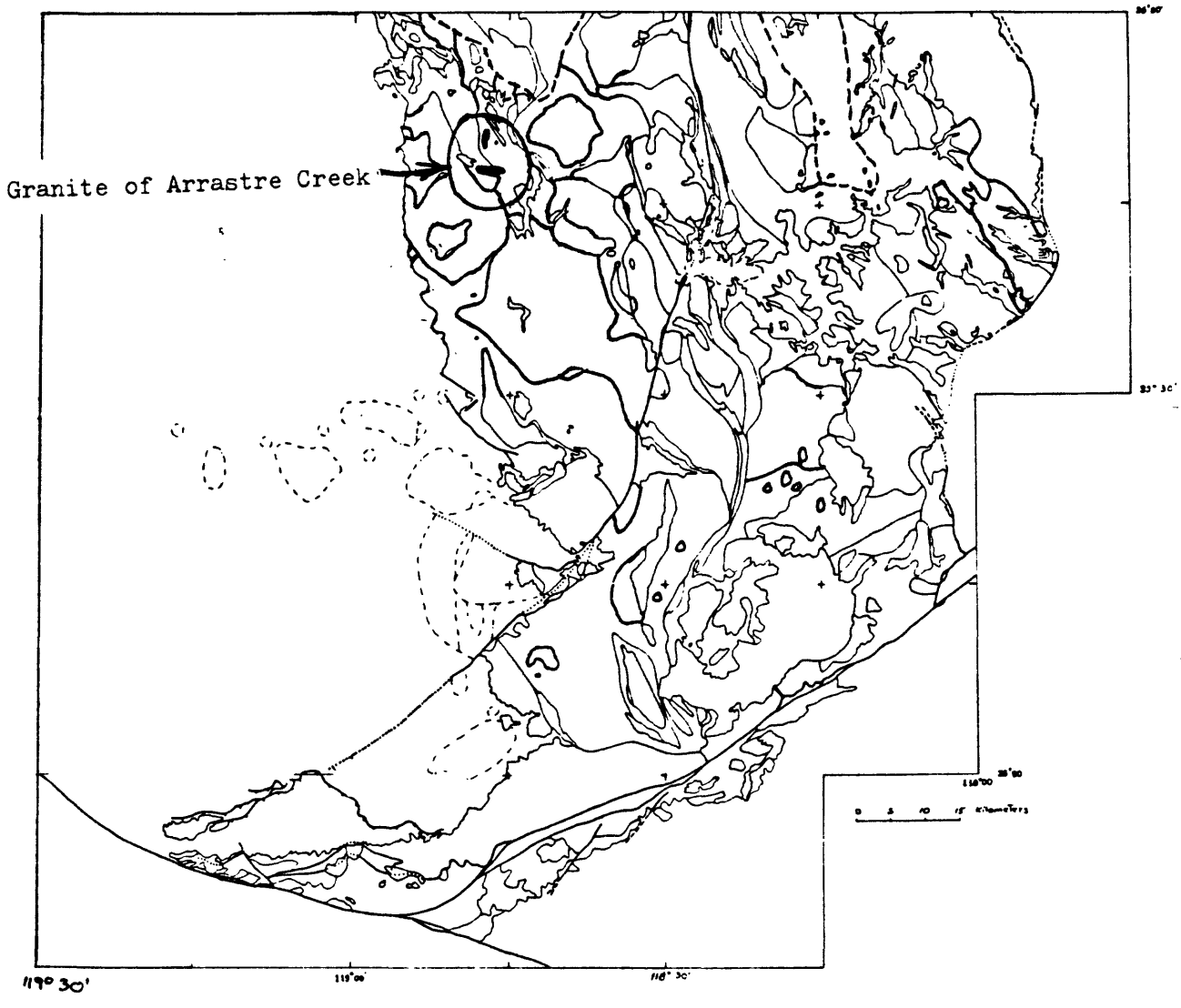
Sample Number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende
5992	46	18	29	7	<1
6081B	30	34	30	6	-
6093	34	22	41	3	-



Modal plot of Granite of Arrastre Creek

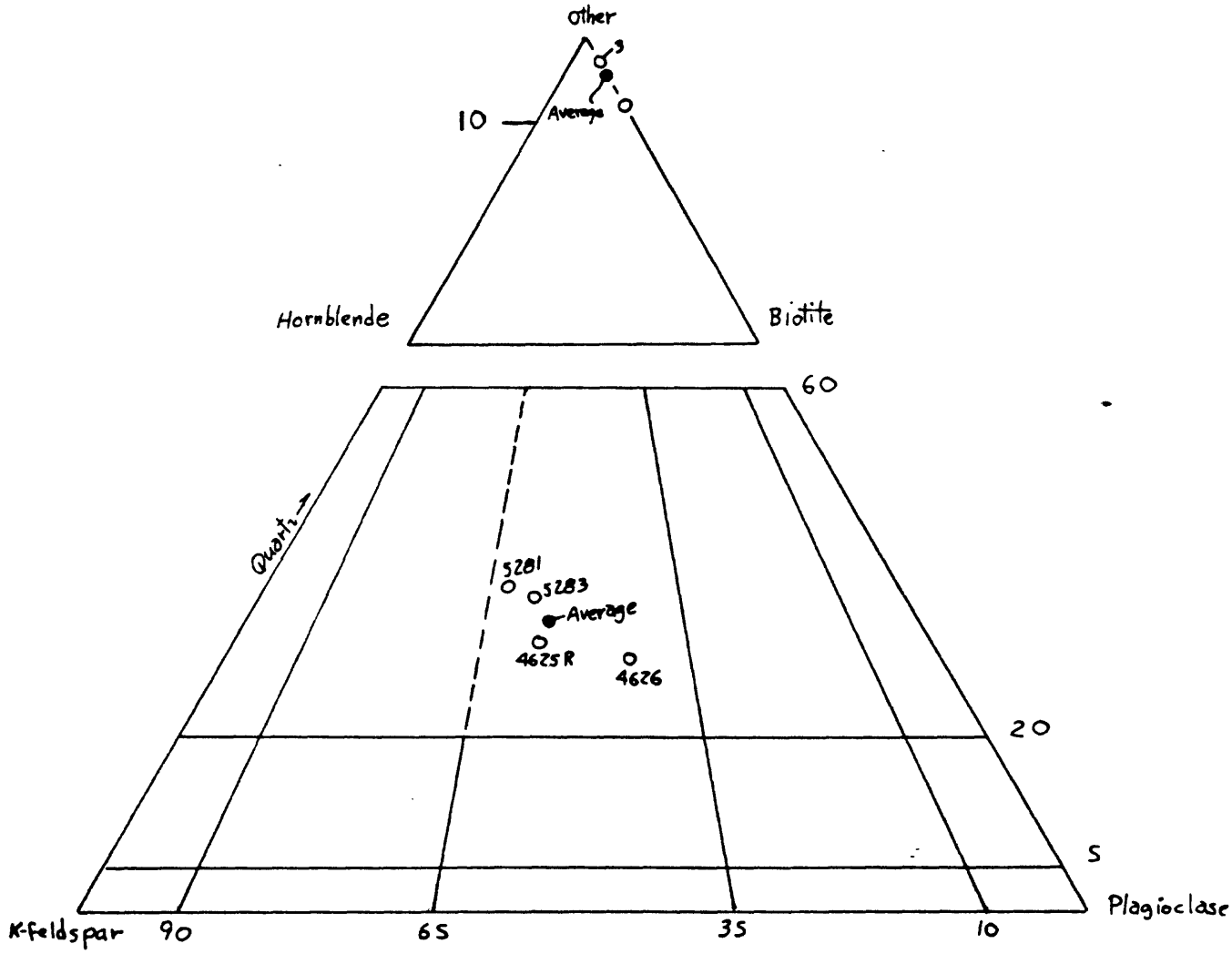


Location of modal samples of Granite of Arrastre Creek

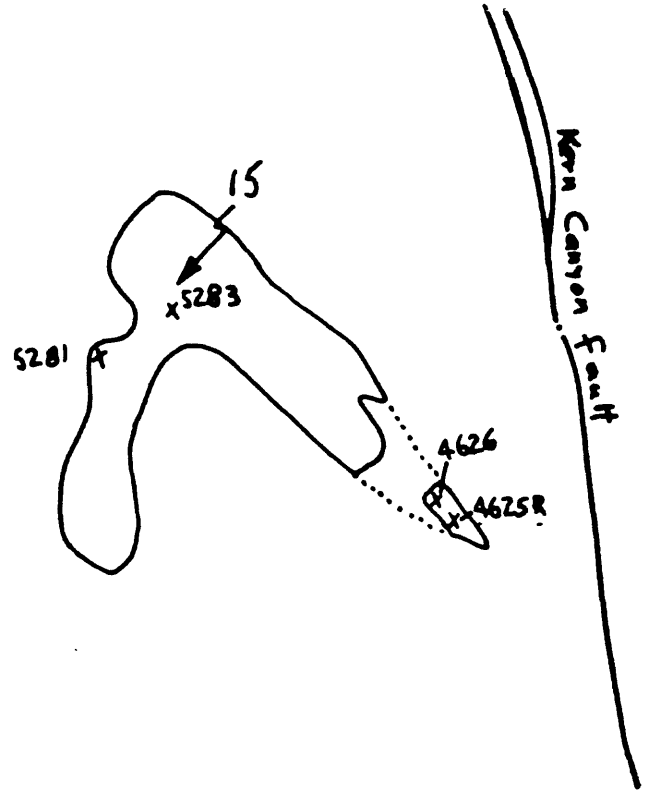

Granite of Arrastre Creek
119° 30'

MODES OF GRANITE OF BAKER POINT

Sample number	Plagioclase	K-feldspar	Quartz	Biotite	Other	Spec. f. gravity
4625R	29	38	30	3		-
4626	37	28	27	8		2.59
5281	23	38	36	3		-
5283	26	36	35	3		-
Average	29	35	32	4		-
Standard deviation	(6.0)	(4.8)	(4.2)	(2.5)		-



Modal plot of Granite of Baker Point



118°30'

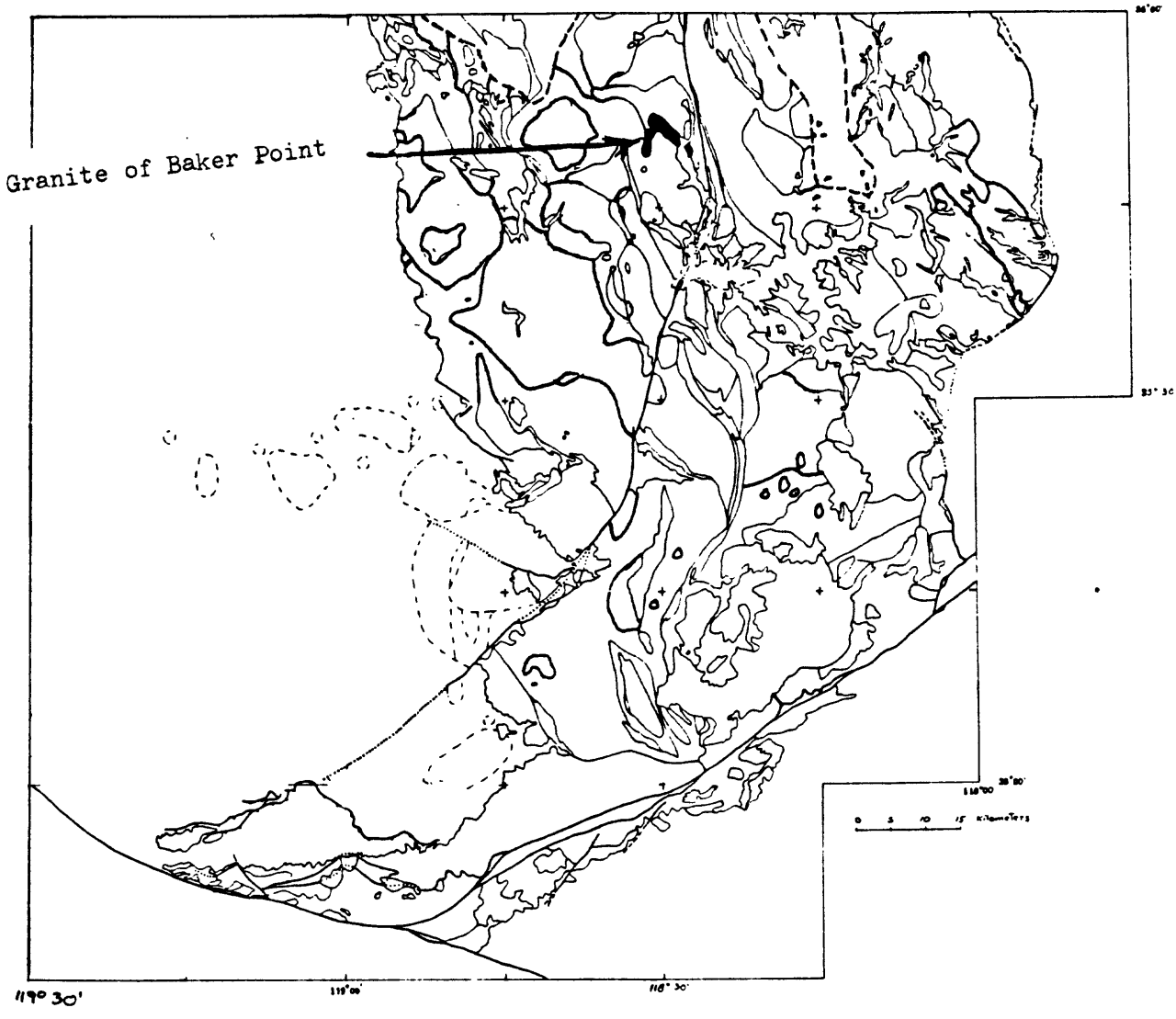
35°45'

X Mode

15 An of plagioclase (index oils)

0 2 4 Km

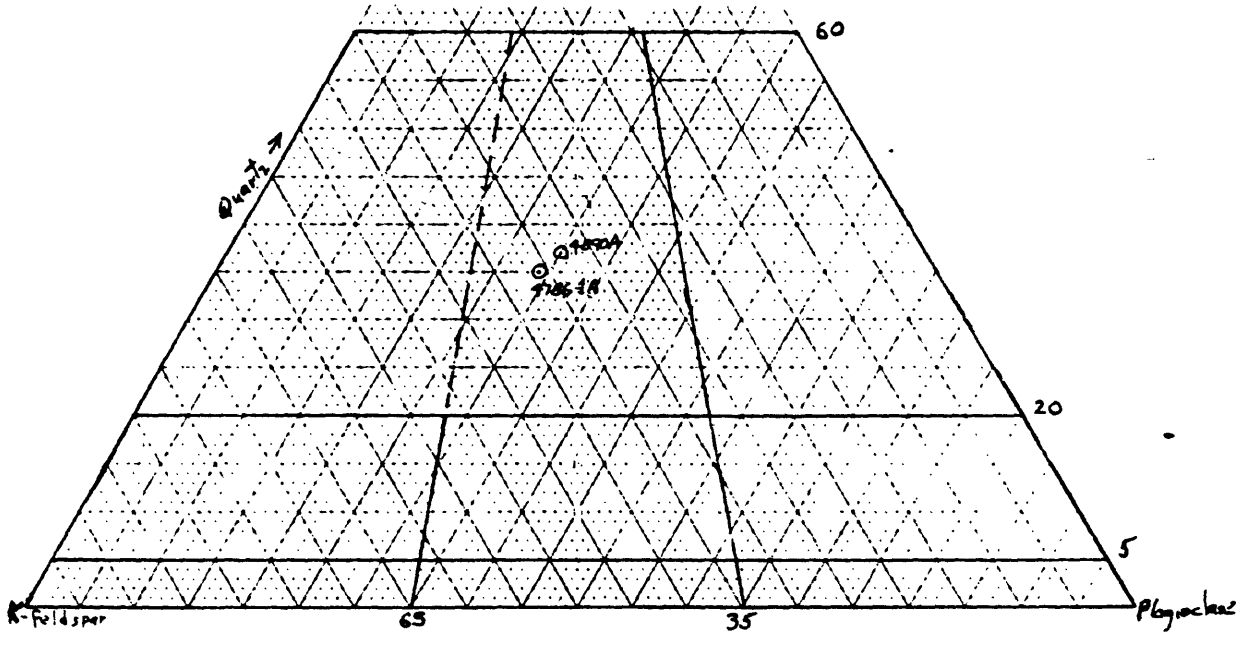
Location of modal samples of Granite of Baker Point


Granite of Baker Point
119° 30'

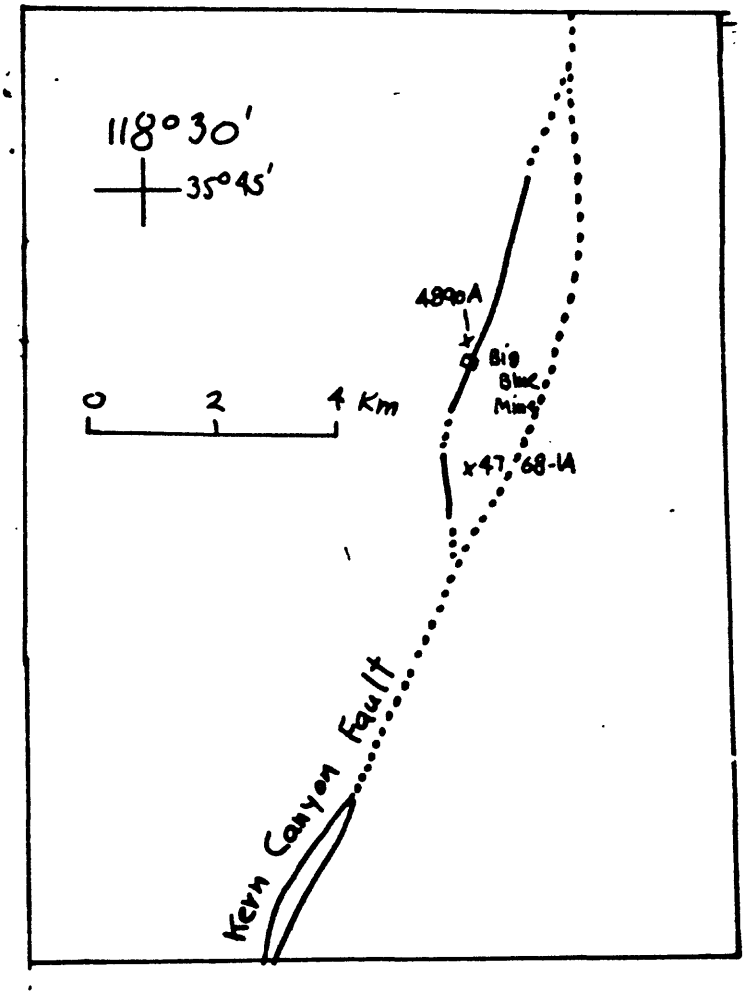
MODES OF ALASKITE OF BIG BLUE MINE AREA

(not a map unit)

Sample number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende		Other		Specific gravity
4768-A	29	36	35	<1	-				2.58
4890A	30	33	37	-	-				2.57



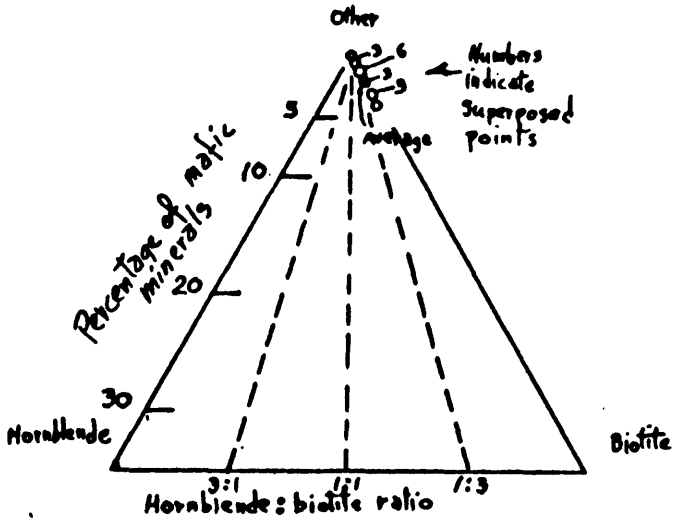
Modal plot of Alaskite of Big Blue mine area

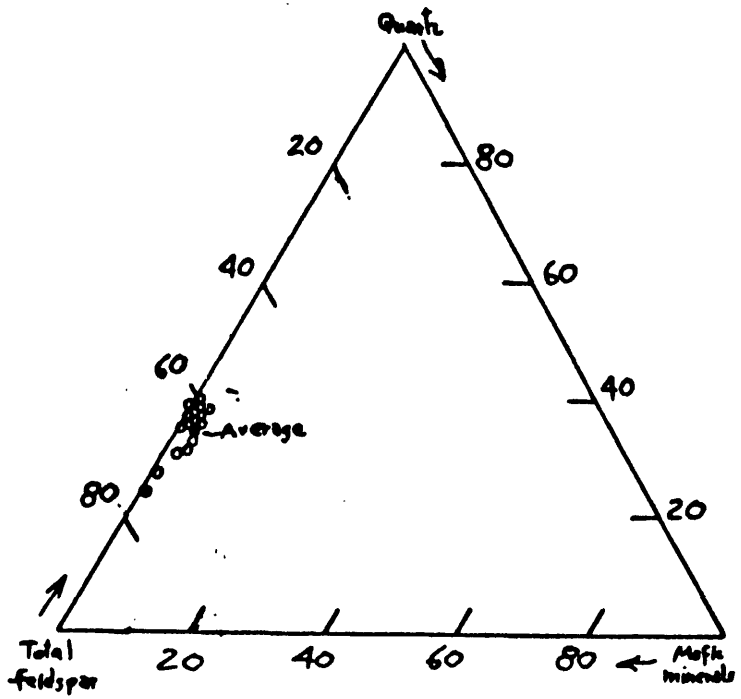


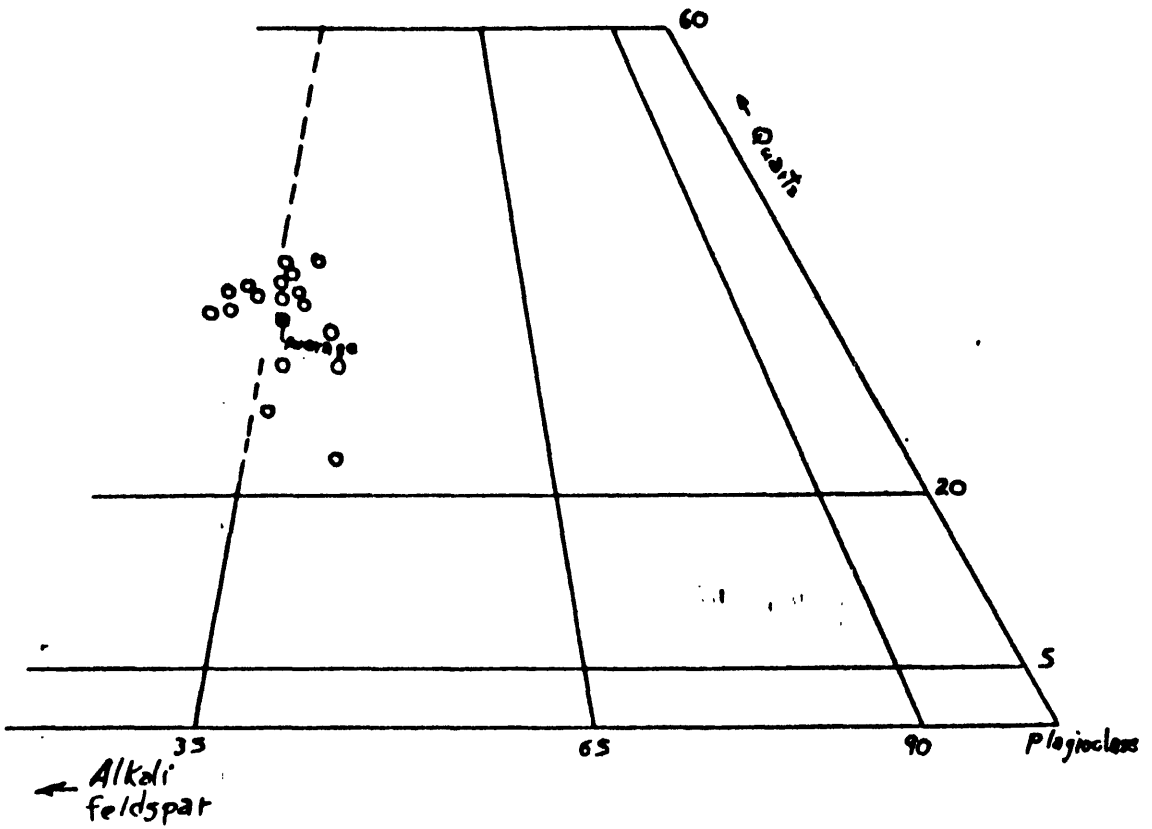
Location of modal samples of Alaskite of Big Blue mine area

MODES OF GRANITE OF BISHOP RANCH

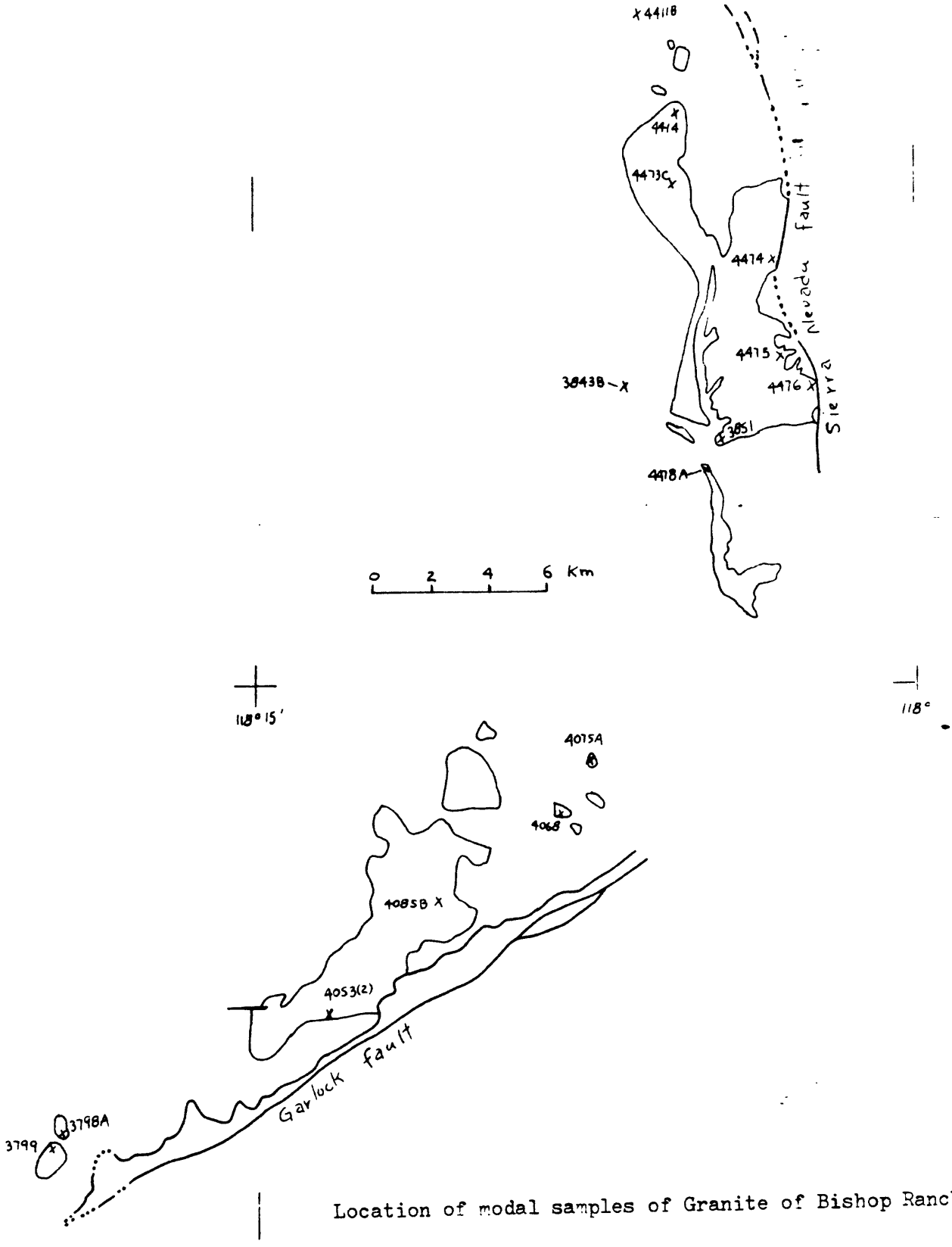
Sample	Plagioclase	K-feldspar	Quartz	Biotite	Opaque minerals	Specific gravity
3798A	33	42	23	1	1	2.54
3799	22	39	39	<1	---	2.49
3843B	18	45	35	2	---	2.60
3851	23	39	36	2	---	2.55
4053	25	42	30	3	---	2.61
4053FL	29	38	30	3	---	2.59
4068	20	43	35	2	---	2.61
4075A	20.5	42	36.5	.5	.5	2.61
4085B	25	38	36	1	---	2.58
4411B	27	36	32	4	1	2.61
4414	22	39	37	1	1	2.59
4473C	24	38	37	.5	.5	2.60
4474	19	43	37	1	---	2.55
4475	27	45	27	1	---	2.59
4476	21	38	38	3	---	2.60
4478A	24	36	39	.5	.5	2.61
4563C	21	41	36	1	1	2.61
Average--------	24	40	34	2	<1	2.58
Standard deviation.	3.9	2.9	4.5	1.1	---	.03



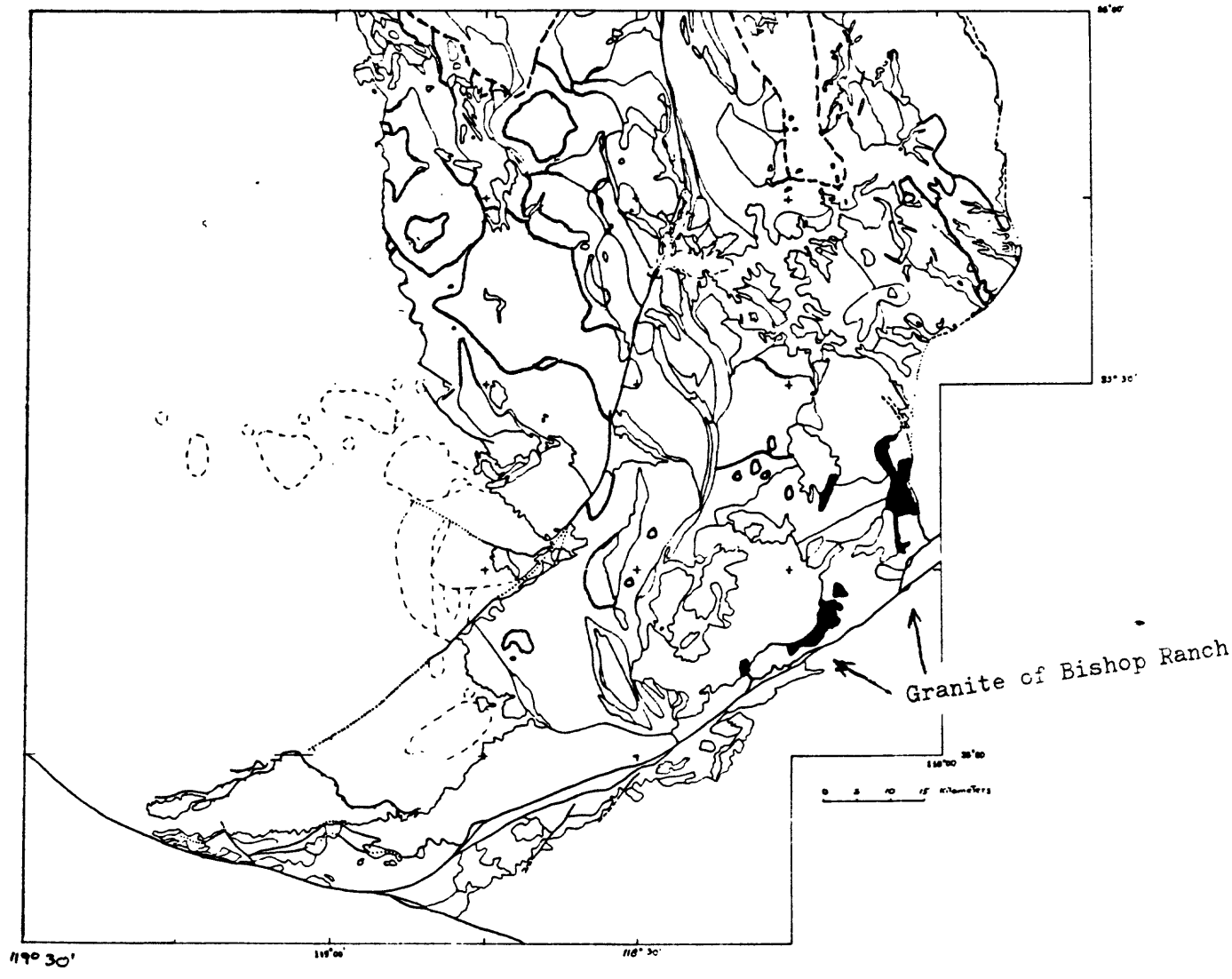




Modal plots of Granite of Bishop Ranch

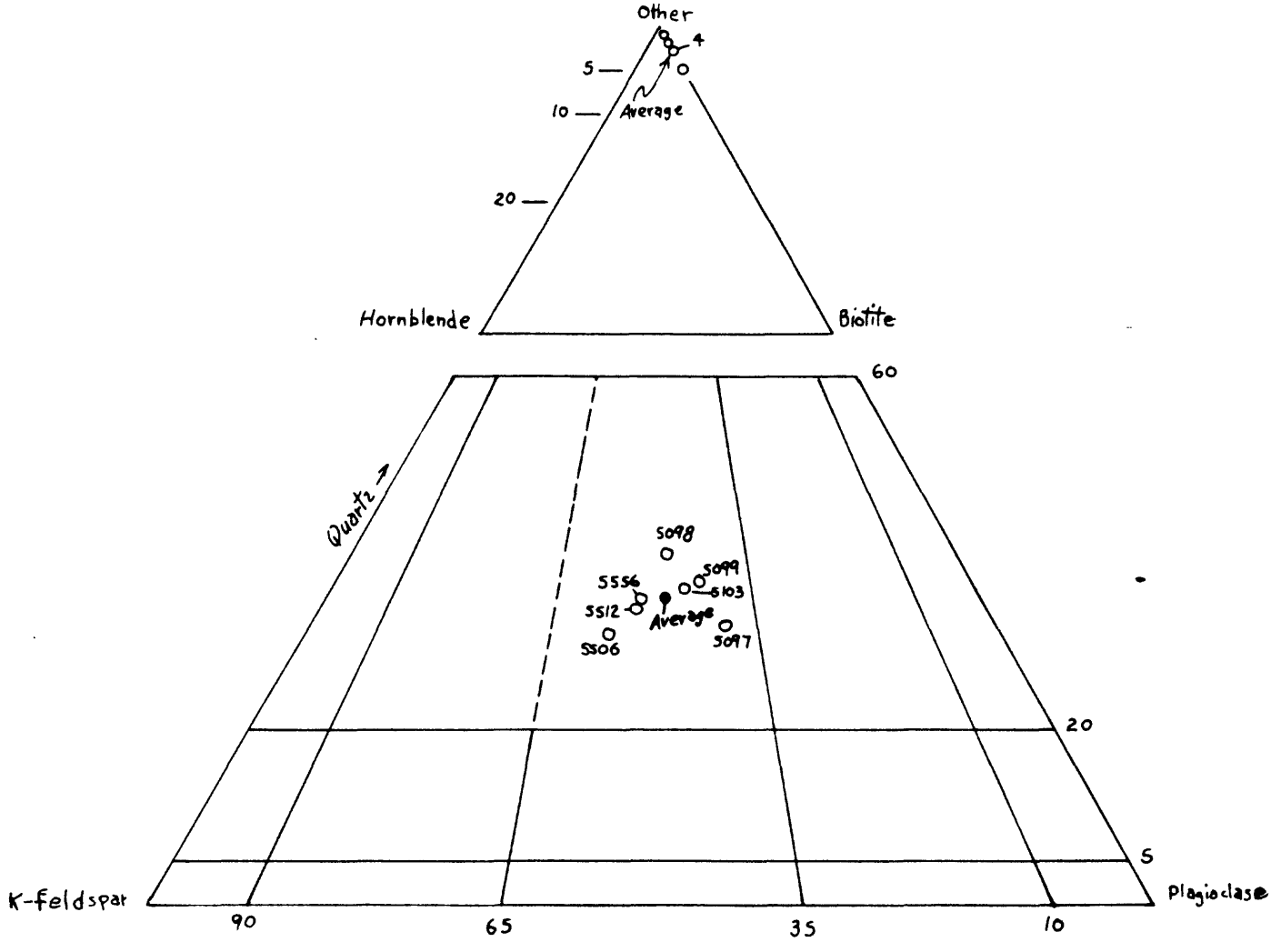


Location of modal samples of Granite of Bishop Ranch

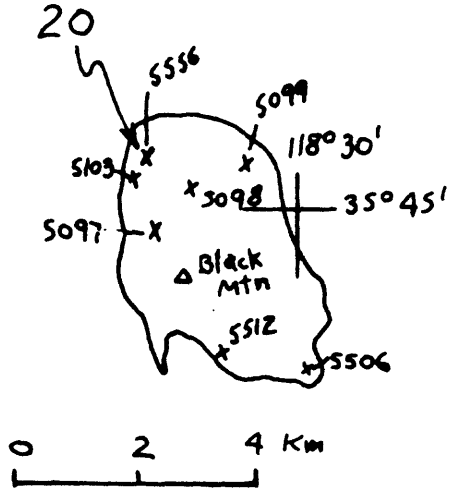

Granite of Bishop Ranch
119° 30'
118° 30'

MODES OF GRANITE OF BLACK MOUNTAIN

Sample number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Other	Specific gravity
-5097	40	27	32	1	-		2.61
-5098	30	28	39	3	-		2.61
-5099	34	26	35	5	-		2.61
-5103	34	28	35	3	-		2.61
-5506	29	38	30	2	-	Garnet 1	
-5512	30	34	33	3	-		
-5556	30	33	34	3	-		
Average	32.5	30.5	34	3	-		
Standard deviation	(3.9)	(4.5)	(2.8)	(1.2)			



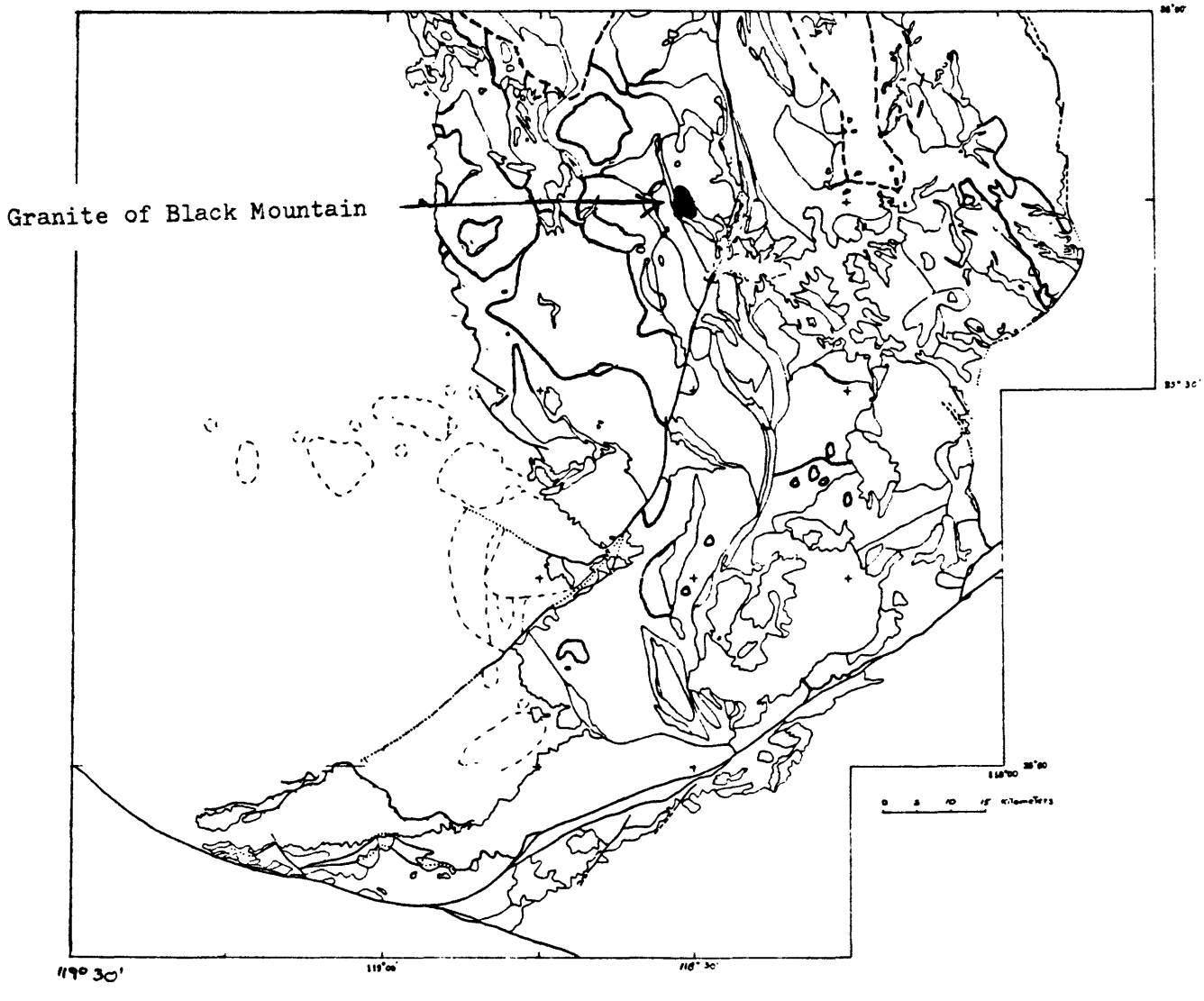
Modal plot of Granite of Black Mountain



X Mode

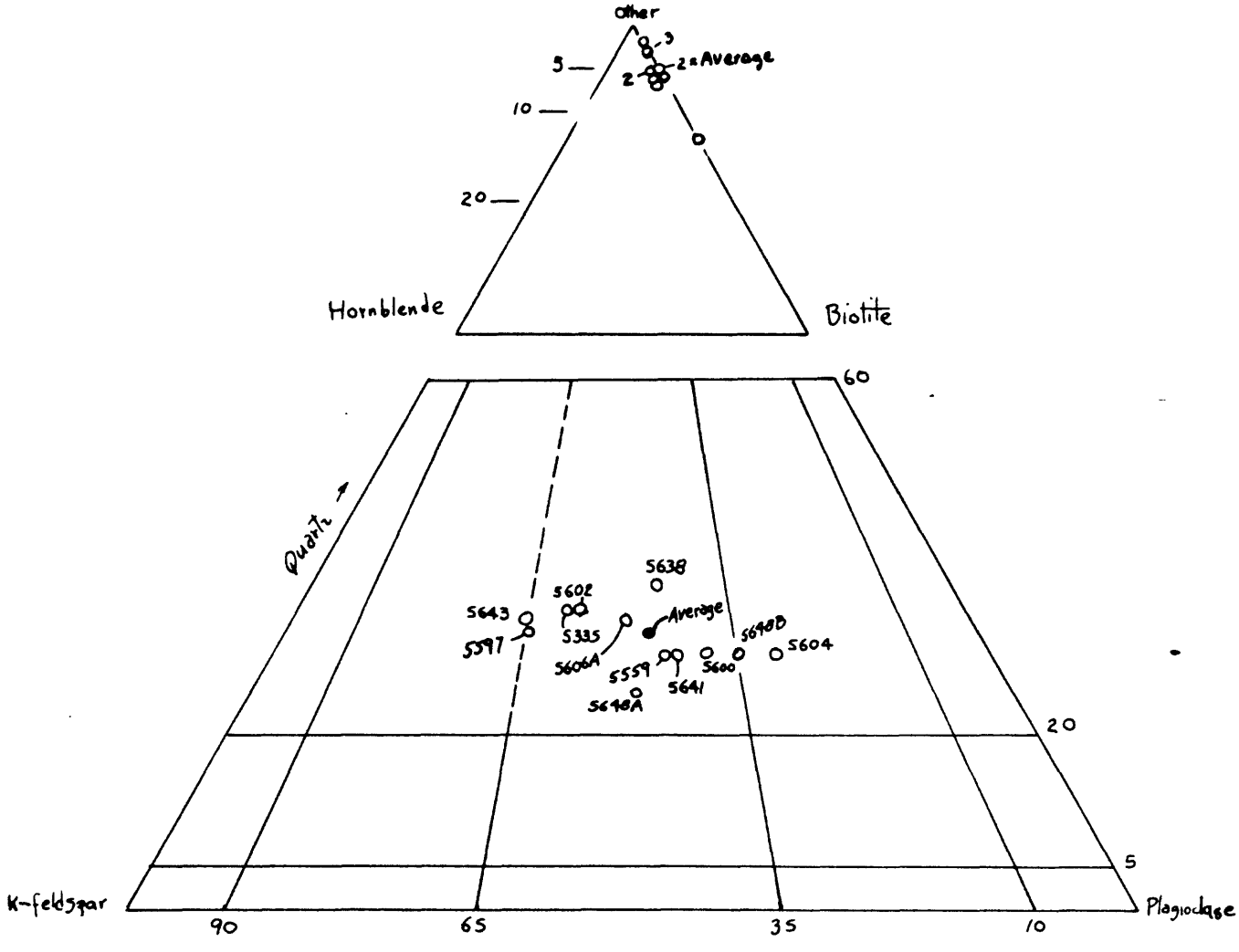
20 → An of plagioclase (index oils)

Location of modal samples of Granite of Black Mountain

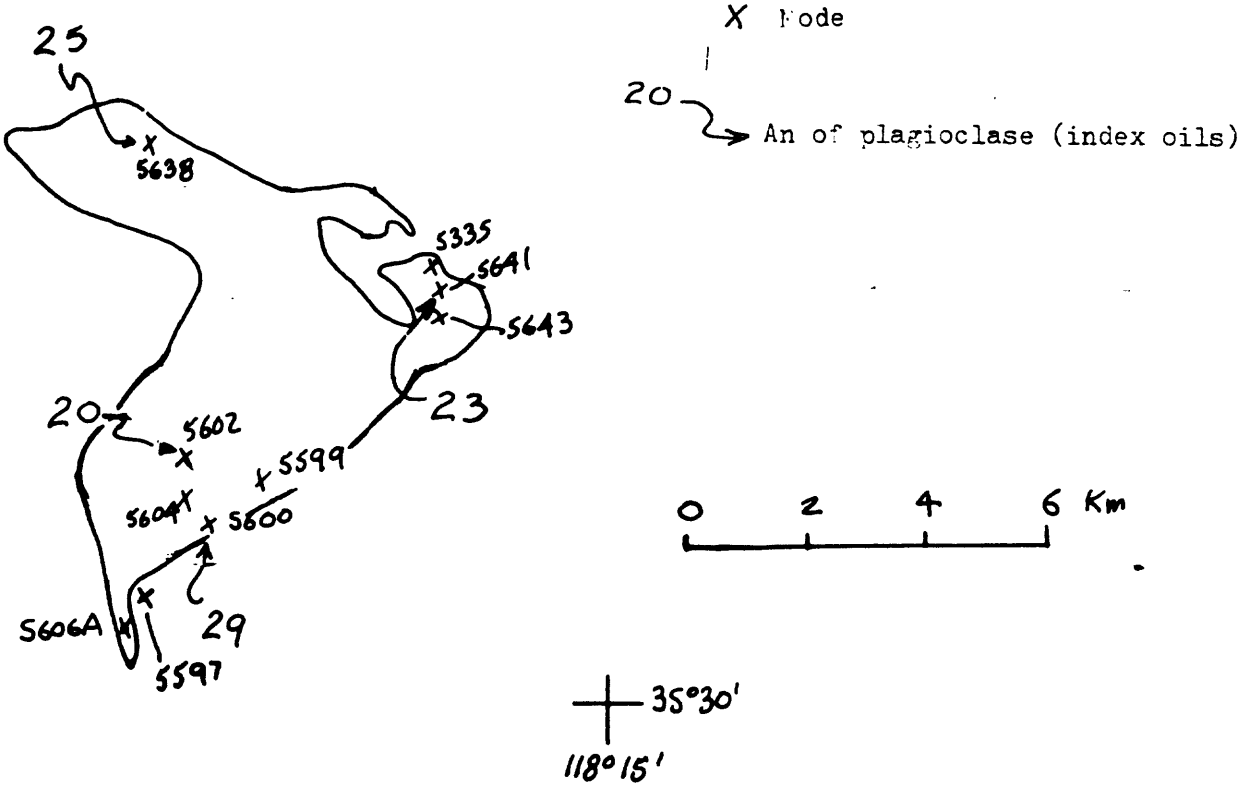

Granite of Black Mountain
119° 30'

MODES OF GRANITE OF BOB RABBIT CANYON

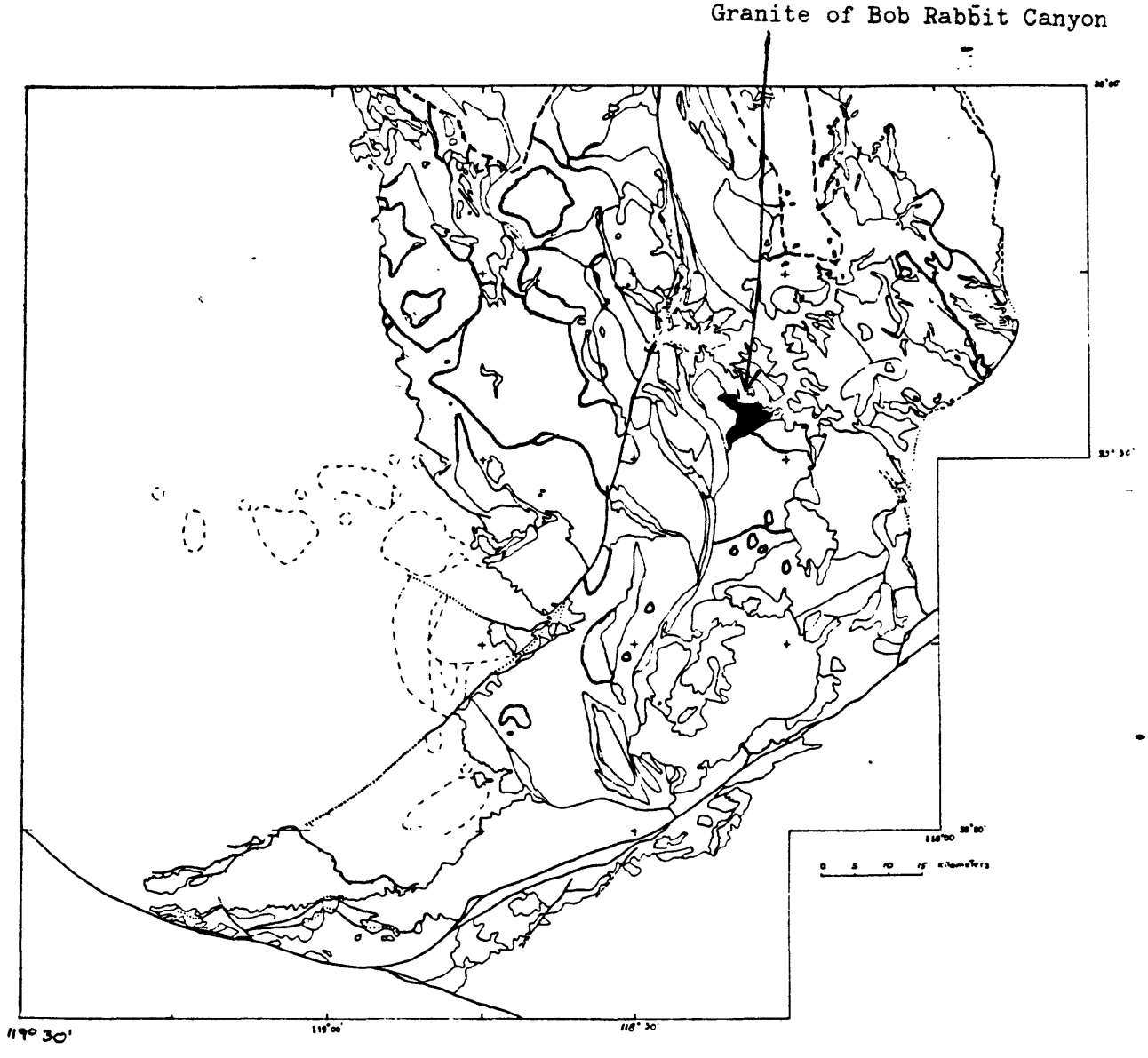
Sample Number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Other
5335	26	38	33	3	-	
5597	23	42	30	4	1	
5599	38	29	27	5	1	
5600	40	26	27	6	1	Sphene 1
5602	27	37	33	1	<1	Allanite 1
5604	46.5	20	27	5.5	1	-
5606A	31	32	31	6	-	-
5638	32	28	35	5	<1	Garnet <1
5641	38	29	28	5	-	-
5643	22	43	32	3	-	-
5648A	37	36	25	2	-	Allanite <1
5648B	40	22	25	13	<1	Allanite <1
Average	34	31	30	5	<1	<1
Standard deviation	7.5	7.3	3.7	3.3	-	-



Modal plot of Granite of Bob Rabbit Canyon

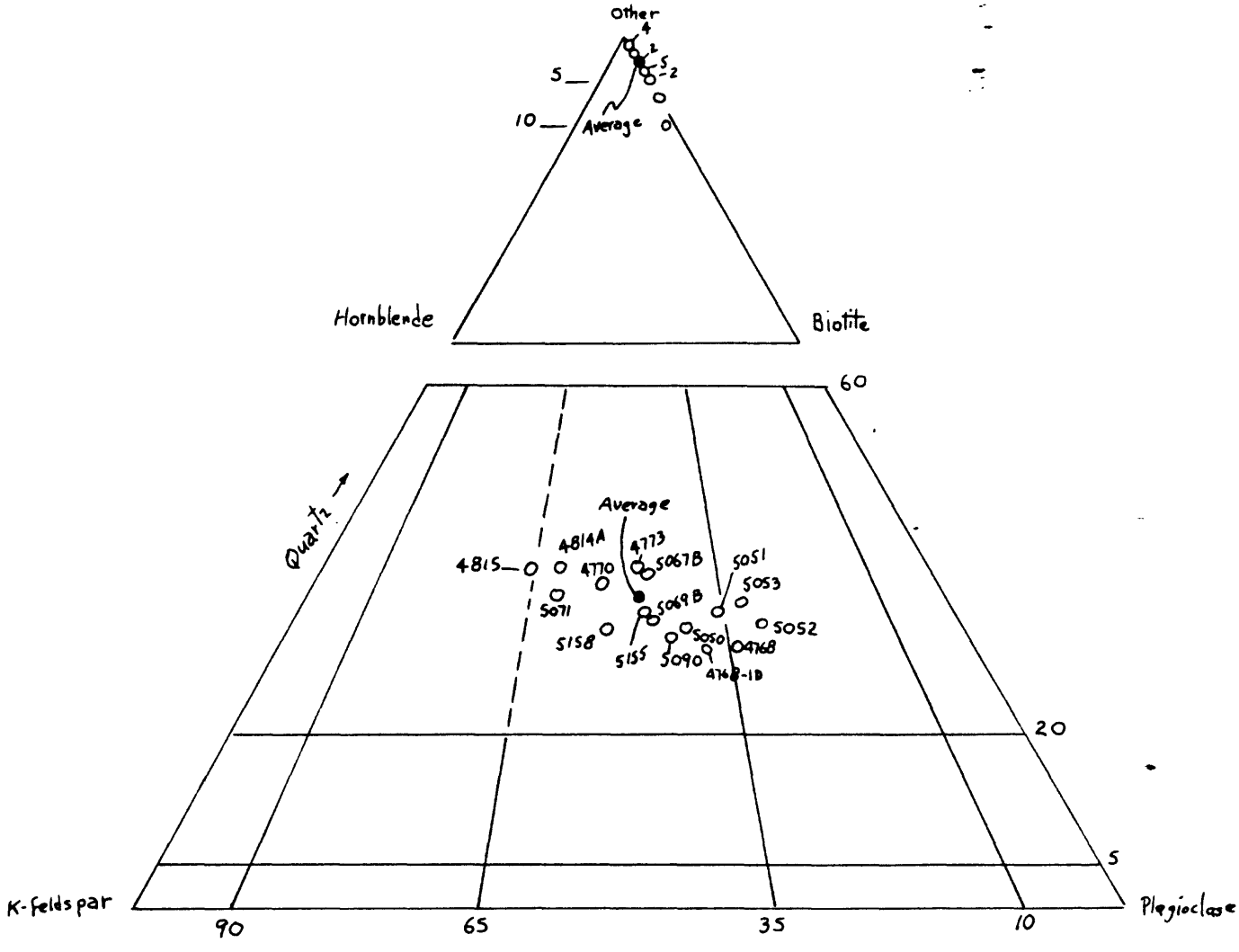


Location of modal samples of Granite of Bob Rabbit Canyon

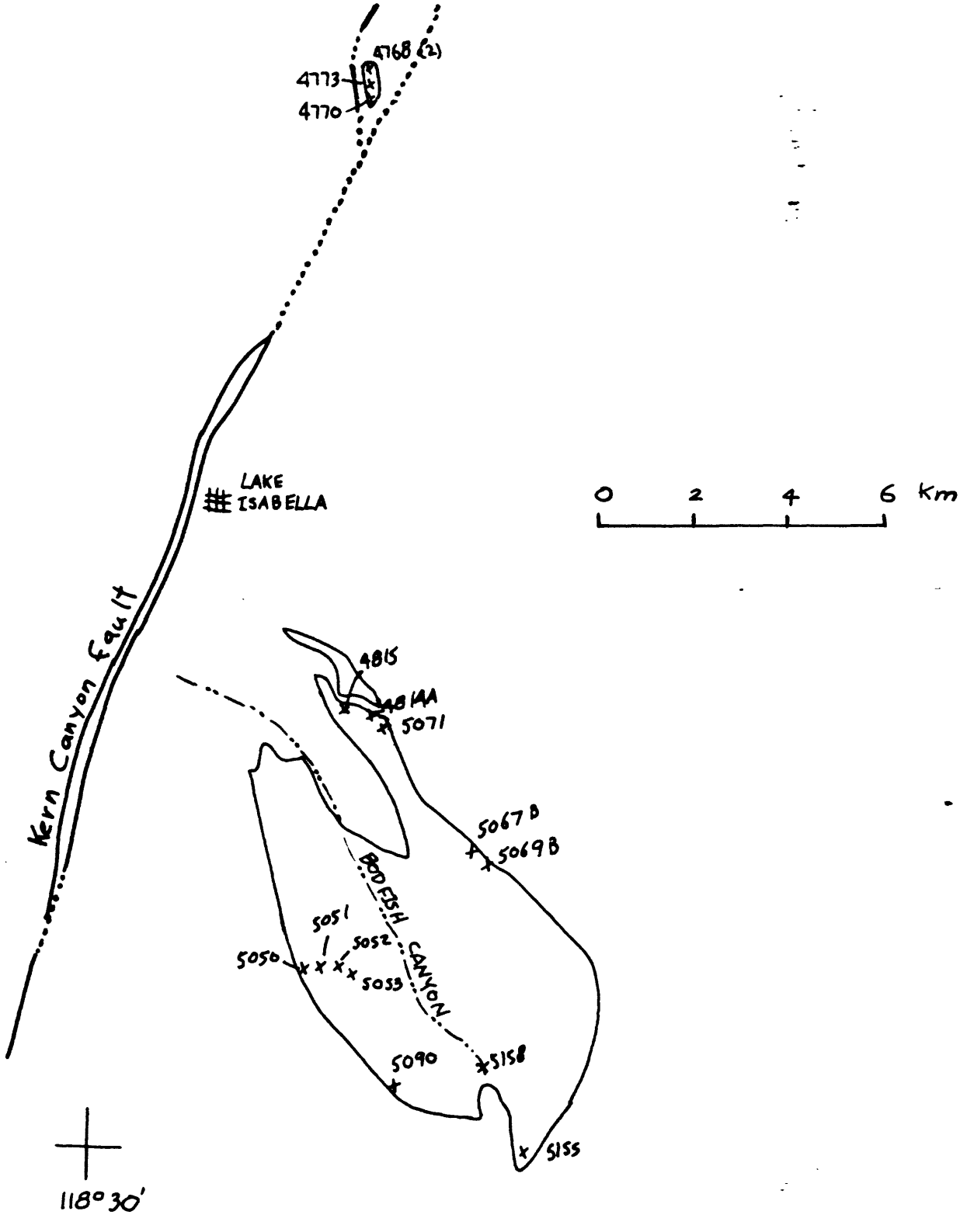

Granite of Bob Rabbit Canyon
119° 30'
118° 30'

MODES OF GRANITE OF BODFISH CANYON

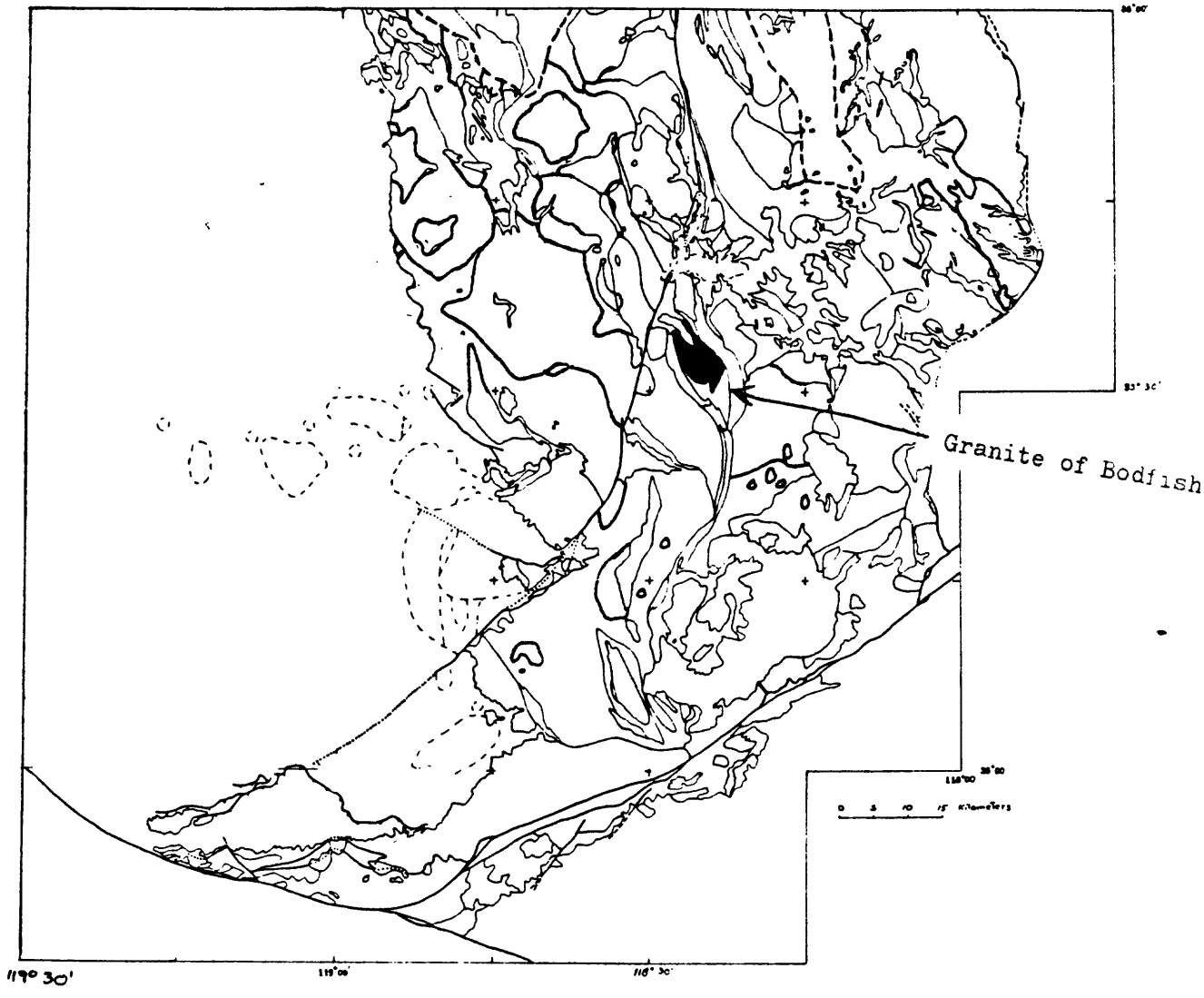
Sample number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende		Other		Specific gravity
4768	42	22	27	9	1				2.63
4768-1D	41	25	29	5	–				2.58
4770	28	34	37	1					2.59
4773	32	28	38	2					2.59
4814A	23	36	38	3					2.61
4815	21	39	36	1					2.59
5050	39	27	31	3					2.65
5051	40	23	33	4					2.63
5052	44	18	31	7	<1		Epidote <1		2.65
5053	42	20	34	4					2.64
5067B	32	28	36	4					2.65
5069B	35	31	33	1					<.61
5071	25	38	36	1					2.62
5090	37	29	30	4					2.63
5155	33	30	32	5					2.62
5158	31	34	31	4					2.61
Average	33	30	34	3					2.62
Standard deviation	(7.1)	(6.3)	(2.8)	(1.8)					(0.02)



Modal plot of Granite of Bodfish Canyon



Location of modal samples of Granite of Bodfish Canyon

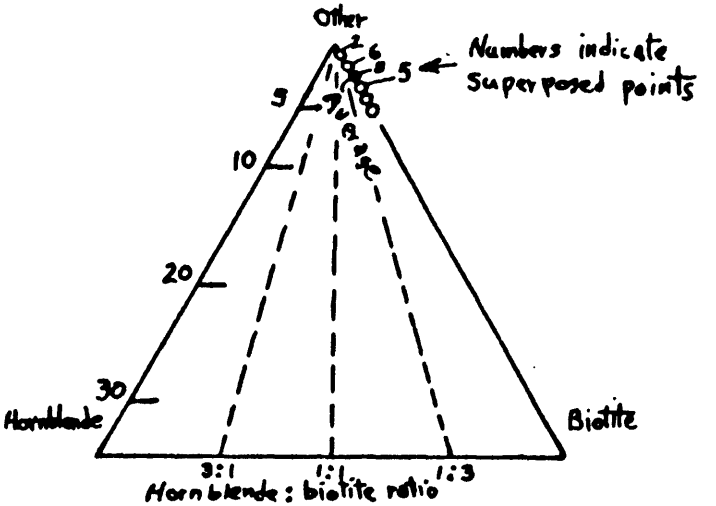

Granite of Bodfish
119° 30'
118° 30'

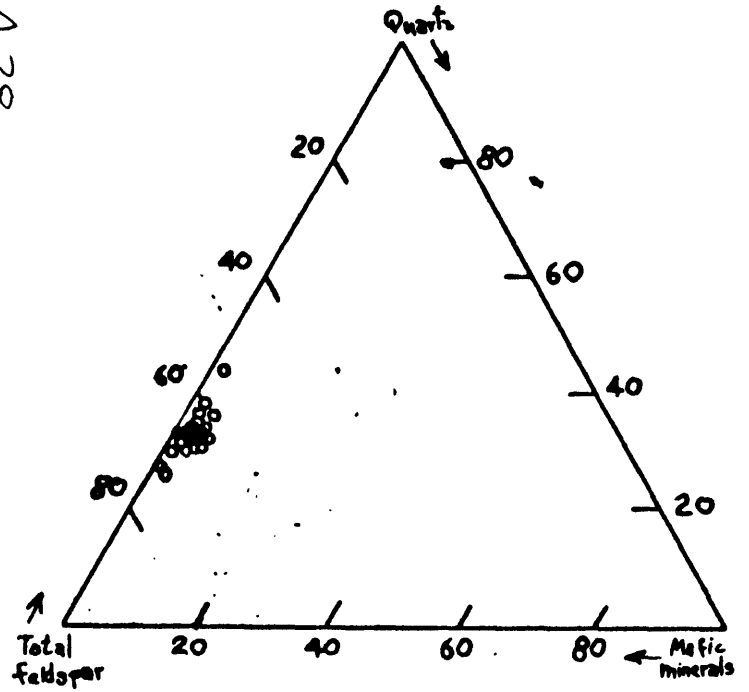
MODES OF GRANITE OF BRUSH MOUNTAIN

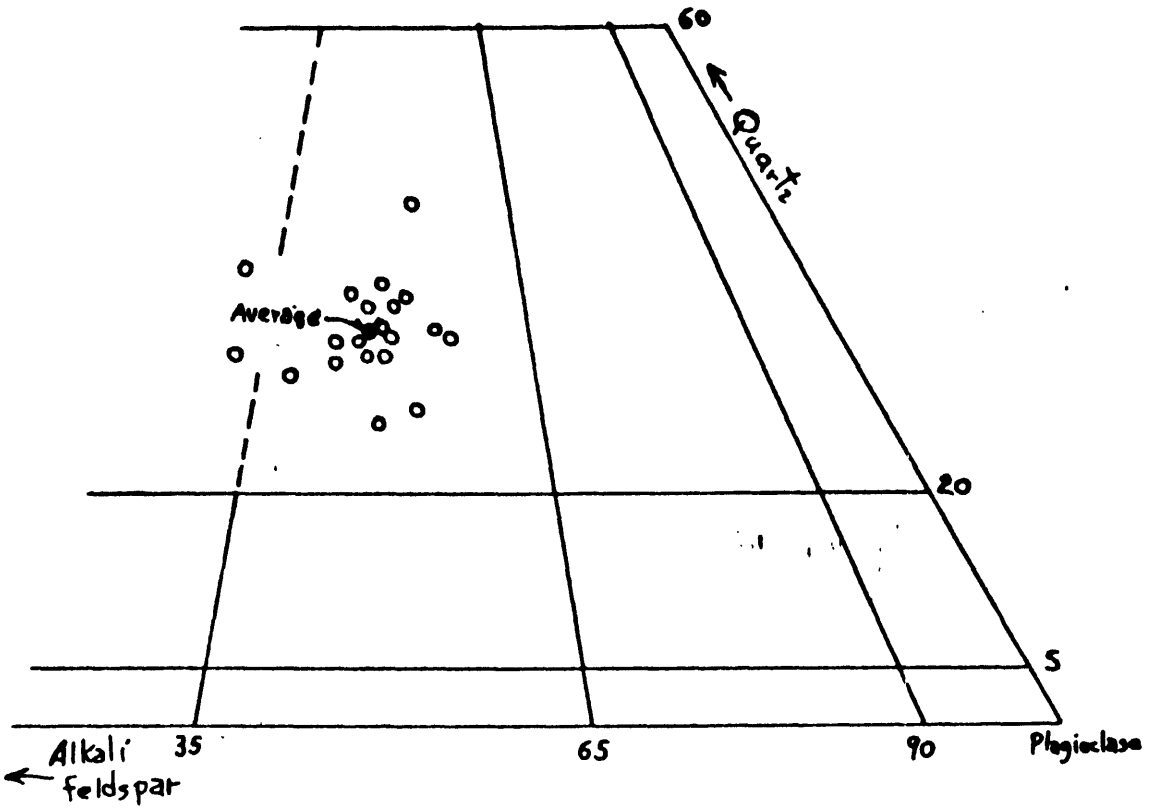
[All modes in volume percent; n.d., not determined. A, altered to chlorite]

Sample	Plagioclase	K-feldspar	Quartz	Biotite	Specific gravity
646	29	38	31	2	2.59
676	31	31	35	3	2.58
681	27	42	30	1	2.60
710	32	33	32	3	2.59
[1]726	28.5	31	36.5	4	2.62
3005	32	33	31	4	2.62
3035	35	37	26	2(A)	2.59
3037	28	26	44	2	2.62
3046	36	29	33	2(A)	2.60
3087A	38	34	27	1(A)	2.60
3089	34	28	32	6(A)	2.62
3102A	29	33	35	3	2.62
3110	30	35	31	4	2.62
3113	31	31	34	4	2.61
3130A	21	44	31	4	2.59
3146	19	41	38	2	2.60
3221	30	34	33	3	2.61
3881	28	36	31	5	n.d.
3882	28	34	36	2	2.56
3887	30	35	32	3	2.57
Average	30	34	33	3	2.60
Standard deviation	4.5	4.6	3.9	1.3	.02

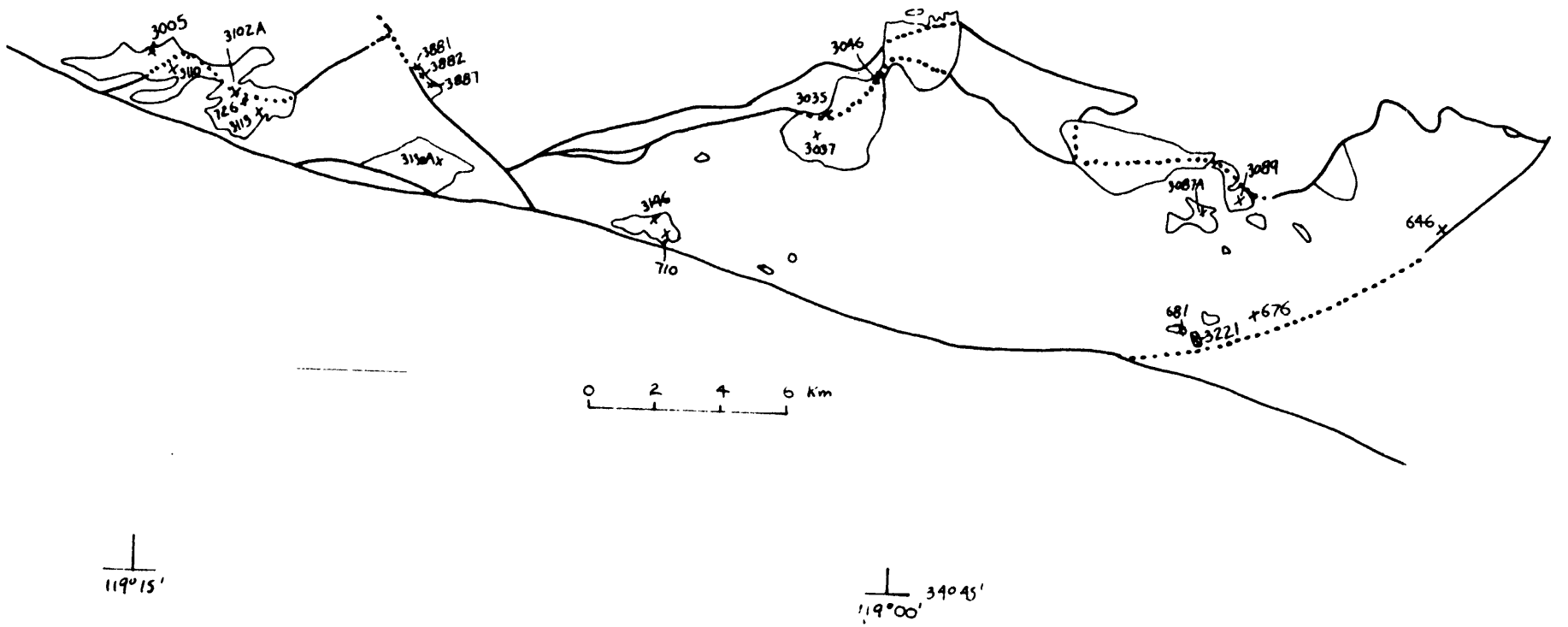
[1]Composite of samples 723 through 727.



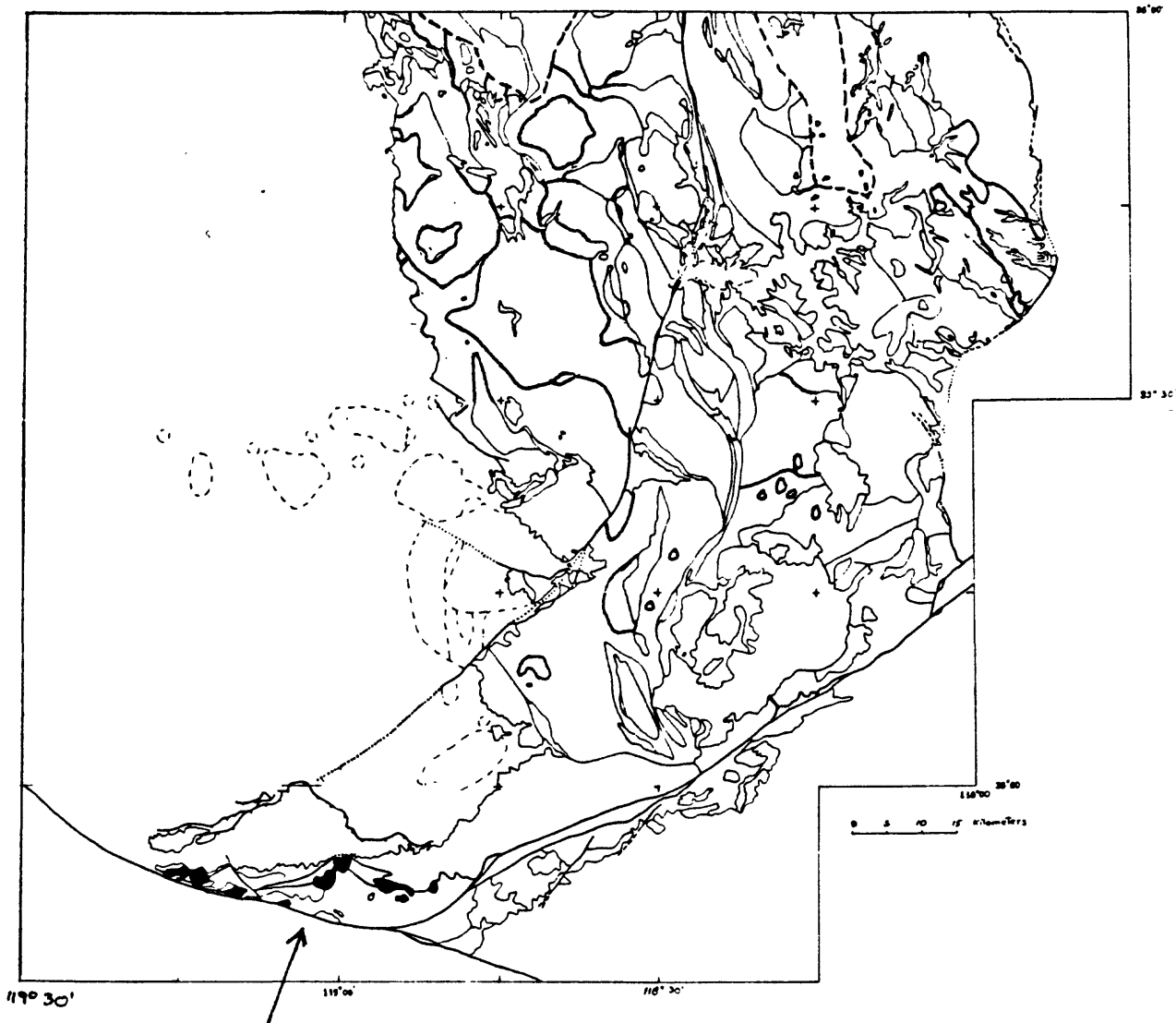




Modal plots of Granite of Brush Mountain



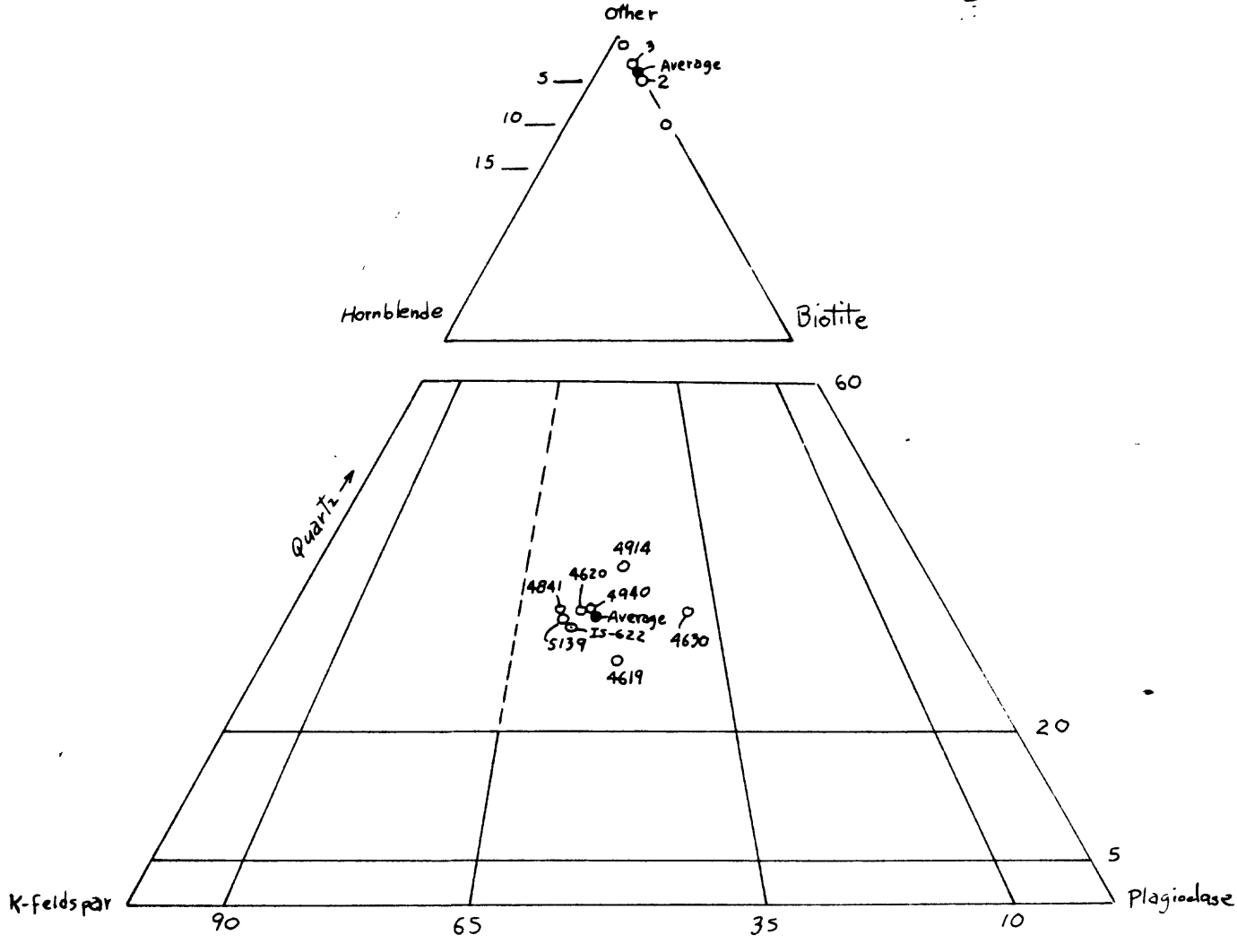
Location of modal samples of Granite of Brush Mountain



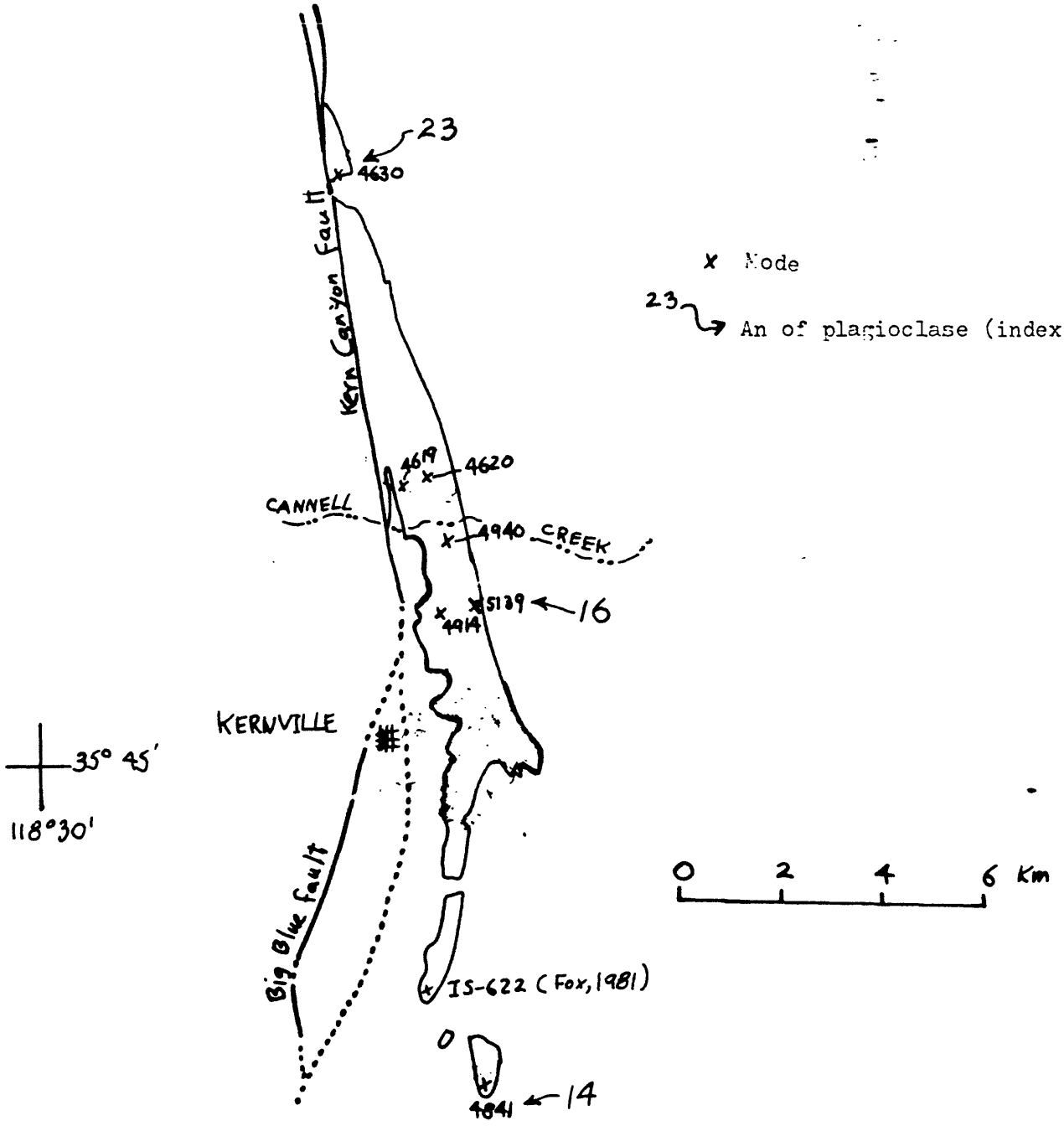
Granite of Brush Mountain

MODES OF GRANITE OF CANNELL CREEK

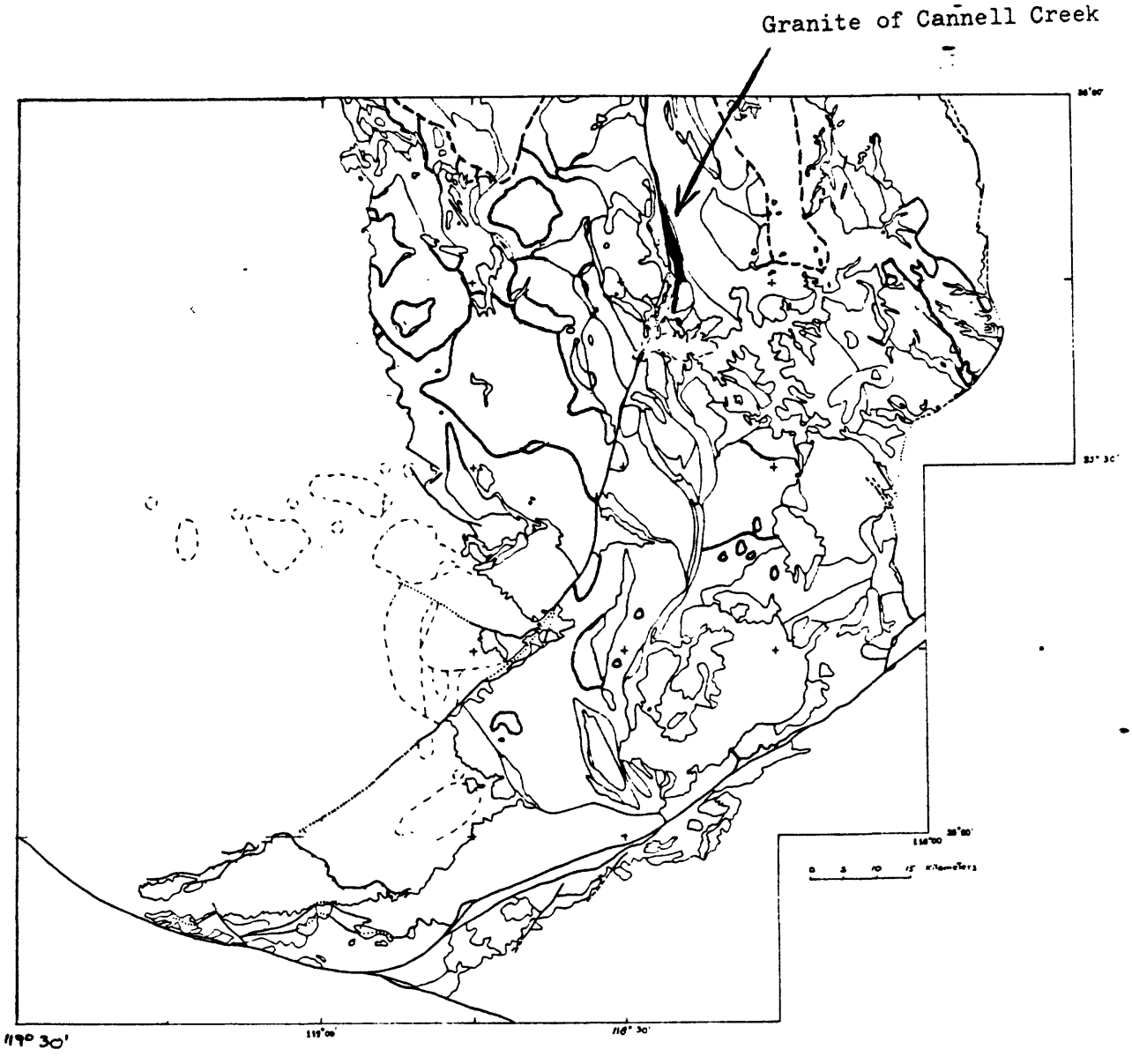
Sample number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Other	Spec. grav.
4619	32	32	25	10	-	Sphene 1	2.60
4620	25	38	32	5	-		2.61
4630	39	25	33	3	-		2.61
4841	26	38	33	3	-	Garnet <1	2.59
4914	29	30	37	4	-	Garnet <1	2.61
4940	30	35	33	1	-	Garnet 1	2.59
5139	27	38	32	3	-	Garnet <1	2.61
TS-622	28	37	30	5	(Fox, 1981)	-	-
Average	30	34	32	4		<1	2.60
Standard deviation	4.4	4.8	3.4	2.7			.01



Modal plot of Granite of Cannell Creek

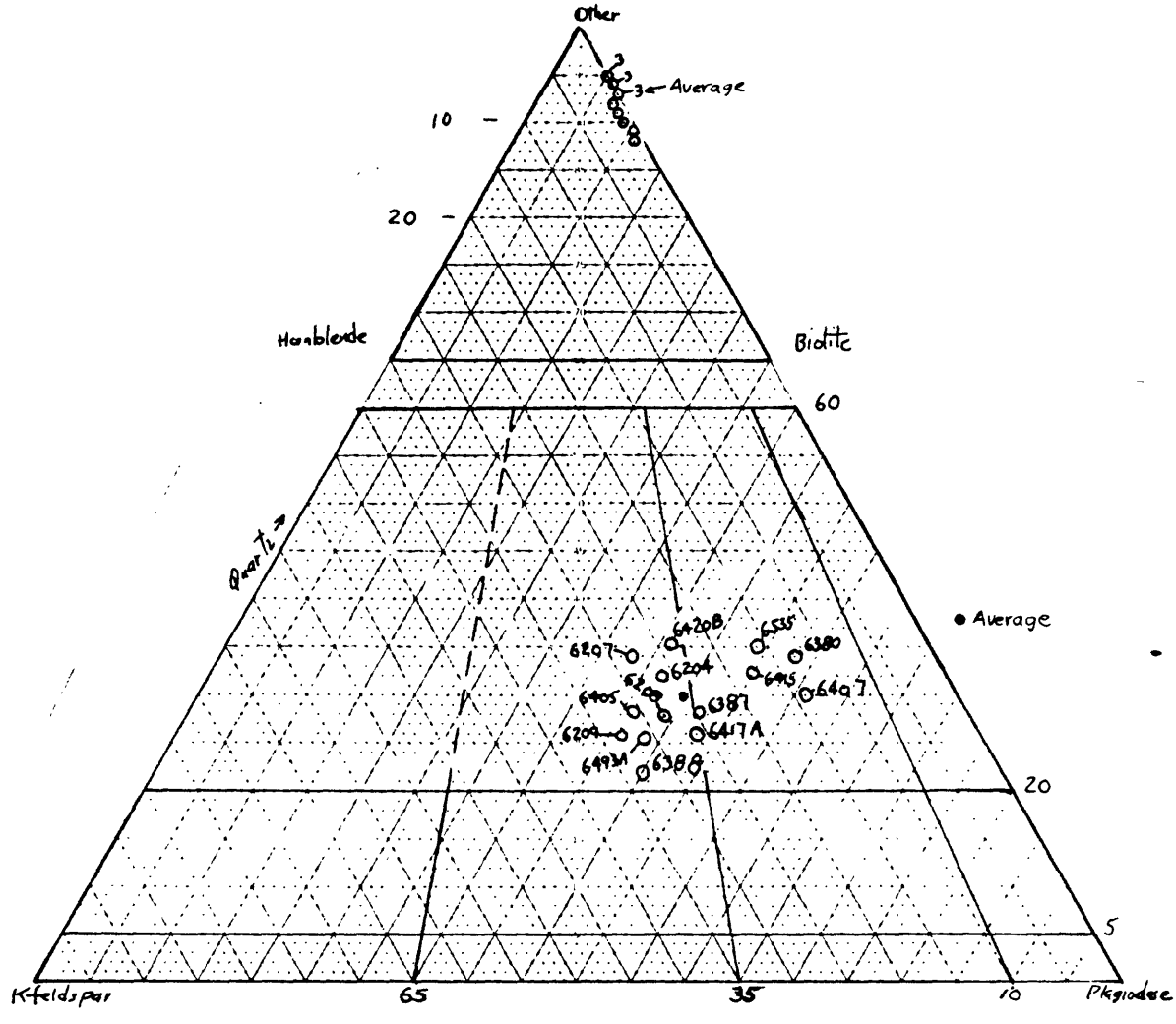


Location of modal samples of Granite of Cannell Creek

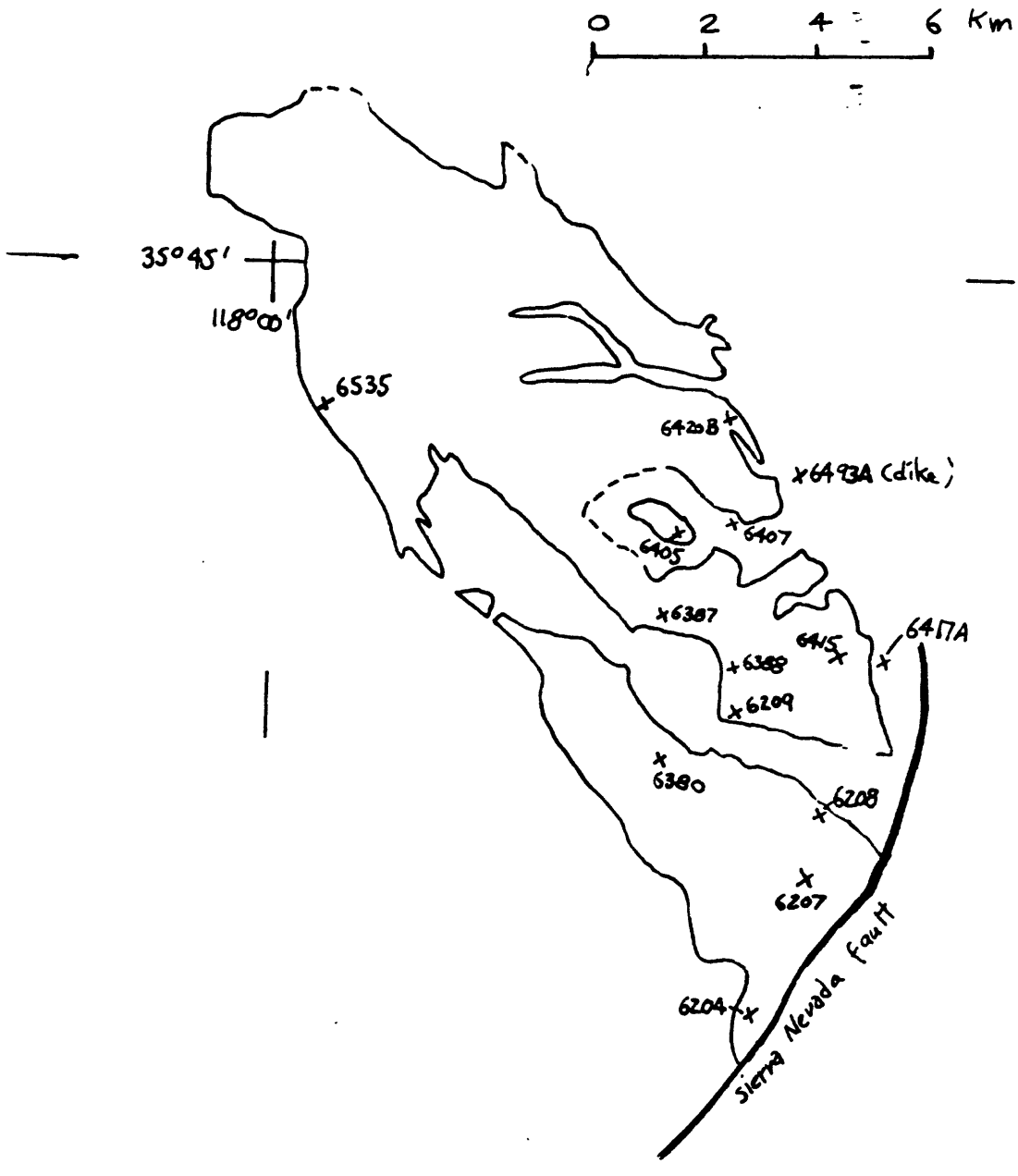

Granite of Cannell Creek
119° 30'

