DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

REPT.BK.NO. 82/93
SAMPLING OF CREEK SEDIMENT FOR FELDSPAR NORTH OF OLARY

GEOLOGICAL SURVEY

by

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DME.645/74

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DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

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SAMPLING OF CREEK SEDIMENT FOR FELDSPAR NORTH OF OLARY

ABSTRACT

A potentially large resource of feldspar has been identified as 55-59 percent of sediment in major creeks draining Willyama Complex rocks north of Olary.

Further auger drilling is required to outline mineable zones and procure samples for beneficiation tests.

INTRODUCTION

Following mapping of four pegmatites that had been mined for feldspar (Olliver, 1974) and a review of chemical analyses of feldspar in Departmental records, a reconnaissance sampling program was undertaken in the Olary Province (Olliver and Steveson, 1982).

Early work was restricted to pegmatites but later granitoid and gneiss were sampled. During this investigation, 10 samples of creek sediment were collected to determine feldspar content in the present drainage system. Three samples were collected from both Whey Whey and Doughboy Creeks and four from Bimbowrie Creek at locations shown on Figure 1.

The samples were taken to a depth of 15 cm at 5 m intervals across the creek and bulked for each traverse.

LOCATION

The area investigated is north out of counties, 18-42 km north of Olary, within the Far North Planning Area. All samples are on Bimbowrie Pastoral Station, except A760/77 which is on Outalpa Station

Access is by well graded road from Olary to Bimbowrie thence westerly to Plumbago via Antro Woolshed.

FELDSPAR RICH SEDIMENTS ELSEWERE

In U.S.A. from 1952 to 1973, feldspar for porcelain, ceramics and glass was produced from sand dunes extending over an area 10 km by 1.6 km at Pacific Grove, Monterey County, California (Hart, 1966). Raw sand contained about 51% potash and soda-lime feldspar. The balance was quartz with minor biotite and heavy minerals.

The following two concentrates were produced after a two stage flotation process.

- quartz - 98-99% SiO_2
- feldspar - 80% feldspar (soda-lime: potash = 2:1)
  - 20% quartz.

In 1963, 16% of USA feldspar output (about 80 600 tonnes) was supplied from these deposits. Environmental considerations closed mining operations in late 1973.

In U.S.A. since 1952, the feasibility of producing feldspar from sand in the Kansas and Arkansas Rivers has been investigated by Bowdish & Runnels (1952), Bowdish (1967) and (1978).

In Czechoslovakia in 1962, feldspar gravel was discovered in the drainage basin of River Luznice, South Bohemia comprising semi rounded pebbles of microcline feldspar, up to 4 cm, with numerous palgioclase inclusions, mica and quartz (Kuzvart, 1981). The 4-63 mm fraction is richest in feldspar (30-70%) and has less than 0.40% Fe_2O_3. After milling and high intensity electromagnetic separation, concentrate is obtained with 0.15 percent Fe_2O_3 suitable for chinaware and electrical porcelain.

GEOLOGICAL SETTING

The Olary Province consists of regional blocks of amphibolite grade metamorphic rocks of Willyama Complex and includes shist, gneiss and granitoid. The blocks are separated by corridors of Adelaidean sediments metamorphosed to biotite grade.

Northeastern contacts of the basement blocks are overlain unconformably by Adelaidean strata whereas southwestern contacts are controlled by faults.

Figure 1 is based on the preliminary plan of the Outalpa 1:50 000 map sheet prepared by G.M. Pitt (Geologist, Regional Geolgy Section).

A comprehensive review of feldspar bearing pegmatites in the region is contained in Olliver and Steveson (1982).

CHEMISTRY AND MINERALOGY OF SAMPLES

Heavy liquid separation was carried out at sp. gr. of 2.96 on minus 1.2 mm material and the light product, into which feldspar will report, was analysed.

The minus 1.2 mm fraction varied from 74.5 to 87.0 percent of the creek sediment and the light product varied from 70.7 to 84.9 percent of that fraction.

Ranges and means of chemical analysis and calculated mineral norms are summarised in Table 1 and Table 2 respectively from data in the Appendix.

