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THE MOUNT LYELL MINING AND RAILWAY COMPANY LIMITED

EXPLORATION LICENCE 26/78 (TASMANIA)

PIEMAN

PRECIOUS STONES

RELINQUISHMENT REPORT

NOVEMBER, 1980

MICROFILMED

M. J. HUTTON

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SUMMARY

E.L. 26/78, Pieman, was granted on 23rd May, 1979, as an exploration lease for precious stones, specifically diamonds. The lease covers 1380 sq. km of N.W. Tasmania and includes the drainage basins of the Donaldson, Savage, Heazlewood and Whyte Rivers as well as the lower reaches of the Pieman River (Figure 1).

Following airphoto interpretation and literature review ten bulk stream sediment samples (averaging 71.3 kg), one bulk tertiary gravel sample (44 kg) and one bulk beach sand sample (121 kg) were collected from the area.

The samples were initially sieved at Mount Lyell to obtain the 1.68 mm to 0.30 mm size fractions. Gravity and magnetic separation were carried out in Perth, W.A., prior to sizing and microscopic examination by an experienced observer.

Most samples contained chromite which may be kimberlitic. No other kimberlite indicators were found.

Total expenditure on E.L. 26/78 was $ 22 044. No further expenditure is warranted. The licence was relinquished on 23rd November, 1980.

1. INTRODUCTION

1.1 EARLY HISTORY

The Pieman River area was the scene of a rush in the early 1880's following the discovery of gold in Middleton Creek. Gold was also found in other tributaries of the Donaldson, Savage and Whyte Rivers as well as in patches of Tertiary gravels perched on the intervening divides and spurs.

Copper, lead, silver and osmiridium were also found in the area but the alluvial gold attracted most attention from prospectors.

In 1894 a prospector, L. Harvey, while sluicing gold for the New Donaldson Sluicing Co., found a small diamond in Harvey's Creek and another in Sabbath Creek (originally known as Sunda y Creek). Further finds of diamond were made in Middleton, Sabbath and Harvey's Creeks.

Petterd (1910) records 16, or at the most 18, diamonds as authenticated. All stones showed good octahedral crystallization, with rounded facets, yellow tinges at the apices and a uniformity of size, nearly all being 0.125 carats with the largest weighing 0.33 carats.

The diamonds were obtained from shallow alluvials during sluicing operations for gold and osmiridium. It is possible that many more were missed by the early prospectors who were primarily after the precious metals.

The only reported search for diamonds in the Pieman area was "a presumably careful examination of Harvey's Creek" which failed to reveal any of a larger size than the original small specimens (Petterd, 1910, p. 64).

1.2 GEOLOGICAL SETTING

The geology of E.L. 26/78 is shown in Figure 2 which is based on the Burnie 1:250,000 sheet and airphoto interpretation.

Two zones of unmetamorphosed Precambrian sediments, the Rocky Cape Group and the Burnie Formation, are separated by the Arthur Lineament, a belt of low-grade regionally metamorphosed schists, quartzites and amphibolites. The Rocky Cape Group consists of a marine sequence of laminated mudstone (Interview Beds), quartz sandstones and conglomerates (Donaldson Group) with minor basaltic lavas and tuffs (Bernafai Volcanics), chert (Delville Chert) and dolomite (Savage Dolomite).

Deformation of the Precambrian sediments occurred during the Penguin Orogeny which produced north-east trending folds. The age of the orogeny is considered to be about 700 m.y., based upon K-Ar dating of probably syn-tectonic sodic dolerite intrusions which parallel fold trends.

Metamorphic rocks of the Arthur Lineament appear to be derived from the sedimentary rocks and dolerites, and result from shearing and metamorphism caused by the eastward movement of the Rocky Cape Group during the Penguin Orogeny (Williams and Turner, 1974).

A thick sequence of turbidite sandstones, mudstones and volcanics (Crimson Creek Formation) were deposited in a trough which developed on the eastern flank of the Rocky Cape Block during Late Proterozoic-Early Cambrian.

The Bald Hill Ultramafic Complex was intruded into the Cambrian sediments as a tectonically emplaced dismembered ophiolite. The layered pyroxenites, dunites and peridotites are associated with basaltic volcanics, dolerite dykes and gabbros with similarities to oceanic tholeiites (Rubenach, 1973). Reid (1921, p. 15) states: "microscopical examination of slides cut from olivine-bearing rocks (peridotite) of Bald Hill shows the presence of diamond". This suggests that the diamonds in the alluvials may have come from zones of locally high pressures created during deformation of the ultramafics (analogous to Pavlenko, et al, 1974).

A small patch of Siluro-Devonian Eldon Group sediments occurs between Bald Hill and the Meredith Adamellite which was emplaced during the Late Devonian.

Prolonged erosion followed the granite emplacement and ended with the deposition of glacio-marine sequences of the Parmeener Super-Group (Williams and Turner, 1974). Although only small patches of the Permian rocks remain in E.L. 26/78, the flat plateau topography may represent the pre-Parmeener peneplain, the overlying sediments having been removed by subsequent erosion. The lack of Jurassic dolerite, which covers much of eastern Tasmania, may also be due to erosion.

This latter point is significant since the Tasmanian Jurassic dolerite and the majority of kimberlites throughout the world are postulated to be associated with the intial breakup of Gondwana land. Therefore there is little chance that kimberlites of that age will be found in N.W. Tasmania as they would have suffered extensive erosion along with the Jurassic dolerite and Permian sediments.

The Tertiary gravels which are found at Brown's Plains, on the divide between the Savage and Whyte Rivers, are part of a possibly marine sequence which now occurs discontinuously throughout N.W. Tasmania. At the western end of Brown's Plains the gravels are silicified and overlain by basalt of approximate Miocene age (Twidale, 1957). These gravels have been worked in the past for gold.

A relative drop in sea level since the Tertiary has given rise to the present river system which is strongly controlled by the regional structural trends. Unconsolidated gravels have been deposited at several terrace levels in the major river velleys (Montgomery, 1894) and are probably due to a pulsatory fall in sea level (Twidale, 1957).

2. EXPLORATION COMPLETED 1978-80

2.1 RECONNAISSANCE

Bulk samples of panned concentrates were collected from Middleton Creek and Sabbath Creek during reconnaissance field trips in October, 1978, and January, 1979 (Table 1). The samples were partly processed by tabling at Mount Lyell before being forwarded to Associated Minerals Consolidated at Capel, W.A., where the heavy mineral fraction was concentrated. The concentrates were inspected by a consultant petrologist who reported no kimberlite indicators.

2.2 AIRPHOTO INTERPRETATION

Colour aerial photographs, at 1:15,000 scale, covering most of E.L. 26/78, were obtained from the Tas. Lands Dept. (F598, Burnie Concession, Runs 26W to 36W). The photos were used to assist in regional geological mapping, to locate zones of high fracture density, to locate unusual circular features which may be pipe-like intrusives and to update Lands Dept. topographic maps with recent logging tracks which were possible access routes. This investigation was conducted in conjunction with E.L. 27/78, Donaldson (all minerals).

A small circular feature, about 250 m diameter, was located in the Sabbath Creek area. Subsequent track cutting and soil sampling revealed slates and siltstones of the Interview Beds underlying the feature.