MODES OF GRANITE OF FIVE FINGERS

Sample Number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Sphene	Opaques	
6204	39	24	30	7				
6207	36	26	32	6			<1	
6208	40	26	26	7		0.5	0.5	
6209	39	31	25	5			<1	
6380	47	12	30	10	0.5		0.5	
6387	44	23	26	7				
6388	42	31	21	6	<1			
6405	39	29	27	5	—		<1	
6407	50	13	27	9	1	<1	<1	
6415	44	16	28	11	1		<1	
6417A	45	24	25	6	<1			
6420B	38	22	32	7	1		<1	
6493A	41	31	26	5			<1	(Dike w/ Sacatar)
6535	44	14	32	8	1	0.5	0.5	
Average	42	23	28	7	<1	<1	<1	
Standard deviation	3.9	6.8	3.2	1.9	—	—	—	

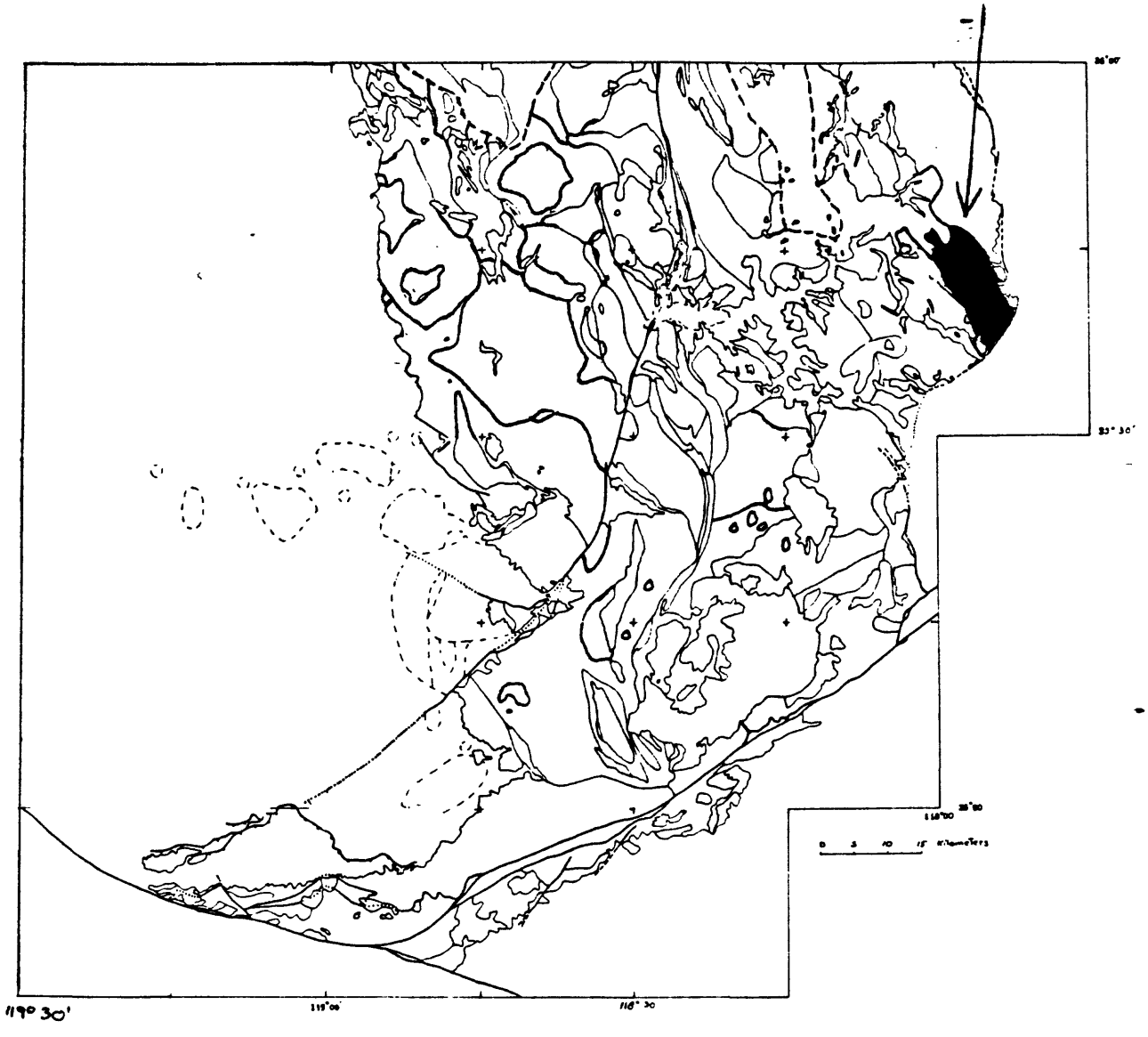


Modal plot of Granite of Five Fingers



Location of modal samples of Granite of Five Fingers

Granite of Five Fingers



MODES OF GRANITE OF THE KERN RIVER

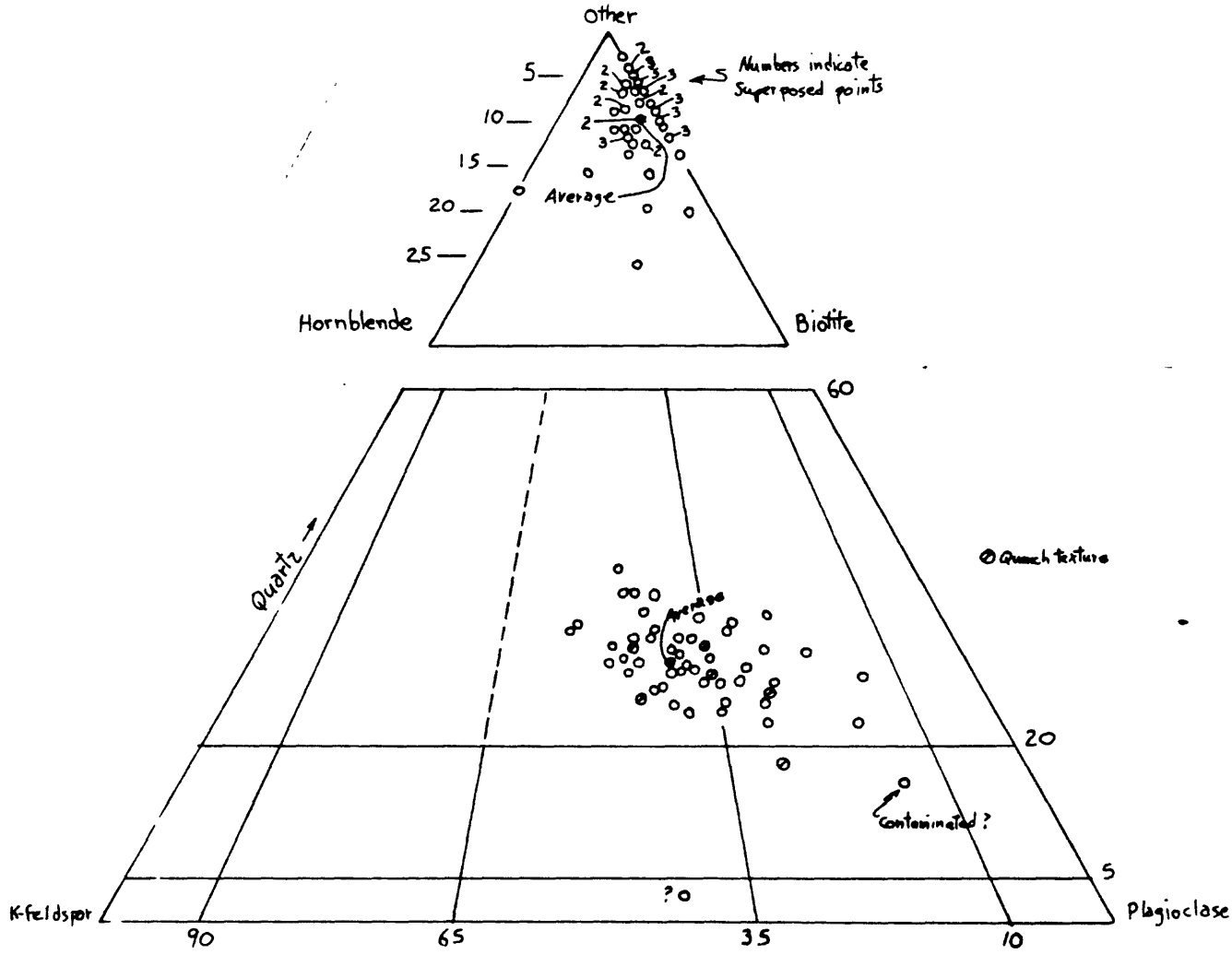
Sample number	Plagioclase	K feldspar	Quartz	Biotite	Hornblende	Other	Specific gravity
4623	42	16	26	12	4		2.67
4624	39	19	30	10	3		2.69
4627	43	23	22	8	4		2.56(?)
⊗ 4637	36	30	22	12	(?)		
⊗ 4642	51	21	16	8	4		2.69
⊗ 4643	42	24	25	6	3		2.68
⊗ 4644A	39	22	28	6	5		2.68
4646	40	22	26	8	4		2.67
⊗ 4648	33	29	28	5	4	Opaque 1	2.65
4672	42	24	25	6	3		2.78(?)
4673	40	29	25	5	1		2.65
4734	29	35	32	4	–		2.58(?)
(?) 4737A	49	35	4	12	–		–
4738	36	28	30	6	–		2.66
4742(?)	40	20	30	10	– (FLOAT)		2.64
4750	49	9	22	14	6		2.71
4762c	34	33	28	5	–		–
4763	39	28	25	7	1		2.66
4764	38	26	29	6	1		2.65
(?) 4766	36	32	26	6	–		2.63
4811	37	26	26	8	3		2.64
4814B	28	26	36	10	(?) (FLOAT)		2.68
4816	31	26	34	9	– (FLOAT)		2.69
4817	33	25	34	7	1 (?)		2.64
4818	33	26	32	9	–		2.63
4819A	34	30	27	9	–		2.66
4819B	37	25	26	11	–	Opaq. + Epidote 1	2.64
4859-1	44	24	22	8	2		2.59
4884A	31	28	34	5	2(?)		2.64
4887	39	24	25	12	–	Allanite 1	2.66
4888	41	27	28	4	– (FLOAT)		2.62
4892	35	27	31	7	– (Shattered ?)		2.58
4894	35	30	28	7	–		2.63
4896	46.5	13	26.5	14	–		2.68
5005	49.5	17.5	22	7	4	Opaq. + Allanite <1	2.69
5006	44	21	25	8	2		2.69
5009	38	25	30	6	1		2.66

Sample number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende		Other		Specific gravity
⊠ S013	43	24	25	8	-		Opaque <1		2.65
⊠ S013R	41	26	27	6	-				-
⊠ S013-1B	40	23	32	5	-				
· S113	33	32	29.5	5.5	-				
· S117C	39	24	30	7	-				
· S120B	43	15	32	10	-				
· S266	41	29	23	5	2				
· S268	43	28	23	6	-				
· S272	42	18	20	18	2	(	contaminated ?)		
· S274	29	35	33	3	-				
⊛ S279	46	18	22	9	5				
△ S286C	53	12	19	6	10				
▲ S286R	39	15	20	16	10				
▲ S288	57	10	13	<1	18		cpx 2	Alkaline	
▲ S290R	43	19	25	9	4			cpx <1	
· S297	47	20	20	10	3				
· Isabella 1	35	30	30	5	-				
Average	40	24	26	8	2				
Standard deviation	(5.7)	(5.8)	(5.3)	(3.1)	(2.4)				

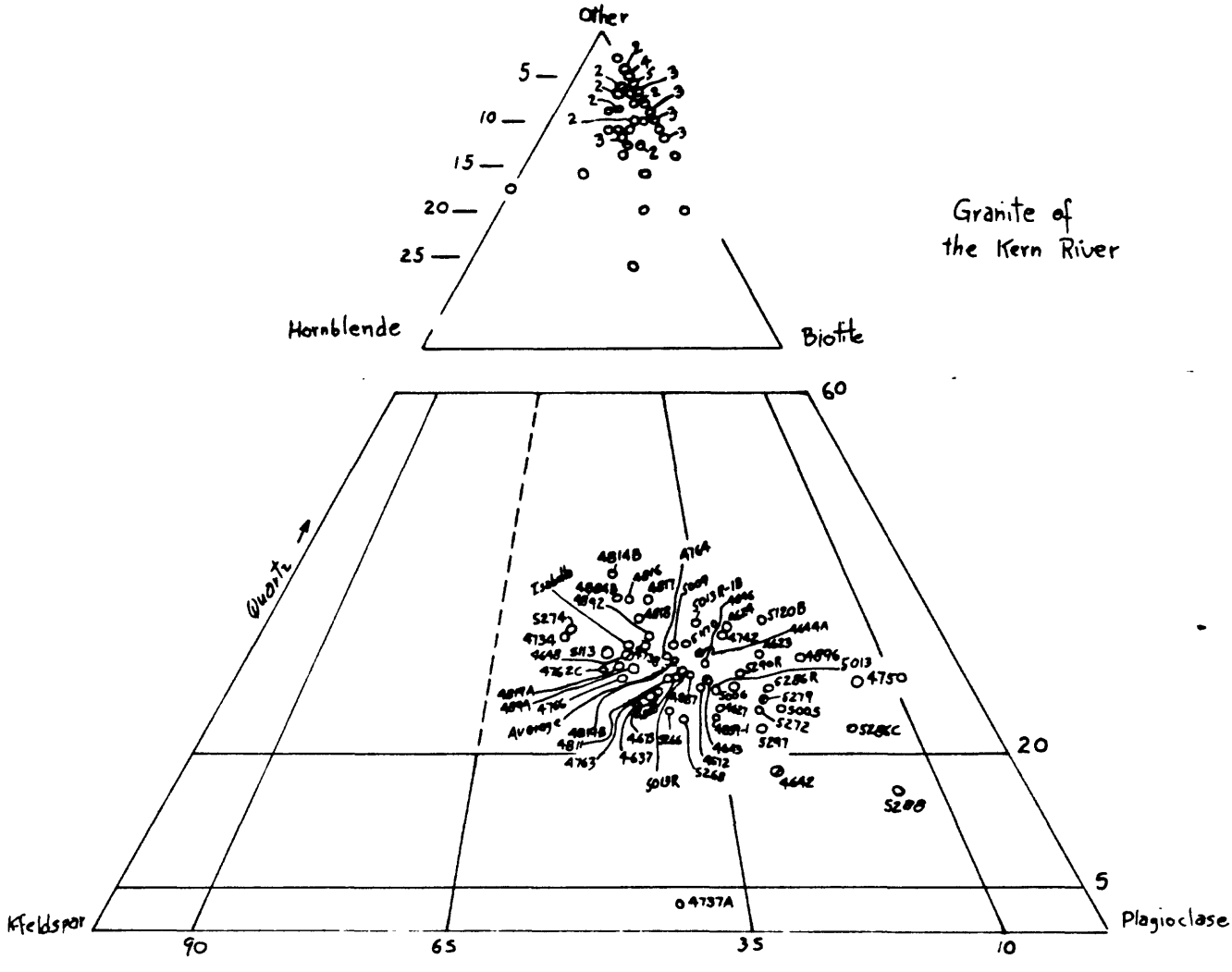
⊛ Quench texture

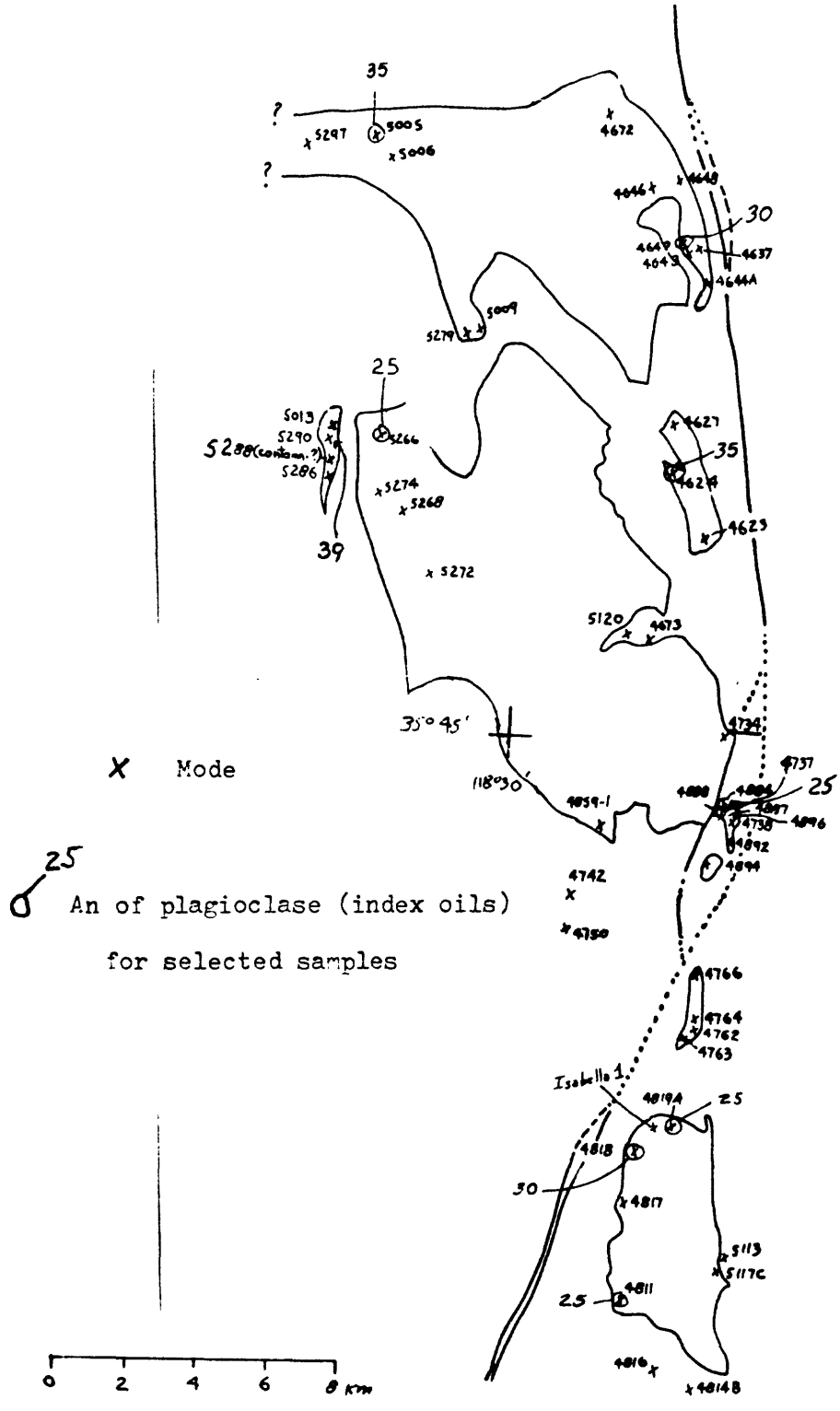
⊠ May be granite of Portuguese Pass

△ Contaminated, possibly from nearby metasedimentary rocks

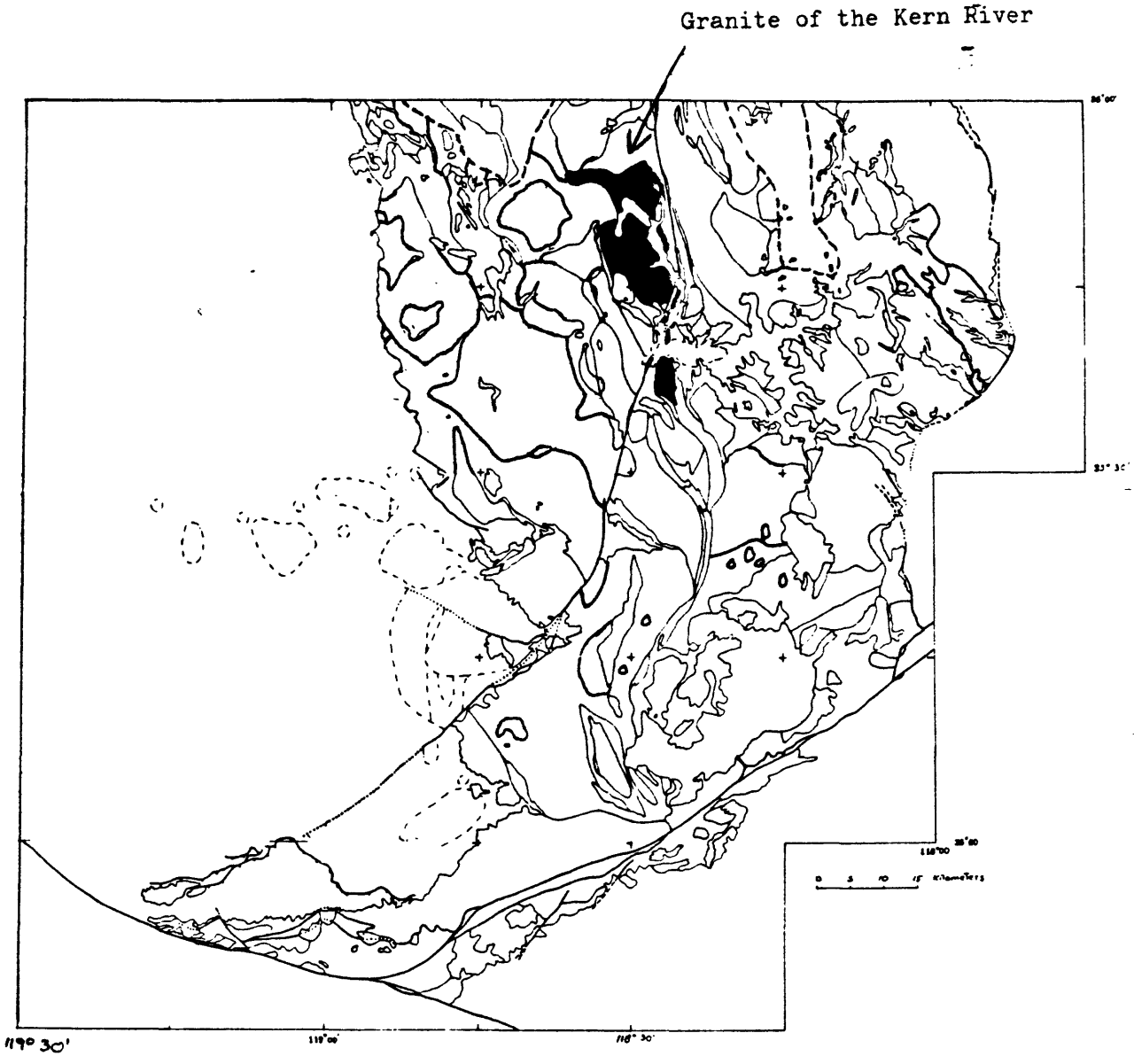


Modal plot of Granite of the Kern River


Other
5
10
15
20
25
Hornblende
Biotite
Granite of
the Kern River
60
20
5
Quartz
K feldspar
Plagioclase
90
65
35
10



Location of modal samples of Granite of the Kern River

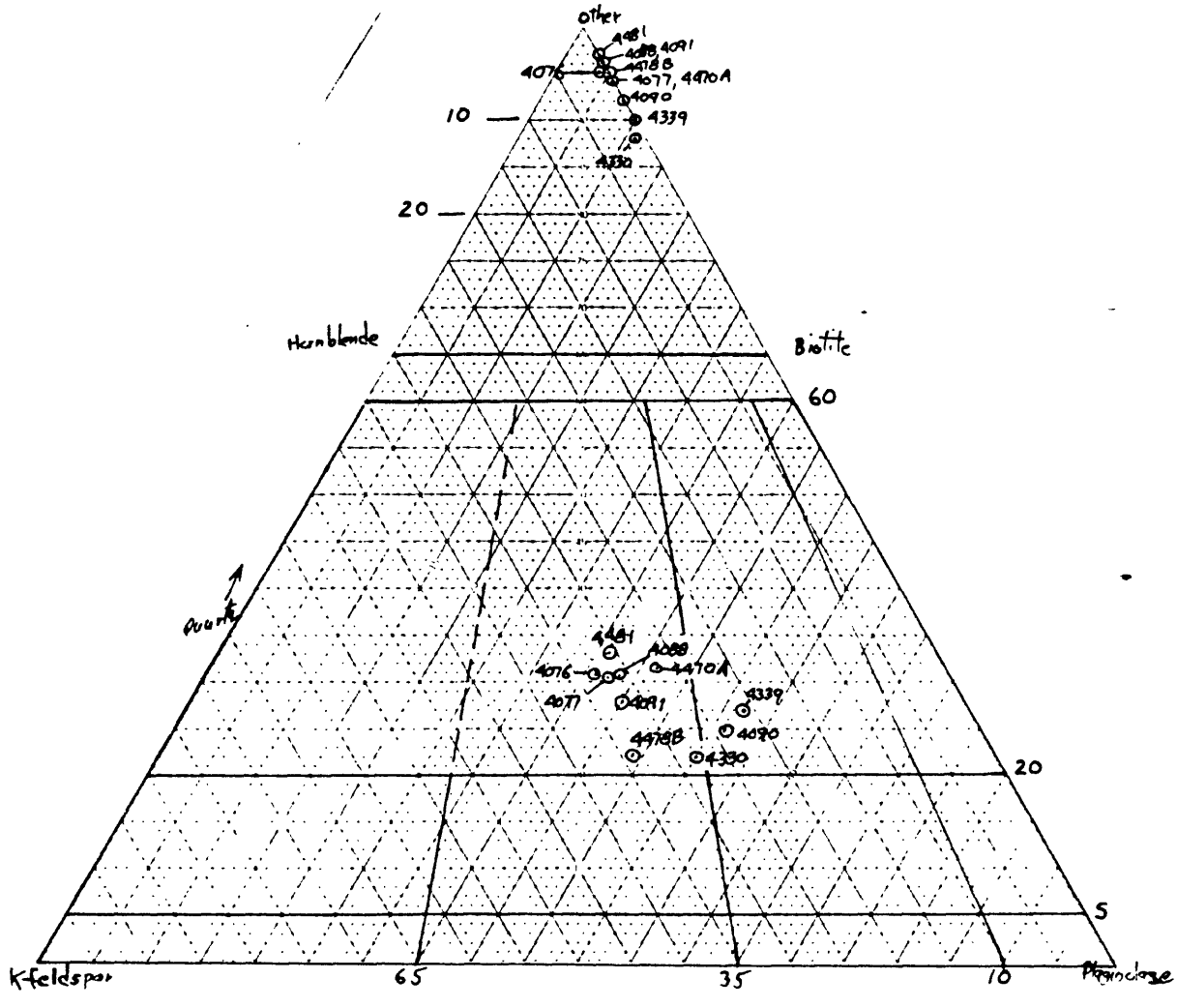

Granite of the Kern River
119° 30'

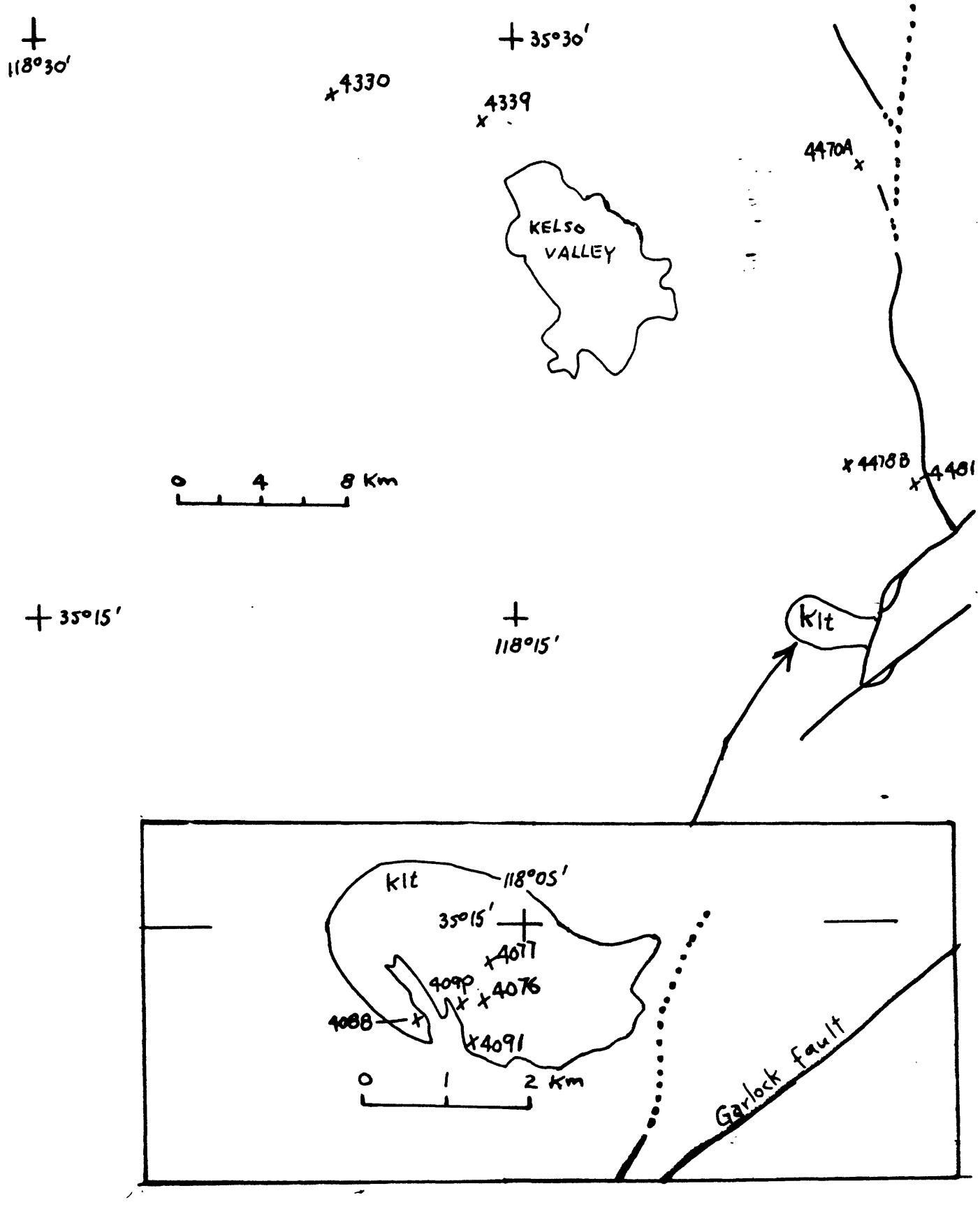
MODES OF GRANITE OF LONE TREE CANYON *

Sample Number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende		Other		Specific gravity
4076	34	31.5	29.5	4	1		Opaque <1		2.62
4077	35	30	29	6	<1		Opaque <1		2.63
4088	36.5	30	29.5	4	<1		Opaque <1		2.64
4090	47	22	23	8			Opaque <1		2.65
4091	38	30	27	4			Opaque 1		2.64
4330	44	25	19	11	1				2.65
4339	47	19	24	10	<1				2.63
4470A	39	25	30	6					2.66
4470B	42	32	21	5					2.63
4481	35	30	32	3					2.62
Average	40	27.5	26.5	6	<1				2.64
Standard deviation	5.0	4.4	4.4	2.7	—				.01

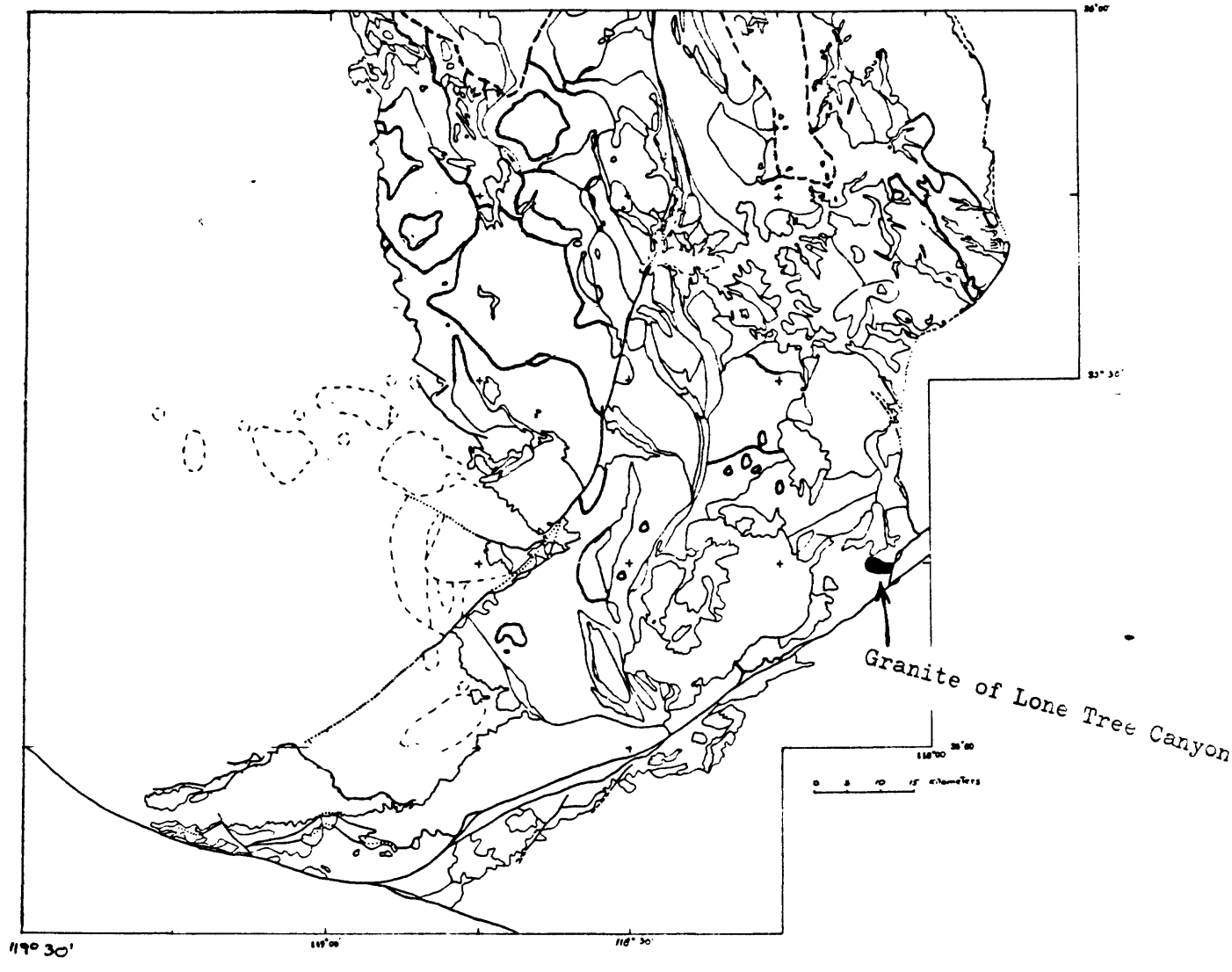
* May be equivalent to Granite of Onyx to the north

Modal plot of Granite of Lone Tree Canyon





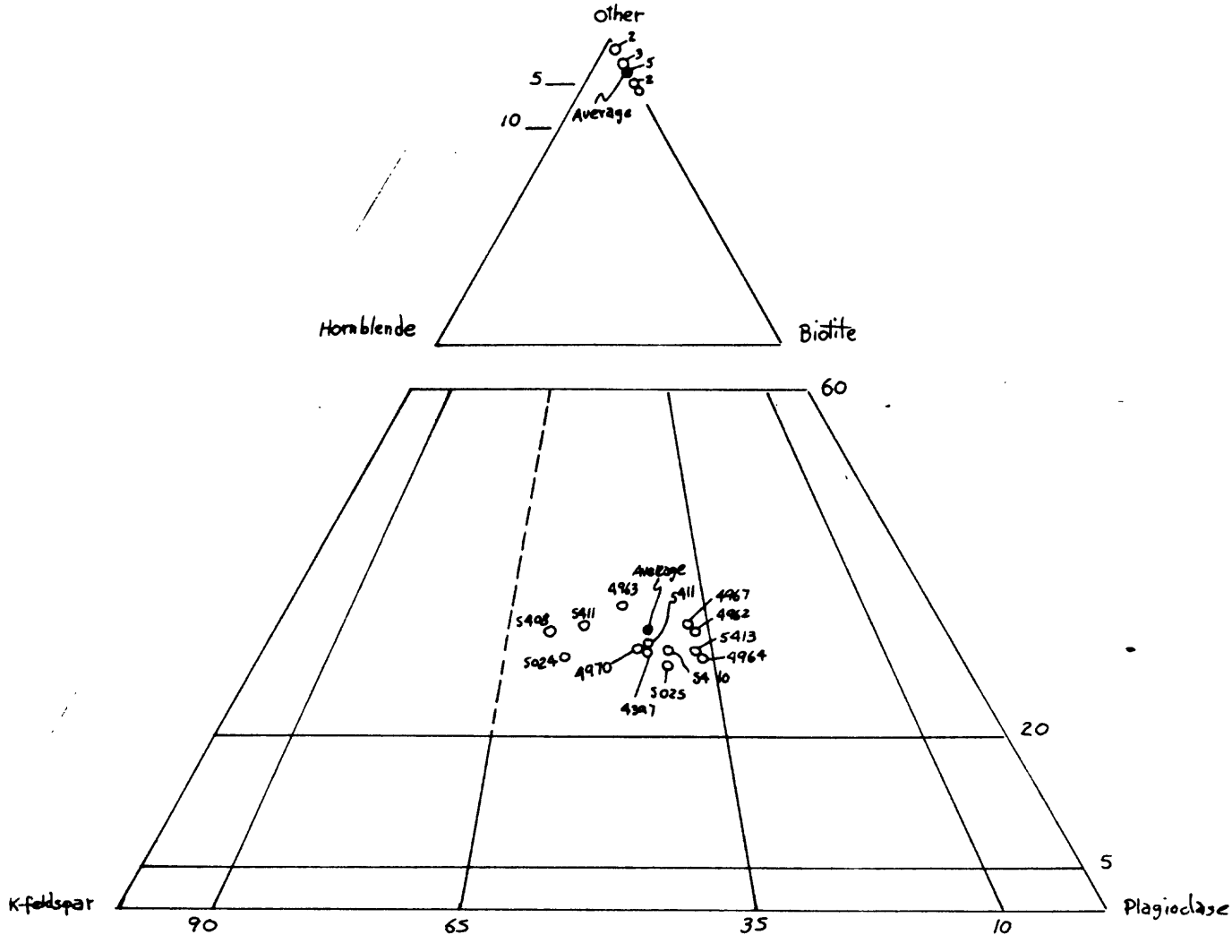
Location of modal samples of Granite of Lone Tree Canyon


Granite of Lone Tree Canyon
119° 30'

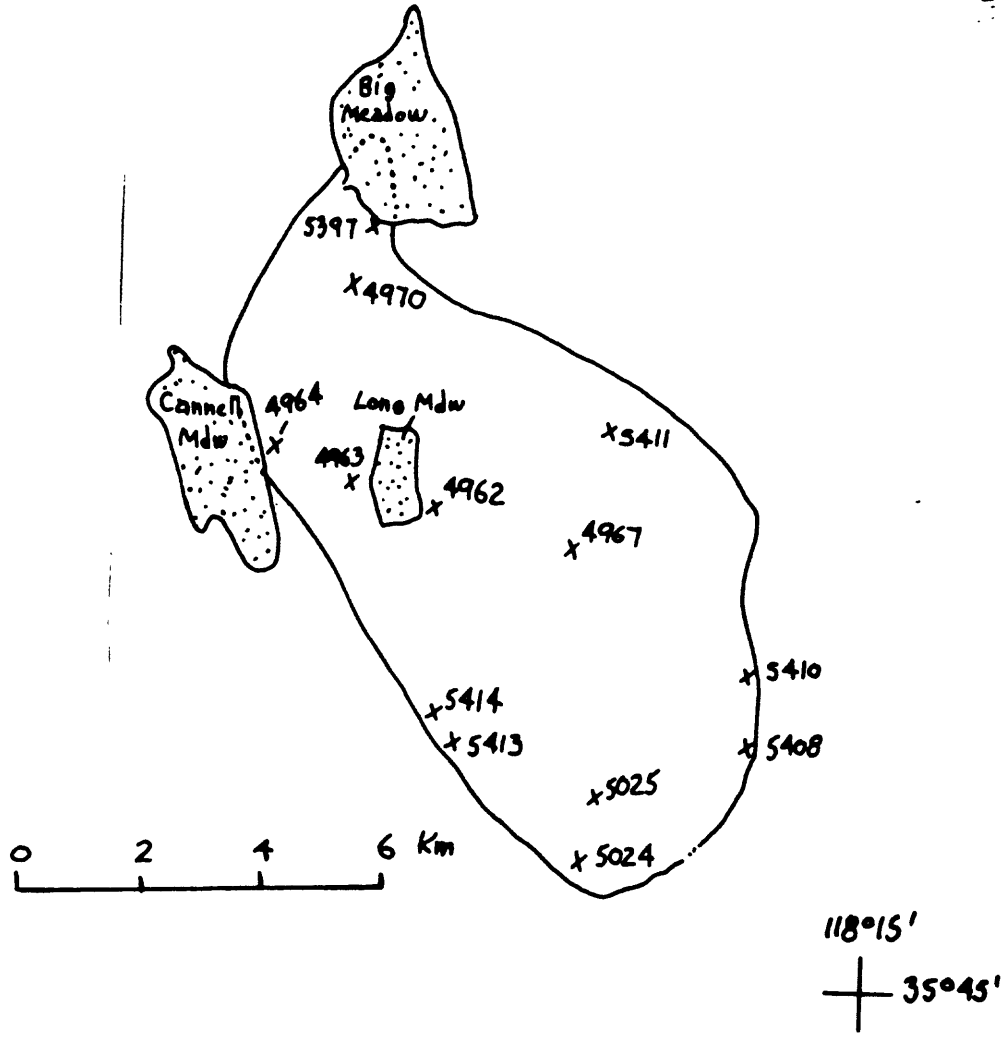
MODES OF GRANITE OF LONG MEADOW*

Sample Number	Plagioclase	K-feldspar	Quartz	Biotite	Muscovite	Sphene	Opaque	Other	Spec. f.g. gravity
4962	41	24	30	5	<1	<1	<1	Epidote <1	2.64
4963	32	29	33	6			<1		2.62
4964	43	25	28	4	<1		<1	Epidote <1	2.69
4967	42	24	31	3			<1		2.64
4970	36	31	29	4			<1		2.63
5024	30	38	28	3			1		2.62
5025	41	29	27	3	<1		<1	Epidote <1	2.61
5397	37	30	29	4			<1		-
5408	28	39	32	1			<1		-
5410	39	28	29	4		<1	<1		-
5411	37	29	29	5		<1	-		-
5413	42	25	29	4			<1		-
5414	31	35	33	1			<1		-
Average	37	29.5	30	3.5			<1		
Standard deviation	(5.1)	(5.0)	(1.9)	(1.5)					

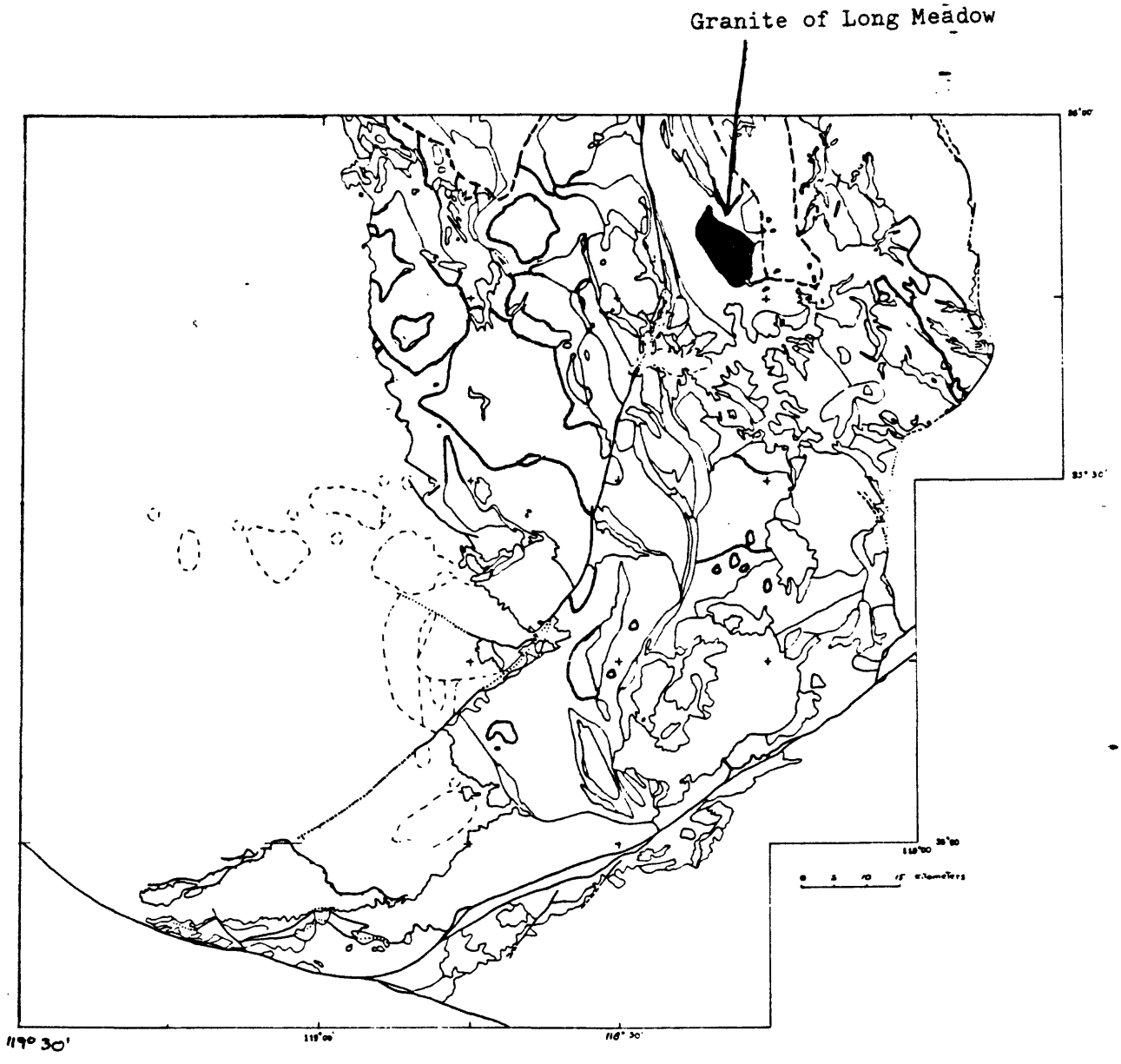
*Porphyritic in part and may be a felsic facies of the Granodiorite of Castle Rock



Modal plot of Granite of Long Meadow

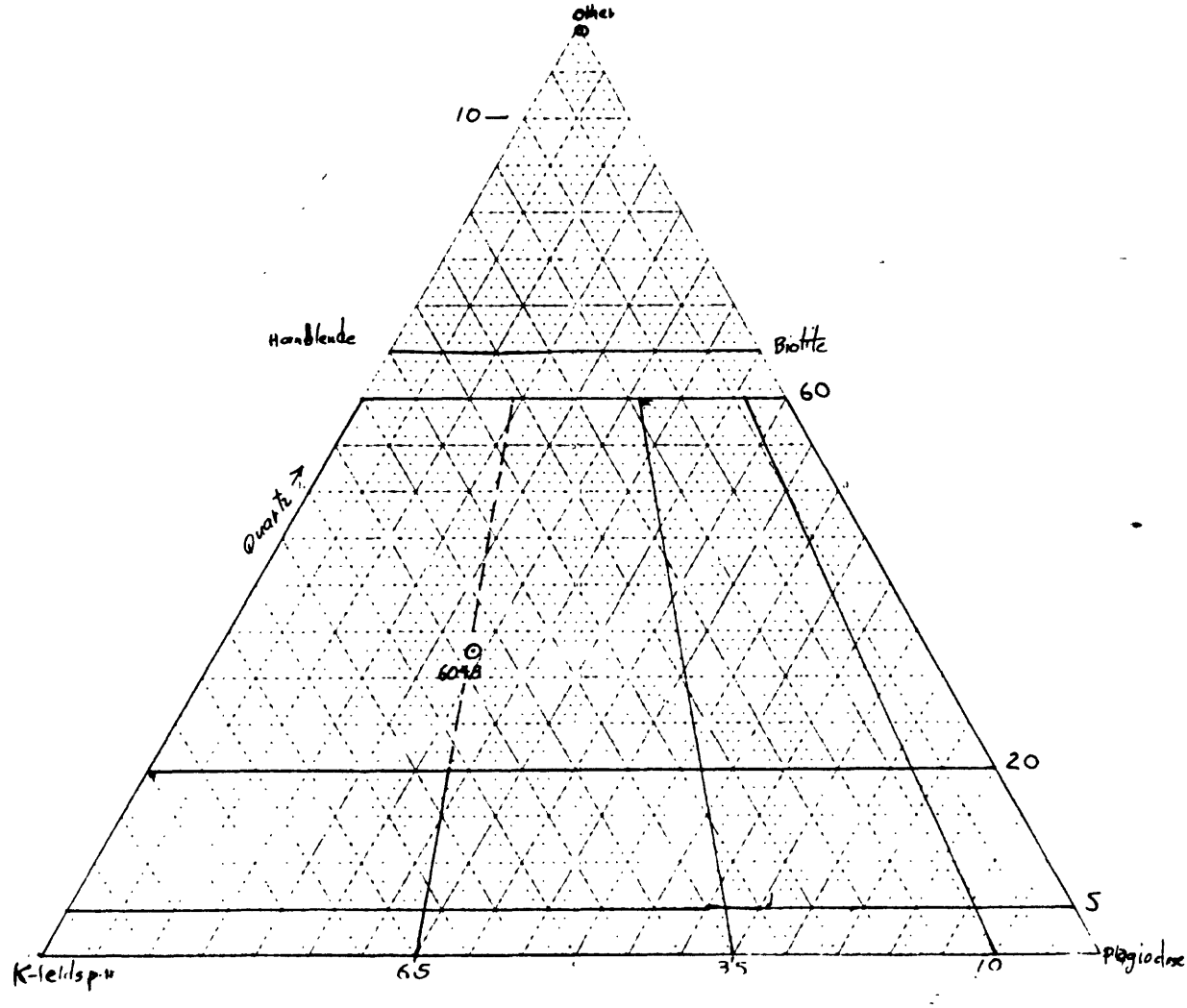


Location of modal samples of Granite of Long Meadow

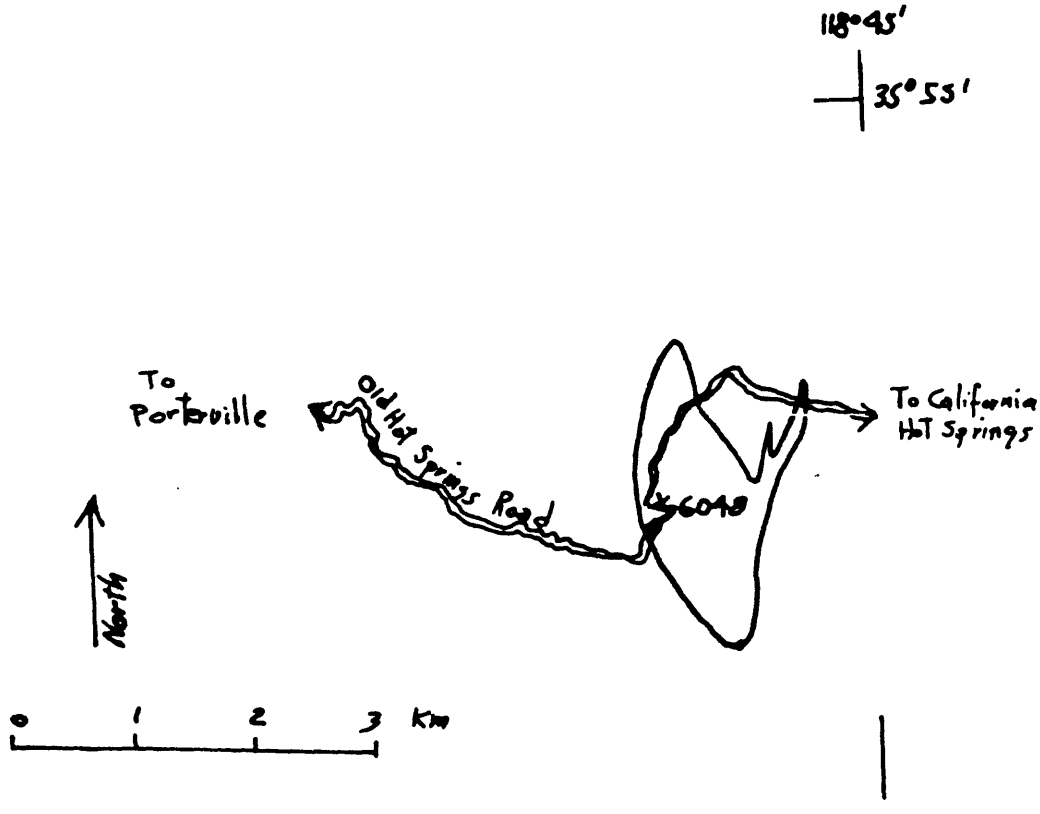

Granite of Long Meadow
119° 30'

MODE OF GRANITE OF OLD HOT SPRINGS ROAD

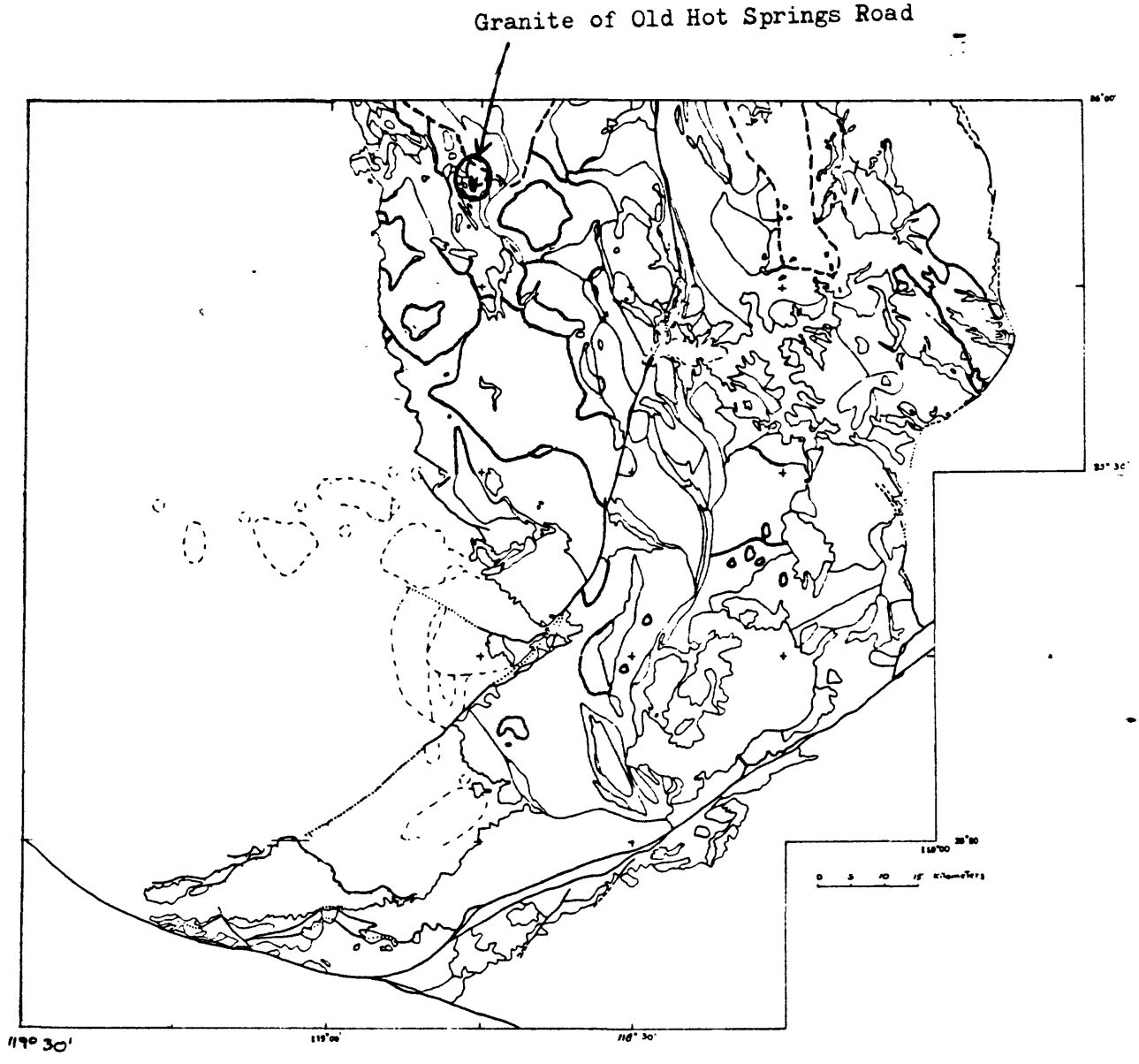
Sample Number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende		Other	
6048	24	43	33	<1			Garnet <1	



Modal plot of Granite of Old Hot Springs Road

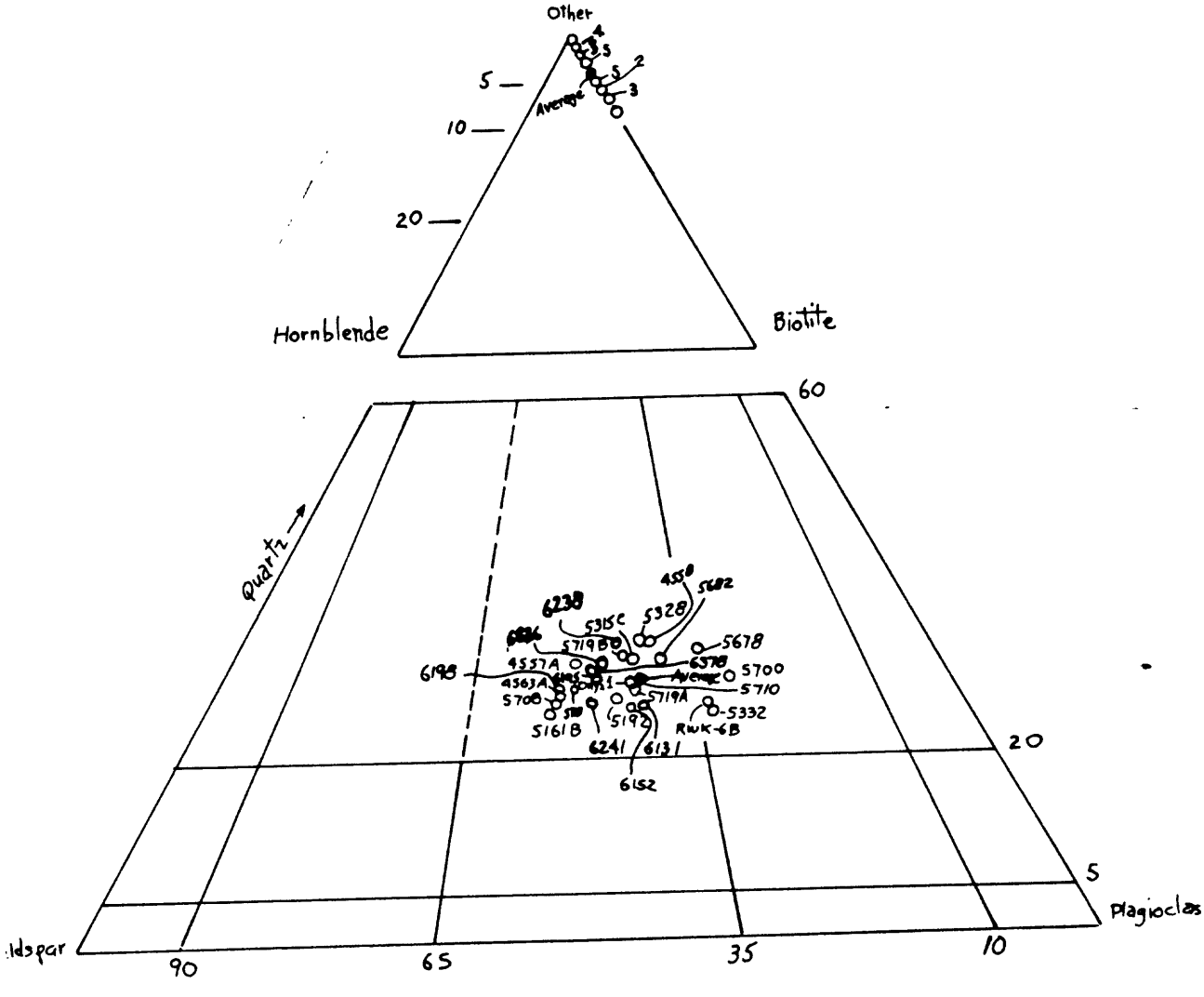


Location of modal sample of the Granite of Old Hot Springs Road

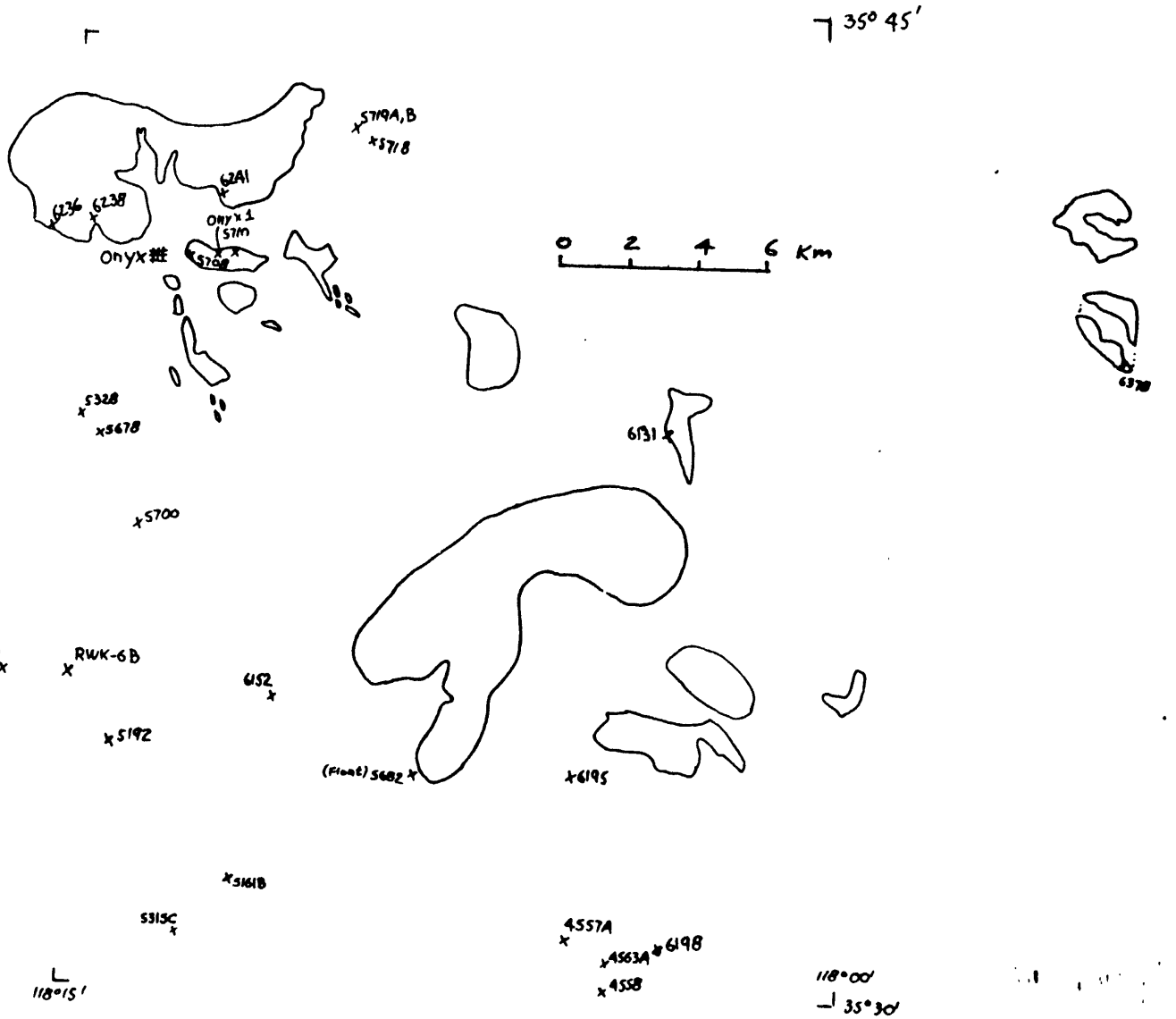

Granite of Old Hot Springs Road
119° 30'
119°00
118° 30'

MODES OF GRANITE OF ONYX

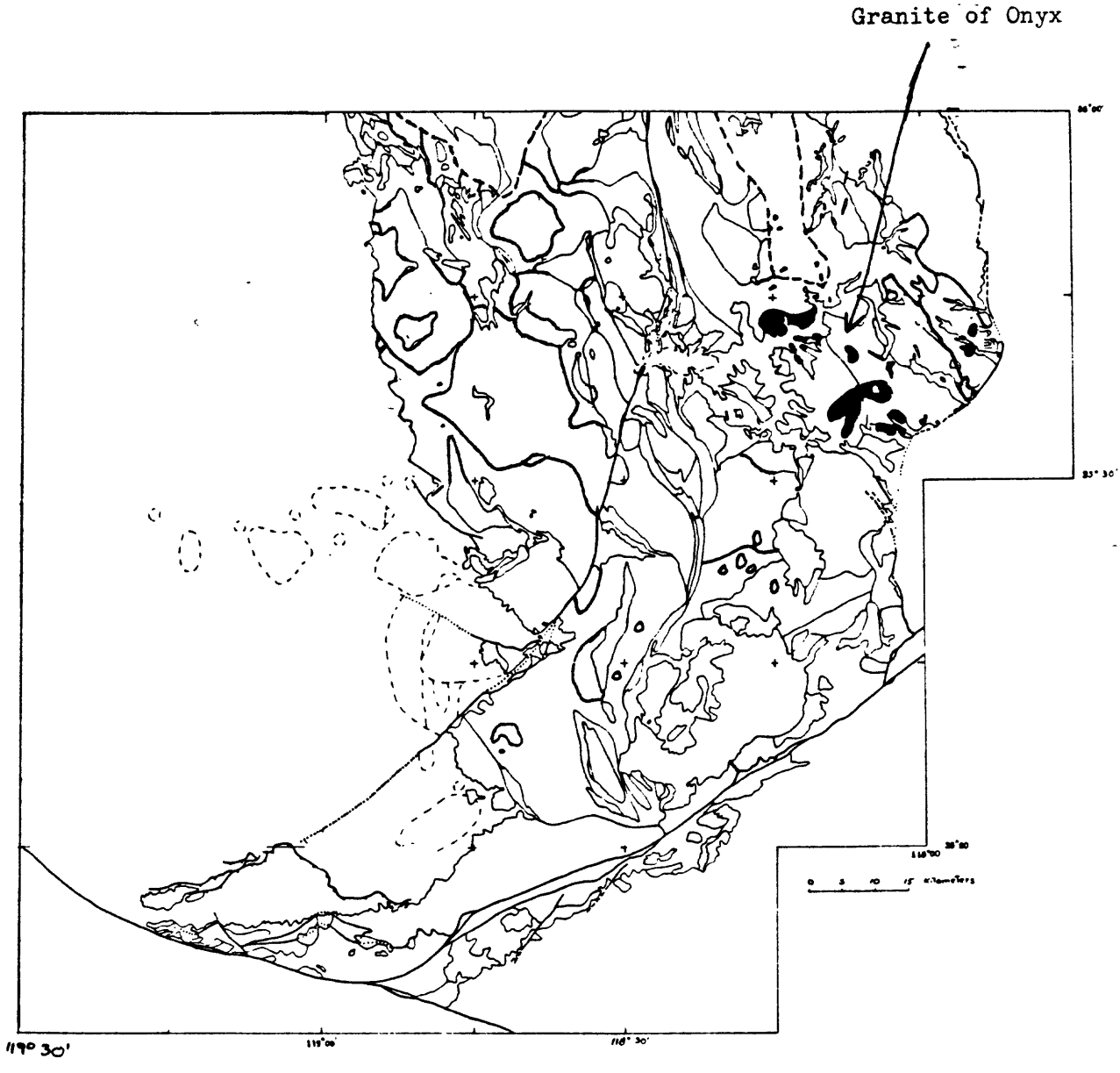
Sample number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Other	Specific gravity
4557A	33	34	31	2	-		2.60
4558	38	26	31	5			2.62
4563A	32	36	25	7			2.62
5161B	33	40	25	2			2.61
5192	37	32	24	7			
5315C	38	30	31	1			
5328	37	27	31	5			
5332	47	24	24	5			
5678	44	22	31	3		Opaque <1	
5682(F1)	40	26	29	5		Musc. <1	
5700	46	20	27	6		Sphene <1 Opaque 1	
5708	34	39	26	1			
5710	40	29	28	3			
5718	34	36	28	2			
5719A	40	31	28	1			
5719B	39	30	31	<1			
6131	42	30	25	3			
6152	41	32	24	3			
6195	36	34	27	3			
6198	33	38	28	1		Opaque <1	
6236	35	31	30	4		Opaque <1	
6238	34	29	30	7			
6241	35	34	25	6			
6378	35	33	29	3	(Cordierite)		
RWK-6B	44	23	24	8.5		Opaque 0.5	
Onyx-1	39	29	27	5			2.65
Average	38	30	28	4			
Standard deviation	4.2	5.0	2.7	2.3			



Modal plot of Granite of Onyx

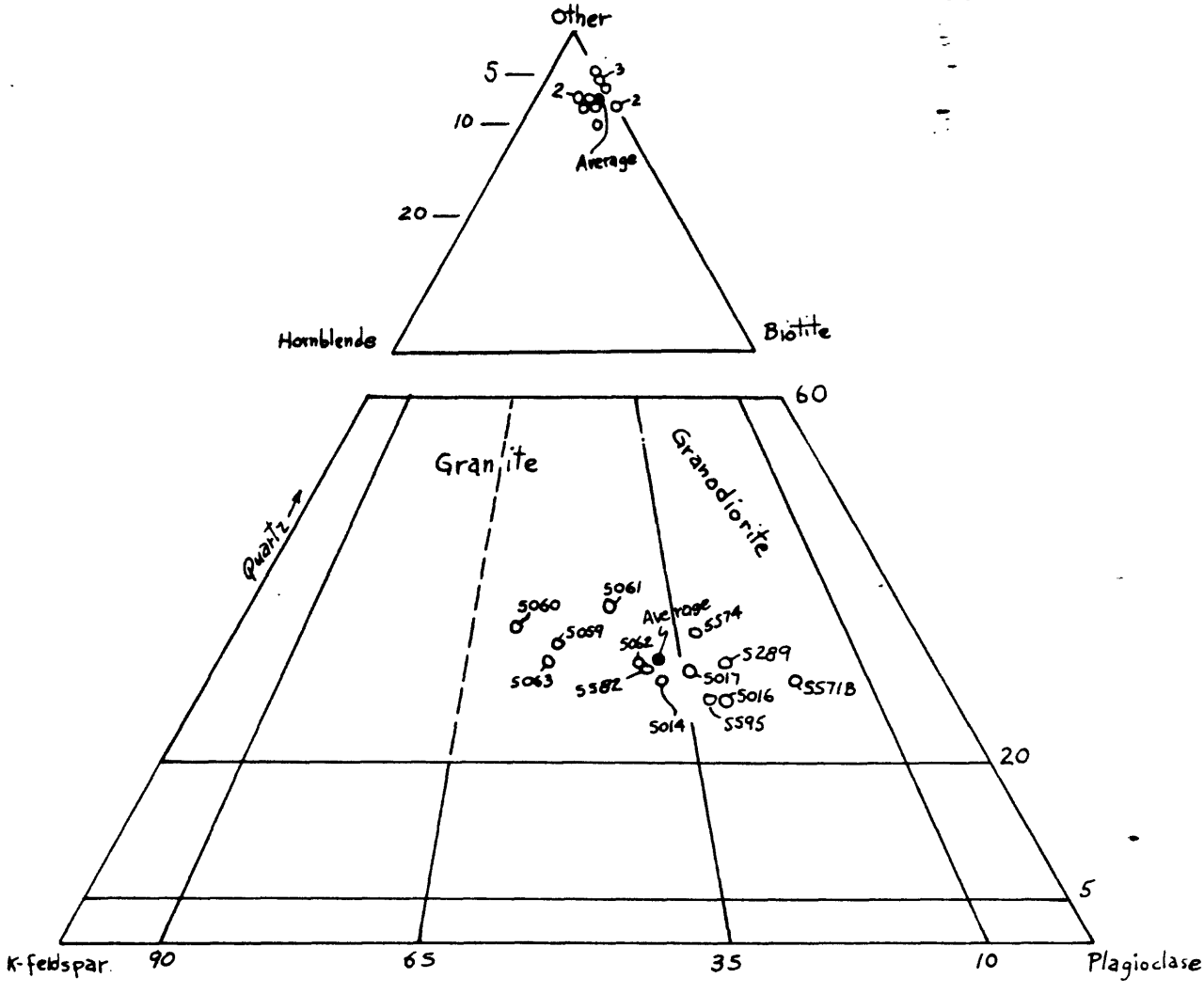


Location of modal samples of Granite of Onyx

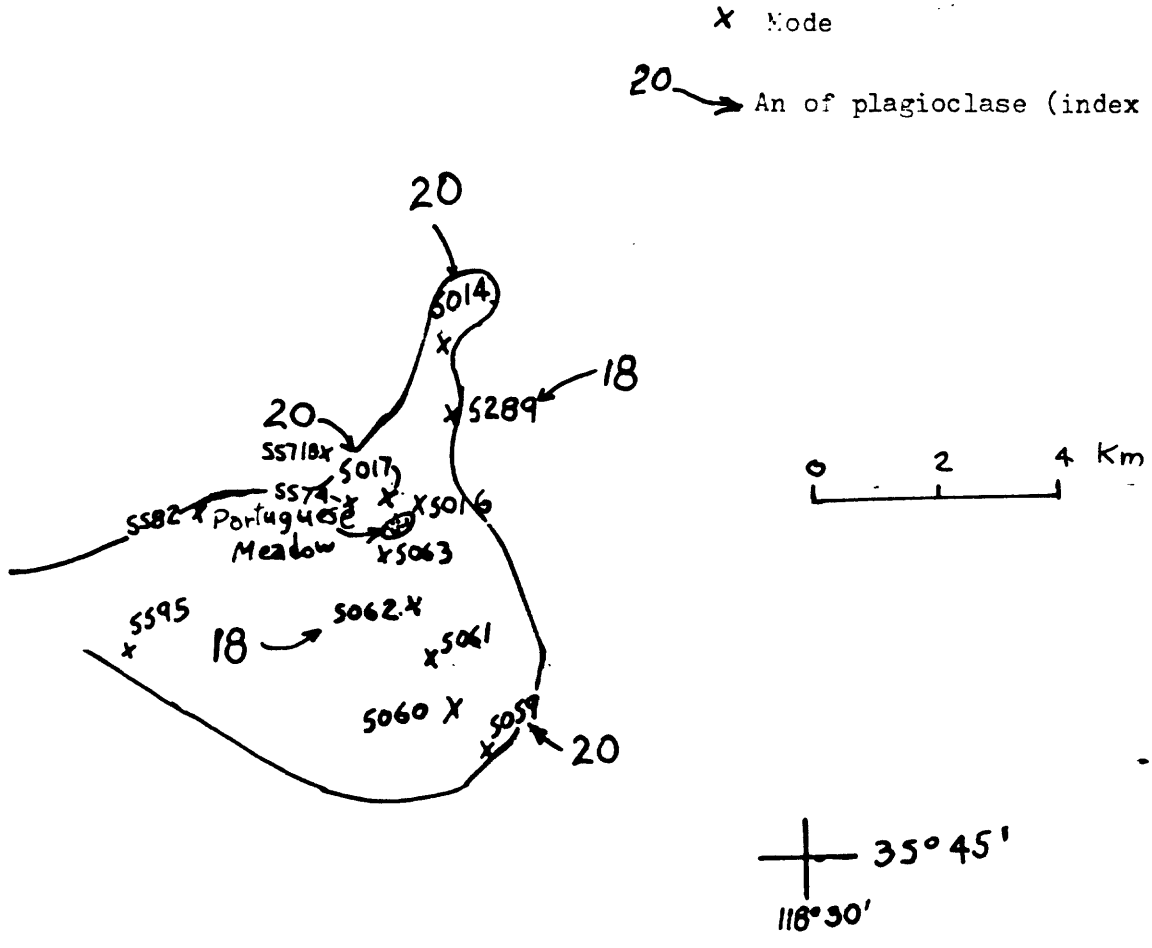

Granite of Onyx
119° 30'

MODES OF GRANITE OF PORTUGUESE PASS

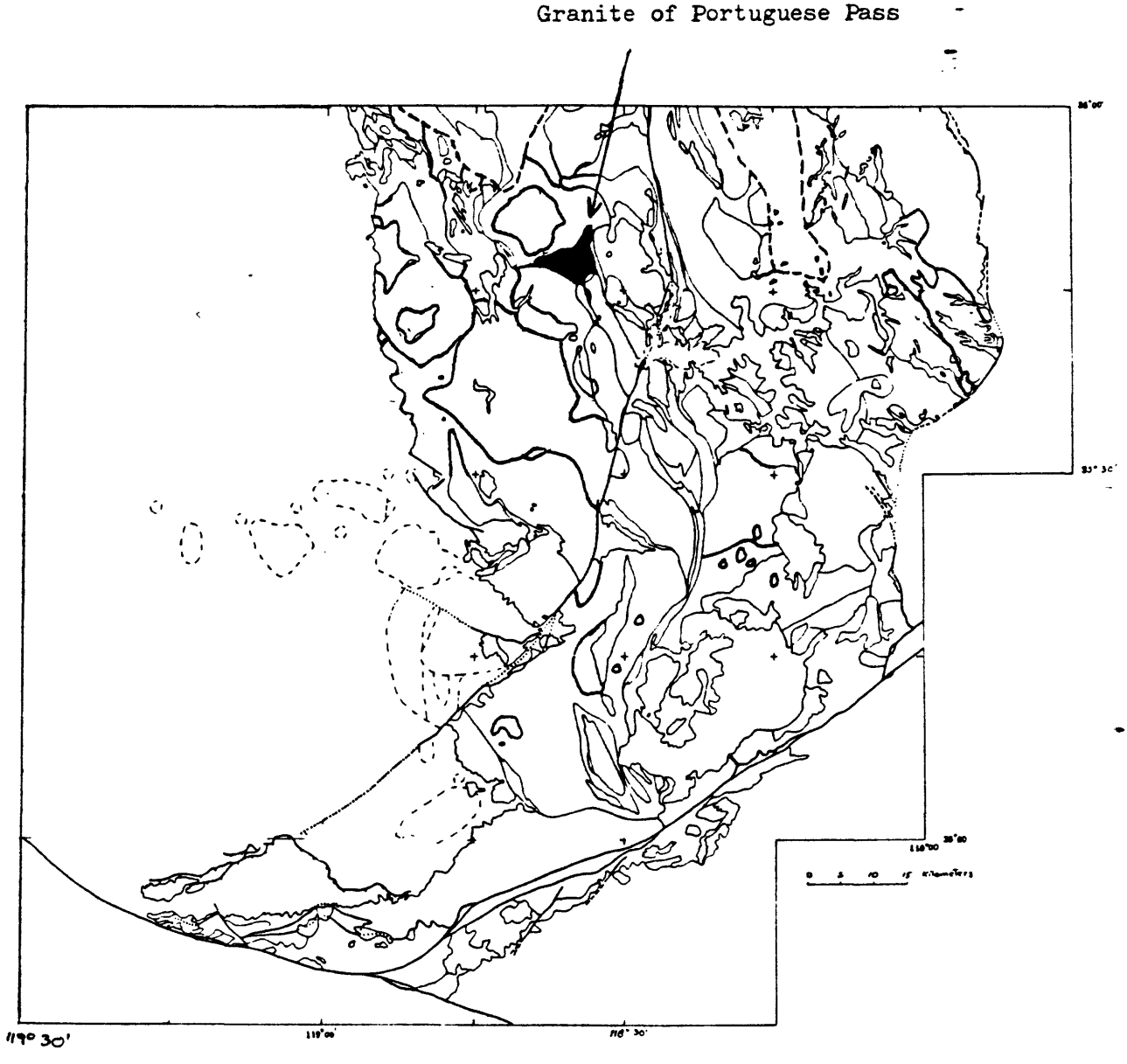
Sample Number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Other	Specific gravity
·5014	41	25	27	5	2	Opx <1	2.66
·5016	47	20	25	5	3	Opx ?	2.65
·5017	42	22	28	6	2		2.66
·5059	31	33	32	4	-	Opaque <1	2.63
·5060	26	36	33	5	<1	Opaque <1	2.64
·5061	33	26	35	6	<1	Opaque <1	2.63
·5062	39	27	29	5	<1		2.65
·5063	30	35	30	5	-	Opaque <1	2.61
·5289	44	18	28	7	3		-
·5571B	52	13	27	8	<1		-
·5574	42	19	31	8	<1		-
·5582	39	26	28	4	3		-
·5595	46	22	25	4	3		-
Average	39.5	25	29	5.5	1		2.64
Standard deviation	(7.5)	(6.9)	(3.0)	(1.4)	(1.4)		(.02)



Modal plot of Granite of Portuguese Pass

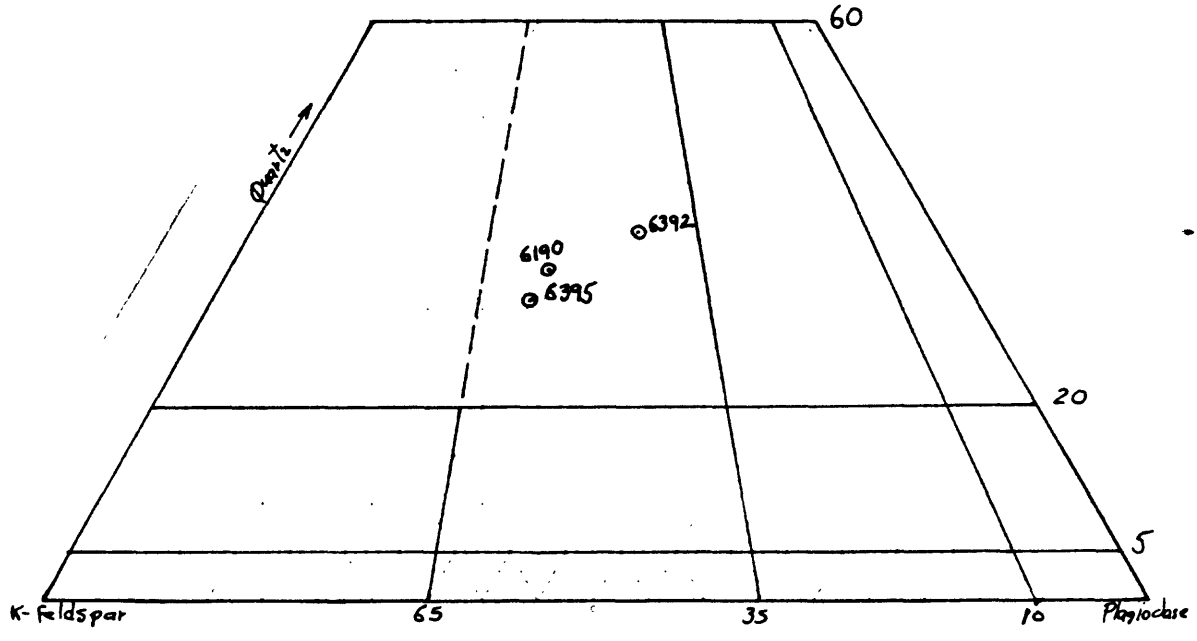


Location of modal samples of Granite of Portuguese Pass

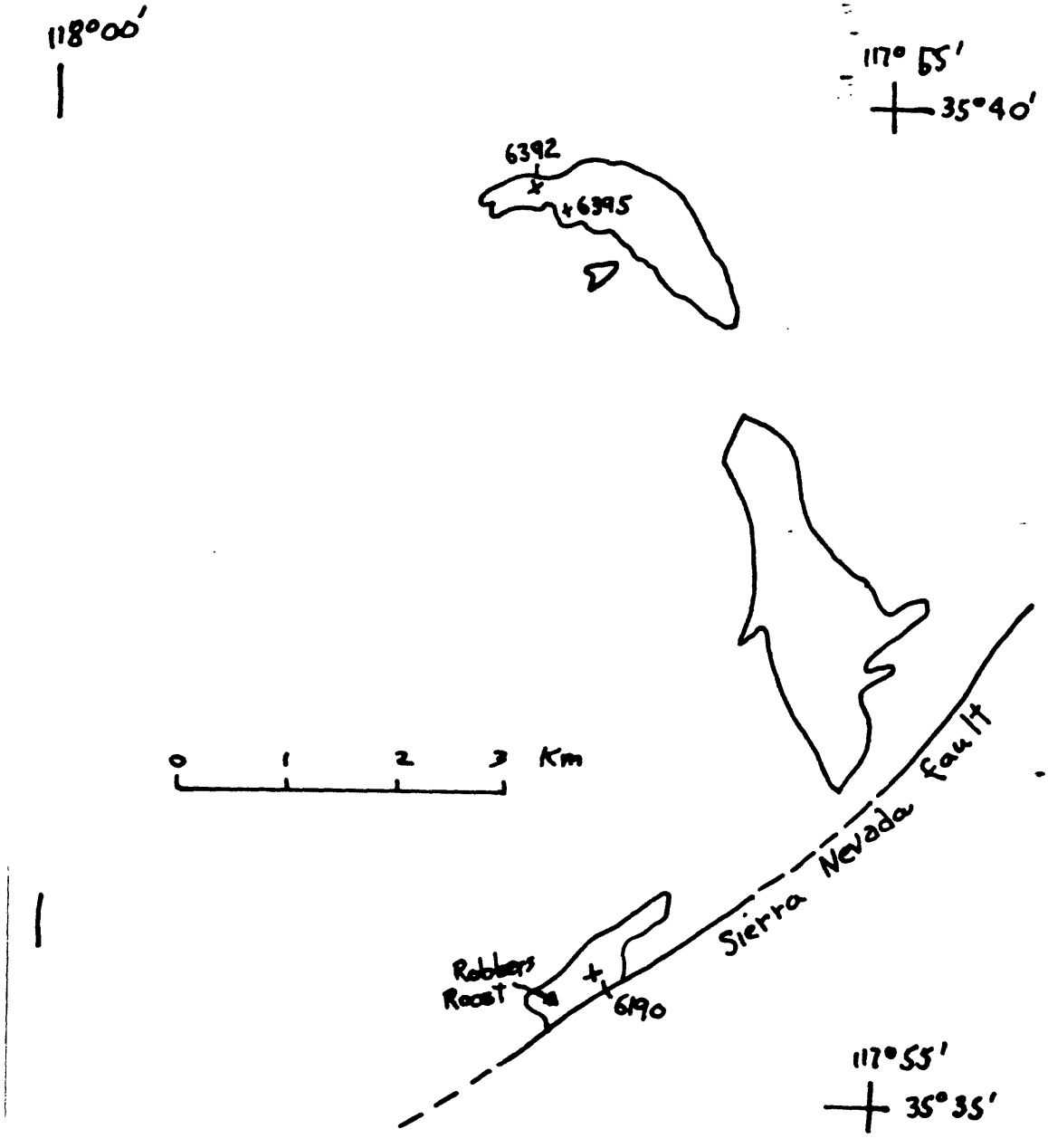

Granite of Portuguese Pass
119° 30'

MODES OF ALASKITE OF ROBBERS ROOST

Sample number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende		Other	
6190	29	37	34	<1			Opaque <1	
6392	34	27	37	1			Opaque 1	Garnet <1
6395	29	40	31	<1			Opaque <1	

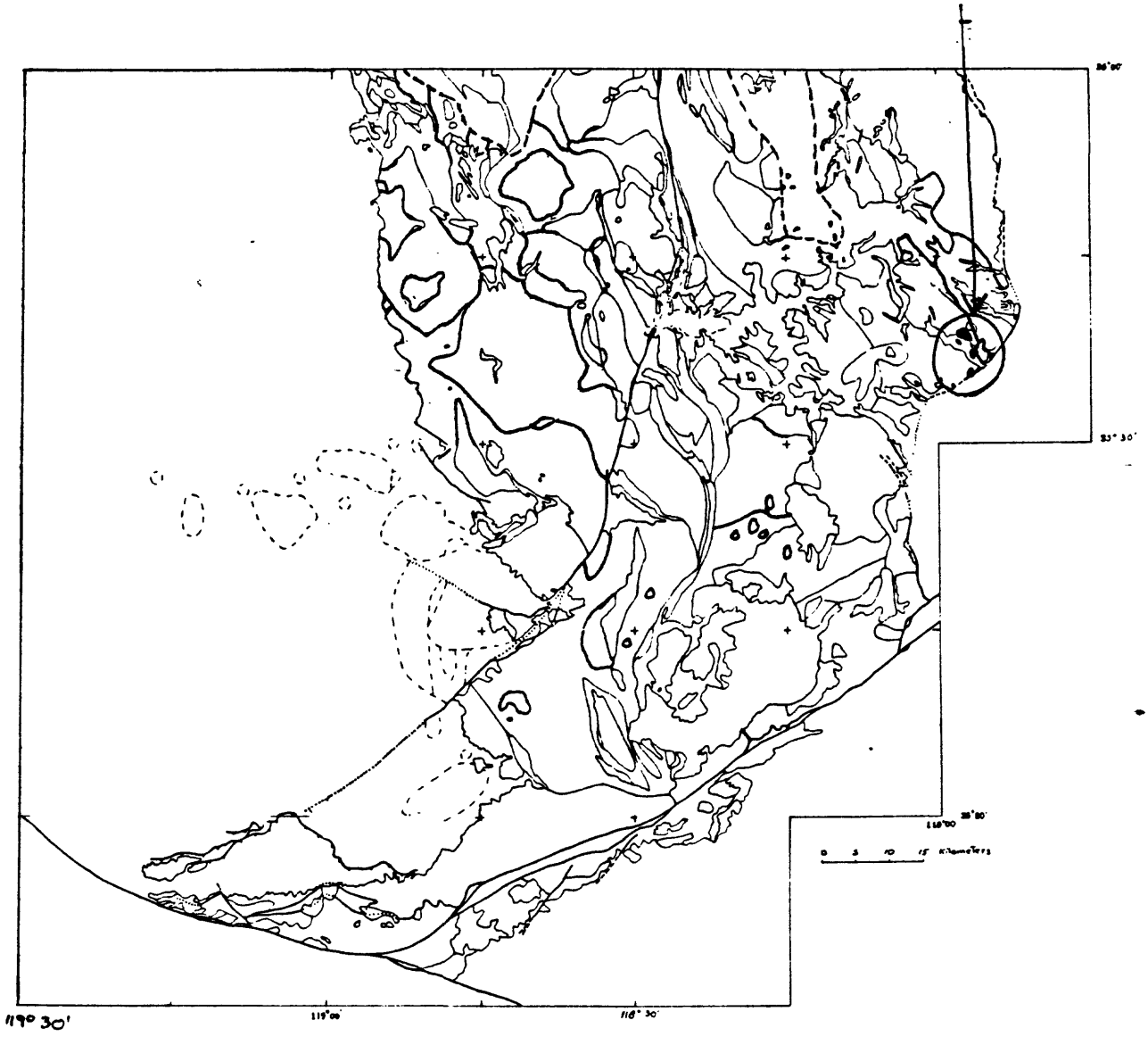


Modal plot of Alaskite of Robbers Roost



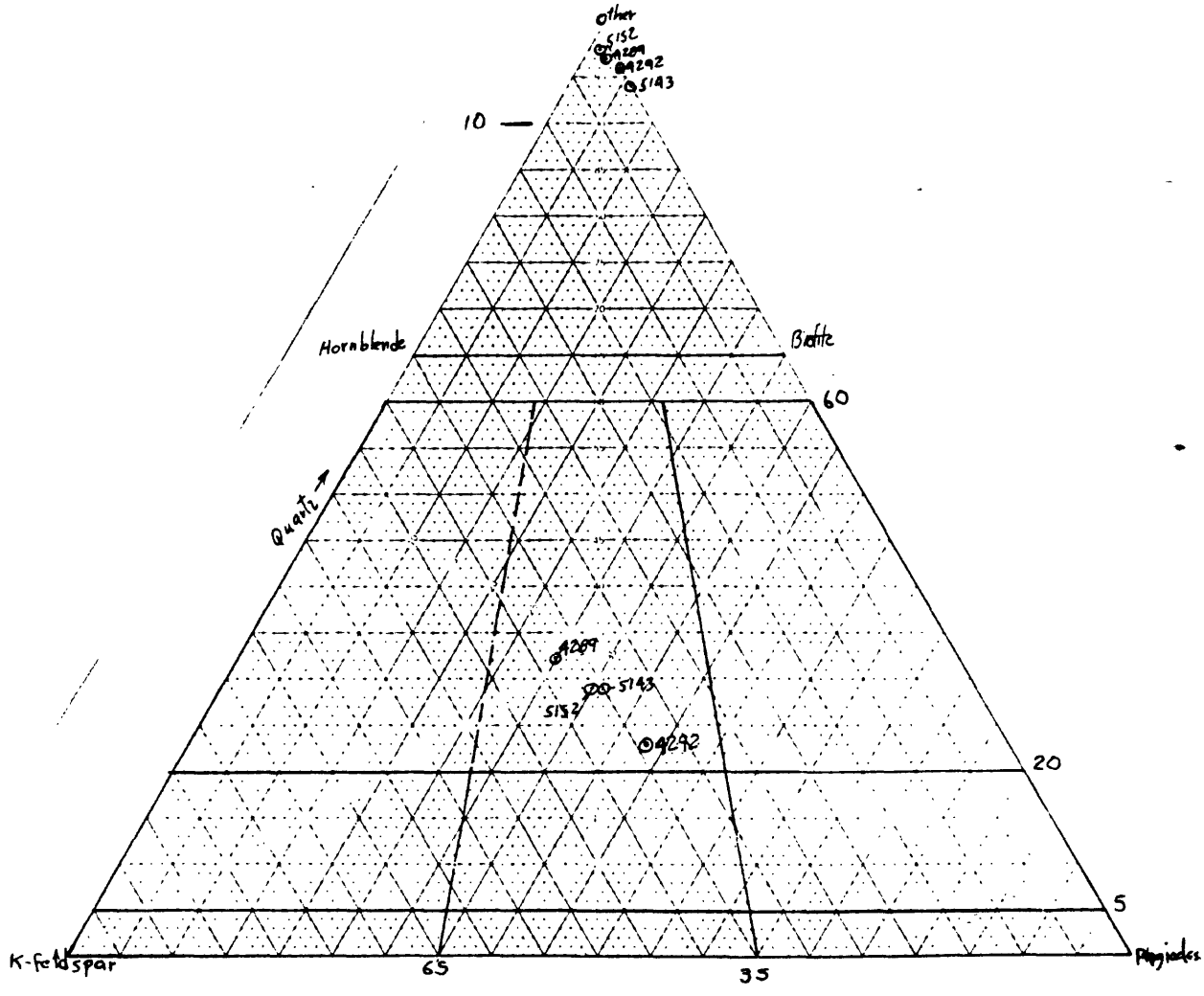
Location of modal samples of Alaskite of Robbers Roost