Table 1

Chemical composition (%)

Doughboy Creek	SiO_2	Al_2O_3	Na_2O	K_2O
Range	72.1-75.8	12.1-13.4	3.8-4.3	1.5-2.0
Mean	74.0	12.8	4.1	1.8
Whey Whey Creek				
Range	75.5-76.3	12.2-12.6	4.9-5.3	1.1
Mean	75.8	12.3	5.1	1.1
Bimbowie Creek				
Range	72.7-75.3	12.5-13.8	4.3-4.6	2.1-2.4
Mean	74.4	13.1	4.4	2.3
Overall Average	74.7	12.8	4.5	1.8

Average MgO content for the 10 samples is 0.4 percent and average CaO content is 0.6 percent.

Table 2

Calculated Mineral Norms (%)

	Albite	Orthoclase	Anorthite	Total Feldspar	Quartz
Doughboy Creek					
Range	37-41	9-13	4-7		39-42
Mean	39	11	5	55	40
Whey Whey Creek					
Range	46-50	6-7	2-3		39-40
Mean	48	7	2	57	40
Bimbowrie Creek					
Range	40-44	13-15	2-3		35-40
Mean	42	14	3	59	38

The average quartz content for the three creeks is similar. Albite is the dominant feldspar mineral, being three to seven times more abundant than orthoclase. In general, the proportions of albite and orthoclase are inversely proportional with Whey Whey richest in albite and poorest in orthoclase.

In AMDEL Progress Report No. 10, Dr. B. Steveson reported that 'Thin sections (TS 39781-3) were prepared of the light products of P760, 763 and 766/77. In general, albite occurs as clean, liberated grains showing little sericitisation or association with fine-grained quartz. Only in P766/77 was a little albite present in perthitic intergrowth with microcline. It is clear that the proportions of "orthoclase" are slightly overestimated in the tabulation above, since muscovite, sericite and biotite are potassium-bearing minerals identified in the sections. A small amount of calcite occurs in P760/77'.

CONCLUSIONS

Major creeks in the Olary region drain terrain composed of Willyama Complex rocks rich in feldspar. Reconnaissance sampling of creek sediment indicates that feldspar content is 55-59% generally as clean liberated grains and 35-40% quartz.

Albite is the dominant feldspar with lesser orthoclase and trace muscovite, sericite, biotite and calcite.

As microcline perthite ('orthoclase') is the dominant feldspar in pegmatites mined for feldspar north of Olary,

- either albite is the major feldspar in schist, gneiss and granitoid rocks.
- or 'orthoclase' breaks down under existing erosion conditions, and is removed from the system.

Sand with similar feldspar content was mined on a large scale in California, U.S.A. from 1952 to 1973.

Hand auger drilling is required at regular intervals across major creeks to determine:

. depth of sediment

. variation in feldspar content

. impurities, in particular Fe_2O_3 content

. reserves

and to obtain bulk samples for beneficiation testing.