Airphoto interpretation also produced minor modifications to the geological mapping previously carried out in the Mt. Donaldson-Corinna area (Spry, 1964) but significant fracture zones were not detected.

2.3 LITERATURE REVIEW

The review of previous data included:

(i) old Mines Dept. reports, chiefly dealing with the alluvial gold workings and mineral deposits of the Corinna-Waratah district, with occasional references to diamonds;

(ii) M. Rubenach's Ph.D. thesis on the Bald Hill Ultramafic Complex;

(iii) Company reports, including Renison's airmagnetic and Esso's INPUT-air magnetic surveys.

Previous geological mapping and air magnetic contours were transferred to 1:50,000 base maps and compared with the airphoto interpretation.

Zones of high air magnetics correlate with basic rocks of the Bernafai Volcanics, amphibolites of the Arthur Lineament and the Bald Hill Ultramafic Complex. All other units gave relatively flat magnetic responses.

2.4 GEOCHEMISTRY CONSULTANT'S REPORT

A geochemistry consultant was contracted to report on reconnaissance geochemical techniques for diamond exploration. The main points of the report (Marshall, 1979) are included as Appendix 1.

2.5 BULK SAMPLING

Twelve bulk sediment samples were collected during March-April, 1980 (Table 2; Figures 3 to 5). Ten bulk samples came from streams and rivers (average 71.3 kg), one from Tertiary gravels outcropping along the Corinna Road (44 kg) and one from beach sands at Pieman Heads (121 kg).

At the sampling points the sediments were sieved to -6 mm. In the case of stream sediment samples the material came from likely heavy mineral traps (crevices, bars, etc.) at several points over a length of 1-2 km of the stream course.

The areas chosen for sampling can be grouped into two categories:

(i) streams draining Ultramafic rocks - Jones Creek, Roaring Mag Creek, Heazlewood River, White River, Nineteen-Mile Creek, Loughnan Creek;

(ii) Streams draining alluvial deposits - Sabbath Creek, Middleton Creek, Harvey's Creek, Longback Creek, and the Brown's Plains Tertiary gravel deposits.

The Pieman Heads beach sands were taken to obtain a "regional" sample.

2.6 SAMPLE PROCESSING

To reduce the weight of the samples for shipping they were sieved at Mount Lyell to extract the 1.68 mm to 0.30 mm size fraction (-10# +50# B.S.S.). This fraction was based on a consultant's experience with kimberlite exploration in W.A. where indicator minerals are generally coarse-grained (see Appendix II).

TABLE 1

RECONNAISSANCE BULK SAMPLING, 1978-79

Sample No.	Location	Sample Type	Weight	Fraction
24601	Middleton Creek	Panned Cons.	5 kg	-10 mm
24602	Middleton Creek	Panned Cons. of 24601	100 g	- 2 mm
24603	Sabbath Creek	Panned Cons.	18 kg	-10 mm
24604	Sabbath Creek	Panned Cons. of 24603	100 g	- 2 mm
24605	Sabbath Creek	Panned Cons.	5 kg	- 2 mm
24606	Sabbath Creek	Tabled mids of 24605	1 kg	- 0.5 mm
24607	Sabbath Creek	Tabled Cons. of 24605	500 g	- 0.5 mm

TABLE 2

BULK SAMPLING, 1980

		Weight	
Sample No.		-6 mm	1.68-0.3 mm
24608	Middleton Creek	86 kg	30.5 kg
24609	Sabbath Creek	99	37
24618	Brown's Plains	44	17
24619	Jones Creek	67	16.5
24626	Roaring Mag Creek	65	21.3
24637	Heazlewood River	74	17.5
24639	Whyte River	67	20.5
24642	Nineteen-Mile Creek	54	14.5
24643	Harvey's Creek	60	16.5
24650	Loughnan Creek	73	21
24653	Pieman Heads	121	92.5
25712	Longback Creek	68	23.5

TABLE 3

SAMPLE PROCESSING, OBSERVED FRACTIONS

Sample No.	Fraction Intervals *		
	Non-mag	9 Amp Mag	5 Amp Mag
24608	A, B, C	A, B, C	
24609	A, B, C	A, B, C	
24618		Sample not split	
24619	A, B, C		A, B, C
24626	ABC		
24637	A,B		A, B
24639	A, B, C		A, B, C
24642	A,B		A, B
24643	A, B, C	A, B	
24650	A, B, C		A, B, C
25712		Sample not split	

* A = 2.0 - 1.0 mm
B = 1.0 - 0.8 mm
C = 0.8 - 0.5 mm

The samples were forwarded to Perth Metallurgical Laboratories, W.A., where heavy mineral concentrates were prepared by gravity methods. The concentrates were then split into magnetic and non-magnetic fractions, some of which were further screened into various size fractions to reduce the volume of each sample to be observed (Table 3).

2.7 RESULTS

The samples were examined by Mrs. Christine Doyle, a contract mineralogical observer who was trained and worked for Tanganyika Holdings. Details of her report are included as Appendix III.

In summary, most samples contained chromites which may be kimberlitic. The identification of possible pyrope garnets in sample 24650 (Loughnan Creek) was not confirmed by Geoff Blackburn, a consultant petrologist, who reported that they are either rutile or ruby. Apparently the identification of kimberlitic chromites is also subjective as they vary from place to place.

3. CONCLUSIONS

The bulk sampling programme on E.L. 26/78 has failed to detect a kimberlitic source for the diamonds reported to have been found during gold-sluicing operations around the turn of the century.

Geologically, N.W. Tasmania does not appear to be favourable for the formation of kimberlites, which require a stable, thick continental crust. Ferguson, et al (1979) state: "it is unlikely that diamondiferous kimberlites of Permian or younger age exist in most of south-eastern Australia." Also, the amount of erosion since the Mesozoic would have removed richer upper levels of a kimberlite pipe. The report of diamondiferous "peridotite" from Bald Hill (Reid, 1921) may also suggest that the diamonds may not have come from a true kimberlite, but instead were formed in zones of high stresses created during folding of the ultramafics (analogous to Pavlenko, et al, 1974). Such occurrences would probably not yield any diagnostic heavy minerals apart from diamonds themselves.

It may also be possible that the grain size chosen for microscopical examination, which was based on West Australian experience, was too coarse under the local conditions of high rainfall and steep terrain. However, examination of the -0.5 mm fraction would prove to be both difficult and time consuming, and therefore costly.

It appears, then, that the chances of discovering an economically viable diamond deposit in N.W. Tasmania is remote and any further exploration would be difficult and costly. Therefore it is concluded that E.L. 26/78 does not warrant any further expenditure.

4. EXPENDITURE

Table 4 shows the total expenditure on E.L. 26/78 during the period 1978-81.

