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MR. L. J. C. SAY

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A REVIEW OF THE CUNI NICKEL DEPOSITS

ZEEHAN AREA, TASMANIA

SPECIAL PROSPECTORS LICENCE NO. 127

By

G. Bell, B.Sc., M.A.I.M.M.

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G. Bell & Associates Pty.Ltd.,
67 Victoria Parade,
Collingwood, Victoria, 3066
Phone: 41.2559 - S.T.D. Code 03.

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A REVIEW OF THE CUNI NICKEL DEPOSITS

DISTRICT OF MONTAGUE, IN THE VICINITY OF MELBA FLATS

SPECIAL PROSPECTORS LICENCE 127

An area of approximately 6 square miles (or 15.5 square kilometres) held by Mr. L.J.C. Say, in the District of Montague, Zeehan Area, Tasmania covers the mine workings commonly known as the Cuni Nickel Deposits.

The area, which is about 8 kilometres east of Zeehan, is ~~s~~^wampy ground situated south-west of the old Emu Bay Railway Argent Tunnel. Workings are mostly west of the old railway.

The following is a summary to give a background to the deposits, but it is felt that a completely new approach to exploration is necessary.

2. HISTORY

The deposits were first located about the year 1893 and were worked spasmodically up to 1959.

Prior to 1914, only 710 tonnes of ore had been shipped to Europe. One bulk sample in 1911, assayed 17.0% Ni and 6.45% Cu.

Between 1912 and 1914, a syndicate sold 2820 tonnes of ore, varying in nickel content from 8 to 11% and copper, from 4 to 14%.

In 1928, Copper-Nickel Mining Company, mined 207 tonnes of ore, but work ceased in 1932.

The Tasmanian Mines Department investigated the area by drilling between 1939-1940. The Vaudeau workings were opened in 1938 by the Australian Nickel N.L. and in 1948, by the Lead Nickel Mining Company.

In 1952-1953, Eagle Metals N.L., drilled 4 holes after the Bureau of Mineral Resources had carried out Geophysical Surveys.

Between 1955 and 1957, 18 holes were drilled by the Tasmanian Mines Department for the Montana Silver-Lead Company N.L., and the Results are discussed by Horvath (Rec. Bur.Min.Res. Aust. 1957/98) and Robinson (Tas. Mines Department, Tech. Report No. 3, 1958).

3. GENERAL GEOLOGY

Highly weathered, grey, green and purplish shales, siltstones, greywacke and breccias of the Crimson Creek Formation, Lower to Middle Cambrian in Age, are intruded by sills and dykes of ultramafic rocks and associated types, including pyroxenite and peridotites of late Cambrian Age. East of the Cuni field, the intrusives which form a mass of some extent, (Zeehan 1:63 360 Geological Sheet) have been extensively serpentinised.

The sill forming the Cuni area of Mineralisation strikes a few degrees west of north with vertical/~~steep~~, easterly dip. Toward the northern part of the sill, strike tends to swing east of north exhibiting an accompanying south-east dip. Toward the south, in the area of the Deverau ore body, the sill has been displaced west by the Nevada fault.

Little basic geochemical data on the sills and intrusives to the east is available. Chromite is not apparent although the symbol 'C' appears on the Zeehan 1:63 360 Geological Sheet in the vicinity of Serpentine Hill.

The ore-bodies are associated with the footwall (or western side of the upturned sill). They conform to the sill in strike and dip and mineralisation extends over the three kilometre length of the dyke, but by no means do they form a continuous ore-body.

4. PREVIOUS DRILLING

In the drilling for the period 1948-1958, ore intersections were assayed for copper and nickel only.

Bores EM 1 to EM 5 were sunk on the Eagle Metals leases, while Bores M 6 to M 23, were sunk on the Montana Silver-Lead Company's leases. Holes EM 5, M 17 and M 22 were not completed.

Summaries of boring, repeated from Technical Report 3 by R.G. Robinson, are given below.

EAGLE METALS DRILLING

Name	Magnetic Bearing	Inclination	Length	Location	Ore Intersections	Comments
EM/1	330°	-45°	120'	Genets Winze Section	(70-79')9'@(0.10%Cu. 1.72% Ni.)	Dyke 47-76' (14.3-23.2m)
EM/2	270°	-50°	120'		(66-81')15'@(0.70%Cu. 0.50% Ni.)	Dyke 45-82' (13.7-25m)
EM/3	270°	-45°	120'	North Cuni Section	(70-85')15'@(0.82%Cu. 1.10% Ni.)	Dyke 57-88' (17.4-26.8m)
EM/4	270°	-45°	140'		(118-121')3'@(1.56%Cu. 0.37% Ni.)	Dyke 109-123' (33.2-37.5m)
EM/5	270°	-45°(?)	65'(?)		Nil	Not completed Indefinite records on EM/5