Alaskite of Robbers Roost

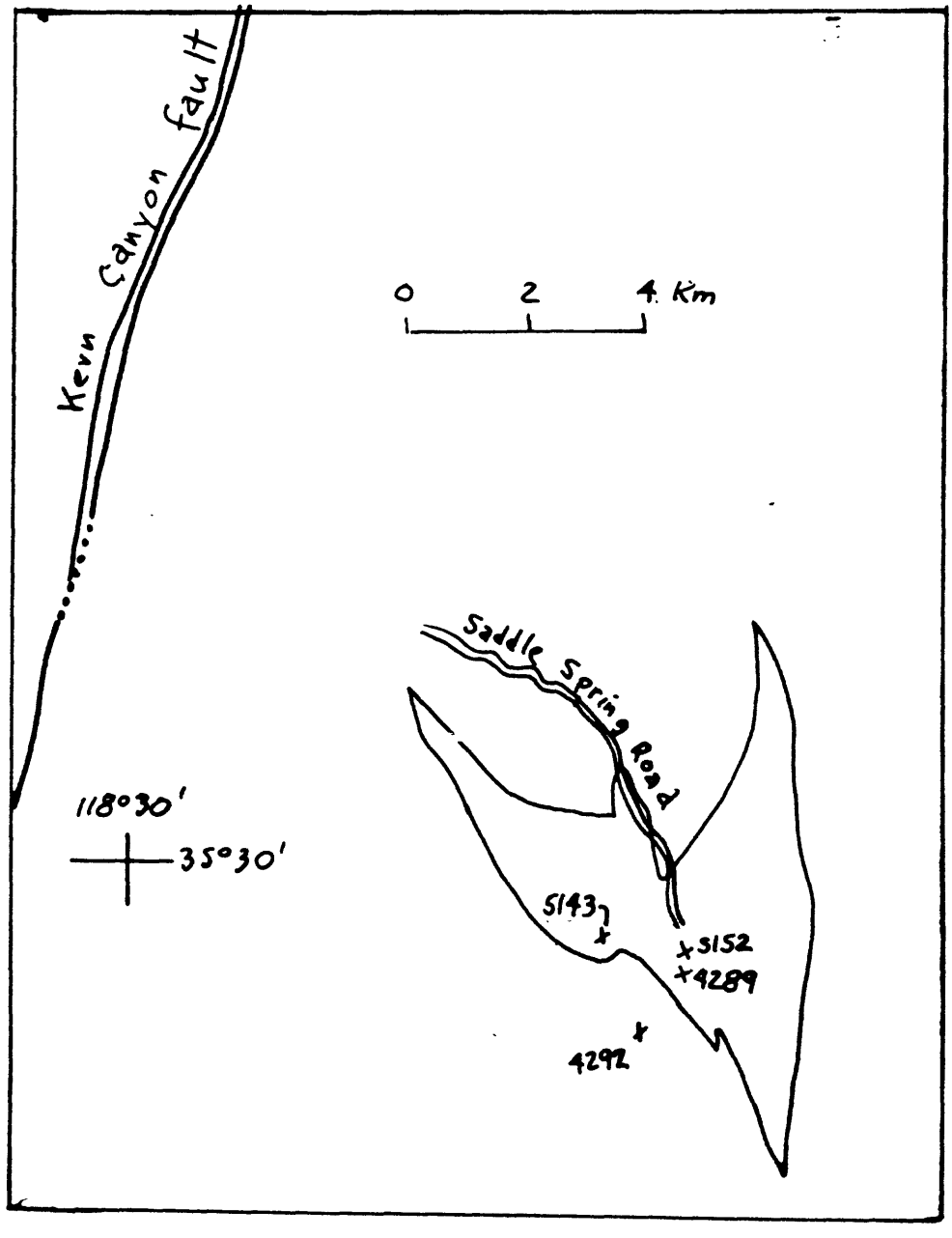


MODES OF THE GRANITE OF SADDLE SPRING ROAD

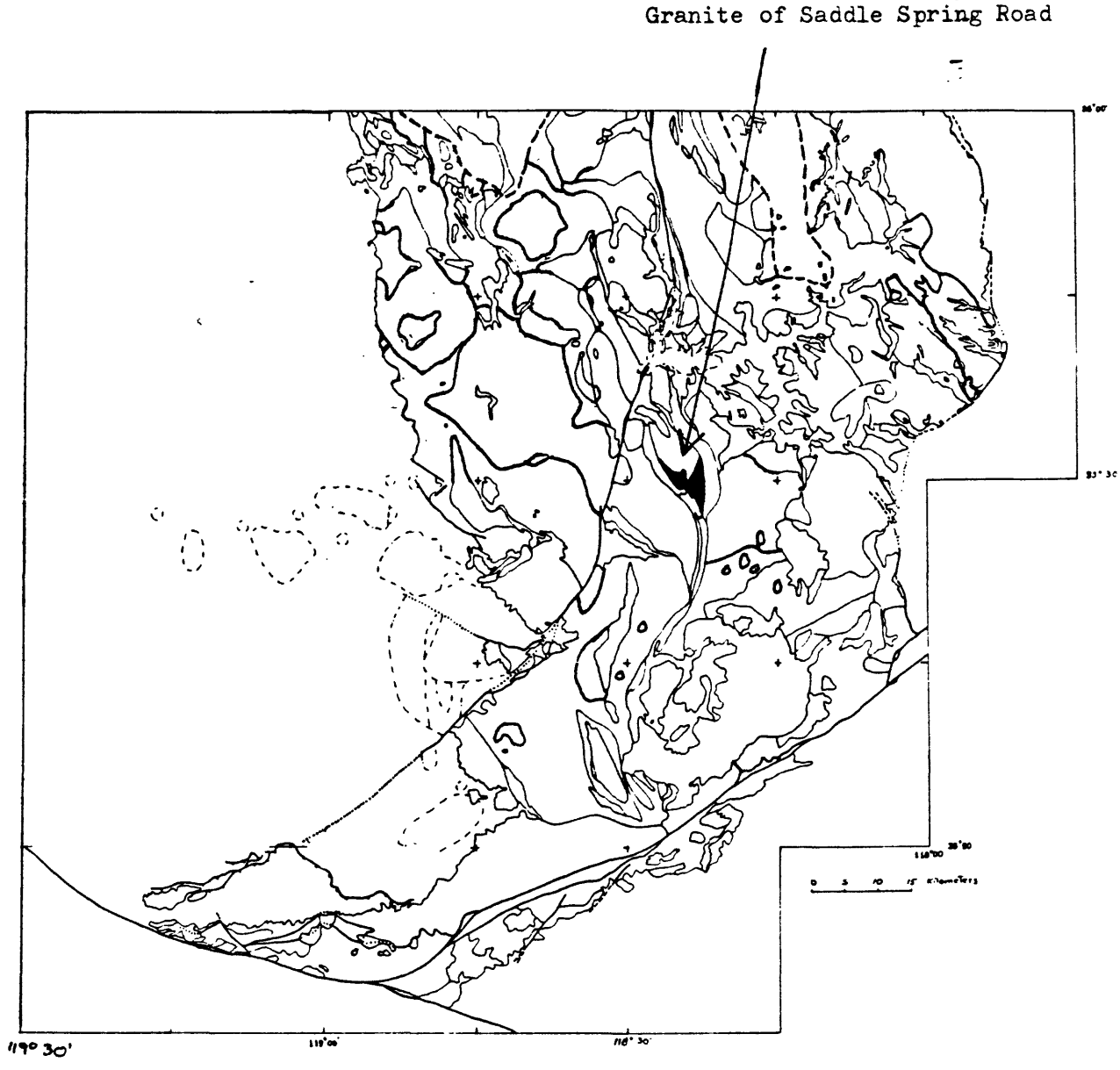
Sample number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Other	Specific gravity
4289	29	36	31	3	1		2.63
4292	41	33	22	4	<1		2.64
5143	34	33	27	6	-	Allanite <1	2.63
5152	34	34	29	2	1		2.63



Modal plot of Granite of Saddle Spring Road

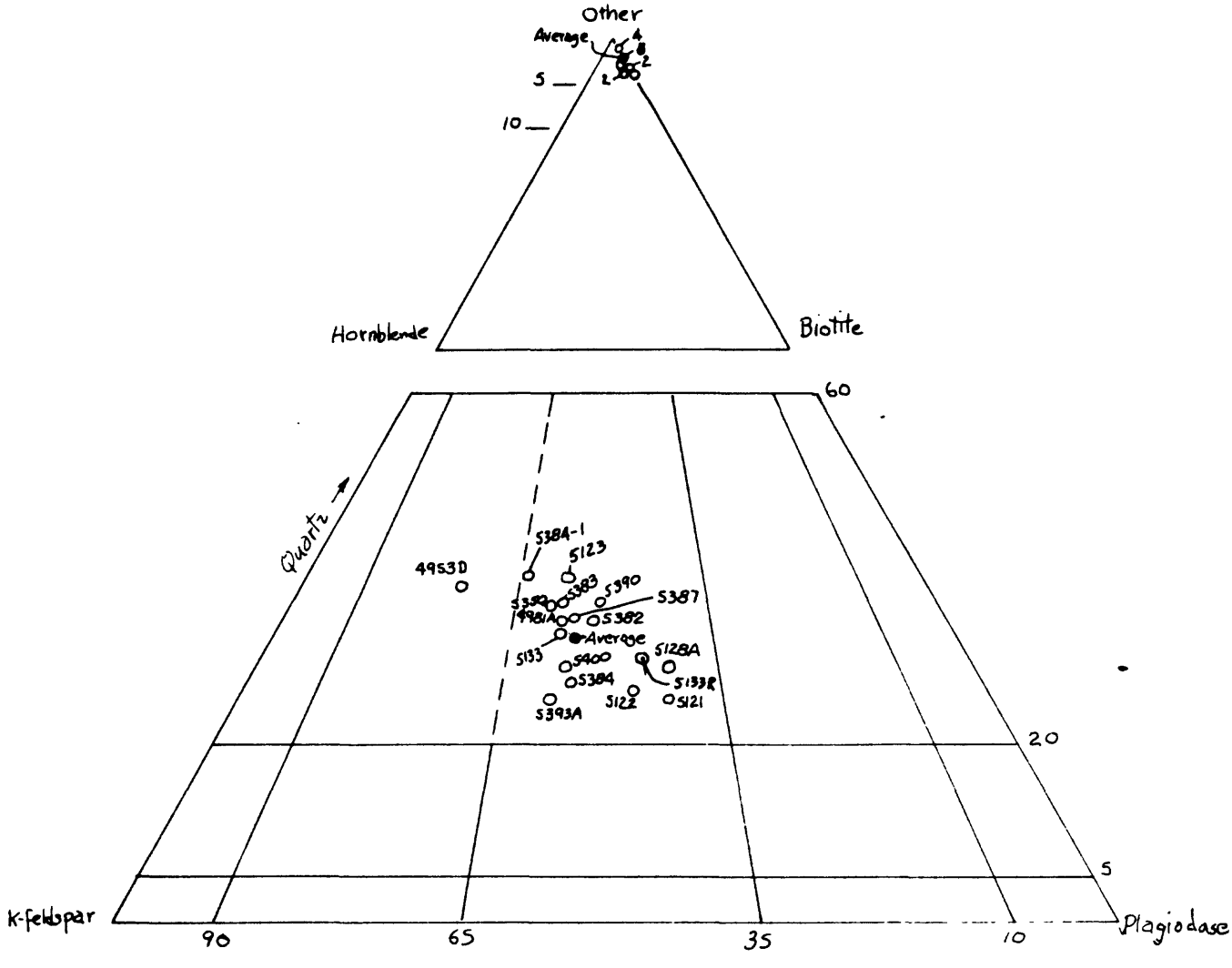


Location of modal samples of Granite of Saddle Spring Road

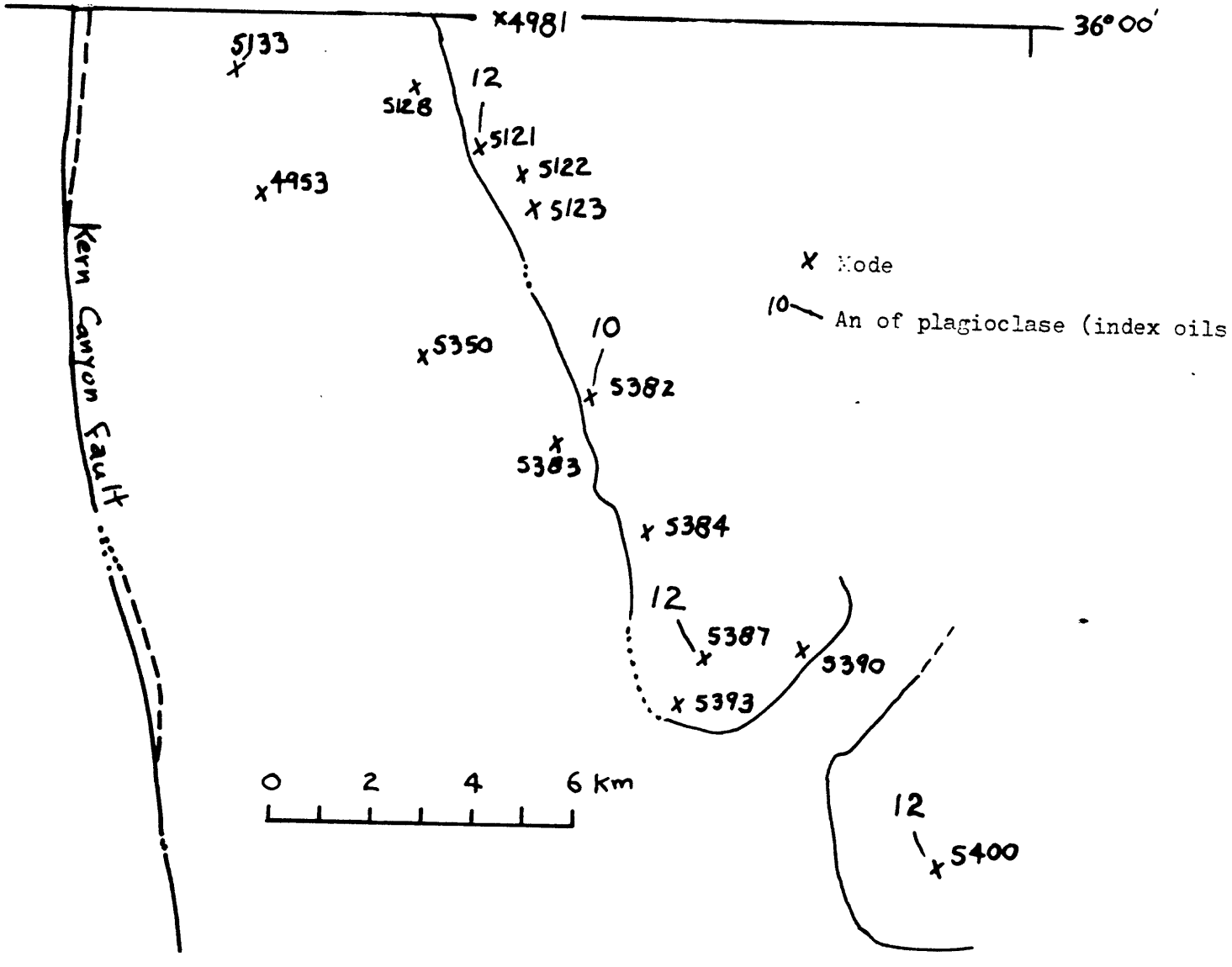

Granite of Saddle Spring Road
119° 30'

MODES OF GRANITE OF SHERMAN PASS

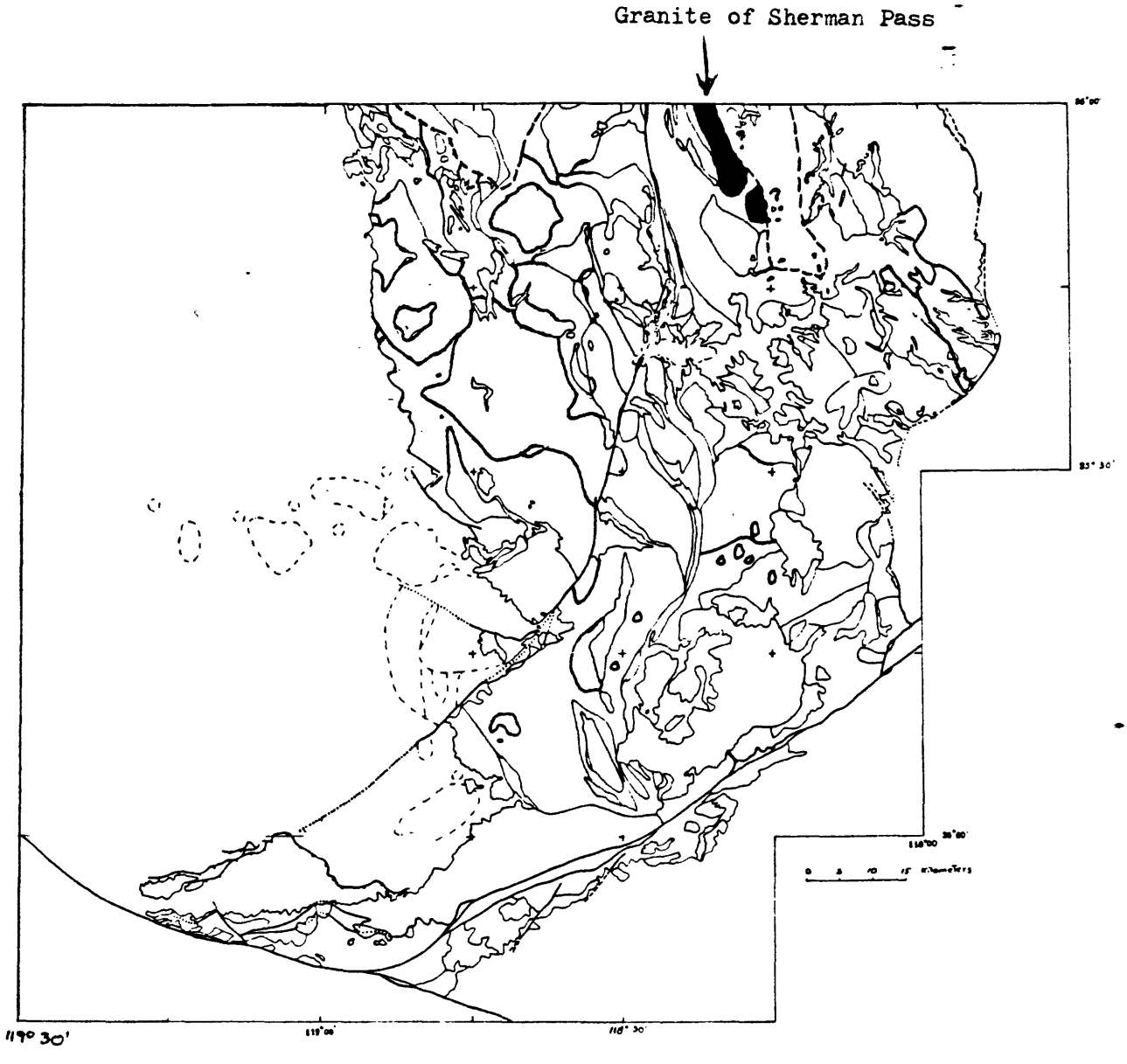
Sample number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Sphene	Opaque	Other	Specific gravity
4953D	15	45	37	3					2.59
4981A	28	37	33	2					2.62
5121	41	30	24	3	1	0.5	0.5		2.62
5122	36	34	25	3	1	0.5	0.5		2.64
5123	26	34	38	1	<1		1		2.61
5126A	40	29	28	2	<1	0.5	0.5		2.63
5133	28	38	32	2					2.62
5133R	30	36	29	4	1				
5350	26	37	35	2					
5382	30	34	33	2	1		<1		
5383	27	36	35	1			0.5	Garnet 0.5	
5384	32	40	27	1			<1		
5384-1	22	38	38	2			<1		
5387	28	37	34	1			<1		
5390	30	32	35	3					
5393A	30	42	24	4					
5400	30	39	29	2			<1		
Average	29.5	36.5	31.5	2		0.5			
Standard deviation	6.1	4.1	4.8	1.0		-			



Modal plot of Granite of Sherman Pass

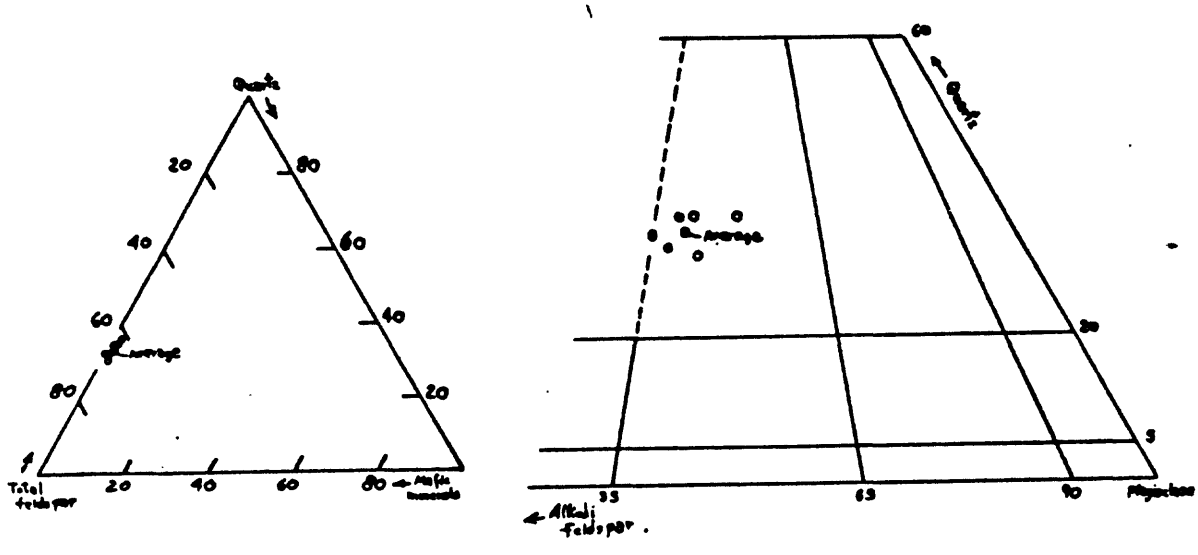


Location of modal samples of Granite of Sherman Pass

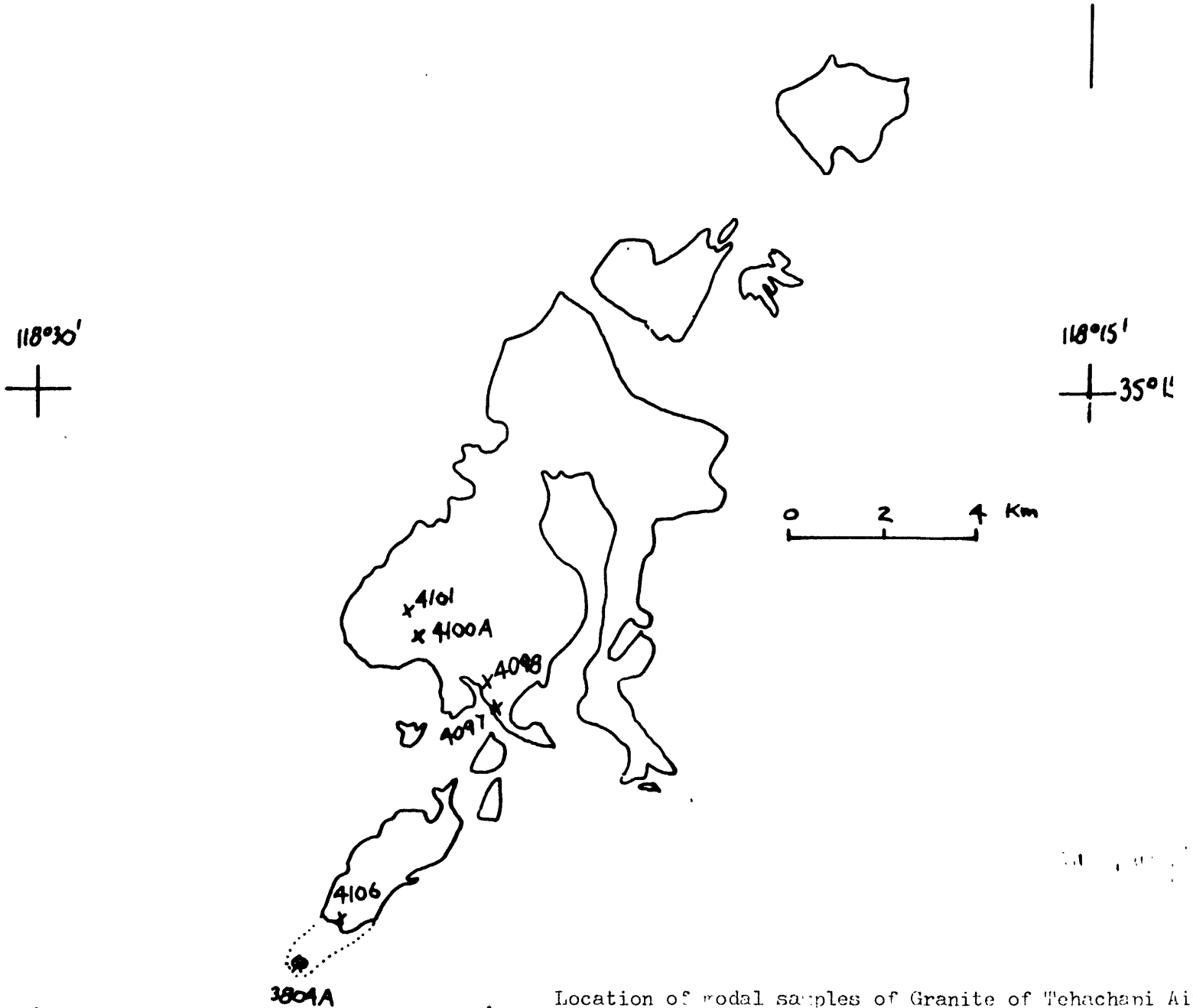

Granite of Sherman Pass
119° 30'

MODES OF GRANITE OF TEHACHAPI AIRPORT

Sample	Plagioclase	K-feldspar	Quartz	Biotite	Garnet	Specific gravity
3804A	26	40	32	---	2	2.55
4097	31	32	35	2	<1	2.61
4098	28.5	38.5	30.5	2	.5	2.61
4100A	22	42.5	33	1.5	1	2.60
4101	25	38	35	2	<1	2.58
4106	27	36	34.5	1.5	1	2.59
Average--------	26.5	38	33	1.5	1	2.59
Standard deviation.	3.1	3.6	1.8	.8	---	.02



Modal plots of Granite of Tehachapi Airport



Location of modal samples of Granite of Tehachapi Airport


119° 30'
119°00
118° 30'
Granite of Tehachapi Airport

MODES OF GRANITES OF TEJON LOOKOUT AND BEAN CANYON

TEJON LOOKOUT

[All modes in volume percent. Others: O, opaque minerals; S, sphene]

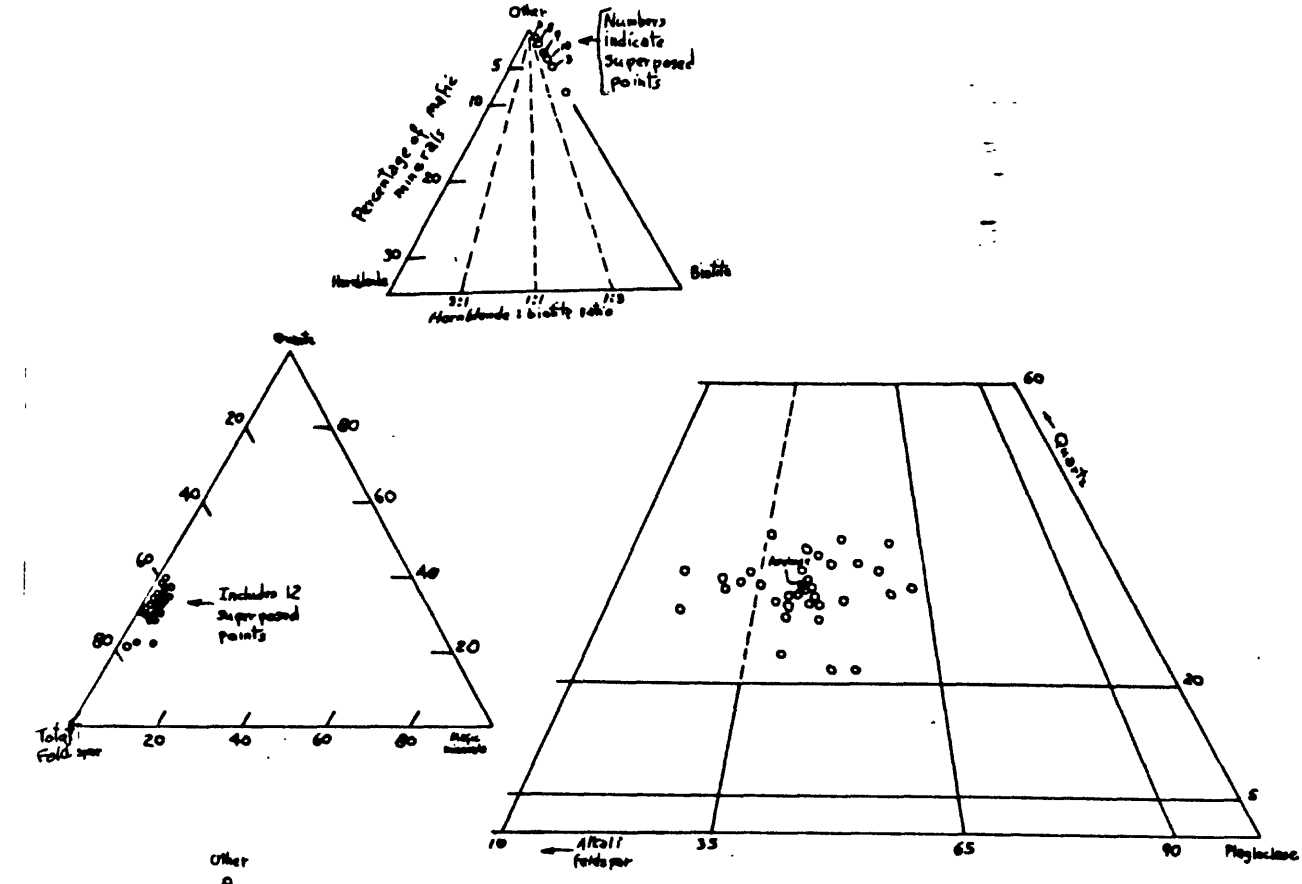
Sample	Plagioclase	K-feldspar	Quartz	Biotite	Others	Specific gravity
647	27	39	30	4	---	2.59
666	38	27	31	4	---	2.64
667B	28	36	32	4	---	2.67
3307A	24	42	32	2	---	2.61
3308	31	35	30	4	---	2.59
3309	22	42	34	2	---	2.59
3313A	32	36	28	4	---	2.60
3315	28	40	28	4	---	2.60
3323	21	44	33	2	---	2.59
3329	19	46	32	3	---	2.60
3330	16	52	29	3	---	2.60
3339	22	37	39	2	---	2.60
3401	40	24	32	4	---	2.60
3457A	31	37	31	1	---	2.57
3458	30	35	30	5	---	2.61
3465	18	46	33	3	---	2.62
3466	31	32	35	2	---	2.62
3467	39	35	22	4	---	2.62
3469A	33	29	35	3	---	2.60
3473	26	41	30	3	---	2.60
3475	34	25	37	5	---	2.60
3476A	36	27	34	3	---	2.62
3480	34	33	30	3	---	2.58
3493	26	34	37	3	---	2.61
3495	28	33	35	4	---	2.62
3509	28	36	33	3	---	2.61
3512	28	37	31	4	---	2.60
3514	28	36	34	2	---	2.58
3741	29	41	22	8	<1(O), <1(S)	2.63
3752A	14	50.5	34	1	.5(O)	2.60
3755	37	39	21	2	1(O)	2.60
3763A	30	30	38	2	---	2.60
3769	27	38	30	5	---	2.61
3771	30	36	33	1	---	2.59
Average--------	28	37	32	3	---	2.61
Standard deviation.	6.3	6.6	4.1	1.4	---	.02

BEAN CANYON

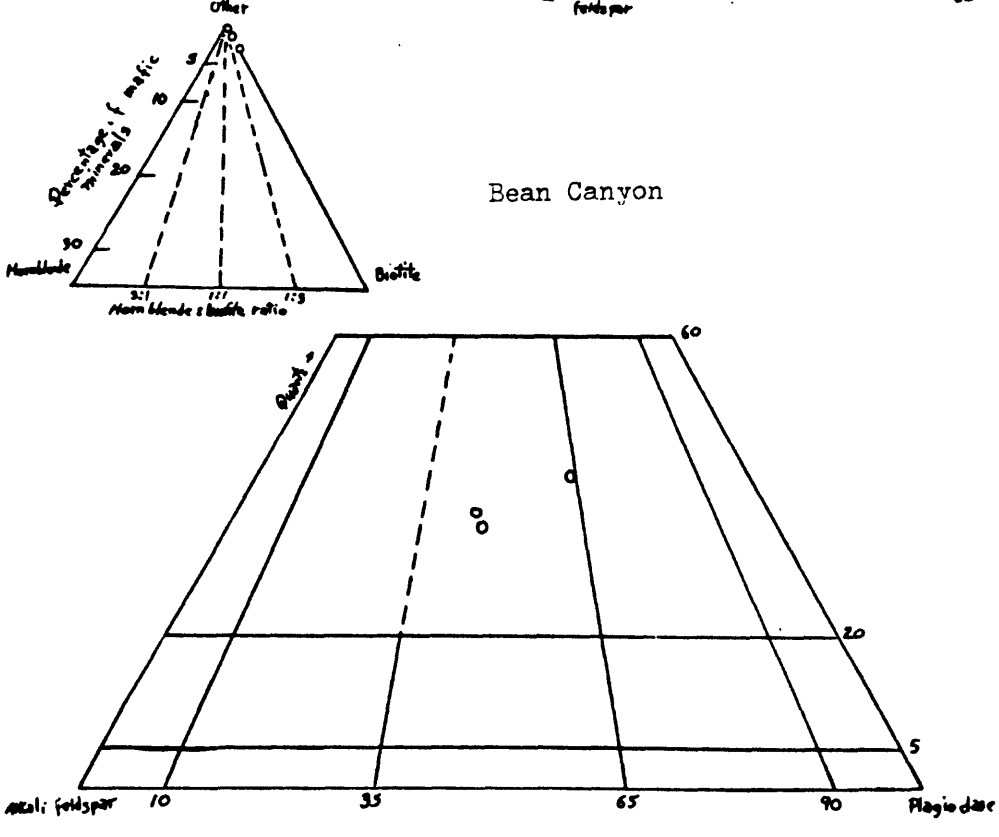
[All modes in volume percent. M, muscovite]

Sample	Plagioclase	K-feldspar	Quartz	Biotite	Specific gravity
3828	37	21	42	1(M)	2.58
4016	30	35	34	1	2.61
4032	34	27	36	3	2.60
Average---	34	28	37	1	2.60

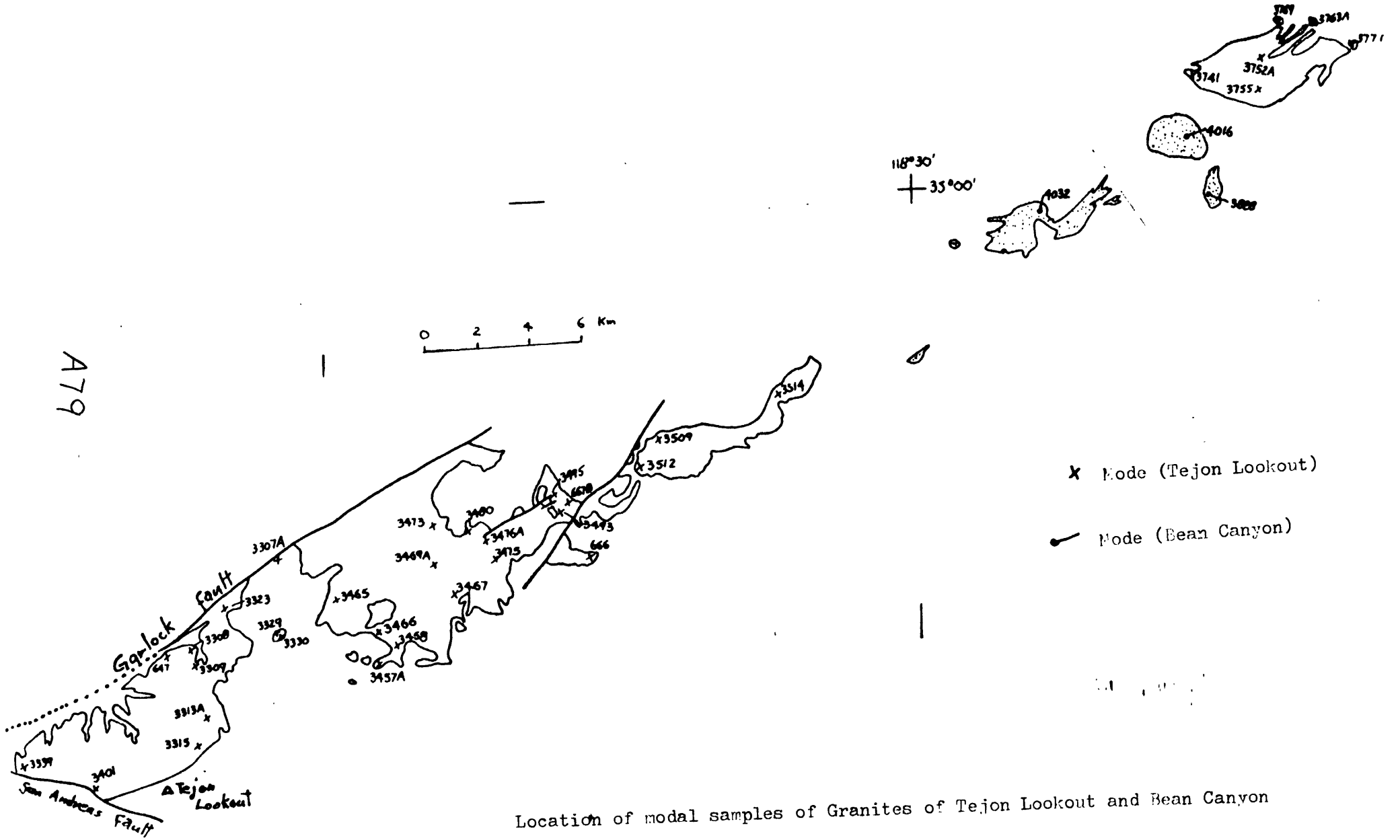
Tejon Lookout



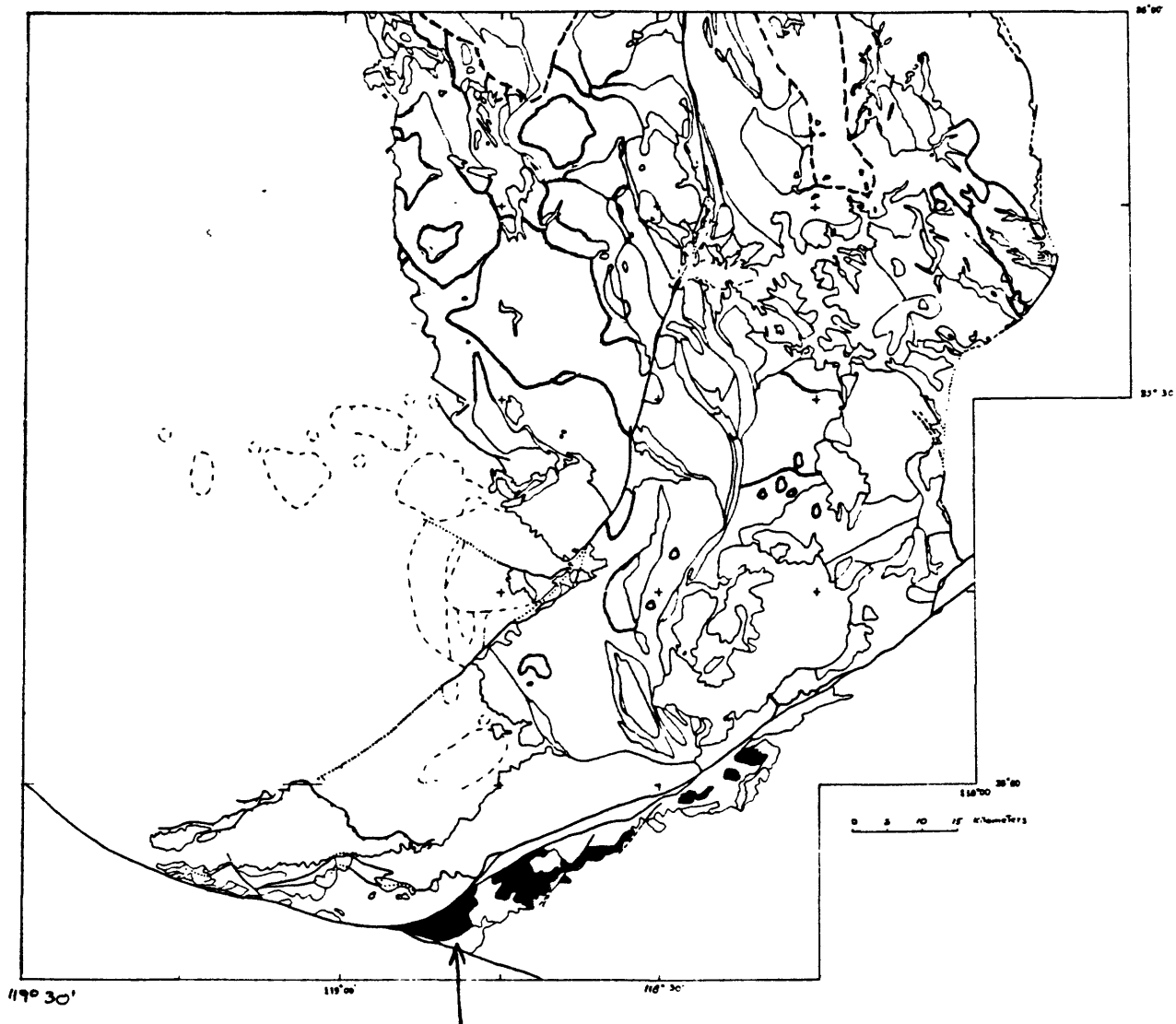
Bean Canyon



Modal plots of Granites of Tejon Lookout and Bean Canyon



Location of modal samples of Granites of Tejon Lookout and Bean Canyon



Granites of Tejon Lookout and Bean Canyon

MODES OF MISCELLANEOUS GRANITES ON EAST SIDE OF THE SIERRA NEVADA

Alaskite of Noname Canyon

Sample Number	Plagioclase	K-feldspar	Quartz	Muscovite	Garnet			
6442A	33	32	33	2	-			
6448B	29	29	38	4	<1			
6451	37	25	37	1	<1			
6457	35	27	35	3	<1			
6468	36	25.5	37	1	0.5			
6536C	33	34	32	1	<1			
6538	43	28	27	2	<1			
6543B	32	28	34	6	<1			
Average	35	29	34	2	<1			
Standard deviation	4.2	3.1	3.6	1.8	-			

Granite of Brown

Sample Number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende		Other	
6430	33	36	24	7	-		Opaque <1	
6446	38	32	21	7	2		Opaque <1	

Granite of Sand Canyon

Sample Number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende		Other	
6448A	39	25	31	5	-		Opaque <1	
6450	42	24	31	4	-		Opaque <1	
6454B	41	28	26	5	-			

Miscellaneous granite dikes and small plugs into granodiorite of Sacatar

Sample Number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende		Other	
6465A	29	49	19	3	-		Opaque <1	
6475B	26	34	37	3	-			
6478	26	36	35	3	-			
6483C	40	30	24	6 (includes some muscovite)				

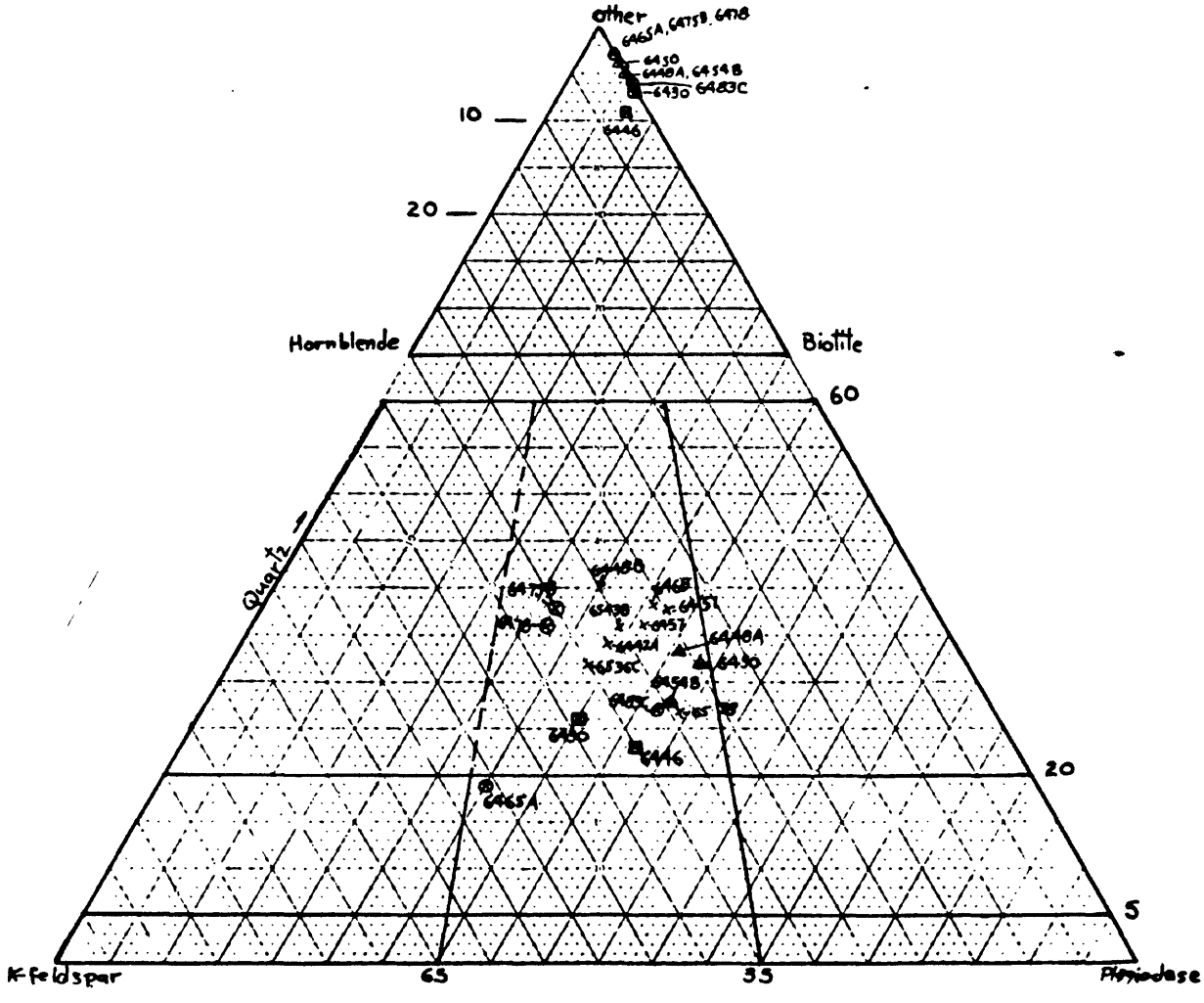
Modal plot of miscellaneous granites on the east side of the Sierra Nevada

X Noname Canyon

⊠ Brown

Sand Canyon

⊗ Miscellaneous into Sacatar



36°00

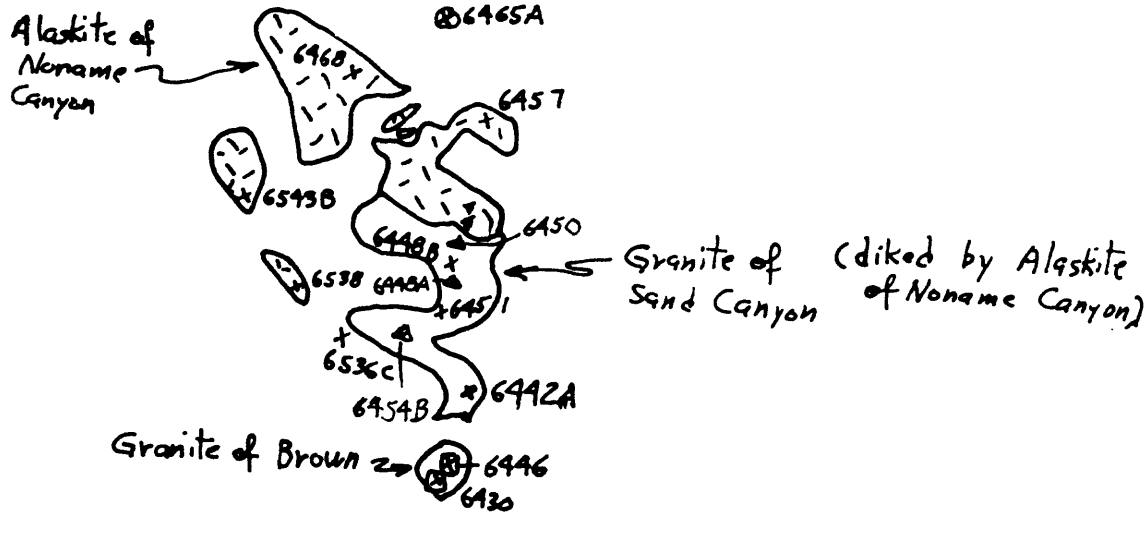
6483

Location of mode samples
of miscellaneous granites
on east side of Sierra Nevada

- Noname Canyon
- Brown
- Sand Canyon
- Miscellaneous into Sacatar

6478
6475B

0 2 4 6 km

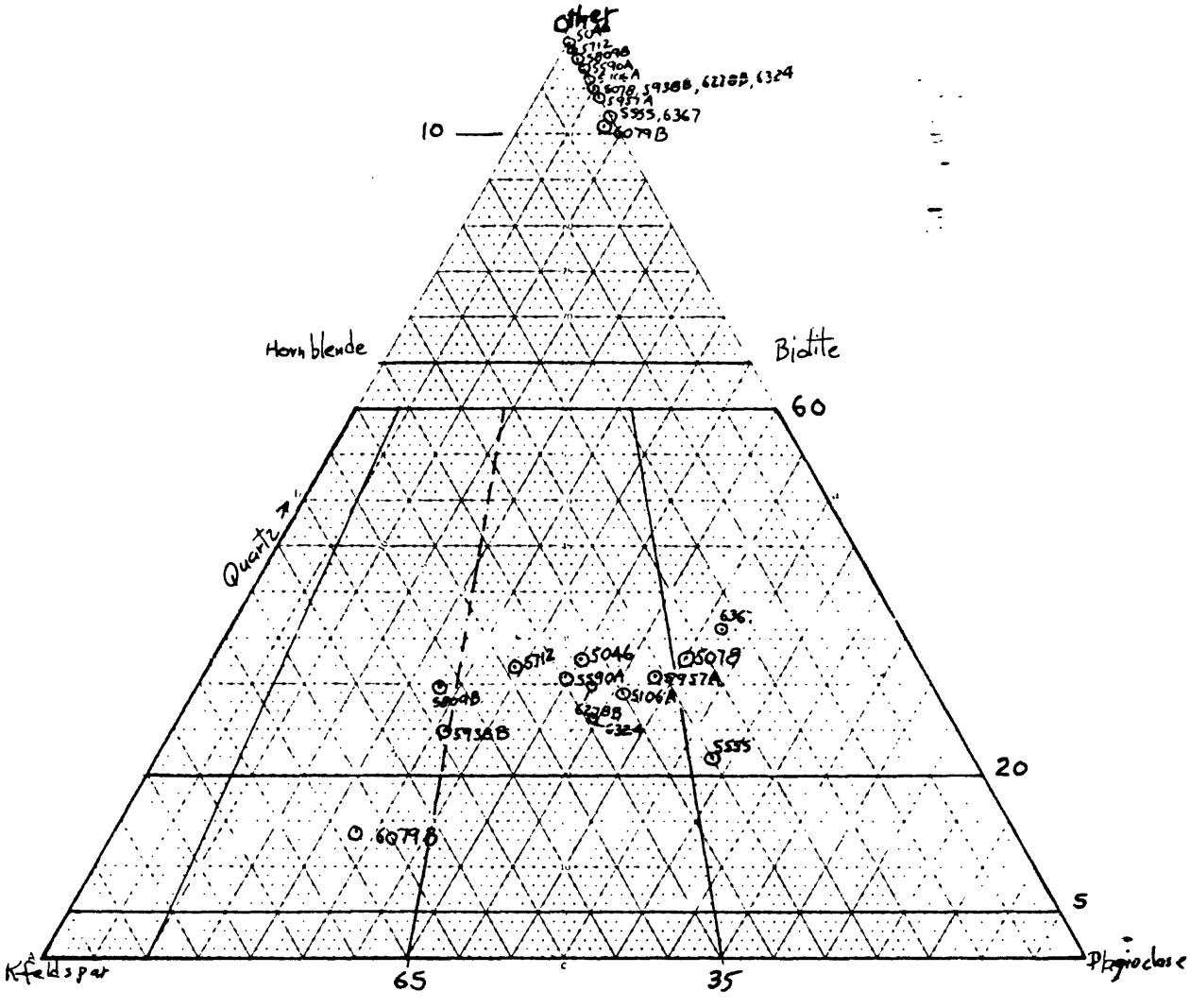


118°00'

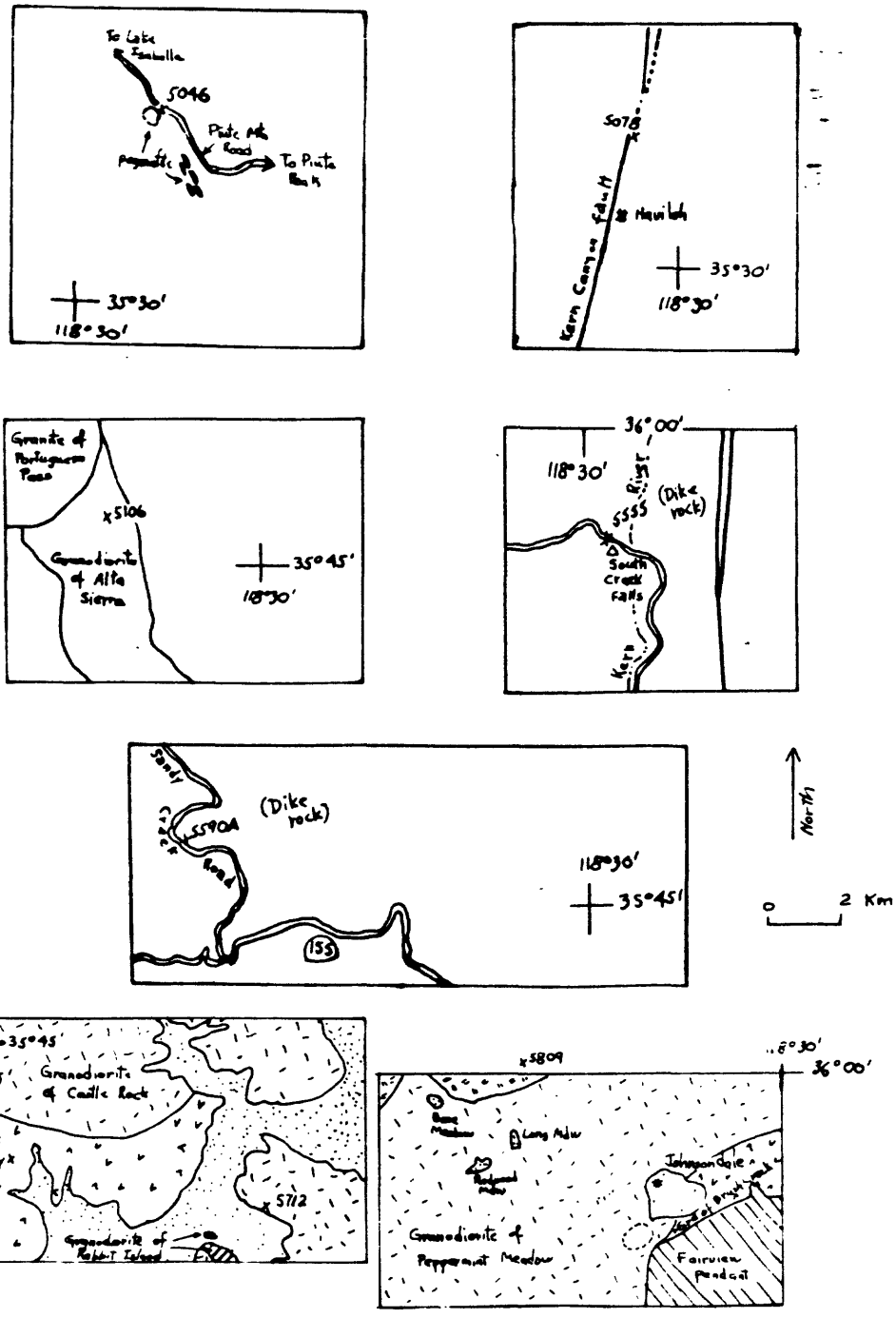
35°45'
117°45'

MODES OF MISCELLANEOUS GRANITIC ROCKS (MOSTLY DIKES)

Sample Number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Other	Specific gravity
5046	35	32	33	—	—	Garnet, Tourmaline 41	2.60
	(Bald Eagle Peak - aplite with pegmatite) - FLOAT						
5078	43	21	31	5	-		2.63
	(Near Havilah - dike into Alta Sierra)						
5106 A	39	29	28	4	-		2.63
	(Northeast of Alta Sierra - dike into Alta Sierra)						
5555	49	23	20	8	-		—
	(Near South Creek Falls - dike of Peppermint Mdw? into Kern Bridge)						
5590 A	33.5	33.5	30	3			
	(Sandy Creek Road - dike into Alder Flat)						
5712	29	37	33	1 (+musc.)		opaque <1	
	(South of Bloomfield Ranch - coarse-grained, probably alaskite w/aplite)						
5809B	23	46	29	2			
	(Northwest of Johnsondale - FLOAT, probably aplite-alaskite)						
5938B	29.5	46.5	24	4		opaque 1	
	(Aplite dike - 1 km southwest of Quonsey Mill - not on Index map)						
5957A	41	24	29	6	?		
	(Dike into Portuguese Pass Pody - Sandy Creek Fire Road - not on index map)						
6079B	21	57	13	8 ?	1 ?		
	(Greenwine Grade - on White River - small unusual plug in Carver-Bowen unit) [Not on Index map]						
6278B	35	31	29	5			
	Granite intrusive into Paso Flat(?) - [On Hwy 155, 3 km WSW of Glennville] (Not on index map)						
6324	37	32	26	5			
	Granitic intrusive into Granite station (like 6278B?) - Just west of Round Mtn [Not on Index map]						
6367	43	16	33	8			
	Granodiorite dike into Bear Valley Springs - - on Hwy 178 at Delonegha Springs [Not on Index map]						



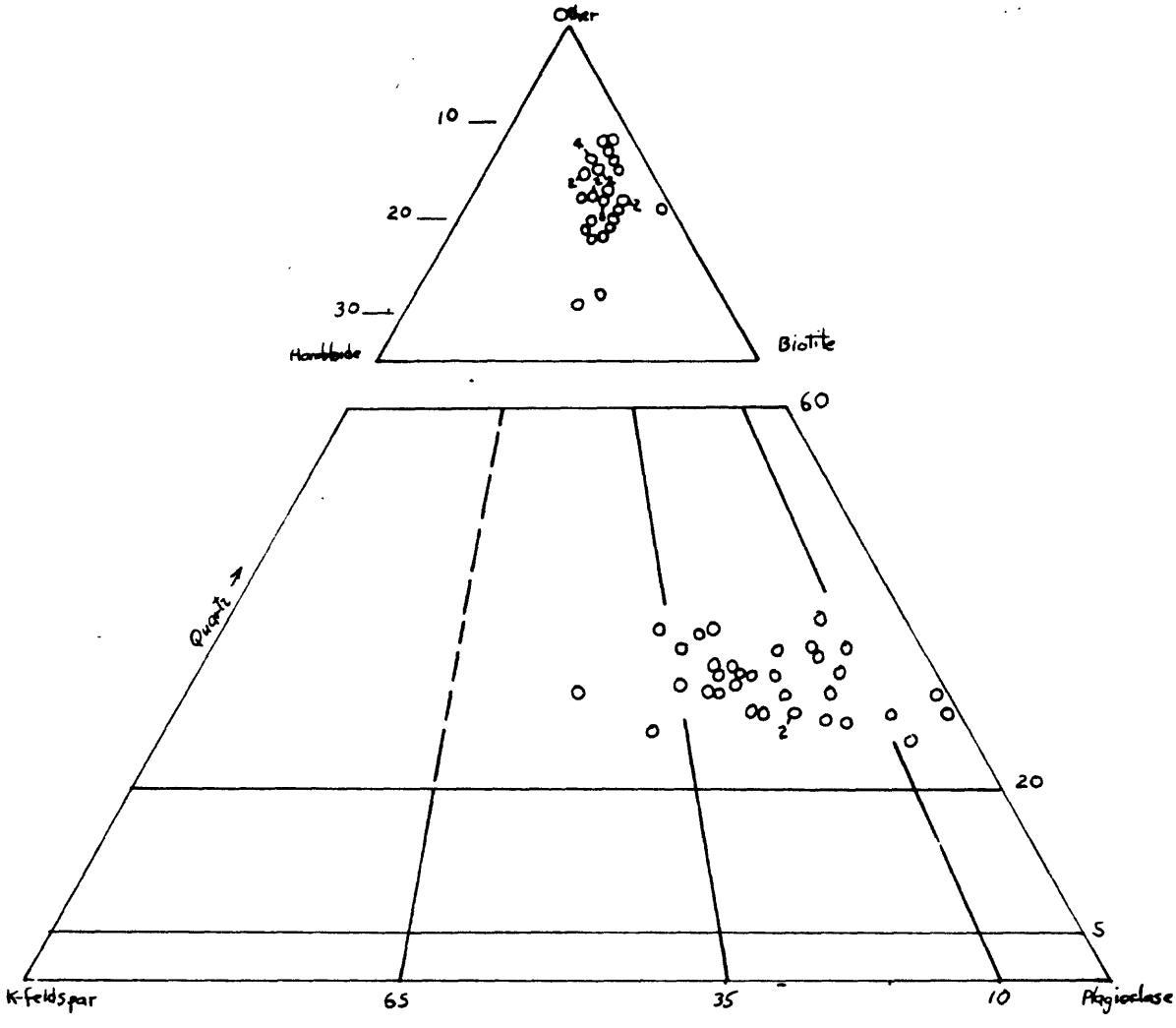
Modal plot of miscellaneous granitic rocks



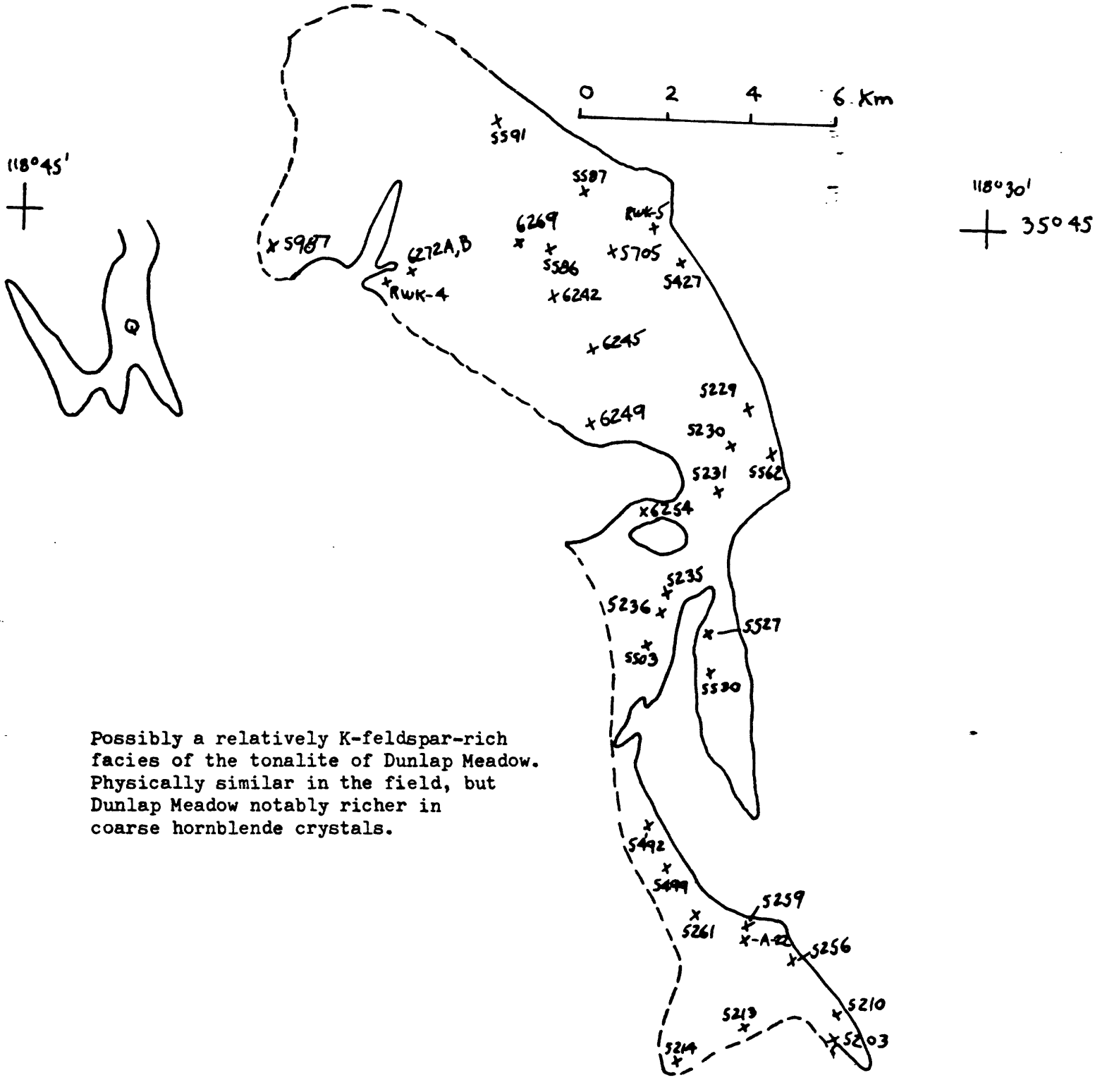
Location of modal samples of some miscellaneous granitic rocks

MODES OF GRANODIORITE OF ALDER CREEK

Sample number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende		Other		Specific gravity
S203	44	12	26	12	6				2.72
S210	45	8	27	12	8		Sphen <1		2.72
S213	49	13	24	9	5				2.72
S214	43	16	27	9	5				2.72
S229	43	8	27	13	9				2.70
S230	38	25	22	9	6				2.71
S231	44	7	31	14	4				2.68
S235	51	1	20	17	11		cpx? <1		2.77
S236	47	4	20	15	14		cpx <1		2.76
S256	55	<1	24	12	9				—
S259	41	17	27	9	6				—
S261	51	9	26	9	5				—
S427	44	12	22	14	8				—
S492	47	6	28	14	5				—
S499	42	14	26	12	6				—
S503	48	10	22	14	6				—
S527	42	15	28	12	3				—
S530	46	16	24	11	3				—
S562	49	9	21	18	1		cpx 2		—
S586	31	30	26	11	2				—
S587	39	16	32	10	3				—
S591	41	17	25	12	5				—
5705	40	21	27	9	3		Allanite <1		
5987	57	5	20.5	11	6.5		Opaque <1		
6242	35	18	29	12	6		Sphene <1		
6245	40	17	28	10	5		Sphene <1		
6249	42	11	28	14	5				
6254	47	7	25	14	7				
6269	36	16	30	10	8				
6272A	44	15	23	12.5	5.5				
6272B	34	20	32	9	5				
Rwk-4	39	18	25	11	7				
Rwk-5	40	15	27	12	6				
A-22	47	13	25	10	5				
Average	43.5	13	26	11.5	6				
Standard deviation	5.7	6.4	3.2	2.8	2.5				

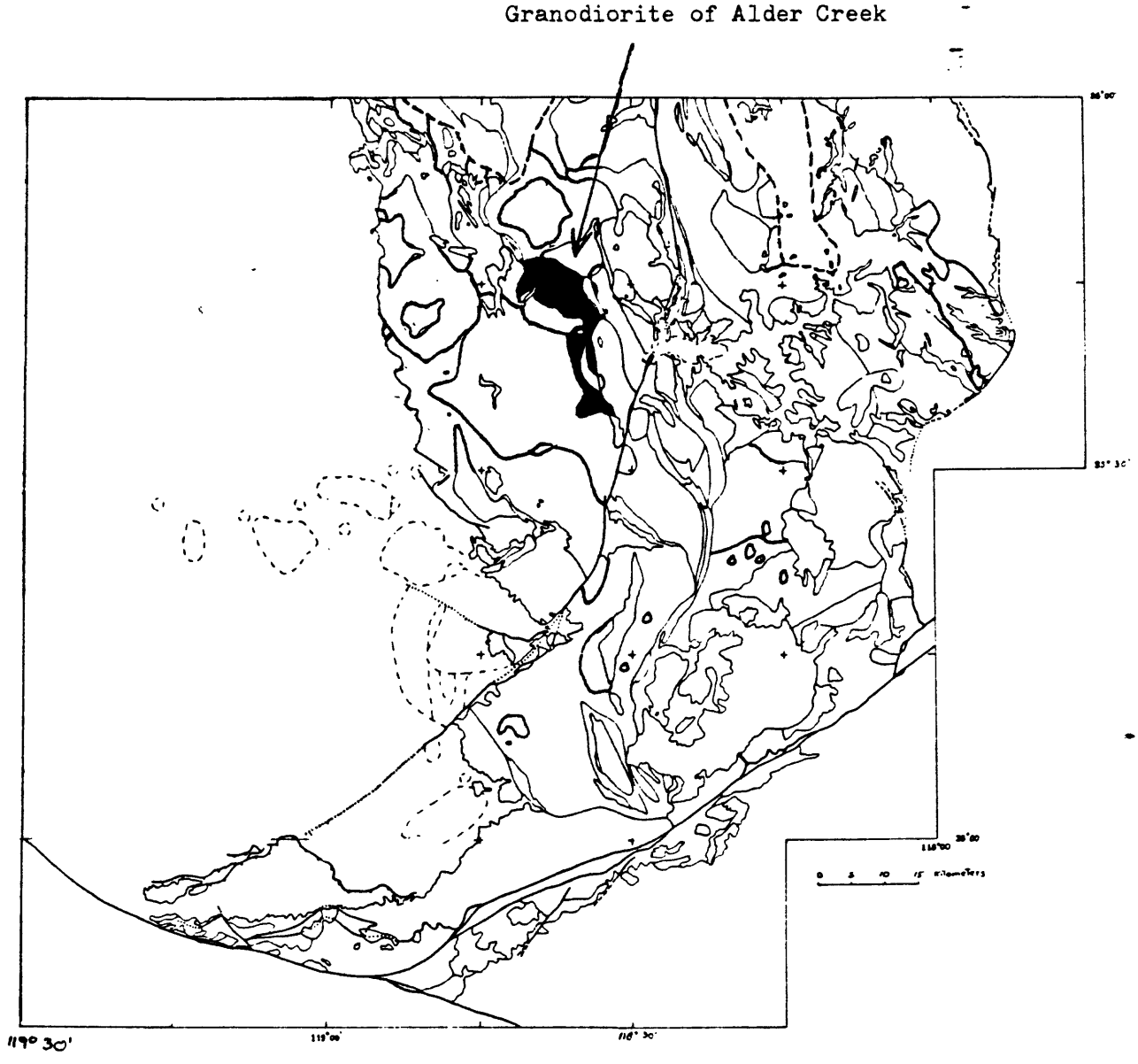


Modal plot of Granodiorite of Alder Creek



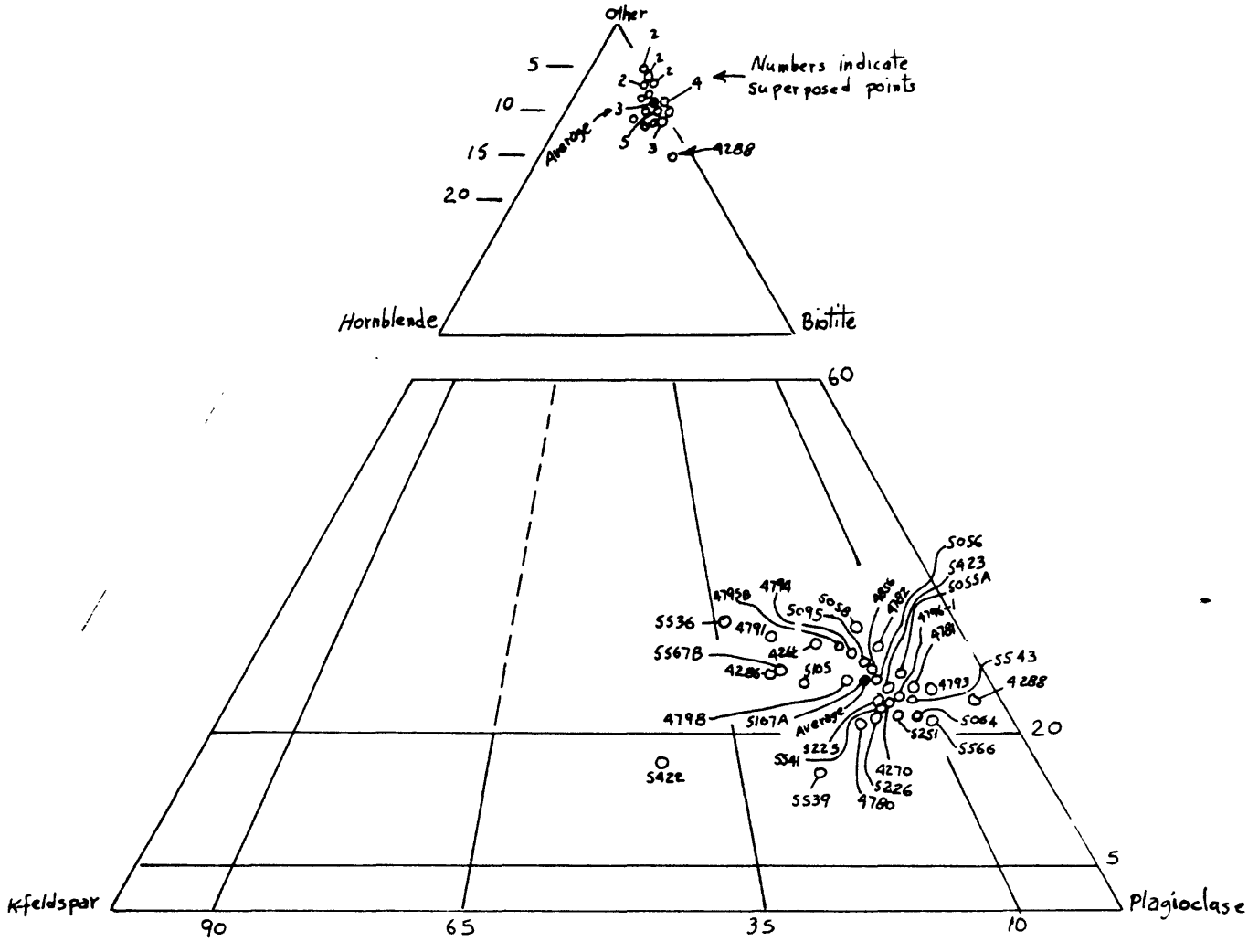
Possibly a relatively K-feldspar-rich facies of the tonalite of Dunlap Meadow. Physically similar in the field, but Dunlap Meadow notably richer in coarse hornblende crystals.

Location of modal samples of Granodiorite of Alder Creek

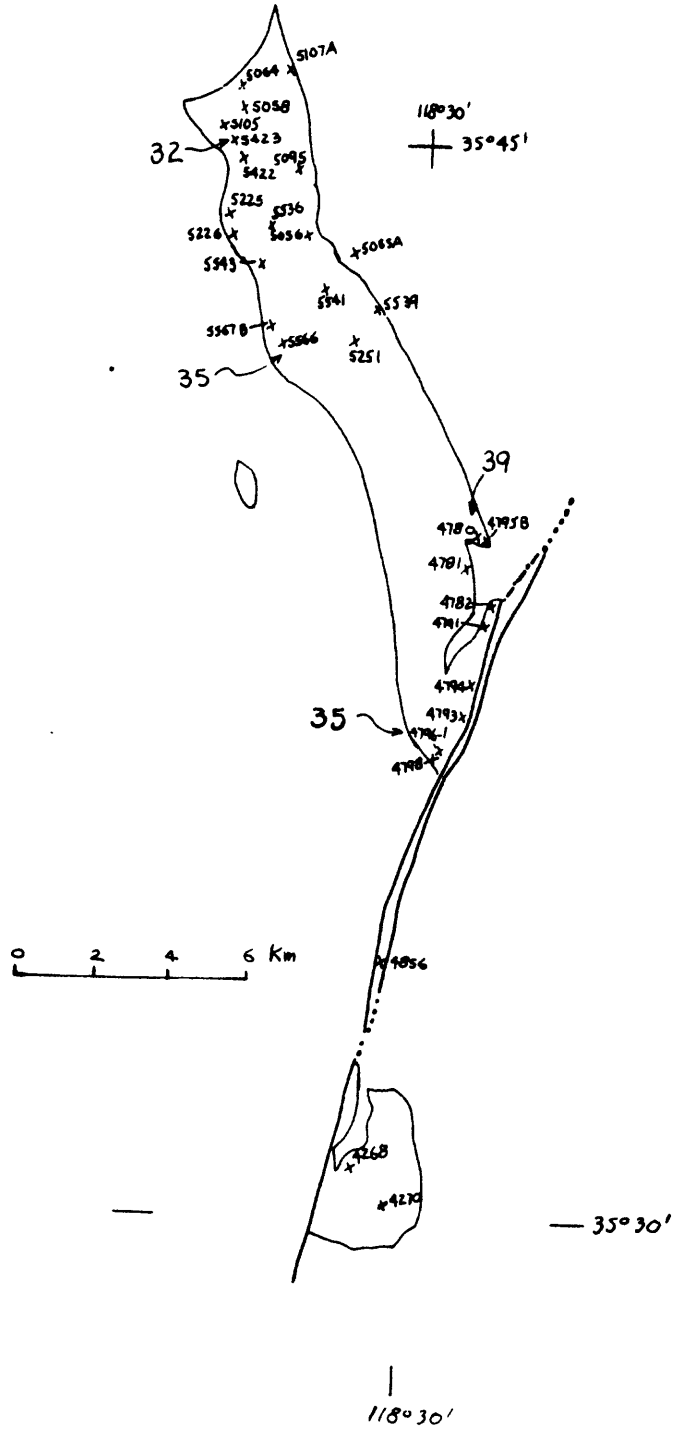

Granodiorite of Alder Creek
119° 30'

MODES OF GRANODIORITE OF ALTA SIERRA

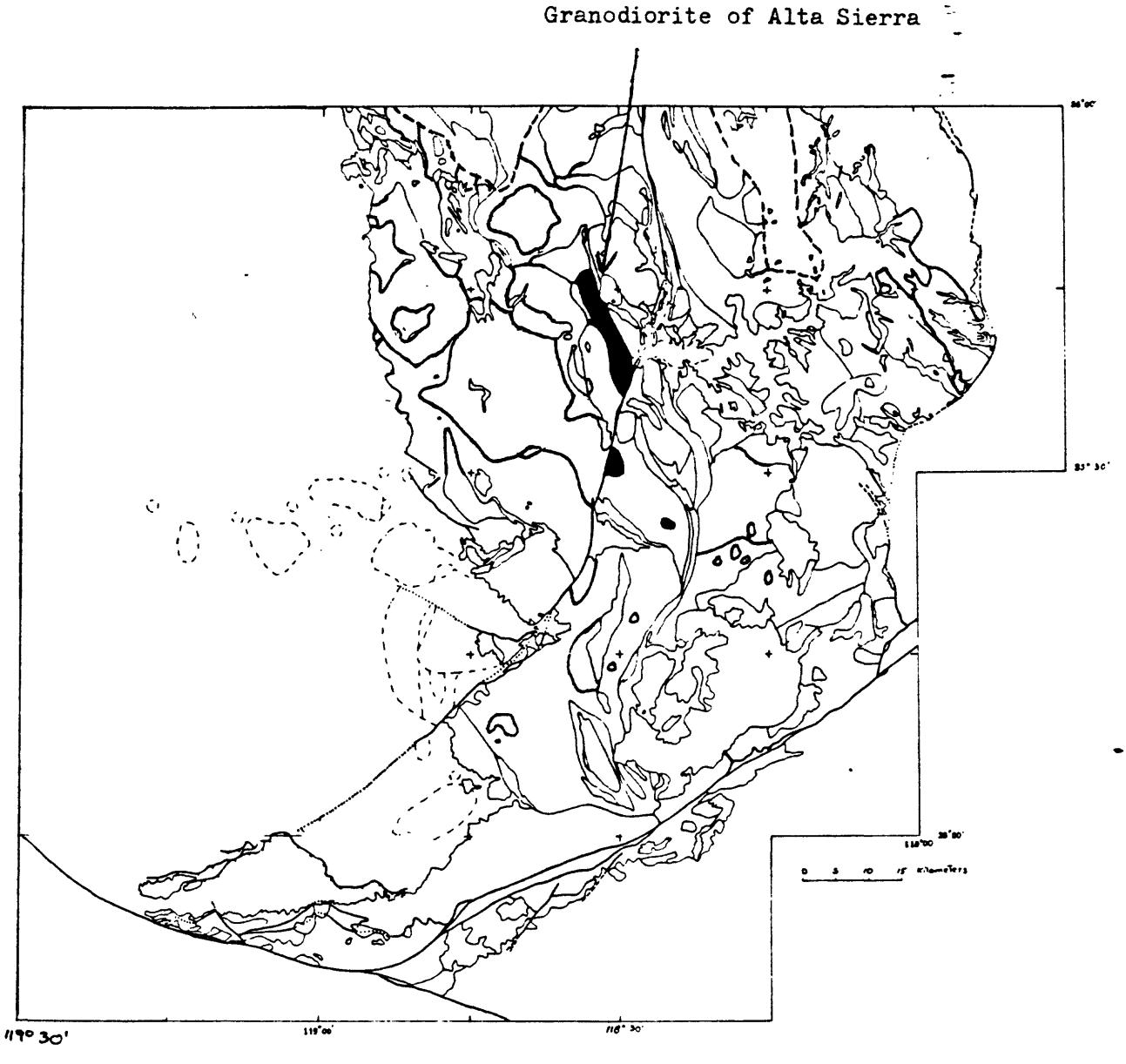
Sample number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Other	Specific gravity
4268	52	14	28	6	-		2.66
4270	58	9	21	10	1	Sph+opaq 1	2.71
4286	48	20	25	6	1		2.67
4288	63	2	20	13	2		2.69
4780	57	13	19	8	1	Sphene 1 Epidote 1	2.68
4781	62	7	23	7	<1	Opaque 1	2.68
4782	55	8	27	10	-		2.68
4791	50	14	29	7	-		2.69
4793	63	6	23	9	<1		2.67
4794	54	11	26	9	<1		2.68
4795B	51	11	26	10	1	Sphene 1	2.68
4796-1	59	9	22	9	1	Sph+opaq<1	2.69
4798	53	12	23	9	2	Sphene 1	2.69
4856	56	10	24	9	<1	Opaq+spid. 1	2.67
5055A	59	7	25	9	<1	Sph+opaq <1	2.66
5056	57	10	24	8	1		2.65
5058	53	9	29	8	1		2.64
5064	61	8	20	7	4	Sphene 1	2.68
5095	57	10	26	6	1	Opaque <1	2.64
5105	53	17	24	6	-		2.65
5107A	56	11	23	8	2		2.69
5225	60	10	22	7	1	Allanite <1	2.62
5226	58.5	12	20	9	0.5	Opaque <1	2.66
5251	60	10	20	7	2	Sphene 1	2.68
5422	44	35	16	5	-		—
5423	58	9	22	10	1	Sphene <1	—
5536	42	22	31	5	-		—
5539	54	19	14.5	8.5	3	Sphene 1	—
5541	58	11	20	9	1	Sphene 1	—
5543	60	8	21	10	1	Sphene <1	—
5566	60	7	19	9	4	Sphene 1	—
5567B	49	20	25	6	-		—
Average	56	11	24	8	1	<1	2.67
Standard deviation	(5.1)	(6.4)	(4.4)	(1.8)	(1.0)	-	(.02)



Modal plot of Granodiorite of Alta Sierra

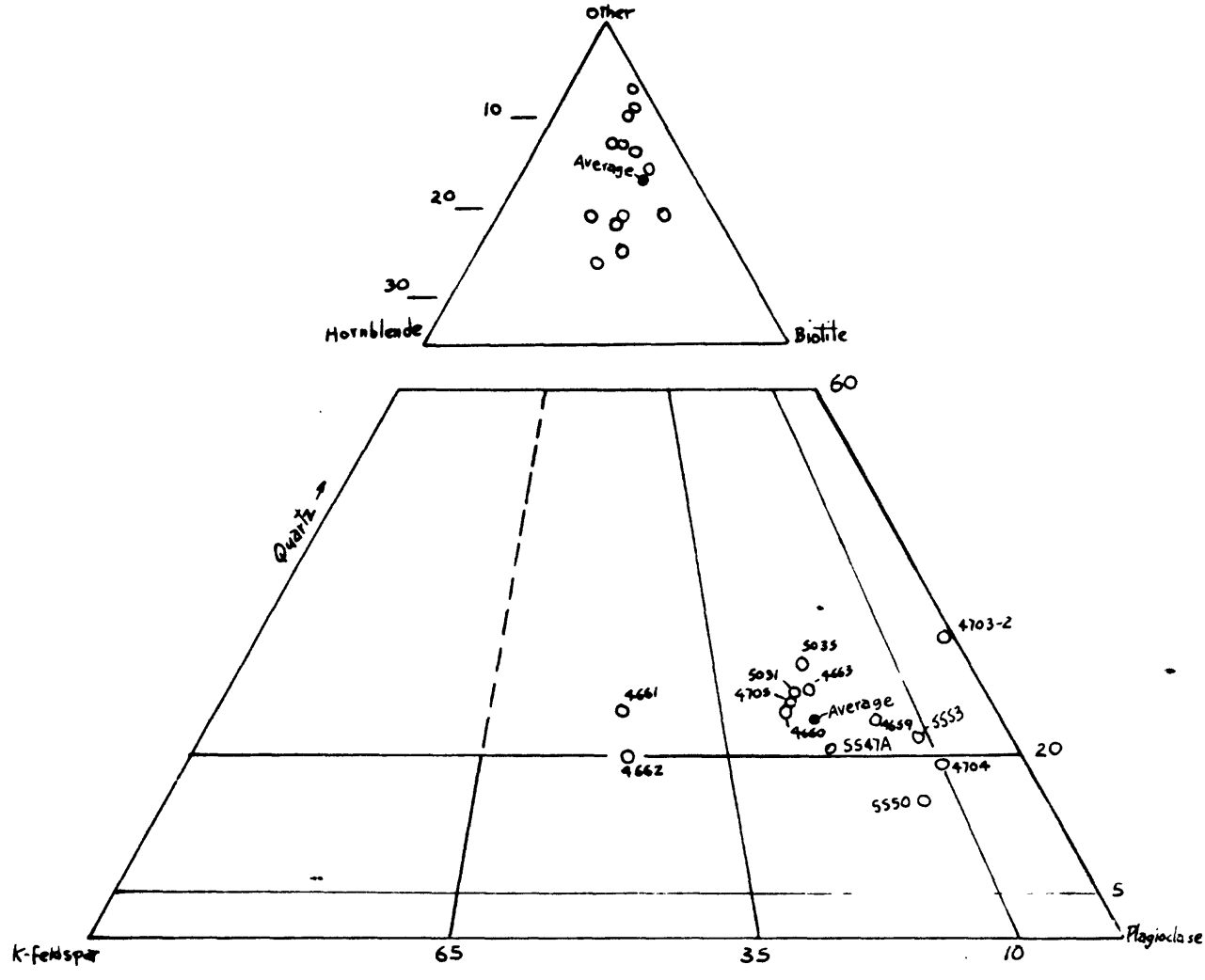


Location of modal samples of Granodiorite of Alta Sierra

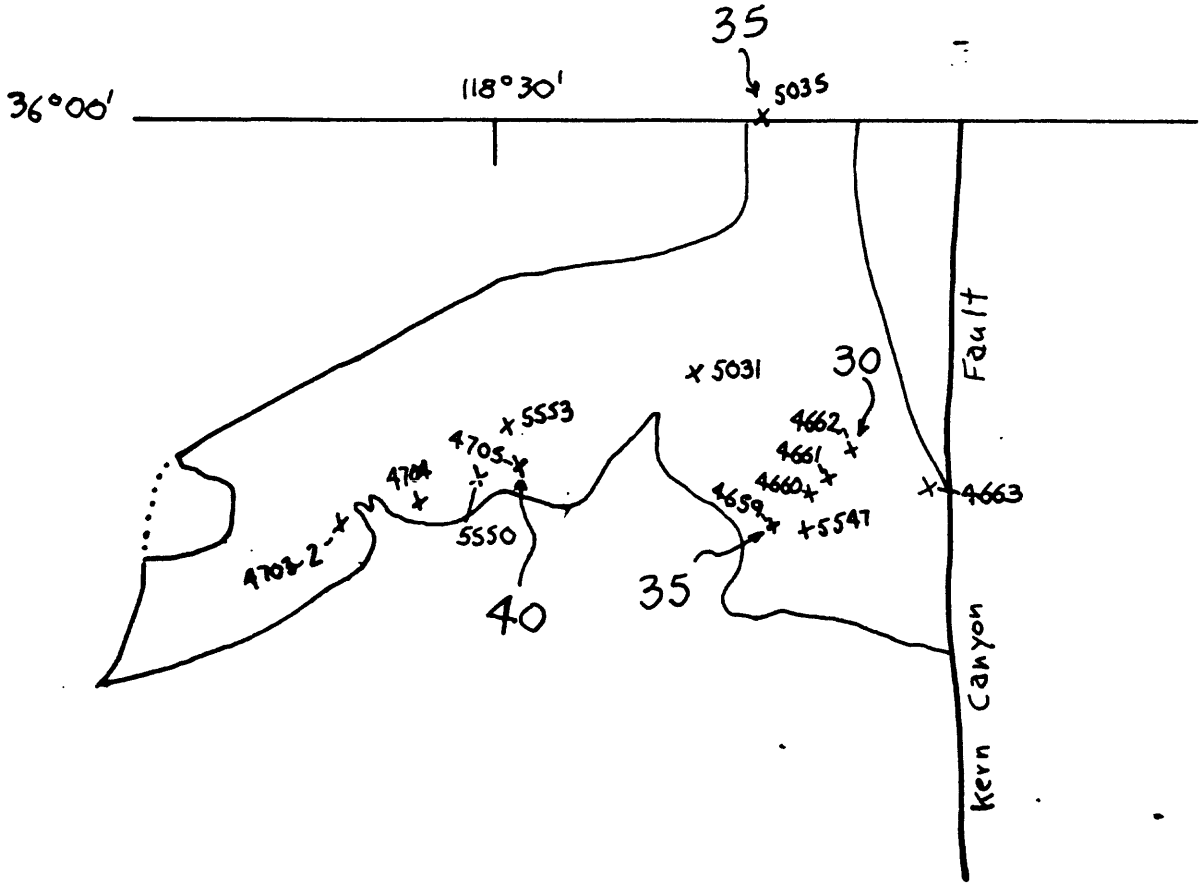

Granodiorite of Alta Sierra
119° 30'

MODES OF GRANODIORITE OF BRUSH CREEK

Sample number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Other	Specific gravity
4659	50	9	19	12	10		2.74
4660	48	17	22	8	5		2.71
4661	36	34	23	6	1		2.67
4662	38	35	18	7	2		2.64
4663	49	15	23	7	6		2.70
4703-2	52	1	26	16	5	cpx <1	2.72
4704	55	6	14	14	11		2.70
4705	43	15	20	9	12	Opaque and Sphene 1	2.75
5031	47	15	23	10	4	Opaque and Sphene 1	2.70
5035	48	14	27	7	3	Opaque and Sphene 1	2.70
5547A	51	15	18	12	4		—
5550	54	9	11	12	14		—
5553	54	7	17	13	10		—
Average	48	15	20	10	7		2.70
Standard deviation	(5.9)	(9.9)	(4.6)	(3.2)	(4.2)		(.03)



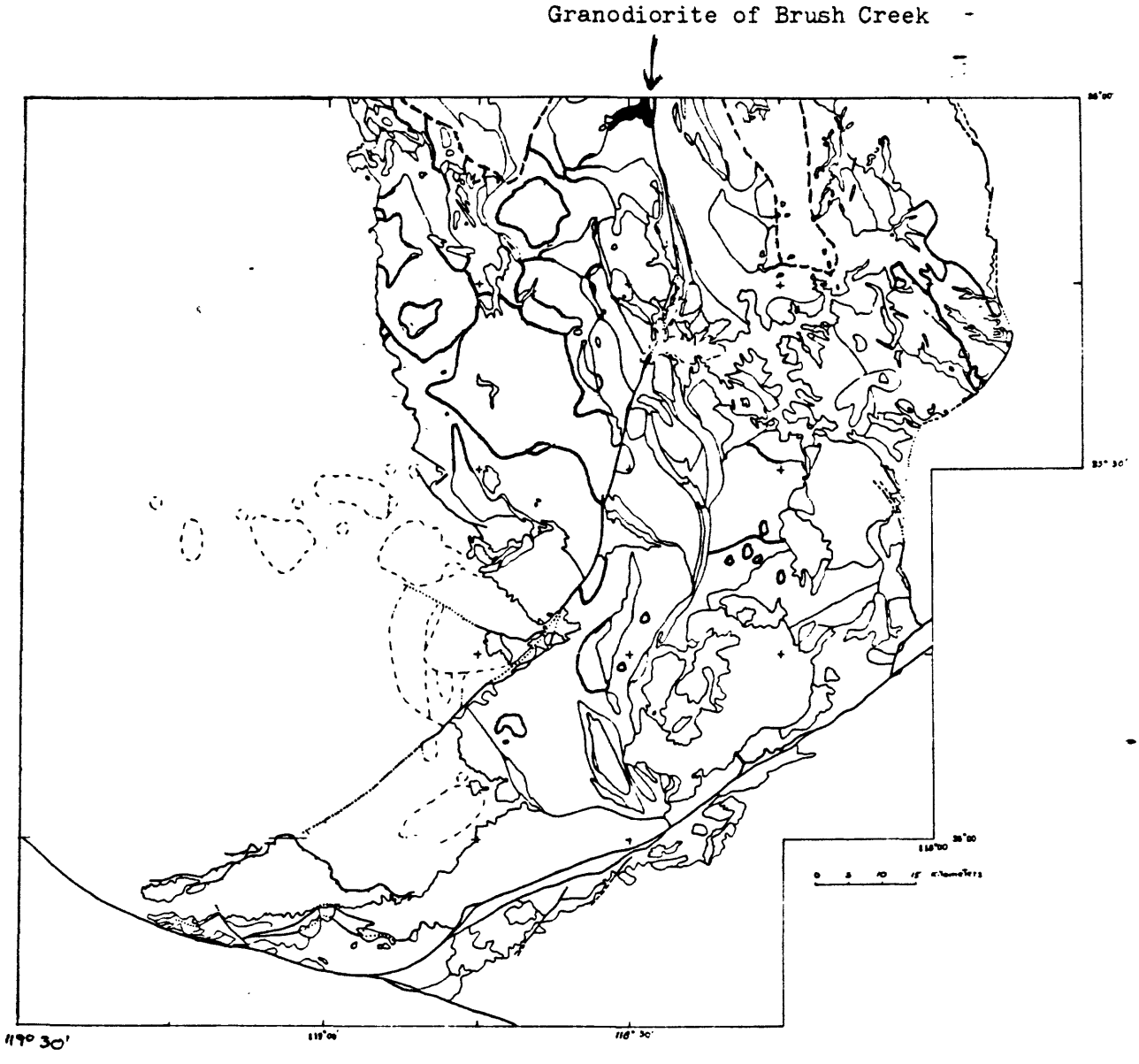
Modal plot of Granodiorite of Brush Creek



X Mode

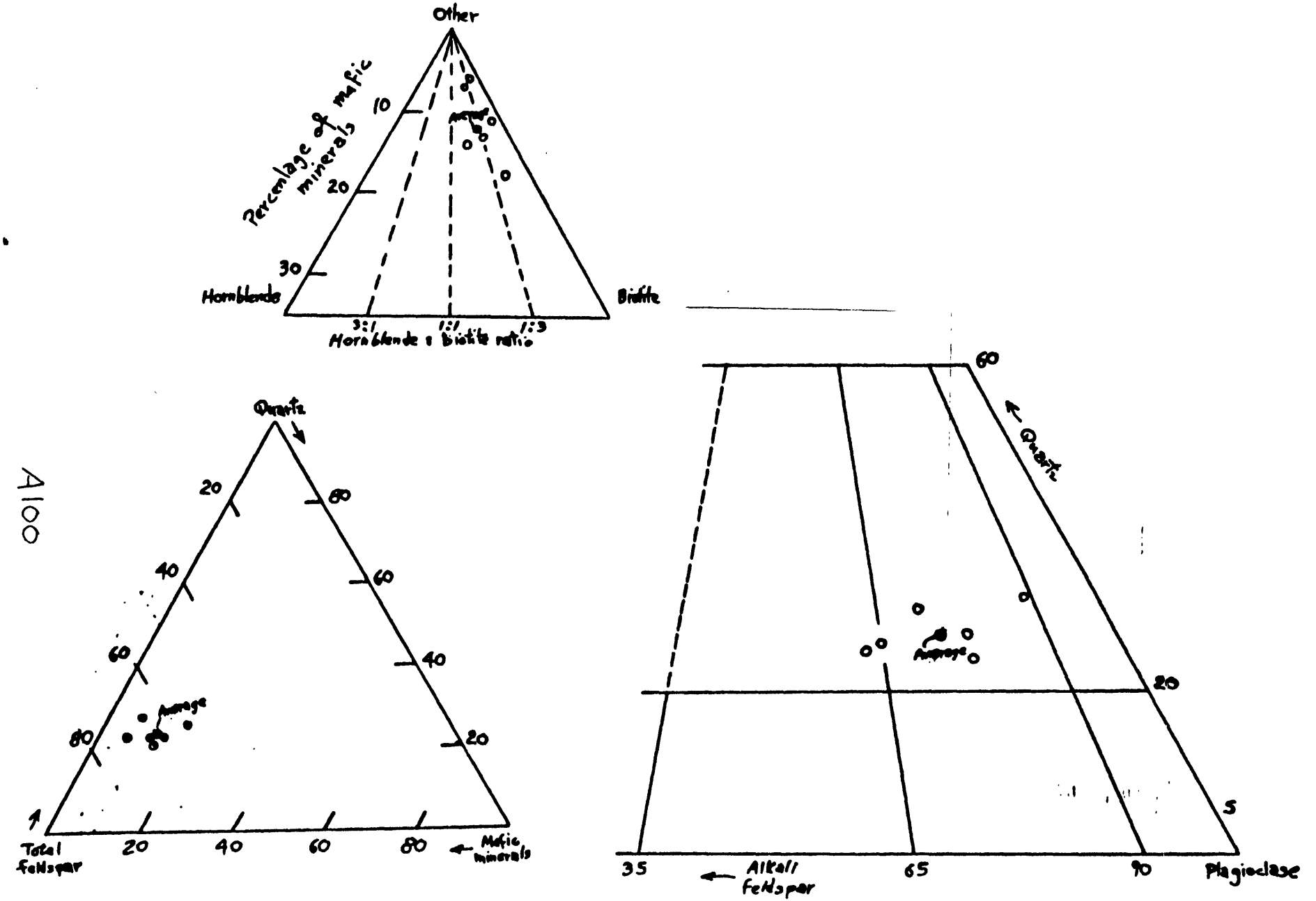
35 → An of plagioclase (index oils)