TABLE 4

E.L. 26/78 EXPENDITURE, 1978-81

Salaries and Wages	$ 9 302
Burden Charges	3 572
Access	706
Geochemistry	2 285
Materials	1 933
Equipment and Facilities	765
General Costs	2 468
Indirect Costs	1 013
TOTAL	$ 22 044

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SUGGESTIONS FOR KIMBERLITE EXPLORATION, EL 26/78

N. J. MARSHALL - GEOCHEMISTRY CONSULTANT

As a cautionary note, there remains the possibility that the 16-18 small alluvial diamonds found in auriferous alluvials within EL 26/78 (Twelvetrees, 1918) were derived from erosion of the folded ophiolite sequence, rather than from any kimberlite intrusive, with its characteristic geochemistry and indicator minerals. See the later discussion on Pavlenko's paper,(enclosed). Classical kimberlites occur in pipes as groups or clusters, probably related to deep seated zones of weakness in stable continental platform areas. (Nixon, chapter 1).

1. Kimberlites are most likely to occur along, or nearer, to areas of greatest crustal fracturing, which may be expressed as zones of statistically greater fracture trace density.

   Thus sampling density and field examination should be biased toward zones of increased fracture trace density, cross-cutting features and dykes. Other favorable loci are lithologic boundaries, particularly where unconformable.

   Thus a prime recommendation is that a detailed photogeologic study be carried out to define likely loci for kimberlitic intrusives.

   Sampling should concentrate preferentially in these areas, which should be more directly related to a source area and therefore less likely to be diluted by barren components.

2. Kimberlitic dykes, if located, can be important tracers for pipes.

   There are 3 types of kimberlitic dyke association, according to the associated heavy mineral suite. (Nixon, chapter 2).

   a) ilmenite + olivine.

   b) ilmenite + garnet.

   c) olivine.

   Kimberlitic dyke wash produces olivine (yellow-green,glassy), + enstatite, bronzite, ilmenite, sporadic garnets of various colors (green, red, violet, orange), chrome diopside (green) and chromite, from disaggregated ultrabasic and eclogite nodules.

   Thus it is important to examine all heavy mineral concentrates prior to magnetic separation, with a binocular microscope and also with a petrographic microscope, using refractive index oils, for mineral identification.

   It would also be worth-while using UV light examination of heavy minerals under the binocular microscope, to look for scheelite and fluorescent diamond.

3. All stream cobble lithologies should be noted in the course of sampling, as well as the geology of adjacent outcrops.

   Sampling should be designed to collect material from drainage basins consisting, as much as possible, of only one rock type - mixed sources introduce contamination problems, dilution by more "barren" material, and complexities in interpretation.

4. Illustrations in the Nixon monograph show large (up to 30 cm diameter) rounded, gneissic xenoliths of basement rock.

   Kimberlitic nodules can consist of ultrabasics containing olivine, enstatite, bright green chrome diopside, chromite and wine red pyrope garnet. Such nodules can weigh 10 kg. or more, are ovoid, and have resistant minerals (eg garnet) protruding from a worn, polished surface. They are in fact deep crustal xenoliths.

   Monomineralic nodules usually of pyrope, also occur in the + 1 cm fraction; other nodules include pale, grass green enstatite, brown bronzite, olivine, and chromite octahedra.

   It is emphasized that in the environment of W. Tasmania, a skilled geologist equipped with a hand lens should examine float samples for possible kimberlitic xenoliths, which would survive in the stream debris. ie) do not rely entirely on panned concentrates of the finer fractions.

   Such detailed observation would also aid in interpreting drainage basin lithology, and hence in evaluating geochemical and petrological stream sediment results.

5. The whole heavy mineral fraction should be sized to several fairly narrow limits, prior to magnetic separation at Capel using a Cook separator.

   The heavy mineral fraction should be analyzed by XRF methods for Nb, Ni, Cr, Ba, Sr, Th, Zr, P, and TiO_2. La and Ce analyses would form a useful back-up.

   Unpulverized splits of each fraction should be retained for electron probe work if required at a later stage.

6. In addition, analyses for Sn, Mo and W are desirable for the possibility of detecting such mineralization in its own right.

7. Such chemical analysis is far cheaper than labor-intensive, and therefore expensive, petrological examination, and is sufficiently comprehensive, in my opinion, to identify source rocks of kimberlitic affinity. Petrological examination should then proceed as follow-up, on these.

   It is also important to weigh the concentrates, and each representative fraction (various magnetic fractions), relative to the weight of original sample.

8. Prior to magnetic separation, the magnetite fraction should be removed with an Eclipse type magnet, weighed (to normalize data as percentage of total HM fraction) and analyzed for base metals, with a view to defining base metal mineralization. - see report by N.J. Marshall, April, 1979 "Geochemical Exploration for Base Metals, West Coast Tasmania, pages 2, and 10-12.

9. The ilmenite fraction from the Cook separator should be analyzed at Capel for Mg and Ti to identify picro-ilmenites. The garnet fraction should be analyzed to look for high Mg and Cr, and low Ca - pyrope garnet.

   Chrome diopside is an important indicator of distinctive appearance, as is any lilac garnet exhibiting an alexandrite effect.

10. Interpretation of such chemical analyses is facilitated where sampling is within one rock type.

    Where mixed source rocks occur, electron probe analyses (comparatively expensive) are required to identify, say, a few Mg rich ilmenite (picro-ilmenite) grains among a predominance of normal ilmenite grains from basalts and other mafic/ultramafic rocks.

11. When applying geochemical techniques, as suggested by Gregory and Tooms, (1969), we must bear in mind the anticipated contrast of elements relative to the rock types occurring in the area.

The following phased approach is suggested for consideration, on EL 26/78 bearing in mind problems of access, and the expense of heavy mineral sampling and subsequent treatment and data acquisition. Also significant, is the rapid dilution by barren material in this rugged terrain, requiring a comparatively high density (and hence cost) of even bulk heavy mineral samples if kimberlites of only a few tens of meters of surface exposure are to be located.

1) Areas of recorded diamond occurrence: Middleton's Ck., Sabbath Ck, Harvey's Ck. Heavy mineral bulked composites as described in letter of June 13th. These are high priority areas, in view of the documented occurrence of diamonds. Weigh concentrate, and relate to initial sample weight. Split into two halves - one to retain. Other half to be further split for pulverizing and chemical analysis for Ni, Cr, Zr, Nb, Ba, Sr, Th, P, TiO_2, La, Ce.
   Other portion to be put through magnetic concentrator - examine fractions petrologically, and electron probe the ilmenite and garnet fractions for picro-ilmenite and pyrope indicators.

2) Mouth of Pieman R. and junctions of Donaldson R., Savage R., and Whyte R. - ie) 4 samples.
Large (100-200 kg.) bulk samples of -1 cm. collected over a km or so, to be treated as above.
The mouth of the Pieman R. should be sampled where there is some wave sorting and/or tidal sorting influence to concentrate placer minerals.