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MONTANA SILVER LEAD DRILLING

Name	Mag. Bearing	Inclination	Length	Location	Ore Intersections	Comments
M6	312°	-45°	161'	Genet's Winze Section	(123-139')16@(1.56%Cu. 2.28% Ni.)	Dyke 107-136'. Rest sediments.
M7	Vertical		186'		Nil	All sediments
M8	312°	-50°	113'		(89-94')5"@ (1.02%Cu. 0.80% Ni.)	
M9	312°	-55°	285'		Traces only	Dyke 255-285'
M10	224°30'	-50°	132'	Devereau Section	Traces only	Dyke 70-121'
M11	256°30'	-45°	143'		Traces only	Dyke 105-143'
M12	40°	-45°	118'		(74-75')1'(1.15% Cu. 2.02% Ni.)	Dyke 62-75'
M13	232°	-45°	145'	Nickel Reward Section	(50-63')13'Uncertain Grade	Core upset in transit to Laun- ceston. Dyke 10-110' Sediments 110-145
M14	232°	-45°	160'		Nil	All sediments
M15	52°	-45°	113'		(32-44')12'@1.57% Cu. 6.42% Ni.)	All in Dyke
M16	55°	-55°	65'		Nil	All in Dyke except for first 20'
M17	52°	-45°	{ 20' 15'		Nil	All in Dyke (two holes)
M17a	10°	-60°	95'		Nil	All in Dyke
M18	10°	-45°	87'		(53-62')9'@(1.15% Cu. 0.98% Ni.)	Dyke 0-64'. Sediments 64-87'
M19	10°	-65°	85'		(50-56')6'@(2.44% Cu. 1.51% Ni.)	
M20	10°	-45°	105'		Traces only	0-22'Dyke, 22-68'Sediments 68-70'Dyke, 70-105'Sediments
M21		Not Drilled				
M22	10°	-45°	{ 33' 8'	Nil Nil	All in Dyke, both into workings	

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Montana Silver-Lead Drilling (cont'd)

Name	Mag. Bearing	Inclin-ation	Length	Location	Ore Intersections	Comments
M23	270°	-45°	170'	Half-way between Nickel Reward and Rension Bell Rd.	Traces only	All in Serpentine on Geophysical Anomaly

Grades shown in Bore EM 3 of 1.10% Ni and 0.82% Cu do not compare favorably with recorded grades of ore mined in the North Cuni Workings; i.e. 10.15% Ni and 5.46% Cu. The discrepancy has been considered to be due to both loss of soft sulphide core and circulating water.

Drilling of the Devereau Section showed less copper at depth in Bore M 12 than at the surface and Bores M 10, 11 and 12 show a southerly dip of the sill, so conforming with the strike and dip of the enclosing strata.

In the Nickel Reward Section, the lode strikes at 185° magnetic, and it is considered that the lode located in Bore M 13 is not directly connected with the lode exposed in surface trenching and that a fault intervenes. Drilling also suggests the possibility of three parallel lodes.

A report of April 13, 1960 gives results of geophysical and geochemical exploration in the Cuni Area by Rio-Tinto Australian Exploration Pty.Ltd. Magnetic and Self-potential surveys were carried out. Conclusions reached were that the magnetic anomaly was due to the ultramafic intrusion while no definite anomalies were recorded in the S.P. survey.

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Geochemical work carried out in the same area suggested a few mineralised zinc zones, one at the peak of the aeromagnetic anomaly in the swamp. The zinc anomalies are undoubtedly due to the slates in the area. The remaining zinc anomalies occurred over slates (slates may contain from 50 to 1000 ppm Zinc).

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5. ORE BODIES

5.1 Geology

The ore shoots occur in the foot wall of an ultramafic sill which dips east at an angle between 80° and 90° . Maximum thickness of the sill is approximately 27 metres.

Drilling has indicated a large number of sills which appear to be concealed by the overlying swamp deposits. These may be lit-par-lit intrusions (Taylor 1952), the sill carrying copper and nickel concentrations being the largest.

One hundred metres west of the mineralised sill, a "gabbro" sill parallels the others and is reported to be a rock similar to the ultramafic sills, perhaps a peridotite (Robinson 1959). Drilling has indicated that mineralisation cuts out at a depth of forty metres below the surface, although little exploration below this depth has been carried out. Mining operations, generally, did not reach the bottom of the shoots.