Location of modal samples of Granodiorite of Brush Creek


Granodiorite of Brush Creek
119° 30'

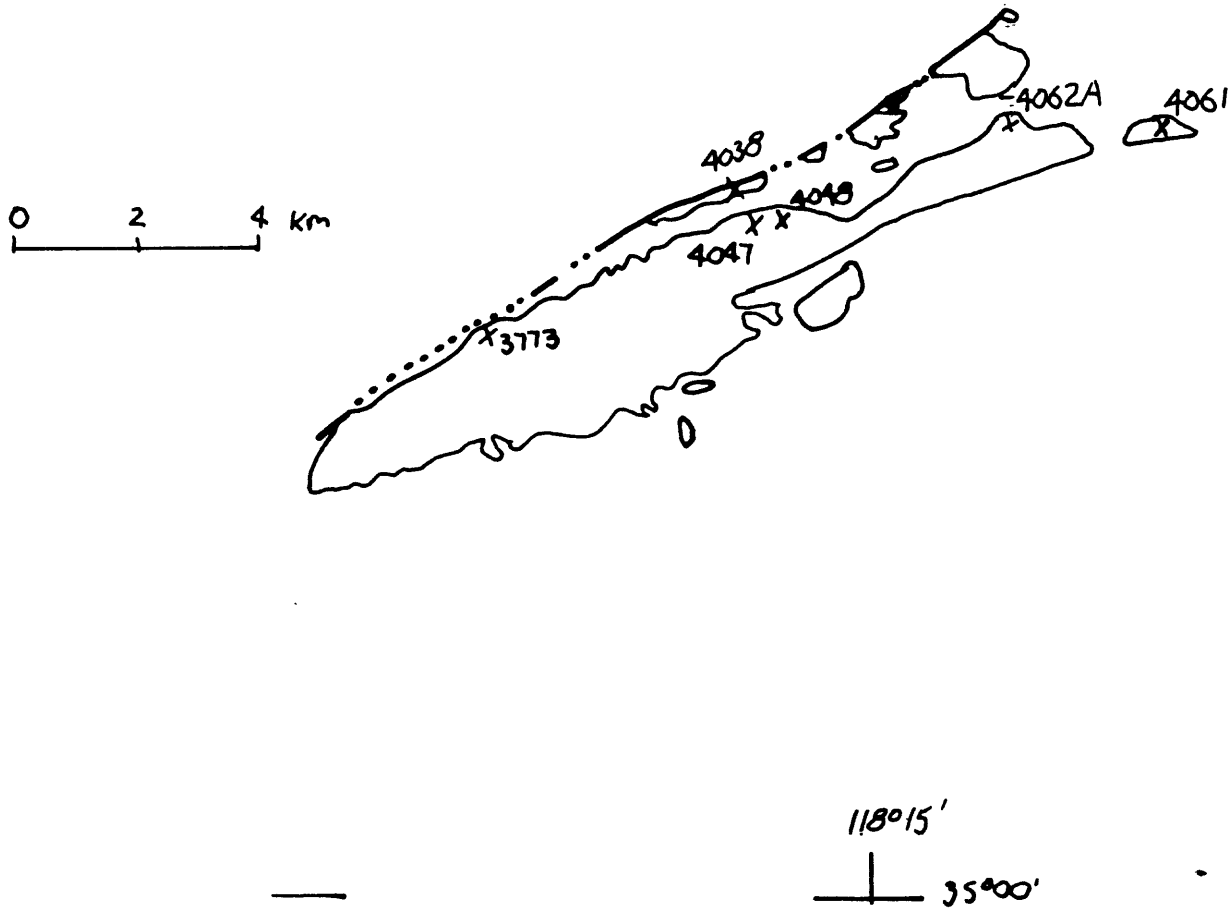
MODES OF GRANODIORITE OF CAMERON

Sample	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Specific gravity
3773	50	6	26	15	3	2.67
4048	51	15	21	10	3	2.64
4047	46	19	28	5	2	2.65
4048	49	14	23	9	5	2.66
4061	45	26	23	5	1	2.63
4062A	43	23	23	10	1	2.66
Average--------	47	17	24	9	3	2.65
Standard deviation.	3.5	7.1	2.5	3.7	1.5	.01

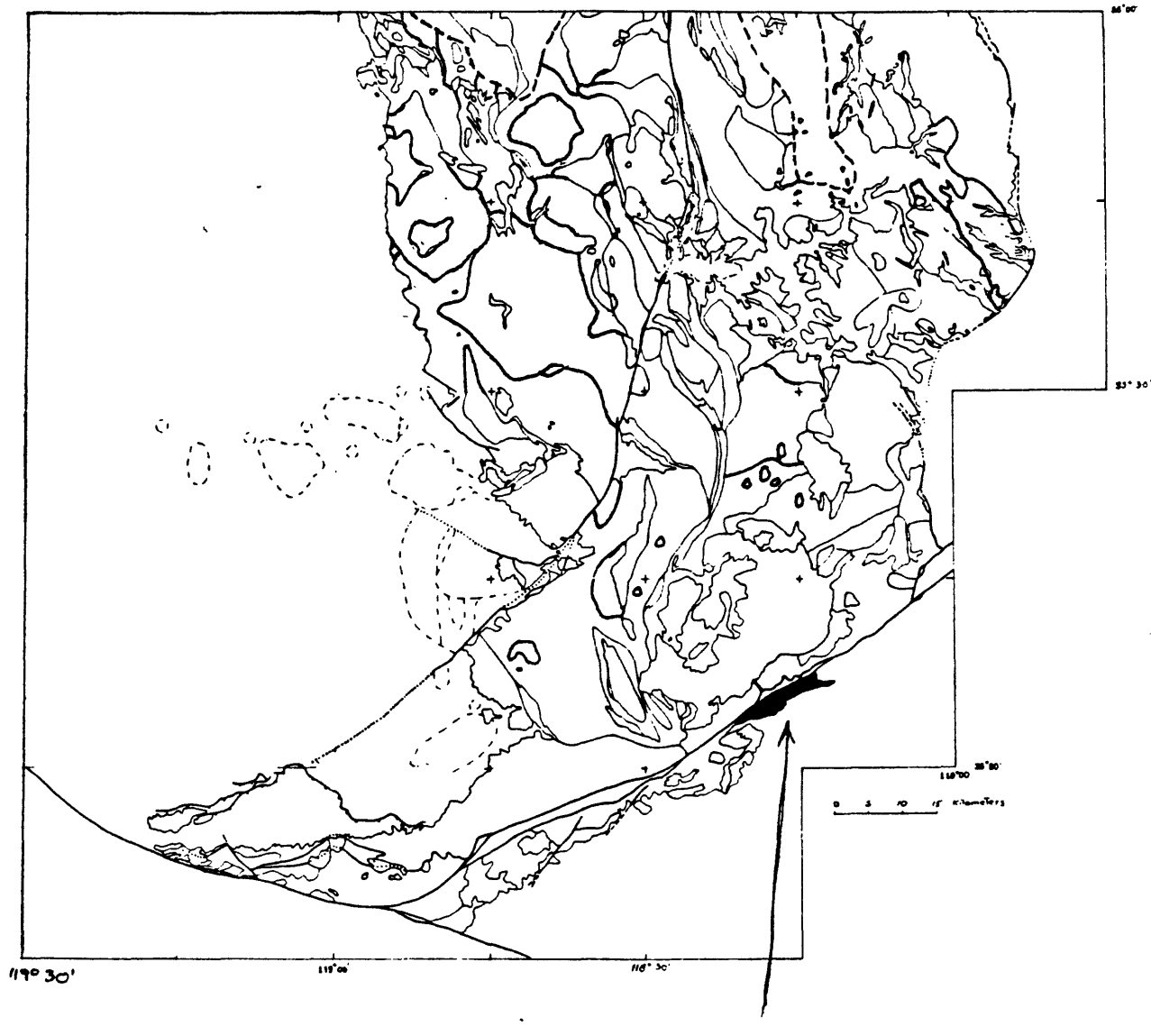


A100

Modal plots of'Granodiorite of Cameron



Location of modal samples of Granodiorite of Cameron



Granodiorite of Cameron

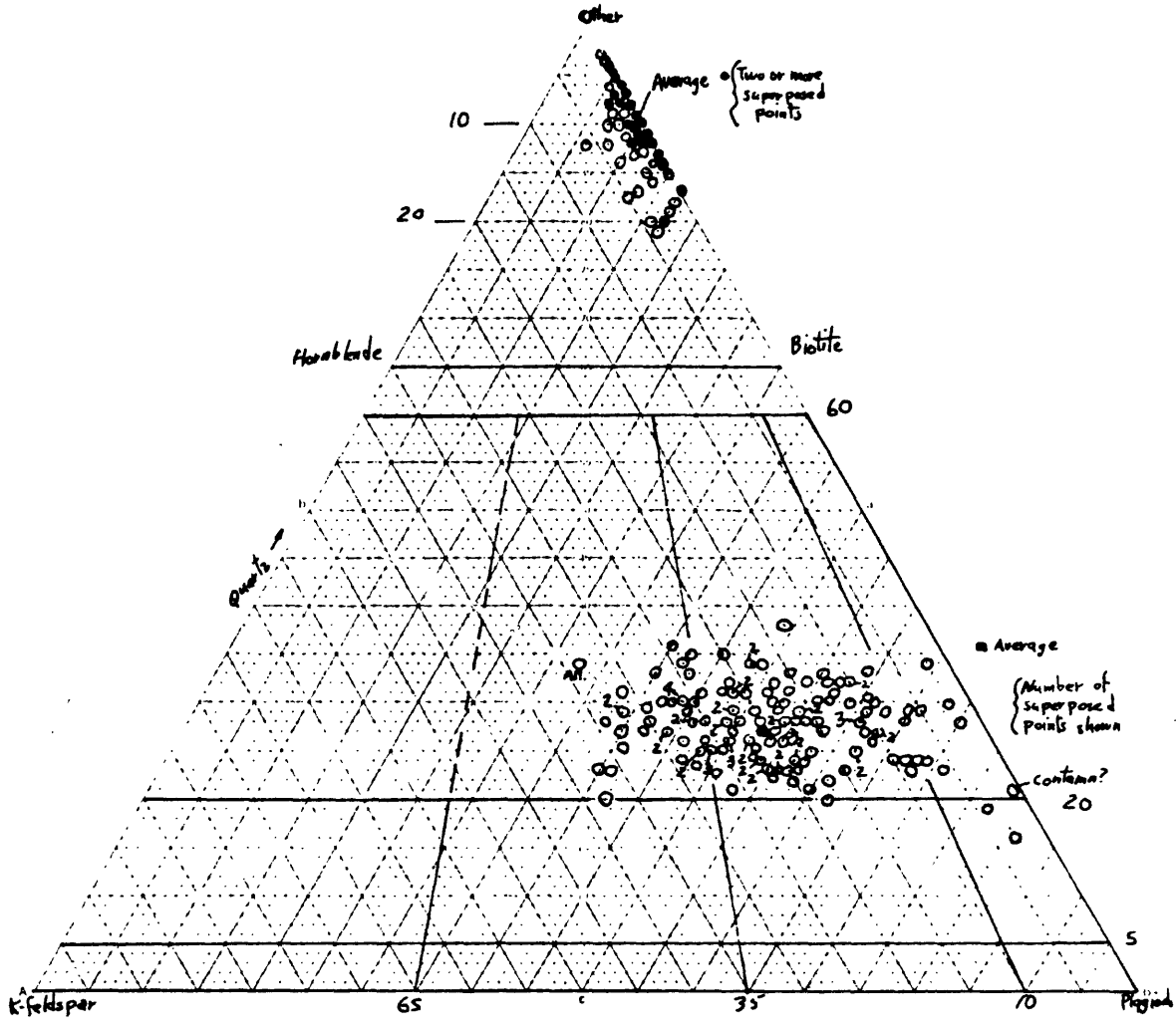
MODES OF THE GRANODIORITE OF CASTLE ROCK

Sample number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Sphene	Opaques		Specific gravity
3848	43	26	24	7	-		—		2.64
3849B	52	9	29	10					2.67
4049(FI)	49	13	23	10	1				2.67
4051	55	7	25	10	1	1	1		2.68
4052	49	11	26	8	4	1	1		2.70
4059A	47	15	26	10	1	1			2.66
4059B	42	18	32	7	<1		1		2.66
4064	53	17	21	9					2.66
4065A	57	5	25	11	1	0.5	0.5		2.71
4067	48	10	27	13	1		1		2.68
4070	54	9	25	10	1		1		2.66
4072	51	20	21.5	5.5		1	1		—
4073	43.5	21	29	4.5	1		1		2.60
4079	39	22	30	7	1		1		2.64
4080	49	17	28	5		1	1		2.65
4086	44	20	26	6	2	1	1		2.67
4087	50	19	25	5	1				2.65
4089A	42.5	25	29	3.5					2.62
4092	44	20	30	5		1	1		2.64
4093	48	15	24	10	2	0.5	0.5		2.68
4093A	47	14	28	10	1				2.67
4094	44	23	26	6	1				2.66
4095B	48	12	22	17	1				2.67
4131(FI)	52	17	22	7	1	0.5	0.5		2.66
4328	50	15	21	12	1	1			2.68
4335	51	10	22	13	4				2.70
4336	54	16	18	10	2	<1			2.71
4341	52	9	24	13	2				2.70
4348	60	6	21	11	2				2.68
4351	57	7	20	13	3				2.70
4352	43	24	26	7	<1				2.65
4353	51	18	19	10	2	<1			2.71
4354	50	11	27	10	2				2.70
4359	60	6	13	17	2	2			2.69
4360	56	12	23	8		1			2.66
4363A	50	18	20	10	2				2.71
4365	51	16	18	10	4	1			2.72
4387A	48	24	19	9					2.65
4398A	45	15	29	11					2.64
4398C	54	8	27	10	1				2.68

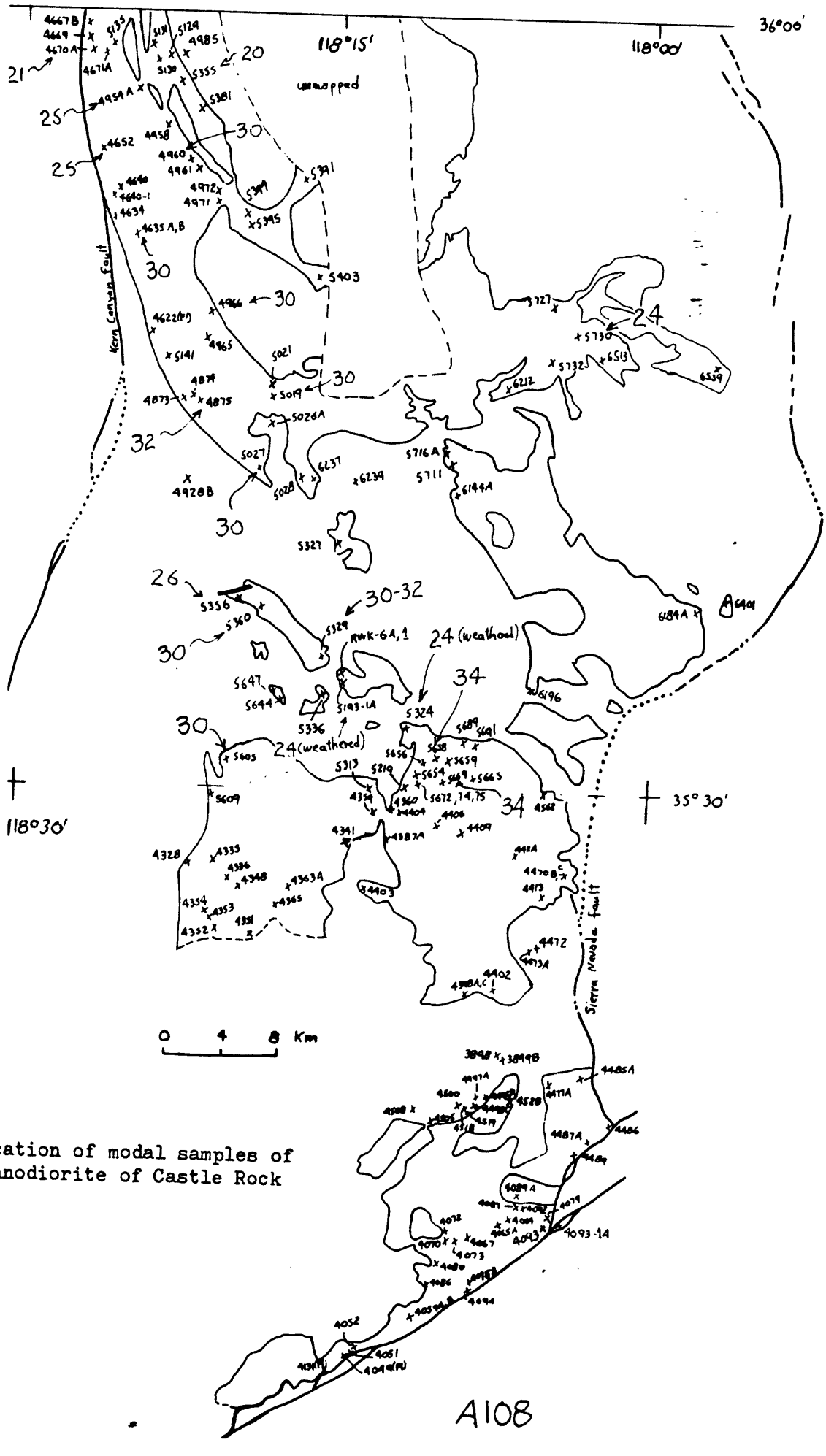
Sample number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Sphene	Opaques		Specific gravity
4402	48	16	25	9	1	1			2.69
4403	60	3	15	17	4	1			2.74
4404	55	2	22	17	3	1			2.69
4406	43	16	31	9	<1	1			2.66
4409	51	10	28	9	1	1			2.71
4411A	59	8	21	12					2.65
4413	40	29	27	4					2.61
4470B	37	30	27	6					2.65
4470C	37	22	34	7					2.64
4472	54	10	25	10		1			2.69
4473A	59	6	25	10					2.76
4477A	39	33	24	4					2.63
4485A	46	26	24	4					2.63
4486	32.5	32.5	33	3	(Altered rock)				2.60
4487A	42	25	28	5					2.61
4489	55	8	20	17					2.72
4496B	31	7	29	13					2.69
4497A	53	2	28	17					2.72
4498C	57	4	25	14					2.71
4500	44	12	34	10					2.68
4505	39	23	32	6					2.64
4508	59	2	26	13					2.70
4518	61	8	21	10					2.65
4519	46	12	27	15					2.69
4528	41	27	27	7					2.66
4562	41	23	28	8					2.61
4622(H)	47	23	20	8	1		1		2.67
4634	49	9	22	16	4				2.69
4635A	46	20	23	10	–				2.65
4635B	44	23	22	10	1				2.66
4640	47	16	26	10	–	0.5	0.5		2.65
4640-1	51	20	21	8	<1				2.66
4652	50	16	26	8	–	<1			2.68
4661B	39	34	22	5	–				2.64
4669	40	36	19	5	–				2.65
4670A	45	25	25	5	–				2.64
4671A	47	21	25	5	<1		1		2.66
4873	42	25	27	6	<1		<1		2.66

Sample Number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Sphene	Opaques		Specific gravity
4874	52	14	25	7	1	0.5	0.5		2.65
4875	43	24	26	7	<1				2.64
4928B	45	20	26	9	-				2.61
4954A	51	17	21	8	2		1		2.65
4958	49	14	26	7	3	0.5	0.5		2.66
4960	47	17	23	6	6	0.5	0.5		2.70
4961	44	20	25	7	2	1	1		2.69
4965	46	21	26	7	<1	<1	<1		2.65
4966	44	25	23	7	-	0.5	0.5		2.65
4971	42	23	29	5	<1	0.5	0.5		2.65
4972	47	18	27	8	-				2.66
4985	38	31	26	4	-	1			2.64
5019	49	21	24	5	-	0.5	0.5		2.65
5021	41	25	28	5	-	0.5	0.5		2.65
5026A	52	17	24	7	<1	<1	<1		2.66
5027	51	20	21	6	2		<1		2.66
5028	45	20	28	6	1		<1		2.65
5129	38	27	27	8	-				2.64
5130	42	25	28	5	-		<1		2.62
5131	45	28	23	4	-		<1		2.66
5135	50	15	26	6	2	0.5	0.5		2.68
5141	49	21	23	7	<1		<1		2.67
5193-1A	51	16	21	12					-
5219	57	9	25	9	<1	<1			2.67
5313	62	1	17	17	3	(contaminated?)			-
5324	36	32	26	6					
5327	37	34	21.5	7	0.5				
5329	36	25	30	9					
5336	48	20	23	9					
5355	39	26	28	7	-				
5356	52	9	29	10	-				
5360	43	23	22	12	-				
5381	40	26	24	10	-				
5391	45	19	29	6	1		<1		
5394	37	30	27	6	-		<1		
5395	47	23	25	5	-	<1			
5403	45	26	23	6	-	<1	<1		

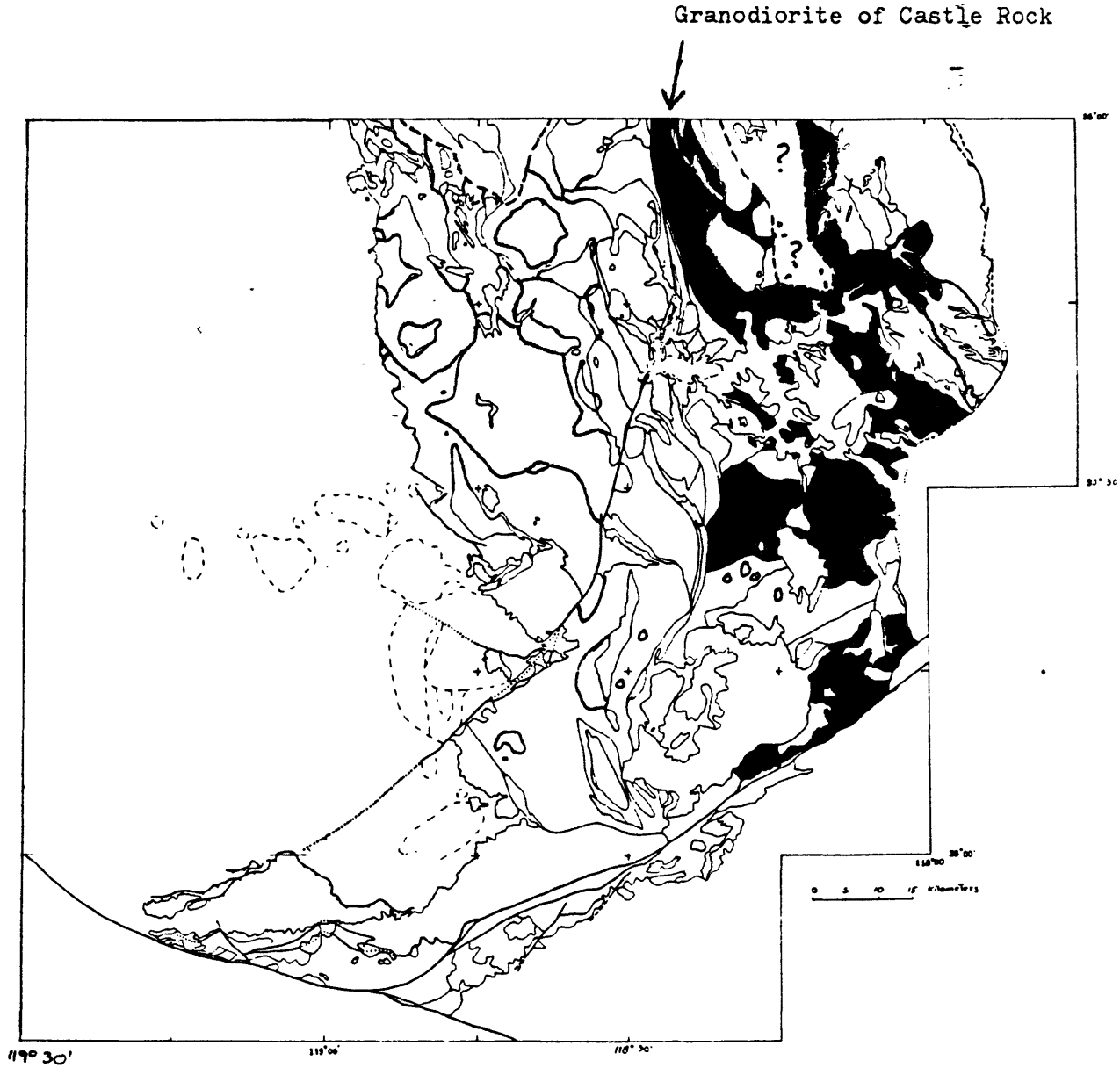
Sample Number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Sphene	Opaques		Specific gravity
5605	39	29	25	7	<1				
5609	46	16	28	9	1				
5644	39	21	33	7	-				
5647	47	14	30	9	-				
5654	39	25	28	8	-				
5656	45	18	29	8	-	<1			
5658	54	10	24	9.5	2	0.5			
5659	43	15	30	10	1	1			
5665	55	10	23	10	2	<1			
5669	49	20	22	7	1	1			
5672	52	8	27	11	1.5	0.5			
5674	58	5	18.5	12.5	5	1			
5675	58	5	18.5	12.5	5	1			
5689	47	23.5	23	6	-	0.5			
5691	44	16	30.5	9	-	0.5			
5711	49	14.5	24.5	12	-	-	<1		
5716A	49	11	30	10	-	<1			
5727	46	24	24	6	-		<1		
5730	52	21	21	6	-		<1		
5732	47	21	26	6	-				
6144A	55	15	20	9		<1	1		
6184A	55	13	20	12			<1		
6196	36	29	30	5			<1		
6212	50	20	22	8			<1		
6237	44	20	23	10	2		1		
6239	56	12	23	9			<1		
6401	54	10	28	8					
6513	48	22	25	5			<1		
6539	47	25	22	6					
RWK-6A	49	17	24	10	-				
RWK-6-1	48	17	23	12	-				
Average	48	18	25	8.5	0.5	<1	<1		2.67
Standard deviation	6.2	7.7	3.8	3.2	1.2	—	—		.03



Modal plot of the Granodiorite of Castle Rock

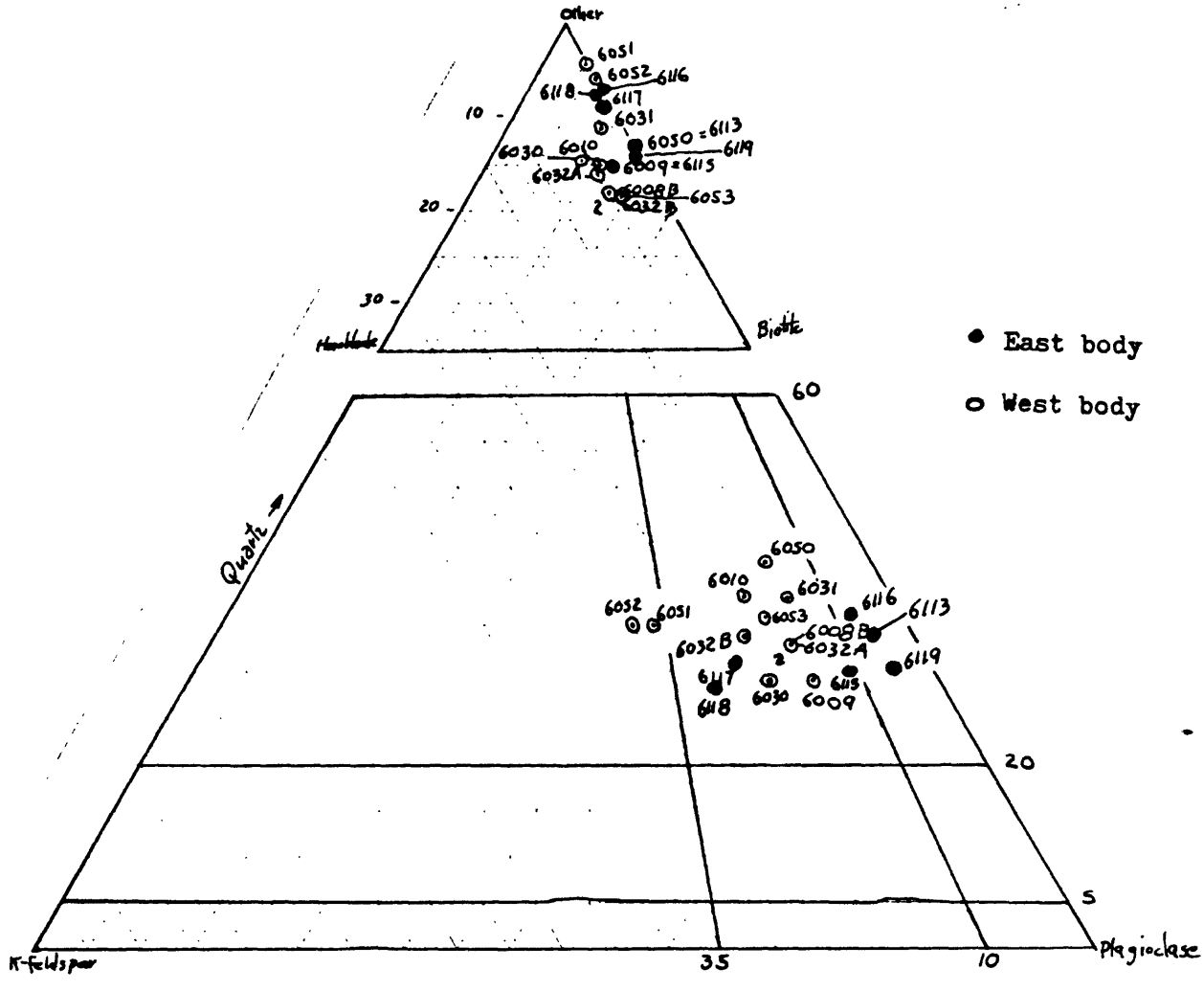


Location of modal samples of Granodiorite of Castle Rock

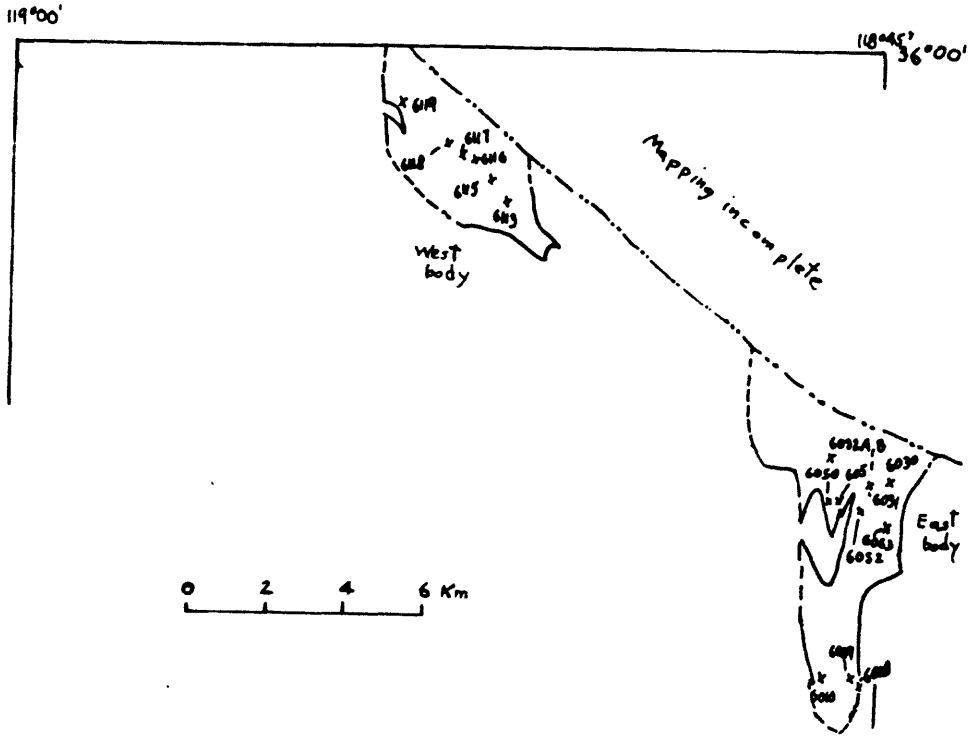

Granodiorite of Castle Rock
?
?
119° 30'

MODES OF GRANODIORITE OF DEER CREEK

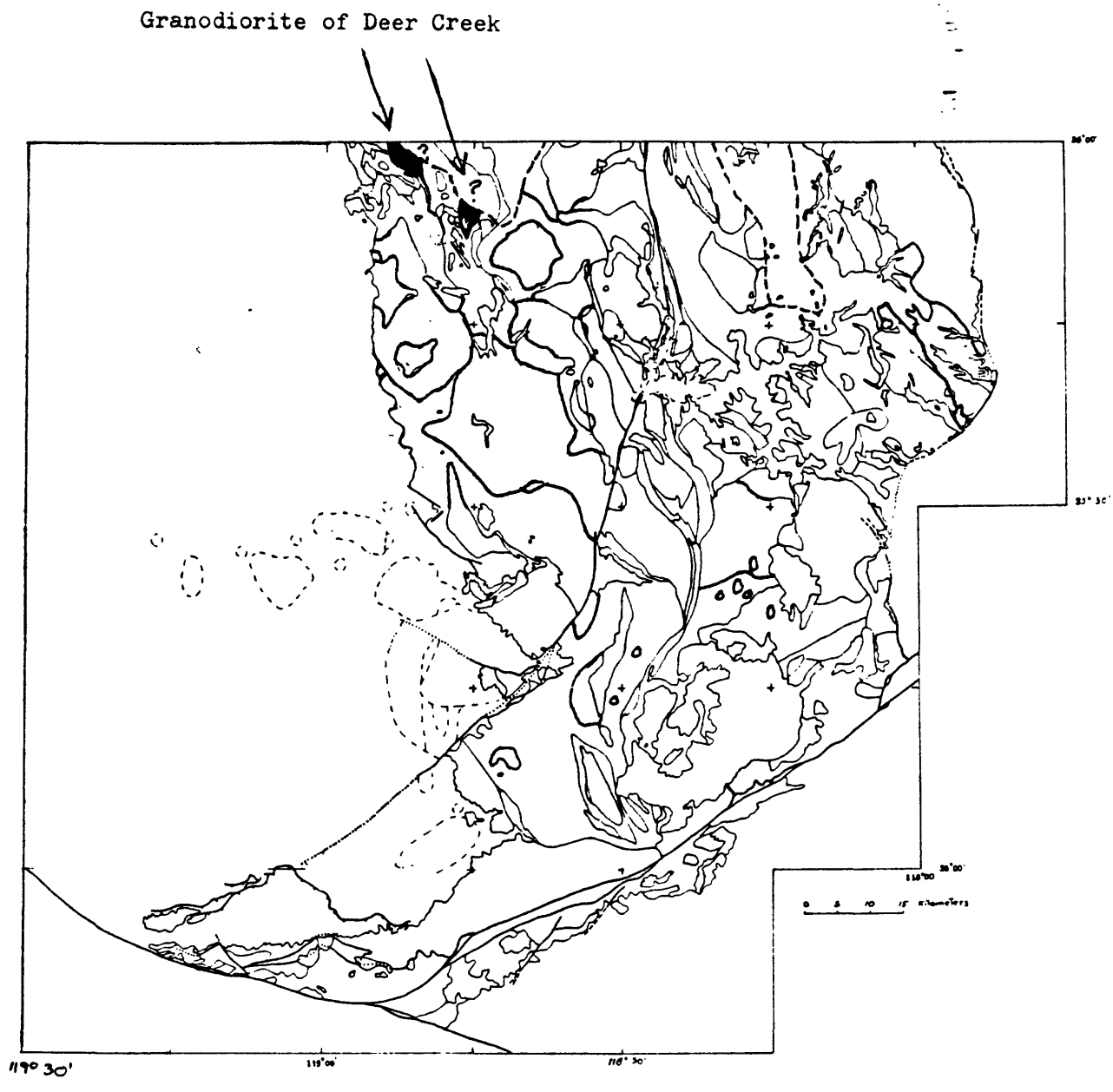
Sample Number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende		Other	
6008B	45	10	27	13	5			East body
6009	50	10	25	12	3			
6010	41	12	32	11	4			
6030	47	14	25	9	5			
6031	46	9	34	9	2			
6032A	46	10	28	11	5			
6032B	41	13	28	13	5			
6050	42	9	36	13	-			
6051	39	23	34	4	-			
6052	37	24	33	6	-			
6053	42	11	29	14	4			
6113	54	3.5	29.5	13	21			West body
6115	53	6.5	25.5	12	3			
6116	55	5	33	7	21			
6117	47	16	28	8	1			
6118	46	19	27	7	0.5		opt Sph 0.5	
6119	56	3	26	14	0.5		opt sph 0.5	
Average (east)	43	13	30	11	3			
Standard deviation	3.9	5.3	3.9	3.2	2.1			
Average (west)	52	9	28	10	1			
Standard deviation	4.3	6.9	2.8	3.2	1.1			
Average (Total)	46.5	12	29.5	10	2			
Standard deviation	5.7	6.1	3.6	3.1	2.1			



Modal plot of Granodiorite of Deer Creek

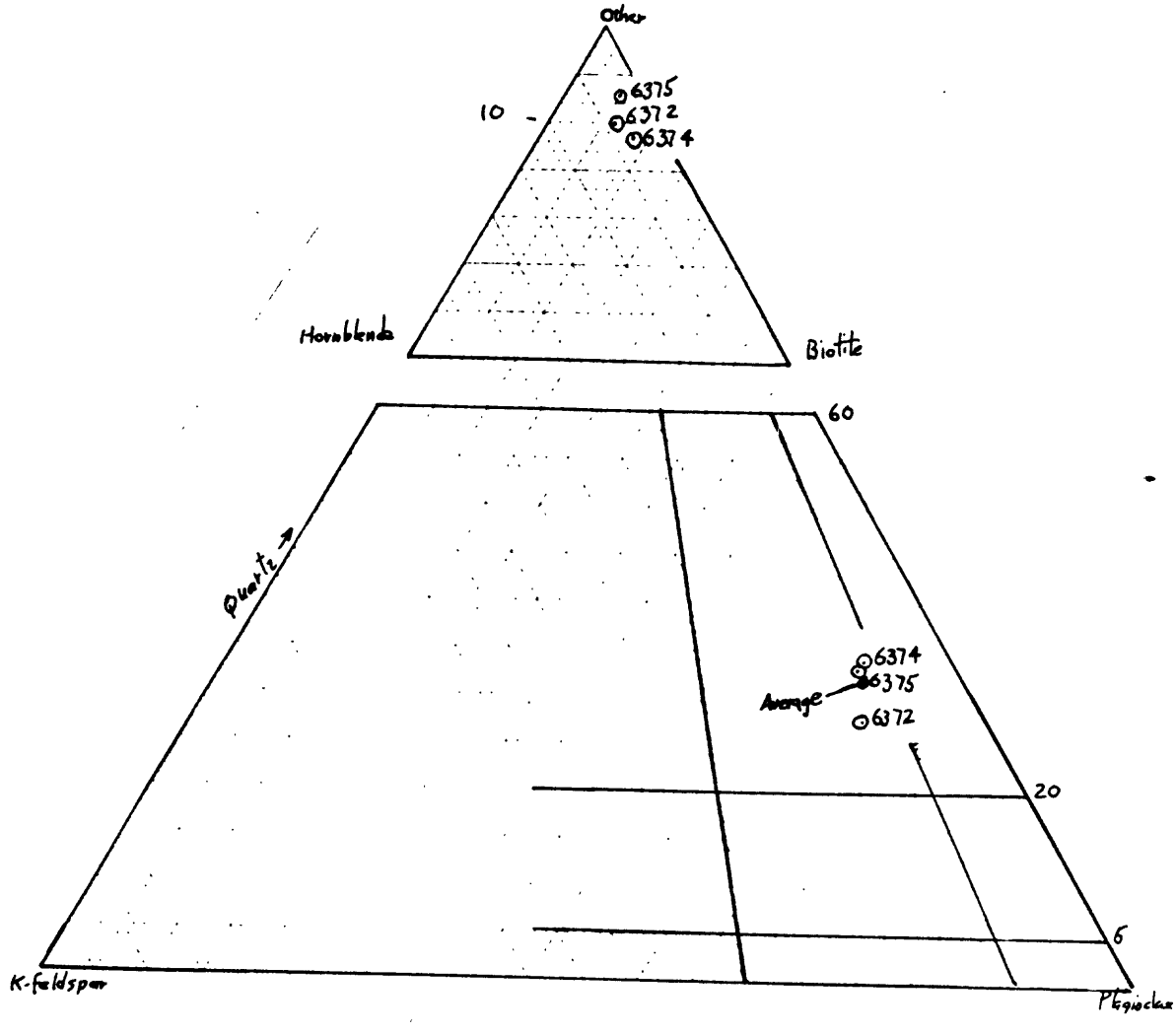


Location of modal samples of Granodiorite of Deer Creek

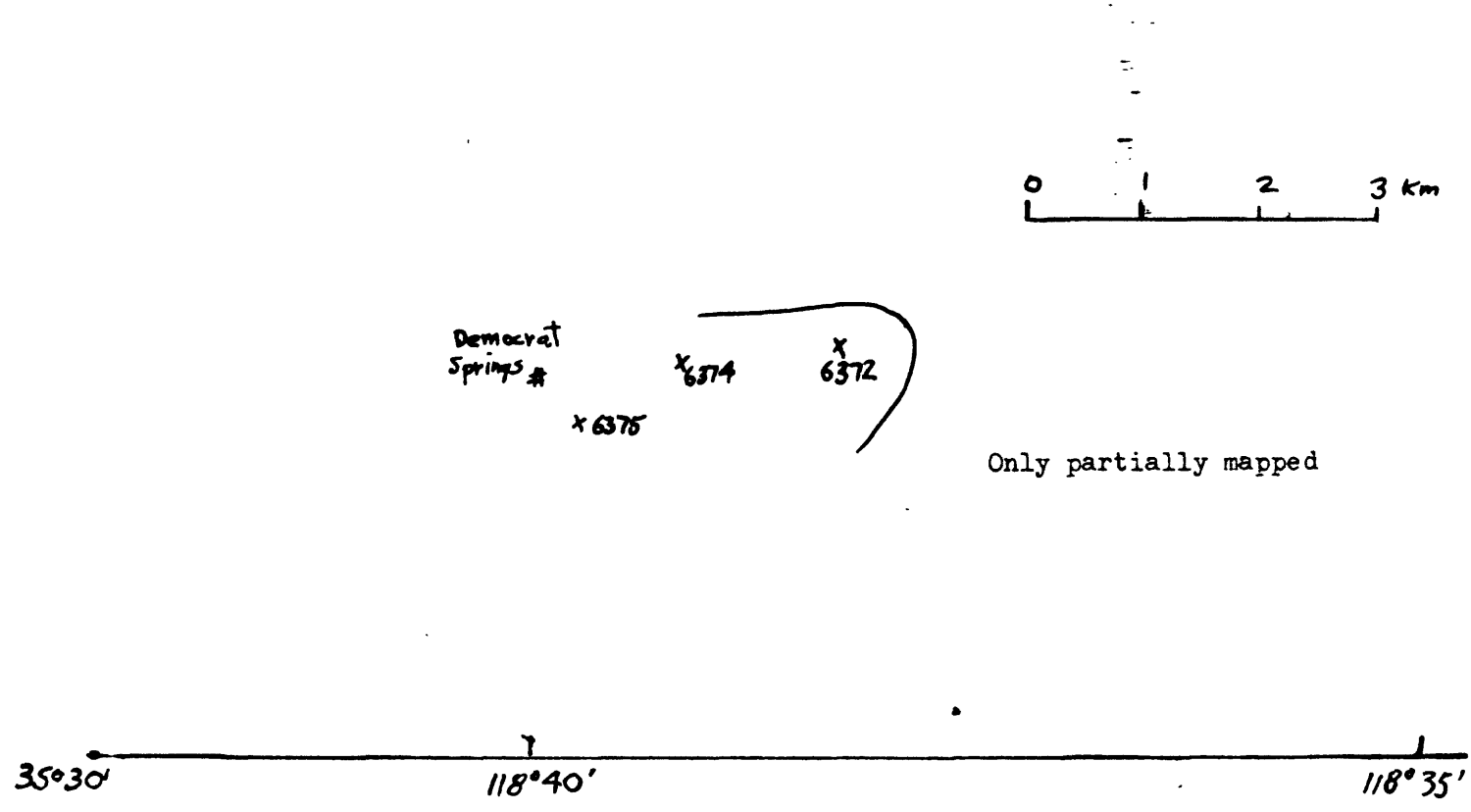

Granodiorite of Deer Creek
119° 30'

MODES OF GRANODIORITE OF DEMOCRAT SPRINGS

Sample Number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende
6372	55	10	25	6	4
6374	51	7.5	30	8.5	3
6375	54	8	31	5	2
Average	53	8.5	29	6.5	3
Standard deviation	2.1	1.3	3.2	1.8	1.0

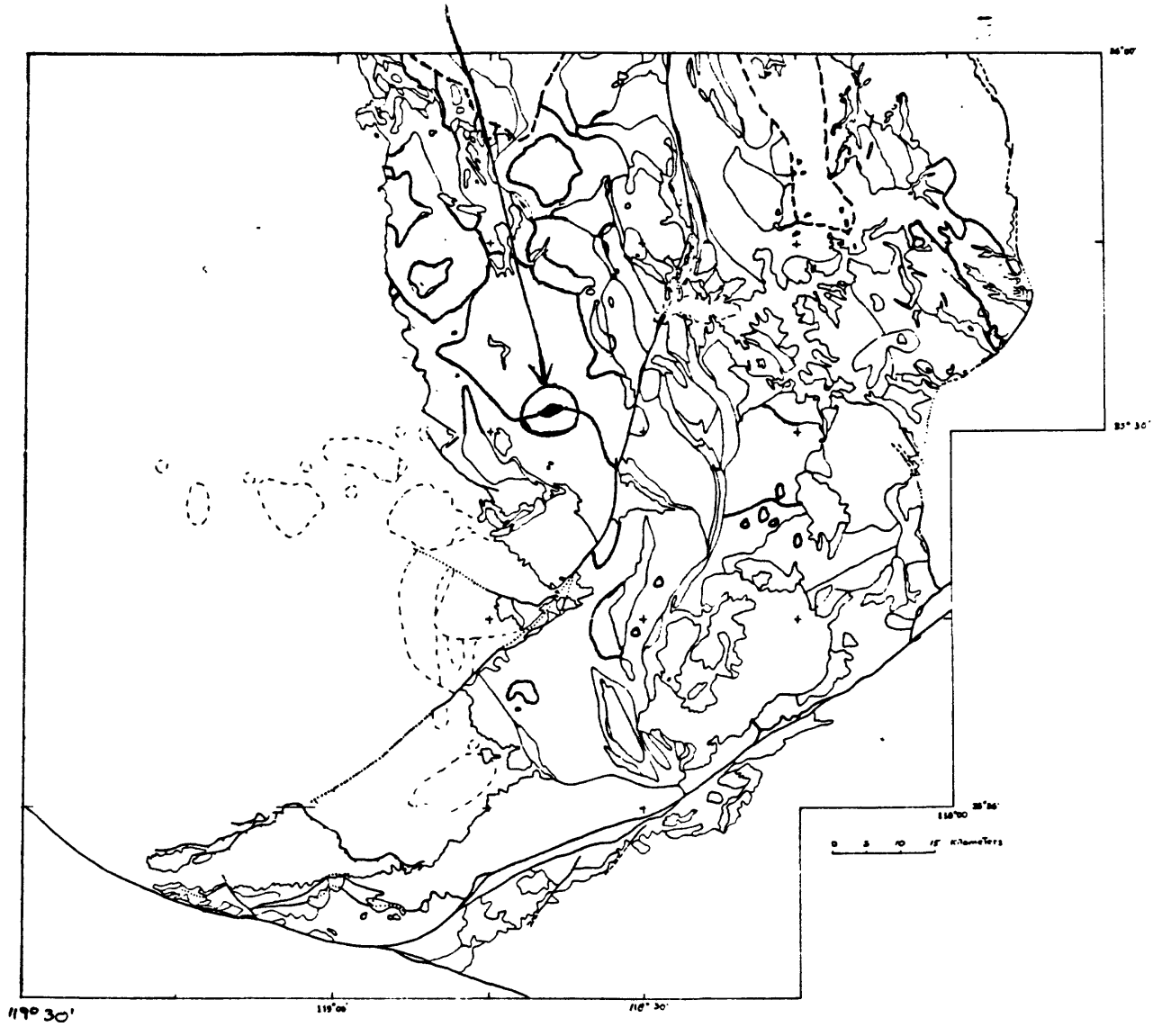


Modal plot of Granodiorite of Democrat Springs



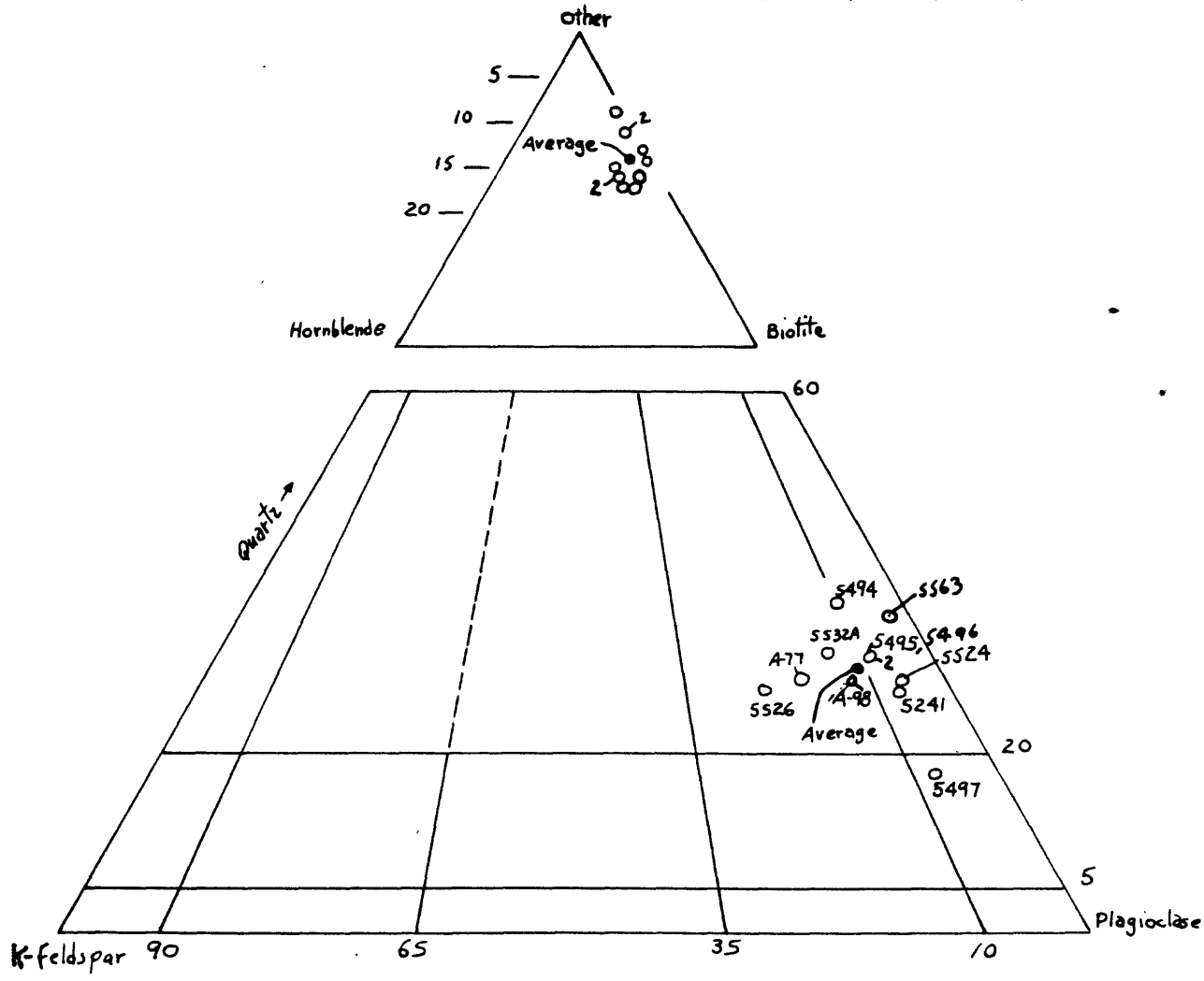
Location of modal samples of Granodiorite of Democrat Springs

Granodiorite of Democrat Springs

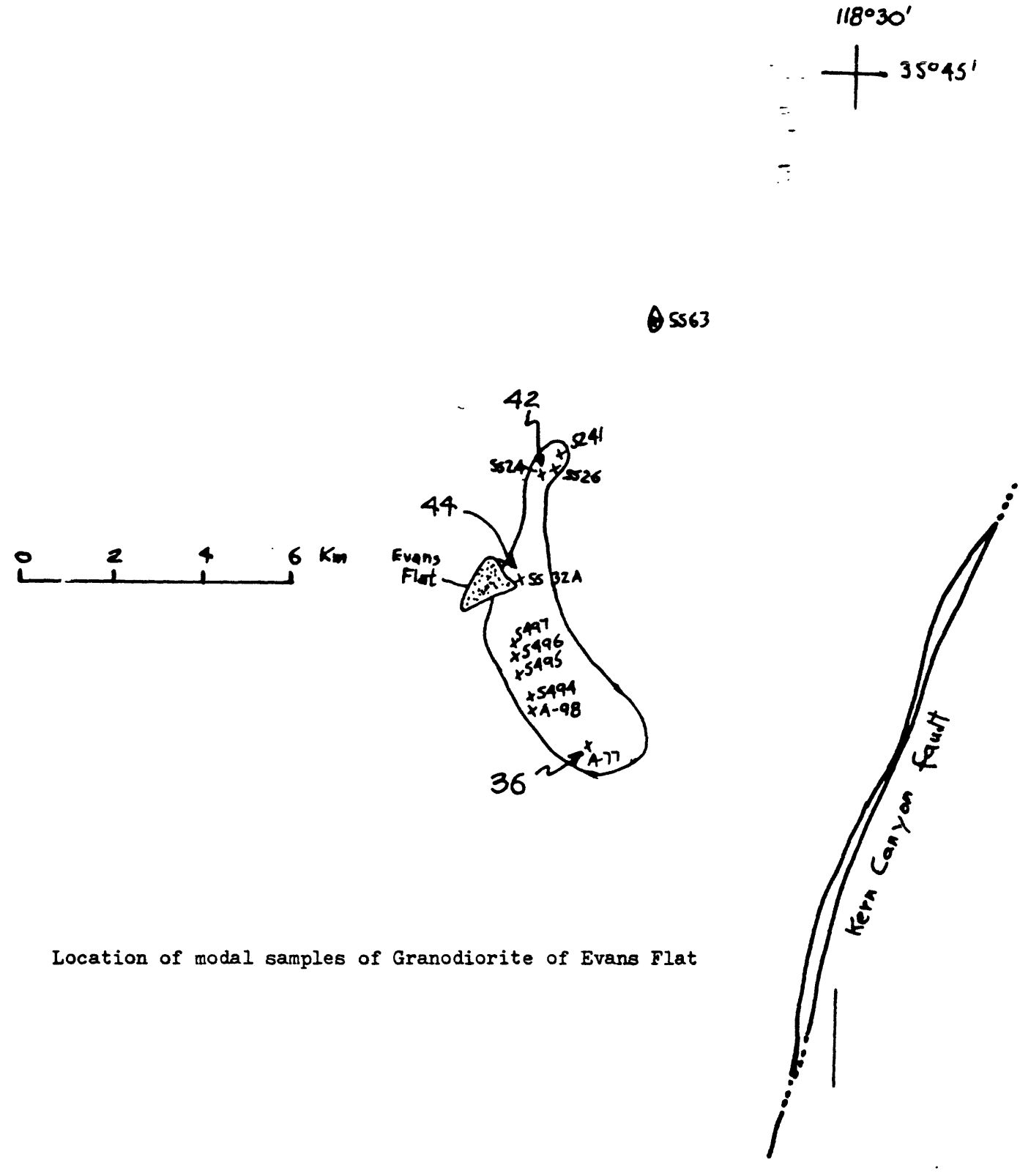


MODES OF GRANODIORITE OF EVANS FLAT

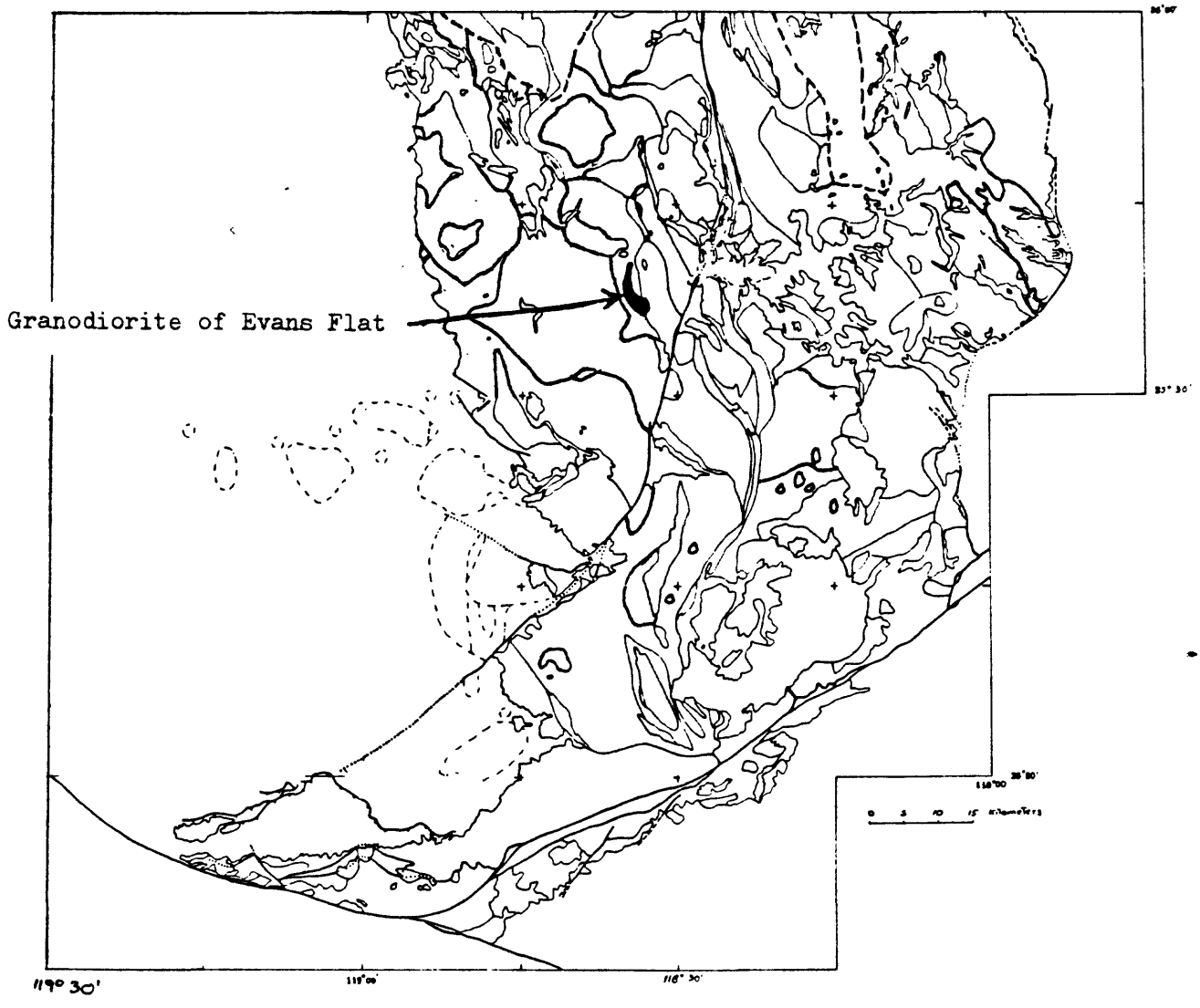
Sample number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende		Other		Specific gravity
S241	57	4	23	12	4				2.72
S494	50	5	32	13	<1				
S495	56	5	28	10	1				
S496	53	5	26	14	2				
S497	63	5	75	14	3				
SS24	58	4	23	11	4		Sphene <1		
SS26	49	16	24	10	1				
SS32A	49	8	26	13	4				
SS63	53	2	29	12	4		cpx <1		
A-77	53	13	25	8	1				
A-98	54	8	24	14	<1				
Average	54	7	25	12	2				
Standard deviation	(4.2)	(4.2)	(4.3)	(2.0)	(1.7)				



Modal plot of Granodiorite of Evans Flat



Location of modal samples of Granodiorite of Evans Flat

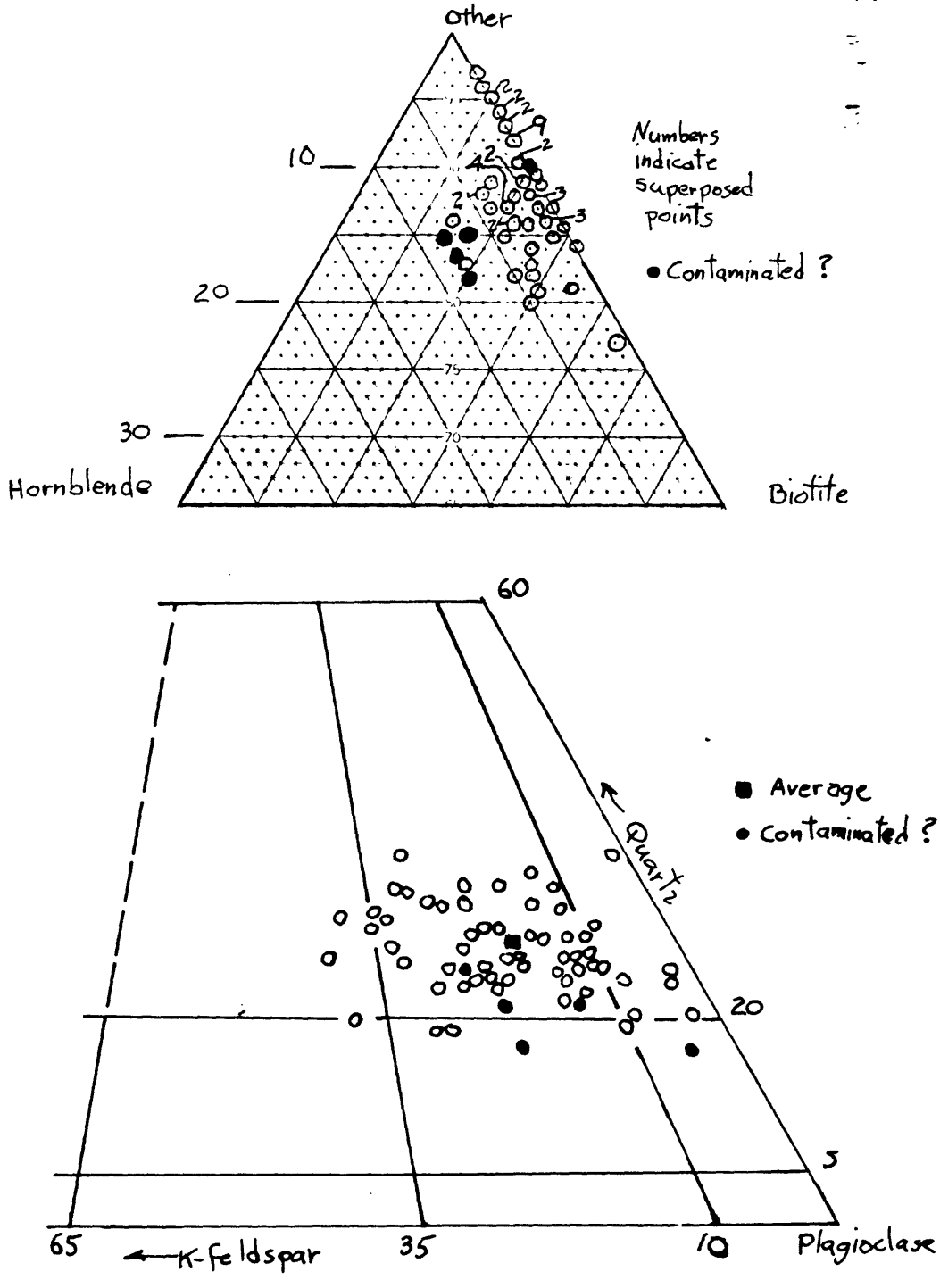

Granodiorite of Evans Flat
119° 30'
118° 30'

MODES OF GRANODIORITE OF GATO-MONTES

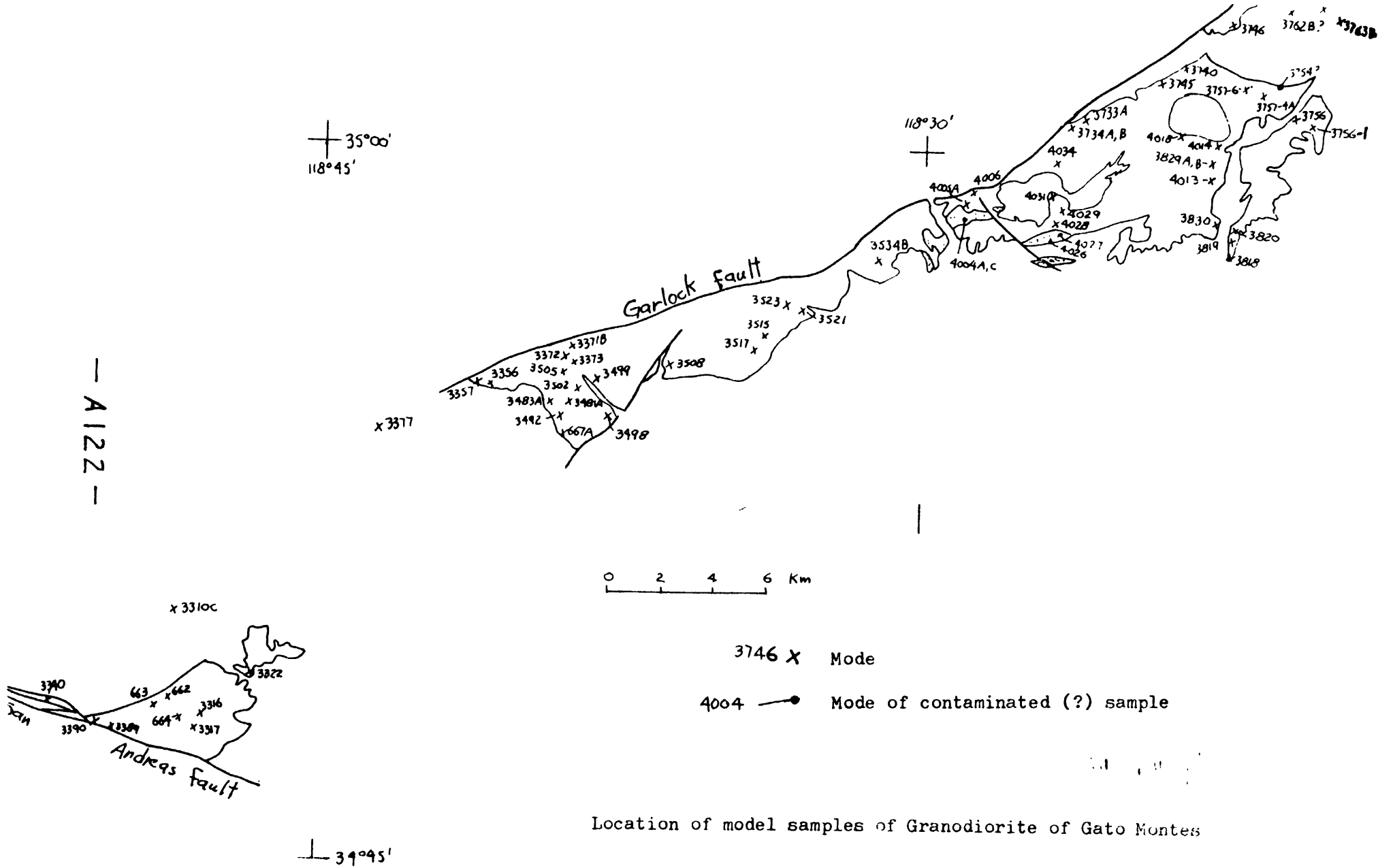
[All modes in volume percent; n.d., not determined. Others: A, allanite; C, clinopyroxene; M, muscovite; O, opaque minerals; S, sphene]

Sample	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Others	Specific gravity
662	50	9	28	10	3	---	2.68
663	57	8	22	10	3	---	2.68
664	53	14	23	10	---	---	2.61
667A	44	21	24	10	1	---	n.d.
3310C	51	15	30	4	---	---	n.d.
3316	53	12	23	8	4	<1(C)	2.69
3317	53	15	20	8	4	---	2.67
3322	52	13	27	8	---	---	2.66
3340	44	13	28	8.5	6.5	---	2.70
3356	57	6	25	11	1	<1(C), <1(S)	2.68
3357	60	5	21	13	1	---	2.70
3371B	52	8	32	8	---	---	2.66
3372	53	6	29	11	1	---	2.68
3373	58	7	23	11	1	<1(C), <1(M)	2.69
3377	51	11	31	7	---	---	2.66
3389	43	19	31	7	---	---	2.64
3390	63	6	28	3	---	---	2.64
3481A	52	10	24	10	3	1(S)	2.71
3483A	62	2	20	16	<1	<1(M), <1(S)	2.72
3492	53	12	22	9	4	<1(S)	2.69
3498	51	17	21	8	3	<1(S)	2.68
3499	63	7	17	12	1	<1(S)	2.70
3502	56	9	21	10	3	1(S)	2.70
3505	60	8	24	8	<1	<1(M)	2.66
3508	40	24	28	8	---	---	2.64
3515	42	22	28	8	<1	<1(S)	2.66
3517	63	2	17	13	5	<1(S)	2.71
3521	43	15	26	13	3	<1(S)	2.69
3523	49	9	22	15	5	---	2.71
3534B	52	15	23	9	.5	.5(S)	2.69
3733A	56	2	18	22	1	<1(A), 1(S)	2.71
3734A	56	9	21	13	1	<1(O), <1(S)	2.66
3734B	55	9	22	12	2	---	2.67
3740	57	7	21	13	1	1(S)	2.625
3745	52	14	20.5	13	---	.5(S)	2.67
3746	41	22.5	25.5	10	1	---	2.65
3747A	55.5	10	19	9.5	5	<1(O), 1(S)	2.69
[1]3754	47	16	20.5	8.5	8	---	2.65
3756	53	19	23	5	---	<1(S)	2.61
3756-1	42	28	25	5	---	---	2.70
3757-4A	42	27	17	14	(?)	---	2.69
3757-6	50	20	16	11	3	---	2.69
3762B(?)	56	1	32	11	---	---	2.69
3763B(?)	56	8	18	14	4	---	2.72
3766(?)	62	6	17	14	1	---	2.69
3818	52	7	23	9	8	1(S)	2.71
3819	52	7	26	11	4	<1(S)	2.69
3820	46	17	29	8	---	<1(A)	2.63
3829A	42	18	34	6	<1	---	2.64
3829B	51	18	23	8	---	<1(S)	2.65
3830	54	16	22	8	---	---	2.65
[1]4004A	58	9	19	7	7	---	2.69
[1]4004C	60	3	13	10	---	<1(C)	2.76
4005A	45.5	14	23	14	3.5	---	2.71
4006	54.5	6.5	20	17	2	---	2.71
4013	43	19	29	8	---	1(S)	2.62
4014	49	15	25	11	---	---	2.69
4018	45	21	28	6	---	---	2.63
[1]4026	50	15	17	10	8	---	2.69
[1]4027	55	16	14	7	8	---	2.70
4028	44	21	23	10	2	---	2.66
4029	47	19	20	11	3	---	2.67
4031	46	19	16	15	4	---	2.71
4034	49	15	23	10	1	2(S)	2.68
Average	52	12	24	10	2	---	2.67
Standard deviation.	6.0	5.9	4.8	3.3	1.9	---	.03

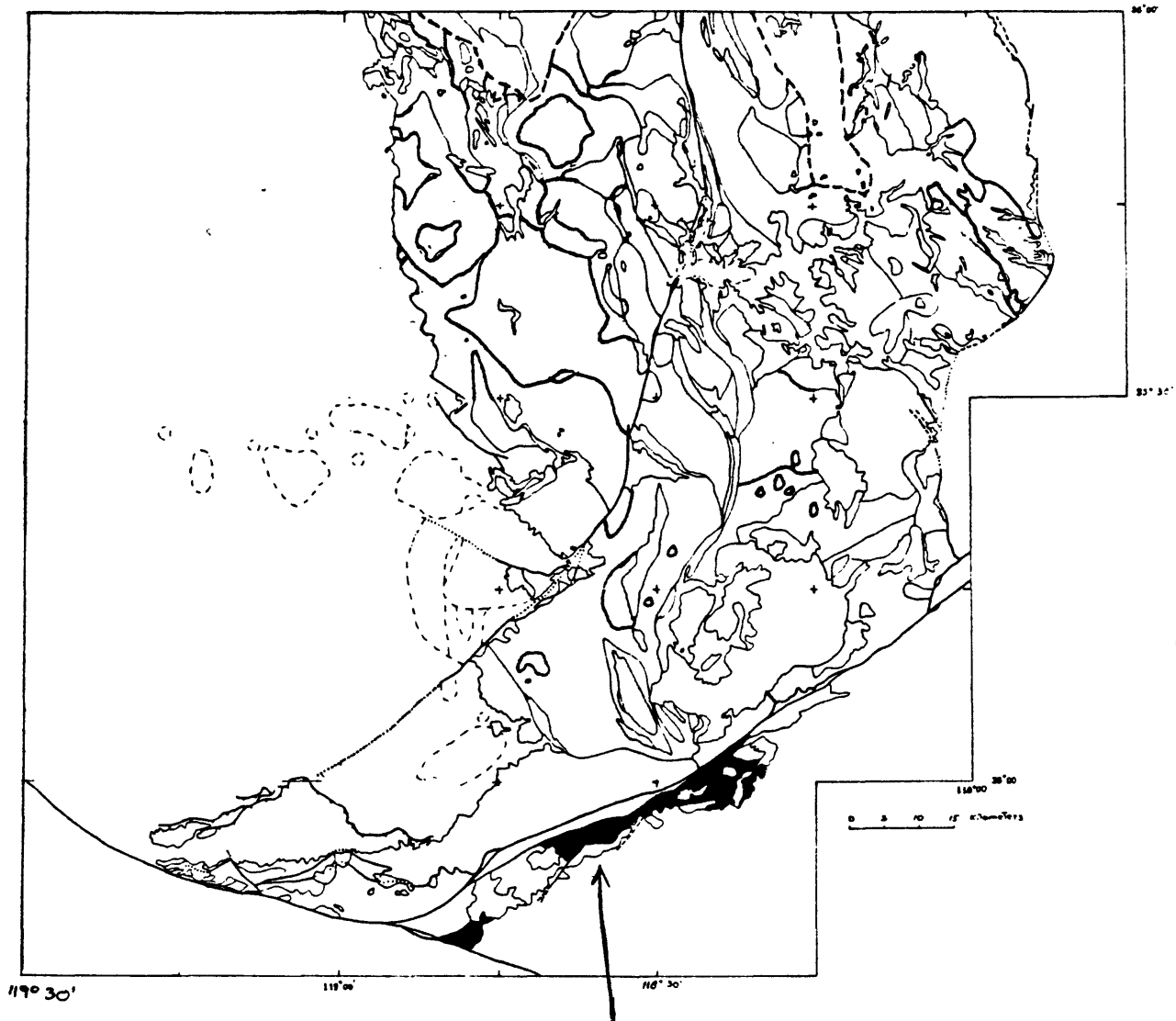
[1]Sample contaminated(?); not used in calculation of averages.



Modal plot of Granodiorite of Gato-Montes



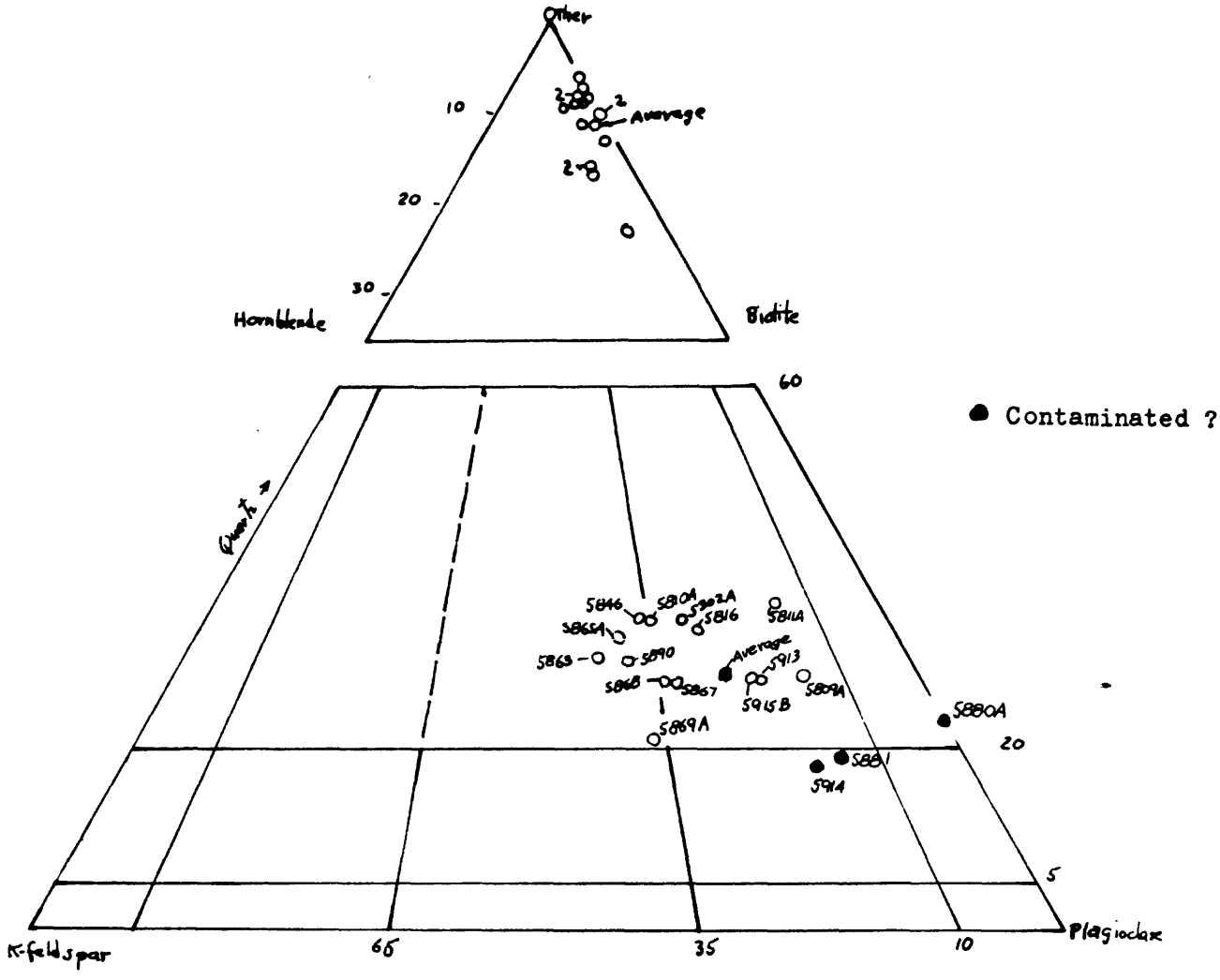
Location of model samples of Granodiorite of Gato Montes


119° 30'
118° 30'
Granodiorite of Gato-Montes

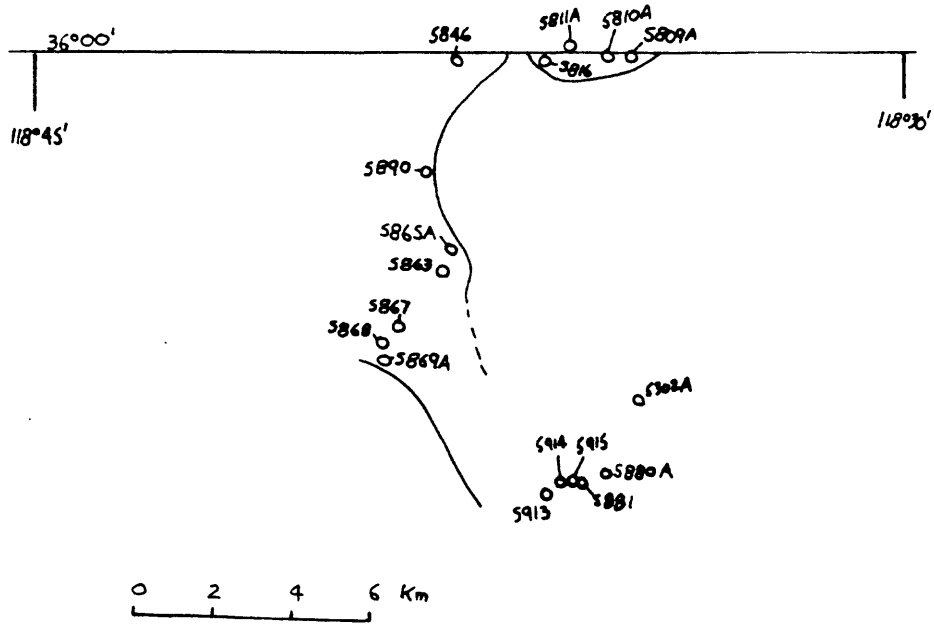
MODES OF GRANODIORITE OF HATCHET PEAK

Sample Number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende		Other
5302A	42	18	31	6	3		
5809A	57	10	26	7	<1 ?		
5810A	40	21	31	8	<1 ?		
5811A	49	9	32	10	-		
5816	43	17	30	10	-		
5846	38	21	30	10	1		
5863	37	27	27.5	7.5	1		
5865A	38	25	29	7	1		
5867	44	21	24	9	2		
5868	46	23	25	6	<1 ?		
5869A	46	27	19	7	<1 ?		
* 5880A	59	<1	18	19	4		
* 5881	59	9	16	12	4		
5890	39	25	27	7	2		Opaque <1
5913	48	13	23	12	4		
* 5914	56	12.5	15	12.5	4		
5915B	49	14	24	12	1	?	
Average	46.5	17	25	9.5	2		
Standard deviation	7.5	7.6	5.4	3.3	1.6		

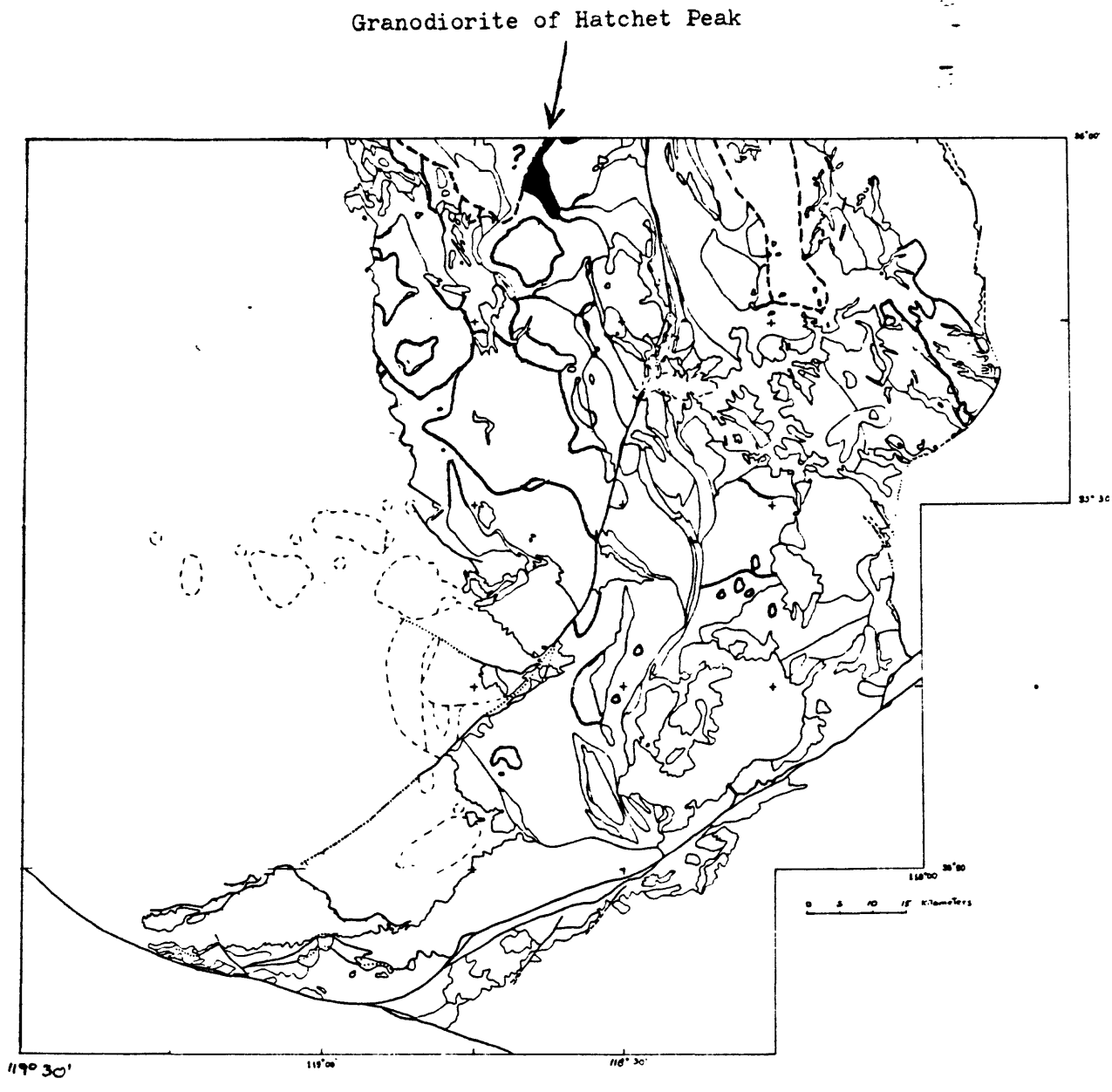
* Contaminated ?