3) Remainder of EL 26/78, concentrating on photo-geologically anomalous zones.

a) -80# stream sediment (conventional) geochemistry for Ni and Cr to locate ultramafic associations away from the known, Heazlewood River Complex, area.
Sampling at 1 km intervals, or less where side tributaries are encountered in the course of sampling. If base metals are also of interest, then Cu, Pb, Zn should also be analyzed, or one could use the approaches advocated in my April 1979 report for base metal exploration in W. Tasmania.

b) subject to orientation studies from the Heazlewood River Complex drainage, one could sample Fe-Mn nodules in streams on a more regional basis, for Ni to define ultramafic source areas, rather than using conventional stream sediments.

c) Heazlewood River Complex <u>and any other Ni-Cr source areas located by above approach</u>:

Analyze stream sediment samples for P_2O_5, Ba, Nb (+ Ni, Cr), La, Ce (XRF) (NB Ba may also accumulate in Mn coated stream pebbles).
In the absence of orientation data, to "play safe" both - 10 + 20#, and - 80# should be collected and analyzed.
I would expect P_2O_5, Ba, Ni and the rare earths to be concentrated as hydrolyzates in the finer, clay dominated fraction, (also, to a certain extent Nb), and Nb, Ba and Cr should concentrate in the coarser fraction. At this stage, sampling at intervals of the order of ½ km is advocated. (within outlined Ni-Cr source areas).

* Incidentally, any chromite rich nodules, or black, natural heavy mineral chromite accumulations, in streams, should be sampled and tested by fire assay for platinoids of the alpine ultramafic association.

d) Any areas of anomalous geochemistry in the above elements in association with Ni and Cr, should then be bulk sampled (as described in letter of June 13) for heavy minerals. These samples should then be examined petrologically, and magnetic separates of the ilmenite fraction and garnet fraction (checked petrologically) analyzed (XRF) to identify picro-ilmenite and pyrope.

If the drainage lithology is multiple, and petrological examination shows that magnetic separates are not virtually monomineralic, then electron probe analyses is required.

N.B. The magnetic response of picro-ilmenite should also be established - it may not report in the normal ilmenite fraction.

12. Finally, should any kimberlitic source be indicated, follow-up sampling would enter the next stage of exploration - base of slope and ridge and spur soil sampling, followed by grid sampling.

13. Rock chip samples of outcrop and float will, if kimberlitic, in this unweathered environment be recognizable by texture and mineral assemblage.
A useful field test for "ultramafic" rocks to check kimberlitic affinity might be to apply concentrated acid. Kimberlites are high in carbonate content, and narrowing down to carbonatites + kimberlites is sufficient at this stage of exploration.
A more diagnostic geochemical test would be a Ni-Cr-Nb-Zr-P etc. association, and, of course, petrology.

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APPENDIX II

20 JUL 1980

G.V. BLACKBURN GEOSERVICE
P.O. BOX 6
GLENFORREST, W.A. 6071

17th July, 1980

Mr. Keith Wells,

Exploration Manager
Goldfields Exploration Pty. Ltd.,
643 Murray Street,
WEST PERTH, W.A. 6005

Dear Keith,

MINERALOGICAL EXAMINATION OF HEAVY MINERAL CONCENTRATES FOR DIAMOND INDICATOR MINERALS

I can sympathise with you on this problem as unless you have sufficient work to justify the full time employment of a mineral observer it can be difficult and expensive to get the samples treated.

Problem one concerns sample size. If the sample is large it will take many hours to observe each grain in the sample. I understand that some of your heavy mineral samples are currently several kilos in weight which could mean 40 - 50 hours observation for each sample, i.e. high cost and a very slow process. The only solution is to reduce the sample bulk by splitting. This can be done in various ways but preferably samples should be split in such a manner so that the indicator minerals are concentrated in the portion to be observed. Hence, normal splitting methods (Jones Riffle Splitter, quartering) etc. are out. Two better methods are:

(i) splitting by sizing, and
(ii) splitting by susceptibility.

I prefer a combination of both methods. Neither of these methods will guarantee that 100% of the indicators will end up in the sample portion to be observed, however, experience has shown that with care recoveries of indicator minerals into selected size and magnetic fractions should be much greater than 95%. (There is probably a much greater loss of indicator minerals during the concentrating process).

Generally speaking it can be said that kimberlitic minerals are coarse grained and hence should appear in the coarser fractions of the stream sample. (It is also true that the number of indicator grains increase as size fraction decreases.) Fortunately, the coarser size fractions are relatively quick to observe. It is suggested that for routine work you observe the -1.0mm + 0.8mm size fraction and for more serious work the -0.8mm +0.5mm fraction.

Splitting the sample magnetically will reduce the sample bulk considerably. Kimberlitic pyropes occur near the non magnetic end of the scale and kimberlitic ilmenites occur near to the middle of the scale. It is possible to split out small fractions of original samples which will contain the indicators. Recovery cannot be guaranteed to be perfect as with all metallurgical processes however I believe the time and cost considerations of an exploration programme need to be balanced against the need to recover every grain. The various magnetic settings vary from instrument to instrument. Further data can be provided should you need it.

APPENDIX III

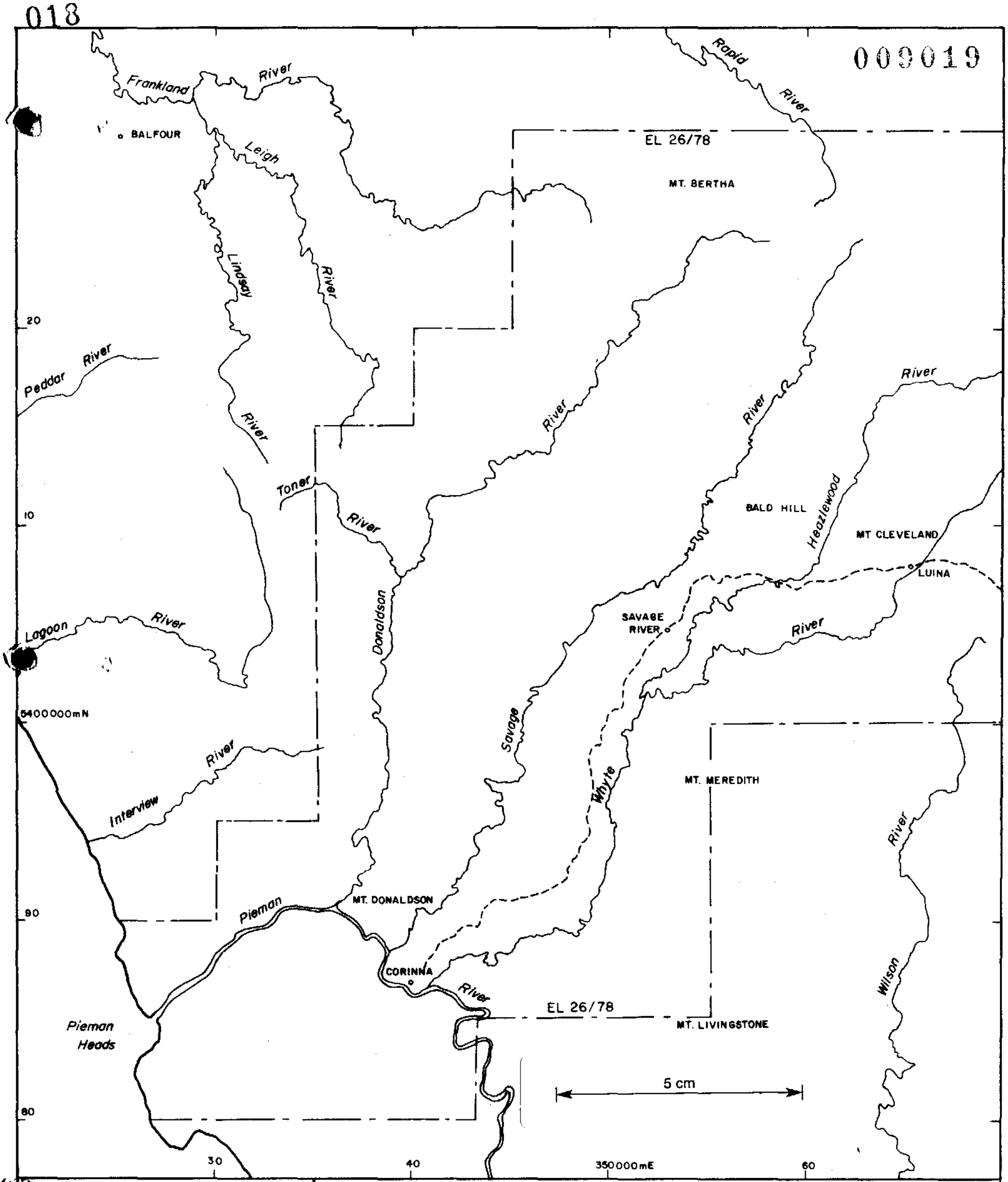
Microscopical Observations of Heavy Mineral Concentrates by C. Doyle, Contract Mineralogical Observer