RJH/JGO:GU

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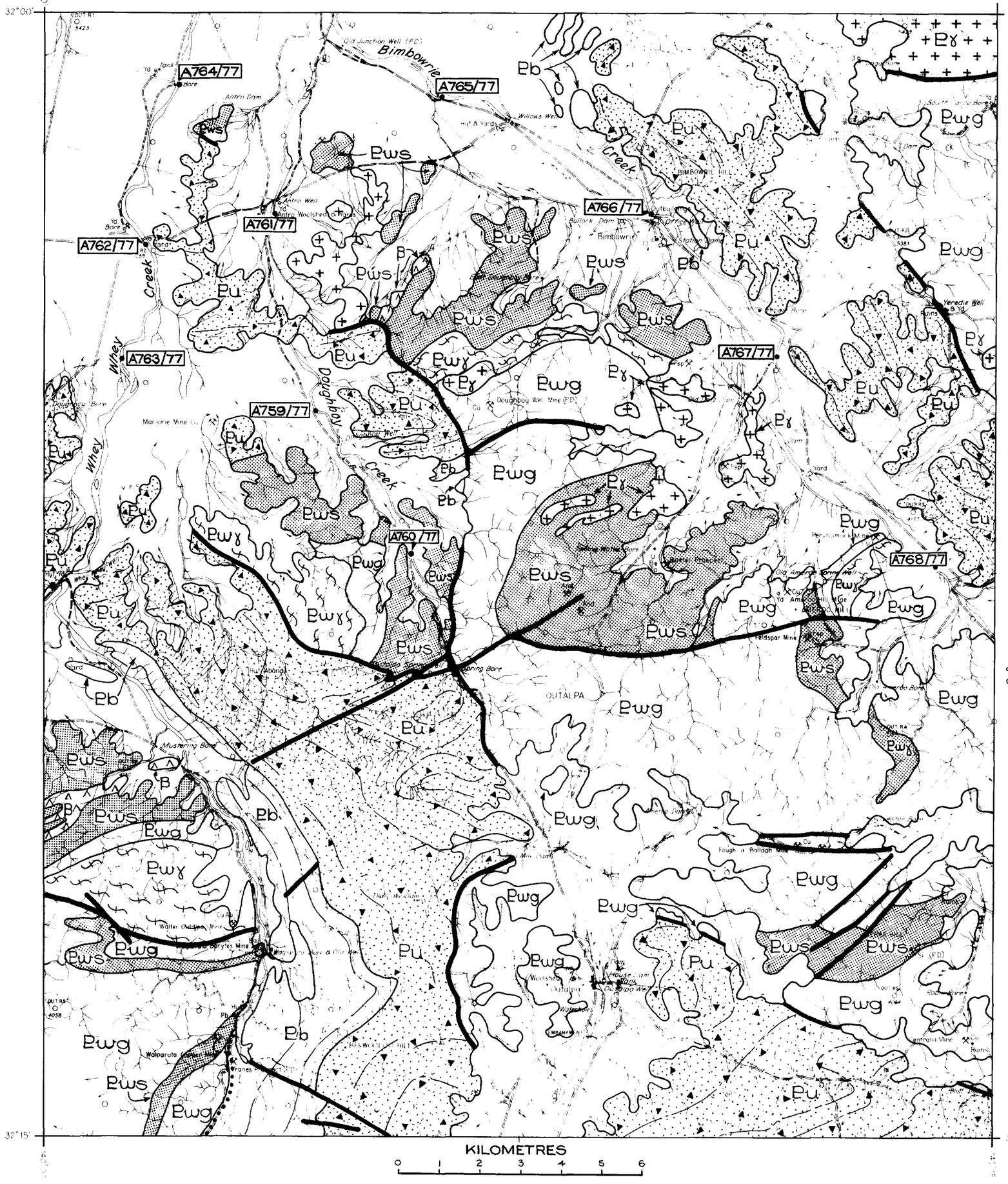
APPENDIX

Chemical analyses and Calculated Mineral Norms extracted from AMDEL report 1/1/169 Progress Report No. 10.

by Dr. B. Steveson.

	Doughboy Creek			Whey Whey Creek			Bimbowrie Creek			
Sample No. P.../77	759	760	761	762	763	764	765	766	767	768
Weight % + 1.2 mm	25.5	21.2	23.9	13.9	13.4	18.2	13.0	15.6	14.7	19.9
- 1.2 mm	74.5	78.8	76.1	86.1	86.8	81.8	87.0	84.4	85.3	80.1
% >2.96 sp. gr in -1.2 mm fraction	3.8	5.0	3.5	4.2	5.4	4.1	2.1	2.9	3.7	9.6
FRACTION ANALYSED										
%<2.96 sp. gr in -1.2 mm fraction	70.7	73.8	72.6	81.9	81.2	77.7	84.9	81.5	81.6	74.5
Chemical content (%)										
SiO_2	74.0	72.1	75.8	75.5	75.6	76.3	75.3	74.8	74.7	72.7
Al_2O_3	13.4	13.0	12.1	12.6	12.2	12.2	12.5	13.1	12.9	13.8
MgO	0.5	0.6	0.3	0.5	0.5	0.5	0.3	0.3	0.3	0.4
CaO	0.7	1.3	0.9	0.5	0.5	0.4	0.5	0.5	0.5	0.5
Na_2O	4.1	3.8	4.3	4.9	5.0	5.3	4.3	4.4	4.4	4.6
K_2O	1.8	2.0	1.5	1.1	1.1	1.1	2.1	2.4	2.2	2.3
Norms (approx %)										
Albite	39	37	41	46	47	50	40	42	42	44
Orthoclase	11	13	9	7	7	6	13	15	14	15
Anorthite	4	7	5	3	2	2	2	3	3	3
Quartz	40	39	42	40	40	39	40	38	39	35