At this level, the sill shows marked, local flattenings, suggesting the possibility of additional ore shoots at greater depths. It has been suggested that the steeper parts are transgressive sections of the sills. If such warps could be related to surface geology of the enclosing sediments, perhaps additional targets at depth could be predicted.

As a rule, shoots pitch north at angles between 40° and 60° . Rich shoots have been found at the intersection of transverse fault fissures and the lode fissures, the dip of the intersecting planes being the pitch of the shoots - (Bul. 36. Geol. Surv. Tasm. 1925 - Dundas Mineral Field).

Generally, ore is dense, massive and free from gangue minerals. Associated rocks are orthorhombic pyroxenites, norite, peridotite and ?gabbro. Ore minerals may extend into the slate foot wall and, although this has lead to the hypothesis that ore deposition was from (aqueous) solution, this is not necessarily so. In depth, however, ore bodies have tended to give way to white vughy or cellular quartz.

5.2 Mineralogy

The nickel-copper deposits are of the sulphide type, consisting essentially of pyrrhotite, pyrite, chalcopyrite and pentlandite. Millerite and Zaratite have been recognised in the deposits and show that secondary deposition has occurred. The occurrence of galena and sphalerite has been noted.

Two main types of ore occur. These are:

- i. High-grade, pentlandite-pyrrhotite at South Cuni and Vaudeau Mine. At North Cuni, pentlandite has been largely replaced by violarite. Pyrite constitutes 20% of the sulphides and chalcopyrite partly replaces other minerals.
- ii. High-grade, millerite ore occurs at the Nickel Reward and Devereau Mines with some low-grade millerite ore at North Cuni.

At Nickel Reward, ore shows intergrowths of millerite and chalcopyrite which corrode residual pyrite.

In the lead-zinc deposits, quartz cements brecciated ore and has, therefore, been considered to be a late-phase injection. There is the possibility of both quartz and lead-zinc being later, hydrothermal introductions into a pre-existing nickel-copper ore although this is discounted somewhat by K.L. Williams.

Williams, (in F.L. Stillwell Anniversary Volume, A.I.M.M. 1958) considers that the sill is far too narrow to allow a magmatic sedimentation origin of the nickel copper ore and the fact that some minerals are replaced by others suggests precipitation from solutions moving along the dyke foot-wall. Williams supports this hypothesis with the fact that some sulphide-free serpentinites of the district contain up to 0.5% (5000 ppm) nickel.

The fact that serpentinites contain 5000 ppm nickel is not unusual; in fact, serpentinitised olivinites commonly contain nickel contents of this order and many serpentinites of West Australia contain greater amounts.

In addition, there does not seem good reason to deny a sedimentary origin for the copper-nickel sulphides. It is possible that such a differentiate could be selectively intruded into adjacent strata, followed by later (or much later) hydrothermal introduction of lead and zinc minerals and quartz.

The writer, at this stage, has no good reason to support any theory of paragenesis, but feels that mineralisation may be a hydrothermal re-distribution of copper and nickel sulphides from a magmatic sediment.

6. OLD WORKINGS

The following Summary is taken from Blissett (1962):

i. Genet's 1929 - 1931

Workings consisted of material taken from a length of 21 m. to a depth of 3 m.

Drilling carried out in 1953 indicated some 15 000 tons of ore containing 4 to 6% nickel and from 2 to 3% copper.

Ore cut out between 33 and 36 metres below the surface.

ii. North Cuni

Between 1912 and 1914, the shaft was sunk to 80 feet (24.4 metres) by the Dundas - Cuni Mining Company. The ore body was a metre in width with an easterly underlay. One batch of ore assayed 17% nickel and 6.45% copper.

Between 1929 and 1932, Copper - Nickel Mining Company drove northwards along the lode for 45 metres and southward for 25 to 30 metres.

Winze on the underlay completed through to south drive about 12.2 m south of the shaft.

Although some stoping carried out above? the south drive, no record of position or output is known.

One bore hole in 1953 intersected ore above the north drive, assaying 1.1% Ni and 0.82% Cu. over a width of 3 metres. A second hole indicated lower-grade mineralisation just below the end of the south drive.

May be 2500 tons above 24.5 m level and 1000 tons below.

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iii. South Cuni Shaft

Shaft sunk to a depth of 23 metres by Dundas-Cuni Mining Co., and lode driven on, to the south, for 29.25 metres. Between 7.6 m,S. and 14 m,S. lode varied from 1.3 m to 0.76 m and bulk assays were as follow:

2.9 to 7.58% Cu.

6.0 to 11.72% Nickel.

Lode pinched out between 14 m, S. and 19 m,S. along the drive, but at 20.5 m it expanded to 1.37 m of high grade ore with 0.5 metres of quartz.