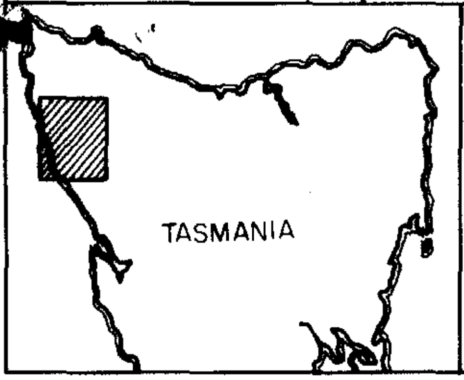
Sample No.	Fraction	Observation
24608 (Middleton Creek)	Non-mag, 0.8-0.5 mm	Chromite, probably kimberlitic, broken octahedron, lustrous centre, pitted surrounds, dull surface.
	9A mag, 0.8-0.5 mm	Predominantly chromite, many possibly kimberlitic. One grain looks like picroilmenite.
24609 (Sabbath Creek)	Non-mag	Zircon-like grains, probably topaz.
	9A mag	Full of octahedra of chromite, many slightly rounded-pitted with lustrous core; could be kimberlitic.
24618 (Brown's Plains)	Entire sample	A great number of (probable) topaz. Chromites are mostly matte, pitted surfaces; could be kimberlitic.
24619 (Jones Creek)	All fractions	Numerous chromites
	Non-mag 0.8-0.5 mm	One grain which could be olivine.
24626 (Roaring Mag Creek)	Non-mag	Few chromites.
24637 (Heazlewood River)	Non-mag	Number of chromites, mostly octahedra and a few twin octahedra. No definite kimberlitic.
	5A mag	Number of chromites.
24639 (Whyte River)	Non-mag 0.8-0.5 mm	One bright green grain, like chrome diopside although possibly not emerald enough in colour. A few chromites.
	Non-mag 1.0-0.8 mm	One unknown grain, orange, blocky, no fluorescence.
	5A mag 2.0-1.0 mm	A few chromites.
24642 (Nineteen-Mile Creek)	Non-mag	A number of chromites
	5A mag	Few chromites
24643 (Harvey's Creek)	Non-mag	Small number of chromites One red grain, possibly pyrope?
	9A mag	A number of possibly kimberlitic chromites.
24650 (Loughnan Creek)	Non-mag 1.0-0.8 mm	One orange garnet, possibly pyrope.
	Non-mag 0.8-0.5 mm	Purple pyrope? One orange-pink pyrope? 3 garnets.
	5A mag	Few chromites.

NOTE: Identification of pyrope garnets not verified by G. Blackburn, Consultant Petrologist.

018

009019

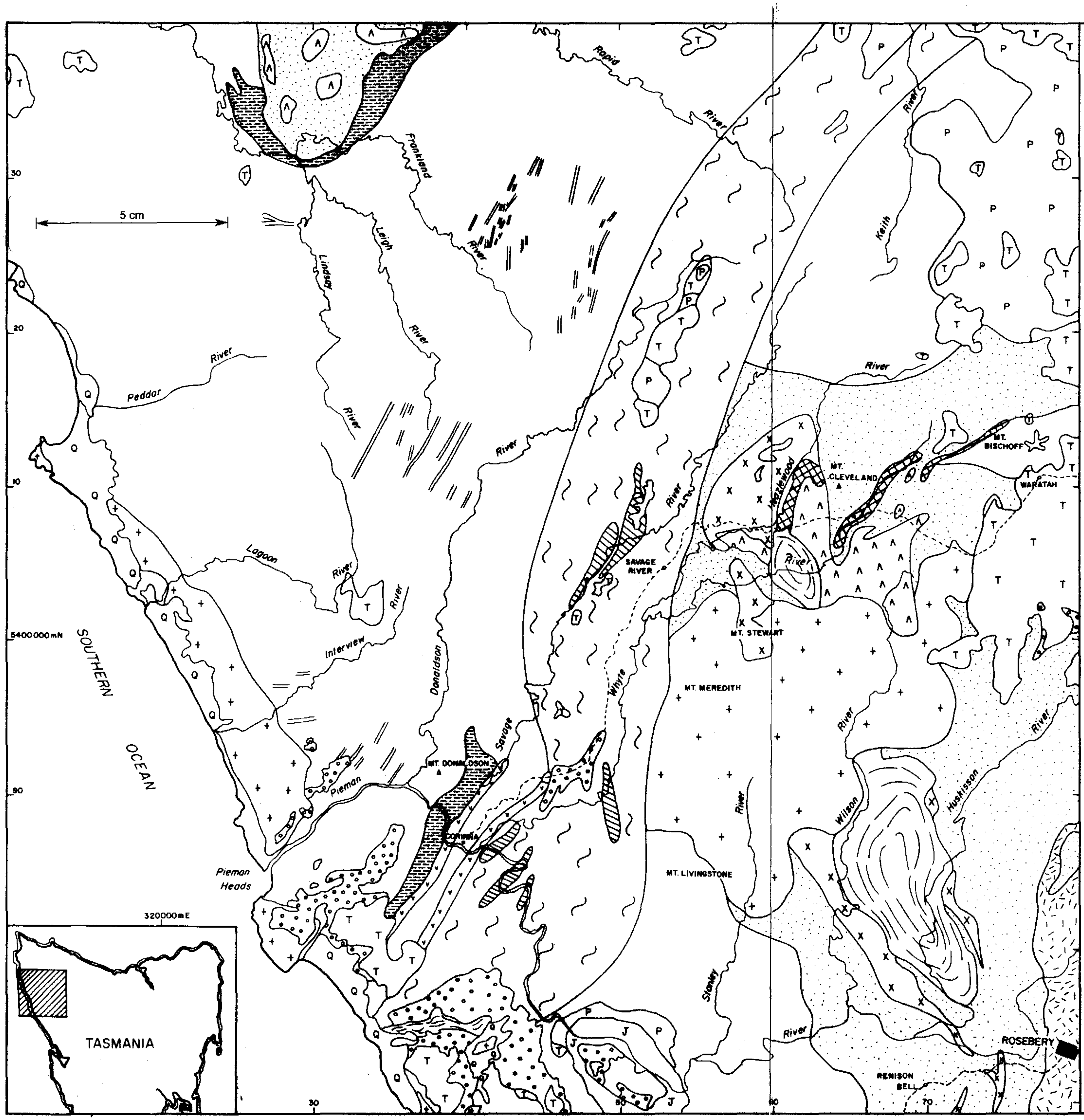




THE MOUNT LYELL MINING & RAILWAY Co. Ltd.