LEGEND

Quaternary (undifferentiated)

ADELAIDEAN SYSTEM

Pu — Umberatana Group (includes Pualco Tillite, Benda Siltstone Braemar Iron Formation, Wilyerpa Formation.).

Pb — Burra Group. (Basal conglomerate shown).

WILLYAMA COMPLEX.

Intrusives.

Pγ — Undifferentiated intrusive granitoid.

Metamorphics

↓Schistose sequence

Schist amphibolite (?metam. extrusive volcanics) — Pws

B

Gneissic equivalents ↓

Schist — Pws / Pwg — Gneiss.

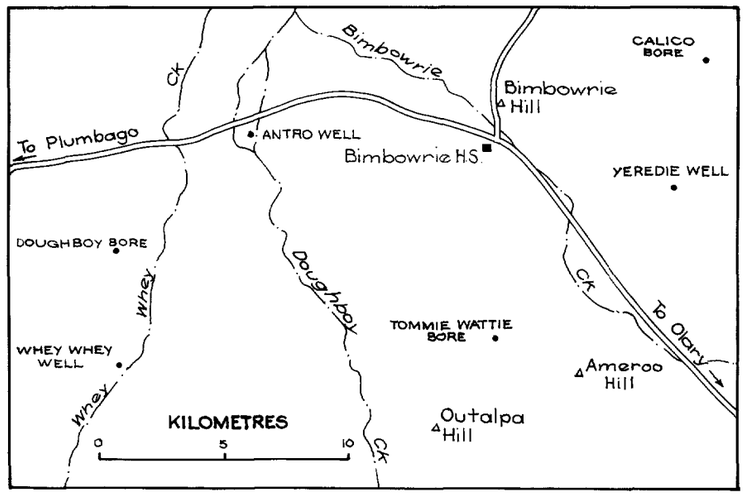
Pwγ — Conformable granitoid gneiss.

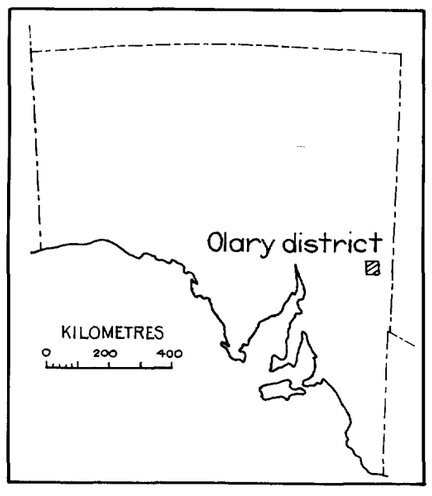
Schist — Pws / Pwg — Gneiss, migmatite.

Pws — Pelitic gneiss, schist.

Pwg — Gneiss, migmatite.

- Head station, Outstation, hut.
- Secondary road.
- Track.
- Fence.
- V P F — Vermin proof fence.
- Bridge.
- Landing ground.
- Mine or mineral prospect.
- Yard.
- Quarry.
- Mountain or hill.
- Embankment.
- Bore, well, tank.
- Spring.
- Waterhole.
- Dam.
- Ephemeral stream.
- Swamp.
- Drain.
- A767/77 — Sample location and number.





DEPARTMENT OF MINES AND ENERGY – SOUTH AUSTRALIA

OLARY PROVINCE
CREEK SEDIMENT SAMPLES
LOCATION AND GEOLOGICAL PLAN

MINERAL RESOURCES SECTION	COMPILED: G. Pitt	DRN: J.W.	SCALE: 1:100,000	PLAN NUMBER
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