Modal plot of Granodiorite of Hatchet Peak



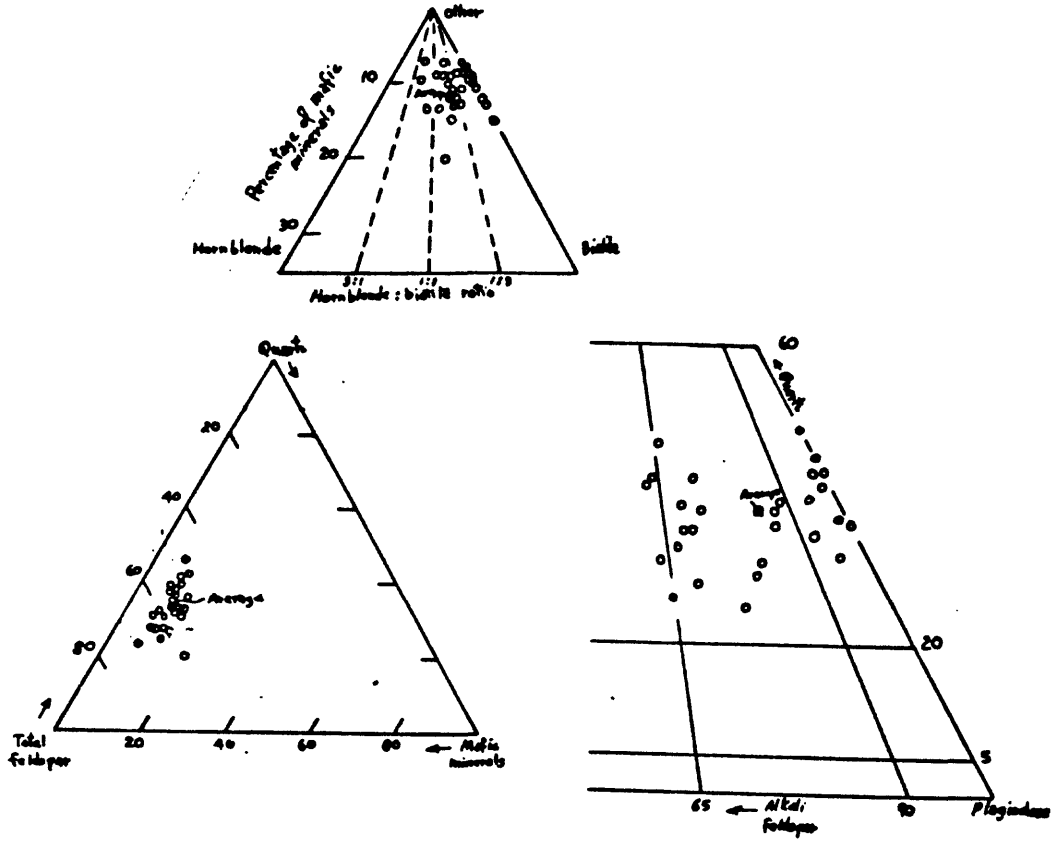
Location of modal samples of Granodiorite of Hatchet Peak


Granodiorite of Hatchet Peak
?
119° 30'
119°00'
118° 30'

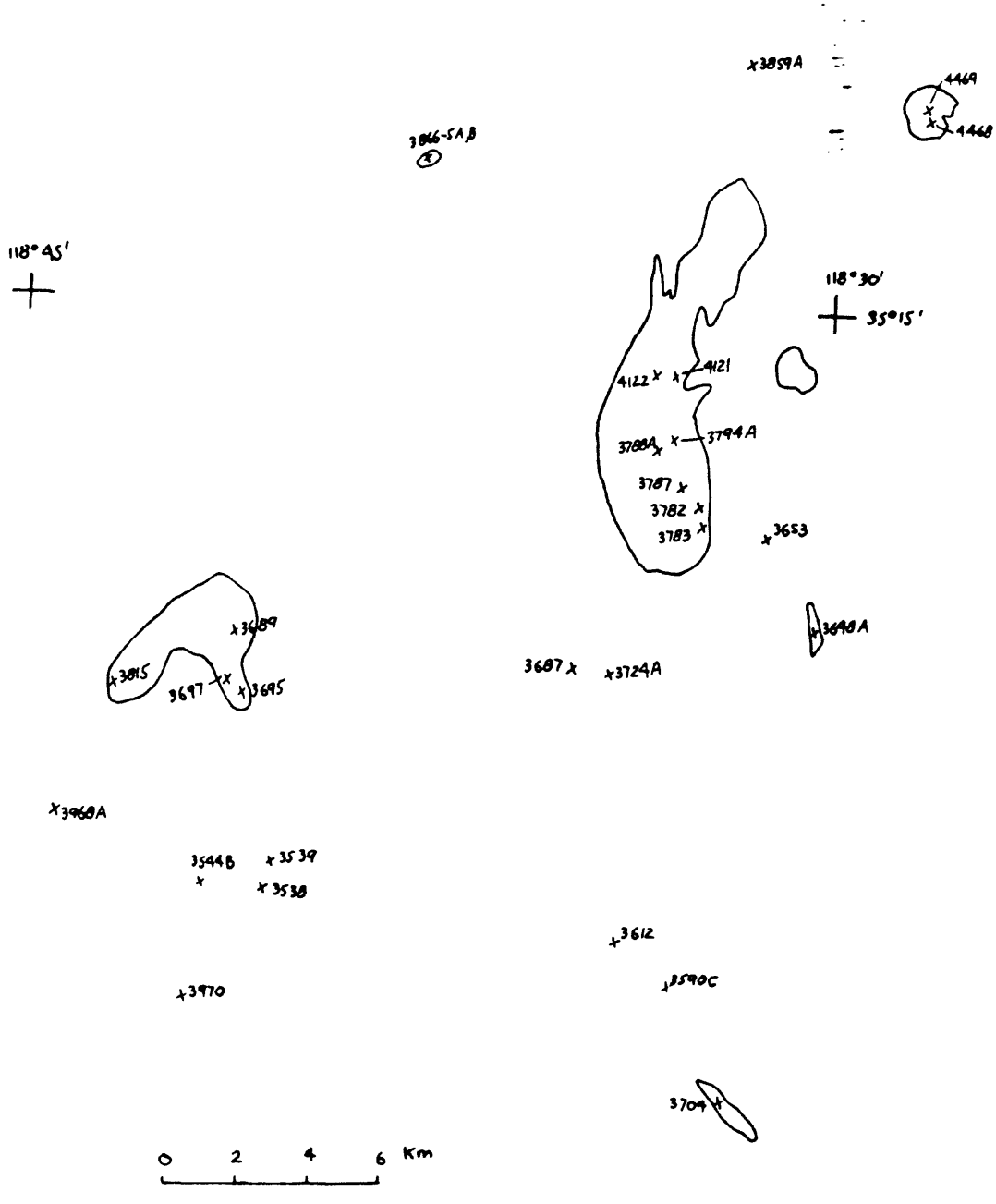
MODES OF THE GRANODIORITE OF KEENE

[All modes in volume percent. Others: G, garnet; O, opaque minerals; S, sphene]

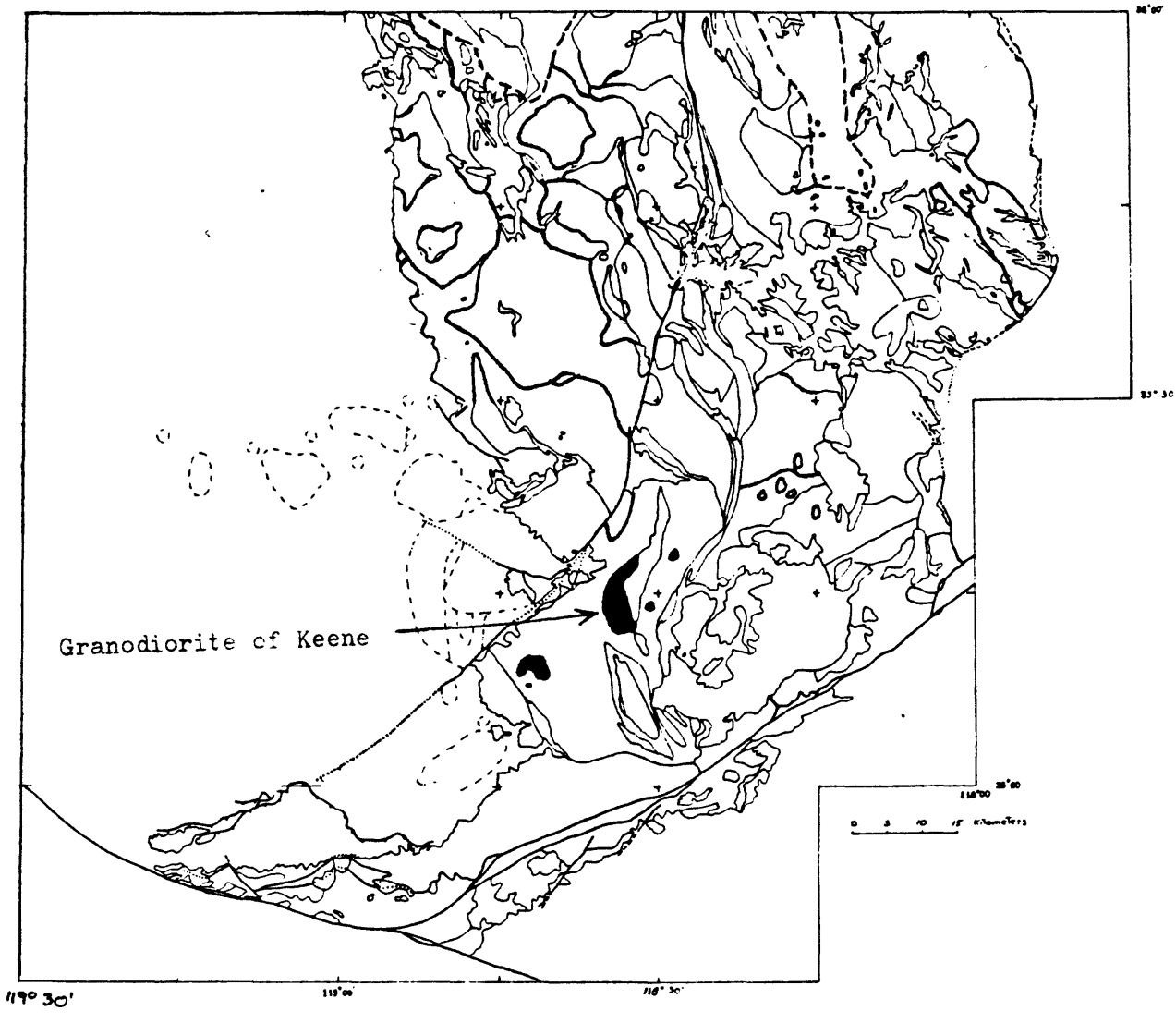
Sample	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Others	Specific gravity
3538	34.5	19	38.5	8	---	---	2.64
3539	48	7.5	31	8	5.5	---	2.70
3544B	48	12	25	15	---	---	2.67
3590C	38	15	38	7	2	---	2.62
3612	51.5	.5	39	6	3	---	2.68
3648A	40	15	34	9	2	---	2.65
3653	50	1	36	13	---	---	2.63
3687	46	14	20	12	8	---	2.69
3689	58	3	28	8	3	<1(S)	2.67
3695	49	11	27.5	9.5	3	---	2.68
3697	47	7	33	6	7	<1(O), <1(S)	2.69
3704	47	---	46	3	4	---	2.66
3724A	50	1	39	7	3	---	2.64
3782	44	19	25	12	---	---	2.62
3783	49	6	35	10	---	---	2.61
3787	50	---	41	9	---	---	2.65
3788A	38	17	33	9	3	---	2.61
3794A	42	20	31	5	2	---	2.66
3815	62	---	28	10	---	---	2.68
3859A	34	20	37	3	6	---	2.65
3866-5A	49	3	35	8	5	---	2.70
3866-5B	51	4	30	10	5	---	2.68
3968A	55	1	33	10	---	1(G)	2.61
3970	32	16	42	9	---	---	2.68
4121	42	18	32	7	1	---	2.65
4122	42	18	32	5	3	---	2.61
4468	40	23	28	9	---	---	2.63
4469	45	24	24	7	---	---	2.62
Average	46	10	33	8.5	2.5	---	2.65
Standard deviation.	7.0	8.1	6.0	2.8	2.4	---	.03



Modal plots of the granodiorite of Keene



Location of modal samples of Granodiorite of Keene


Granodiorite of Keene
119° 30'
118° 30'

MODES OF GRANODIORITE OF LEBEC

[All modes in volume percent; n.d., not determined. Others: A, allanite; C, clinopyroxene; M, muscovite; O, opaque minerals; S, sphene]

Sample	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Others	Specific gravity
643	50	19	20	11	---	<1(M)	2.69
660	49	15	25	11	---	---	2.62
673	48	15	25	11	1	<1(M)	2.67
674	48	16	21	14	1	---	2.72
679A	43	21	28	7	1	<1(M)	2.65
680	47	15	28	10	<1	<1(A,M)	2.68
682	44	22	29	5	---	<1(M)	2.64
683	53	6	27	14	---	<1(A)	2.67
686	45	18	26	10	1	<1(M)	2.68
687	49	12	27	11	1	<1(A)	2.68
688	51	12	22	15	---	<1(M)	2.71
690	48	15	27	8	2	---	2.67
691	34	26	28	11	1	---	2.66
692	48	14	26	11	1	<1(C)	2.67
693	49	10	27	14	---	---	2.68
694	47	14	23	13	3	<1(C)	2.71
695	47	16	25	10	2	---	2.65
696	41	19	24	13	3	<1(C,M)	2.68
697	49	12	26	13	---	<1(A)	2.68
698	41	17	27	13	2	---	2.68
699	57	4	24	15	---	<1(A)	2.69
700	49	13	22	14	2	<1(C,M)	2.69
701	49	6	30	14	1	---	2.63
702	52	9	24	12	1	2(C)	2.70
706	58	2	18	19	3	---	2.69
707	52	9	23	14	2	<1(C)	2.70
712	47	20	28	5	---	---	2.65
713	48	16	26	10	---	---	2.67
779	52	7	29	12	---	---	2.68
780	60	1	27	12	<1	<1(C), 1(M)	2.71
FM-1	47	12	24	17	<1	---	2.71
3047	56	6	26	10	2	---	2.70
3048	62	1	20	16	1	---	2.72
3053	49	12	22	16	1	<1(A)	2.70
3054	48	6	30	15	1	<1(S)	2.70
3056	45.5	11.5	34	9	---	---	n.d.
3069	41	21	25	10	3	<1(S)	2.66
3078	44	17	30	8	1	---	2.67
3079	50	14	24	10	2	<1(A)	2.68
3081	56.5	9	21	10	3.5	---	2.69
3086	43	18	30	9	---	<1(A,S)	2.65
3088	58	12	18	7	4	1(S)	2.70
3132	50	15	25	9	---	1(S)	2.65
3138A	32	24	36	8	---	---	2.64
3142	63	7	17	12	1	<1(A,O,S)	2.68
3145	40	15	33	12	---	---	2.63
3148	56	2	26	16	---	<1(A)	2.68
3162	46	14	27	11	2	<1(A)	2.66
3181	51.5	8	27	11.5	2	---	2.67
3185	51	7.5	28	12.5	1	<1(A)	2.68
3190	50	11	30	9	---	---	2.68
3193	47	13	27	12	1	<1(A)	2.68
3195	53	10	21	14	2	<1(A)	2.68
3197	45	11	26	17	1	---	2.65
3203	44.5	15	28.5	10	2	---	2.63
3204	52	9	24	13	2	---	2.67
3208	45	17	33	4	---	---	2.66
3211	44	19	30	6	1	<1(A)	2.64
3212	58	7	21	11.5	2.5	<1(A)	2.685
3213	56.5	11.5	18	13	1	---	2.70
3217	40	23.5	29	7.5	<1	---	2.65
3222	48	15	30	7	<1	<1(S)	2.66
3262	54	7	22	17	---	---	2.69
3263	52	10	25	12	1	---	2.69
3888	47	16	23	12	2	<1(A)	2.68
3890	45.5	17	23	11.5	3	---	2.68
3891	54	7	22	15	2	<1(A)	2.69
Average	49.5	13	25	11.5	1	---	2.68
Standard deviation.	7.3	6.9	4.7	3.6	1.1	---	.02

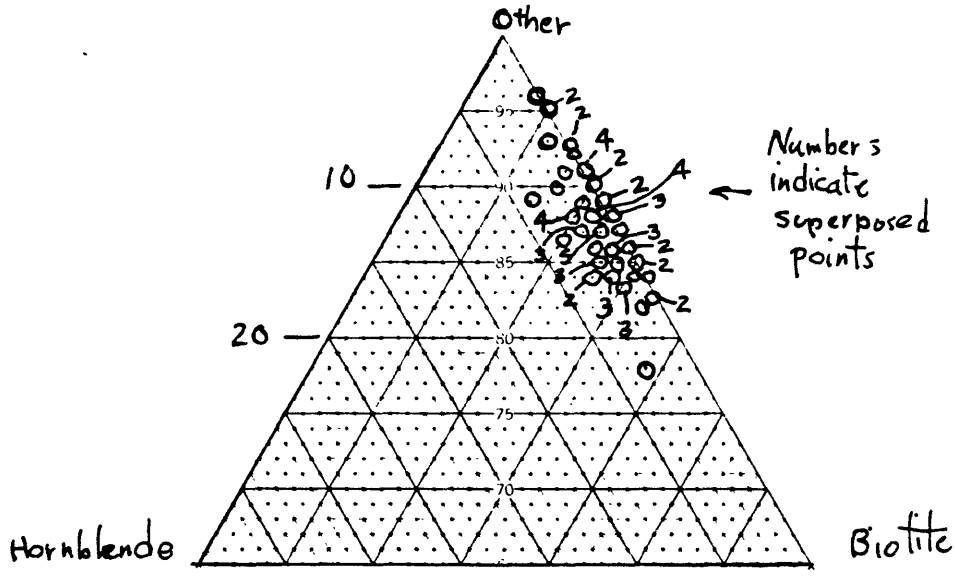
MODES OF FINE-GRAINED FACIES(?) OF GRANODIORITE OF LEBEC

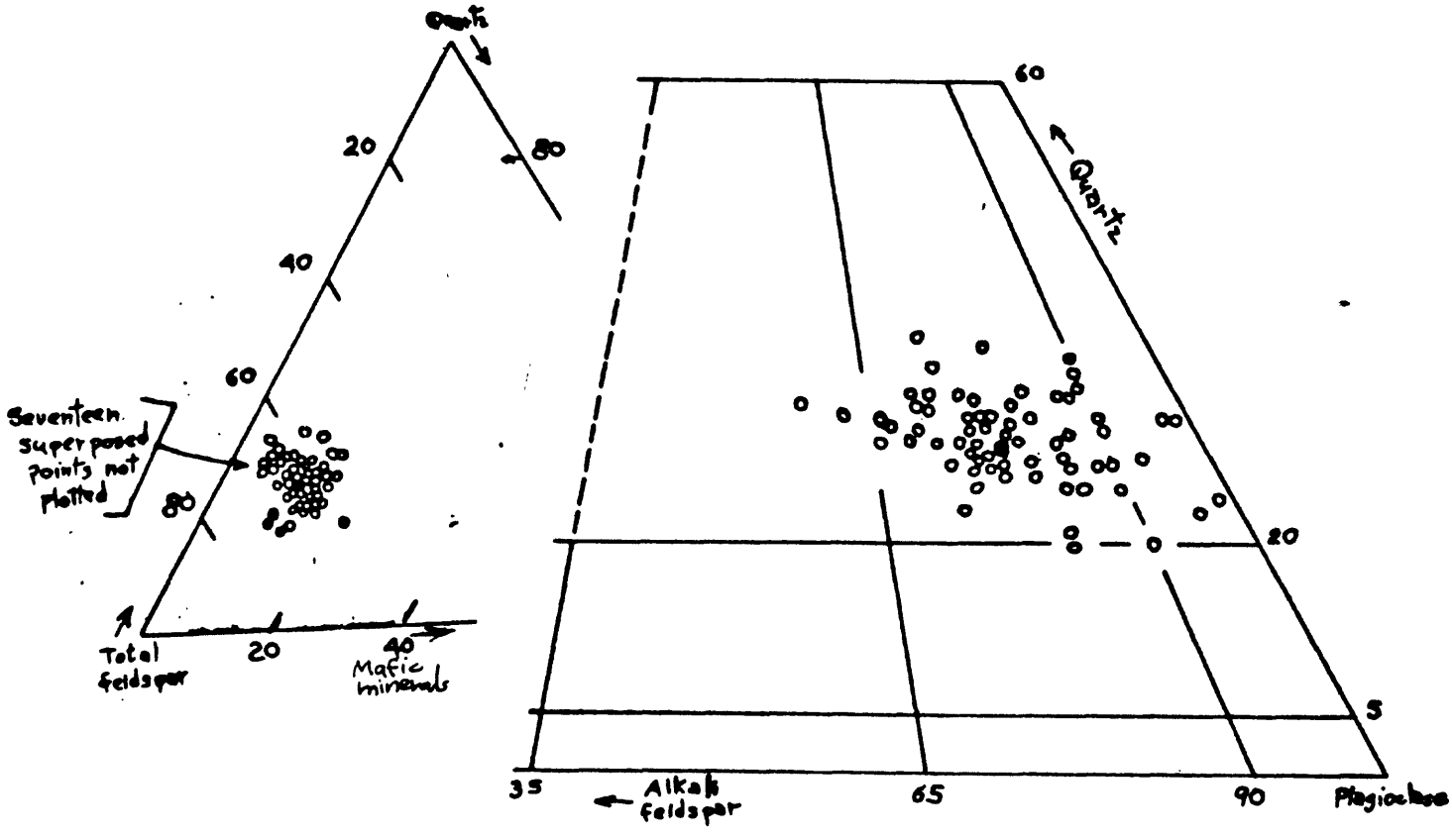
Sample	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Specific gravity
721	42	31	23	4	---	2.63
722	41	31	22	6	---	2.65
3115	33	26	39	2	---	2.62
3118	48	13	34	5	---	2.66
3119	42	21	34	3	<1	2.63
3125	30.5	30	37	2.5	<1	2.60
3127	44	22	31	3	---	2.62
3136	38	26	32	4	---	2.62
3164	48	20	28	4	---	2.655
3167	43	25	27	5	<1	2.64
3169	46	21	28	5	---	2.65
3186	31	38	29	2	---	2.61
3225	45	18	33	4	---	2.61
Average--------	41	25	30	4	---	2.63
Standard deviation.	6.0	6.6	5.0	1.3	---	.02

MODES OF FELSIC MARGINAL FACIES(?) OF GRANODIORITE OF LEBEC

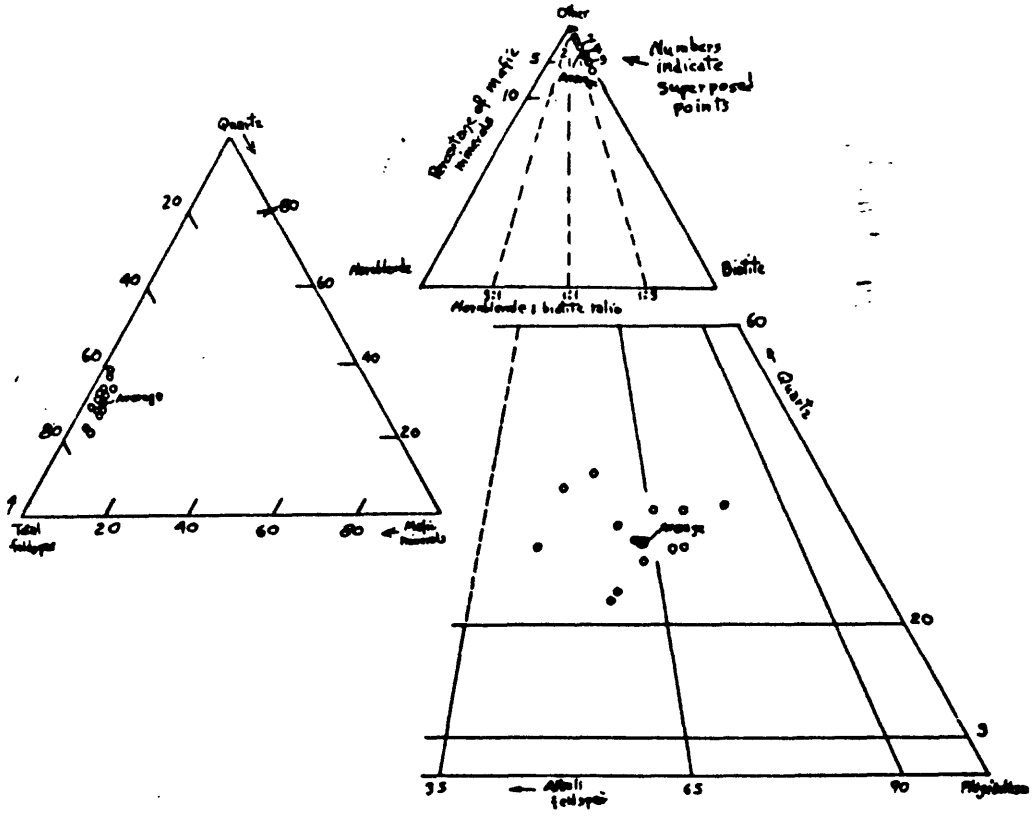
Sample	Plagioclase	K-feldspar	Quartz	Biotite	Others	Specific gravity
678	33	28	34	5	<1(M)	2.64
3010	33	22	42	3	---	2.63
3012A	31	28	37	4	---	2.62
3138A	32	24	36	8	---	2.64
3879	29.5	31	36	3.5	---	2.59
3880	29	34	31	6	---	2.60
Average--------	31	28	36	5	---	2.62
Standard deviation.	1.7	4.4	3.6	1.9	---	.02

Others: M, muscovite]

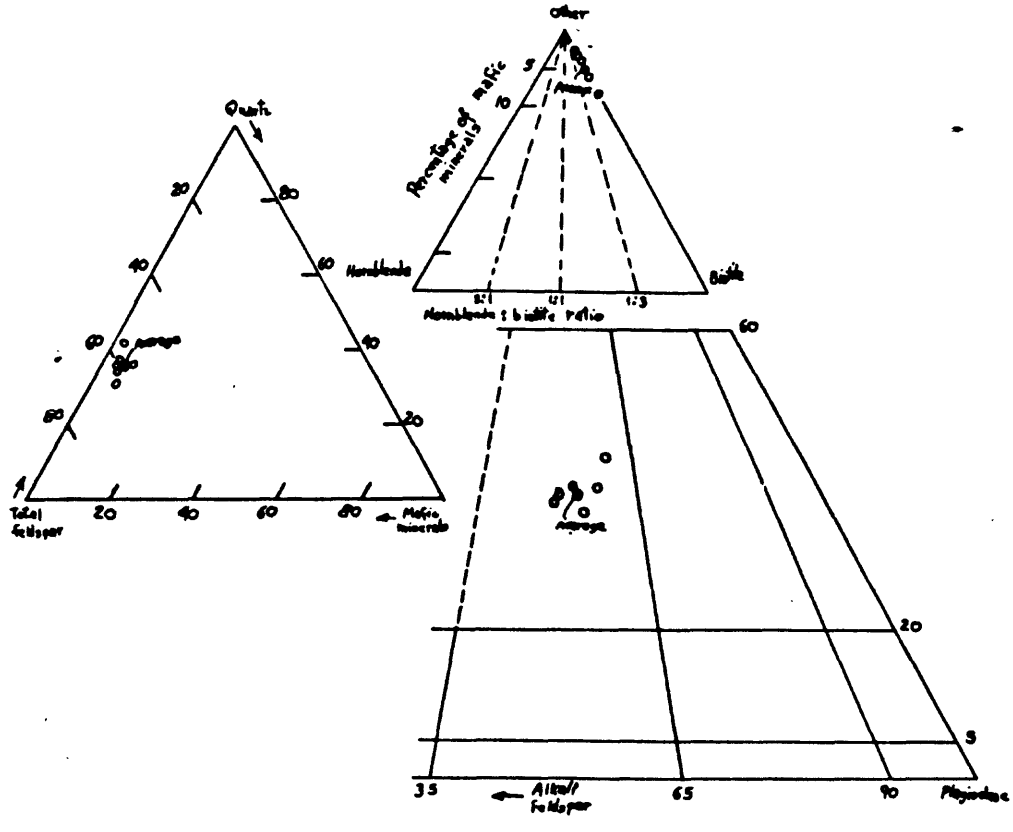




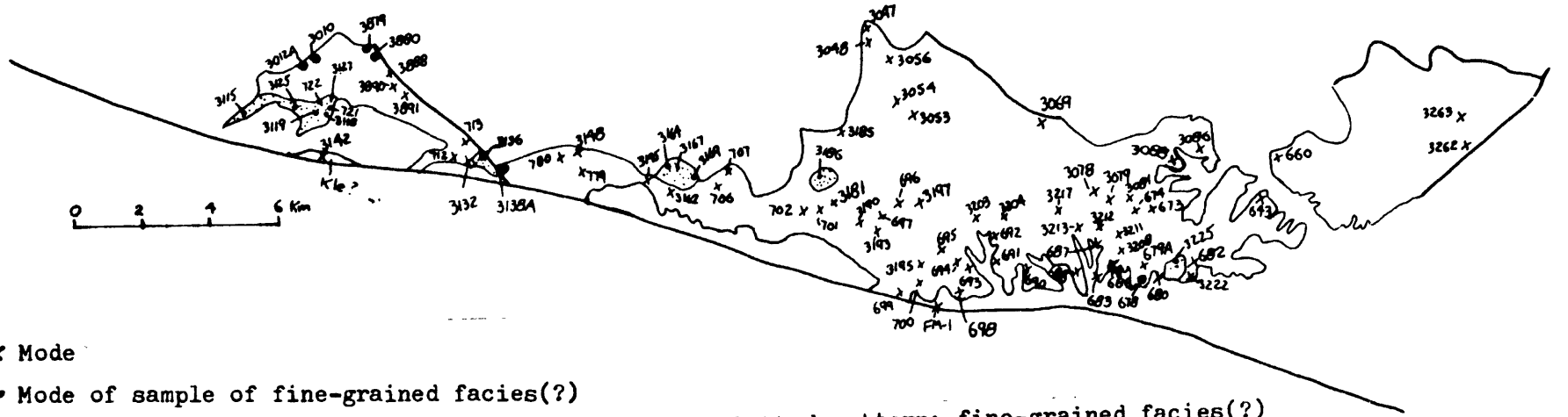
Modal plots of Granodiorite of Lebec



Modal plots of fine-grained facies(?) of Granodiorite of Lebec



Modal plots of felsic marginal facies(?) of Granodiorite of Lebec



X Mode

—• Mode of sample of fine-grained facies(?)

—● Mode of sample of felsic marginal facies(?)

Dotted pattern: fine-grained facies(?)

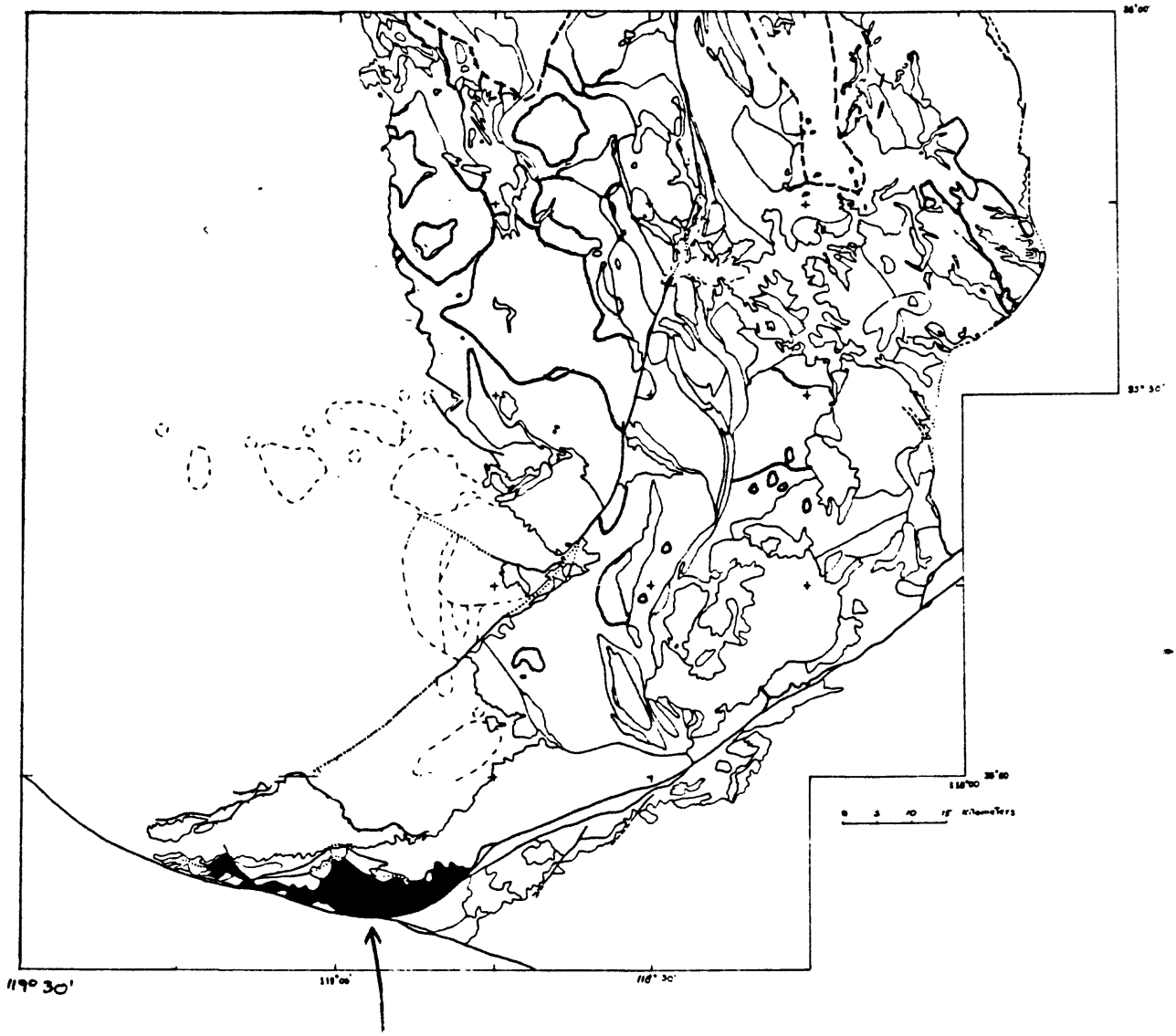
119°15'

119°00'

34°45'

A135

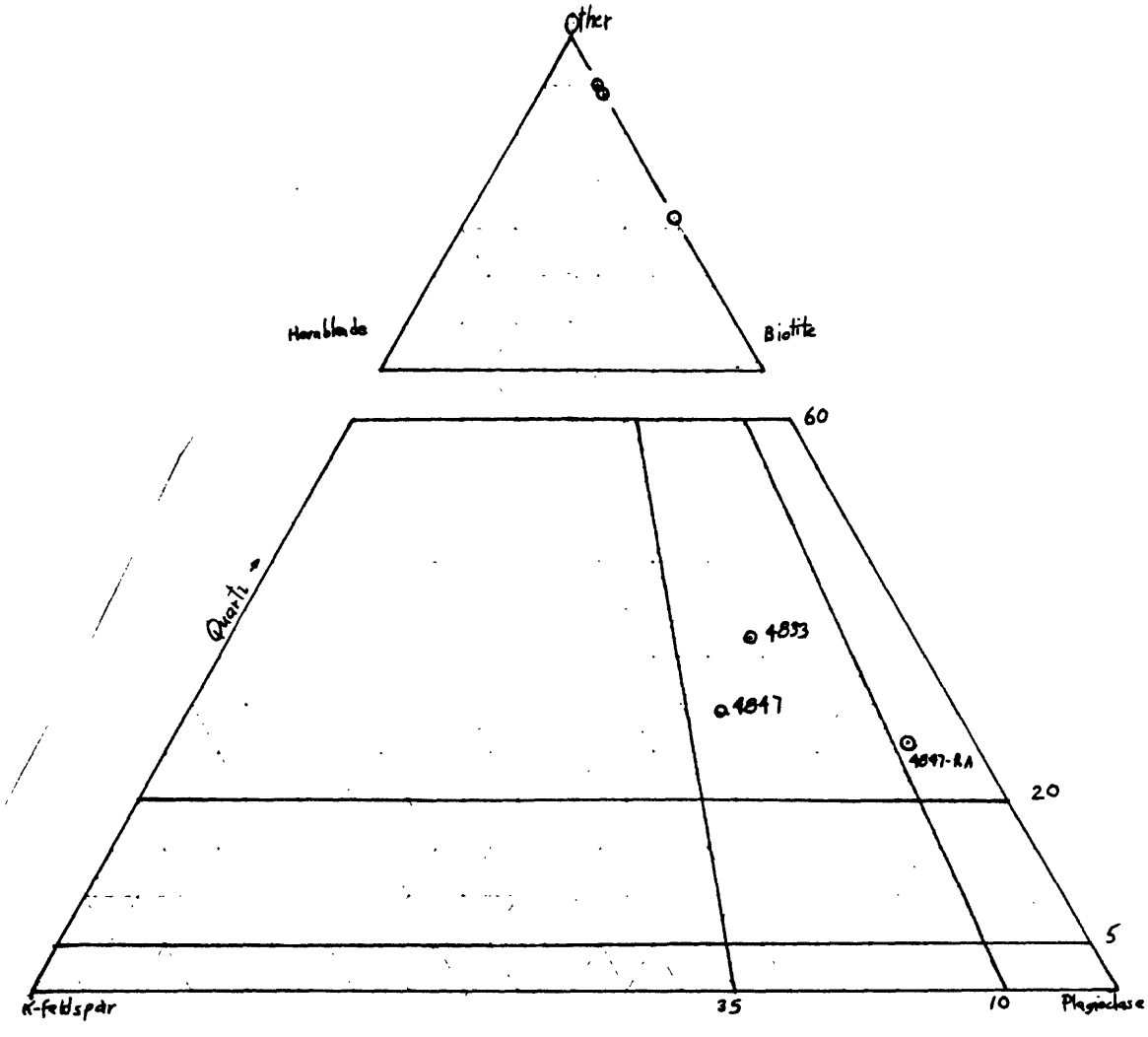
Location of modal samples of Granodiorite of Lebec and fine-grained and felsic marginal facies(?)



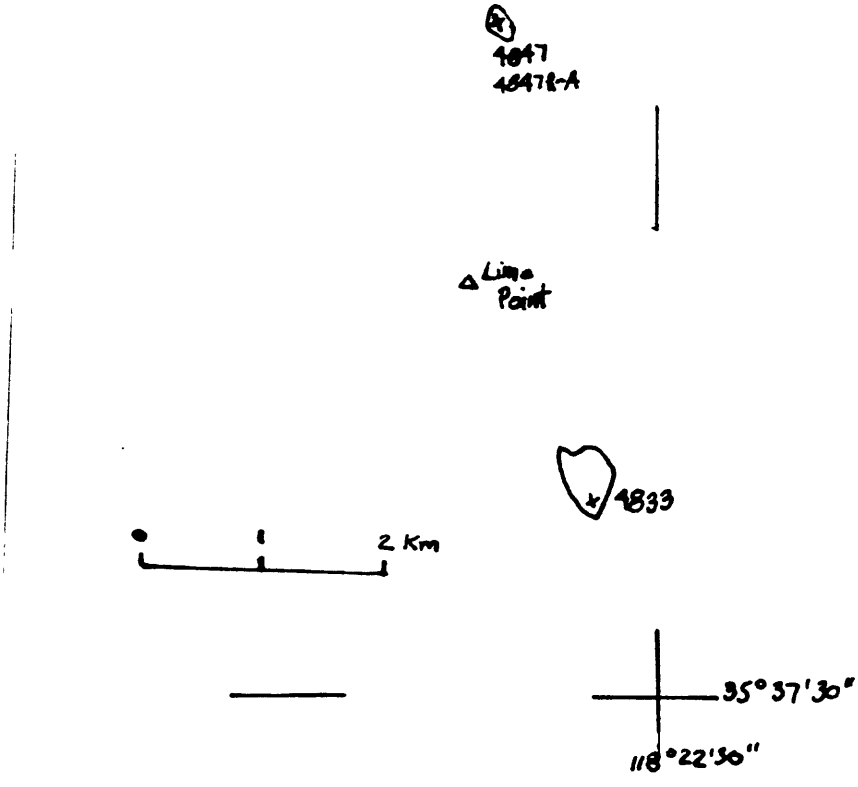
Granodiorite of Lebec

MODES OF GRANODIORITE OF LIME POINT

Sample Number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende		Specific gravity
4833	46	14	35	5	-		2.63
4847	46	21	27	6	-		2.62
4847-RA	55	5	21	19	←	(contaminated?)	-
Average	49	13	28	10	-		2.63
Standard deviation	5.2	8.0	7.0	7.8			-

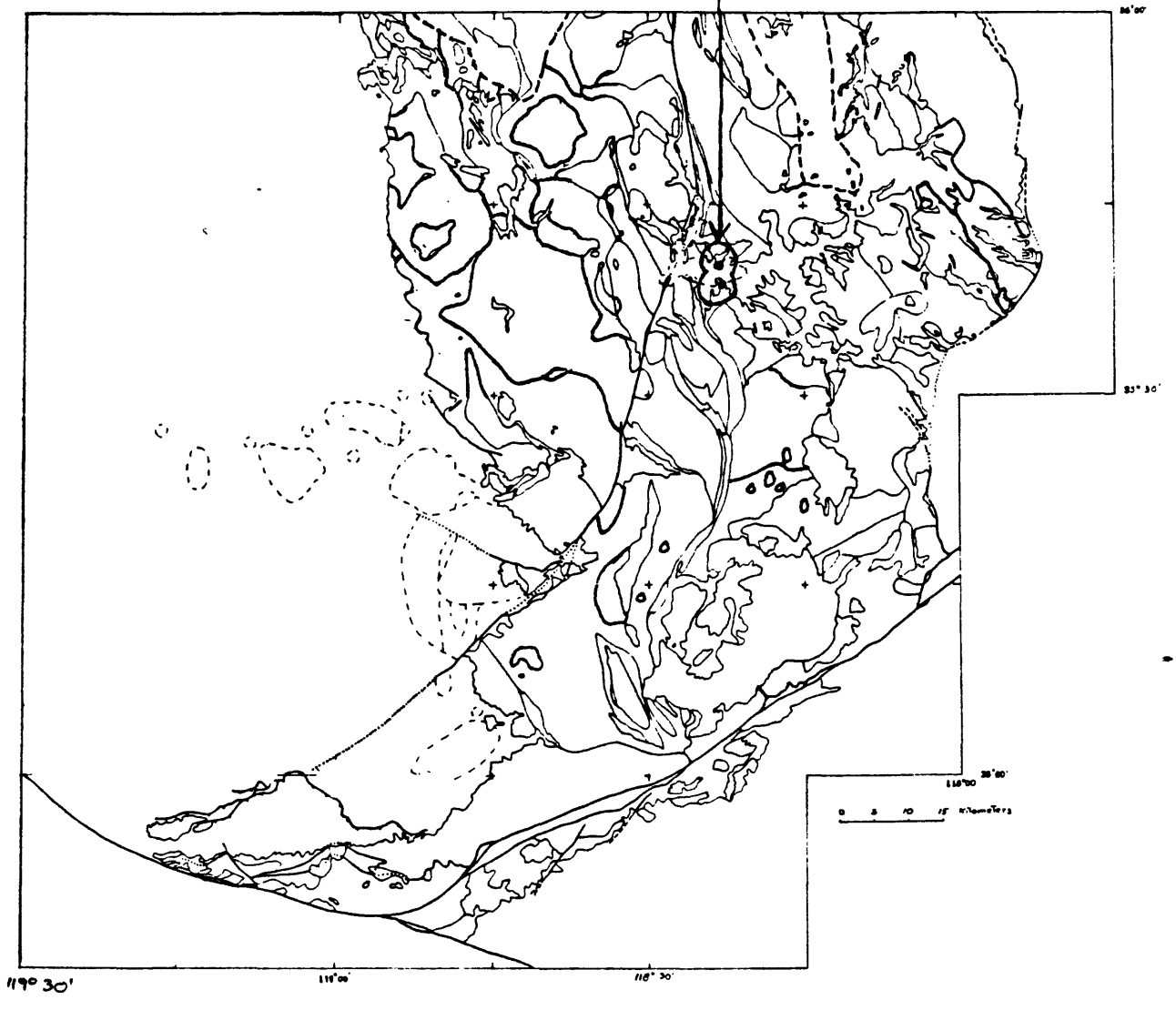


Modal plot of Granodiorite of Lime Point



Location of modal samples of Granodiorite of Lime Point

Granodiorite of Lime Point

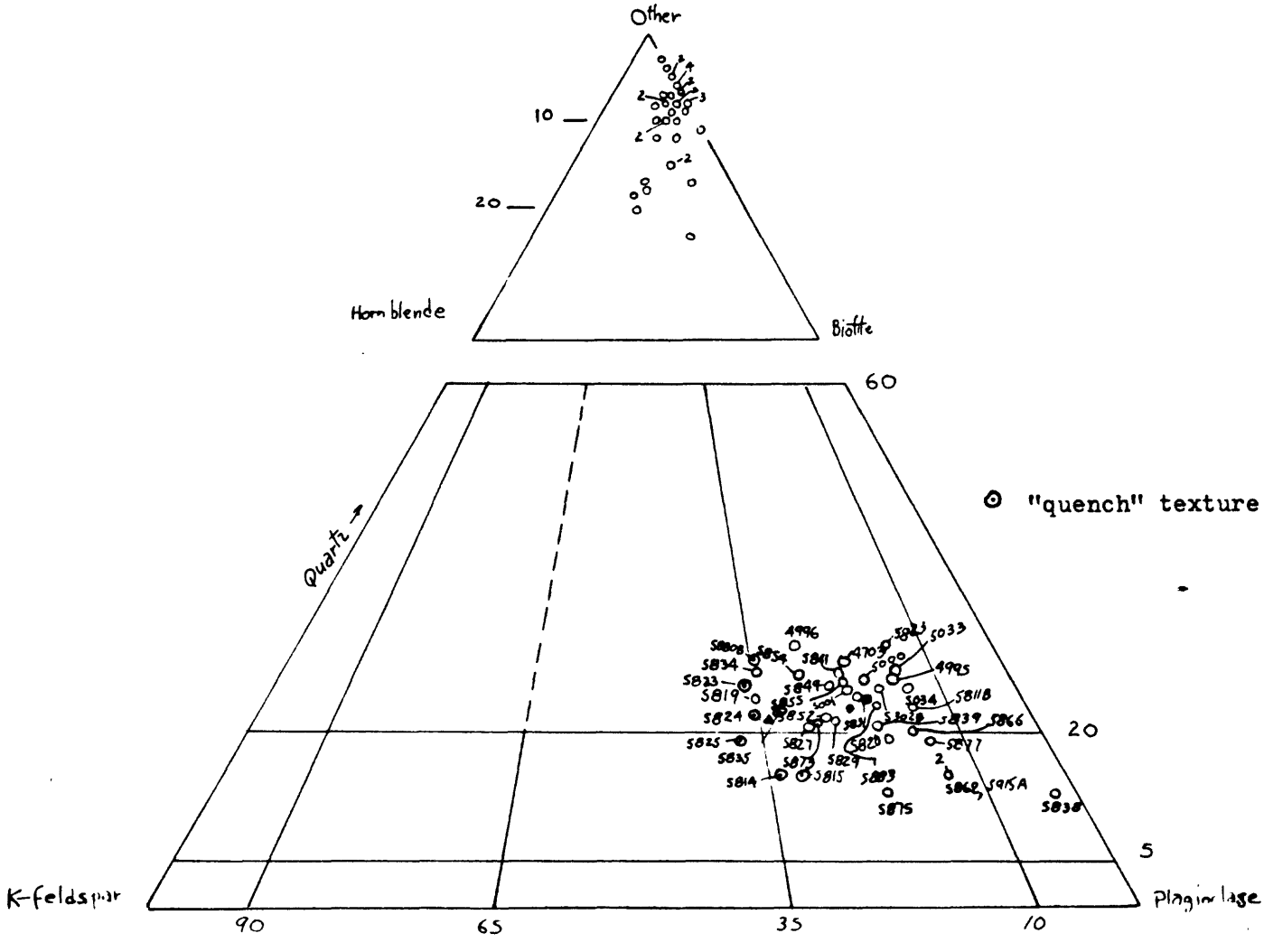


MODES OF GRANODIORITE OF PEPPERMINT MEADOW

Sample Number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Sphene	Opaque	
4703	52	15	25	5	3			
4995	57	11	24	5	2	0.5	0.5	
4996	46	18	28	6	1	0.5	0.5	
5000	53	13	23	7	3	0.5	0.5	
5001	52	15	22	6	4	1		
5033	48	9	20	16	7			
5034	52	9	20	9	9	1		
5302B	54	12	22	7	5			
5811B	55	10	18	13	4			
5819	45	25	22	8	<1		<1	
5820	59	15	17	8	<1		1	
5823	54	10.5	27	8	<1	<1	<1	
5827	54	17	22	6	<1	1	<1	
5829	55	19	21	5	—		<1	
5831	54	15	22	7	1	<1	1	
5834	47	24	26	3	<1			
5838	69	2	10.5	8	10.5	<1		
5839	57	15	19	6	2	1	<1	
5841	49	15	24	9	3	<1	<1	
5849	51	17	24	7	1		<1	
5852	51	18.5	21	8.5	0.5	0.5		
5854	48	20	25	6	-	1	<1	
5855	51	16	23	7	2	0.5	0.5	
5862	61	10	13	10	5	0.5	0.5	
5866	60	12	18	8	2	<1		
5873	51	20	20	6	2	1	<1	
5875	54	15	10	9	11	1	<1	
5877	58	9	16	8(?)	9(?)			
5883	53	13	21	7	3	0.5	0.5	
5915A	61	10	14	10	5			
Average	54	14	21	8	3	<1	<1	
Standard deviation	5.1	4.8	4.5	2.5	3.3			

"Quenched" texture

Sample Number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Sphene	Opaque
5814	52	27	14	7	-		
5815	52	24	13	11	?		
5824	47	26	21	6	-		
5825	47	29	18	6	-		
5833	45	27	24	4	-		
5835	47	24	22	5	-		
5880B	44	22	27	7	-		
Average	48	25.5	20	6.5	—	—	—
Standard deviation	3.2	2.4	5.2	2.2	—	—	—
Grand Average	53	16.5	20.5	7	3	<1	<1
Standard deviation	5.3	6.3	4.6	2.4	3.2	-	-

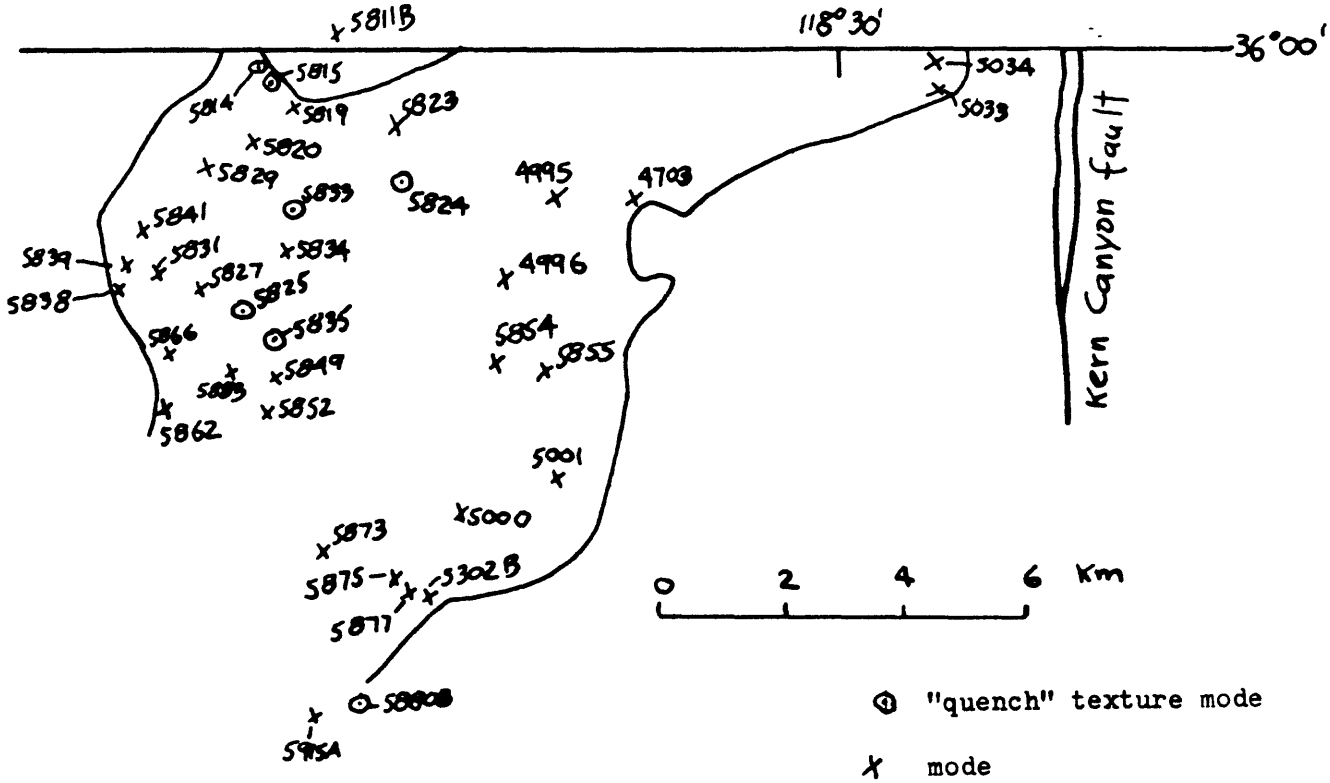


Modal plot of granodiorite of Peppermint Meadow

■ Average, normal texture

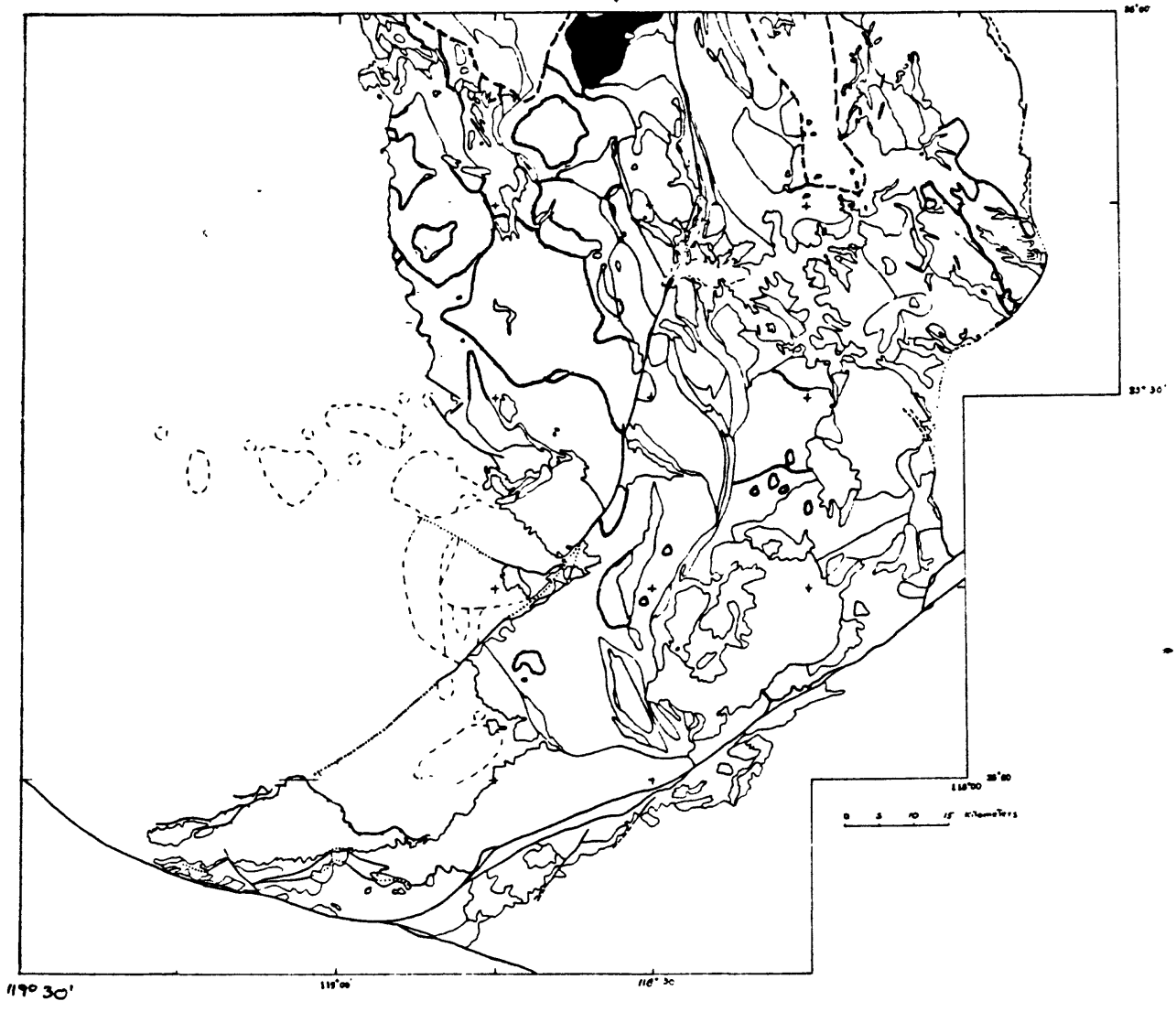
▲ Average, "quench" texture

● Grand Average



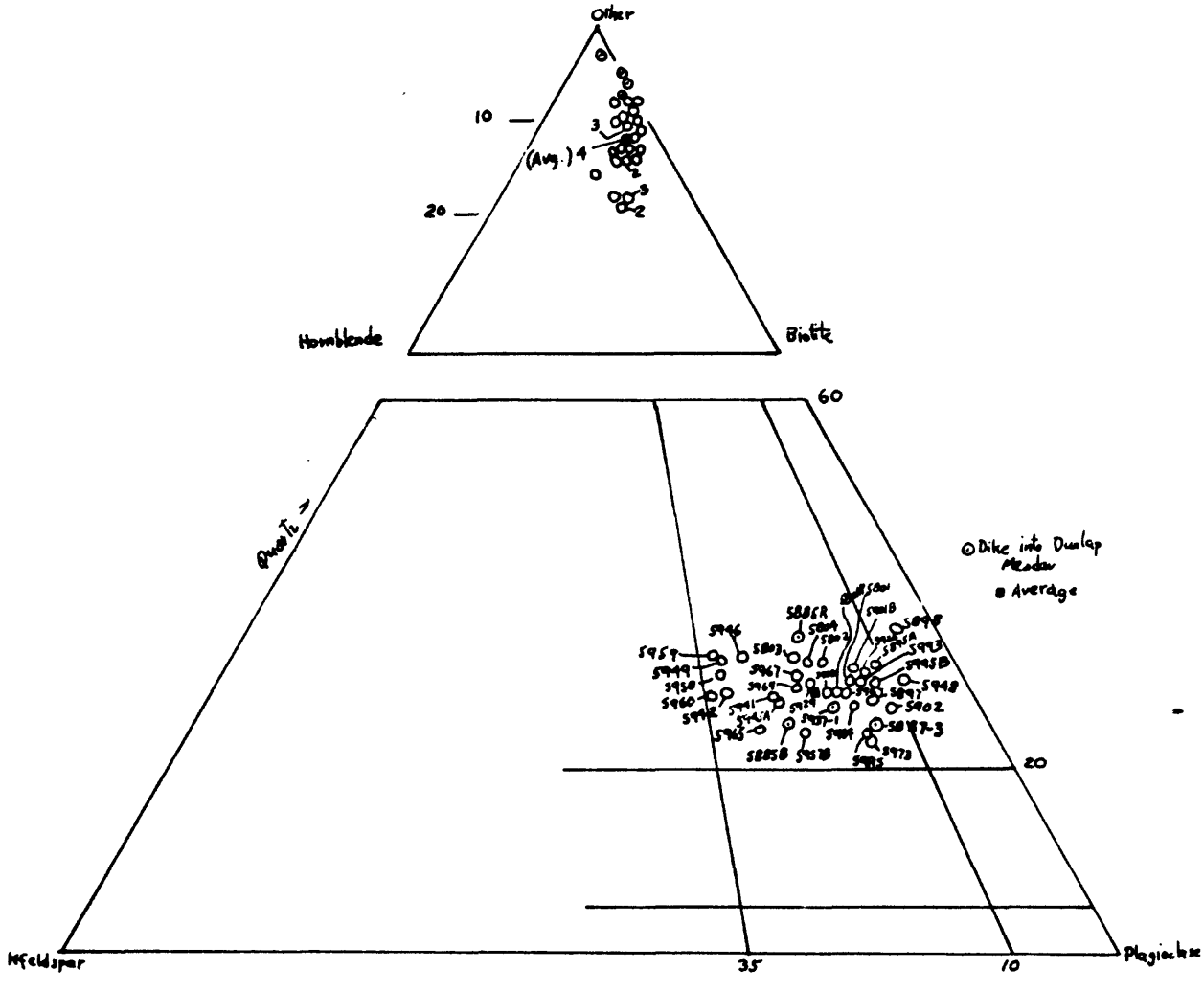
Location of modal samples of granodiorite of Peppermint Meadow

Granodiorite of Peppermint Meadow

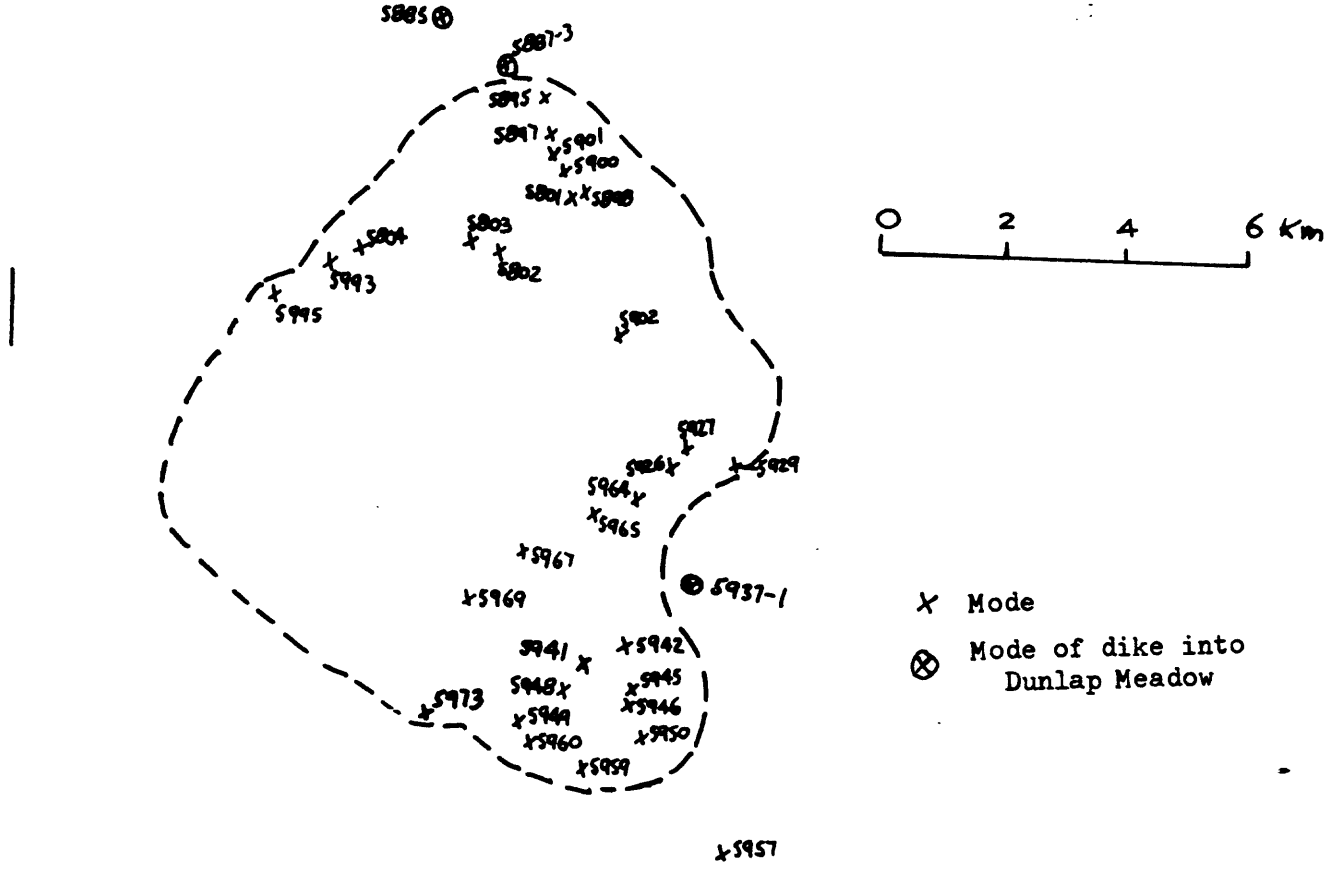


MODE OF GRANODIORITE OF PINE FLAT

Sample number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Sphene	Opaque	
S801	52	10	25	10	3	<1		
S801R	53.5	11.5	25	7.5	2	0.5		
S802	50	12	28	9	1			
S803	47	13	29	10	1		<1	
S804	50	13	28	8	1	<1		
S885B	53	18	24	5	<1			Dike
S885R	49	13	32	6	<1			Dike
S887-3	62	11	24	2	1			Dike
S895A	50	7	25	11	7			
S895B	51	7	24	12	6			
S897	52	8	22	12	6			
S898	55	4	31	8	2		<1	
S900	51	11	24	11	3			
S901B	52	10	26	9	3			
S902	59	7.5	25	7	1		0.5	
S926	52	8	26	10	4			
S927	52	10	24	9	5	<1		
S929	48	13	25.5	8.5	5			
S937-1	55	13	24.5	6.5	1			Dike
S941	46	15	24	11	4			
S942	42.5	20	25	8.5	4			
S945A	44	15	23	12	6			
S946	43	18	29	7	3			
S948	52	5	24	12	7			
S949	41	20	29	8	2			
S950	42	20	26	10	2			
S957B	49	15	20	8	8			
S959	41	19	28	9	3			
S960	41	22	25	8	4			
S964	56	11	25	6	2		<1	
S965	50	20	22	8	-			
S967	47	14	26	11	2		<1	
S969	48	15	25	9	3		<1	
S973	52.5	9.5	19	12	7			
S993	53	9	27	8	2	0.5	0.5	
S995	55	10	21	10	4			
Average	50	13	25	9	3			
Standard deviation	5.0	4.6	2.7	2.2	2.2			



Modal plot of Granodiorite of Pine Flat



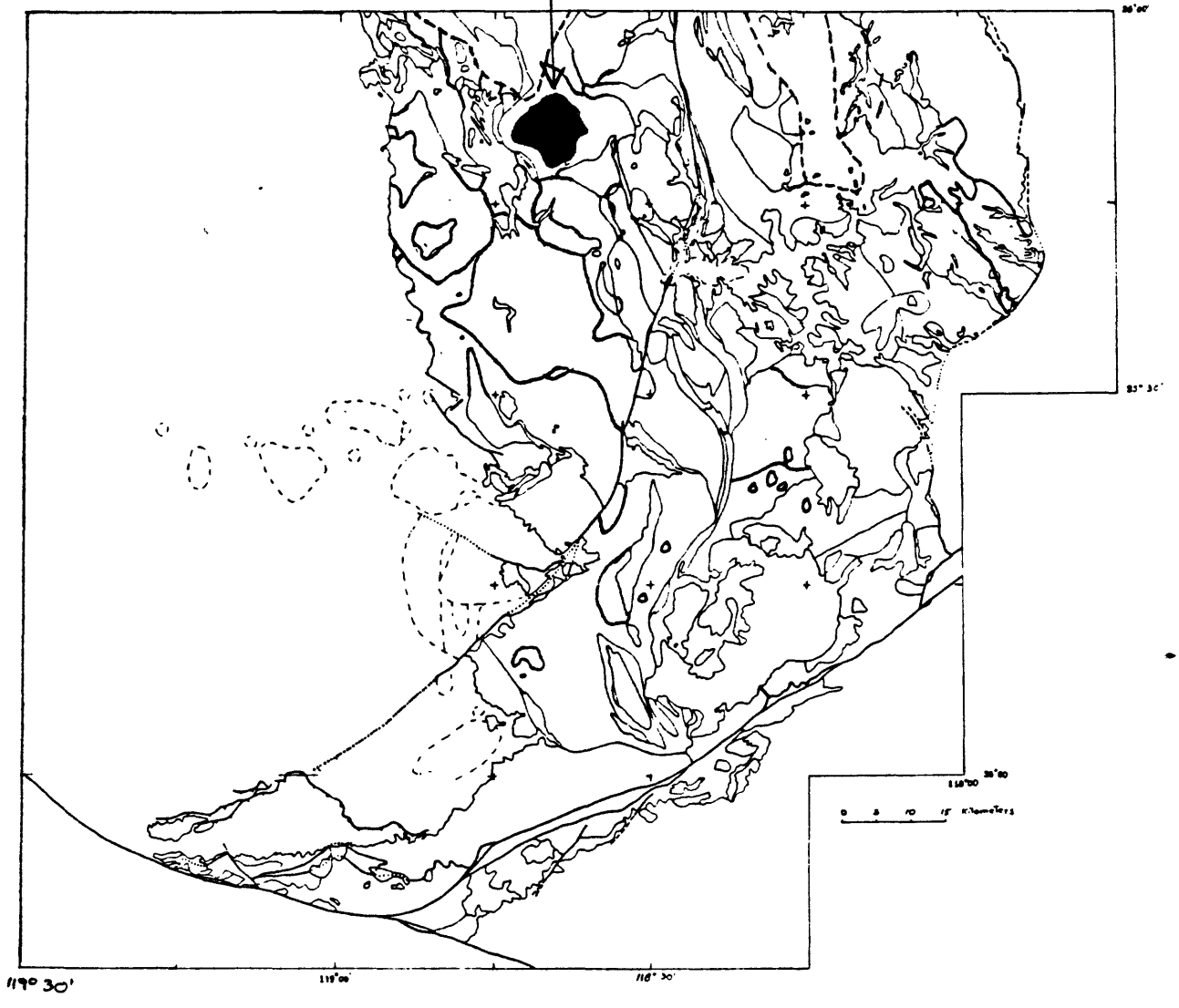
Location of modal samples of Granodiorite of Pine Flat

118°45'

35°45'

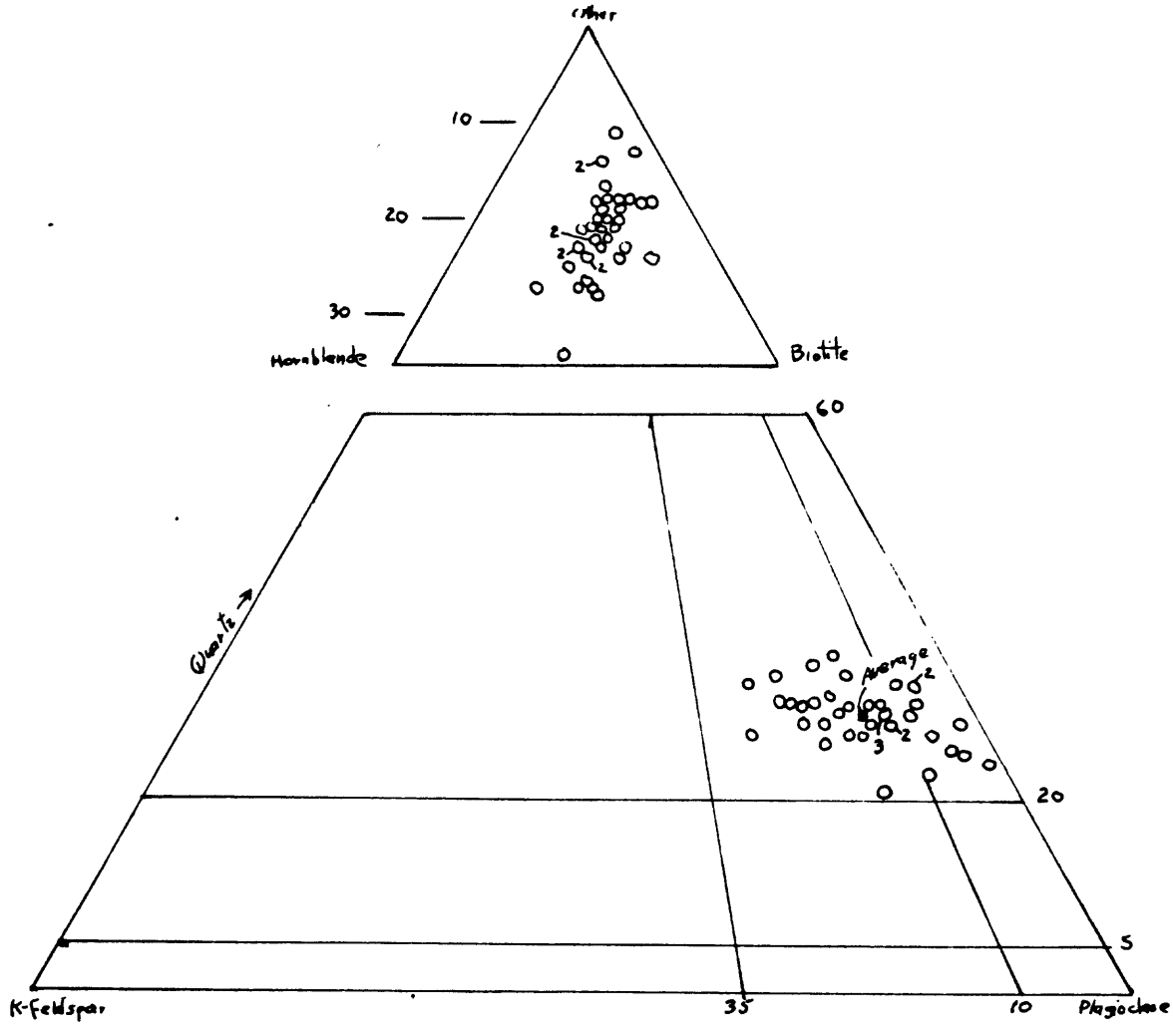
118°30'

Granodiorite of Pine Flat

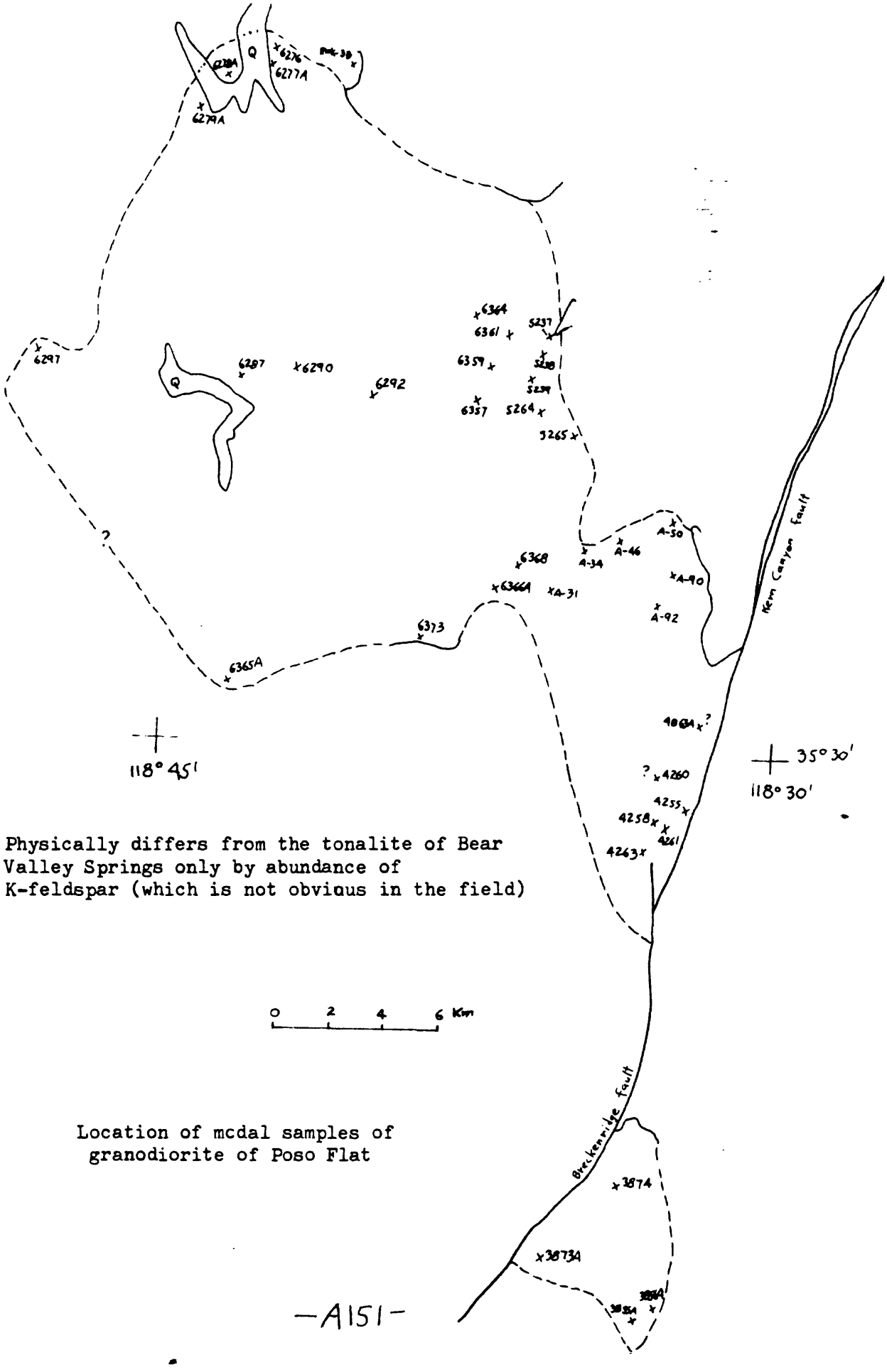


MODES OF GRANODIORITE OF POSO FLAT

Sample Number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende		Other		Specific gravity
3855A	49	9	28	8	6		—		2.70
3856A	45	12	25	15	3		Sphene <1		2.71
3873A	49	8	22	10	11				2.76
3874	34	14	18	15	19				2.79
4255	47	12	21	13	7				2.67
4258	49	6	21	15	9				2.75
4260(?)	52	4	21	13	10				2.73
4261	49	6	22	15	8				2.75
4263	50	12	27	8	3				2.68
4863A(?)	52	3	18	9	18				2.77
5237	45	9	24	13	9				2.77
5238	45	9	22	12	12				2.77
5239	535	1.5	22	11	12				2.77
5264	49	9	15	14	13				—
5265	49	5	25	13	8				—
6276	45	8	28	12.5	6.5				—
6277A	50	3	25	12	10				—
6278A	41	9	26	18	6				—
6279A	55	7	25	11	2				—
6287	49	7	24	12	8				—
6290	49	9	21	12	9				—
6292	48	9	24	11	8				—
6297	53	7	26	8	6				—
6357	51	5	17	13	14				—
6359	49	4	23	12	12				—
6361	51	5	23	11	10				—
6364	54	1	17	15	13				—
6365A	42	13	27	11	7				—
6366A	48	6	21	11	14				—
6368	45	13.5	25	10	6.5				—
6373	49	6	23	12	10				—
A-31	46	11	23	11	9				2.73
A-34	43	14	25	10	8				2.78
A-46	40	16	26	14	4				2.72
A-50	46	13	23	13	5				2.72
A-90	53	2	19	13	13				—
A-92	47	9	21	11	12				—
PWK-38	53	3	26	12	6		(Dike?)		—
Average	48	8	23	12	9				
Standard deviation	4.5	3.9	3.2	2.1	3.8				

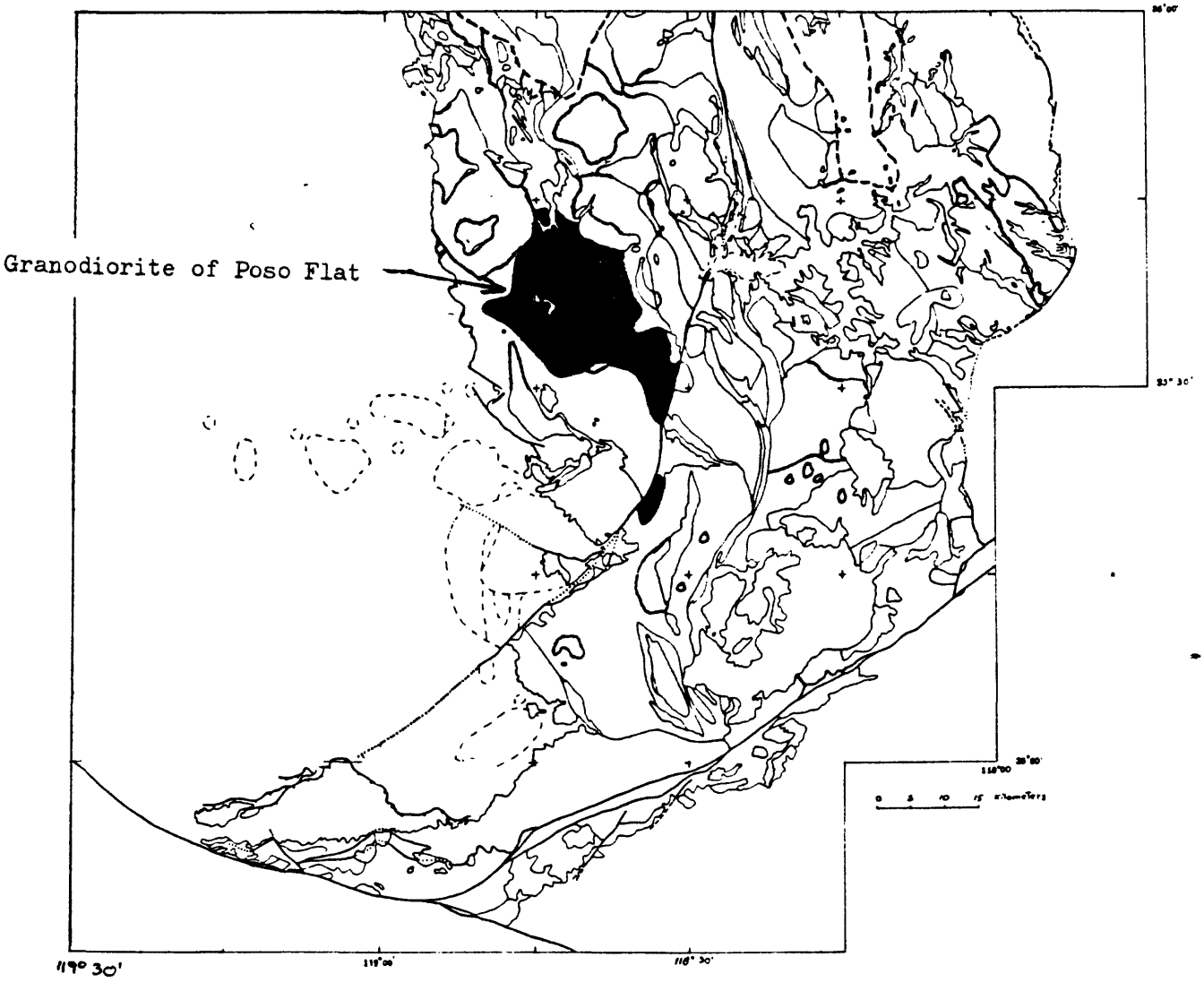


Modal plot of granodiorite of Poso Flat



Physically differs from the tonalite of Bear Valley Springs only by abundance of K-feldspar (which is not obvious in the field)

Location of modal samples of granodiorite of Poso Flat

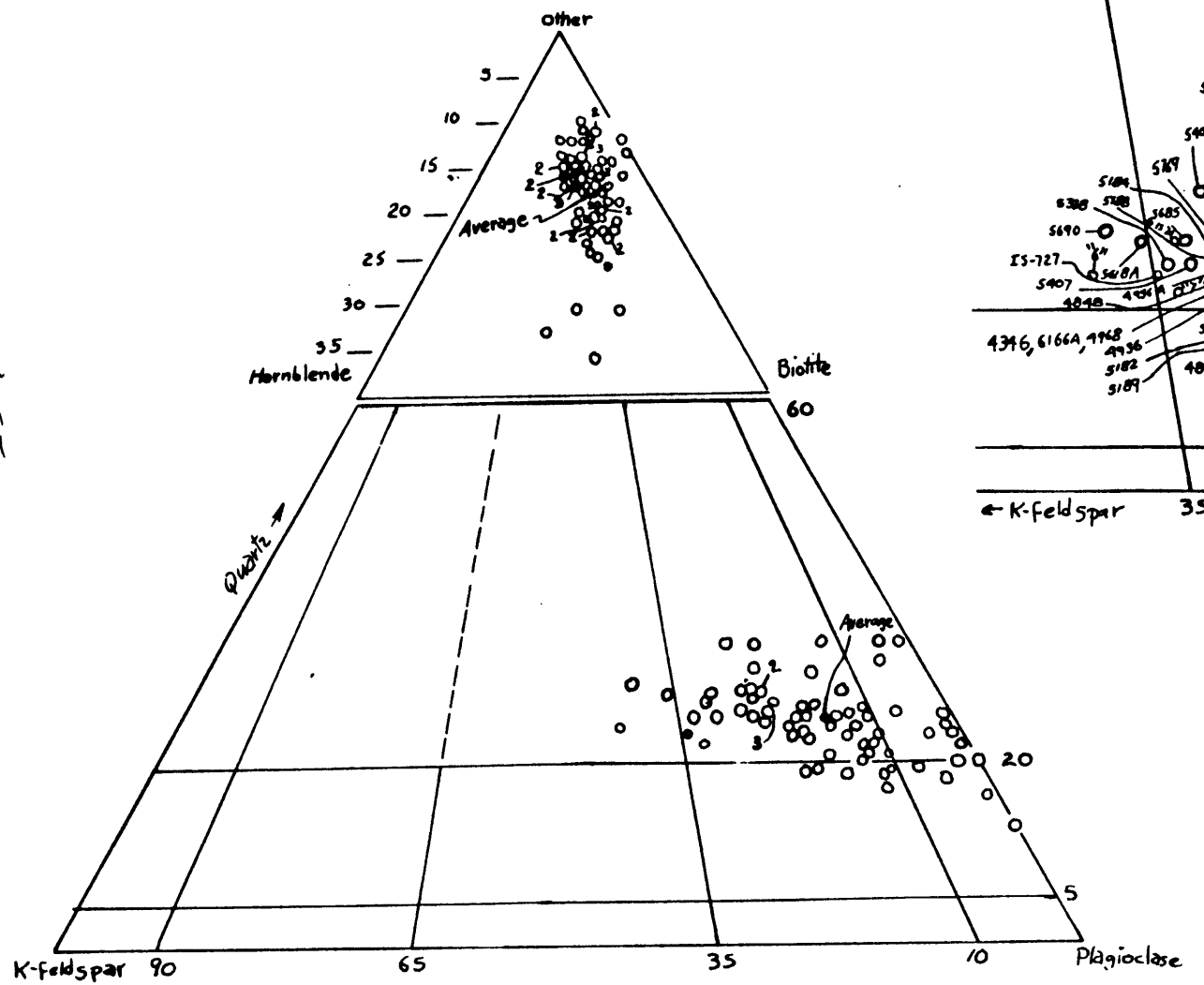

Granodiorite of Poso Flat
119° 30'
118° 30'
0 5 10 15 kilometers

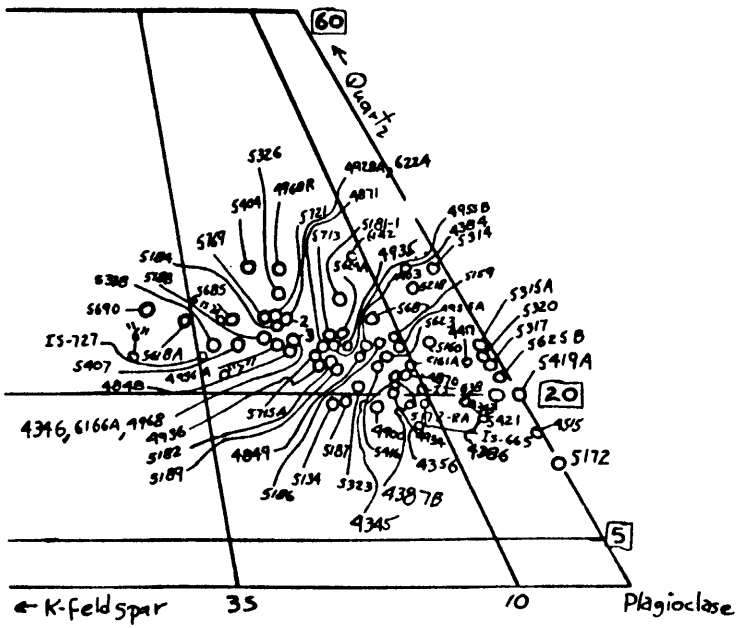
MODES OF GRANODIORITE OF RABBIT ISLAND

Sample number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Sphene	Opaques	Epidote	Specific gravity
4343A	61	5	15	13	6				2.71
4345	59	9	18	11	3				2.69
4346	49	15	22	12	2				2.68
4356	61	8	14	11	4	2			2.70
4384	55	3	28	13	–		1		2.70
4386	62	3	14	14	6	1			2.71
4387B	57	7	15	13	7	1			2.69
4415	64	1	12	16	7				2.77
4417	59	2	18	13	7	1			2.73
4848	47	15	21	10	5	2	–	–	2.73
4849	54	10	20	7	7	1	0.5	0.5	2.71
4870	57	7	18	9	8	1	–	<1	2.72
4871	47	12	20	14	6	0.5	0.5	<1	2.73
4900	56	11	17	8	6	1	–	1	2.71
4903	52	9	20	10	7	1	0.5	0.5	2.72
4928A	48	13	24	7	5	0.5	0.5	1	2.71
4934	55	9	16	12	8	0.5	0.5	–	2.75
4935	51	11	20	10	7	0.4	0.3	0.3	2.73
4936	50	13	20	9	7	0.5	0.5	–	2.79
4955A	56	8	21	9	5	0.5	0.5	–	2.69
4955B	52	12	21	8	6	0.5	0.5	–	2.70
4956A	50	17	22	7	3	0.4	0.3	0.3	2.70
4968	47	15	20	11	6	0.5	0.5	–	2.70
4968 R	45	13	28	9	5	<1	–	–	–
5134	53	14	16	11	5	0.5	0.5	–	2.73
5159	50	5	19	16	9	0.5	0.5	–	2.72
5160	55	4	21	15	4	0.5	0.5		2.72
5161A	54	6	18	12	9	0.5	0.5		2.72
5172	38	–	9	15	18	–	–		2.80
5172-RA	52	7.5	17	14.5	9	–	–		–
5181-1	50	9	25	8	7	1	–		–
5182	31	12	20	10	6	1	–		2.72
5184	46	14	23	9	7	0.5	0.5		2.70
5186	53	8	21	11	6	0.5	0.5		2.72
5187	53	13	16	12	5	0.5	0.5		2.74
5188	47	17	23	6	6	0.5	0.5		2.69
5189	52	13	19	9	6	1	–		2.71
5218	51	3	24	14	8	<1	–		2.76
5314	51	1	26	15	7	<1	–		
5315A	55	1	19	16	7	2	–		

Sample Number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Sphene	Opaques	Specific gravity	
5317	60	1	18	16	5	–	–		
5320	61	1	19	14	5	<1	–		
5323	58	12	19	9	2	–	–		
5326	47	14	27	12	–	–	–		
5338	41	21	21	10	6	0.5	0.5		
5404	41	15	27	14	2	1	–		
5407	44	18	22	9	6	1	<1		
5416	55	9	19	12	5	<1	–		
5419A	53	4	14	17	14	–	–		
5421	50	1	13	21	15	–	–		
5618A	41	23	25	9	2	–	–		
5623	50	8	18	15	9	–	–		
5624A	48	10	20	16	6	–	–		
5625B	53	1	15	21	10	<1			
5679	44	16	23	13	4	<1			
5685	44	19	25	8	4	–			
5687	53	8	24	11	4	<1			
5690	37	25	25	8	5	–			
5713	46	11	20	14	8	1			
5715A	49	13	20	11	6	1			
5721	44	15	23	10	7	0.5	0.5		
6142	50	8	29	9	3	1	<1		
6157A	44	20	24	8	3	<1	1		
6166A	47	13	21	10	7	<1			
6264	46	14	23	12	4	1	<1		
IS-638	52	6	15	17	8	2	<1		Fox (1981)
IS-665	55	7	15	12	8	2	1		
IS-727	50	22	19	10	7	2	<1		
"6"	35.5	26.5	19	19					Bergquist and McKenzie (1982)
"7"	41	19	17	23					
Average	51	10	20	12	6	0.5	0.5	2.72	⊛
Standard deviation	6.0	6.5	4.1	3.2	3.0	–	–	0.02	

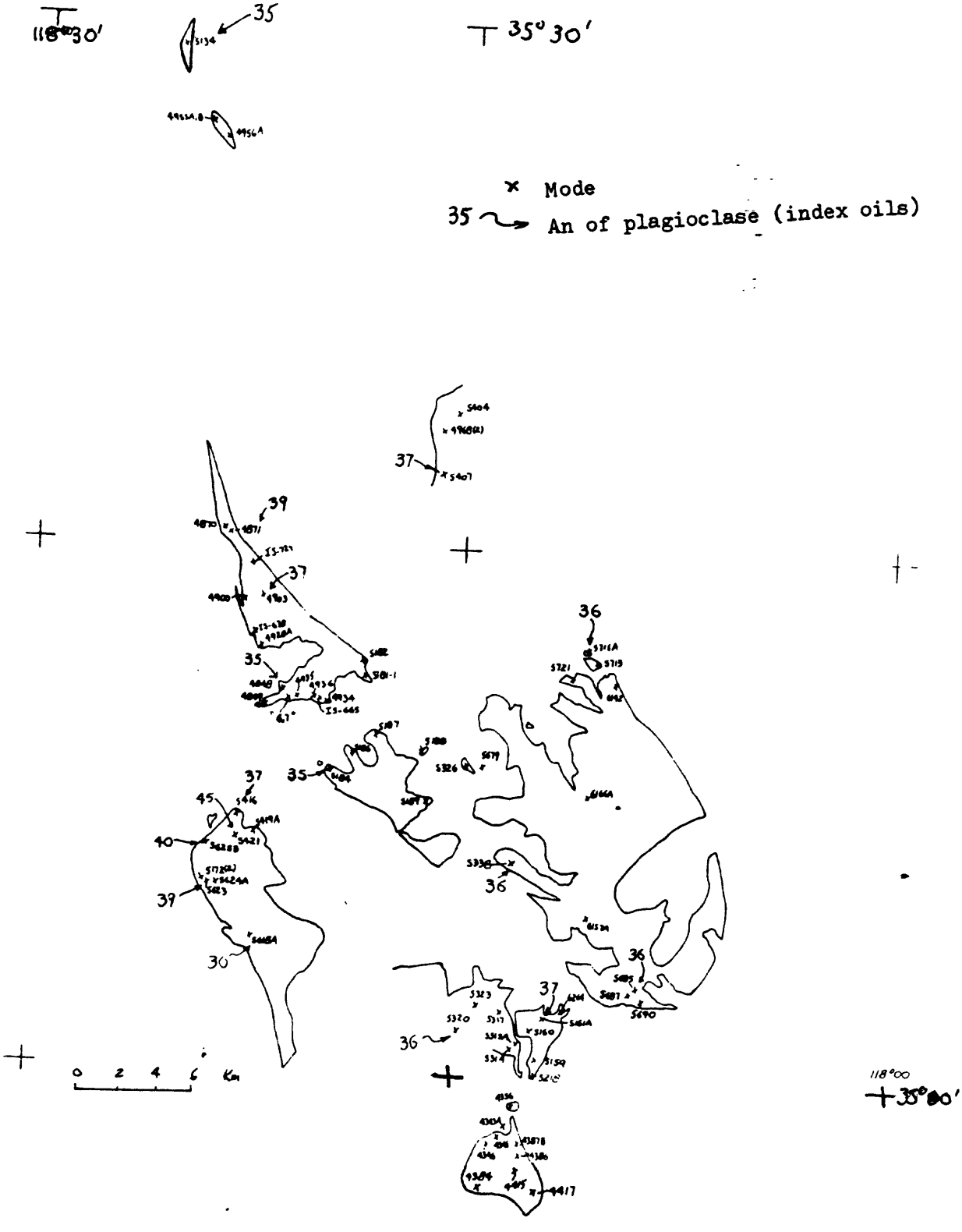
⊛ Only determined for 35 samples



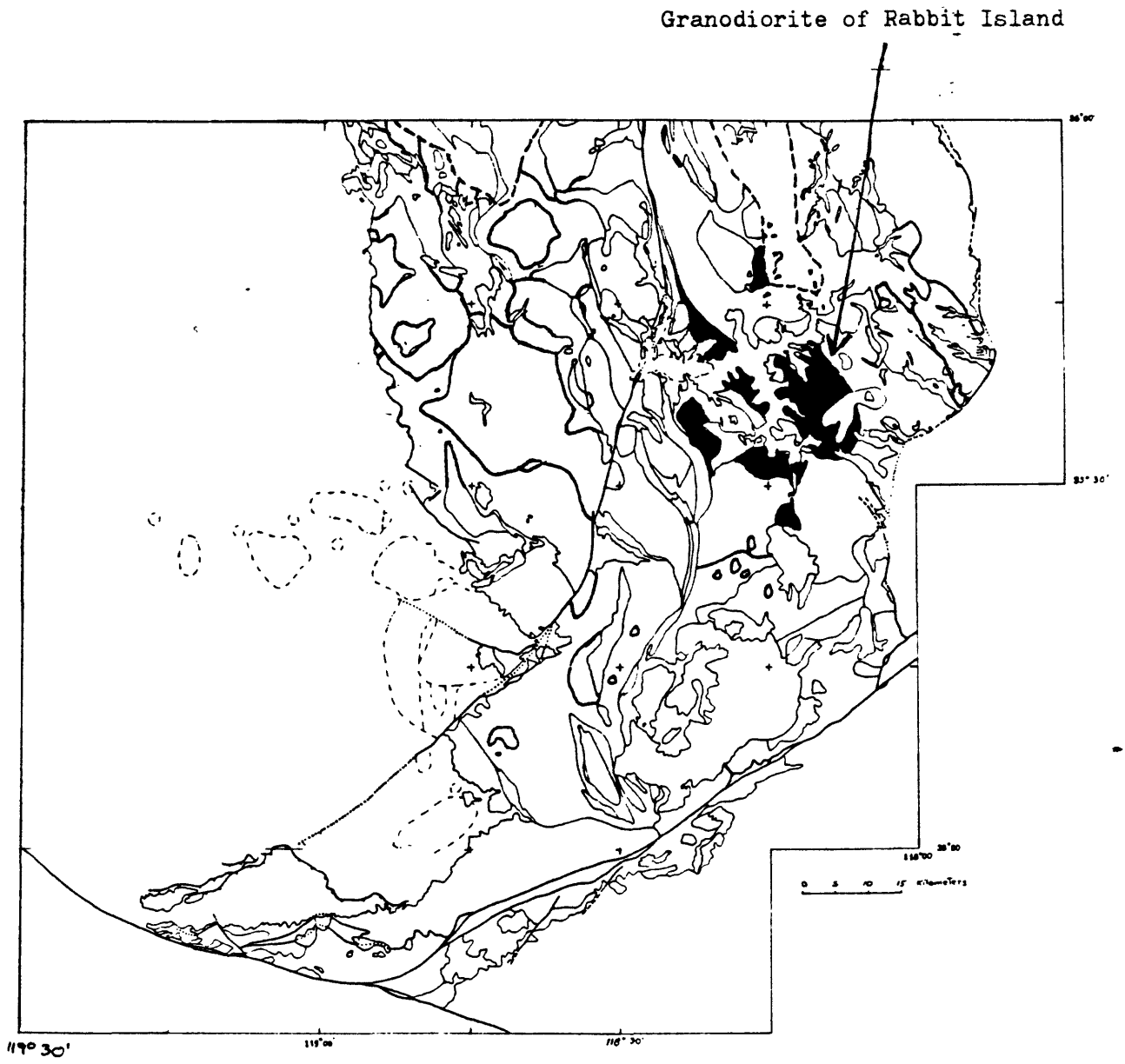


A155

Modal plots of Granodiorite of Rabbit Island

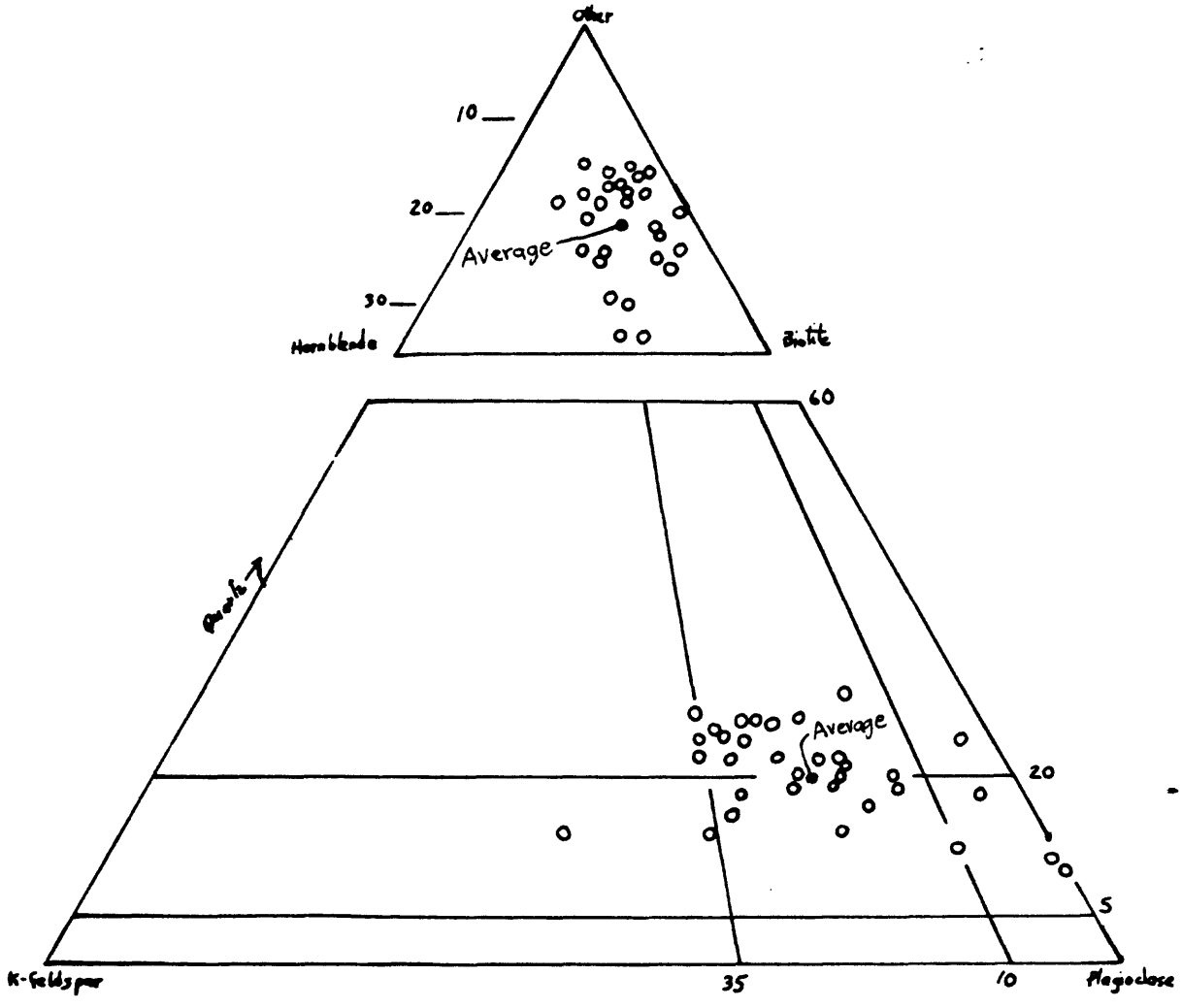


Location of modal samples of Granodiorite of Rabbit Island

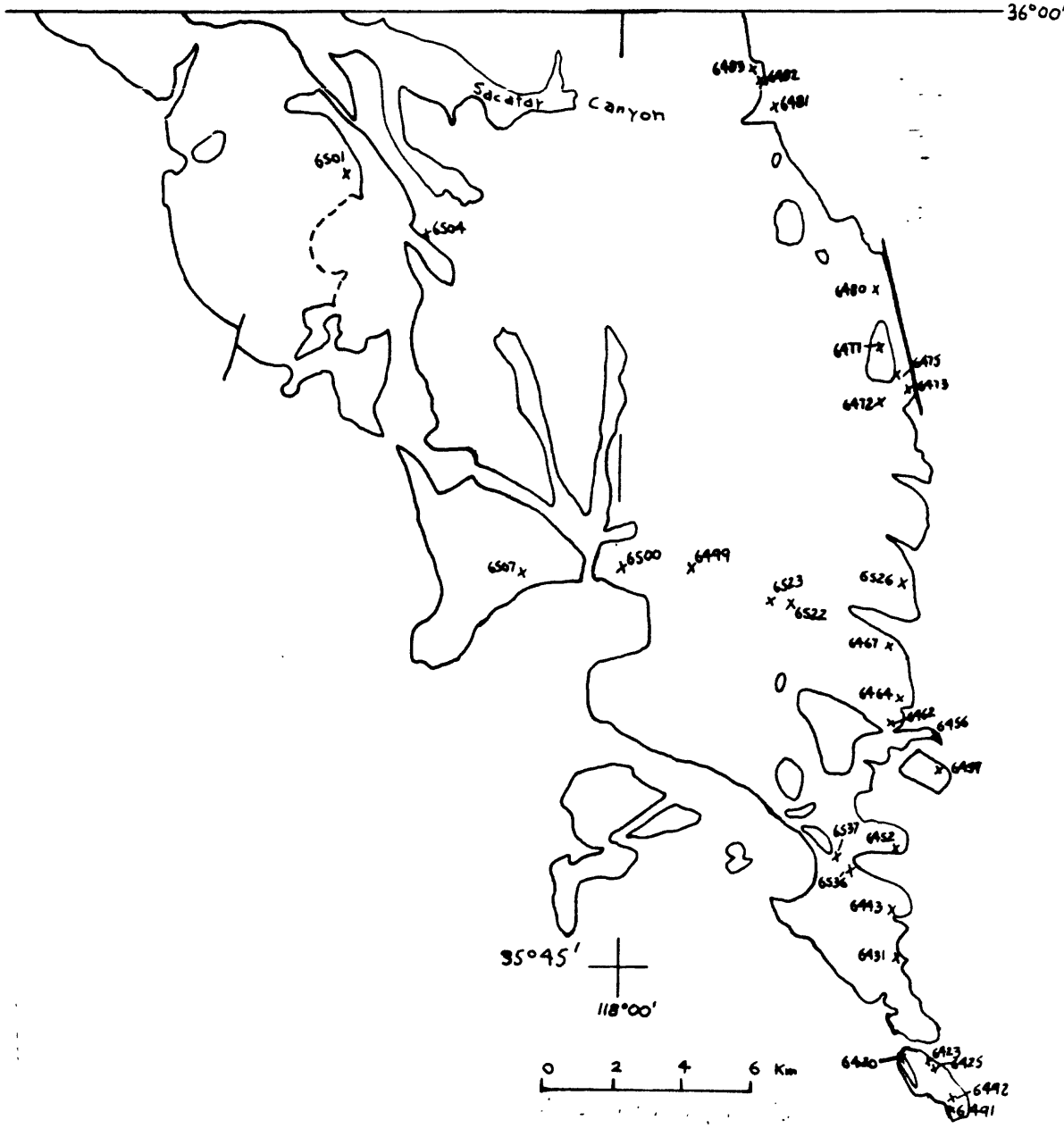

Granodiorite of Rabbit Island
119° 30'
118° 30'