EL 26/78
PRECIOUS STONES
LOCATION PLAN

M. HUTTON	DRAFTSMAN: H.D.J.	A4 - 1
SCALE: 1:250,000	DATE: 24-11-1980	



LEGEND

009020

QUATERNARY	Q	Coastal sand dunes
TERTIARY	T	Basalt
	∘	Gravels
JURASSIC	J	Dolerite
PERMIAN	P	Glacio-marine sediments
DEVONIAN	+	Adamellite
DEVONIAN-ORDOVICIAN	▨	Marine sediments, limestones
CAMBRIAN	░	Trough sediments
	░	Acid-intermedite volcanics
	^	Basic volcanics
	▩	Gabbro
	X	Ultra-mafics
PRECAMBRIAN	▤	Dolomite, dolomitic sediments
	V	Basic-intermediate volcanics
	☐	Marine mudstone-sandstone
	~	Pelitic schists, quartzites
	▨	Amphibolite
	//	Sodic dolerite dyke swarm

84-1517

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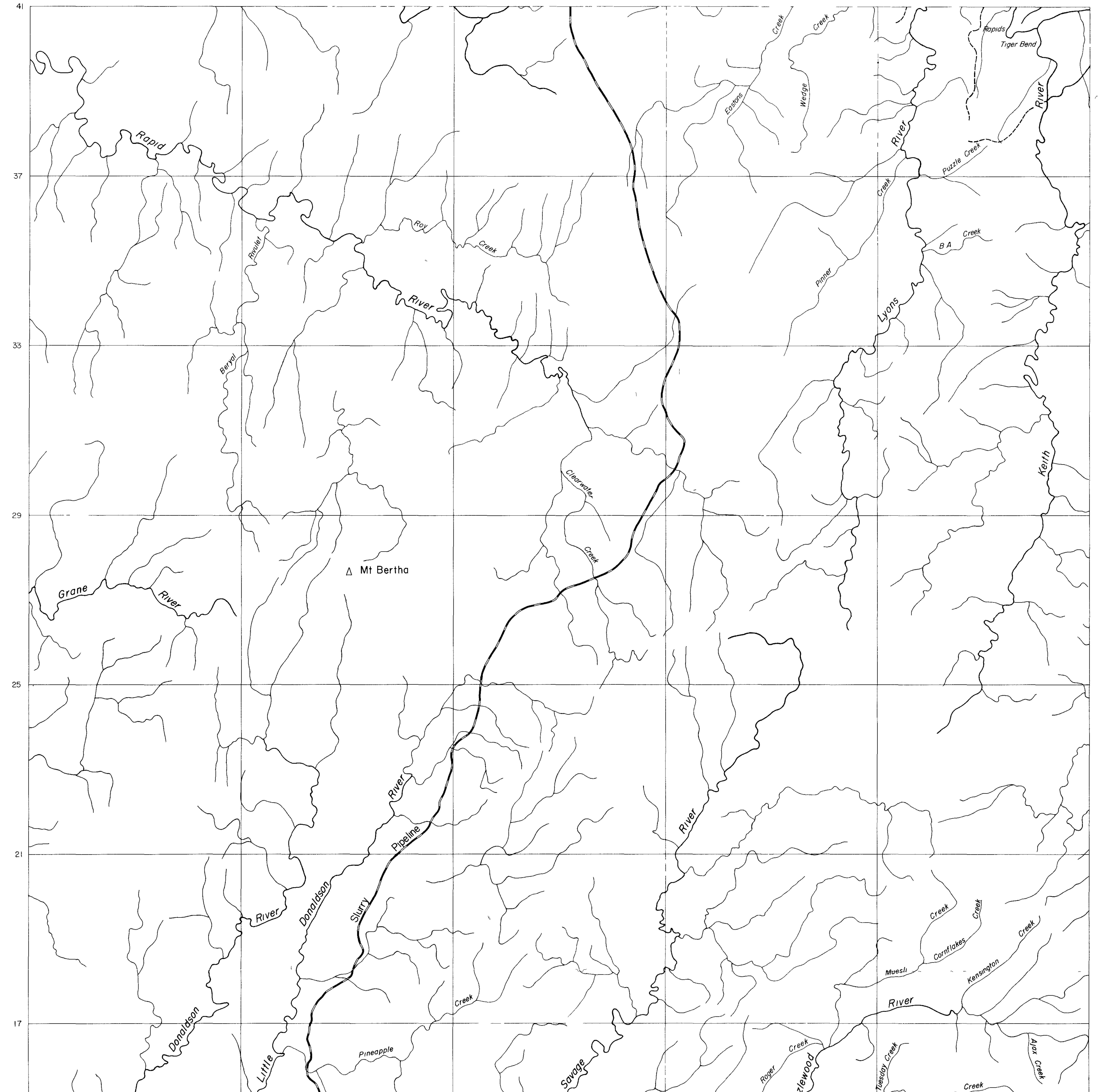
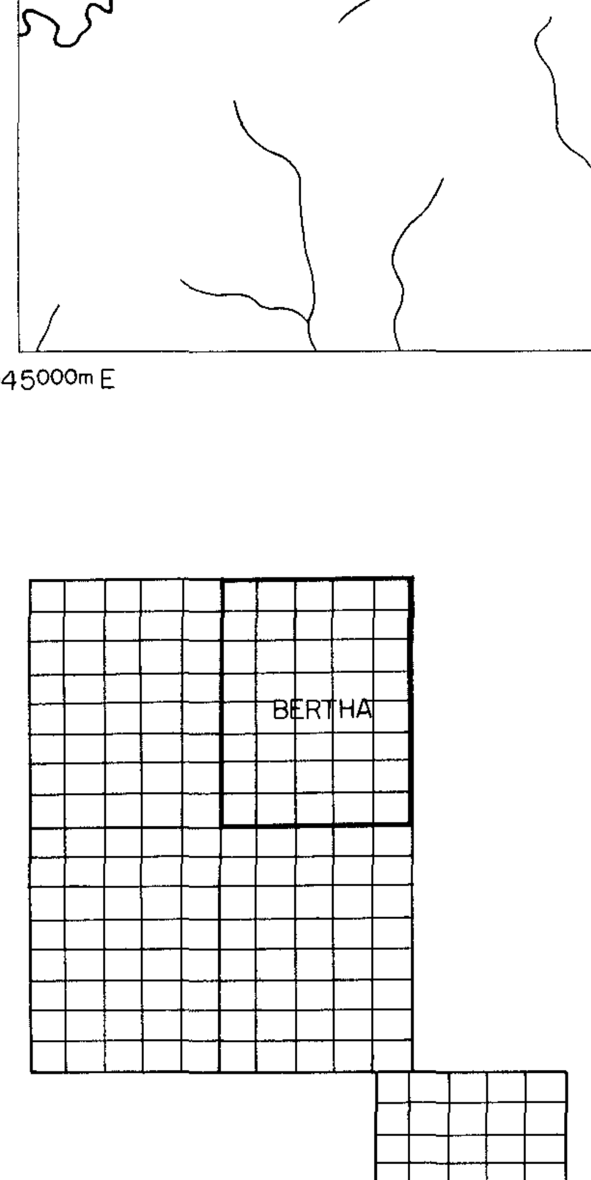
EL 26/78
PRECIOUS STONES
REGIONAL GEOLOGY
N.W. TASMANIA