Farther south, high grade ore on the footwall cut out at 26 metres and both quartz and low grade siliceous ore ended at 29.25 metres.

Most ore above the drive to the surface has been stoped out.

Production 1189 tons produced to closing of mines in 1914.

427t.	420 tons	5.53% Cu.	11.57% Ni.
10 tonnes	10 "	5.12% Cu.	10.37% Ni.
60 "	59 "	5.12% Cu.	11.66% Ni.
20 "	20 "	5.53% Cu.	11.57% Ni.

Three bore holes in 1930 indicated the absence of mineralisation 61 metres south of the shaft and 24.5 metres to north.

Only a few hundred tons ore below drive (Robinson).

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iv. Blowfly Shaft

Small shoot 18.3 metres in length at surface and 10.7 metres in length at bottom of shaft.

Deposit almost worked out in 1914 after production of 280 tons.

v. Mosquito Shaft

1914 - 52 tons, but no records of workings. Two holes, 1930, well to south of shaft, did not intersect mineralisation.

vi. Vandeau Shaft

1912. Ore body trenched along surface for 25.3 metres.

1912-14. After 5 exploratory bore holes, shaft sunk to 38.7 metres and levels opened at 21.3 m and 37 metres.

Upper level driven 8.2 metres ^{north} and 15.8 metres south and stopes yielded 2500 tons with 10.4% Cu.

No ore in north drive.

In south drive, shoot was found 3.3m from the cross-cut and driven on for 9 metres. Ore body averaged 1 metre in width and a 5.5 m stope worked above this level.

1938. 278 tons of ore containing 19.75 tons Ni and 11.19 tons Copper.

1948. 750 tons, but no market. Rise between levels completed and most ore stoped out between the levels south of the shaft.

Total production 3880 tons of ore averaging 10% Nickel and 5% Copper. Most ore appears to have been extracted.

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vii. Nickel Reward

Shaft probably only 6 metres deep. Small quantities of ore produced, 8-12% Ni. and 3-5% Cu. with a little silver and a trace of gold.

Two bores prior to 1914 did not intersect economic ore.

A shoot 9 metres long, width 0.6 - 2.4 metres.

Horvath and Robinson, from self-potential surveys and bore holes, considered two, possibly three, ore bodies ranging up to 6.97% Ni. and 3.14% Cu.

A half-ton of ore from a deep costean north-east of old Nickel Reward workings assayed 7.23% Ni. and 5.26% Cu. (Mines Dept. Labs. Launceston).

Body may be less than 100 feet long and over 3 metres thick at the centre. Extent in depth - not known.

viii. Devereaux Prospect

Shoot at surface 0.3 - 0.46 metres in width.

Depth of shaft - not known.

Assays gave 5.5% Ni. and 18.1% Cu. In 1956, three bore holes (MD) and self-potential surveys suggested that mineralisation was low-grade and of limited extent.

ix. Other Occurrences

Low grade nickel mineralisation within the main ultrabasic intrusion east of the Cuni ore bodies described by Horvath (1957), near Nevada Creek immediately west of the Renison Bell Road.

1957. Trench and bore hole on magnetic anomaly (pyrrhotite) gave values of about 0.36% Ni, and nickel was present over a length of 42 metres (30 metres horizontal and vertically).

SUMMARY OF MINE WORKINGS

	Length metres	Width metres	Depth metres	
Devereaux				
Nickel Reward	9	0.6-0.5		
Vaudeau	24 at 21m 9 at 37m	0-3 1m at 37m	37	
Mosquito	14.3	?	small	Worked to 3m.
Blowfly	18.3	?	small	" " 4.25m.
Dundas Cuni South (East)	27.5	?	23	" " 23m.
Dundas Cuni South (west)	Possible 46m.	0.6-1.2	?	
Dundas Cuni North (Cuni South)	24.4 at 21 Possibly 60-90m	0.6	21.3	90m, Zone indicated by Geophys Survey.
Cuni North	105m. max.	0.9	33.5	Worked to 3m. in Genet's Winze - Geophys. Survey. 20 trenches and 2 bores proved body.

7. CONCLUSIONS

- i. Nickel mineralisation on the foot-wall of basic (ultrabasic) sills over a north-south length of 3.2 km.
- ii. Ore bodies generally less than 150 feet in length, but are high grade.
Discontinuity due in part to faulting.
Some lodes pinch out in depth, up to 37 metres but there is no structure or reason to suggest that other shoots do not occur in depth.
- iii. Geophysical Surveys, supported by drilling and trenching, indicated additional ore bodies which should be investigated further.
- iv. Sill is very narrow, maximum 30 metres, maximum 100 feet width - perhaps main body is a better prospect.
- v. Ore bodies grade into vughy quartz.
- iv. Quartz and mineralisation controls suggest hydrothermal origin.