MODES OF GRANODIORITE OF SACATAR

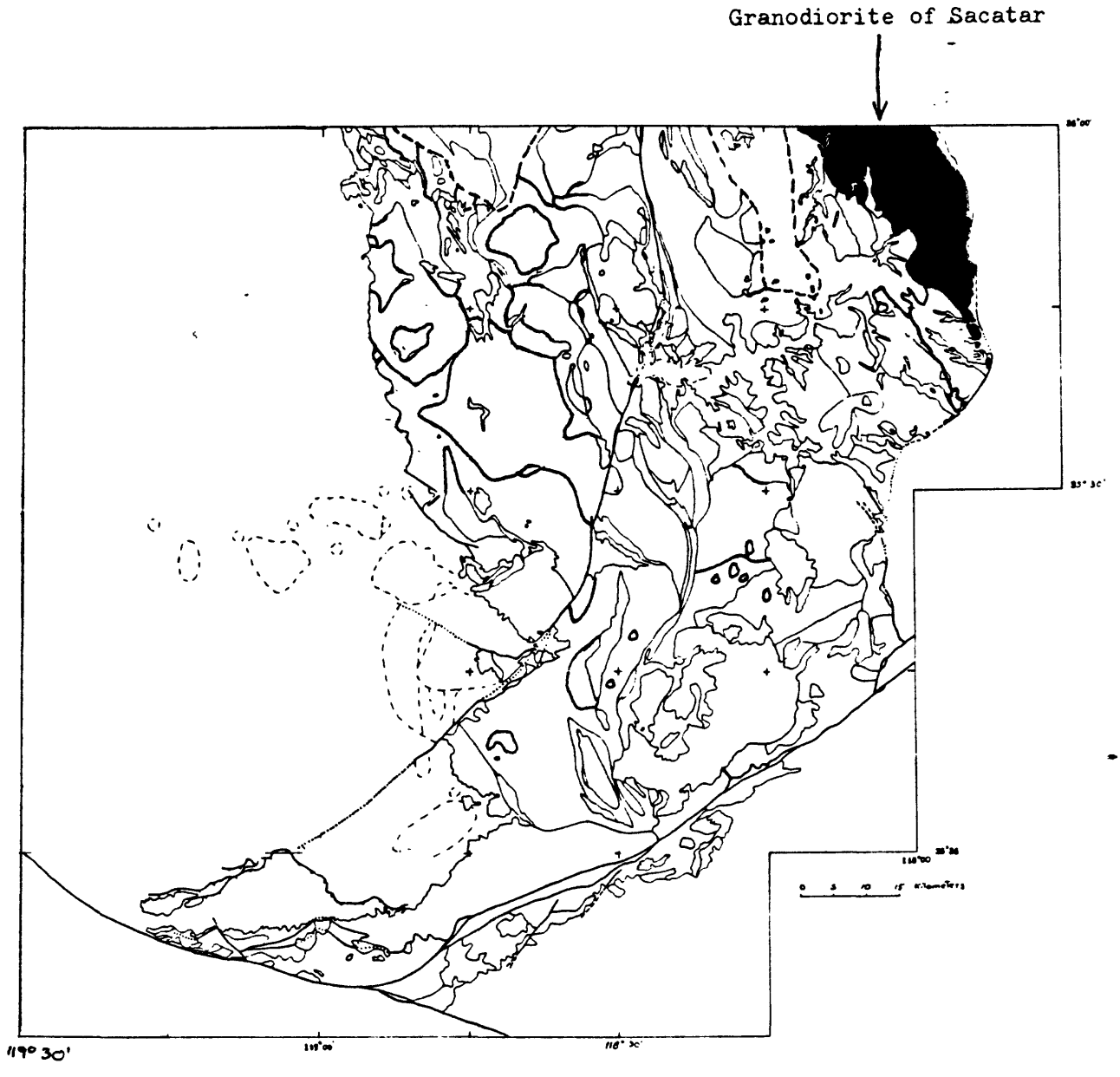
Sample Number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Sphene	Opaques	
6420A	60	-	7	20	13			
6423	42	23	18	11	6			
6425	41	20	20	11	8			
6431	45	18	22	7.5	7.5		<1	
6443	56	9	16	7	12			
6452A	39	21	22	9	9	<1	<1	
6456A	48	11	12	17	12			
6459	48	9	23	19	1			
6462A	47	17	18	15	3			
6464	58	3	13	21	5			
6467	47	13	10	19	11		<1	
6472A	47	12	15	21 ?	5 ?			
6472B	46.5	22	15	13 ?	3 ?		0.5	
6473A	50	12	16.5	10.5	10		1	
6475A	48.5	14	22	12	3	0.3	0.2	
6477	50	18	16	13.5	2		0.5	
6480	32	35	11	22				
6481	43	18	21	12	5		1	
6482A	45	23	13	13.5	5.5		<1	
6483A	58	7	9	14	10	1	1	
6491A	59	1	7	22	11	<1		
6491B	58	9	16	12	5			
6492	52	14	15	19			<1	
6499A	55	2	18	14	11	<1	<1	
6500A	44	21	21	14				(Mostly biotite)
6501A	49	12	17	17.5	4	0.5		
6504	45	25	11	13	5	<1	1	
6507	46	13	17	12	12		<1	
6522A	40	19	17	21	3		<1	
6523A	41	18	19	18	4			
6526	46	15	15	19	5	<1		
6536B	46	17	21	11	5		<1	
6537	41	23	20	11	5		<1	
Average	48	15	16	14.5	6.5	<1	<1	
Standard deviation	6.5	7.6	4.4	4.3	3.5			



Modal plot of Granodiorite of Sacatar



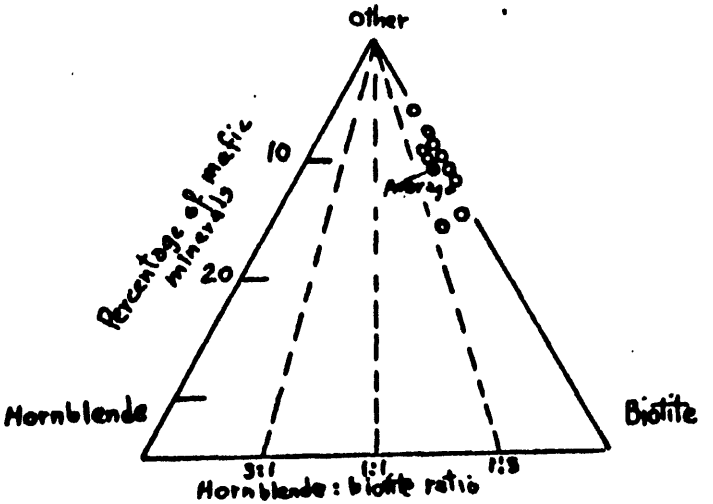
Location of modal samples of granodiorite of Sacatar


Granodiorite of Sacatar
119° 30'

MODES OF GRANODIORITE OF SORRELL PEAK

[All modes in volume percent. tr, trace; n.d., not determined]

Sample	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Specific gravity
4363B	35	26	31	8	---	2.63
4366	38	19	33	9	1	2.66
4368	34	30	30	6	---	2.64
4369	38	26	26	9	1	2.65
4372	40	22	28	10	---	2.61
4373	43	19	26	12	---	2.66
4376B	40	23	28	9	tr	2.66
4377	42	19	23	13	3	2.68
4381	39	22	24	14	1	2.66
4567	46.5	18	24.5	10	1	n.d.
4570	46	18	25	11	---	n.d.
Average--------	40	22	27	10	1	2.65
Standard deviation.	4.0	4.0	3.2	2.3	.9	.02



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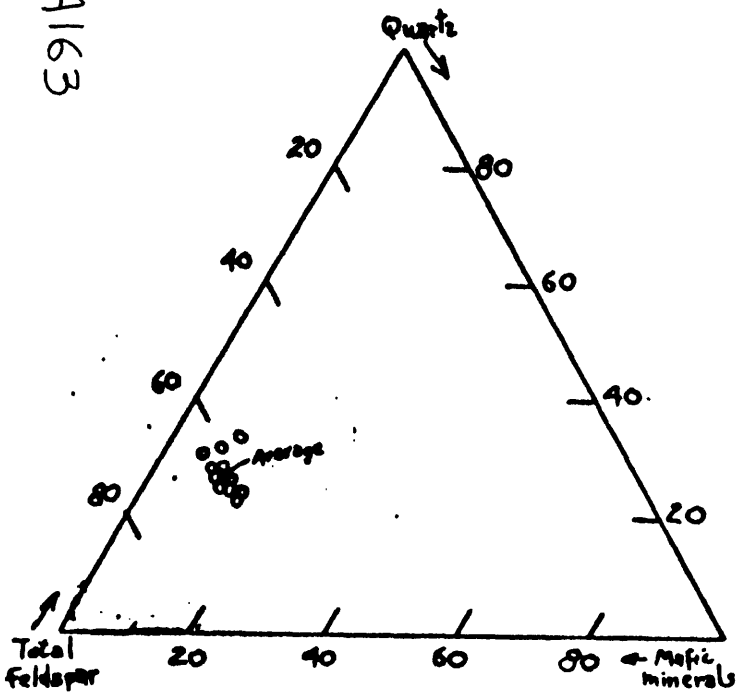
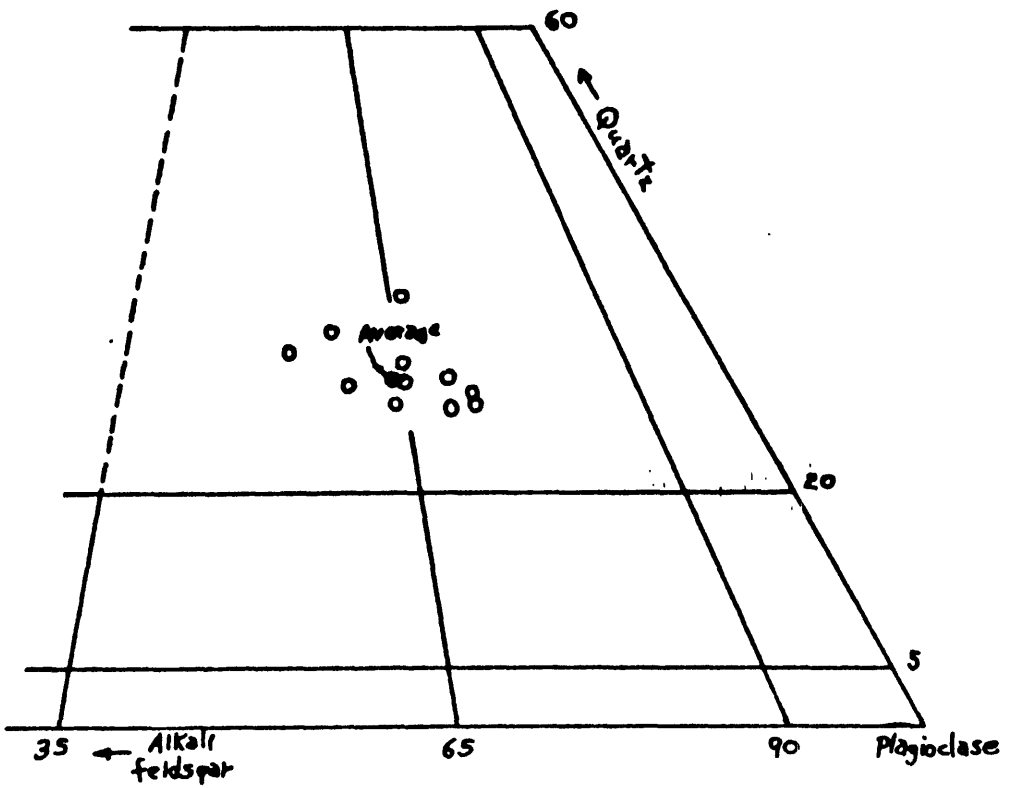
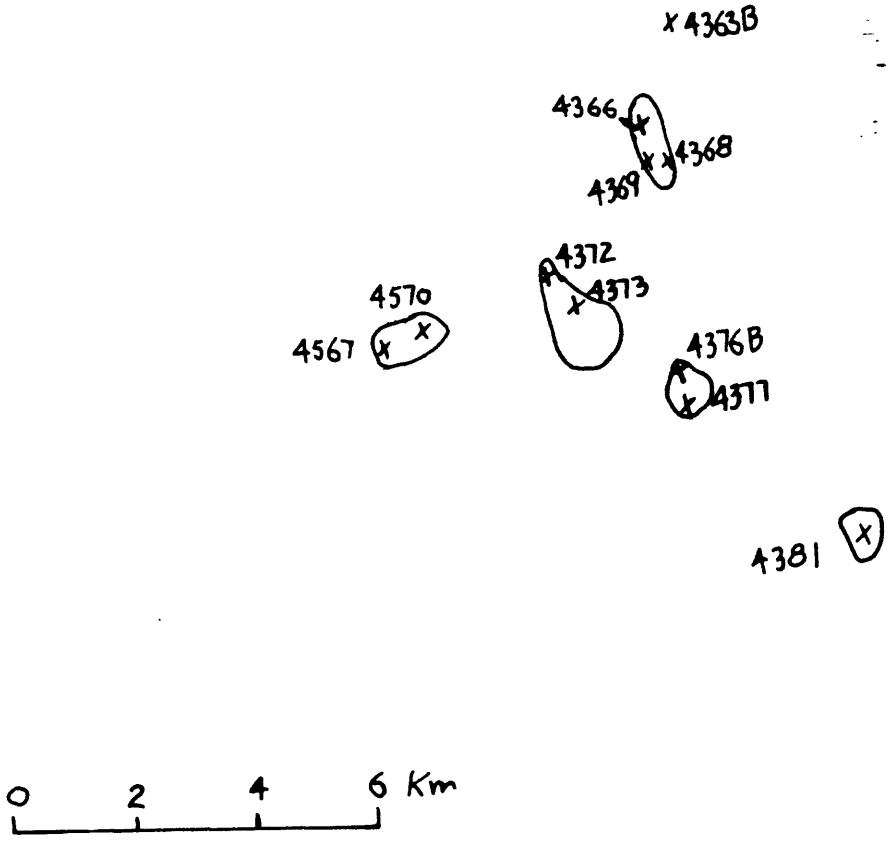
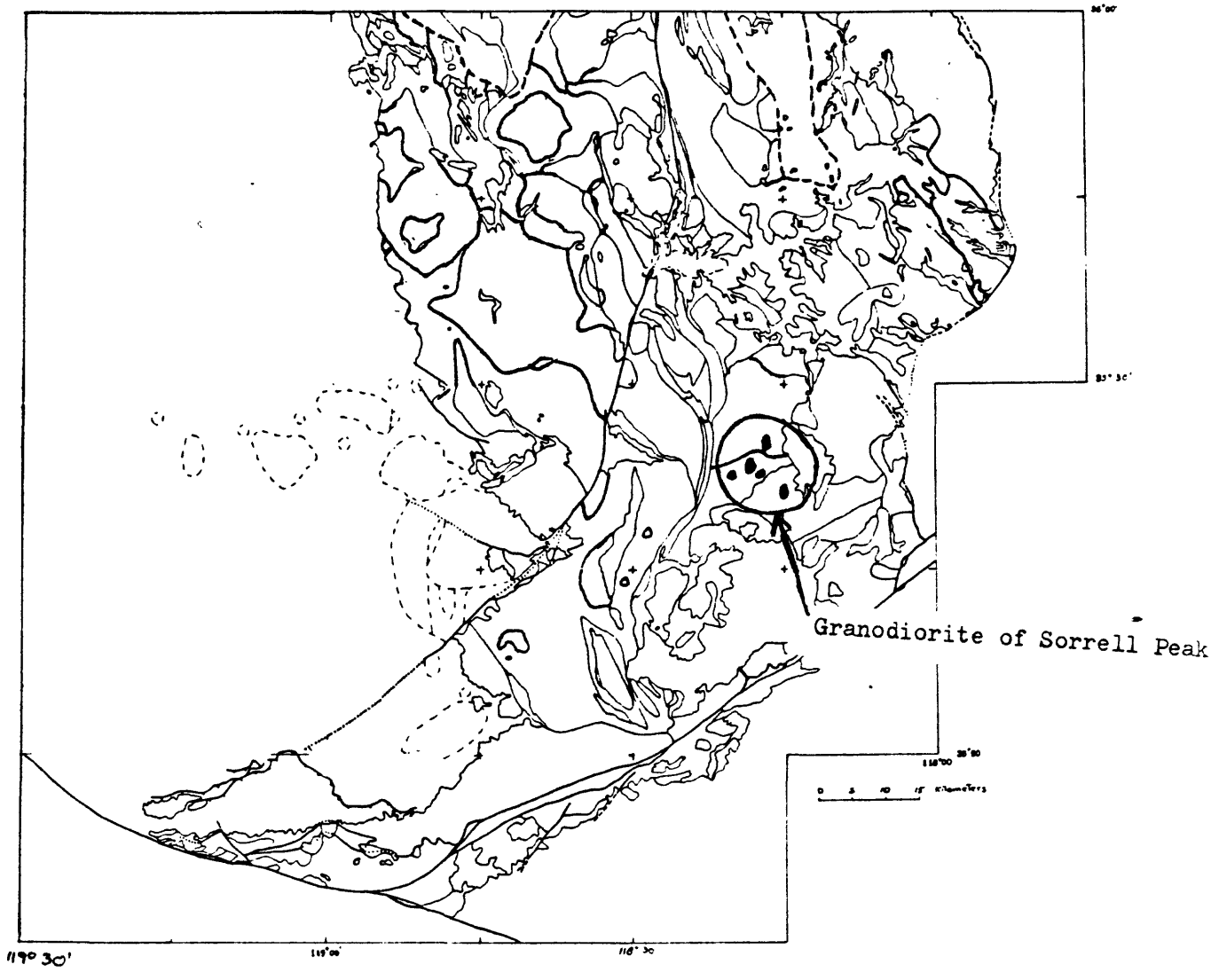




Modal plots of Granodiorite of Sorrell Peak



Location of modal samples of Granodiorite of Sorrell Peak

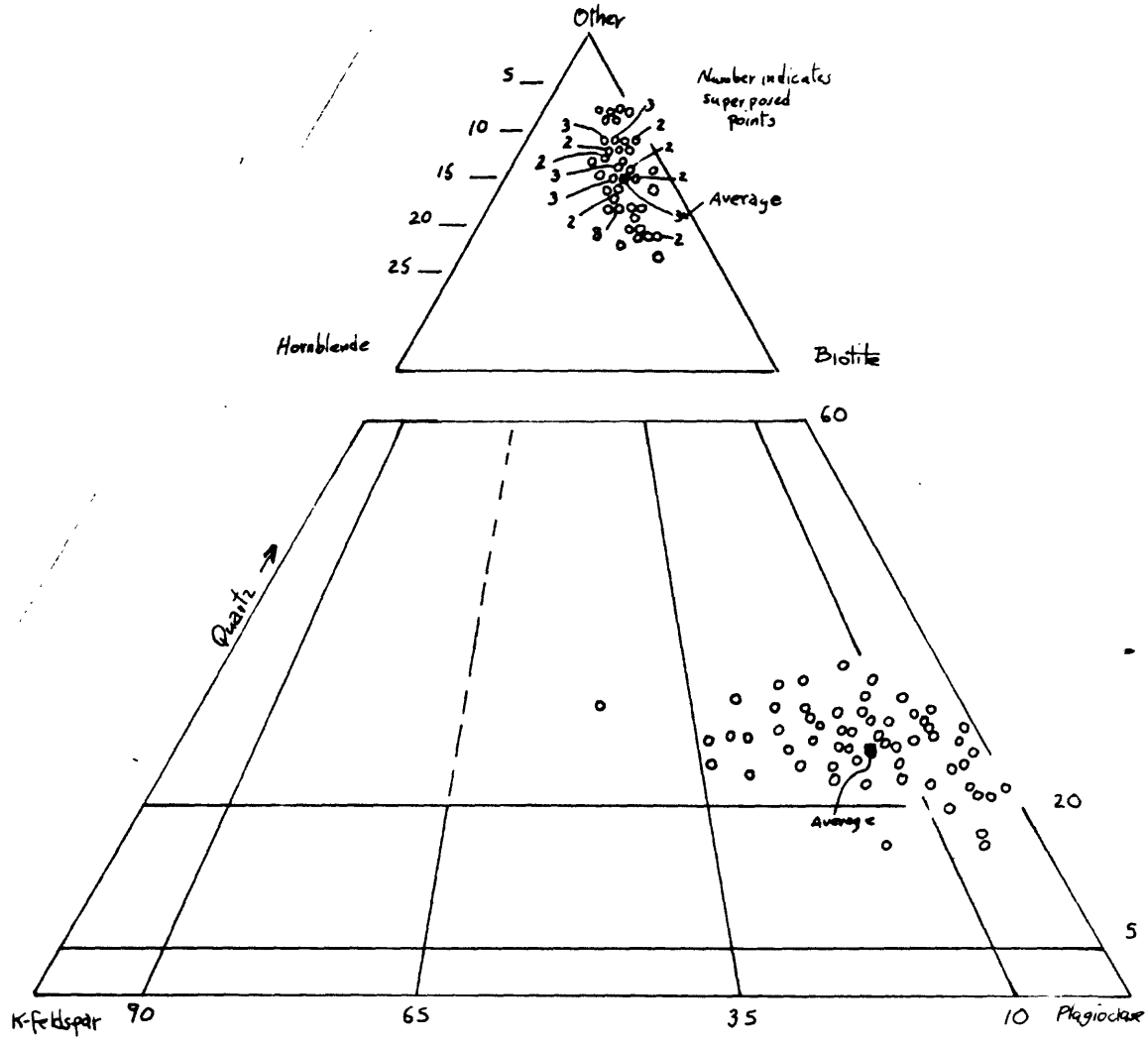

Granodiorite of Sorrell Peak
119° 30'
119° 00'
118° 30'

MODES OF GRANODIORITE OF WAGY FLAT

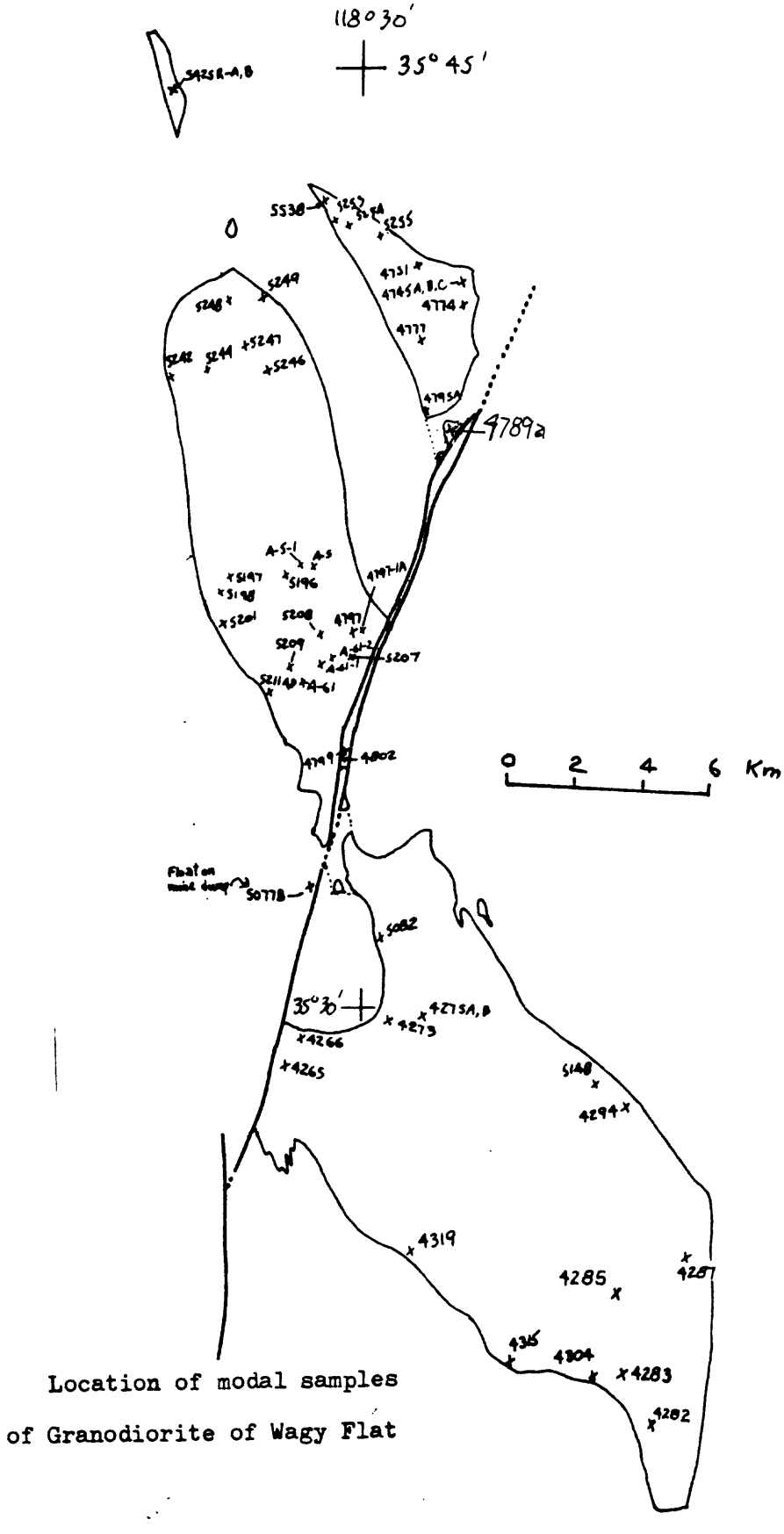
Sample number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Sphene	Opaques	Other	Specific gravity
4265	51	10	23	11	5	---			2.69
4266	62	12.5	14.5	10	1				2.68
4273	54	13	20	10	2	1			2.69
4275A	50	10	25	11	4				2.72
4275B	53	8	24	12	3				2.73
4282	60	2	20	12	6				2.71
4283	52	10	18	14	6				2.70
4285	58	2	22	14	2	2			2.73
4287	65	2	18	13	1	1			2.70
4294	59	2	16	14	8	1			2.75
4304A	60	2	20	14	4				2.72
4315	60	<1	17	18	5				2.73
4319	56	1	22	17	4				2.73
4745A	34	30	28	8	<1				2.65
4745B	48	12	29	8	3				2.69
4745C	48	8	29	12	3				2.69
4751	45	18	29	6	2				2.66
4774	48	12	25	11	4				2.68
4777	47	11	24	13	5				2.67
* 4789A	59	3	26	10	1	0.5	0.5	Epidote <1	2.70
4795A	45	23	22	7	2	0.5	0.5		2.68
4797	50	12	24	7	6	0.5		Epidote 0.5	2.72
4797-1A	45	19	19	10	6	0.5		Epidote 0.5	2.70
4799	51	10	24	10	3			Epidote 2	2.69
4802	47	15	26	8	3	0.5	0.5		2.70
4858	47	16	24	5	7	1			2.69
5077B	52	8	26	11	3				2.70
5082	45	14	27	10	4				2.69
5148	58	3	19	15	5	<1		Allanite <1	2.73
5196	52	9	24	10	5	<1			2.70
5197	55	11	22	8	4				2.71
5198	57	3	22	11	7				2.74
5201	55	3	23	14	5				2.72
5207	54	5	26	11	4	<1	<1		2.63
5208	53	7	27	8	4	1			2.71
5209	54	7	23	10	5	1		Allanite <1	2.71

Sample number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Sphene	Opaques	Other	Specific gravity
5211A	56	7	22	9	6	<1			2.73
5211D	49	6	27	12	6				2.73
5242	44	19	24	8	5				2.67
5244	48	15	22	10	5				2.70
5246	58.5	7	23.5	8	3		<1		2.64
5247	61	7	20	7	4	0.5	0.5		2.69
5248	65	5	18	7	4	0.5	0.5	Epidote <1	2.71
5249	61	7	23	5	3	1			2.70
5253	52	16	22	6	3	0.5	0.5		2.68
5254	67	3	18	7	4	0.5	0.5		2.71
5255	45	18	24	8	5				2.70
* 5425	64	4	14	12	6				-
* 5425R-A	66	4	13	11	6	<1			-
* 5425-B	63	5	19	10	3	<1			-
5538	52	4	23	15	6				-
A-5	52	13	21	10	4				2.69
A-5-1	44	23	25	7	1				2.67
A-61A	50	13	23	11	3				2.71
A-61B	53	10	23	10	4				2.71
A-61-1A	55	5	22	11	6	1			2.73
A-61-1B	51	6	22	16	5				2.73
A-61-2	53	3	23	17	4				2.71
Average	53.5	9	22.5	10.5	4	0.5	<1	<1	2.70
Standard deviation	6.7	6.3	3.6	3.0	1.7				.03

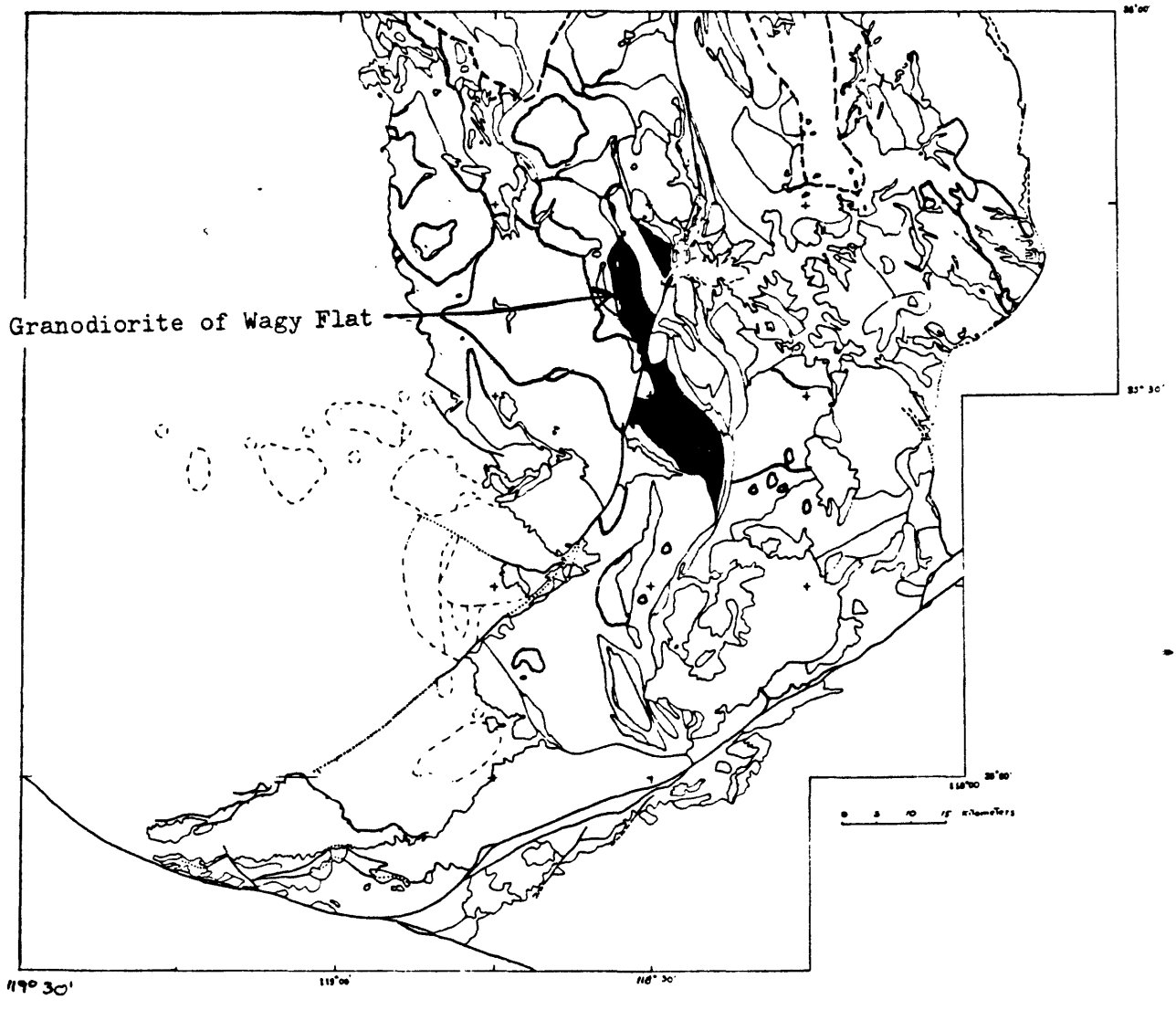
*Texture and mineral content similar to other Wagy Flat samples, but a somewhat lower $^{87}Sr/^{86}Sr$ ratio suggests to R.W. Kistler (written commun., 1986) a closer affinity to the presumably closely related Granodiorite of Alta Sierra.



Modal plot of Granodiorite of Wagy Flat

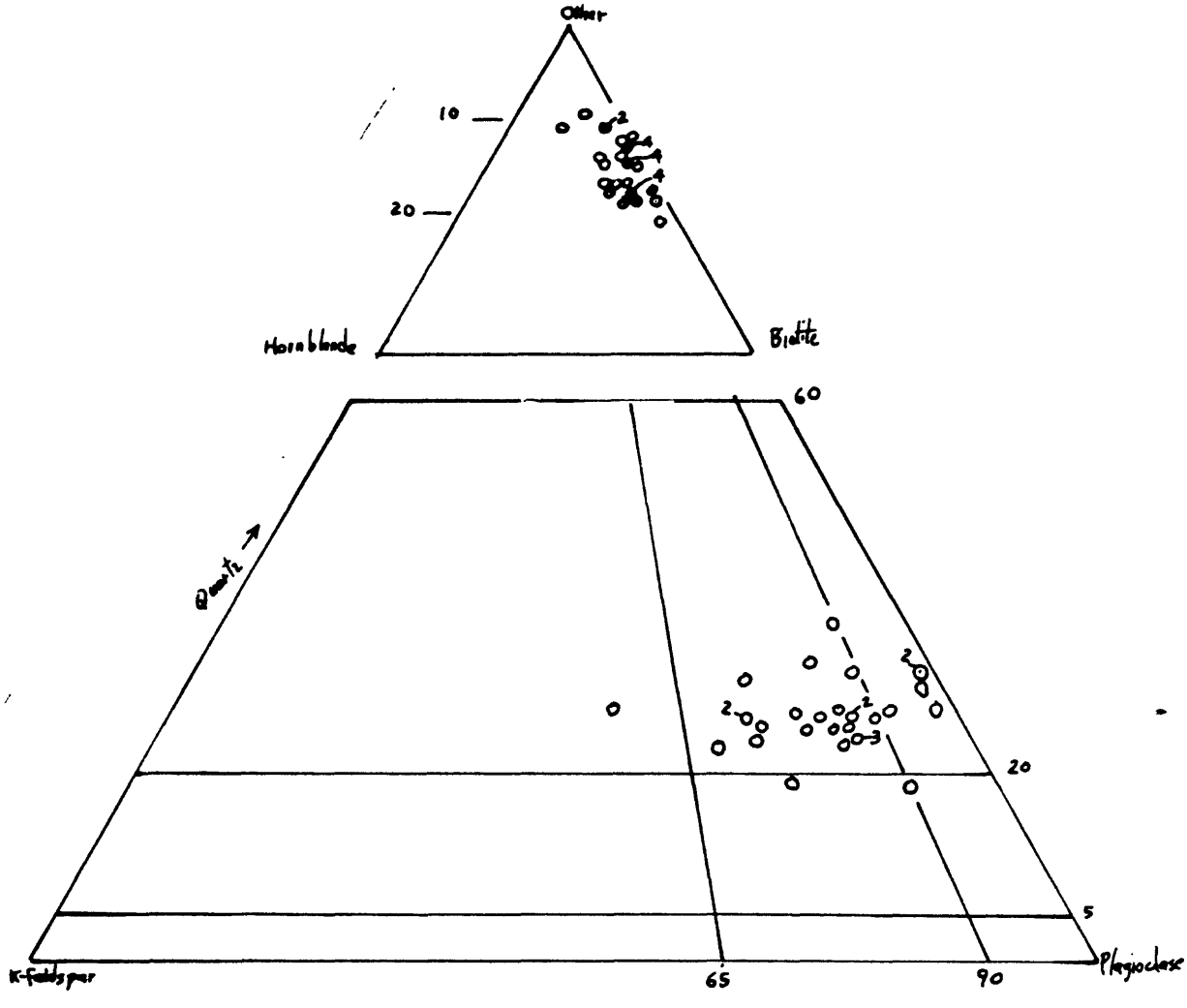


Location of modal samples
of Granodiorite of Wagy Flat

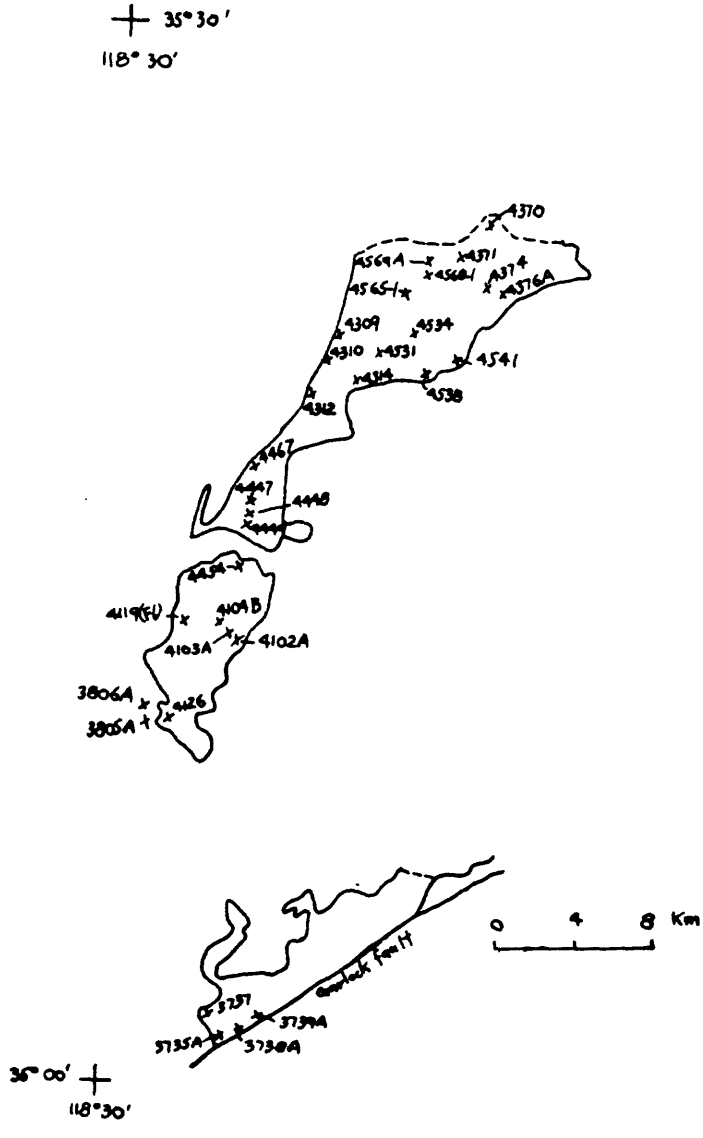

Granodiorite of Wagy Flat
119° 30'

MODES OF WHITEROCK FACIES OF THE GRANODIORITE OF CASTLE ROCK

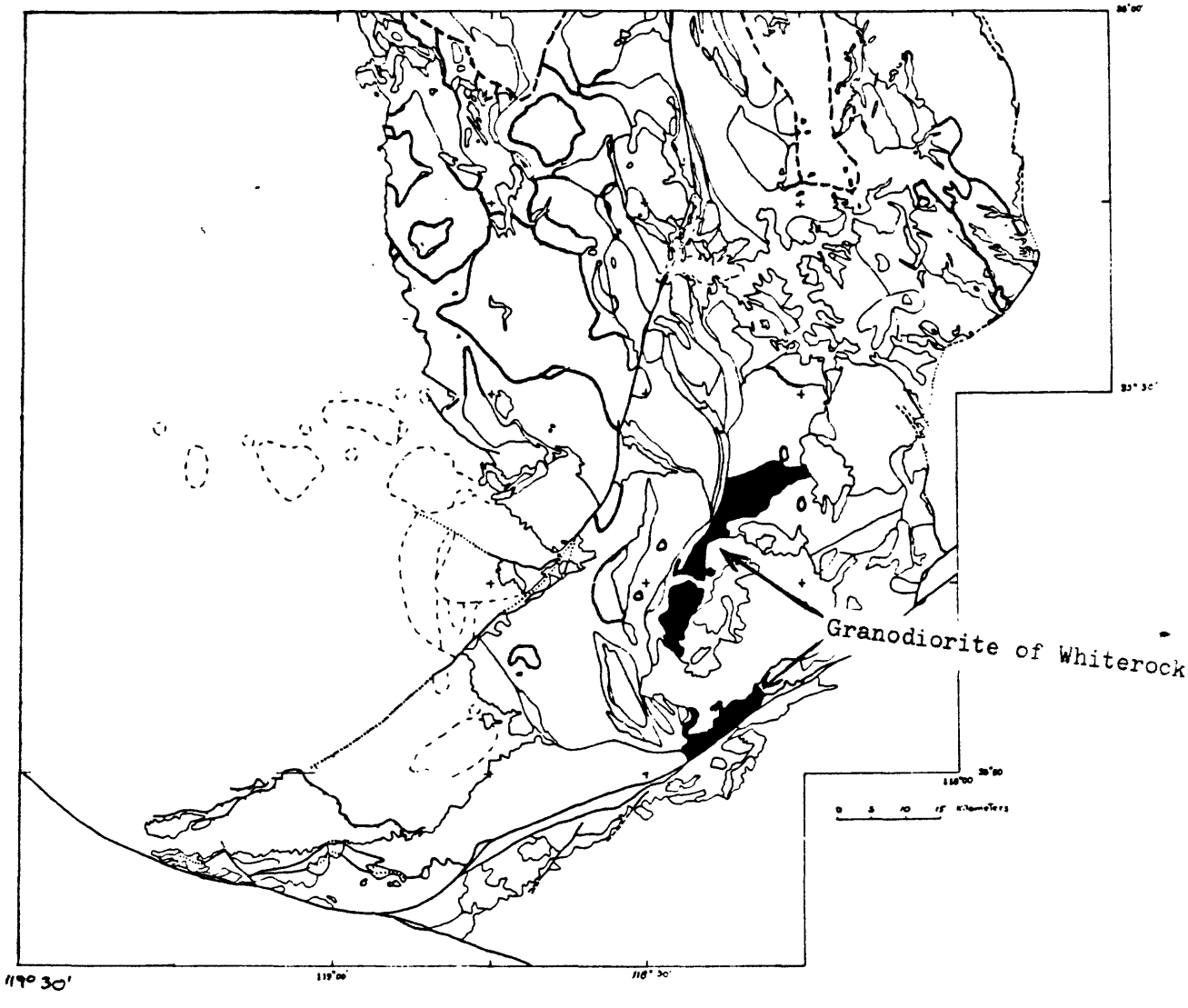
Sample number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Sphene	Opaque		Spec. f. g. gravity
3735A	57	7	22	12	1	1			2.64
3737	60	4	20	11	4	1	<1		2.64
3738A	53	9	20	15	3	<1			2.65
3739A	36	28	24	5	6	1			2.63
3805A	60	1	27	12	-				2.70
3806A	58	2	24	13	2	1	<1		2.74
4102A	56.5	9	23.5	9	2				2.67
4103A	49.5	9.5	28	12	1				2.68
4104B	47	16	27.5	6.5	3				2.67
4119(FL)	57	9	23	9	2				2.70
4126	55	1	25	15	3	1			2.70
4309	53	9	23	13	2	<1			2.69
4310	43	20	19	13	4	1			2.70
4312	53	9	21	14	3	<1			2.69
4314	51	16	16	12	5	<1			2.70
4370	53	11	23	12	1	<1			2.70
4371	57	2	22	15	4	<1			2.72
4374	56	9	21	12	2				2.69
4376A	50	6	31	12	1	<1			2.69
4441	45	16	21	15	3				2.70
4448	47	16	21	14	1	1			2.72
4449	45	16	19	18	1	1			2.71
4454	55	5	22	17	1				2.73
4467	51	13	21	13	2				2.69
4531A	44	16.5	21.5	15	3				2.70
4534	51	10	20	16	3				2.73
4538	40	12	22	13	5				2.73
4541	40	6	25	19	2				2.71
4565-1	57	10	20.5	11.5	1	<1			-
4568-1	55.5	10	19.5	13	2	<1			-
4569A	62	7	16	10	4	1			-
Average	52	10	22	13	3	<1			2.69
Standard deviation	5.8	6.0	3.3	3.0	1.4				0.03



Modal plot of Whiterock facies of the Granodiorite of Castle Rock



Location of modal samples of Whiterock facies of the Granodiorite of Castle Rock

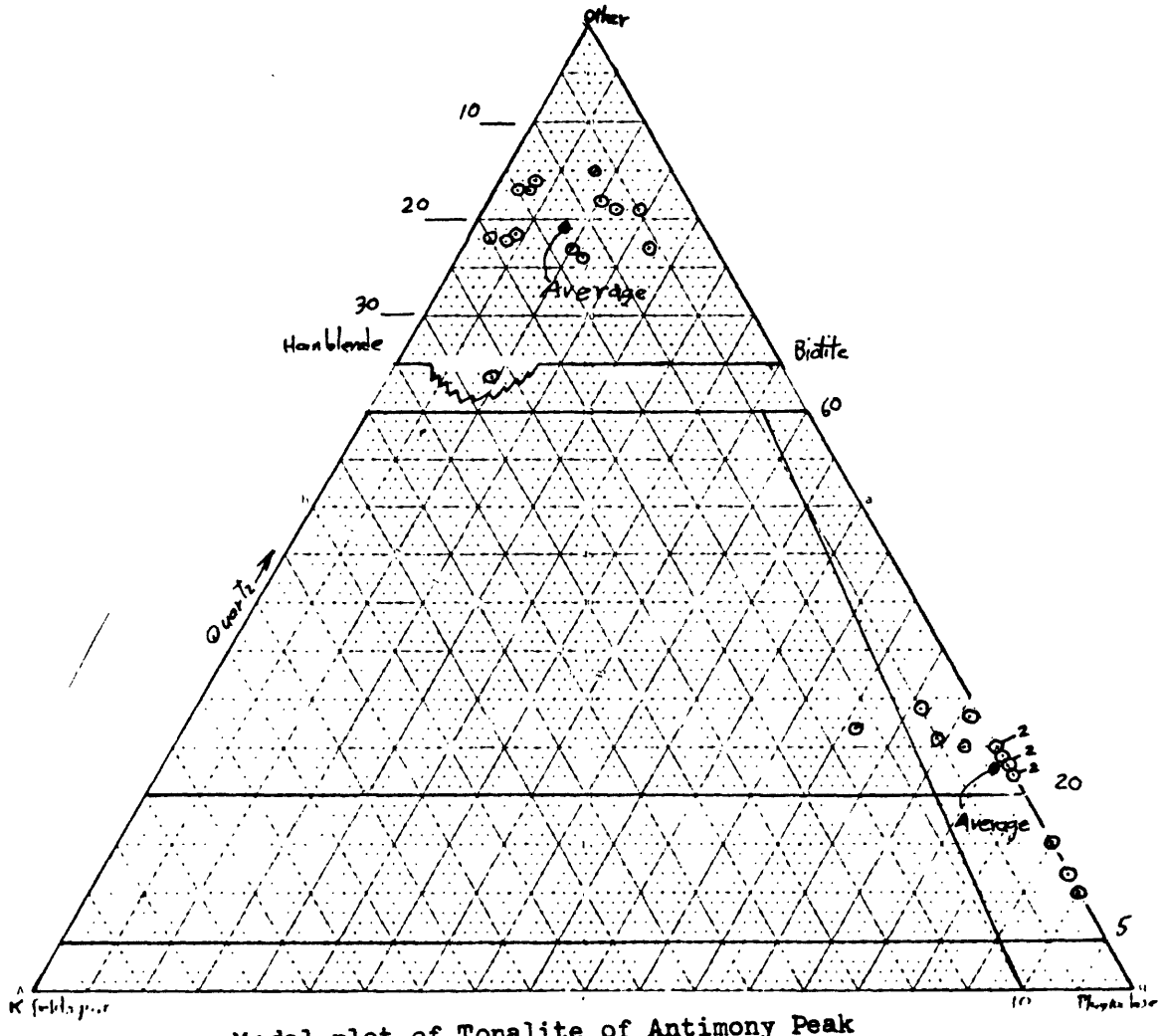

Granodiorite of Whiterock
119° 30'
119° 00'
118° 30'

MODES OF TONALITE OF ANTIMONY PEAK

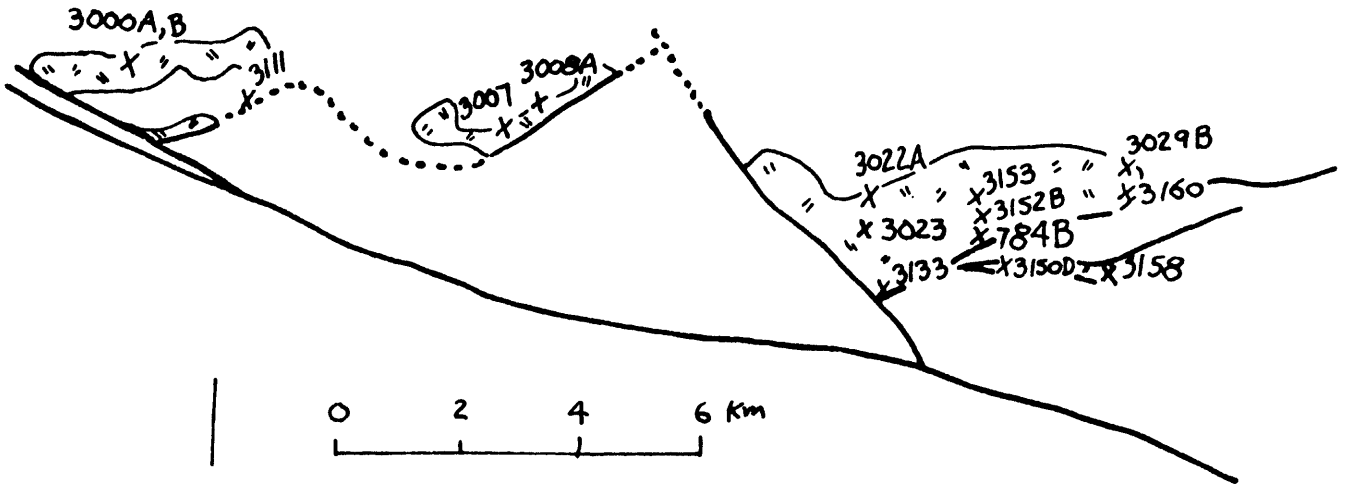
[All modes in volume percent. Others: E, epidote; S, sphene]

Sample	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Others	Specific gravity
7848	65	---	18	2	15	---	2.73
3000A	53	4	23	14	5	1(S)	2.70
3000B	58	1	23	10	8	---	2.68
3007	62	---	20.5	8	7	2.5(E)	2.71
3008A	56	---	7.5	9.5	27	---	2.80
3111	57	---	19	11.5	12.5	---	2.69
3022A	70	---	8	2	20	---	2.76
3023	66	---	12	3.5	18.5	---	2.73
3029B	64	---	19	[1]17	---	---	2.72
3133	55.5	2.5	19	17	6	---	2.74
3150D	47	9	21	10	13	---	2.73
3152B	61	---	17	4	18	---	2.75
3153	64	---	19	3	14	---	2.73
3158	56	4	21	12	7	---	2.69
3160	64	---	20	3	13	---	2.69
Average--------	60	1	18	8	13	---	2.72
Standard deviation.	6.0	2.6	4.9	4.9	6.3	---	.03

[1]Biotite+hornblende.



Modal plot of Tonalite of Antimony Peak



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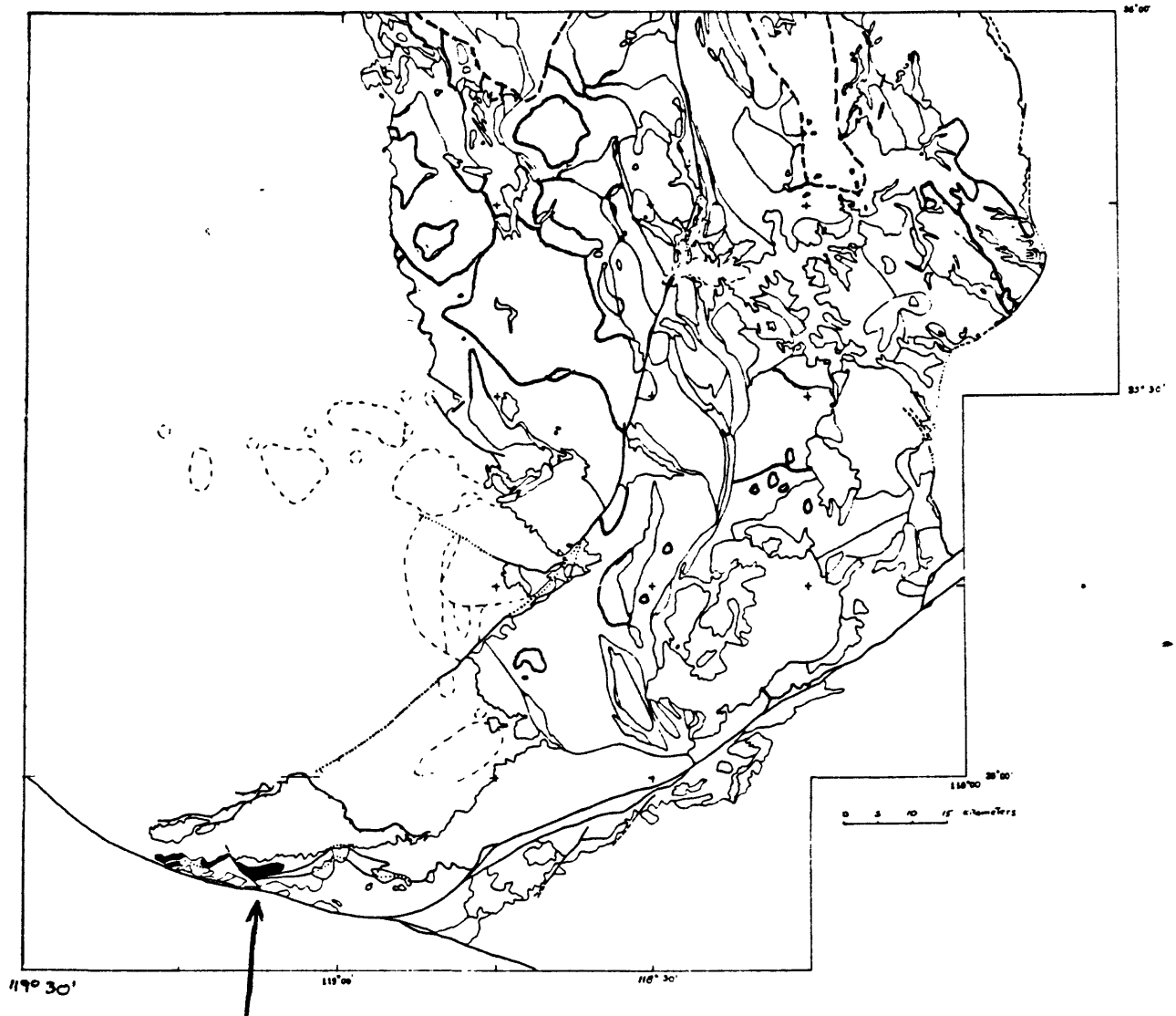
Location of modal samples of Tonalite of Antimony Peak

119°15'

34°45'
119°00'



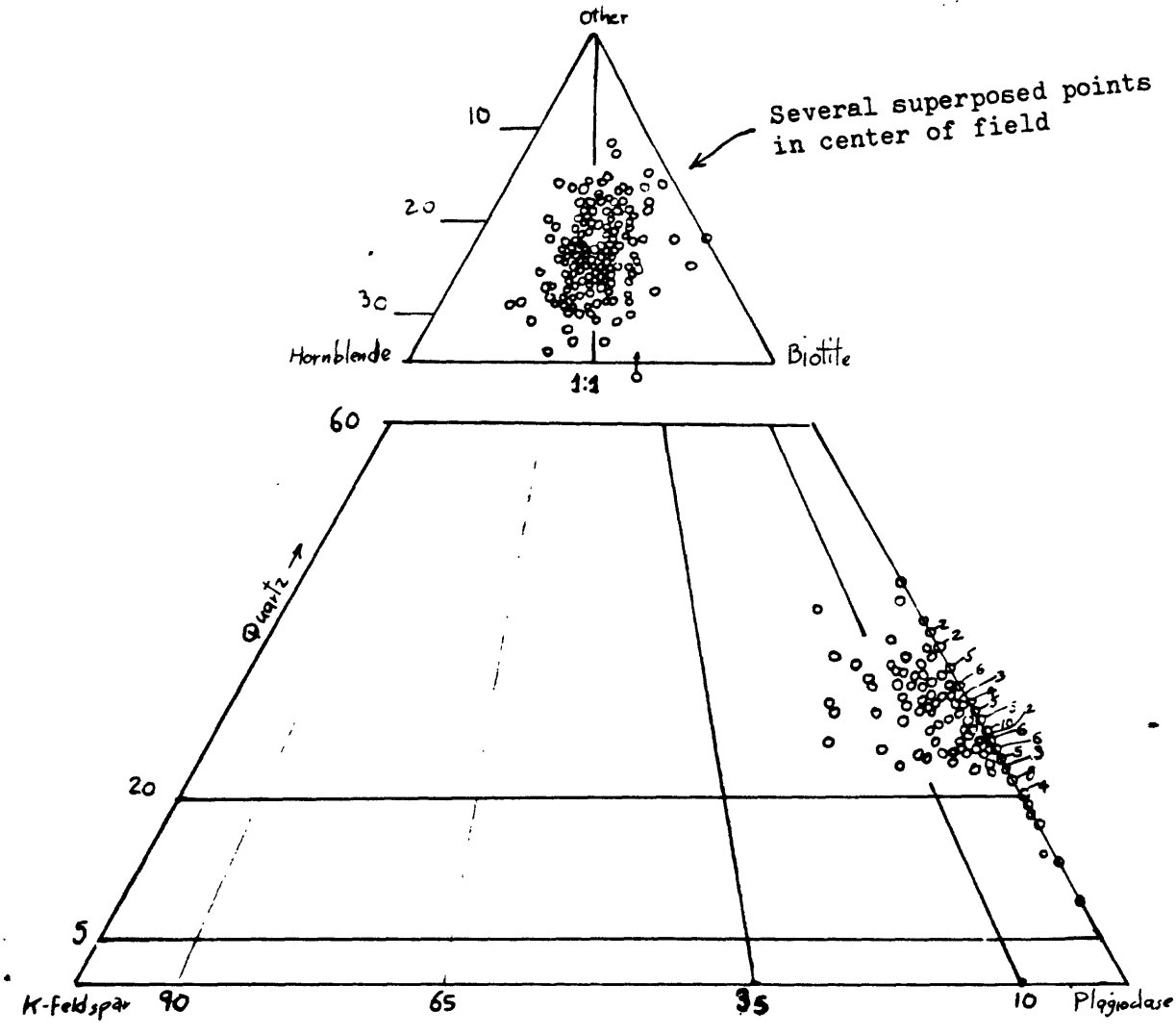
Tonalite of Antimony Peak

MODES OF TONALITE OF BEAR VALLEY SPRINGS

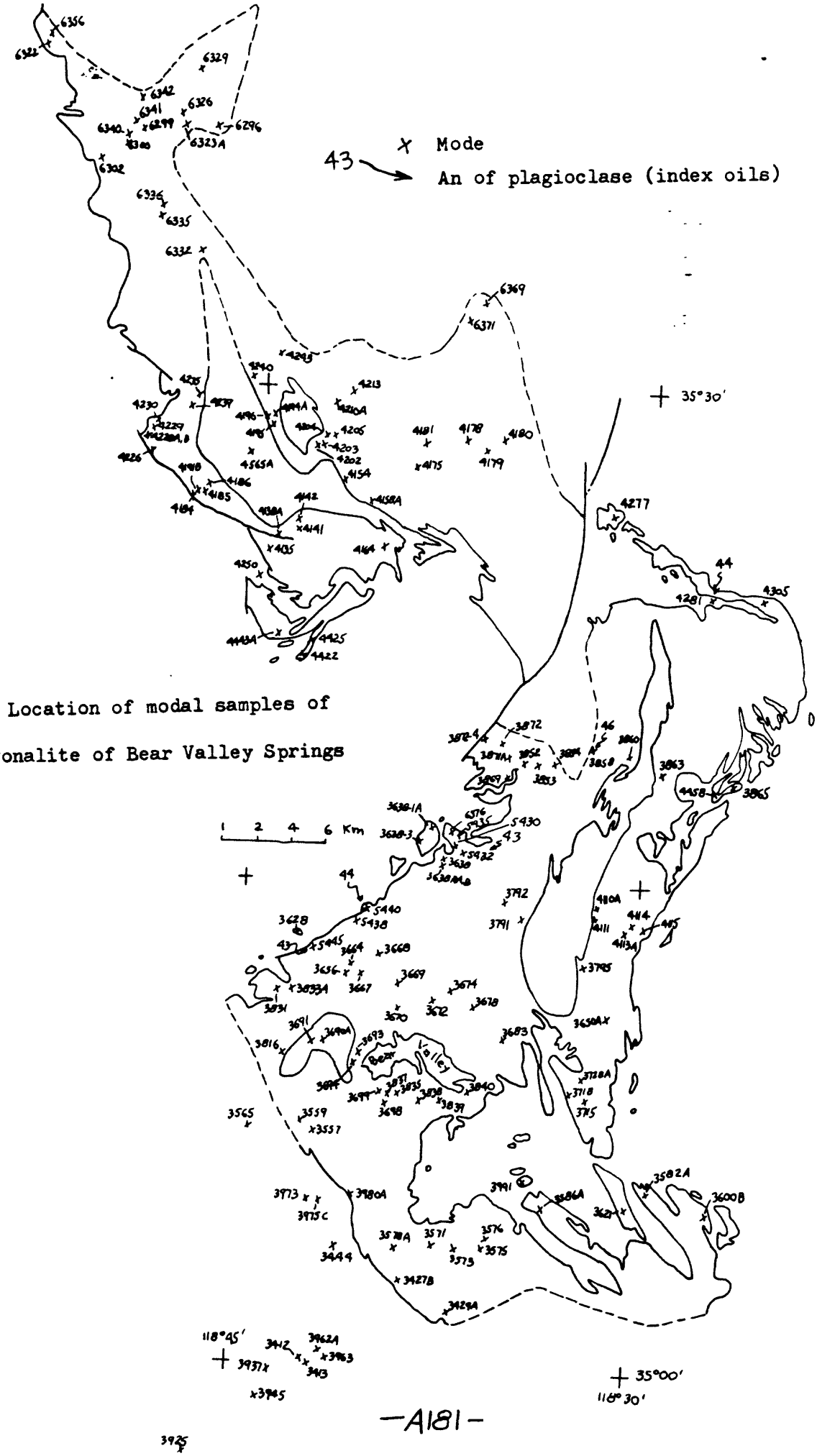
[All modes in volume percent; n.d., not determined. Others: A, allanite; C, clinopyroxene; G, garnet; O, opaque minerals; S, sphene]

Sample	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Others	Specific gravity
3412	54	1	21	12	9	3(C)	2.77
3413	52	---	31	11	6	---	2.74
3427B	55	<1	26	11	8	---	2.76
3429A	62	<1	20	9	9	---	2.72
3444	61	1	20	10	8	---	2.75
3557	51	2	23	16	8	---	2.66
3559	57	---	25	13	10	---	2.70
3565	45	8	28	13	6	---	2.67
3571	51	1	23	13	12	---	2.73
3573	53	<1	20	12	15	---	2.76
3575	49	1	21	18	11	<1(C)	2.77
3576	51	<1	20	12	17	---	2.78
3578A	48	1	24	12	15	---	2.72
3582A	60	---	14	17	9	---	2.72
3586A	48	---	27	11	14	---	2.68
3600B	48	7	22	16	1	6(C)	2.75
3621	46	<1	35	15	4	---	2.69
3628	54	---	17	12	17	---	2.72
3638	51.5	4.5	27	12	5	---	2.70
3638-RA	53	<1	23	13	11	---	n.d.
3638-RB	54	9	21	9	7	<1(S)	n.d.
3638-1A	58	---	16	11	15	---	2.79
3638-3	54	---	22	9	15	---	n.d.
3650A	59.5	<1	24	7	9.5	---	2.72
3656	49.5	2.5	24	10	14	---	2.76
3664	44	3	23	14	16	---	2.76
3667	46	3	23	14	14	---	2.76
3668	47	3	20	13	17	<1(S)	2.77
3669	47	3	25	16	9	<1(S)	2.73
3670	57	<1	16	12	15	<1(S)	2.78
3672	47	<1	24	18	11	<1(S)	2.78
3674	44	<1	23	18	15	<1(S)	2.79
3678	49.5	---	19	13.5	18	<1(A)	2.78
3683	53	1	23	12	11	---	2.77
3690A	61	1	10	13	15	<1(S)	2.73
3691	48	3	24	15	10	---	2.71
3693	51	5	18	14	12	---	2.71
3694	47.5	6	25.5	14	7	<1(S)	2.72
3698	44	3	27	13	13	---	2.77
3699	45	4	21	15	15	<1(O), <1(S)	2.77
3715	45	1	32	16	6	<1(O)	2.70
3718	43.5	2	17.5	23	14	---	2.75
3728A	44	8	35	9	4	<1(O)	2.66
3791	52	---	24	12	12	---	2.78
3792	55	---	20	15	10	---	2.81
3795	55	---	22	10	13	---	2.78
3816	54	---	20	12	14	---	2.74
3831	55	---	20	13	12	---	2.76
3833A	49	---	31	12	8	---	2.73
3835	49	5	21	12	13	<1(S)	2.76
3837	47	7	20	11	15	---	2.81
3838	50	1	23	15	11	---	2.77
3839	53	<1	21	14	12	---	2.76
3840	51	---	18	16	15	---	2.80
3852	46	2	22	15	15	---	2.76
3853	51	4	19	12	14	---	2.77
3854	51	5	18	11	15	---	2.76
3858	51	3	20	14	12	<1(S)	2.78
3860	50	1	20	16	13	---	2.78
3863	58	---	9	15	18	---	2.82
3865	55	1	20	13	11	<1(A)	2.74
3869	51	2	18	15	14	---	2.78
3871A	49	5	23	11	12	---	2.75
3872	53	4	18	12.5	12.5	---	2.74
3872-4	57	---	27	10	7	---	2.72
3925	56	---	26	12	6	---	2.63
3927	52	1	28	10	9	---	2.69
3937	51.5	---	20	16	12.5	---	2.68
3945	48	---	24	16	12	---	2.62

Sample	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Others	Specific gravity
3962A	45	---	27	20	8	---	2.68
3963	48	?	22	22	3	3(C)	2.73
3973	59	---	21.5	13.5	6	---	2.67
3975C	47	11	25	12	5	---	2.68
3980A	69	---	7	22	---	2(G)	2.72
3991	60	---	19.5	13	7.5	---	2.71
4110A	54	<1	31	13	2	---	2.74
4111	48	4	27	13	8	---	2.73
4113A	54	---	17	8	21	---	2.79
4114	59.5	---	15	11.5	14	---	2.77
4115	51	---	18	10	21	---	2.78
4135	58	---	19	12	11	---	2.74
4138A	66	---	13.5	9.5	11	---	2.76
4141	54	---	28	8	10	---	2.74
4142	55.5	---	23.5	13	8	---	2.72
4154	56	1	23	10	10	---	2.71
4158A	54.5	---	19.5	17	9	---	2.77
4164	57	---	16	10	17	---	2.76
4175	53	---	21	14	12	---	2.72
4178	52	1	29	10	8	---	2.74
4179	62.5	---	17	10	10.5	---	2.77
4180	58	---	18.5	9	14.5	---	2.77
4181	52	---	25	11	12	---	2.75
4184	52.5	---	19.5	13	15	---	2.79
4185	53	3	23.5	7	13.5	---	2.71
4186	55.5	<1	18.5	15	11	---	2.76
4191B	51	---	19	13	17	---	2.78
4194A	59	---	21	6	14	---	2.74
4195	55	---	17	14	14	---	2.76
4196	59	---	19	9	12	1(O)	2.75
4207	58	---	16.5	8	17.5	---	2.78
4203	52.5	---	19	10.5	18	---	2.81
4204	60	1	18	9.5	11.5	---	2.76
4205	55	---	16	7	22	---	2.77
4210A	58.5	---	25.5	8	8	---	2.72
4213	59	---	22	9	10	---	2.75
4226	60.5	---	16	9.5	14	---	2.79
4228A	51	13	23	8	4	1(O)	2.68
4228B	56.5	1	21	12.5	9	---	2.73
4229	57	---	19	10	14	---	2.78
4230	54	---	12	13	21	---	2.82
4235	62	---	17.5	10	10.5	---	2.73
4239	66	---	17	5	11	1(O)	2.72
4240	60	---	22	14.5	3.5	---	2.73
4243	57.5	1	22.5	9	10	---	2.72
4250	55	---	22	14	9	---	2.77
4277	52	3	24	14	7	---	2.72
4281	46	7	21	13	13	---	2.75
4305	54	1	23	19	3	---	2.75
4422	61	<1	17	12	9	1(S)	n.d.
4425	53	---	16	18	13	---	2.77
4443A	56	4	24	9	7	---	2.74
445R	50	<1	20	19	11	---	2.75
4565A	62	---	17	14	7	---	2.75
5430	52	---	27	13	8	---	n.d.
5432	49.5	3	20.5	12	15	---	n.d.
5435	46	5	26	11	14	---	n.d.
5438	46	6	26	10	12	<1(S)	n.d.
5440	54	< 1	23	13	10	---	n.d.
5445	43.5	7	26	12.5	11	---	n.d.
6296	60	2	23	13	5	---	n.d.
6299	57	< 1	20	13	10	---	n.d.
6300	58	< 1	17	17	8	---	n.d.
6302	56	< 1	20	13	11	---	n.d.
6322	56	1	19	13	11	---	n.d.
6322R	48	2	26	14	10	---	n.d.
6323A	61	---	19	9	11	---	n.d.
6326	53	4	19	14	10	---	n.d.
6329	55	1	19	15	10	---	n.d.
6332	57	1	20	15	7	---	n.d.
6335	52	1	23	16	8	---	n.d.
6336	54	3	17	14.5	11.5	---	n.d.
6340	51	5	26	11	7	---	n.d.
6341	55	2	19	14	10	---	n.d.
6342	55	---	18	15	12	---	n.d.
6356	52	2	27	12	7	---	n.d.
6369	53	1	24	7	15	---	n.d.
6371	53	2	20	12	13	---	n.d.
6376	45	10	22	11	12	---	n.d.
Average--------	53	2	21.5	12.5	11	---	2.74
Standard deviation.	5.5	3.2	4.5	3.4	4.3	---	.04

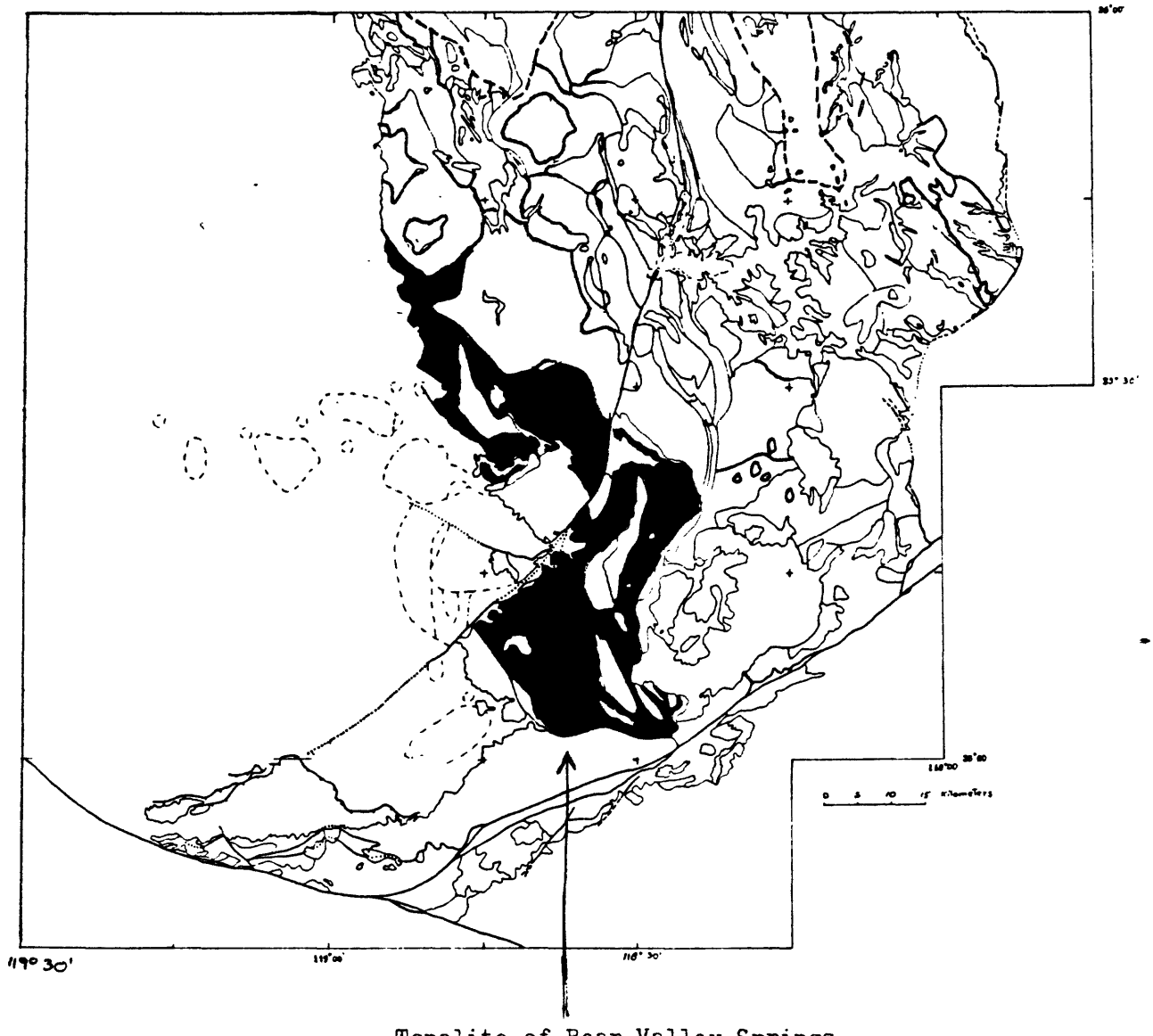


Modal plot of tonalite of Bear Valley Springs



Location of modal samples of

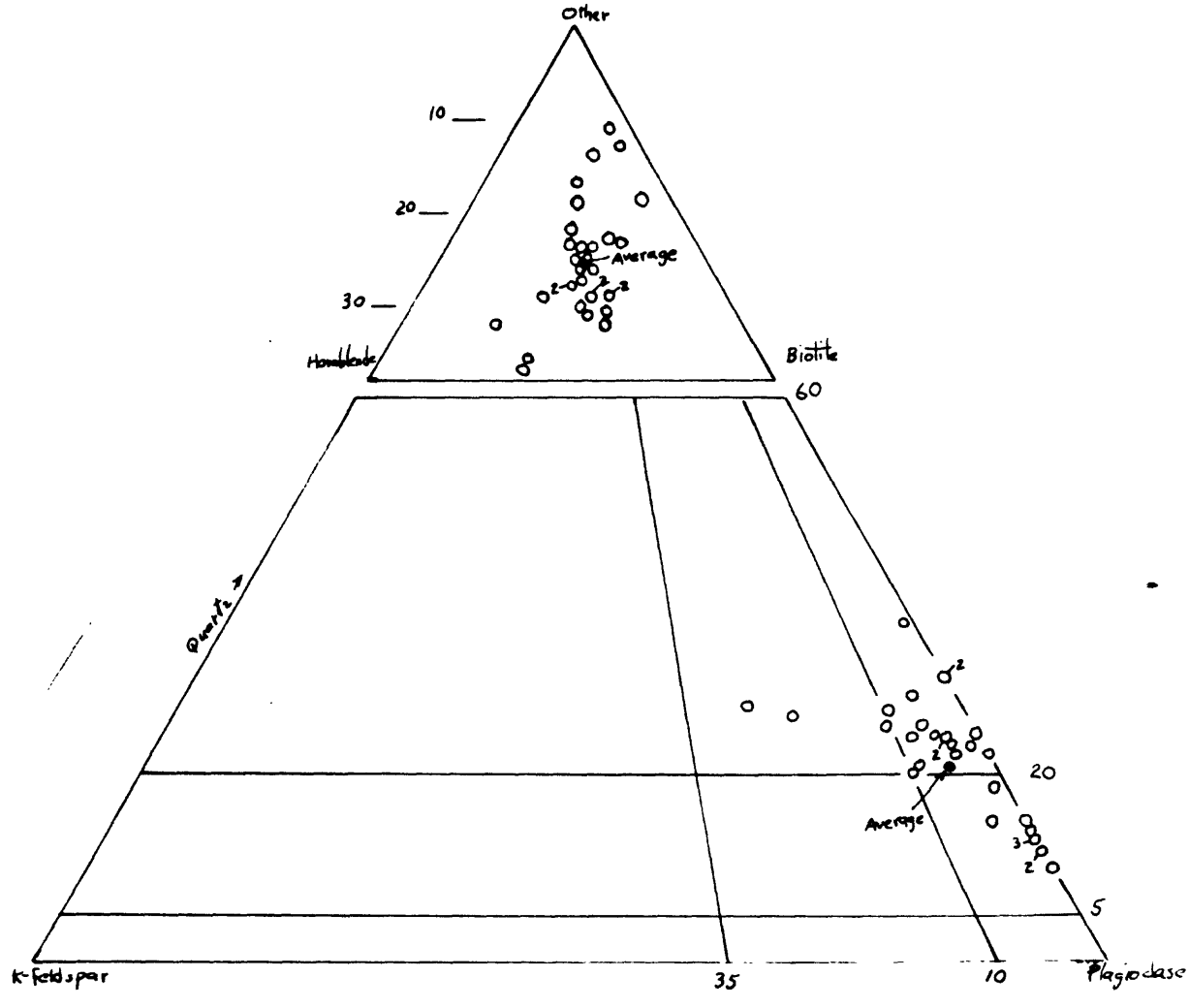
Tonalite of Bear Valley Springs



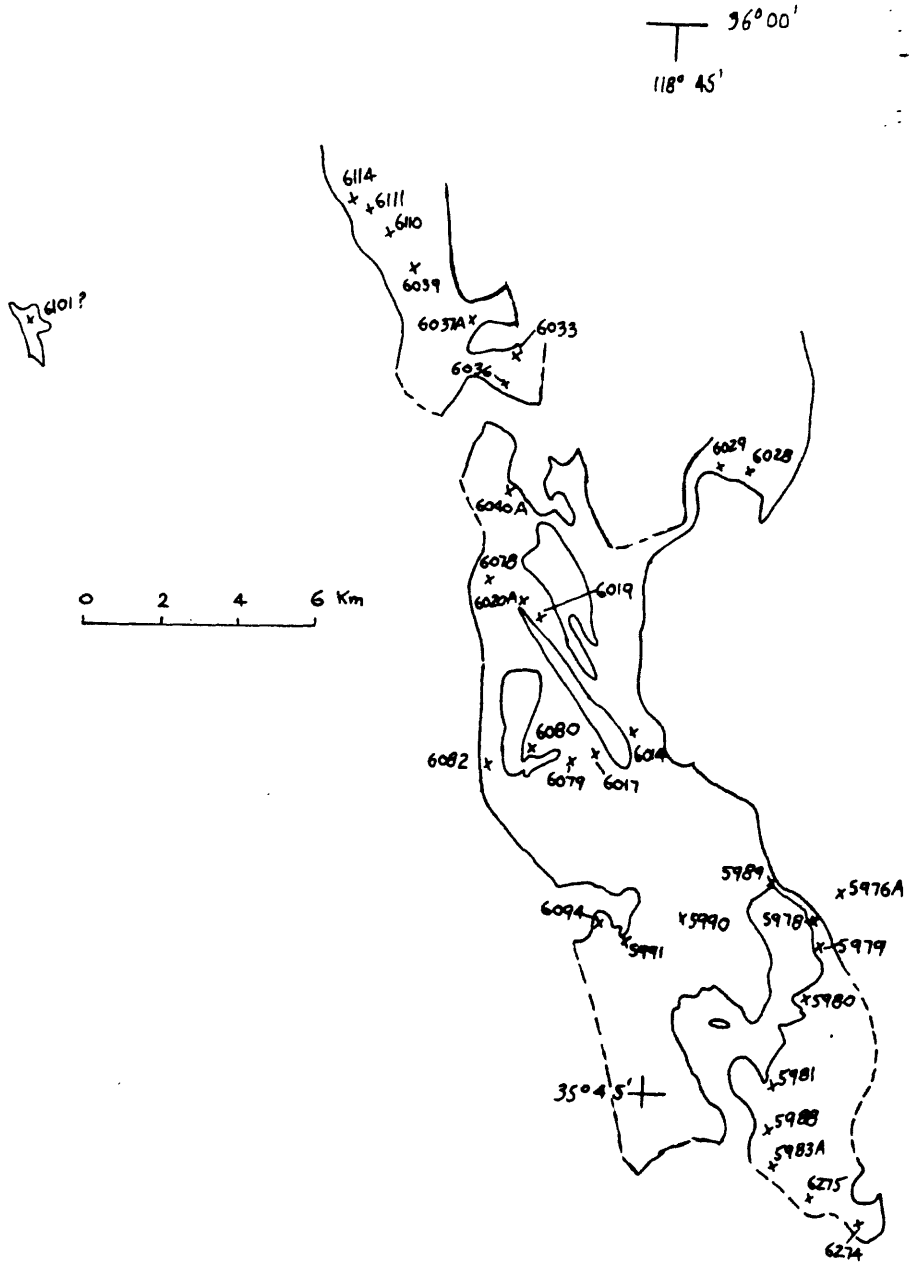
Tonalite of Bear Valley Springs

MODES OF TONALITE OF CARVER-BOWEN RANCH

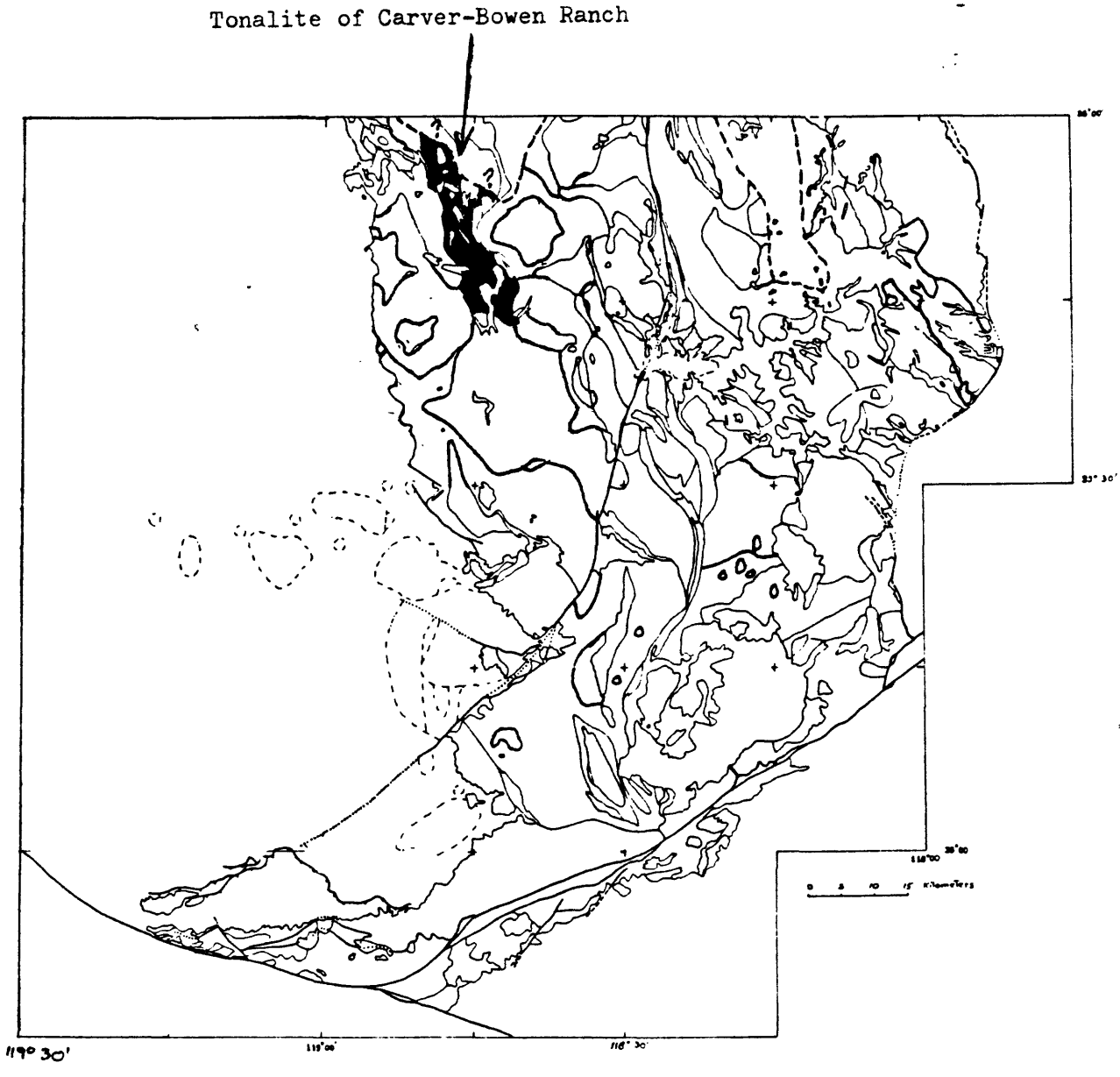
Sample Number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Sphene	Opaques	Other
5976A	61	2	11	14	12			
5978	54	1	13	19	13			
5979	54	1	16	16	13			
5980	51	3	17	16	13			
5981	50	5	15	14	16			
5983A	54	<1	17	18	11			
5988	54	-	9	14	23			
5989	56	-	8	14	22			
5990	46	17	23	9	5			
5991	51	3	21	14	11			
6014	64	-	25	11				
6017	45	0.5	26	17	11.5			cpx <1
6019A	65	-	26	9				
6020A	58	-	16	15	11			
6028	61	-	11	14	14			
6029	65	-	10	13	12			
6033A	55	6	15	14	10			
6036	47	13	2	10	9			
6037A	56	2	18	15	8	0.5	0.5	
6039	56	2	18	12	12		<1	
6040A	54	4	19	15.5	7.5			
6078	63	-	7	12	17		1	
6079A	54.5	2	16	14.5	12.5			cpx 0.5
6080	63	-	9	14	14			
6082	60	-	8	9	23		<1	
6094	72	<1	11	9	8		<1	
6101(?)	55	-	14	17(?)	14(?)			
6110	57	3	18	11	11			
6111	49	6	18	14	13			
6114A	50	5	20	12	13(?)			
6274	57	5	20	15.5	2.5			
6275	50	-	17	17.5	13.5			
Average	56	3	15.5	13.5	12			
Standard deviation	6.2	3.9	5.8	3.6	5.1			



Modal plot of Tonalite of Carver-Bowen Ranch



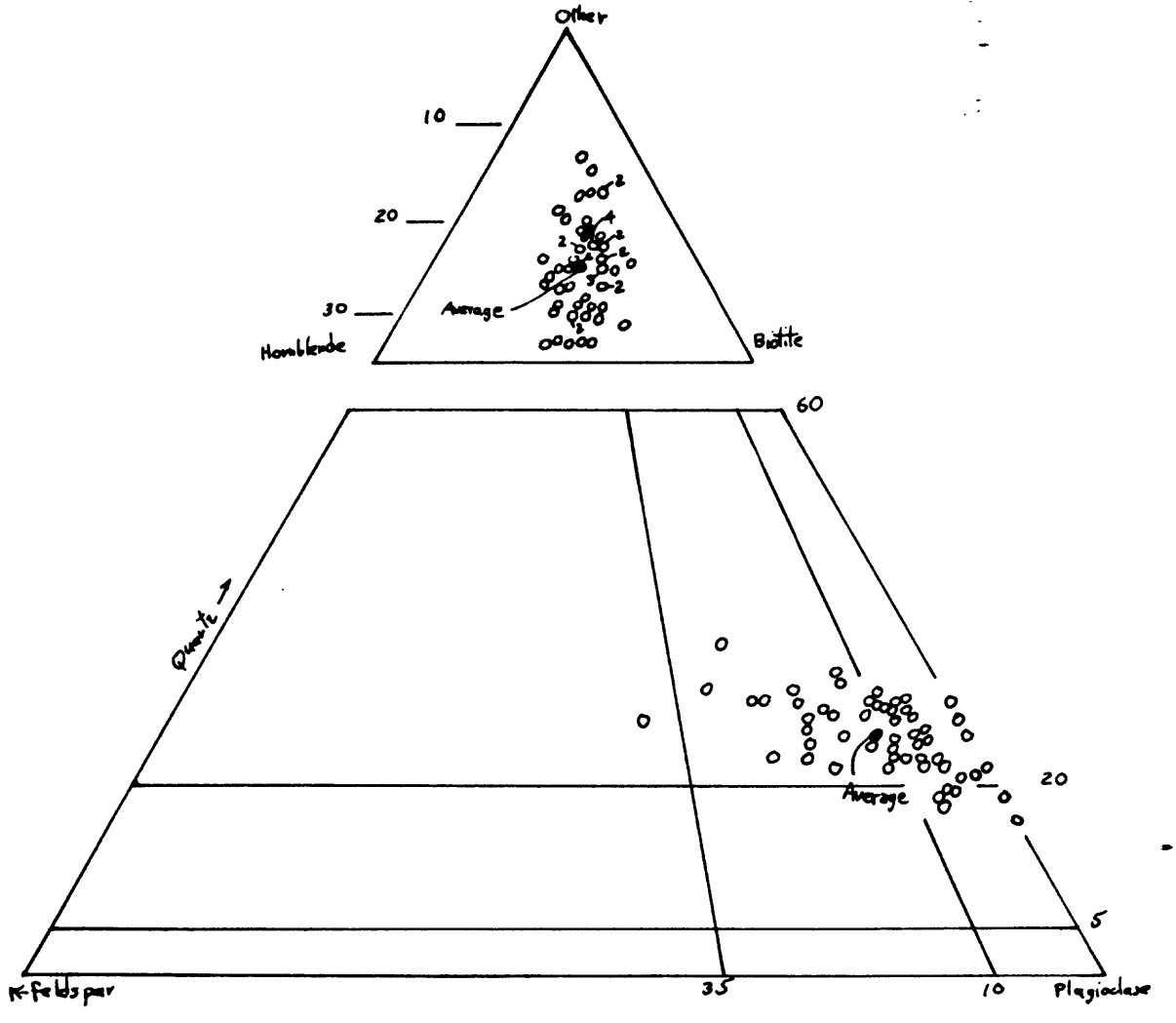
Location of modal samples of Tonalite of Carver-Bowen Ranch


Tonalite of Carver-Bowen Ranch
119° 30'
118° 30'

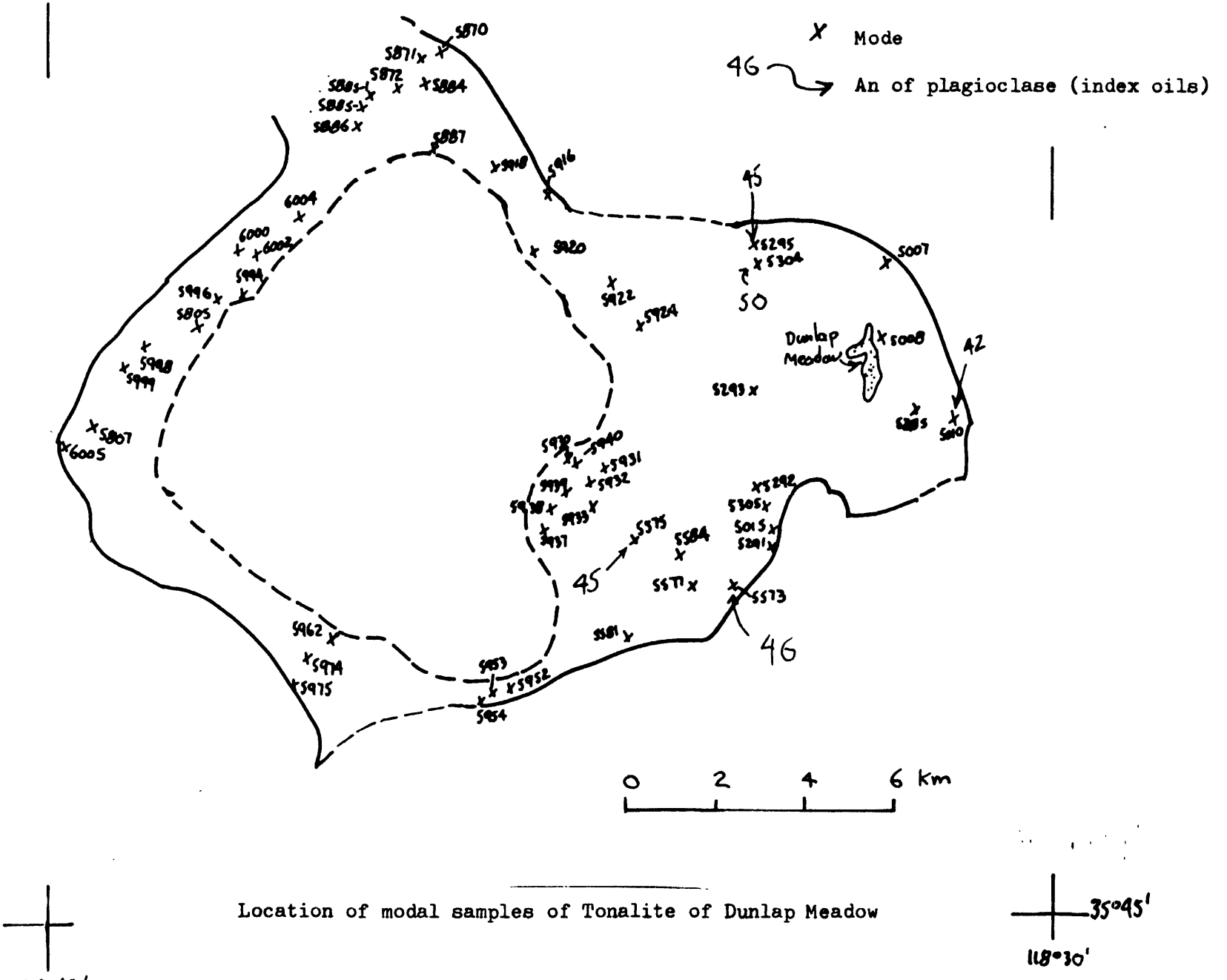
MODES OF TONALITE OF DUNLAP MEADOW

Sample Number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende		Other
5007	50	6	17	14	13		
5008	53	2	15	14	15		cpx 1
5010	57	3	15	10	14	←	cpx 1 opx Tr.
5015	39	15	29	11	6		
5015R	40	18	25	10	7		
5285	52	3	15	14	16		
5291	37	25	23	10	5		
5292	45	11	21	13	10		
5293	46	12	17	16	9		
5295	56	–	11	15	18		cpx ?
5304	50	–	14	21	10	←	opx 5 cpx <1
5305	50	17	20	8	5		
5573	45	11	24	10	10		cpx <1
5575	50	5	18	17	10		
5577	52	11	18	9	10		
5581	48	9	19	13	11		
5584	44	11	22	13	10		
5805	50	5.5	22	14	8.5		
5807	45	9	21	16	9		
5870A	49	6	19	12	14		
5870B	48	6	21	12	13		
5871	54	<1	13	15.5	17.5		cpx <1
5872	46	4	20	15.5	14.5		
5884	50	4	13	19	14		
5885A	42	10	19	18	11		
5885-1	48	4	15	17	16		
5886A	55	<1	22	15	8		
5887	56	3	24	12	5		
5916A	52	–	19	17	12		opaque <1
5918	51	3.5	21	15.5	9		sphene <1

Sample number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende		Other
S920	51.5	4	23	13	8.5		
S922	49	7	19	14	11		
S924	53.5	2.5	17	13.5	13.5		opaque <1
S930	50	4	21	18.5	6.5		
S931	51	4	20	17	8		
S932	51	5	19	16	9		
S933	53	4	19	16	8		
S937	59	3	16	14	8		
S938A	49	5	21	16	9		
S939A	46	8	21	14	11		
S939B	45	7	24	15	9		
S940	49	5	23	14	9		
S952	43	14	23	12	8		
S953	44	15	24	12	5		
S954	45	4	18	18.5	14.5		
S962	52	4	18	14	12		
S974	48	11	20	12	9		
S975A	54	7	17	14	8		opaque <1
S994	46	7	24	14	9		
S996	51	3	18	16?	12?		
S998	54	3	20	15	8		
S999	47	5	21.5	11.5	15		
6000	57	4	14.5	17	8		
6002	51	1	17.5	18.5	12		
6004	56	1	16	17	10		
6005A	53	4	18	13	12		
Average	49.5	6.5	19	14.5	10.5		
Standard deviation	4.7	5.1	3.5	2.7	3.2		