3012

M. HUTTON	DRAFTSMAN: P.J.R	A3-2
SCALE: 1:250,000	DATE 9·12·1980	



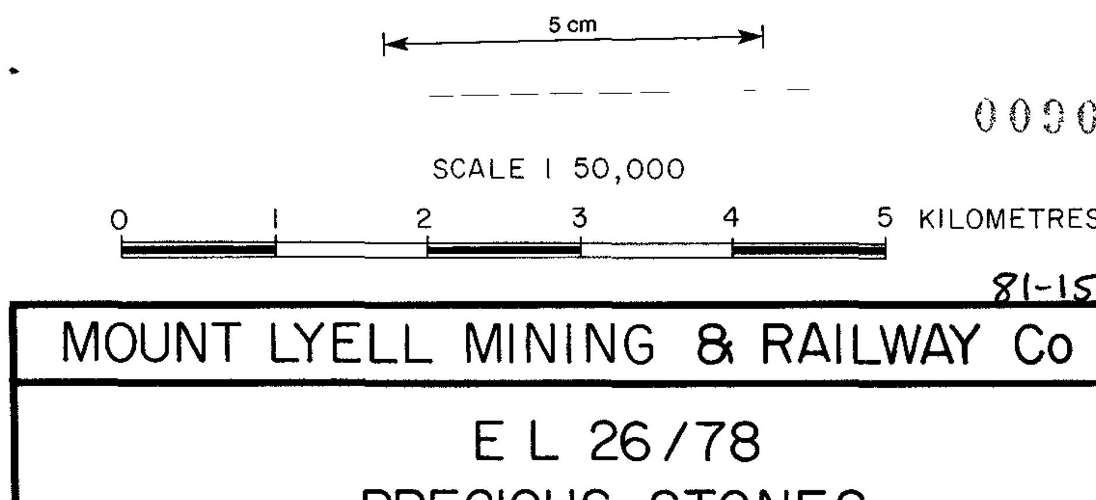


Sampling location

24611 Sample number

------- 4 wheel drive track

000021



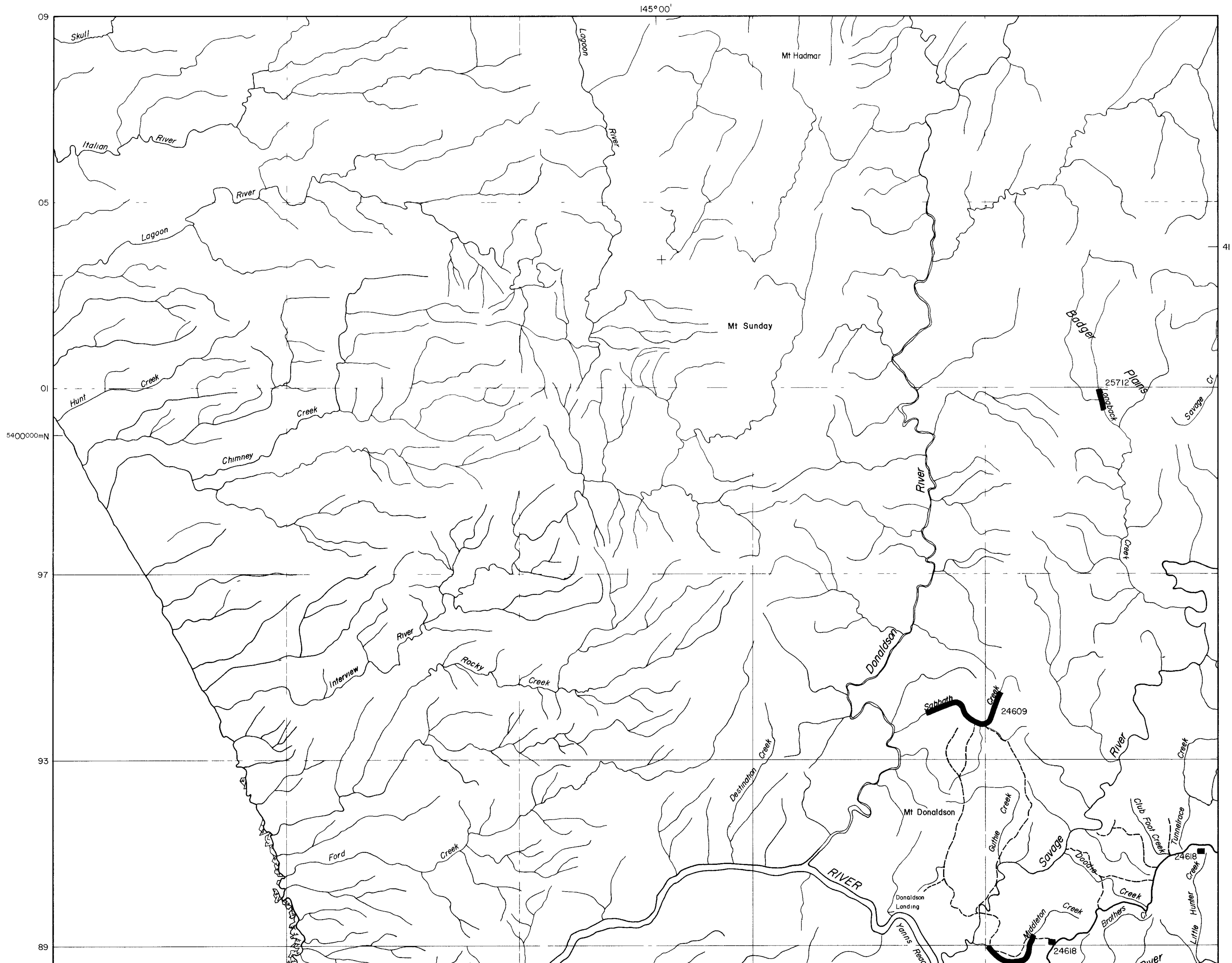
81-1517

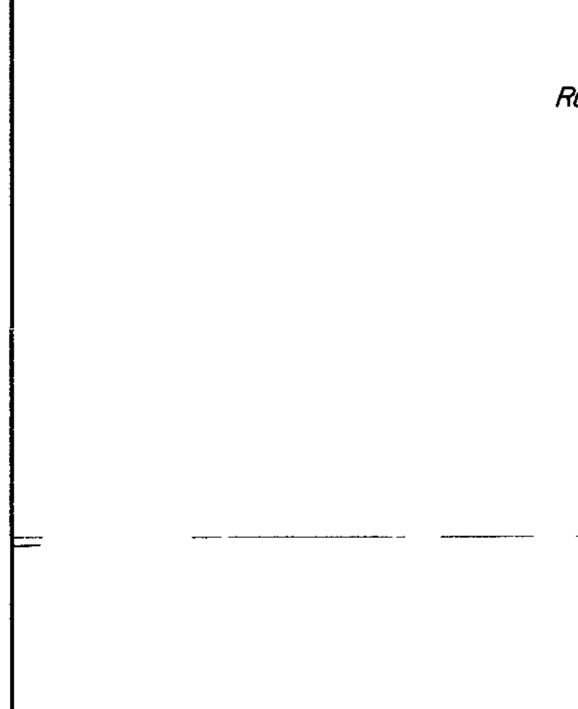
MOUNT LYELL MINING & RAILWAY Co Ltd

E L 26/78
PRECIOUS STONES
BULK SAMPLING LOCATIONS
-6mm SEDIMENTS

3015

Date 9 12 80	Author M HUTTON	Drawn by H D J & PJR	A1 -3





GRID DENOTES 1 5000 MAP SERIES BASED ON 1000 METRE INTERVALS OF THE AUSTRALIAN MAP GRID ZONE 55

▬ Sampling location

24611 Sample number

------- 4 wheel drive track

5 cm

009022

SCALE 1 50,000

0 1 2 3 4 5 KILOMETRES