8. SUMMARY OF PREVIOUS GEOPHYSICAL INVESTIGATIONS

The Bureau of Mineral Resources has carried out magnetic and self-potential investigations.

Horvath in B.M.R. Records 98, 1957 refers to "even more important, (is the) more-extensive, disseminated mineralisation in the dyke. This is a new discovery which improves the prospects for the field", and "Comparison of drilling results with geophysical results, appears to indicate that the distinct self-potential anomalies are caused by the compact ore on the foot-wall of the dyke, while the disseminated ore gives only very weak, self-potential indications. Geophysical work appears to be of only little assistance if drilling targets have to be selected for the investigation of the extent of disseminated ore".

Also, "nickel sulphides associated with magnetite occur in the serpentine of the main mass of ultramafics in the east and were found by drilling a magnetic anomaly. The ore body is only low grade, but seems to be of greater dimensions than the deposit associated with the "meta dolerite dyke". Bore sections are shown where up to 3 metres of foot-wall shale contains 1.8% Ni and 1.0% Cu.

Other references are -

Kennecke B.M.R. Rec. 1952/71
1953/82.

9. RECOMMENDATIONS

The narrowness of the pyroxenite sill, the association of quartz and structural control of mineralisation with its associated small "pods" of ore, suggests a hydrothermal origin of the copper-nickel. It is possible that a late stage of fracturing from the massive ultramafics to the east has resulted in the intrusion of the Cuni pyroxenite sill. Whether this magma took copper-nickel minerals with it, or whether the offshoot provided a path for later solutions, is not known.

Because of the small size of ore-bodies, considerable difficulty and expense would be involved in tracing additional bodies in depth and the cost of mining to extract such ore-bodies would be high.

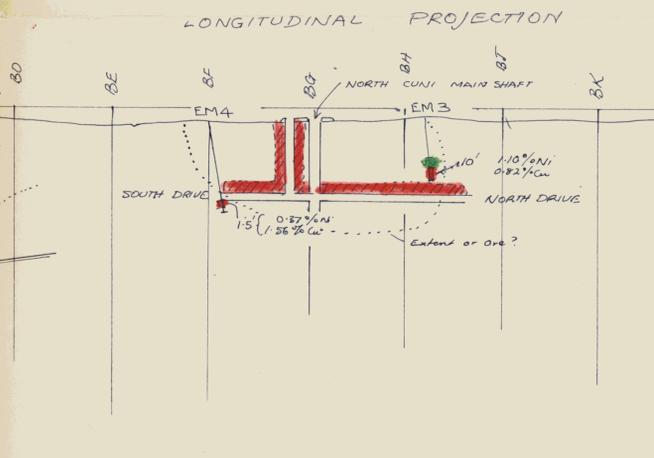
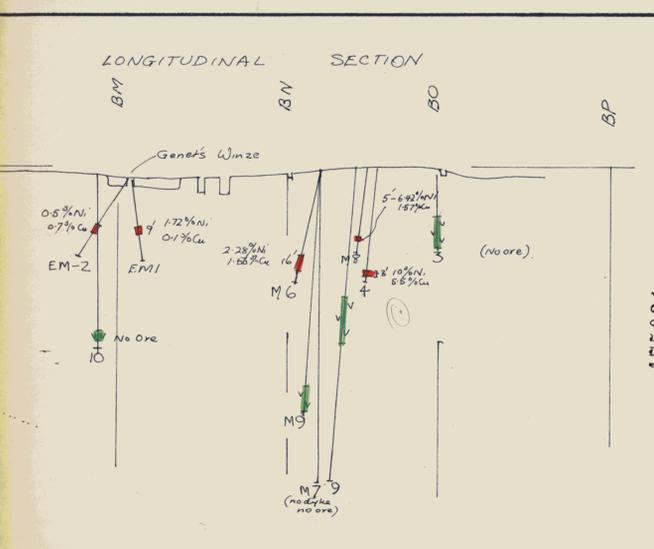
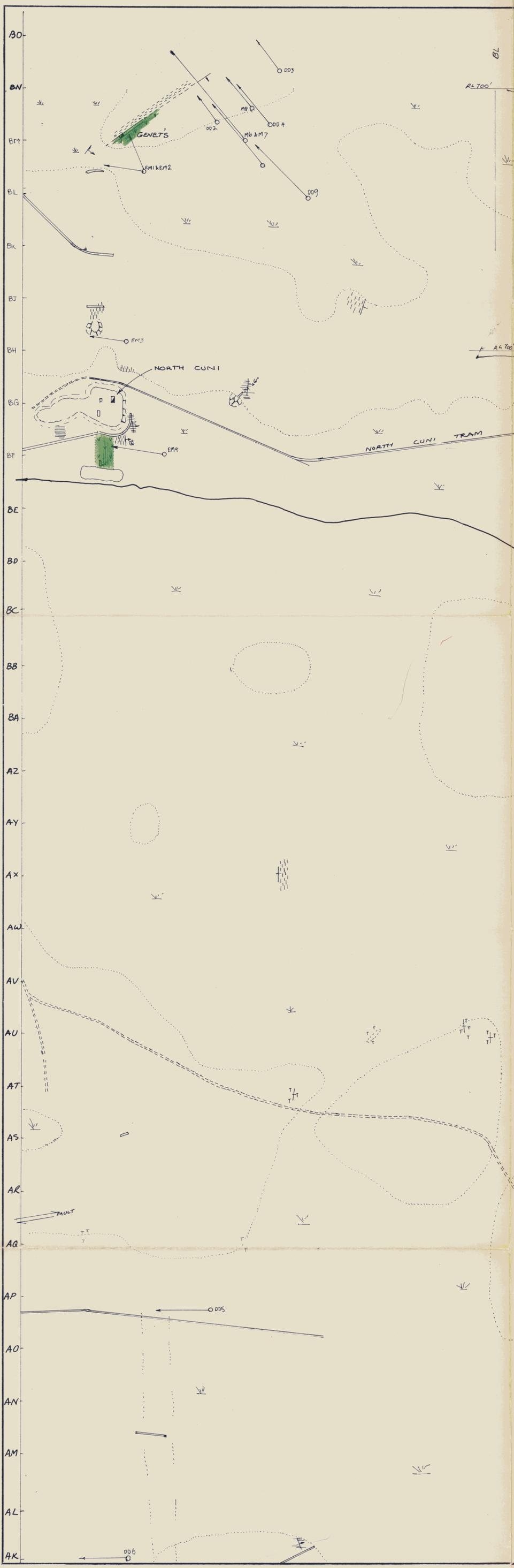
The larger ultramafic intrusions to the east appear as though they could be worthwhile prospecting and if this area could be secured the whole could be attractive.