Modal Plot of tonalite of Dunlap Meadow



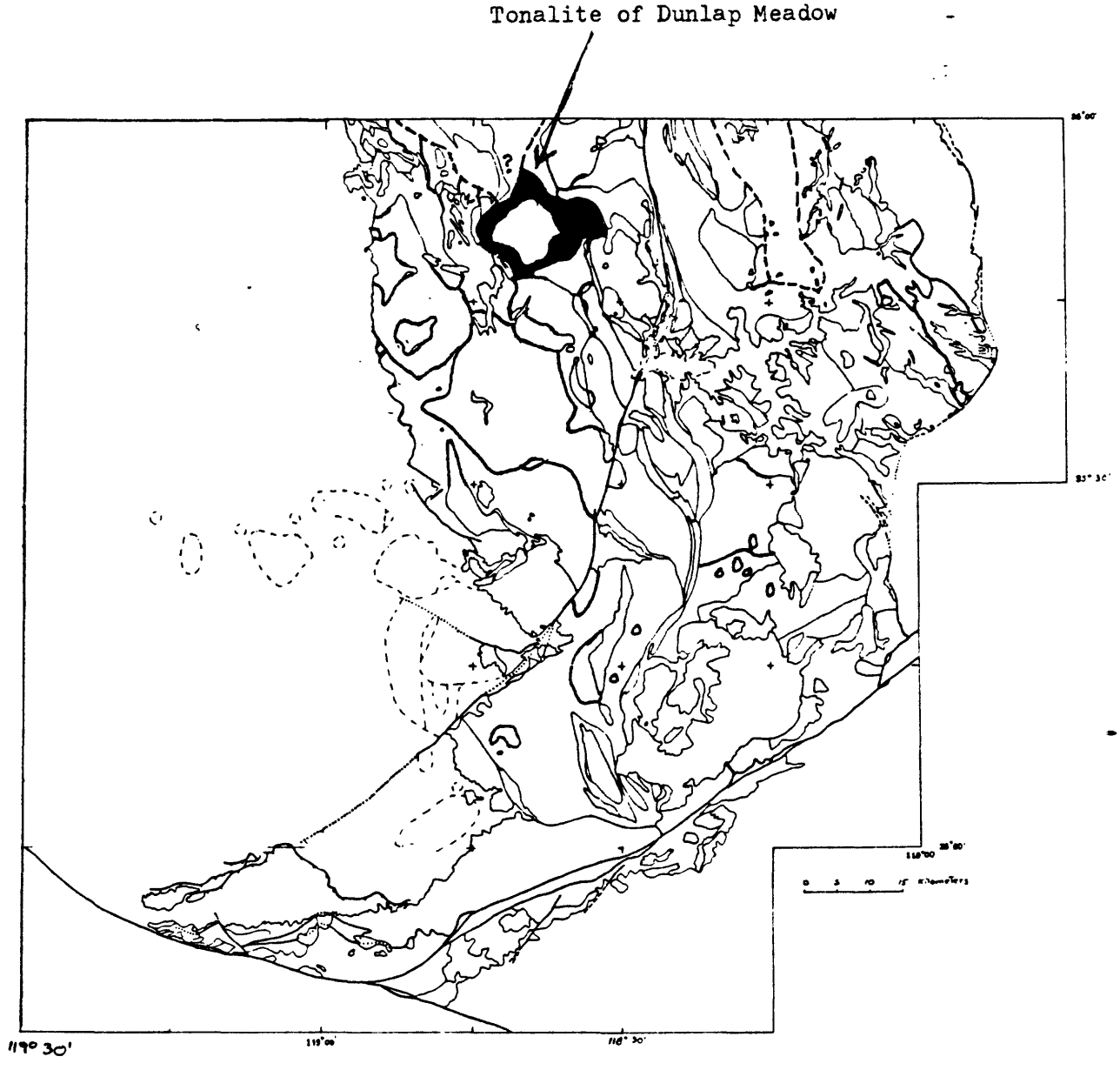
Location of modal samples of Tonalite of Dunlap Meadow

118°45'

35°45'

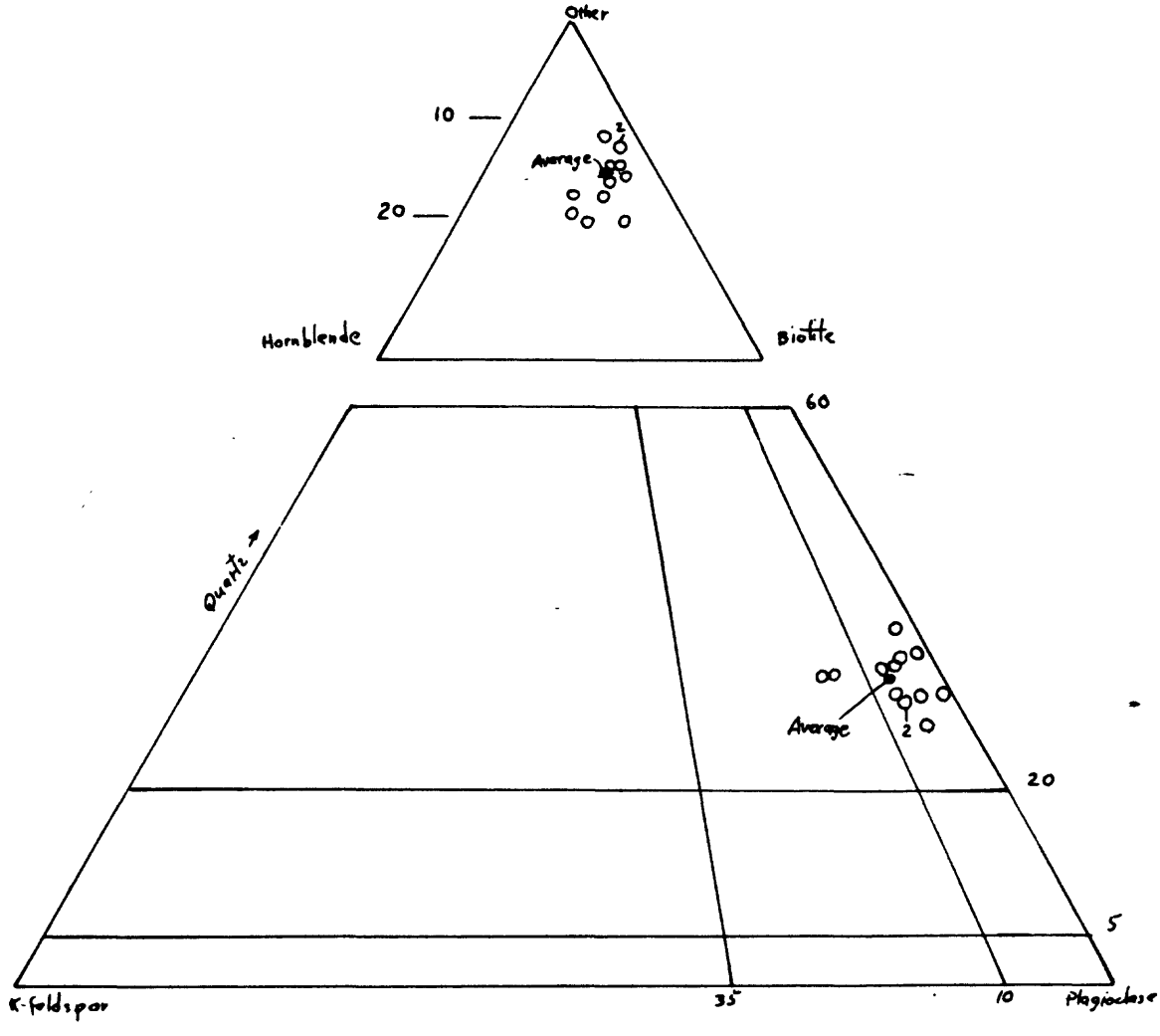
118°30'

A190

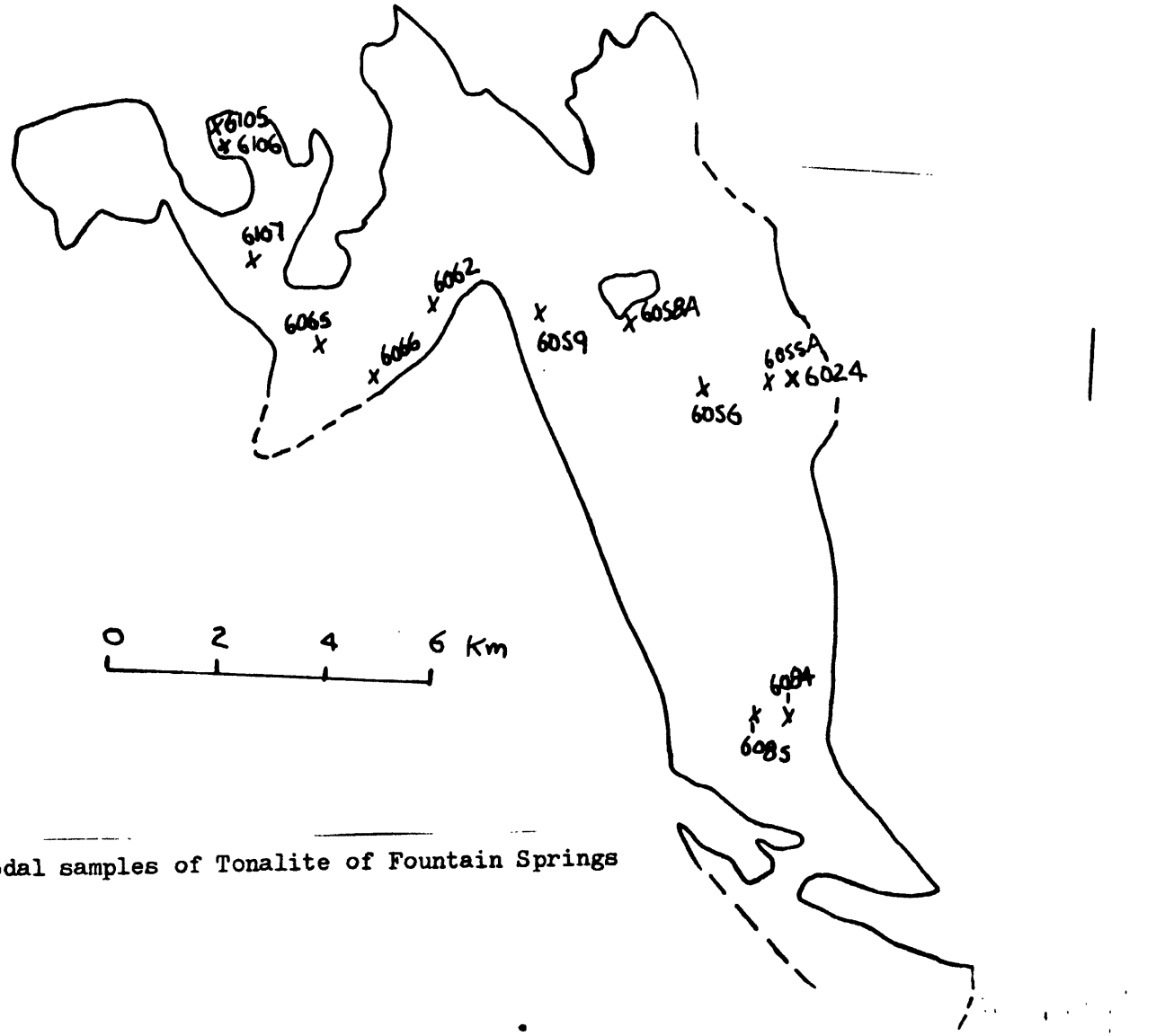

Tonalite of Dunlap Meadow
?
119° 30'
118° 30'

MODE OF TONALITE OF FOUNTAIN SPRINGS

Sample Number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende
6024	55	3	22	10	10
6055A	50	2	27.5	15	5.5
6056	48	8	27	12	5
6058A	52	3	27	12	6
6059	56	1	30	11	2
6062	51	2	31	13	3
6065	58	4	26	9	3
6066	60	1	26	11	2
6084	48	9	27	11	5
6085	55	4	26	11	4
6105	53	2	24	12	9
6106	53	5	24	9	9
6107	53	4	28	12	3
Average	53	4	27	11	5
Standard deviation	3.6	2.5	2.4	1.6	2.7

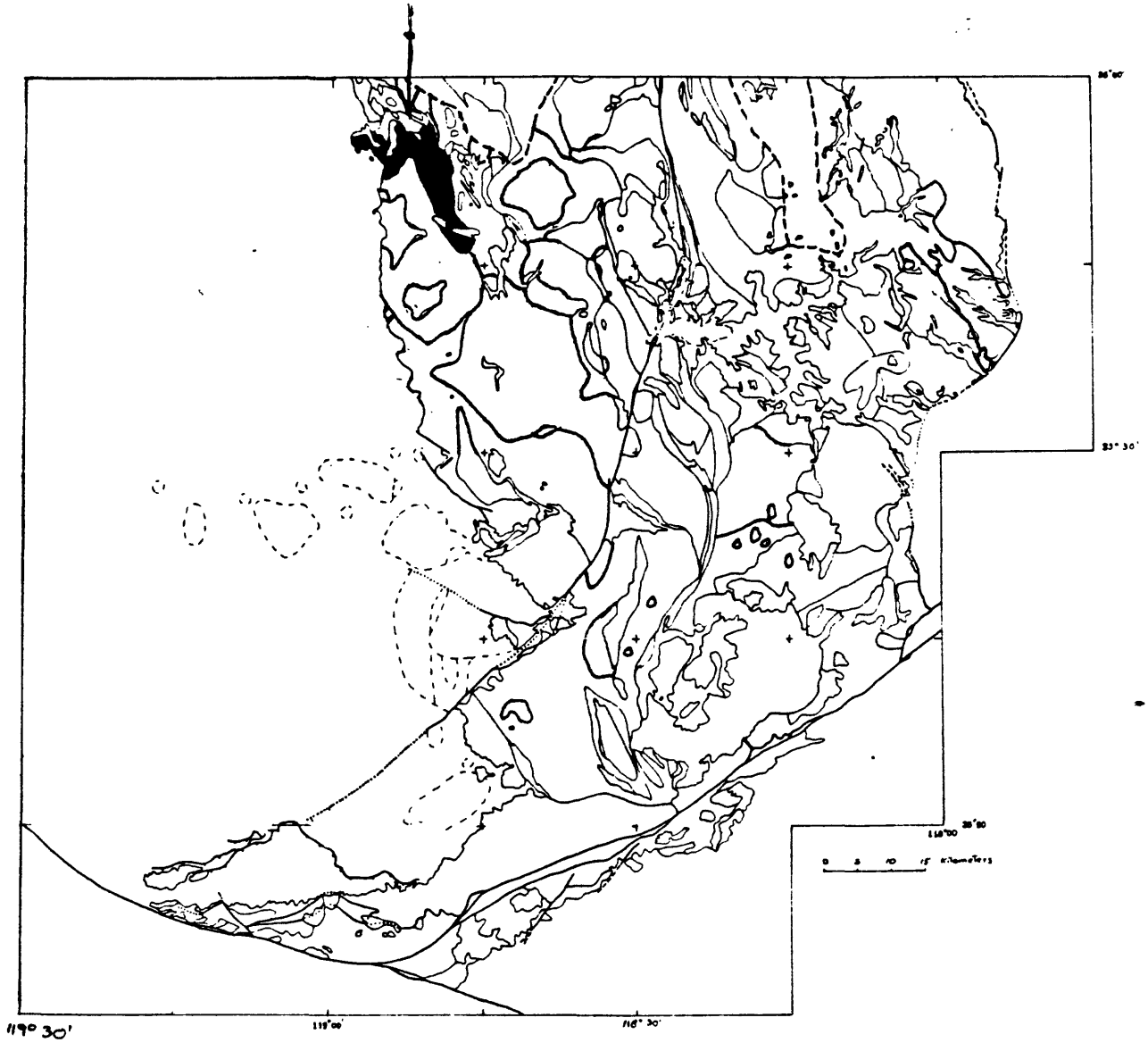


Modal plot of Tonalite of Fountain Springs



Location of modal samples of Tonalite of Fountain Springs

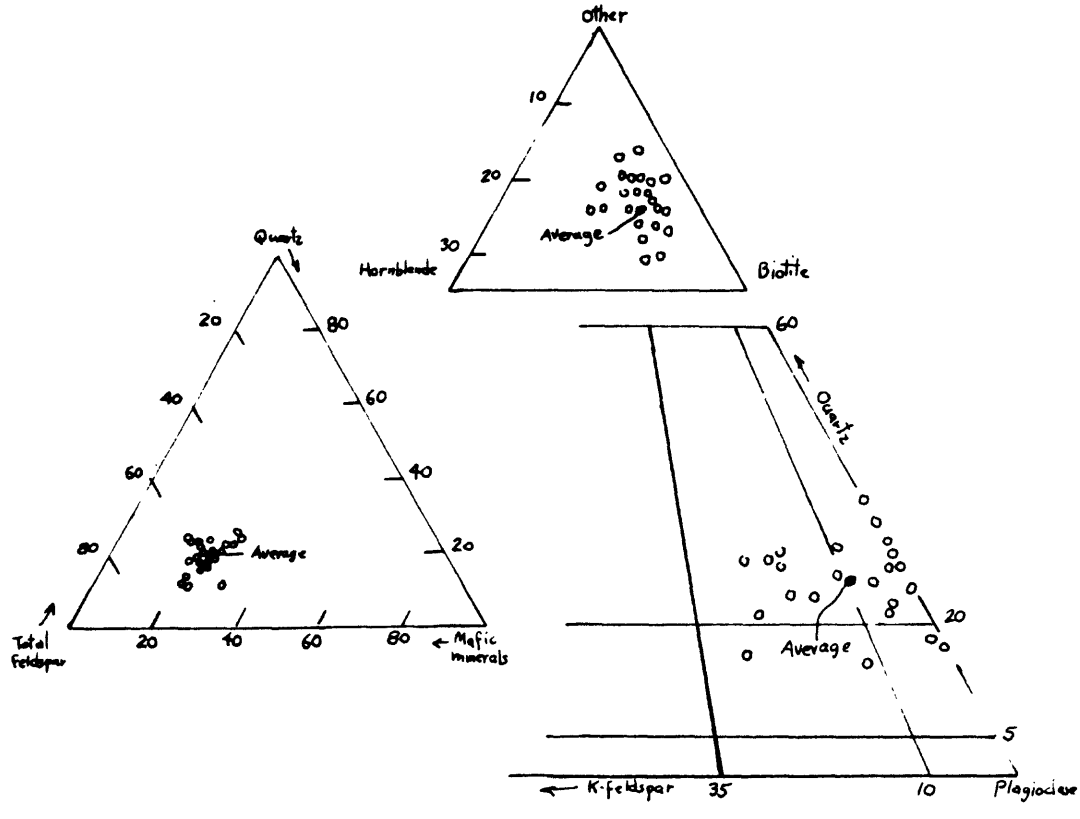
Tonalite of Fountain Springs



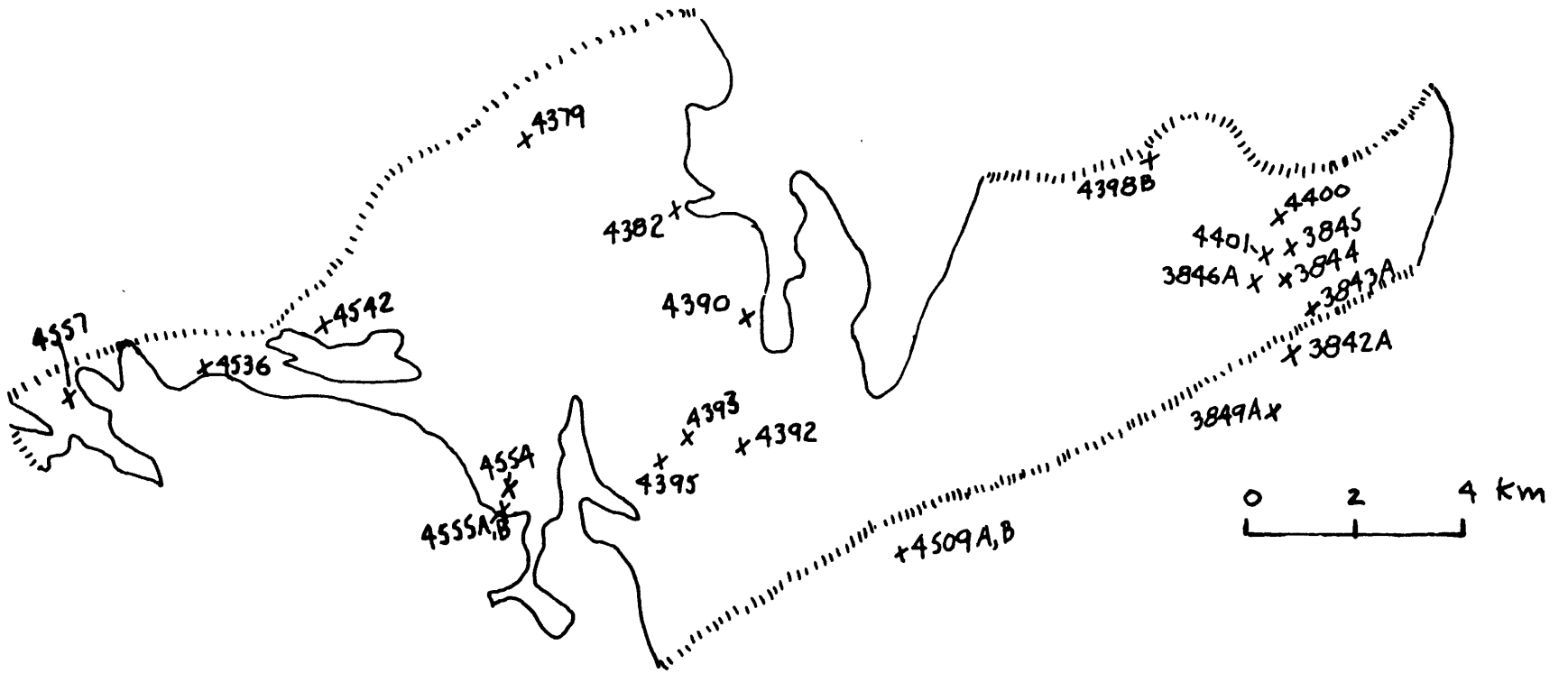
MODES OF TONALITE OF HOFFMAN CANYON

[All modes in volume percent. tr, trace; n.d., not determined. Others: C, clinopyroxene; O, opaque minerals; S, sphene.

Sample	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Others	Specific gravity
3842A	59	3	18	15	5	---	2.74
3843A	45	12	23	15	5	---	2.70
3844	49	5	24	14	8	---	2.70
3845	48	11	25	13	3	---	2.70
3846A	46	11	22	17	4	---	2.73
3849A	58	7.5	11.5	18	5	---	2.77
4379	56	2	17	11	13	1(S)	2.78
4382	51	6	21	16	6	---	2.73
4390	52	3	19	18	8	---	2.73
4392	54	1	21	18	2	4(C)	2.72
4393	57	---	19	12.5	11	.5(O)	n.d.
4395	57	---	12	22	9	---	2.71
4398B	64	1	14	17	4	---	2.73
4400	49	9	18	16	8	---	2.73
4401	44	15	24	11	6	---	2.71
4509A	47	19	13	11	10	---	2.72
4509B	45	15	16	19	5	---	2.69
4536	51	<1	22	20	4	3(C)	n.d.
4542	49	---	22.5	19.5	9	---	n.d.
4554	53	---	20.5	20	6.5	---	2.78
4555A	46	tr	27	22	5	---	2.75
4555B	46	---	24	22	8	---	n.d.
4557	49	12	19	13	7	---	2.74
Average	51	5	20	17	7	---	2.73
Standard deviation.	5.4	5.9	4.3	3.6	2.7	---	.03



Modal plots of tonalite of Hoffman Canyon

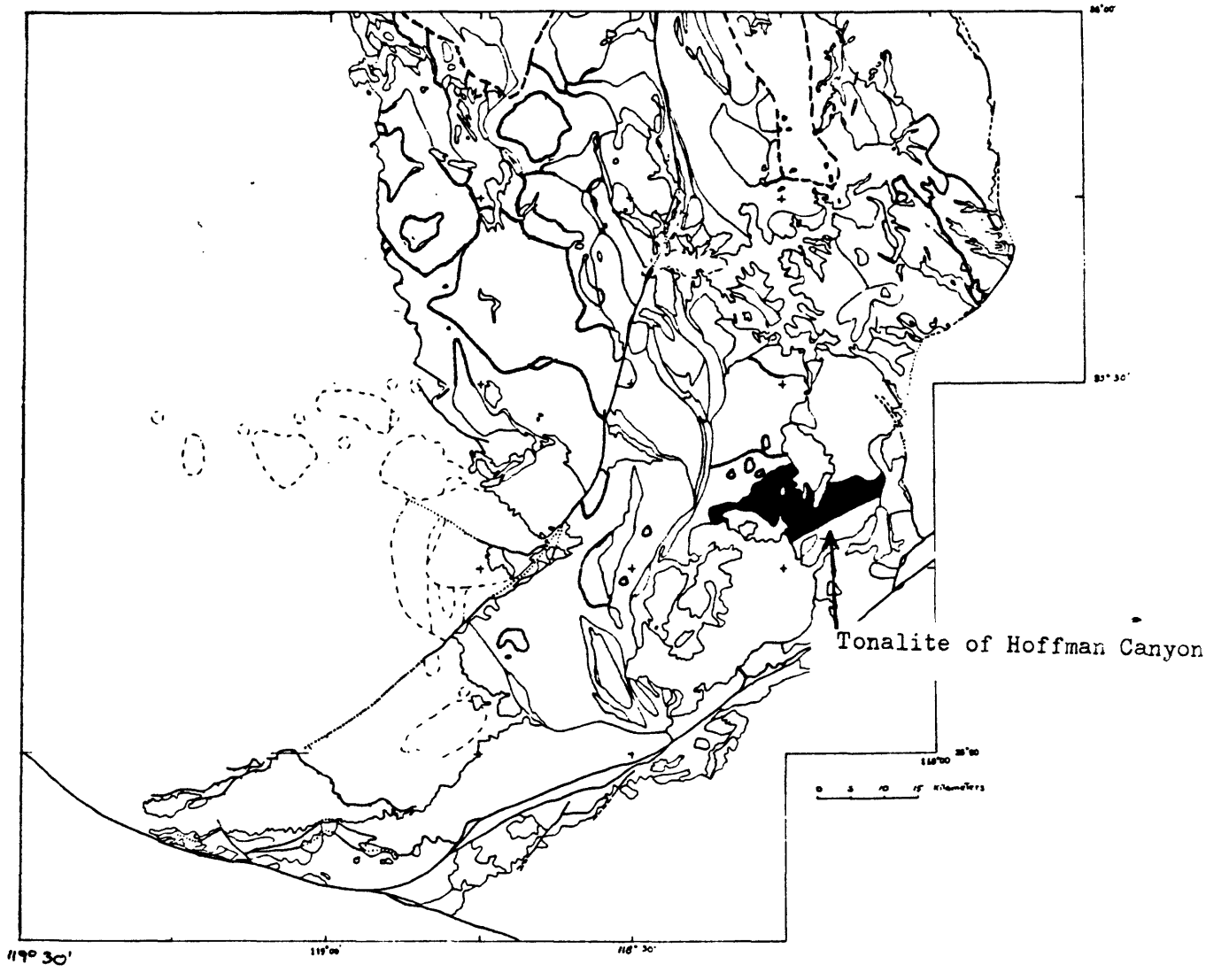


Location of modal samples of tonalite of Hoffman Canyon
(hachured lines indicate gradational contacts)

35°15'

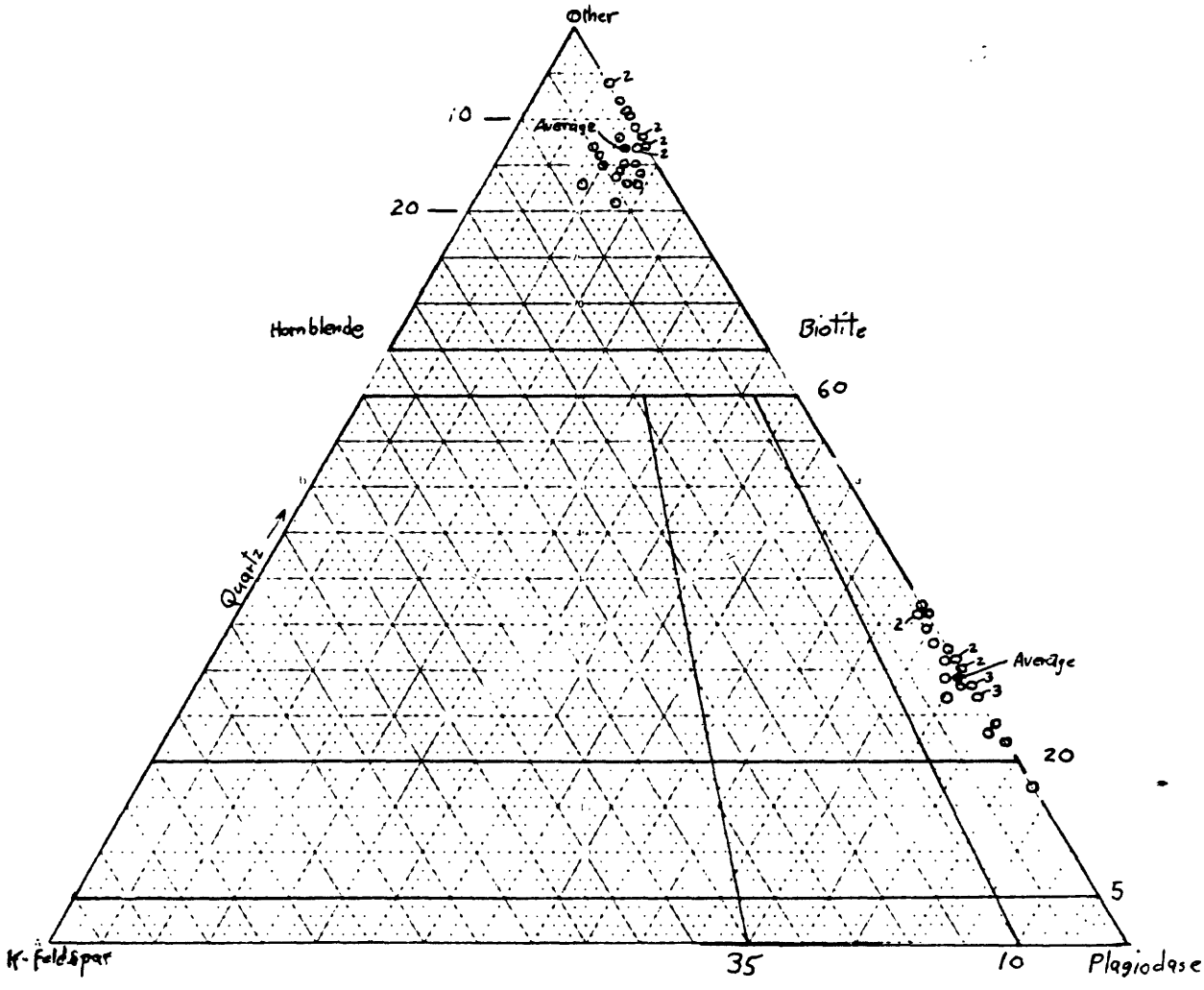
118°15'

A198


Tonalite of Hoffman Canyon
119° 30'
119° 00'
118° 30'

MODES OF TONALITE OF MOUNT ADELAIDE

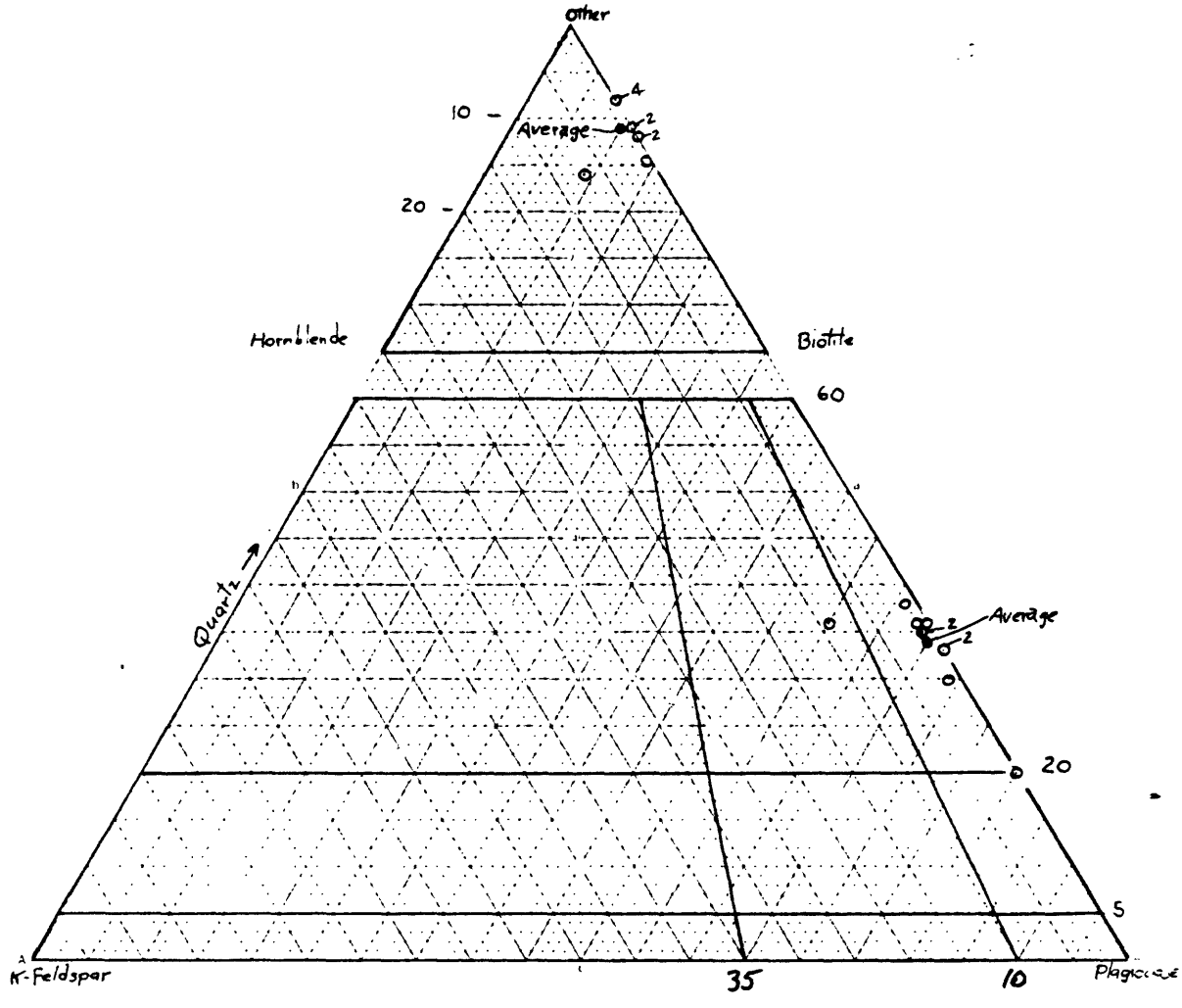
Sample number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende		Other		Spec. f. gravity
3631	72	-	15	8	5				2.64
3631-1	67	-	19	9	5				2.73
3631-2	58	-	34	8	-				2.65
3866 2	59	1	34	6	-				2.66
3872-7	58	<1	33	9	-				2.65
4144A	58	-	25	9	8				2.72
4145	59	<1	25.5	12	3.5				2.68
4145-2	52	1	30	14	3				2.66
4145-4	59	-	22	13	6				2.72
4148A	64	-	20	14	2				2.66
4189	62	1	24	12	1				2.70
4197	62	-	23	10	5				2.70
4220	63	-	24	13	-				2.70
4236	66	1	20	12	<1		Opaque 1		2.64
4238	59	1	27	12	1				2.70
4246	59	-	26	13	2				2.70
4253A	66	3	25	6	-				2.64
4253B	62	2	26.5	9.5	-				2.67
4419	59	1	29	11	-				2.65
4420	56	1	30	13	-				2.69
4564	60	-	23	13	4				2.71
4567	57	-	27	12	4				2.73
4569	62	-	23	12	3				2.73
6331	63	<1	25	10	2				—
"Rock Pile"	61	<1	27	12	—				2 63
Average	61	0.5	25.5	11	2				2.68
Standard deviation	4.1	—	4.6	2.4	2.4				.03



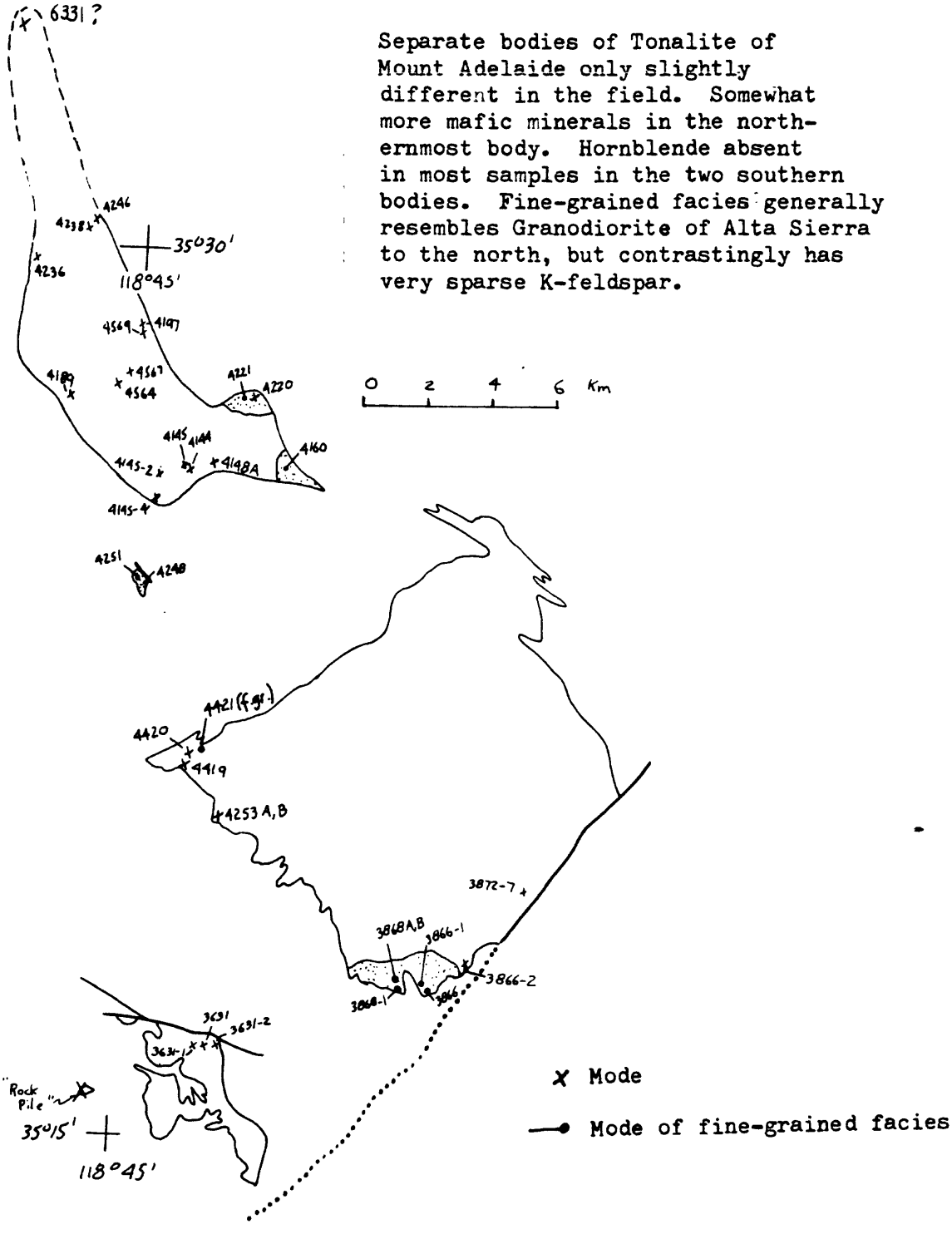
Modal plot of Tonalite of Mount Adelaide

MODES OF FINE-GRAINED FACIES OF TONALITE OF MOUNT ADELAIDE

Sample number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende		Other		Spec. f. gravity
3866	51	8	33	8	-				2.63
3866-1	62	-	30	8	-				2.70
3868A	61	1	27	11	-				2.67
3868B	56	1	35	8	-				2.66
3868-1	58	1	33	8	-				2.69
4160	56	<1	32	11	<1		Opaque 1		2.65
4221	67	-	17	9	7				2.76
4248	57	<1	28.5	14	0.5				2.66
4251	56	1	31	12	-				2.63
4421	56	1	31	12	-				2.67
Average	58	1	30	10	1				2.67
Standard deviation	4.4	2.4	5.0	2.2	2.2				.04

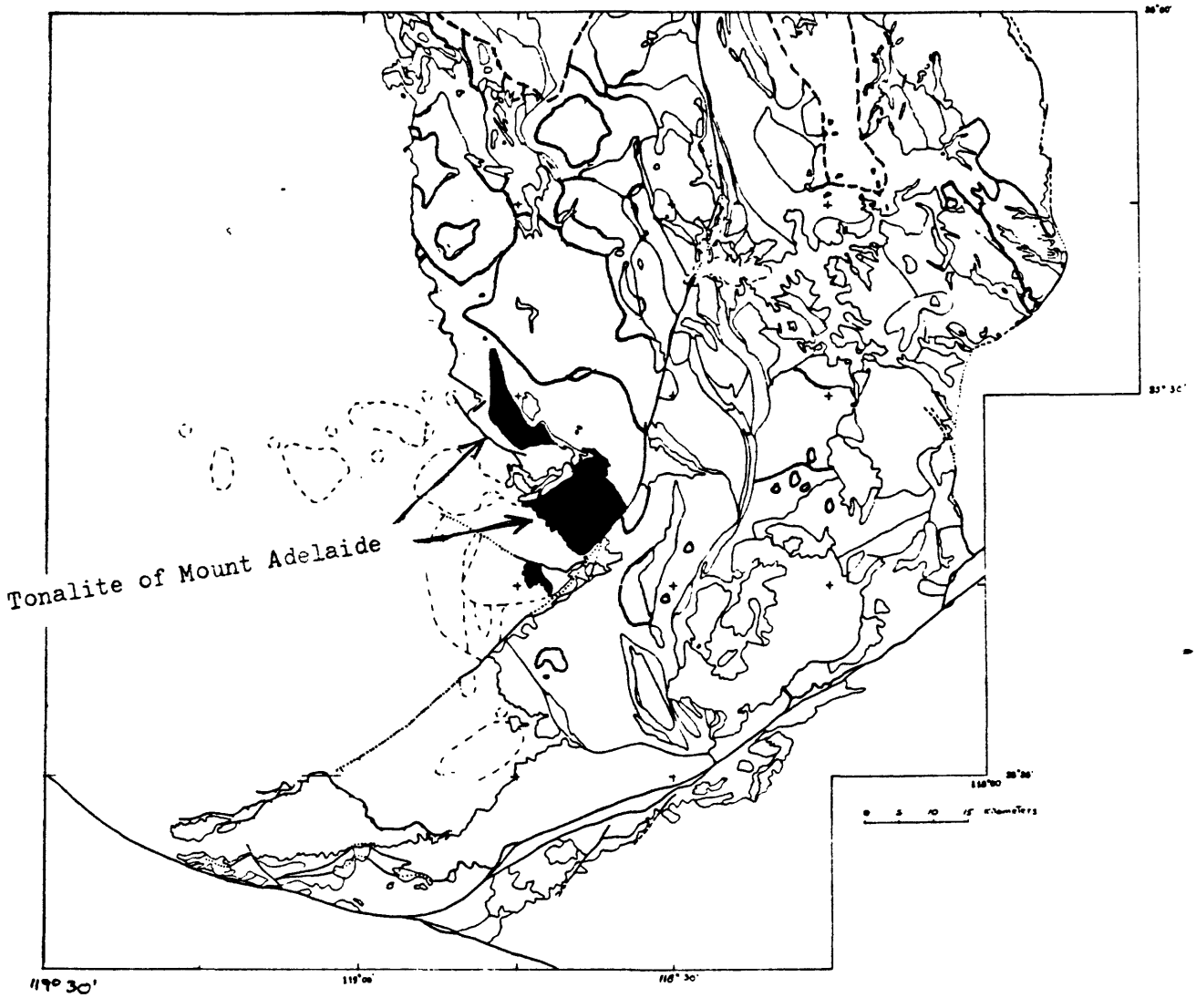


Modal plot of fine-grained facies of Tonalite of Mount Adelaide



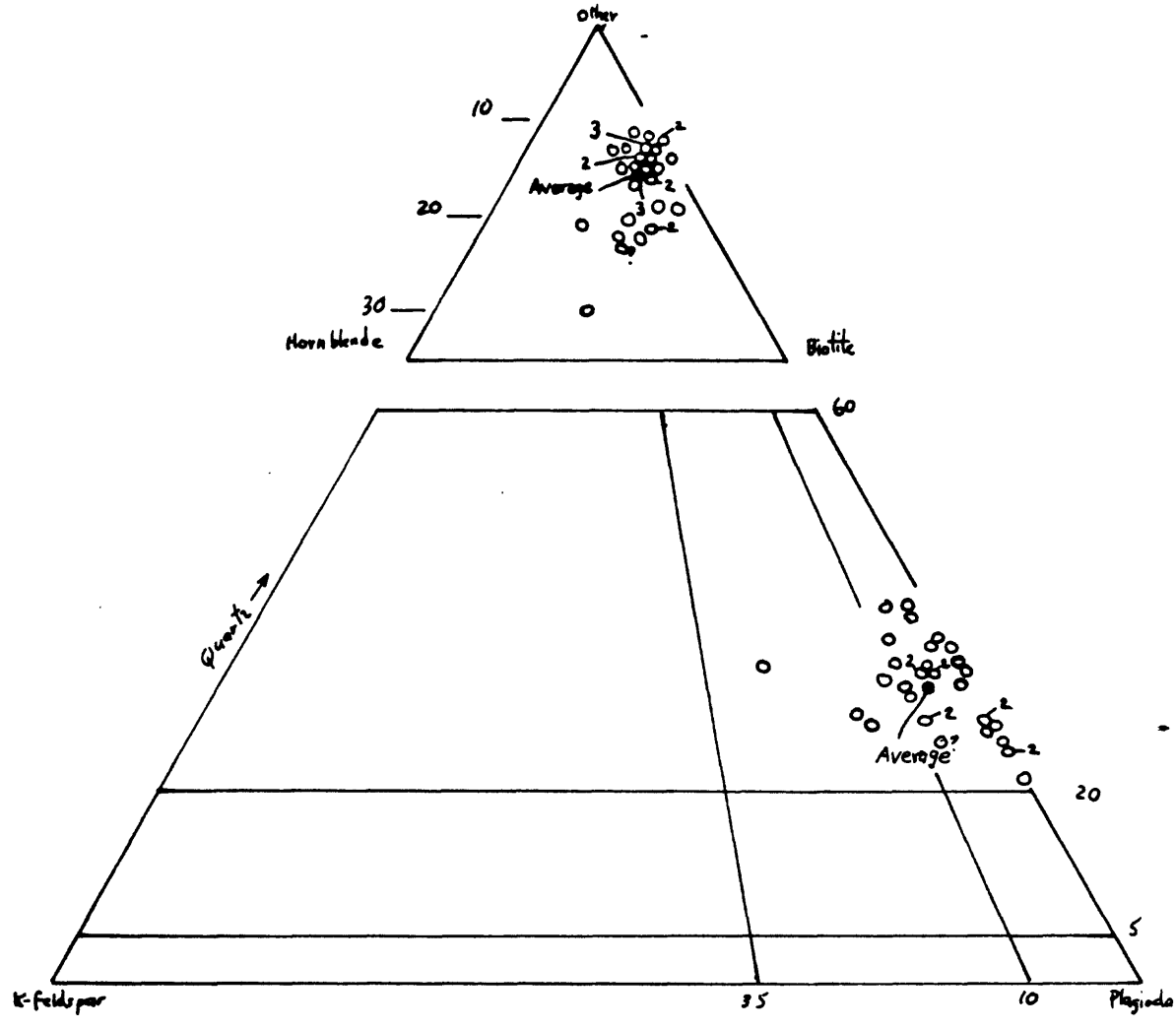
Separate bodies of Tonalite of Mount Adelaide only slightly different in the field. Somewhat more mafic minerals in the northernmost body. Hornblende absent in most samples in the two southern bodies. Fine-grained facies generally resembles Granodiorite of Alta Sierra to the north, but contrastingly has very sparse K-feldspar.

Location of modal samples of Tonalite of Mount Adelaide (fine-grained facies shown by dotted pattern)

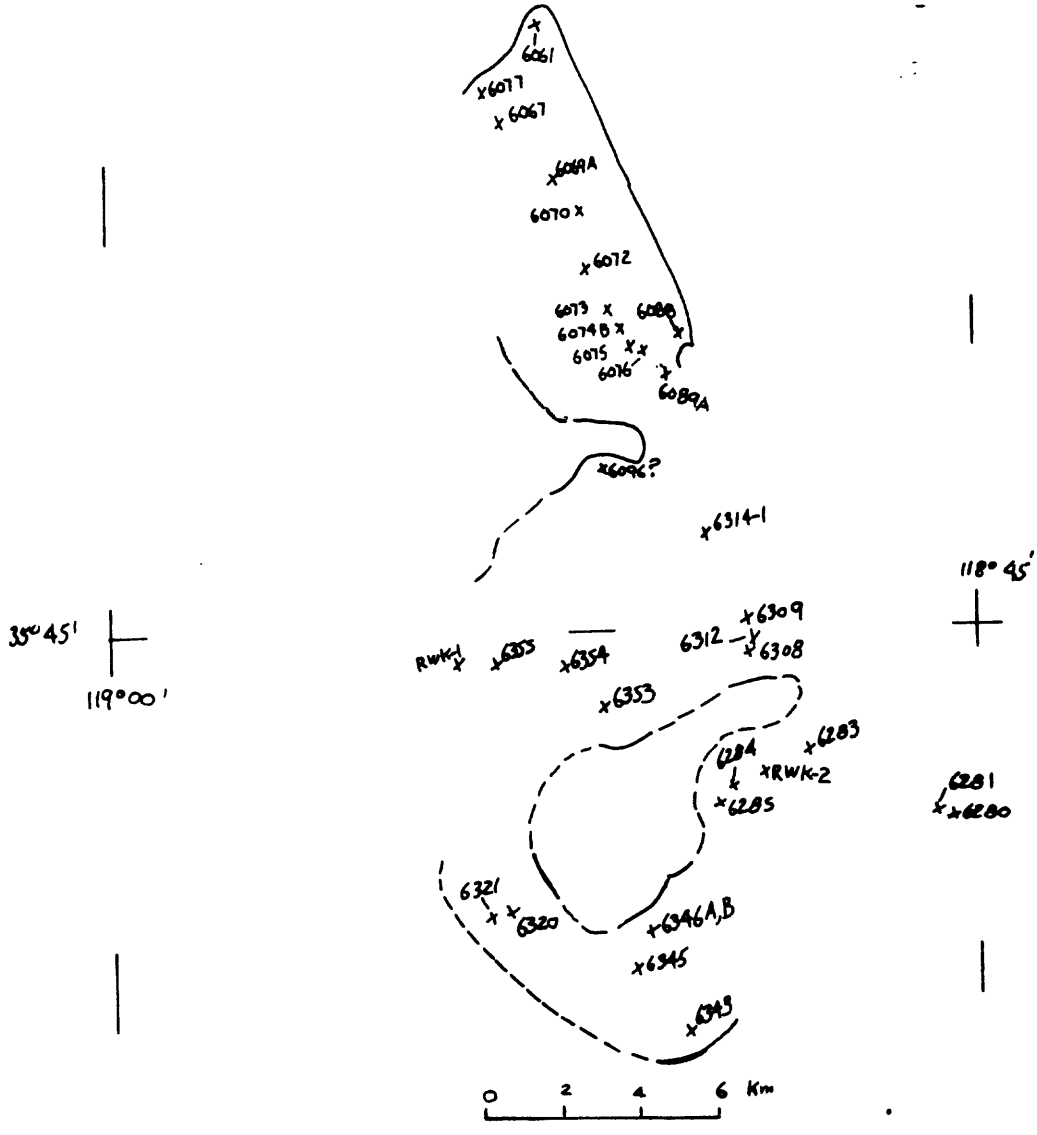

Tonalite of Mount Adelaide
119° 30'
118° 30'

MODES OF TONALITE OF WALT KLEIN RANCH

Sample Number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende
6061	50	4	30	13	3
6067	52	5	28	12	3
6069A	52	10	24	11	3
6070	56	1	21	13	9
6072	57	3	28	12	<1
6073	56	-	30	12	2
6074B	59	-	19	15	7
6075	59	1	21	15	4
6076	67	-	18	11	4
6077	55	2	30	12	1
6088	51	2	33	14	-
6089A	59	-	22	17	2
? 6096	53	5	19	14	9
6280	61	<1	22	12	5
6281A	59	<1	20	15	6
6283	56	6	25	11	2
6284	58	5.5	23.5	8	5
6285	53	7	28	11	1
6308	56	-	28	13	3
6309	54	1	25	13	7
6312	58	<1	27	12	3
6314-1	42	16	28	11	3
6320	49	3	33	13	2
6321	51	3	25.5	9	11.5
6343B	55	1	31	11	2
6345	56	3	28	9	4
6346A	55	3	29	11	2
6346B	56	5	27	12	<1
6353	50	2	33	12	3
6354	53	9	23	10	5
6355	50	3	25	16	6
RWK-1-RA	53	<1	17	14	16
RWK-2(125)	60	5	24	9	2
Average	55	3	26	12	4
Standard deviation	4.5	3.6	4.4	2.1	3.4

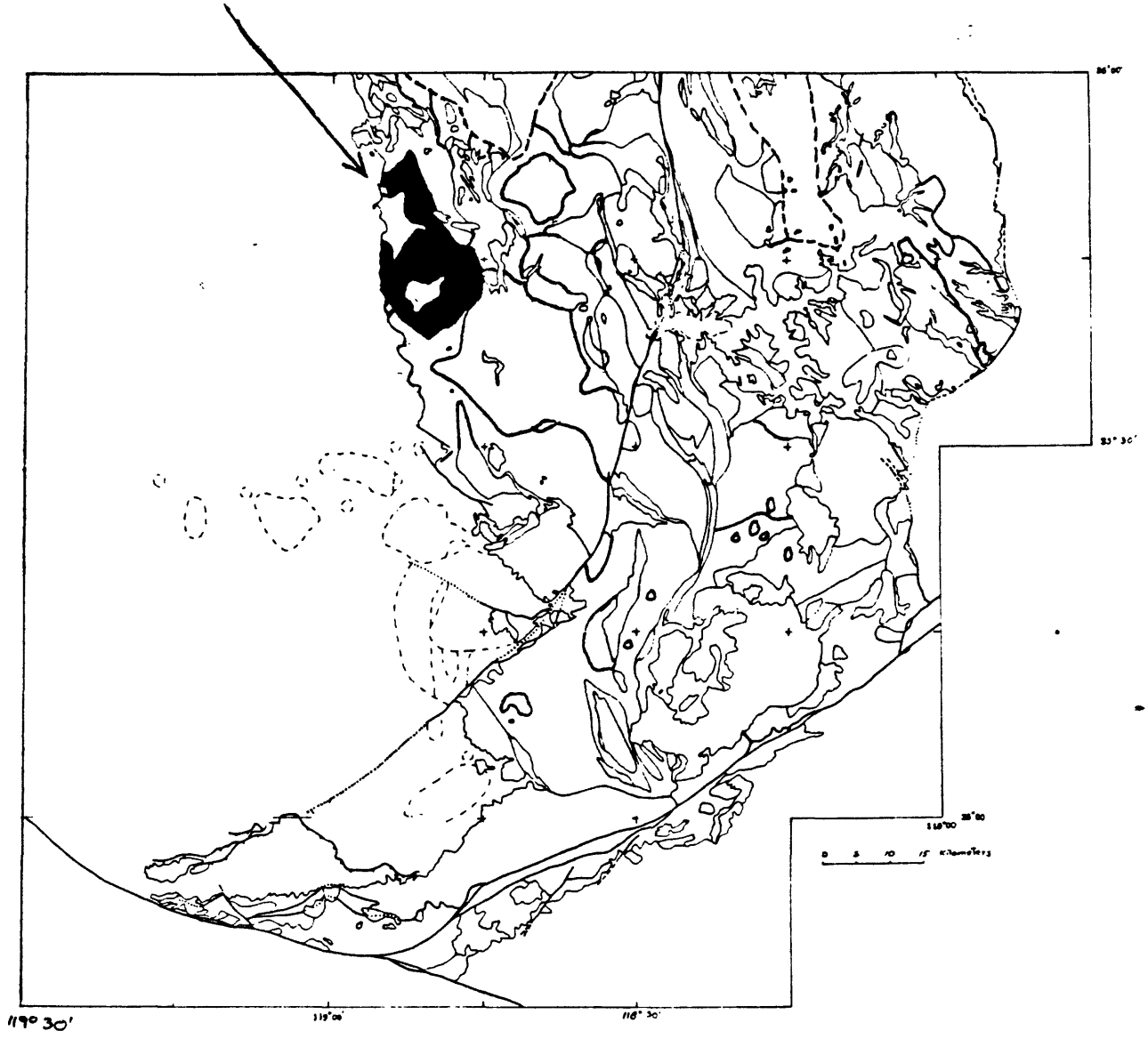


Modal plot of tonalite of Walt Klein Ranch



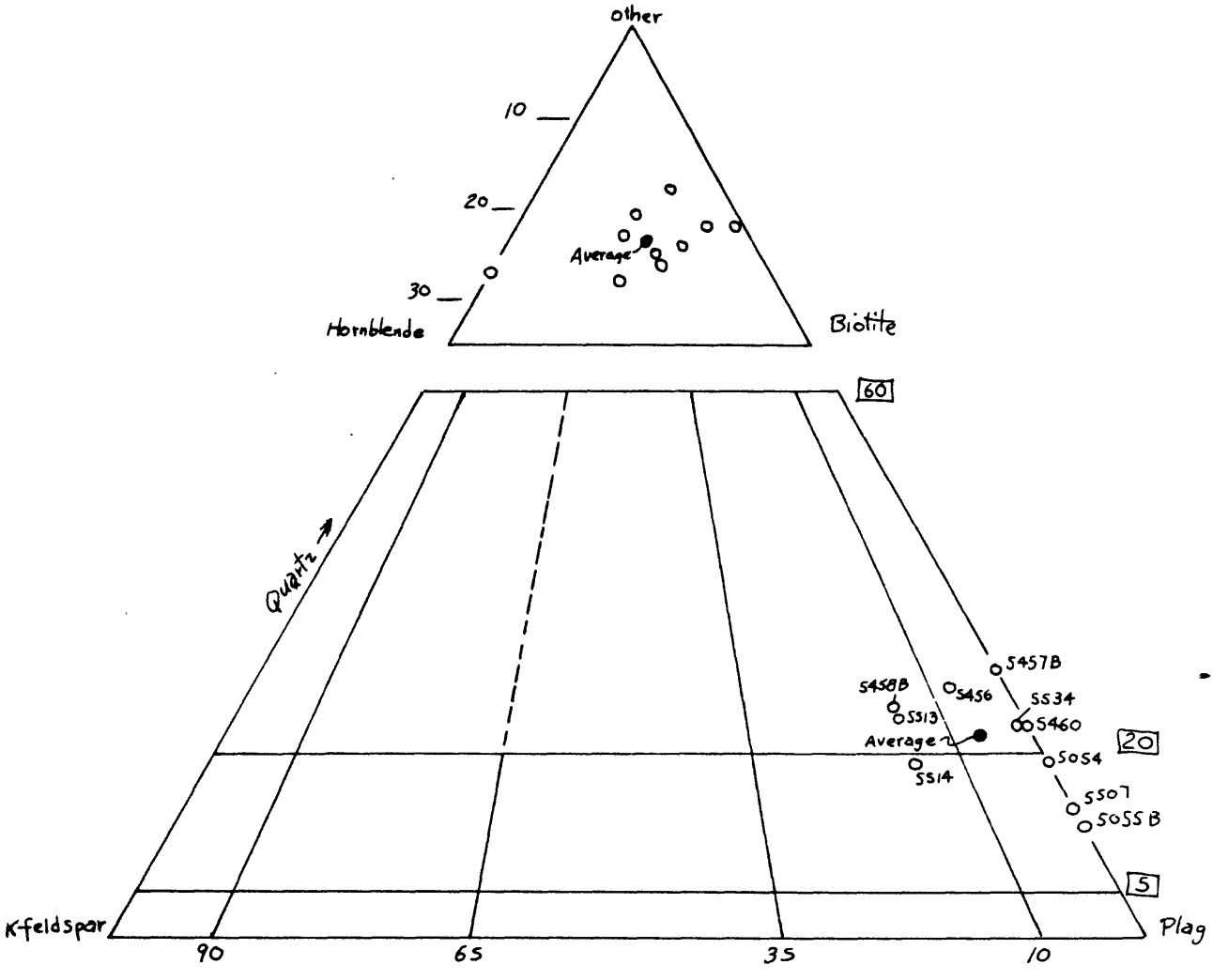
Location of modal samples of Tonalite of Walt Klein Ranch

Tonalite of Walt Klein Ranch

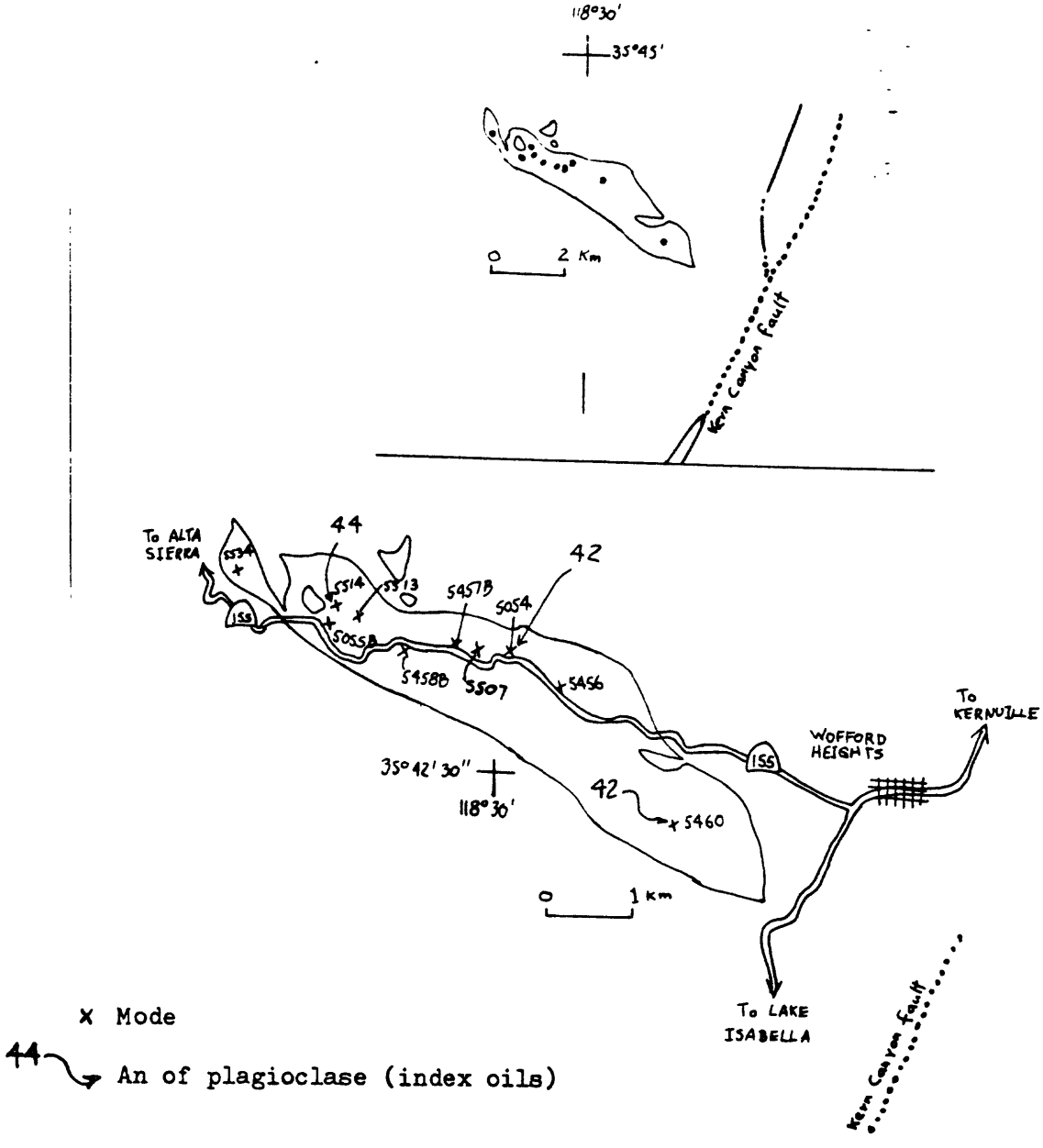


MODES OF TONALITE OF WOFFORD HEIGHTS

Sample number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Other	Specific gravity
· 5054	58	-	14	13	15	Opaque <1	2.79
· 5055B	68	<1	9	11	12	Opaque <1	2.78
· 5456	49	4	20	16	10	Opaque 1	-
· 5457B	55	<1	22	21	1	Opaque 1	-
· 5458B	52	10	21	12	5		
· 5460	58	-	17	15	10		
· 5507	60	-	9.5	<1	27	Sphene 2.5 Opaque 1	
· 5513	49	9	18	17	7		
· 5514	54	10	15	11	10		
· 5534	59	1	18	18	4		
Average	56	3.5	16.5	13.5	10	0.5	
Standard deviation	(5.6)	(4.3)	(4.5)	(5.1)	(7.0)		

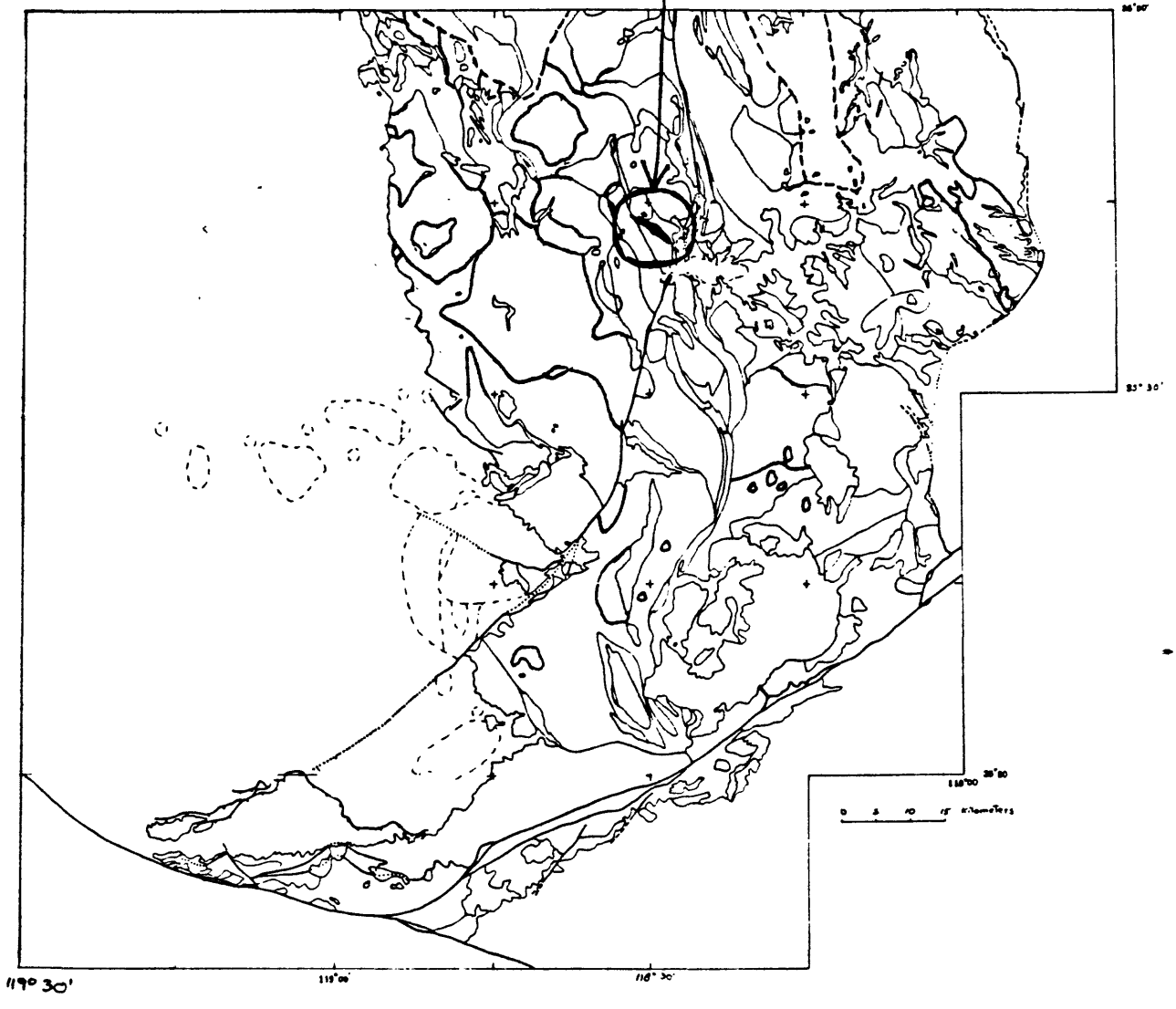


Modal plot of Tonalite of Wofford Heights



Location of modal samples of Tonalite of Wofford Heights

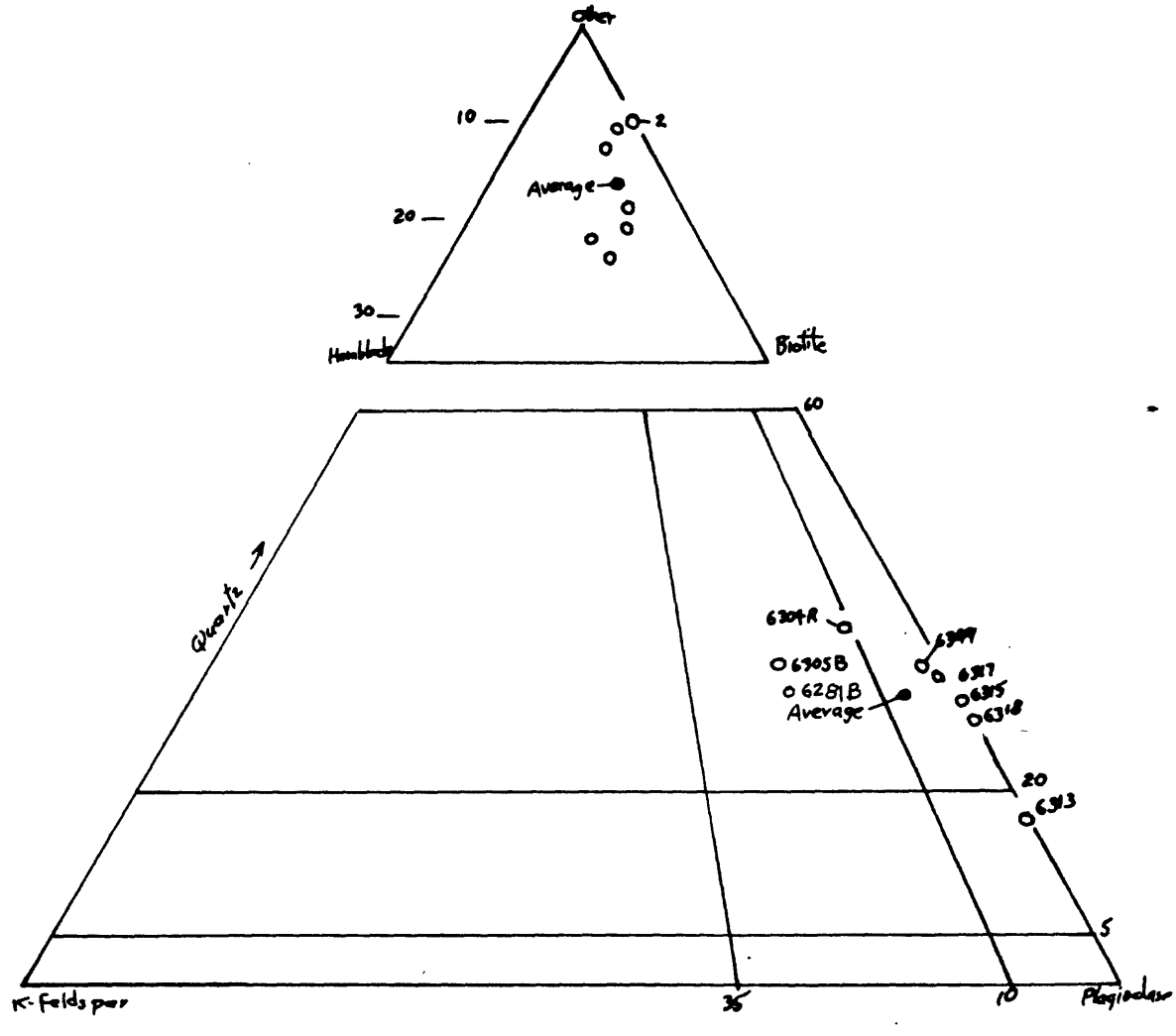
Tonalite of Wofford Heights



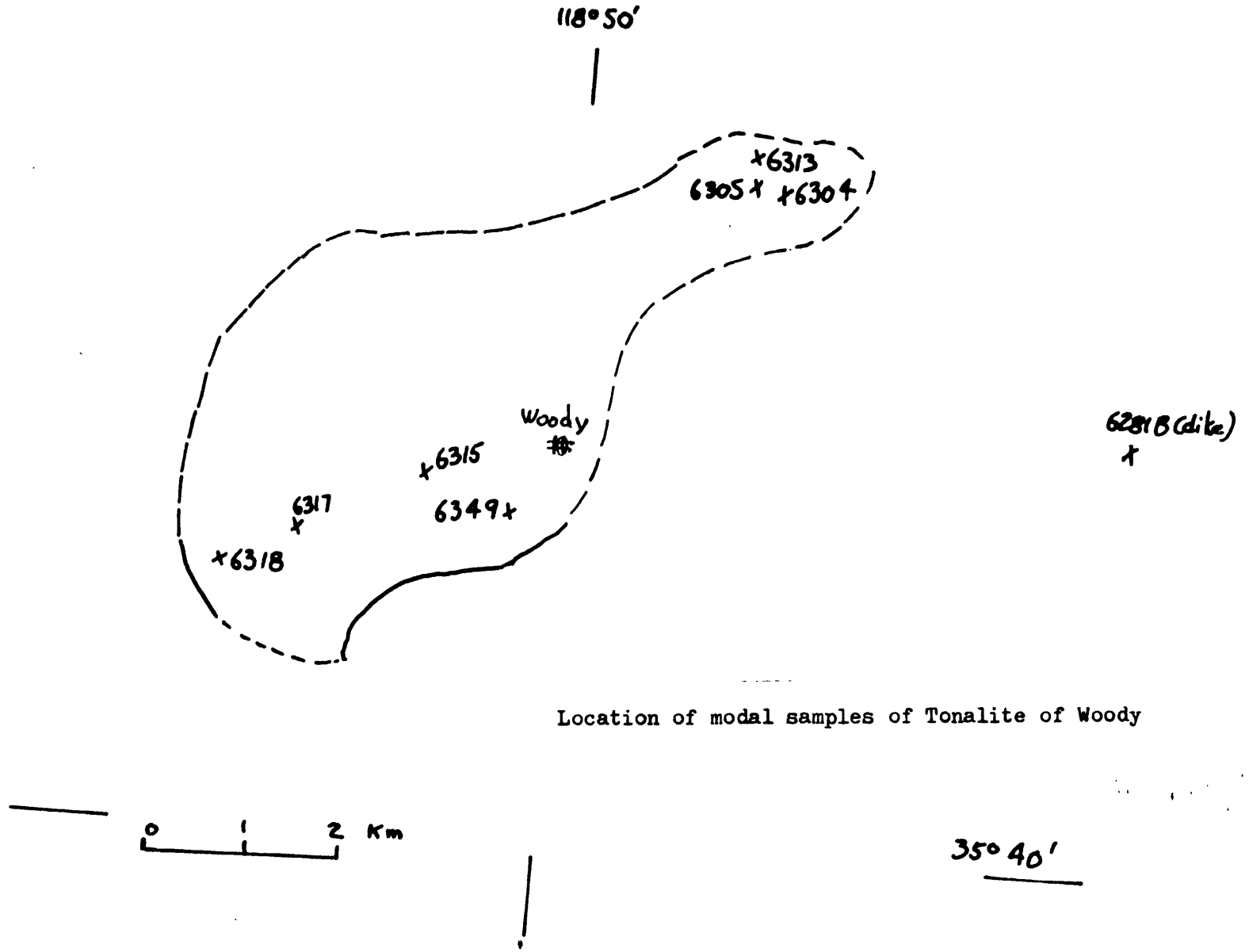
A213

MODES OF TONALITE OF WOODY

Sample Number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende
6281B	49	13	28	10	-
6304R	31	6	33	10	-
6305B	45	13	29	9	4
6313	63	-	13	15	9
6315	56	-	23	15	6
6317	54	1	26	14	5
6318	57	-	21	12.5	9.5
6349	58	2	29	9	2
Average	54	4.5	25	12	4.5
Standard deviation	5.7	5.7	6.2	2.6	3.7

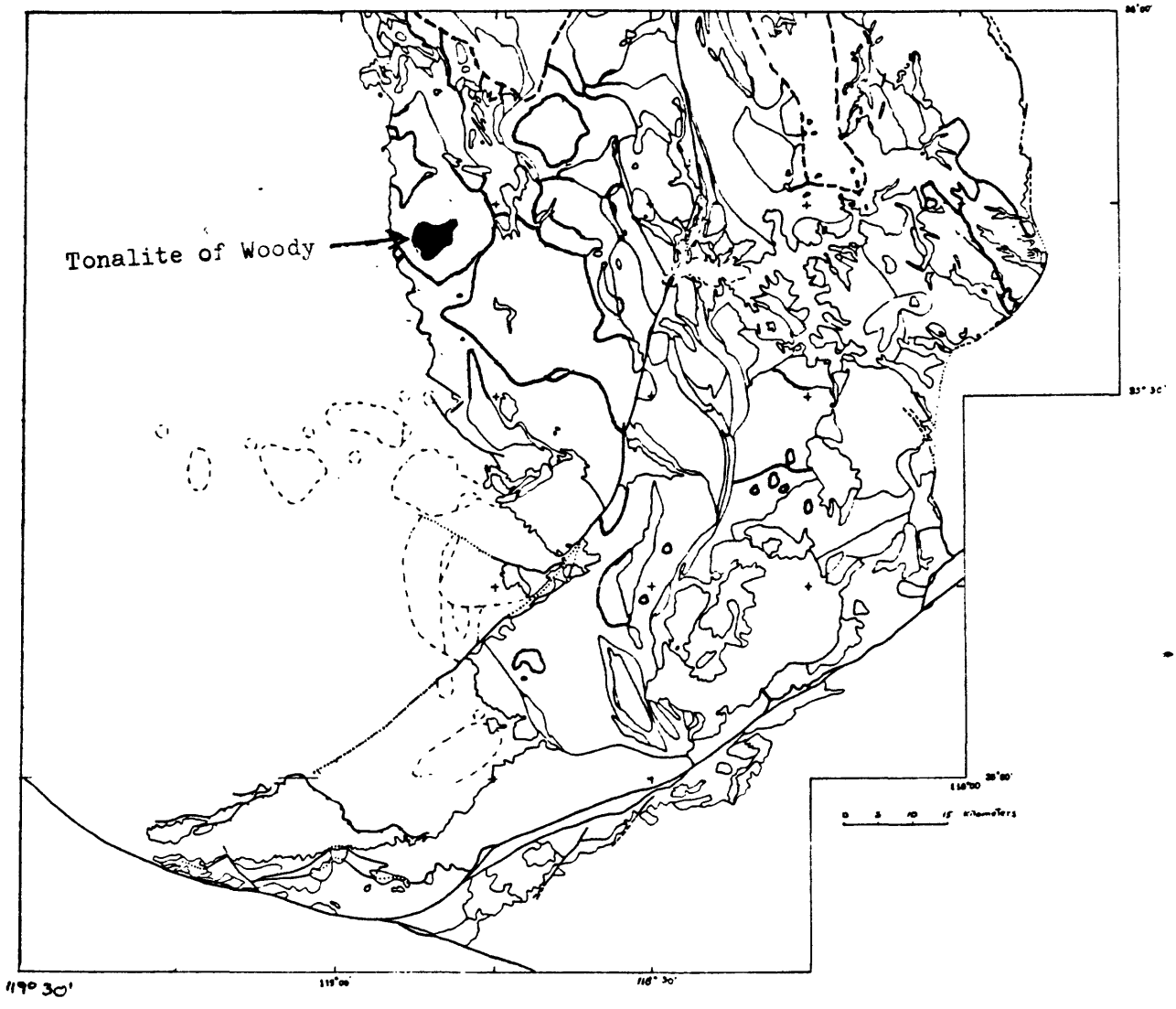


Modal plot of Tonalite of Woody



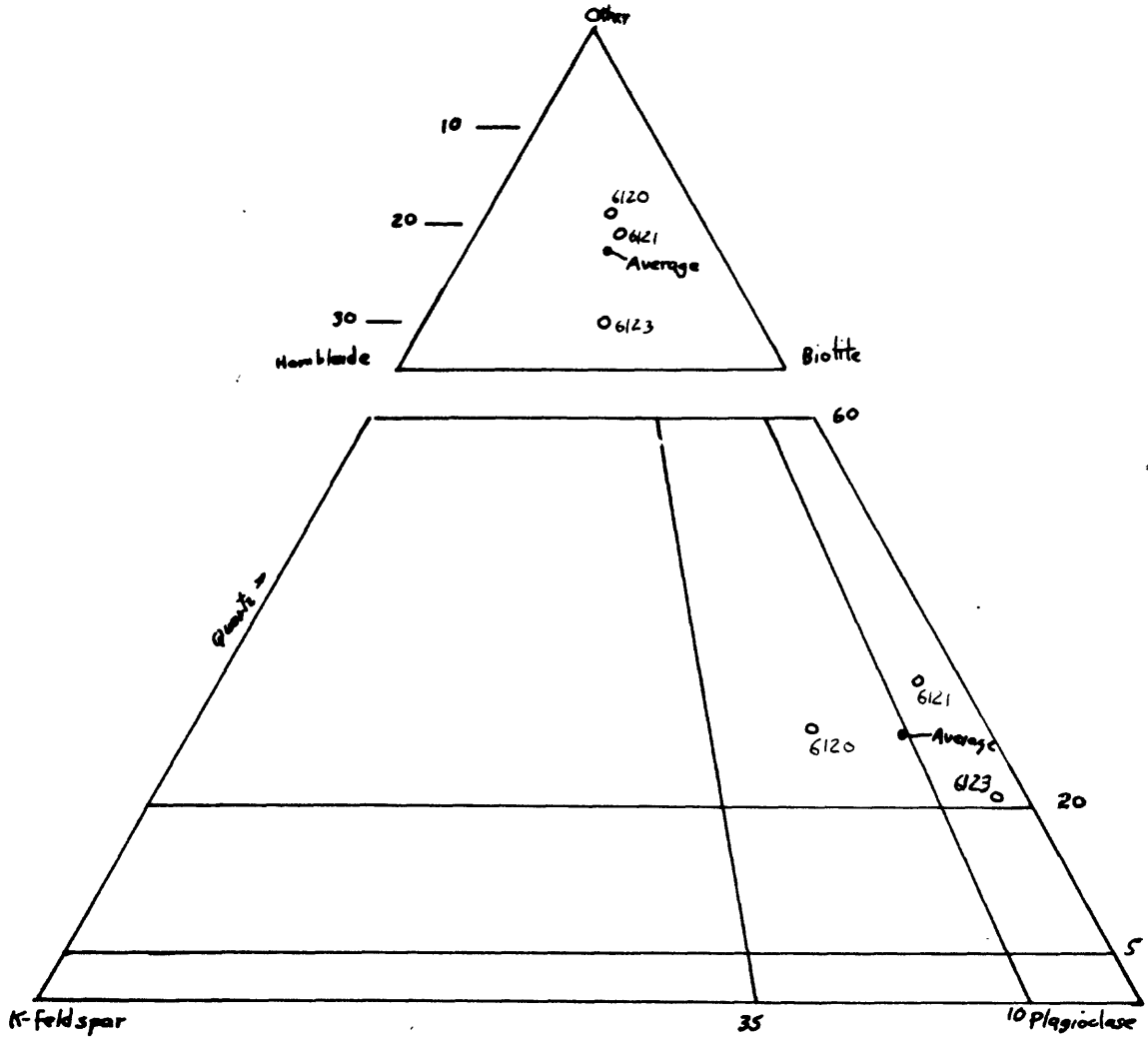
Location of modal samples of Tonalite of Woody

A215

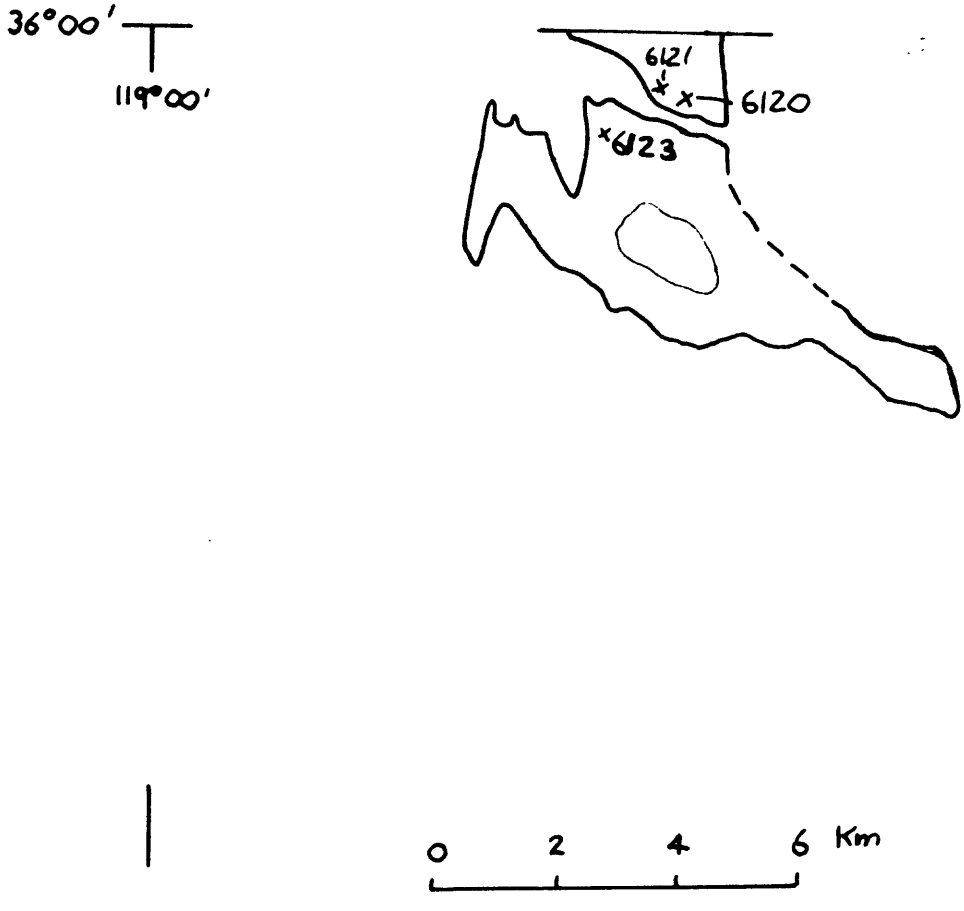

Tonalite of Woody
119° 30'

MODES OF TONALITE OF ZUMWALT RANCH

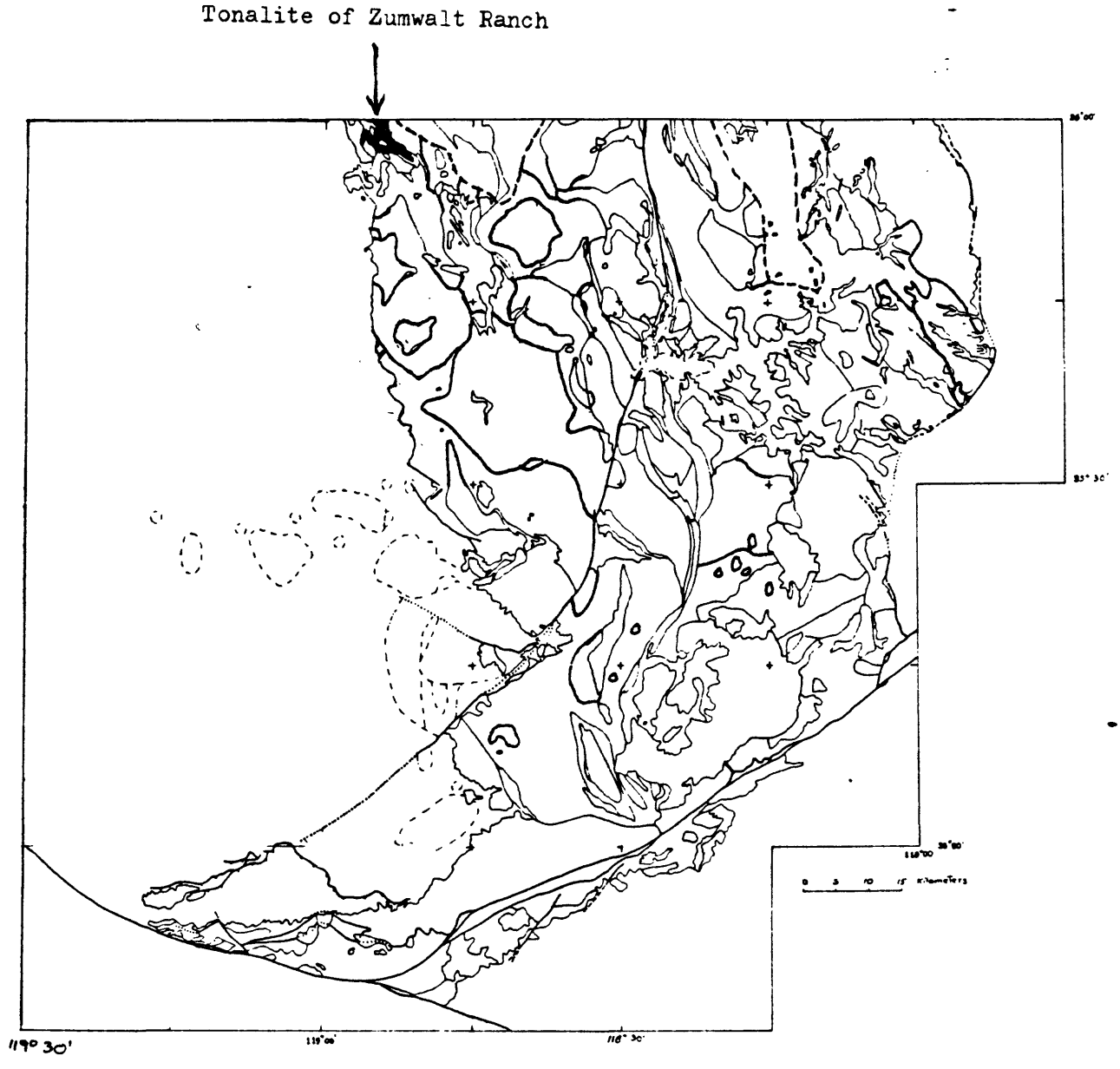
Sample number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende		Other	-
6120	45	13	23	11	8		Sph <1	
6121	50	3	26	13	8		Sph <1	
6123	53	2	15	16	14		Sph <1	(Epi?)
Average	49.5	6	21.5	13	10			
Standard deviation	4.0	6.1	5.7	2.5	3.5			



Modal plot of Tonalite of Zumwalt Ranch



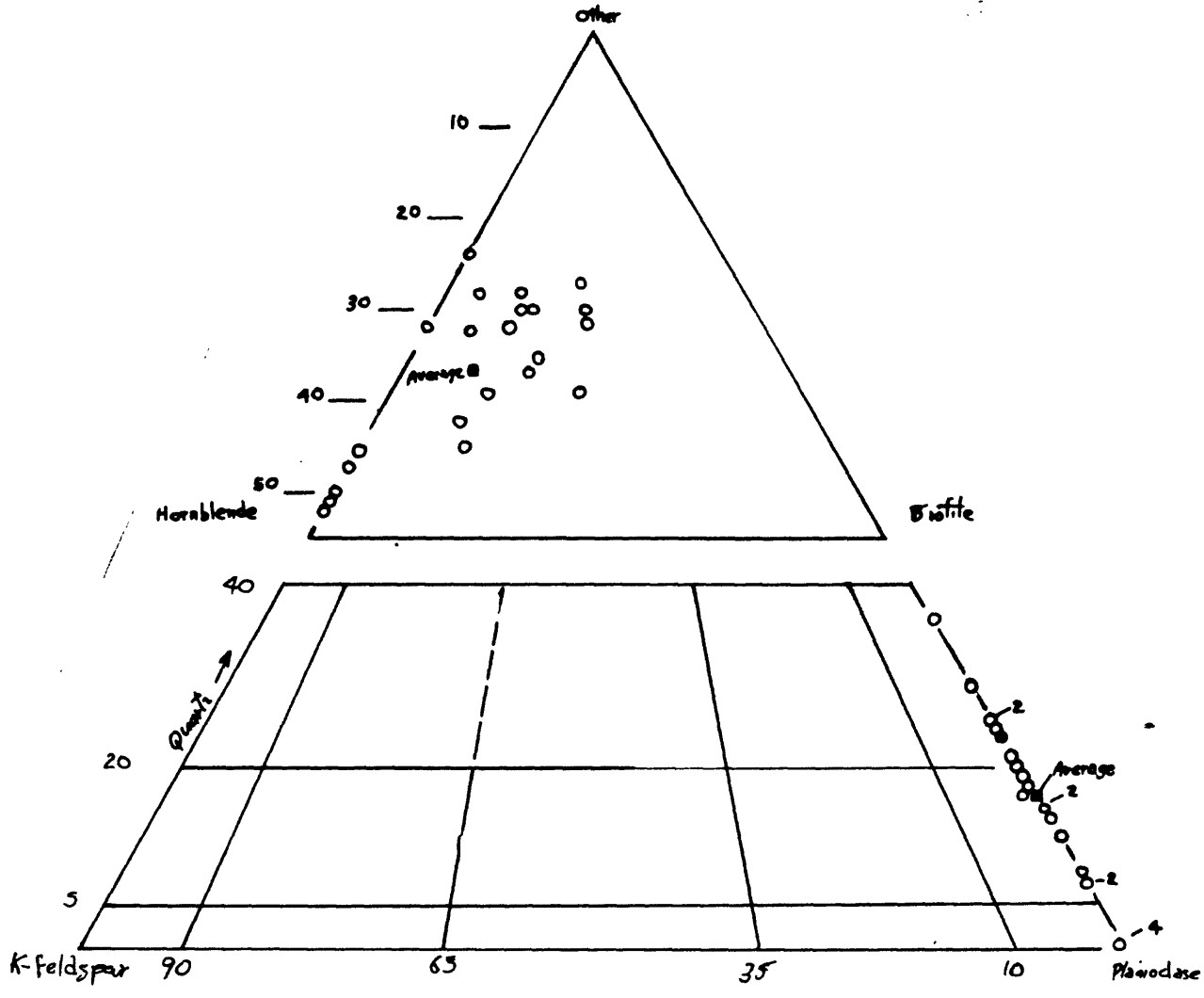
Location of modal samples of Tonalite of Zumwalt Ranch


Tonalite of Zumwalt Ranch
119° 30'
119° 00'
118° 30'

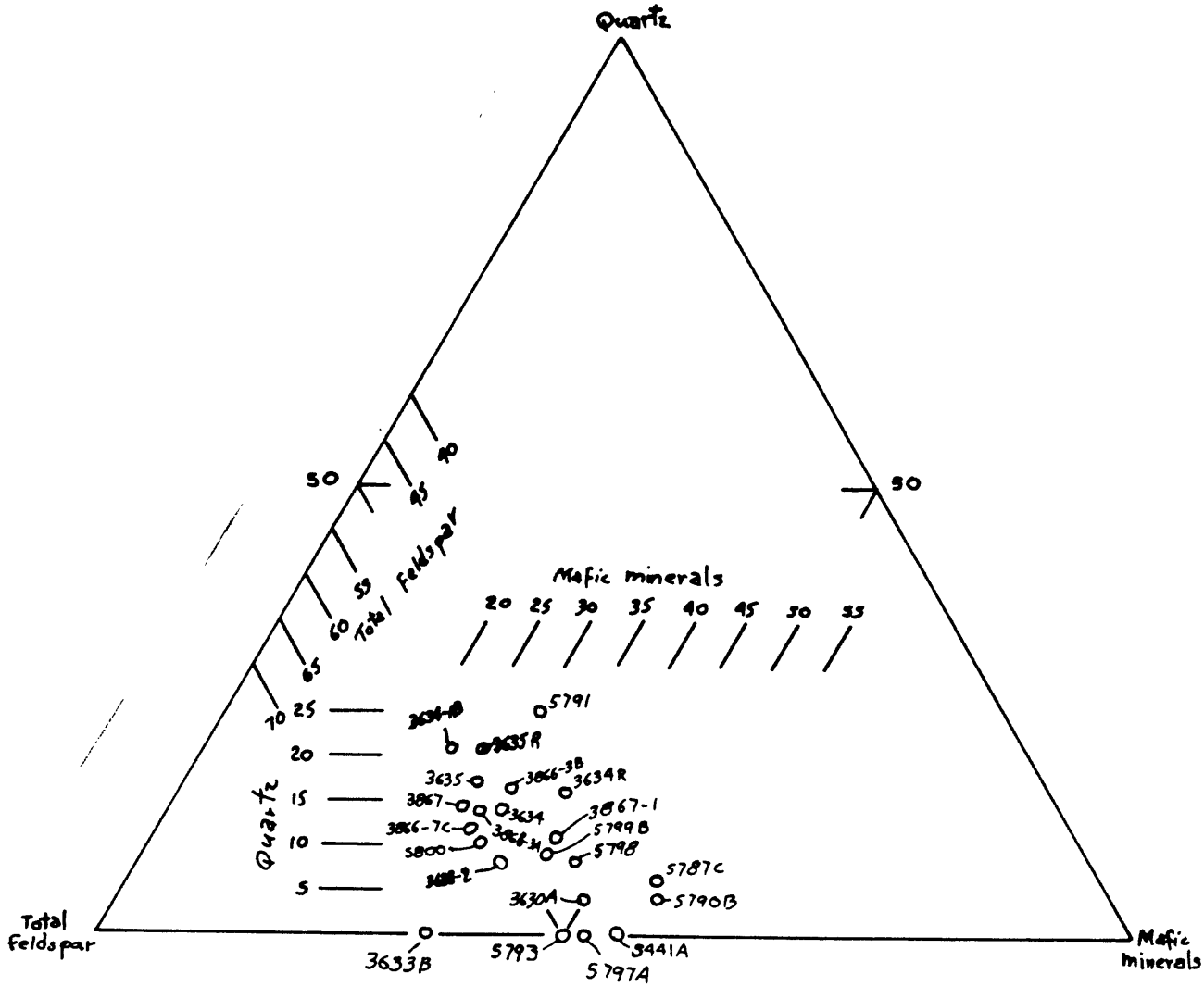
MODES OF QUARTZ DIORITE OF CALIENTE

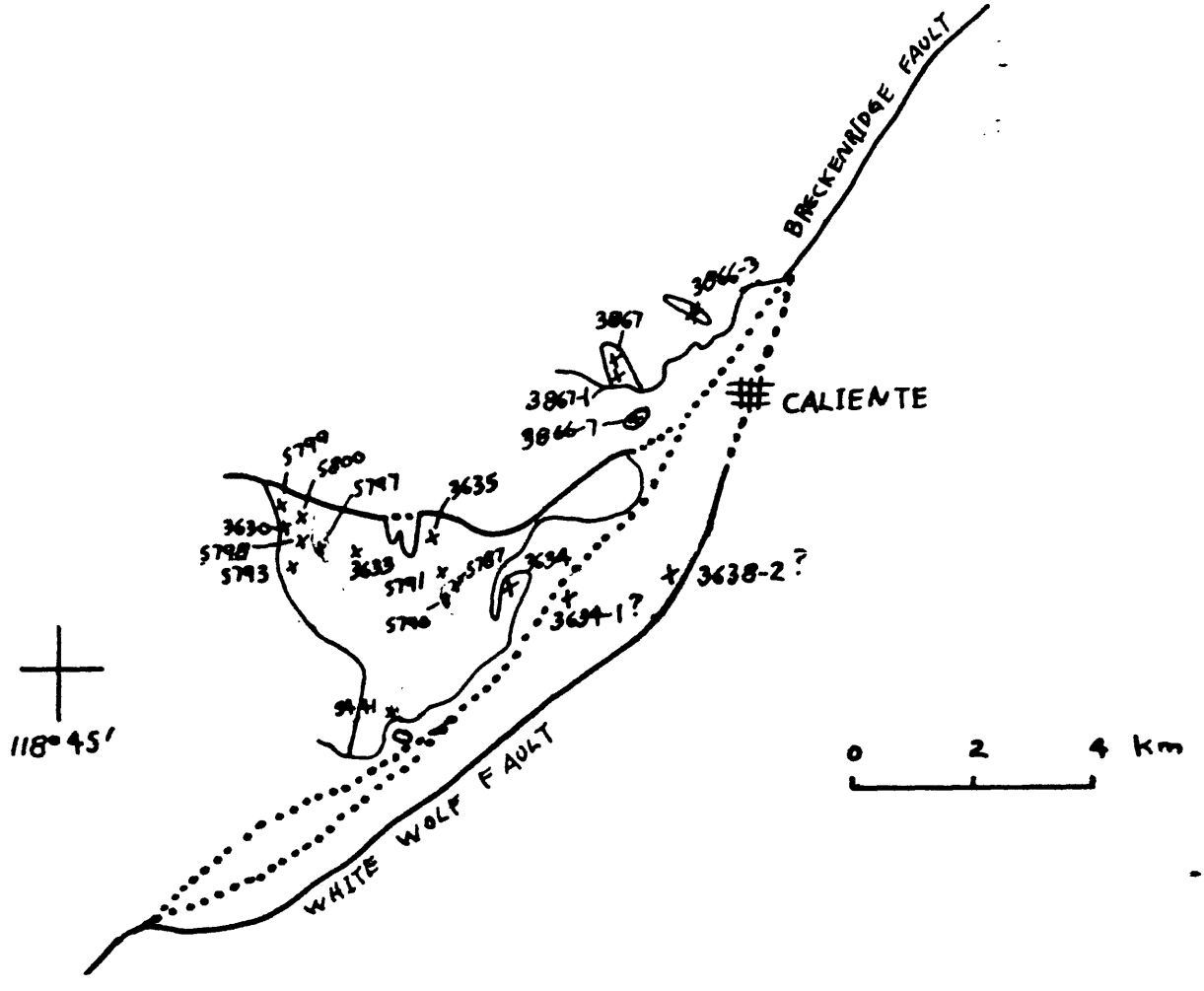
Sample Number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende		Other		Specific gravity
3630A	51	–	4	10	35				2.82
3633B	68	–	–	–	32	⊗			2.84
3634	54	–	14	8	24				2.77
3634R	47	–	16	12	25				–
3634-1B(?)	55	<1	21	–	24				–
3635	55	–	17	3	25				2.75
3635R	52	–	21	12	15				–
3638-2(?)	57	<1	8	12	23				–
3866-3A	56	–	14	14	16				2.72
3866-3B	52	–	16.5	15	16.5				2.75
3866-7C	57	1	12	8	22				2.75
3867	57	–	14	7	21				2.77
3867-1	50	–	11	18	21				2.81
5441A	50	–	–	–	50	⊗			–
5787A	43	–	6	–	51				–
5790B	44	–	4	–	52				–
5791	45	–	25	9	21				–
5793	55	–	–	–	45	⊗			
5797	53	–	–	–	47	⊗			
5798	50	–	8	8	34				
5799B	52	–	9	10	29				
5800	58	–	10	4	28				
Average	52.5	<1	10.5	7	30				
Standard deviation	5.5	–	7.4	5.8	11.9				

⊗ probably amphibolite derived from gabbro



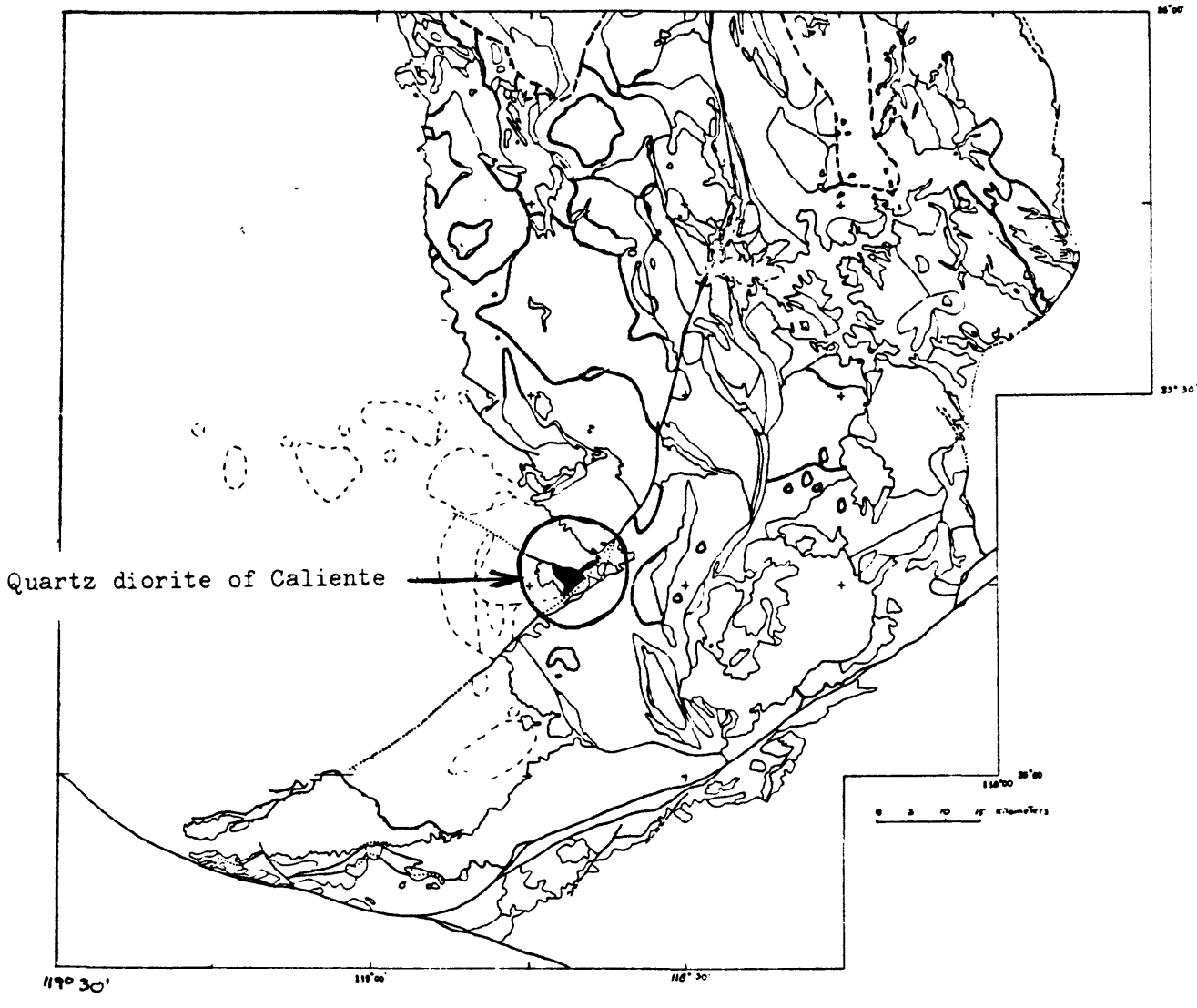
Modal plots of Quartz diorite of Caliente


Quartz
Total feldspar
Mafic minerals
Total Feldspar
Quartz
50
45
40
55
60
65
90
20 25 30 35 40 45 50 55
10 25
20
15
10
5
3635
3635R
3634R
3634
3867
3867-1
5799B
5798
5787C
5790B
3633B
5793
5797A
3441A
Total feldspar
Mafic minerals



The Quartz diorite of Caliente ranges widely from rocks composed solely of plagioclase and hornblende (almost surely derived from gabbro) to tonalitic rocks that are similar (possibly gradational) to the Tonalite of Bear Valley Springs.