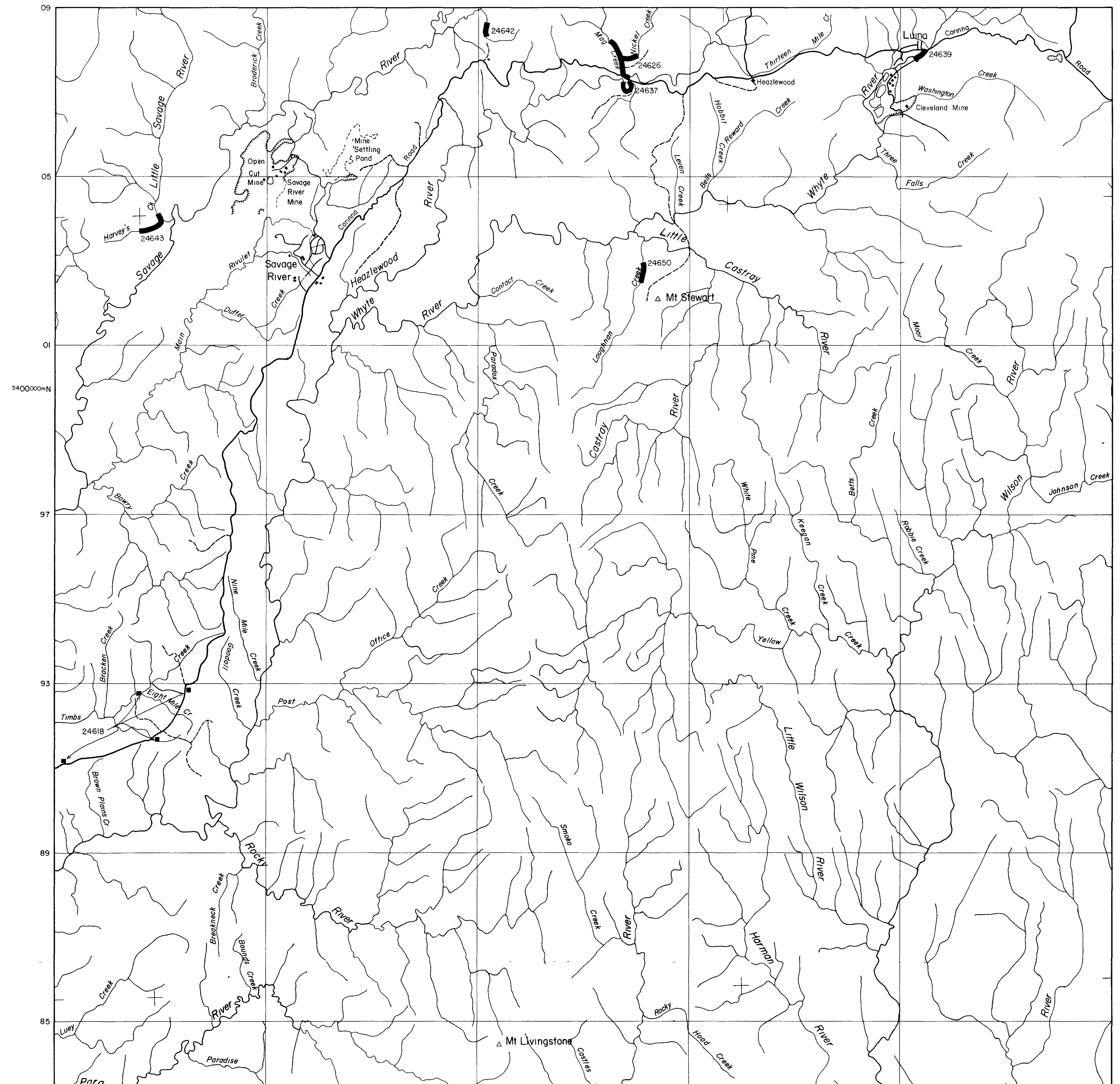
81-1517

MOUNT LYELL MINING & RAILWAY Co Ltd

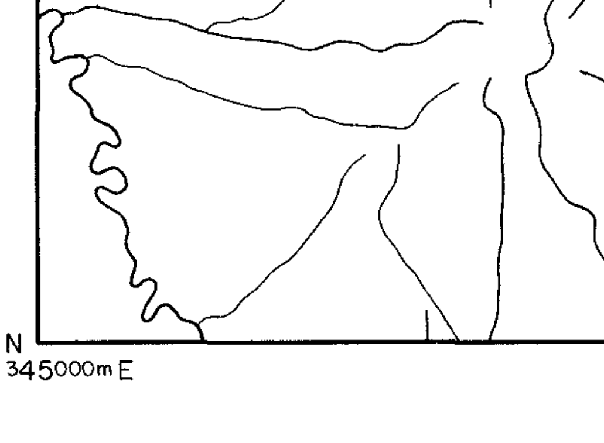
E L 26/78
PRECIOUS STONES
BULK SAMPLING LOCATIONS
-6mm SEDIMENTS

3013

Date 9 12 80	Author M HUTTON	Drawn by H DJ & PJR	A1 — 4



LIVINGSTONE SHEET



▬	Sampling location
24611	Sample number
-------	4 wheel drive track

5 cm

SCALE 1 50,000

0 1 2 3 4 5 KILOMETRES

3014

81-1517

MOUNT LYELL MINING & RAILWAY Co Ltd

E L 26/78

009023

PRECIOUS STONES

BULK SAMPLING LOCATIONS

-6mm SEDIMENTS

Date 9 12 80	Author M HUTTON	Drawn by HDJ&PJR	A1-5

GRID DENOTES 1 5000 MAP SERIES BASED ON 1000 METRE INTERVALS OF THE AUSTRALIAN MAP GRID ZONE 55