If the latter area is not available, it is recommended that the area held be relinquished.

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G. Bell



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G. BELL AND ASSOCIATES PTY. LTD.
for
L. J. C. SAY 75-1147 020

SHEET 1 OF 3

CUNI NICKEL DEPOSITS
SKETCH PLAN & SECTIONS

LOCATION: ZEEHAN DISTRICT, TASMANIA

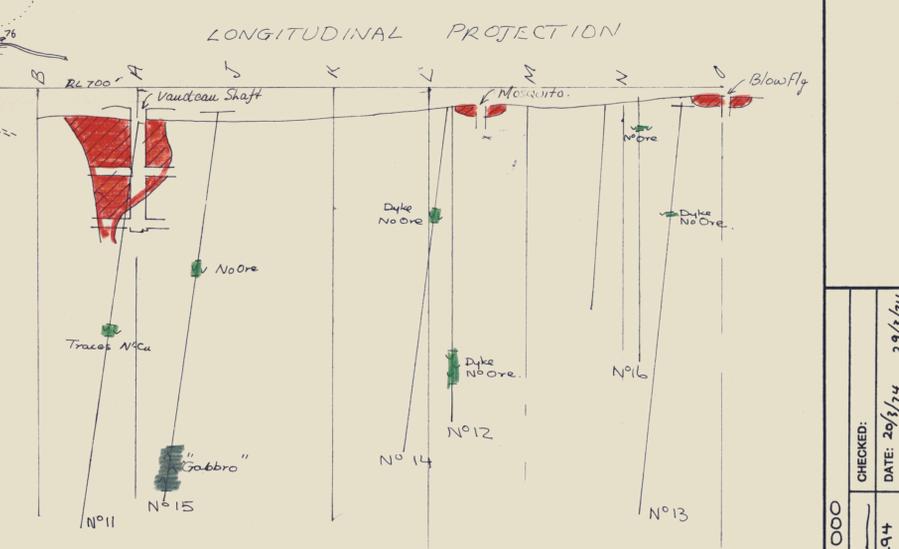
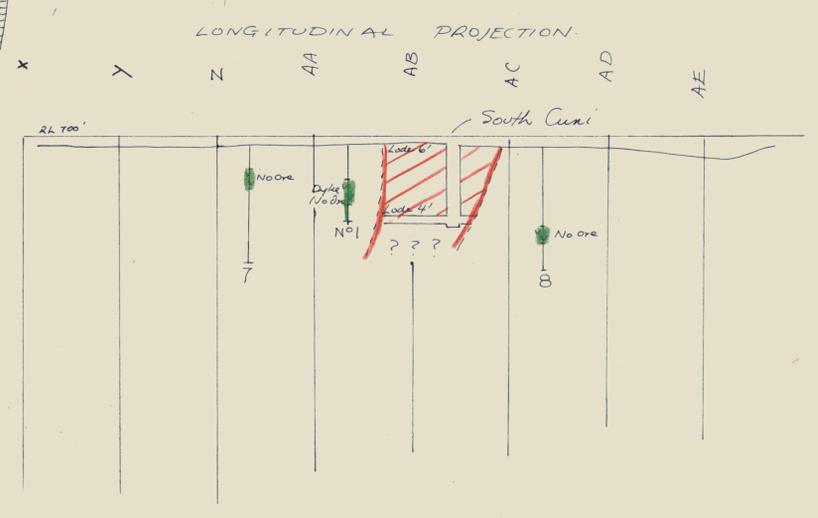
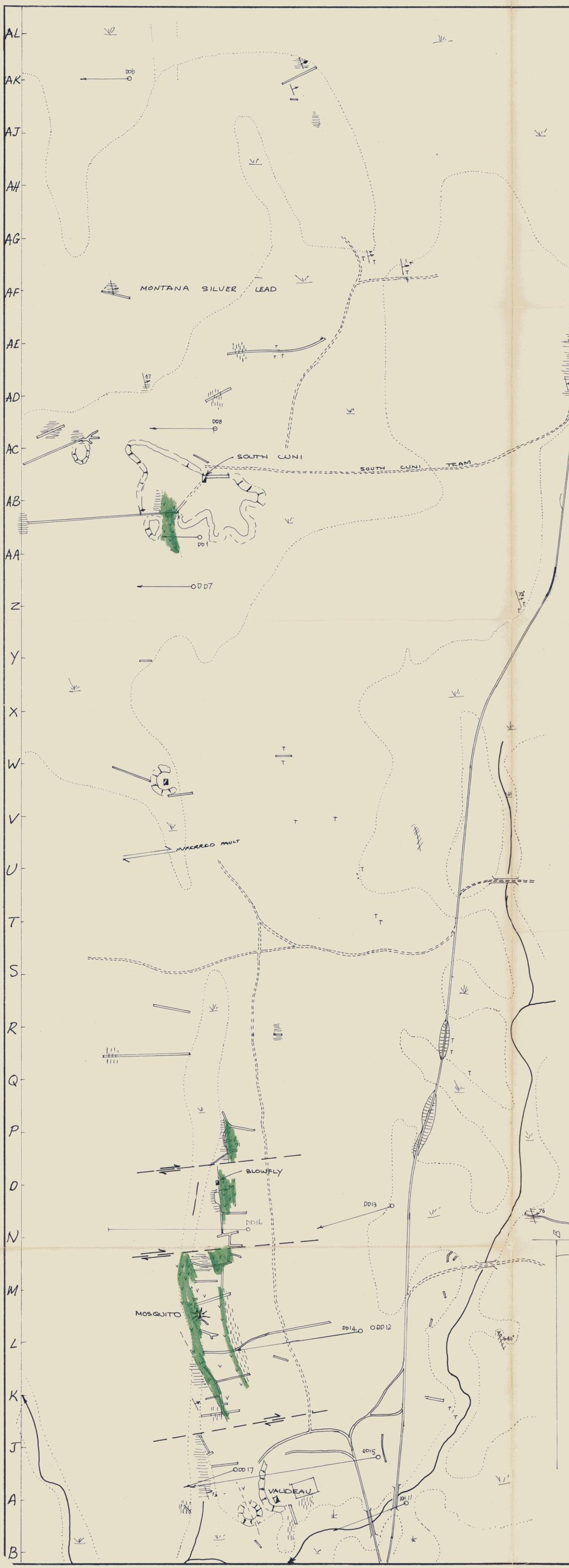
MAGNETIC MERIDIAN