Location of modal samples of Quartz diorite of Caliente


Quartz diorite of Caliente
119° 30'

MODES OF QUARTZ DIORITE OF CYRUS FLAT

Sample Number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Cpx	Opx	other	Specific gravity
4758A	41	–	–	–	19	37	–	Opaque 1 Sphene 2	–
4759	39.5	15	15	20.5	3	4	2	Opaque 1	–
4840	64	5	10	14	7	–	–	–	2.72
4850	61	2	16	11.5	9.5	–	–	–	2.74
4850-1	63	2	17	10	8	–	–	–	2.75
4865A	53	–	9	18	20	–	–	Sph.+Op. <1	2.76
4897A	80	–	–	1.5	17.5	–	–	Opaque 1	–
4897B	76	3	3	1	13	3.5	–	Opaque 0.5	–
4898A	59	2	15	18	6	5	4	Opaque 1	–
4899	46	10	15	14	Tr.	10	3	Opaque 2	–
4904A	56	15	10	7.5	1	6	3	Opaque 1.5	–
4905	59	10	11	7.5	5	1.5	5	Opaque 1	–
4920	61	2	10	16.5	1	6	2.5	Opaque 1	–
4922	50	1	18	20	10	1	–	Opaque <1	–
4923	57	–	5	19	19	–	–	–	2.79
4926	57	10	10	10	2	5	5	Opaque 1	–
4930	55	8	18	12	7	–	–	–	2.71
4938	55	5	14.5	14.5	11	–	–	–	2.76
Average	57	5	11	12	9	4	1	1	–
Standard deviation	(10.2)	(5.1)	(5.8)	(6.5)	(6.6)	(8.7)	(1.9)	–	–

MODES OF UNIT "B" OF FOX (1981) [1]

Sample number	Plag.	K-feld	Quartz	Biot.	Hbnd	cpx	opx	Apatite	Opaque	Sphene
IS-627	40	-	12	26	21	-	-	-	1	-
IS-628	35	-	12	22	26	2	3	-	-	-
IS-632	47	2	13	23	12	-	2	1	-	-
IS-636	39	3	16	25	13	-	1	1	1	1
IS-641	45	2	21	23	8	-	-	-	-	1
IS-642	49	1	11	25	9	4	-	-	1	-
Is-643	65	-	7	11	2	7	5	1	2	-
IS-644	55	2	7	17	-	6	13	-	-	-
IS-646	44	17	13	13	4	-	6	1	2	-
IS-647	50	7	10	16	13	-	3	-	1	-
IS-651	48	<1	9	23	19	-	-	1	-	-
IS-723A	46	13	16	12	13	-	-	-	-	-
IS-725	49	<1	22	17	10	-	-	-	-	2
IS-734	45	<1	8	24	21	-	-	-	1	1
Is-A18	59	3	13	15	8	-	-	-	2	-
Average	48	3	13	20	12	1	2	<1	1	<1

[1] Fox (1981) recognized two distinct units, on the basis of petrography and chemistry, in the Quartz diorite of Cyrus Flat. Unit "A" on the west side of the body, essentially leucocratic gabbro to gabbro norite, was distinguished from Unit "B", which constitutes the great bulk of the Quartz diorite of Cyrus Flat.

MODES OF UNIT "A" OF FOX (1981)

Sample number	Plag	K-feld.	Quart.	Biot [2]	Hbld	cpx	opx	Apatite	Opaque
IS-624	43	-	-	12	40	5	-		<1
IS-630 [3]	34	-	2	27	35	-	-	<1	2
IS-631	47	-	-	7	37	4	-	1	4
IS-654	53	-	-	8	33	-	6	<1	<1
IS-655	51	-	-	8	35	-	2	1	3
IS-658	63	-	-	6	25	2	2	-	2
IS-660	57	<1	<1	2	28	6	1	-	6
Average	50	<1	<1	10	33	2.5	2	<1	2.5

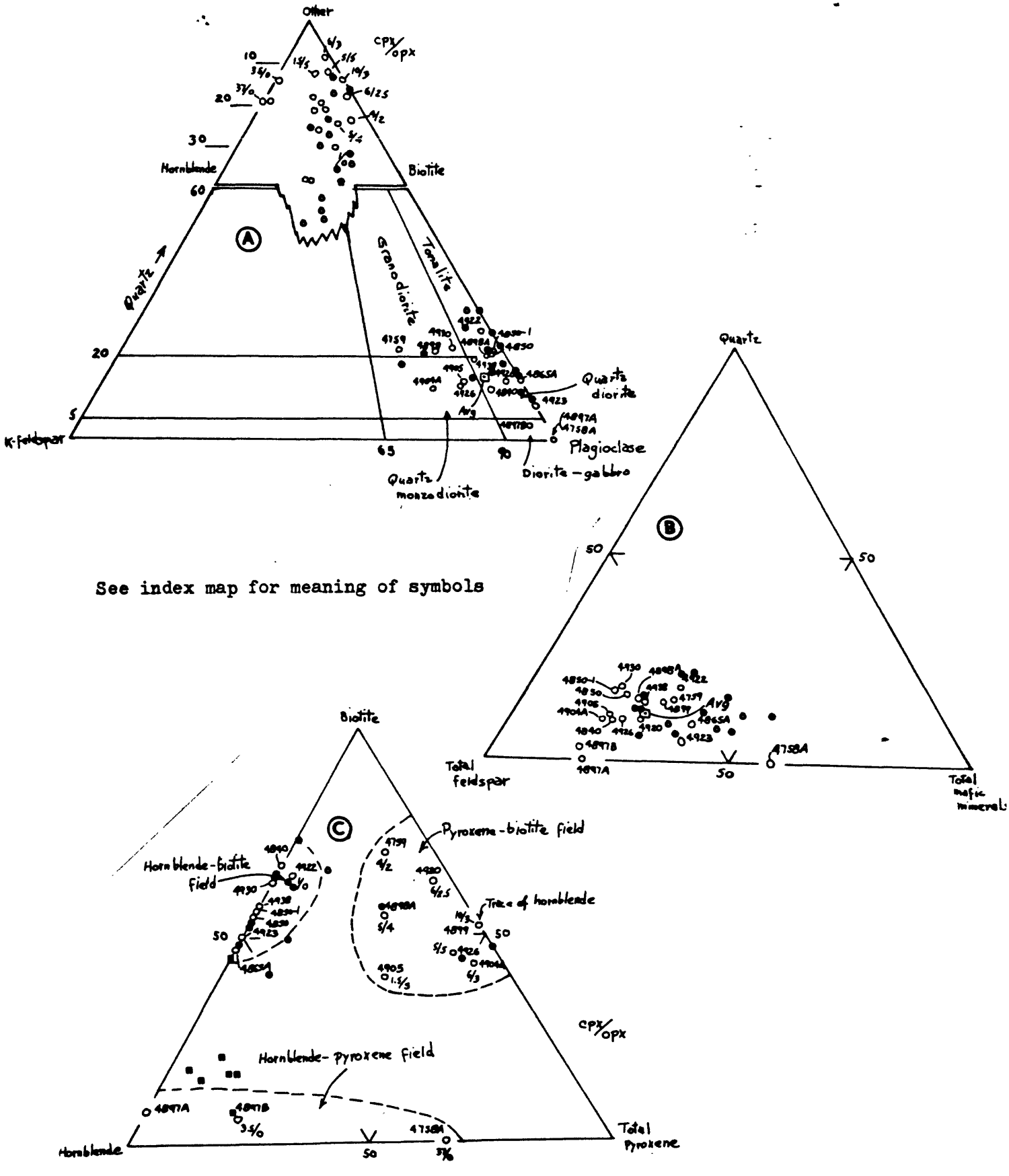
[1] Modes based on 500 counts on each of two thin sections per sample

[2] Chlorite in samples (from 2 to 11 percent); lumped here with biotite from which it is presumably derived

[3] Triangular plots suggest possible affinity with Unit "B" (abundant biotite and presence of quartz)

PARTIAL MODES OF L. G. COLLINS SAMPLES

Sample number	Biotite	Hornblende	CPX	Collins name
LGC-12	1	-	26	gabbro
LGC-13	1	10	21	gabbro
LGC-14	9	-	18	quartz gabbro
LGC-15	13	30	-	quartz diorite
LGC-16	15	24	-	"
LGC-19	20	5	-	"
LGC-20	18	23	-	"
LGC-21	19	10	-	"
LGC-22	11	4	-	quartz monzonite
LGC-24	18	30	-	quartz diorite

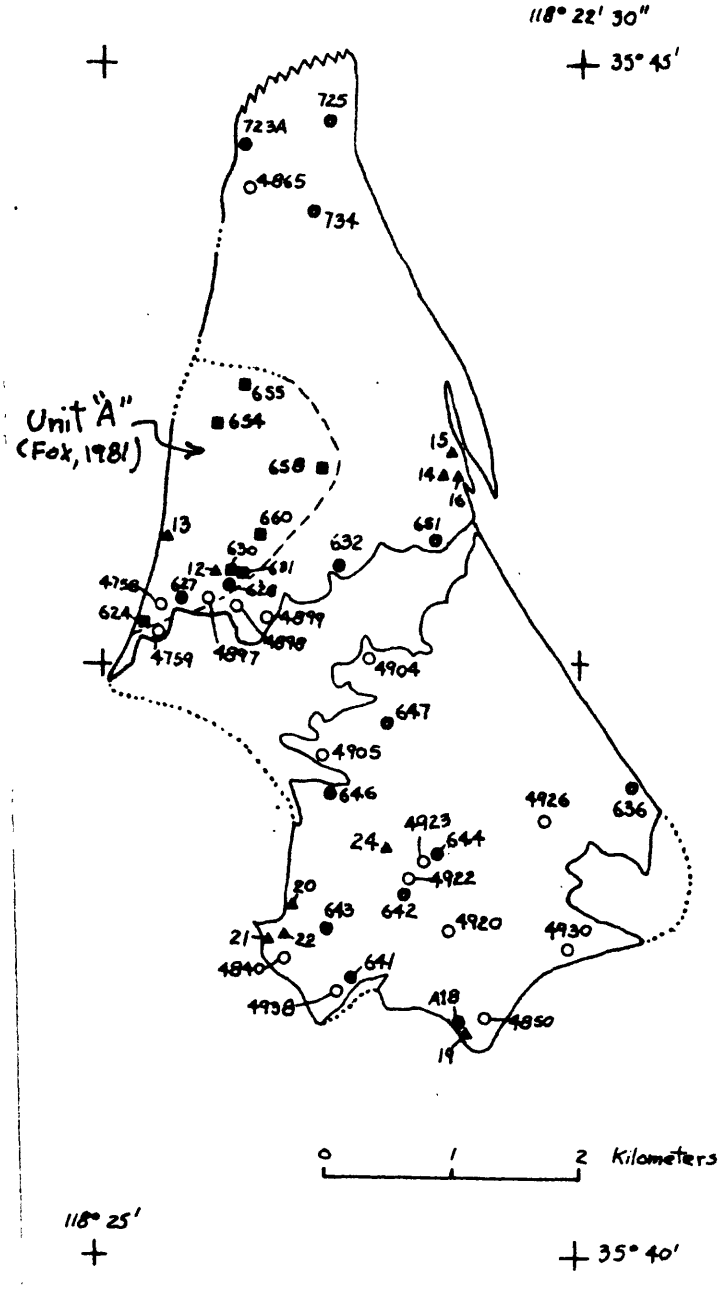


See index map for meaning of symbols

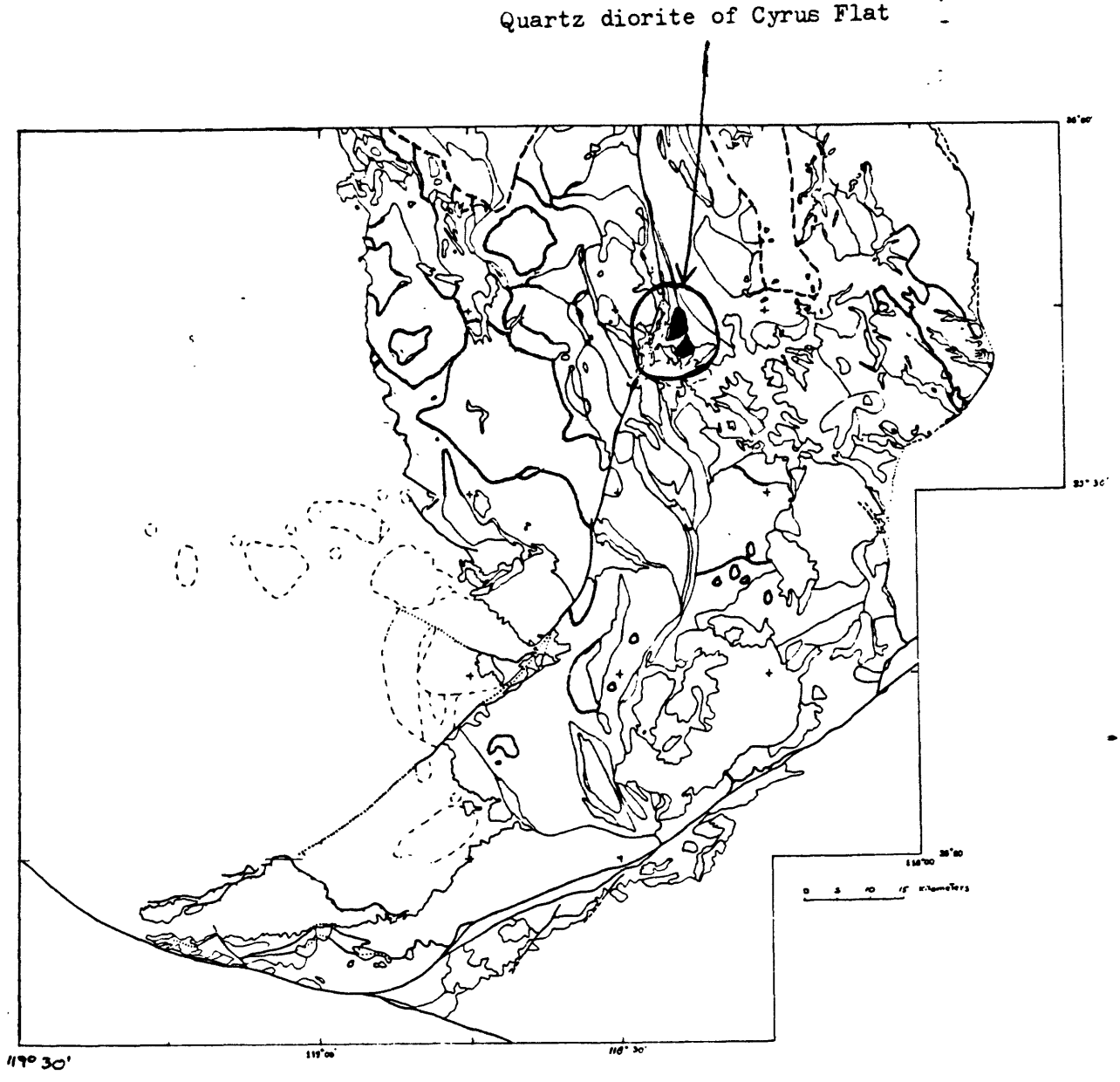
Modal plots of Quartz diorite of Cyrus Flat

Modes

- ○ Ross samples
- ■ Samples of unit "A" (Fox, 1981)
- ● Samples of unit "B" (Fox, 1981)
- ▲ Samples of L.G. Collins (written commun., 1983)



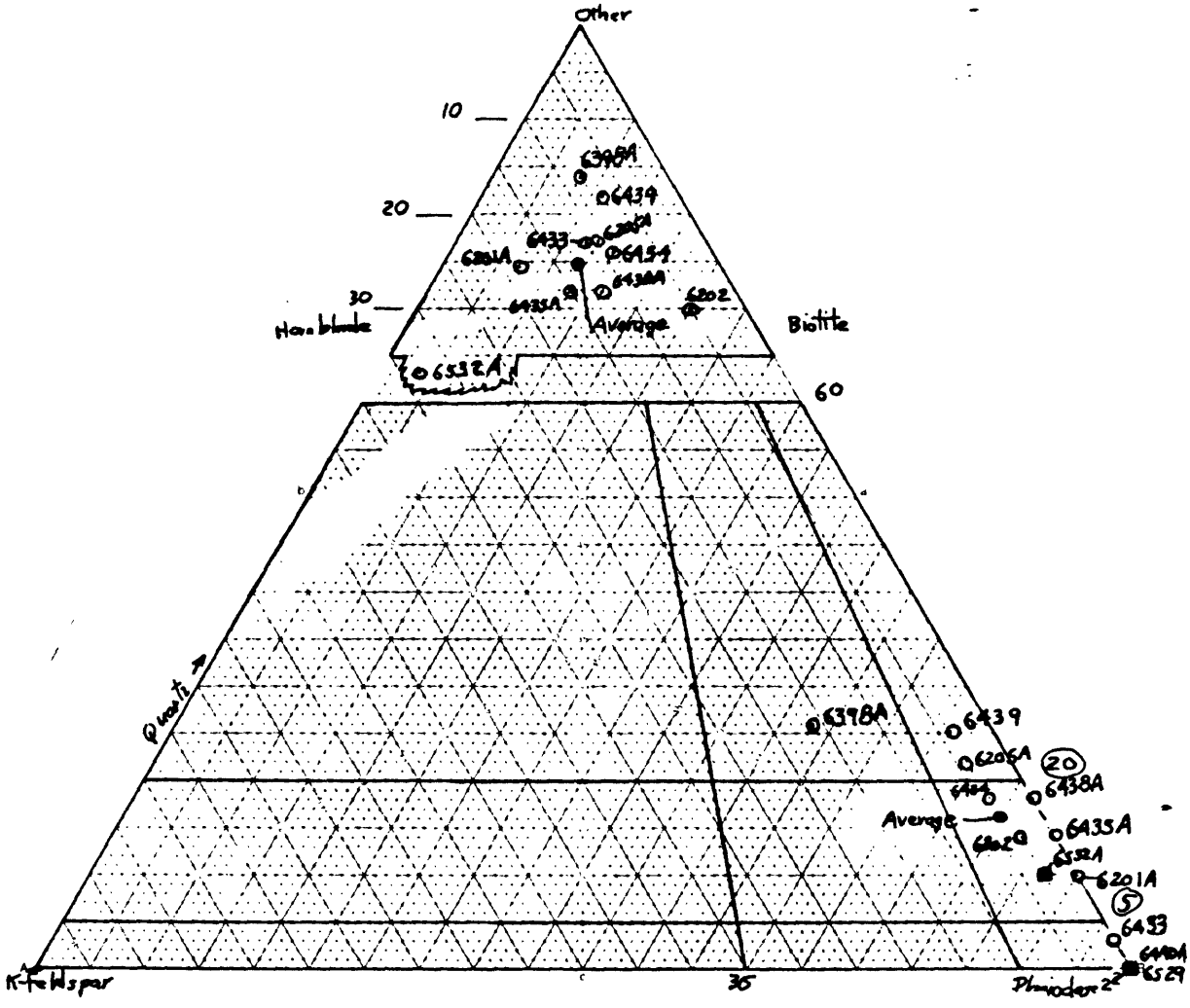
Location of modal samples of Quartz diorite of Cyrus Flat


Quartz diorite of Cyrus Flat
119° 30'
118° 30'

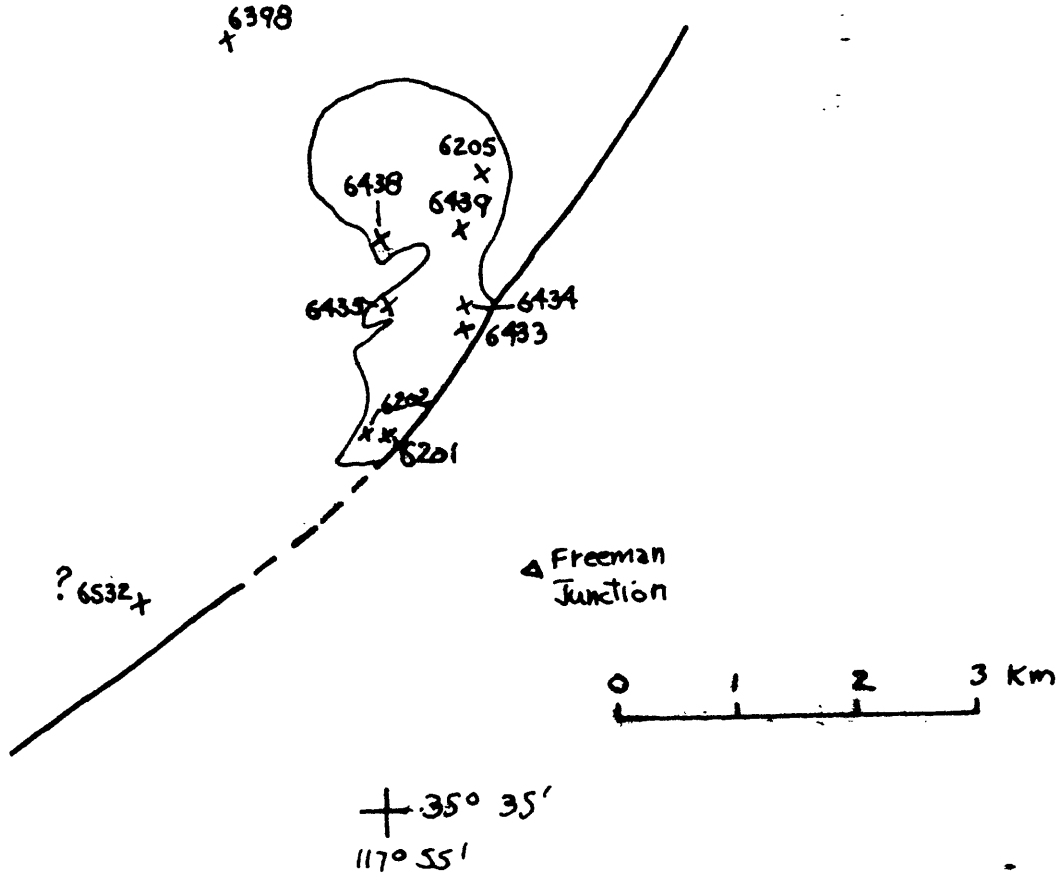
MODES OF QUARTZ DIORITE OF FREEMAN JUNCTION

Sample Number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende		Other
⊛ 6201A	66	-	7	7	18.5		Opaque 1.5
6202	58	2	10	25(?)	5(?)		
⊛ 6205A	57	3	17	13	10		
6398A	49	13	22	8	8		
⊛ 6433	74	-	2	12	11		Opaque 1
⊛ 6434	59	3	14	15	9		
6435A	61	-	10	13	15		Opaque 1
6438A	59	-	13	16	12		
⊛ 6439	58	3	21	11	7		
6532A	55	2	6	4	33		Sphene <1
Average	60	3	12	12	13		<1
s.d.	6.6	3.9	6.5	5.8	8.1		-

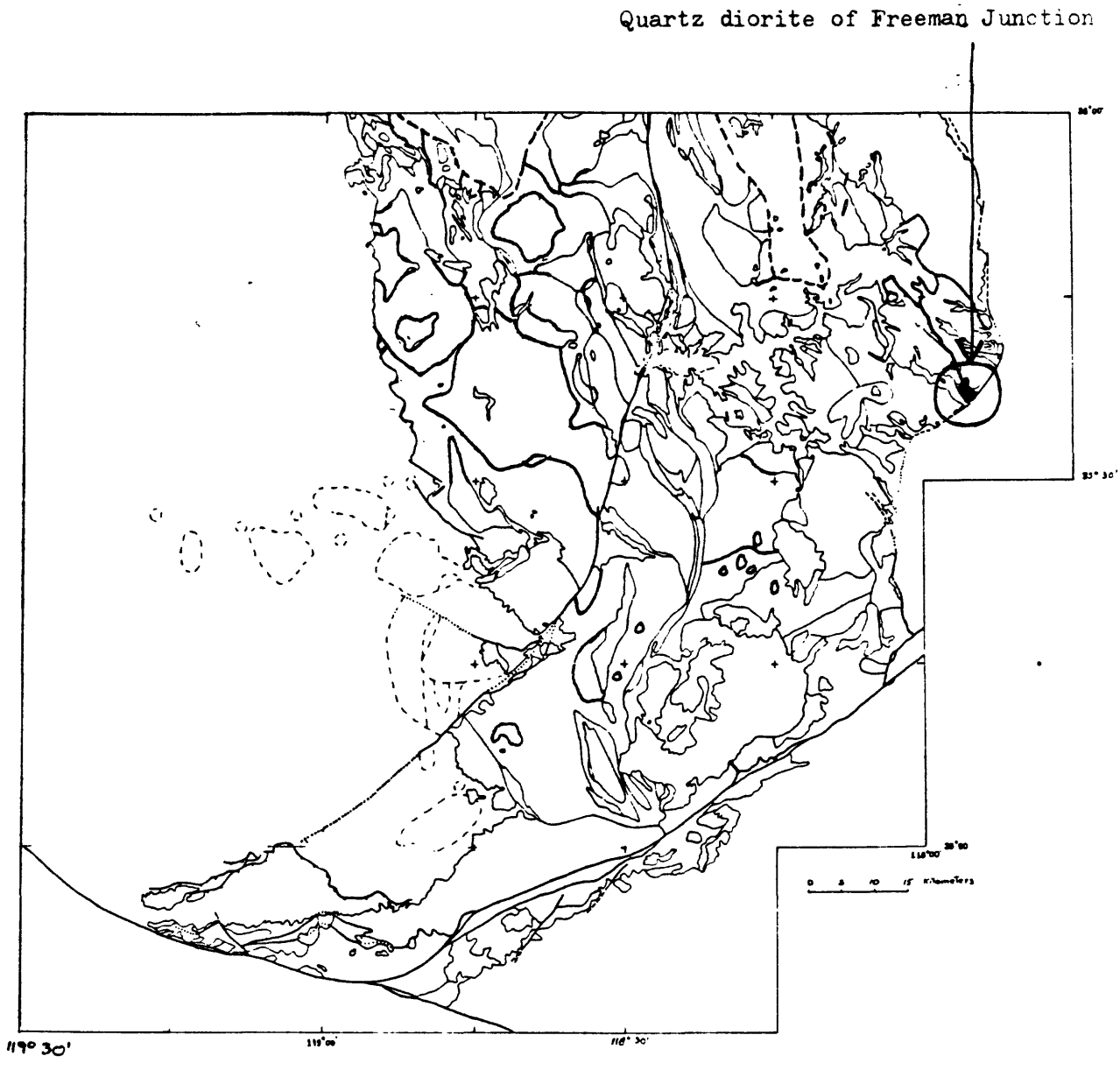
⊛ Texture somewhat similar to Walker Pass body



Modal plot of Quartz diorite of Freeman Junction



Location of modal samples of Quartz diorite of Freeman Junction



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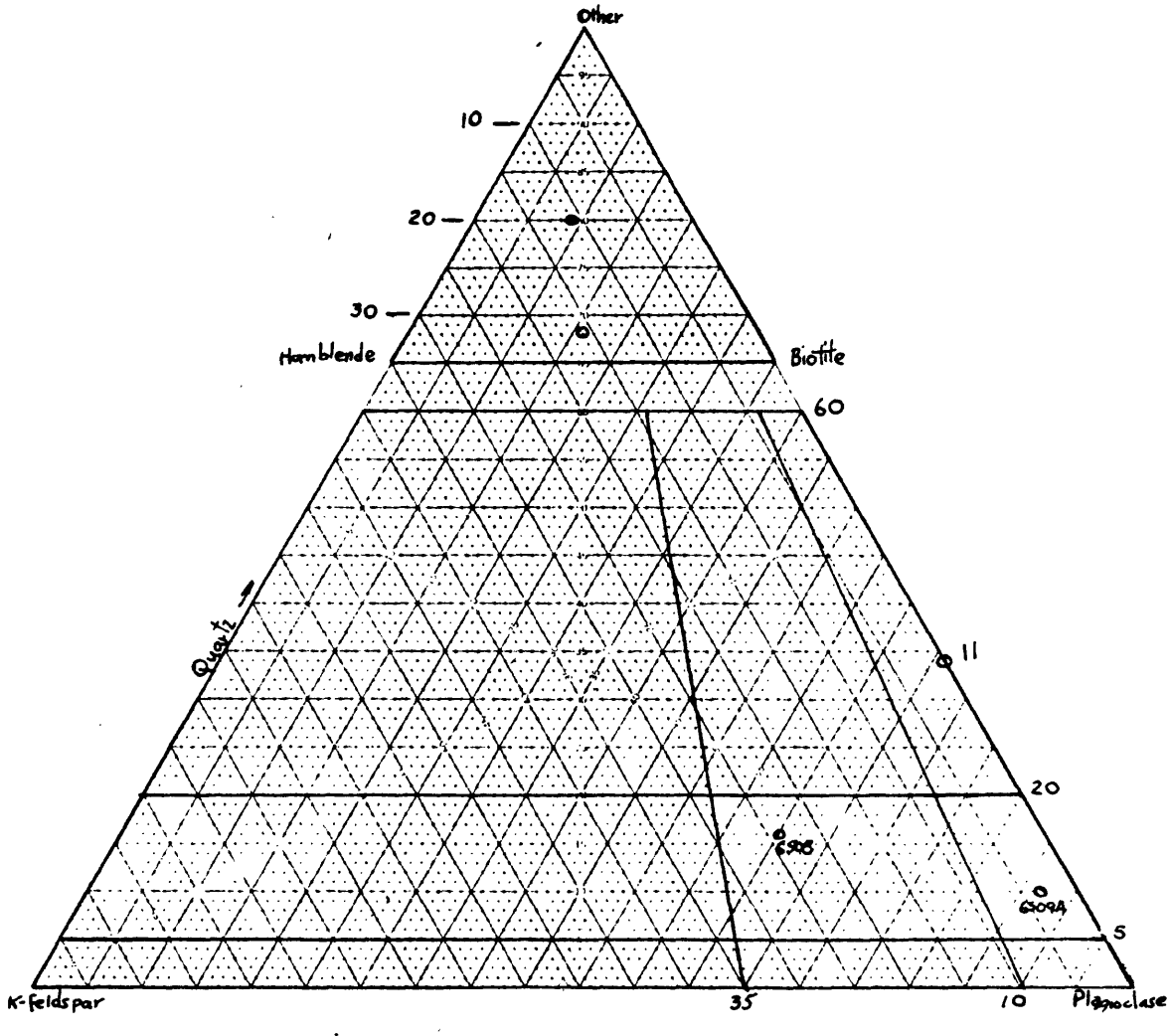
MODES OF QUARTZ DIORITE OF LONG VALLEY

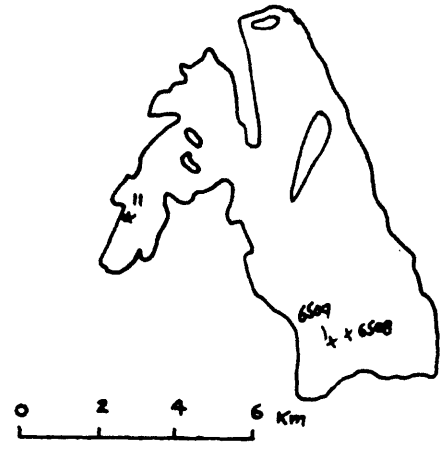
Sample number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Sphene	Opaques
6508	48	19	13	9	11	<1	<1
6509A	59	2	7	16	16		<1
11	23	-	12	65			

(Bergquist and Mitchell, 1982)



Modal plot of Quartz diorite of Long Valley

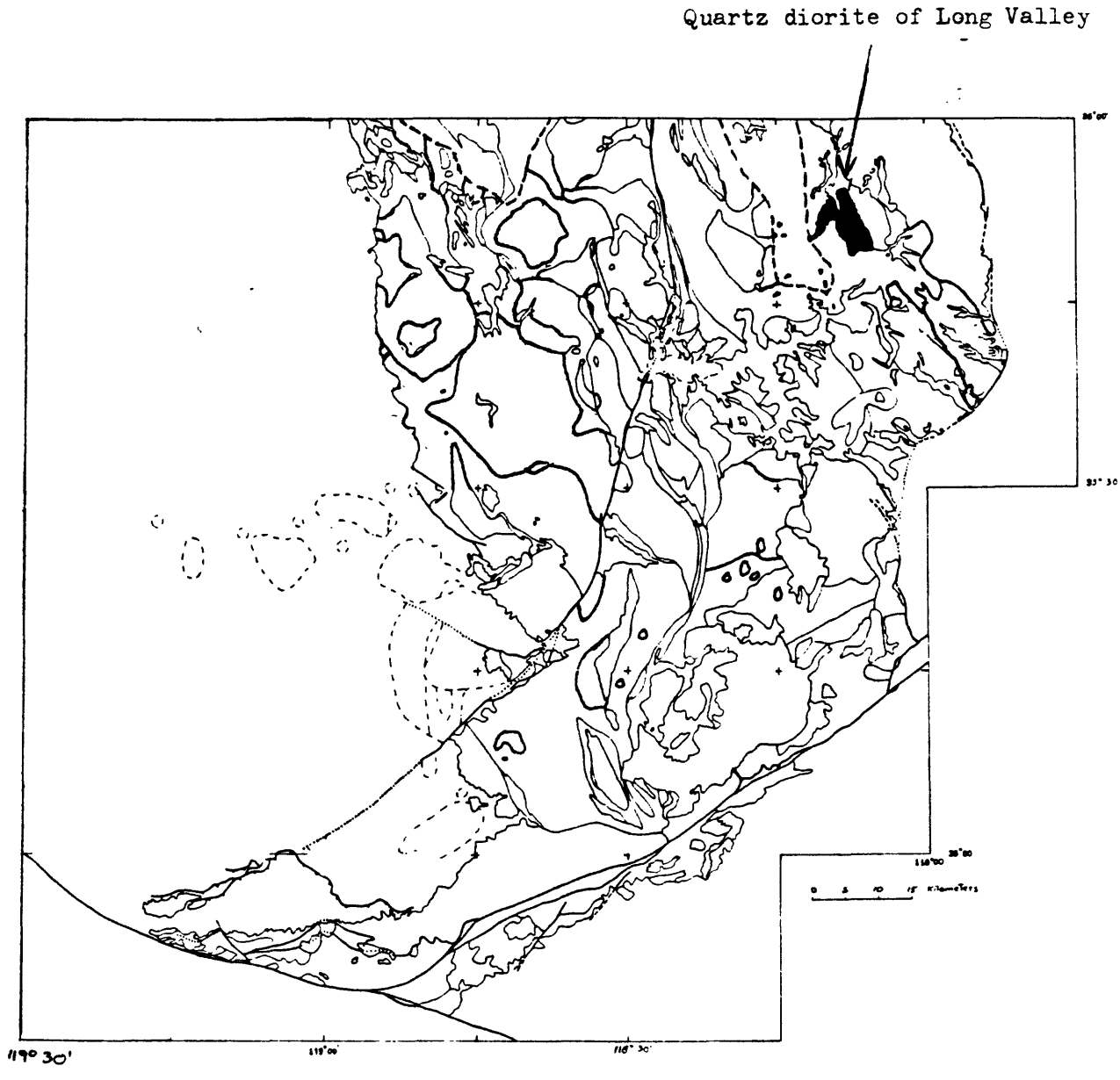
$^{87}Sr/^{86}Sr$ ratio much lower than the Granodiorite of Sacatar to the east, which it in part resembles physically. Some resemblance physically and isotopically to the Quartz diorite of Freeman Junction.



118°15'
35°45'

Location of modal samples of Quartz diorite of Long Valley

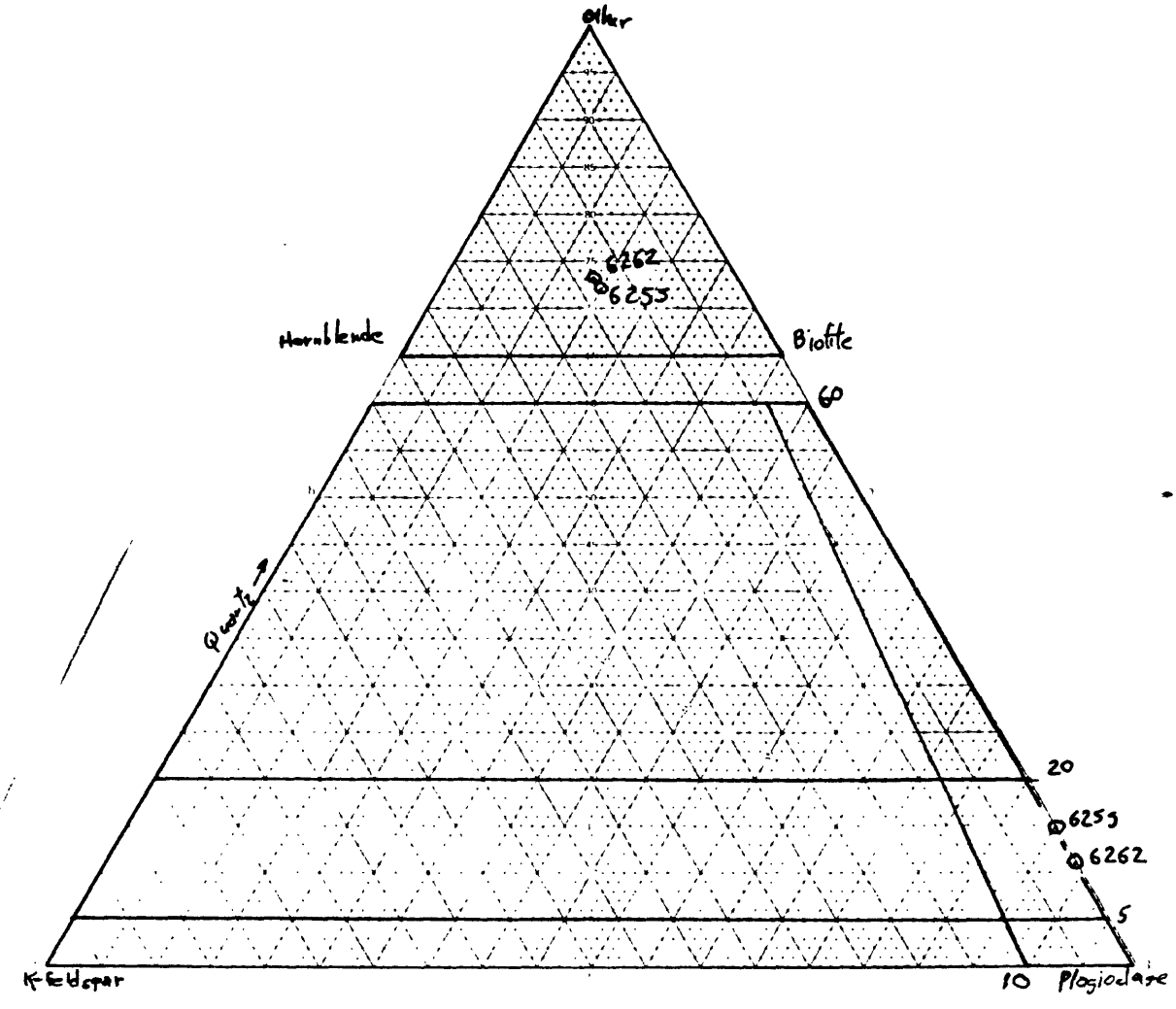
A237



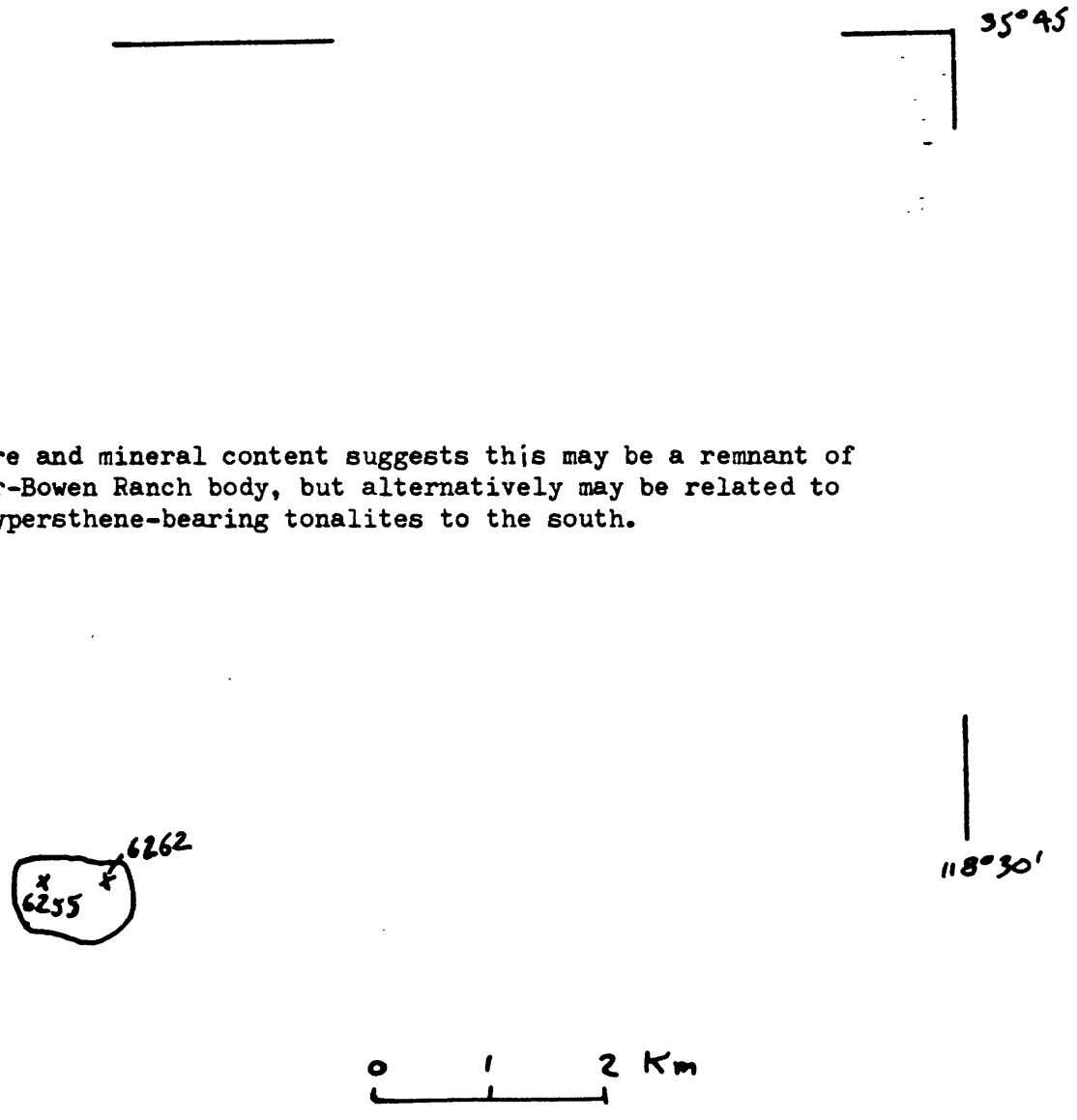
A238

MODES OF QUARTZ DIORITE OF RHYMES CAMPGROUND

Sample Number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	-	Other
6255	61	-	11	15	13		opx<1
6262	55	-	8	14	13		opx<1



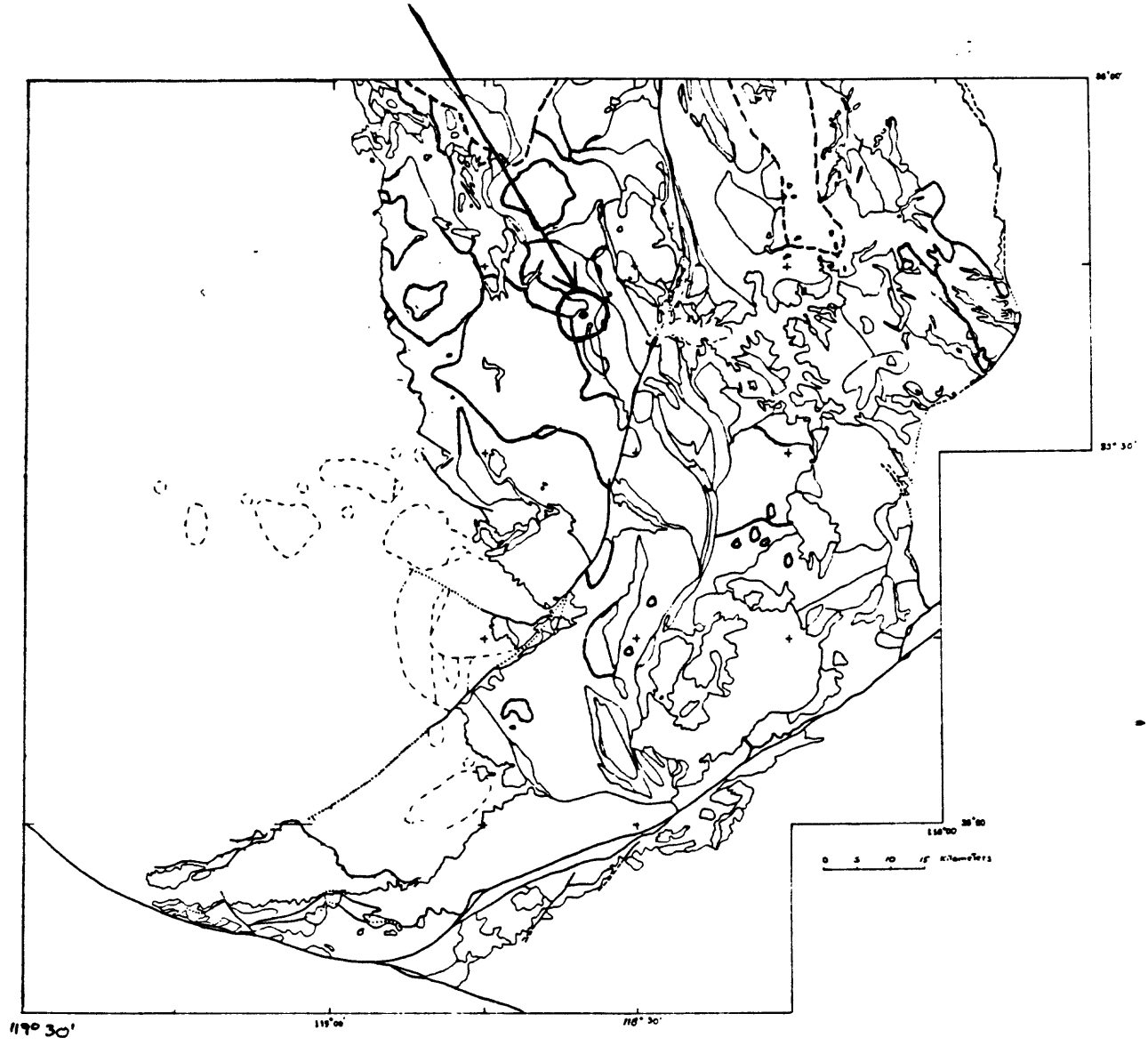
Modal plot of Quartz diorite of Rhymes Campground



Texture and mineral content suggests this may be a remnant of Carver-Bowen Ranch body, but alternatively may be related to the hypersthene-bearing tonalites to the south.

Location of modal samples of Quartz diorite of Rhymes Campground

Quartz diorite of Rhymes Campground



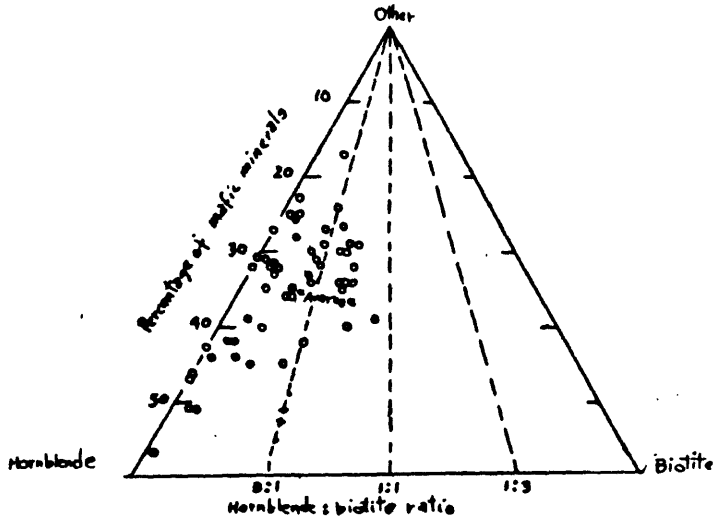
A241

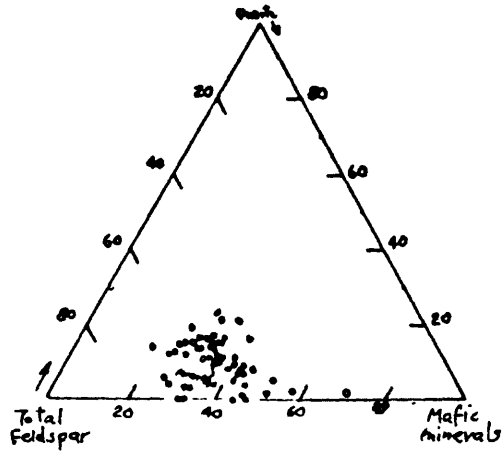
MODES OF QUARTZ DIORITE OF THE TEHACHAPI MOUNTAINS
(not a map unit)

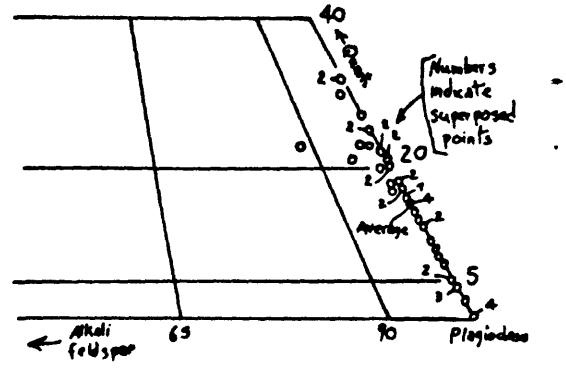
[All modes in volume percent; n.d., not determined. Others: G, garnet; O, opaque minerals]

Sample	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende	Others	Specific gravity
3097	53	---	8	3	36	---	2.85
3098A	47	---	8	6	39	---	2.86
3098B	44	---	5	3	48	---	2.87
3100	50	---	7	---	43	---	2.89
3246	53	---	11	6	30	---	2.84
3252	48	[1]1	21	10(?)	20(?)	---	2.76
3254A	50	---	8	2	40	---	2.85
3266B	49	---	9	2	40	---	2.90
3266-1	53	---	<1	---	47	---	2.84
3268	53	---	1	1	43	2(O)	2.89
3270	56	---	<1	[2]4	40	---	2.89
3276	69	---	4	---	[3]27	---	2.79
3283	62	[1]1	13	6	18	---	2.81
3285A	65	---	3	3	29	---	2.86
3285B	66	---	3	1	30	---	2.85
3304A	55	---	10	3	32	---	2.85
3333	55	[1]1	12	2	30	---	2.79
3345	41	---	2	1	56	---	3.02
3359A	56	---	19	2	[4]23	---	2.79
3360A	69	---	---	---	31	---	2.84
3400B	60	<1	15	[2]1	24	---	2.81
3407A	69	---	6	1	24	---	2.81
3419A	68	---	14	3	14	---	2.75
3430	50	<1	16	12	22	---	2.83
3431	52	---	15	7	26	---	2.79
3432A	52	---	17	7	24	---	2.81
3435A	56	[1]<1	11	3	30	---	2.82
3439A	47	---	2	2	[5]49	---	2.85
3442	53	---	15	3	[6]29	---	2.81
3448A	57	---	14	11	18	---	2.76
3552A	51	---	7	11	31	---	2.83
3572A	54	<1	14	12	20	---	2.78
3605	55	[1]3	15	6	21	---	2.76
3651	60	---	10	10	20	---	n.d.
3709	44	---	16	15	25	---	2.80
3710	44	---	21	12	23	---	2.80
3729	54	---	10	6	30	---	2.83
3730A	50	1	15	13	21	---	2.82
3777	56	---	10	12	22	---	2.83
3793	48	---	23	10	19	---	2.76
3895B	48	---	5	---	47	---	2.80
3899A	57.5	---	11	8	18.5	5(G)	2.81
3950	54	---	12	8	26	---	2.79
4009	51	---	9	5(?)	35	---	2.84
4045A	48	6	16	6	24	---	2.73
4192A	65	---	12	1	22	---	2.77
Average-------	54.5	<1	10.5	5.5	29.5	---	2.82
Standard deviation.	7.0	-	5.9	4.3	9.6	---	.05

[1]Late veinlets.
Chlorite.
[3]Includes epidote.
[4]Some colorless to pale.
[5]Brown and pale actinolite.
[6]Minor clinopyroxene and actinolite.

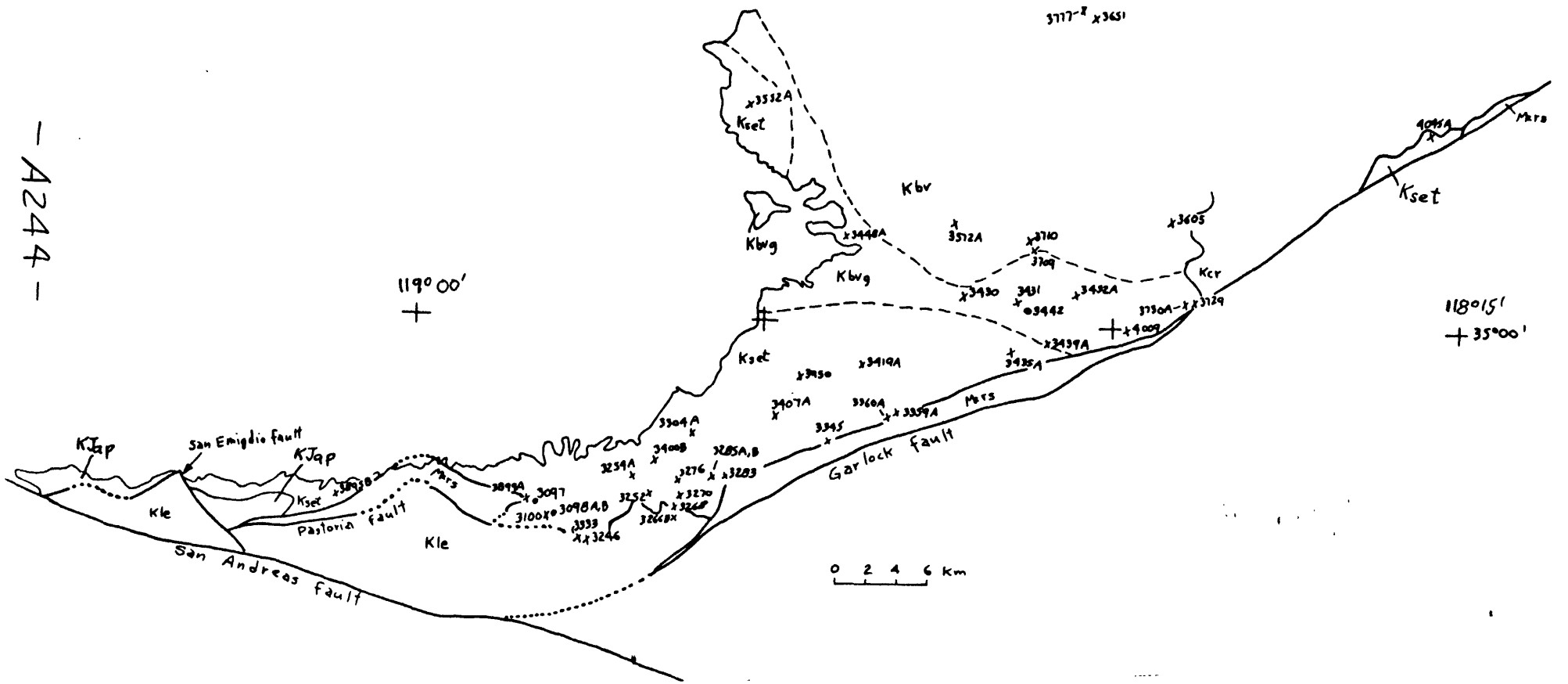






Modal plots of Quartz diorite of the Tehachapi Mountains

Relatively homogeneous samples chiefly from the gneiss complex and the mixed zone between the gneiss complex and the tonalite of Bear Valley Springs. Characterized by hornblende much in excess of biotite; some samples are probably amphibolite.

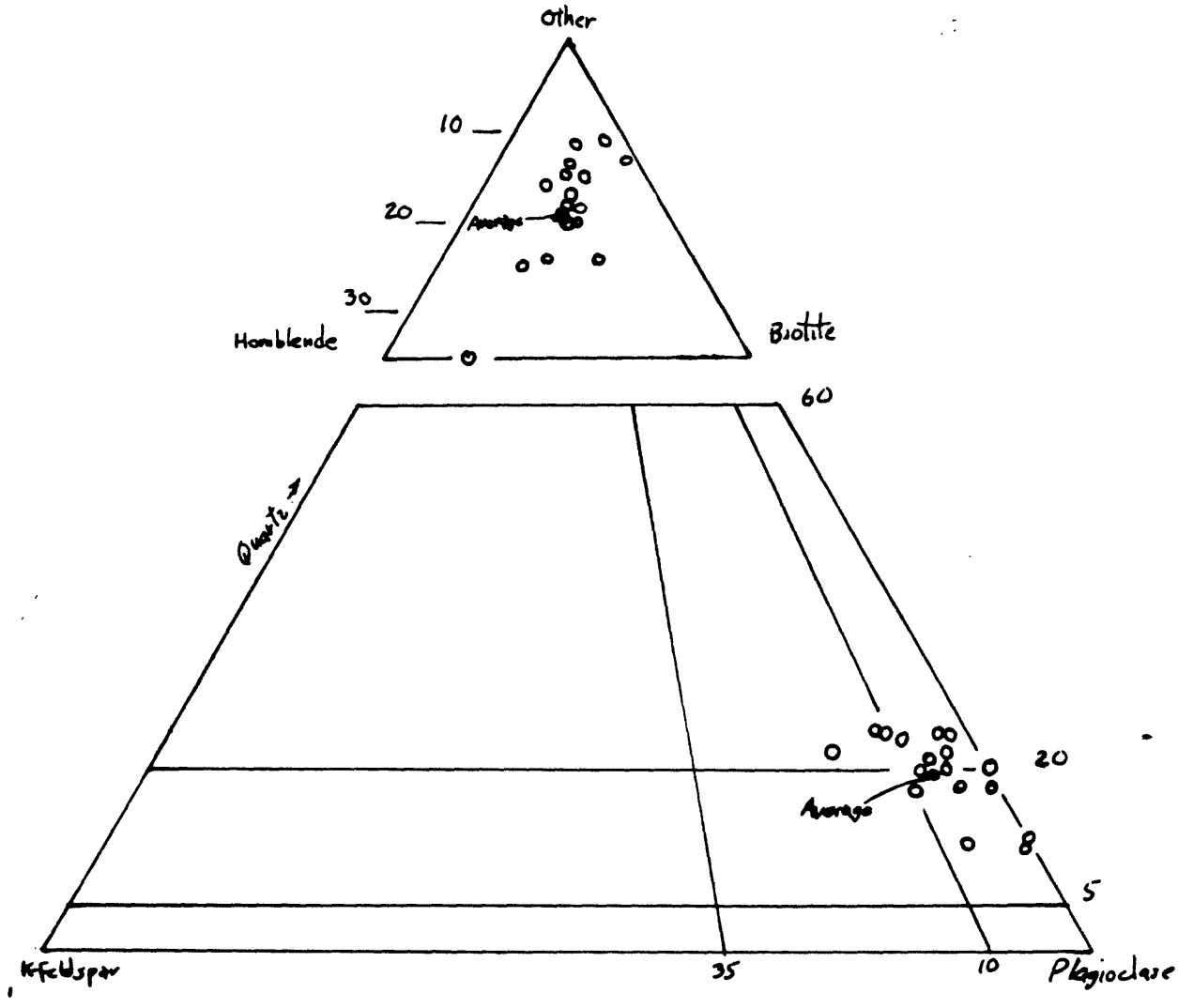


34°45'

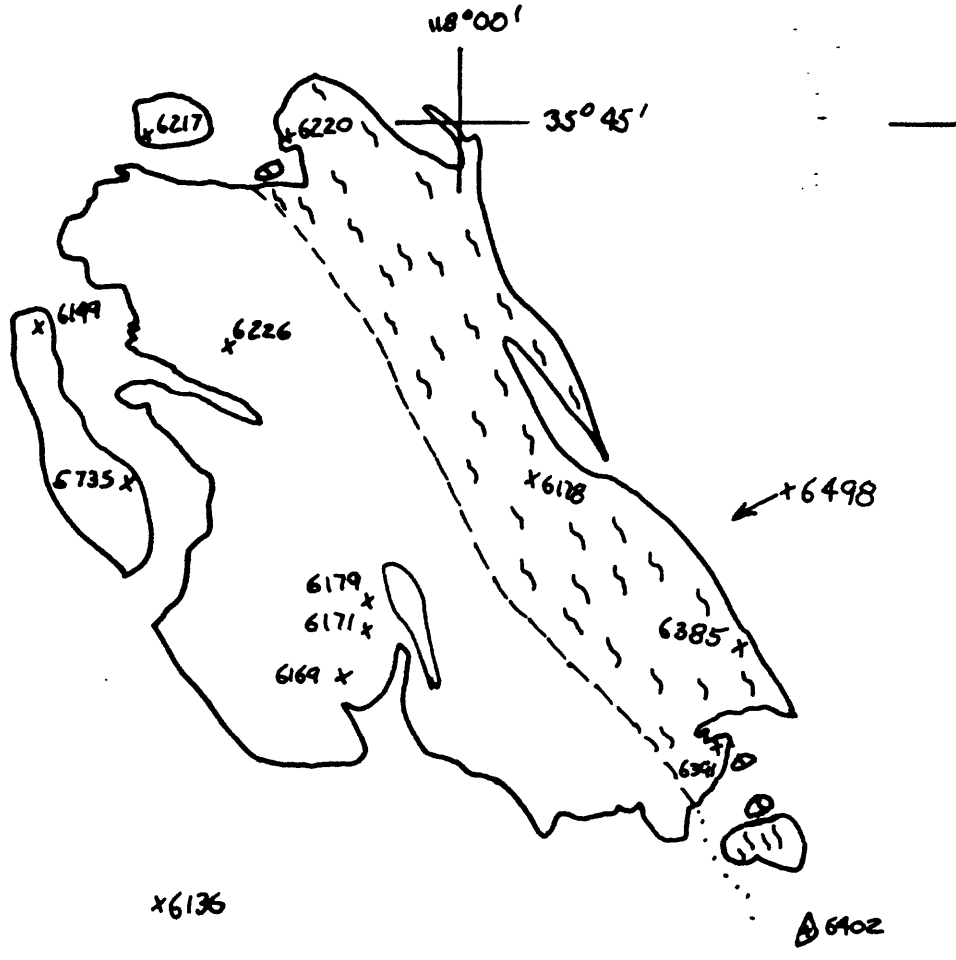
Location of modal samples of Quartz diorite of the Tehachapi Mountains

MODES OF QUARTZ DIORITE OF WALKER PASS

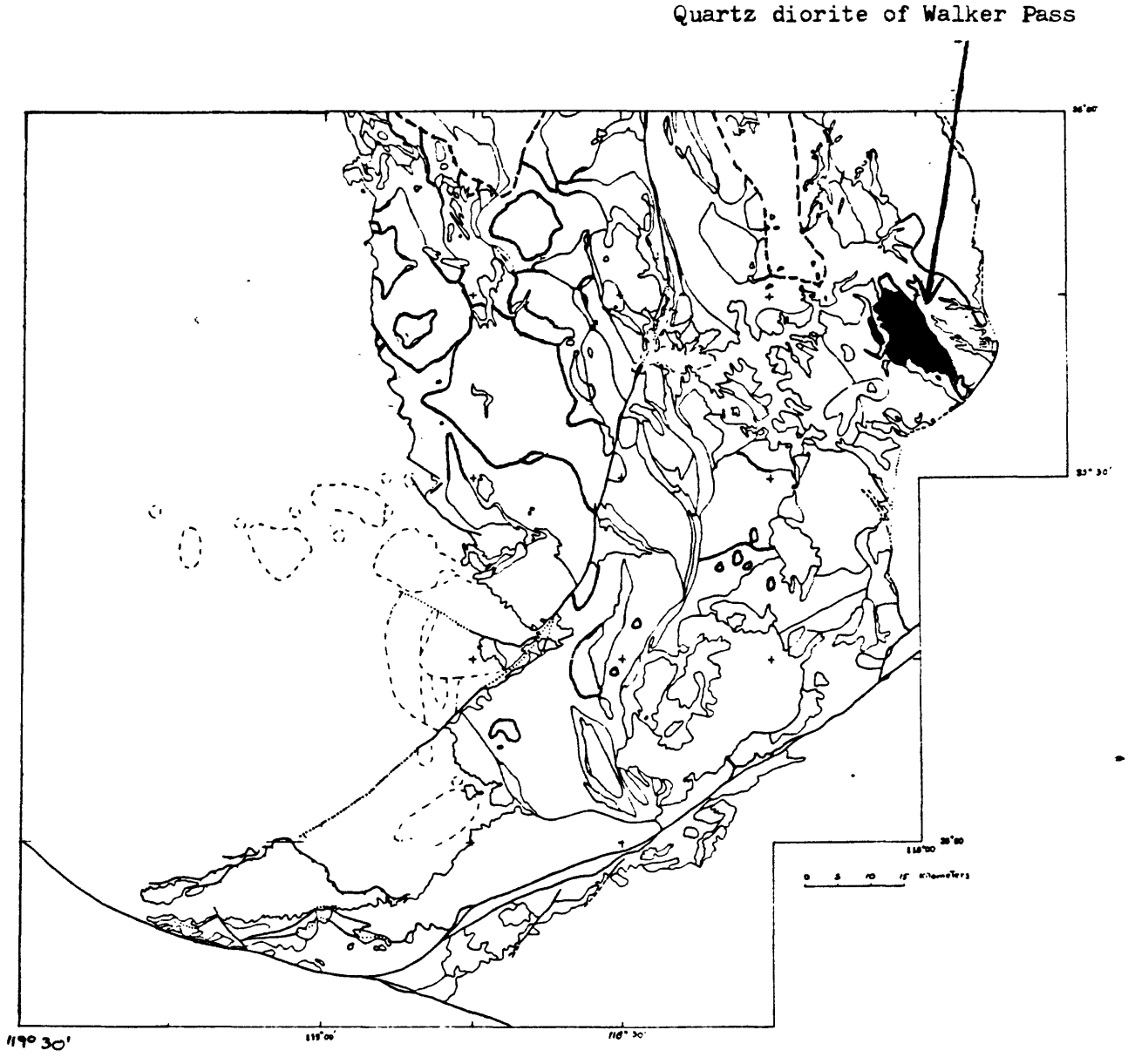
Sample Number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende		Other
5735A	54.5	7	19	9	10.5		
5735B	59	6	14	11	9		sph + opqs 1
5735C	63	3	15	9	10		opqs <1
6136	71	5	11	12	1		
6149	56	5	15	15	9		
6169	66	2	21	9	2		sph+Oz <1
6171	64	4	18	6.5	5		sph 1.5 op 1
6178A	58	7	20	7	8		sph+op <1
6179	62	2.5	20	9	6		sph 0.5
6193A	57	3	15	8	17		
6217	67	0.5	15	8.5	8		opaque 1
6220	60	2	18	10	10		"
6226	59	6	19	6	10		sph <1
6385C	56	-	8	8	27		opq 1
6391	66	<1	16.5	9.5?	8?		
6402	67	1	8	10?	14?		
6498	54.5	12	19	7	7		sph <1 op 0.5
Average	61	4	16	9	10		<1
Standard deviation	5.0	3.1	4.0	2.2	5.9		-



Modal plot of Quartz diorite of Walker Pass



Location of modal samples of Quartz diorite of Walker Pass
(squiggly pattern indicates strongly foliated part)

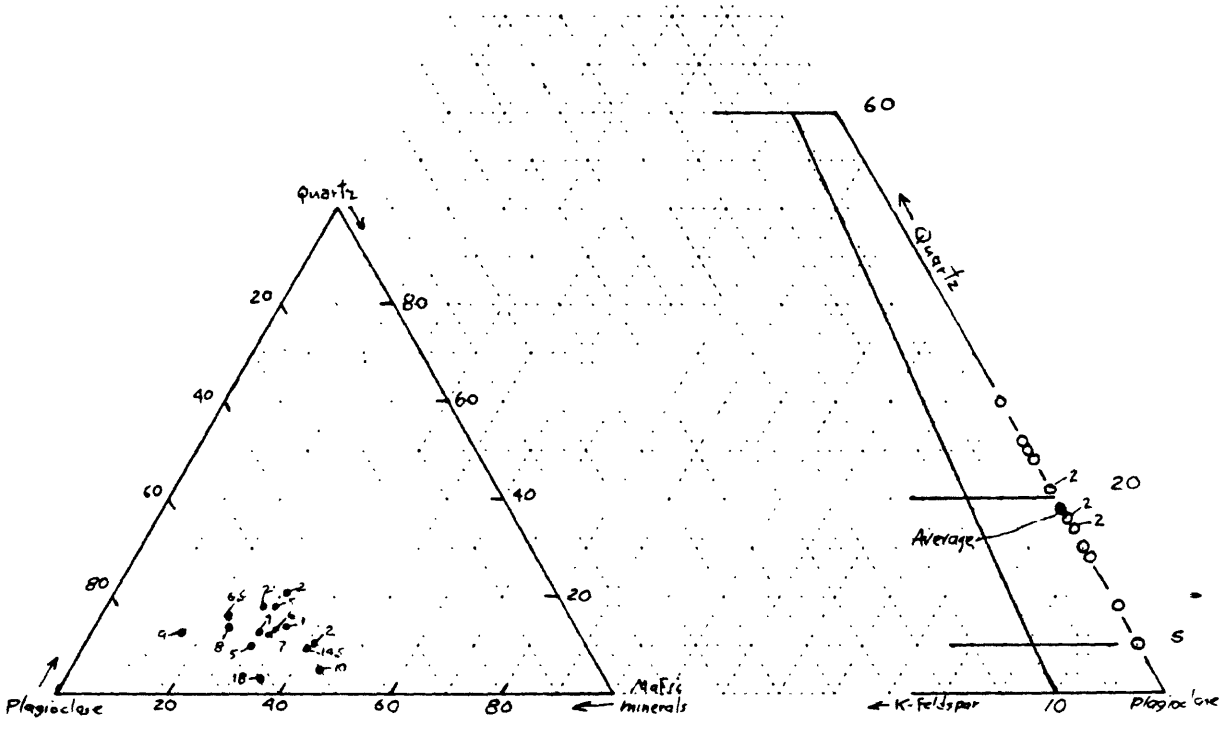

Quartz diorite of Walker Pass
119° 30'

MODES OF MISCELLANEOUS HYPERSTHENE-BEARING TONALITES AND QUARTZ DIORITES
(not a map unit)

Sample	Plagioclase	Quartz	Biotite	Hornblende	Hypersthene	Opaque minerals	Specific gravity
			Tonalite to quartz diorite				
3352C	57	13	---	23	7	---	2.83
3353	52	18	---	25	5	---	2.82
3440	56	12	7	18	7	---	2.82
3441	54	18	8	18	2	---	n.d.
3593	61	16	<1	16.5	6.5	---	2.78
3594	60	10	5	19	5	1	2.82
3595	48	21	11	18	2	<1	2.81
3596A	52	16	11	21	<1	---	2.80
3702	54	14	---	26	6	---	2.80
☒ 3796	49	10	10.5	28.5	2	<1	n.d.
3990C	49	10	10	16.5	14.5	---	2.79
⊛ 4166B	71	13	4	3	9	<1	n.d.
4209A	62	14	4	12	8	---	2.70
44238	50	5	4	30	10	1	2.91
4429	62	3	3	13	18	1	2.89
Average	56	13	5	19	7	<1	2.81
Standard deviation.	6.4	4.8	4.2	6.7	4.8	-	.05

⊛ Called anorthositic gabbro in the field, but significant quartz and andesine plagioclase suggests it is related to tonalites, although it is relatively poor in biotite and hornblende.

☒ Inclusion from Loop inclusion swarm (Ross, in press)



Percentage of hypersthene indicated
for each sample

Modal plots of miscellaneous hypersthene-bearing tonalites and quartz diorites

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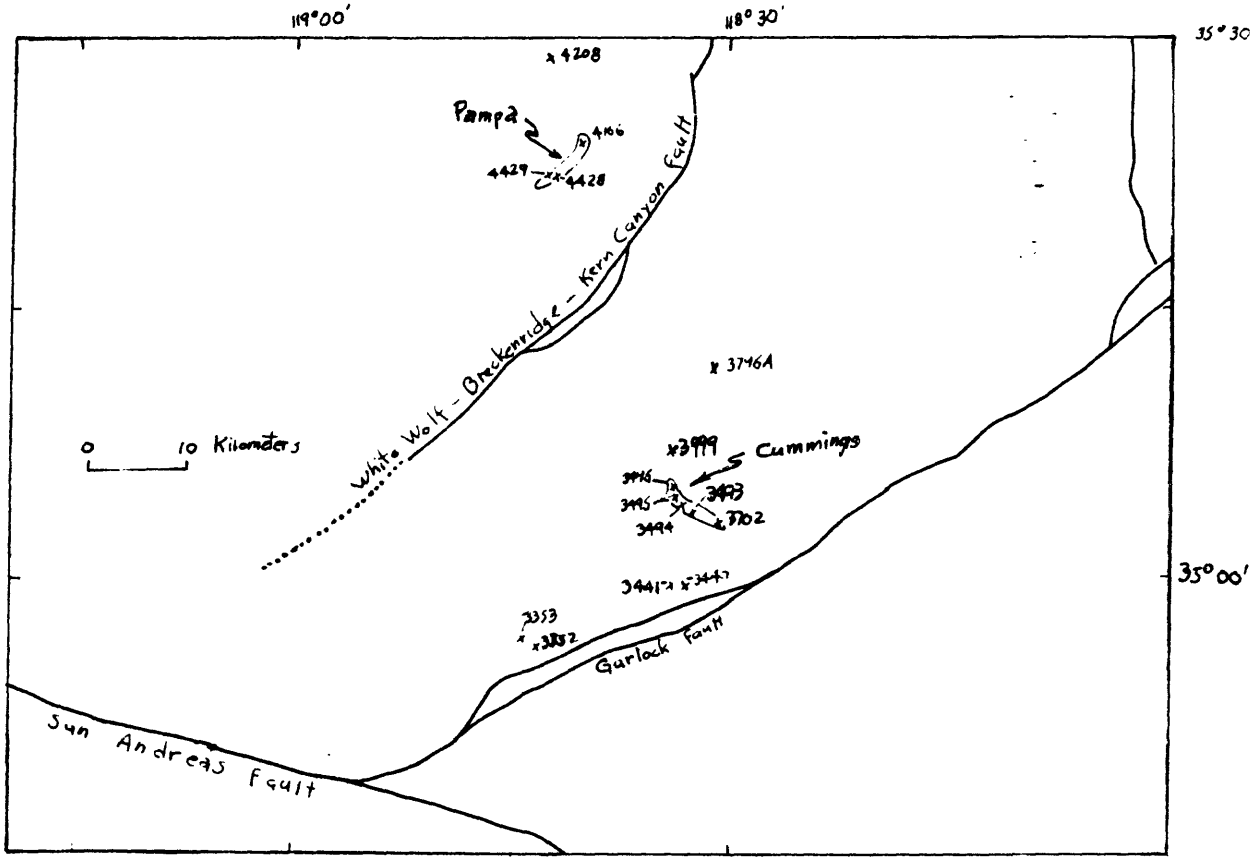


Both Pampa and Cummings bodies contain in addition some mafic and ultramafic remnants (Ross, 1987 a)

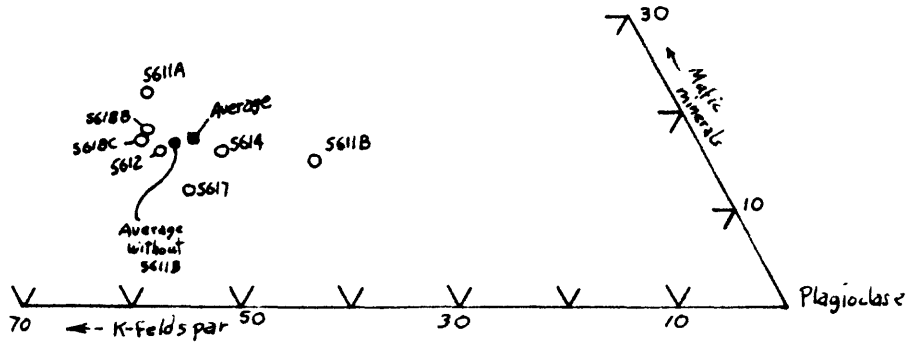
Location of modal samples of miscellaneous hypersthene-bearing tonalites and quartz diorites

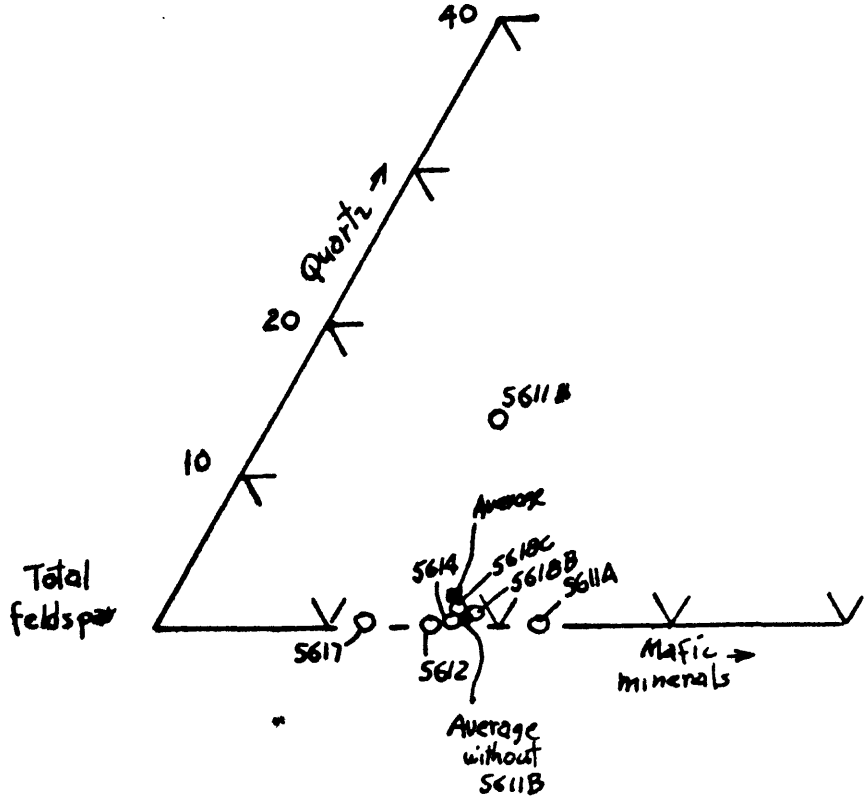
MODES OF MONZONITE OF ERSKINE CREEK [1]

Sample Number	Plagioclase	K-feldspar	Quartz	Biotite	Hornblende		Other
5611 A	30	48	-	15	7		
⊛ 5611 B	42.5	31	13.5	10	3		
5612	34.5	49.5	-	4	12		
5614	39	42.5	0.5	8.5	7.5		Garnet 2
5617	39	49	<1	4	8		
5618 B	32	49	1	3	15		
5618 C	32	50	1	2	15		
Average	35.5	45.5	2	7	10		
Standard deviation	(4.6)	(6.9)	(5.0)	(4.7)	(4.5)		
Average w/o 5611 B	34.5	48	0.5	6	11		
Standard deviation	(3.8)	(2.8)	(0.5)	(4.9)	(3.7)		

⊛ Dike of Granodiorite of Rabbit Island?

[1] Unusual body (modal data not included in summary figures)

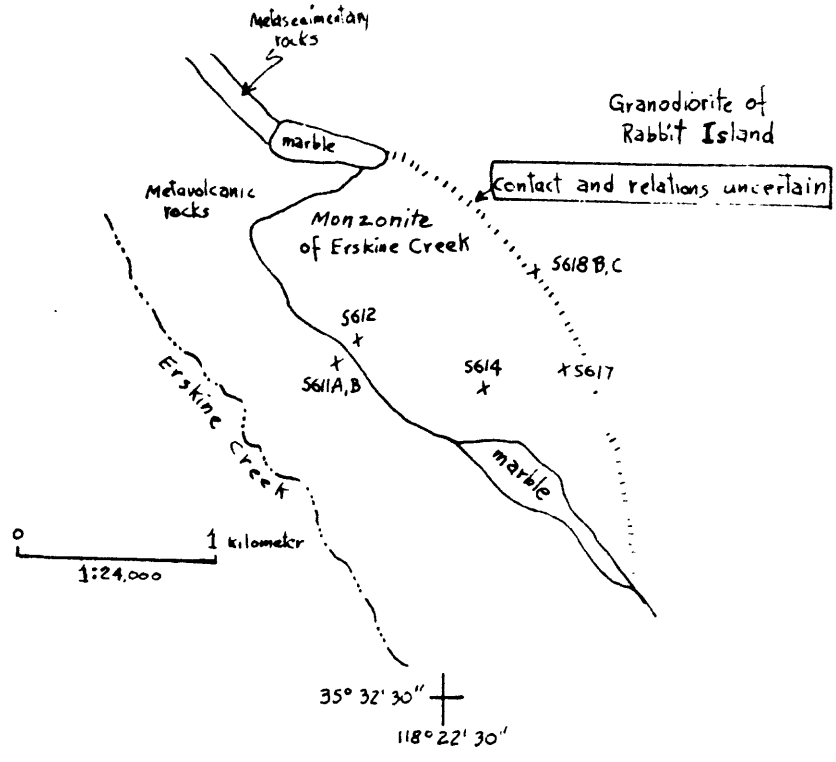




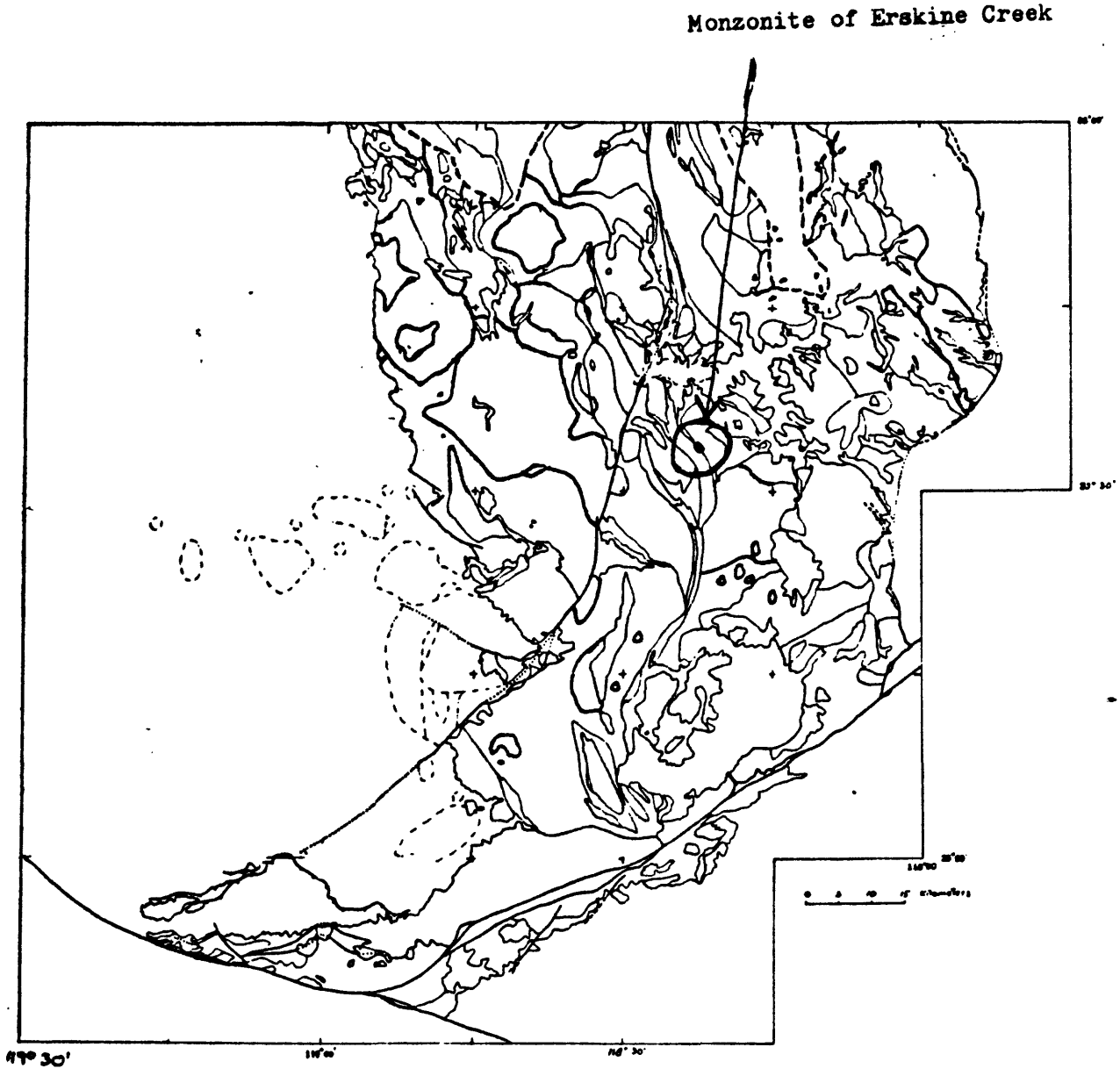
Modal plots of Monzonite of Erskine Creek

+35°35'

Strongly foliated rocks that may be related to the metavolcanic pendant along Erskine Creek



Location of modal samples of Monzonite of Erskine Creek


Monzonite of Erskine Creek