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ALL DATA FROM PUBLICATIONS
OR THE TASMANIAN GEOL. SURVEY

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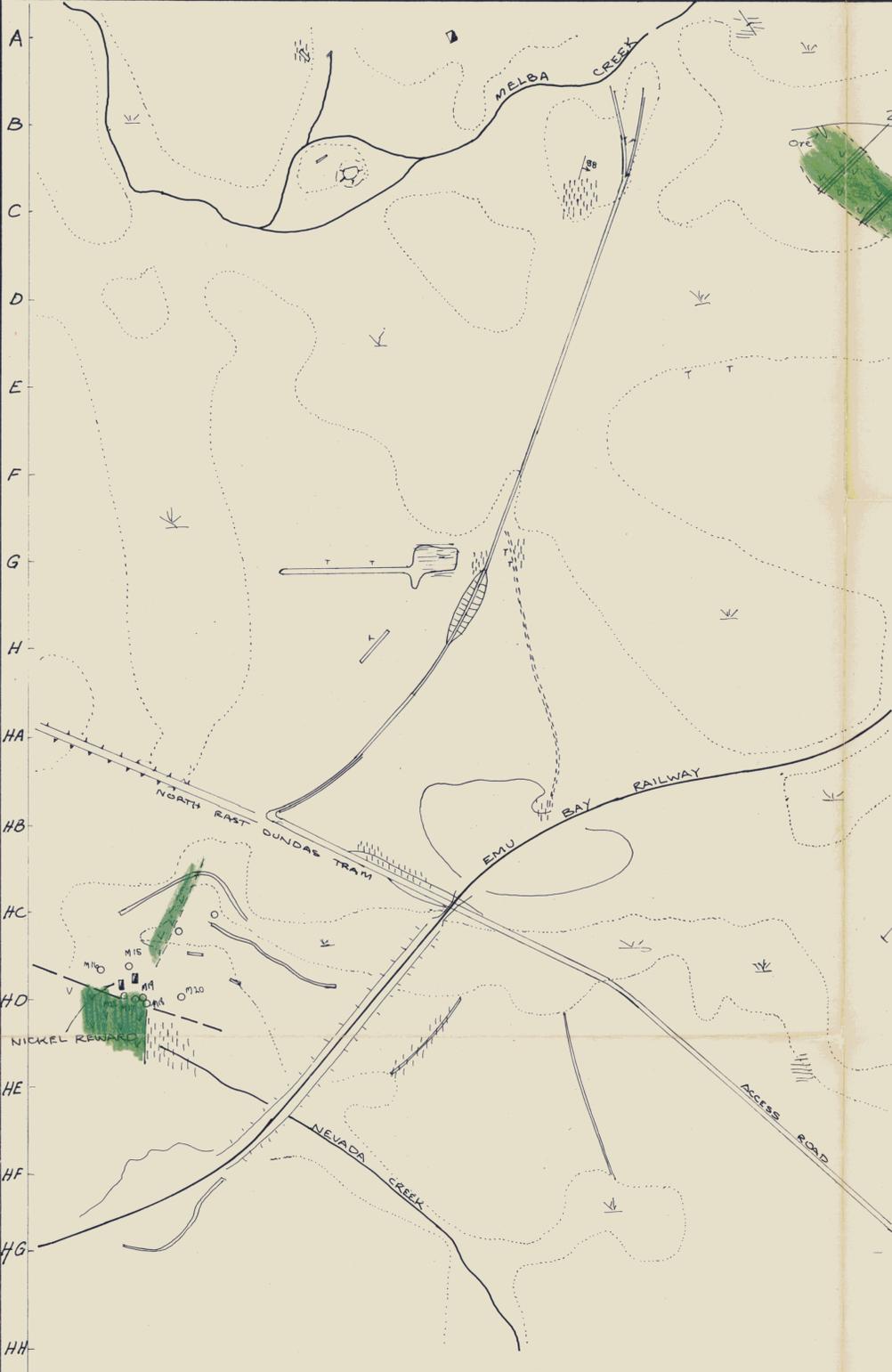
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 CUNI NICKEL DEPOSITS
 SKETCH PLAN & SECTIONS
 LOCATION: ZEEHAN DISTRICT, TASMANIA

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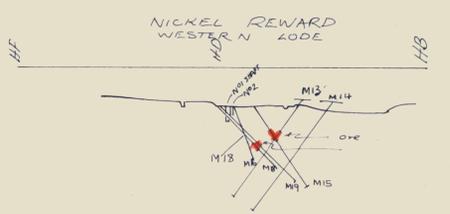
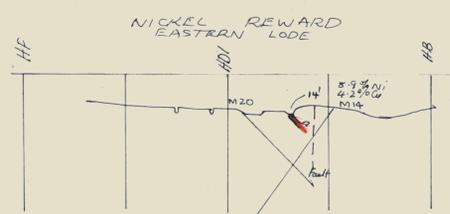




VEAUDEAU SECTIONS



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 SHEET **3** OF **3**
CUNI NICKEL DEPOSITS
SKETCH PLAN & SECTIONS
 LOCATION: ZEEHAN DISTRICT, TASMANIA



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