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DEPARTMENT OF MINES
SOUTH AUSTRALIA

FIFTH GEOLOGICAL AND GEOCHEMICAL REPORT ON THE LYNDHURST DIAPIR

by

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Rept.Bk.No. 67/109
G.S. No. 4137
D.M. 1571/68

10th December, 1968

DEPARTMENT OF MINES
SOUTH AUSTRALIA

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FIFTH GEOLOGICAL AND GEOCHEMICAL REPORT ON THE LYNDHURST DIAPIR

ABSTRACT

No significant mineralization was intersected at South Breccia in diamond drill hole DLY9.

Basic igneous rock and dolomite outcrops in and around the diapir have been re-examined and rock-chip sampled.

Further investigation of zinc-rich, Burra Group dolomites, south of the Avondale Mine, is recommended.

The basic igneous rocks have been divided on grain-size into two types, microdiorites and diorites. The diorites are closely associated with copper mineralization and contain up to 12 times the copper content of the microdiorites. Wagon drilling of two diorite intrusions is recommended.

INTRODUCTION

The Lyndhurst Diapir was reserved from the operation of the Mining Act on the 8th January, 1966. Intensive geochemical, geophysical and geological investigations resulted in the discovery of a number of copper and lead-zinc anomalies. Details of the work are recorded in four previous reports. References to all previous reports are included in the Fourth Report.

The Fourth report recommended that a zone of low-grade copper mineralization, associated with a coincident Induced-Polarization anomaly in the South Breccia area, should be tested by diamond drilling. The hole, DLY 9, was completed on 3/10/68 at a depth of 582'9". No significant mineralization was intersected.

The wagon and latest diamond drilling has indicated that copper mineralization in the breccia is closely related to intrusive plugs of medium to coarse-grained diorite. Surface outcrops of all known basic igneous rock in the diapir have received further scrutiny and have now been rock-chip sampled. The basic rocks have been divided into two types on their grain-size, ie. microdiorites (less than ½mm.) and diorites (greater than ½mm.) The rock sampling has shown that the diorites carry up to 12 times the copper content of the microdiorites.

Outcrops of dolomite and limestone within andbordering the diapir have also been checked for the prescence of secondary zinc minerals. No obvious zinc minerals were discovered but more work is considered necessary in testing the zinc-bearing Burra Group Dolomites, south and southeast of the Avondale Mine.

GEOLOGY

The reader is referred to the summary of the stratigraphy, structure and mineralization of the Lyndhurst Diapir recorded in previous reports, especially the Second and Fourth Reports. (Rept. Bks. 63/127 and 67/36).

DIAMOND DRILLING

The summary log of hole DLY9, together with core-recovery and atomic absorption assays of chips from the core, is appended. A geological plan and a section of the area drilled are shown on plans S 7034 and S 7035.

The hole, sited at co-ordinates 13200N, 24200E in the South Breccia area, was drilled for 582'9" northwards at an angle of -55^{o} and designed to pass below the zone of copper mineralization, and test a coincident I.P. anomaly. The hole intersected 466'6" of weathered sandstone and siltstone breccia containing a mass of altered diorite between 429'5"-435'6", then passed through 45'3" of altered diorite, 37'3" of very ferruginous, weathered breccia and extended 33'9" into the northern block of siltstone. Assays of chips taken every 6" and bagged every 10', along the core all gave less than 1,000 ppm copper.

The copper mineralization at South Breccia outlined by the wagon drilling is probably the halo of mineralization above a differentiated diorite intrusion. A diorite mass extends east-west beneath the cupriferous breccia along the southern margin of a large siltstone block. (see plan S 7034)

Late stage hydrothermal fluids, rich in iron, copper and silica, arising from the cooling diorite intrusion have moved up and outwards into the sponge-like breccia mass, productinge a stockwork system of cupriferous quartz and micaceous haematite veins. Channeling of the fluids occured between the diorite and the northern siltstone block as the breccia in this position is heavily veined with micaceous and earthy haematite. This ferruginous breccia was also intersected in the top 30 feet of hole LW24 and in holes LW10 and 25 and can be traced on the surface and in wagon holes along the southern edge of the siltstone block. This concentration of micaceous haematite probably explains the I.P anomaly.

The absence of copper around the diorite intersected in hole DLY9, is probably due to the extreme depth of weathering, over 450 feet, into the breccia. Possibly the hole has also passed beneath the mineralized halo and intersected the diorite at a lower level. More detailed study of the weathering and distribution of copper in the oxidized zone is needed to solve this problem.

The copper mineralization outlined by wagon drilling at South Breccia is restricted in depth and is of no immediate interest. The differentiated diorite intrusives into the breccia, however, may contain sufficient tonnages of copper-bearing rock to be of interest. The diorite outcrops have been closely examined and the findings are presented later in the report.

ROCK CHIP SAMPLING

Dolomite Outcrops

A visit was made to the Puttapa area (S.M.L. 153, M.C. 5350) where the Electrolytic Zinc Co. of A/asia Ltd. is drilling a deposit of the zinc mineral, willemite, located in faulted Cambrian, Wilkawillina limestone.

As a result of this visit dolomite outcrops within and bordering the Lyndhurst Diapir were re-examined for similar outcrops of secondary zinc minerals. East-West striking Burra Group dolomites, south of the Avondale Mine, received most attention as they were discovered to contain anomalous zinc by J.E. Martin (See plan S 7047). The samples taken by Martin are shown below in Table 1.

TABLE 1

ROCK CHIP SAMPLES ALONG LINE 12400E
(J.E. MARTIN, 1966)

LOCATION		Cu	Pb	Zn	Co	Ni
10670N- 10700N	Ridge of Bedded Dolomite	24	12	420	17	32
10640N- 10670N	Ridge of Bedded Dolomite	11	16	710	17	32
10700N,	Soft brown, manganese rich quartzite bed in dolomite.	58	10	820	17	20
10700N,	Magnesite bed, 2" thick with galena? grains.	18	<5	3500	8	20
10700N,	Ridge of Bedded Dolomite	11	12	3500	14	29
10800N-10810N	Algal Dolomite	4	12	50	17	35
11100N-11125N	Algal Dolomite (2-6ft thick).	9	40	6000	14	35

These dolomites are overlain to the north by a sequence of argillaceous quartzites and siltstones also anomalous in zinc and lead. At the Avondale Mine, four, north-south trending sphalerite and galena lodes, up to 3ft. wide, cross-cut these quartzites. An extensive, zinc soil anomaly extends for over 1 mile along the quartzite and covers the Avondale Mine. Rock chip samples taken by Martin along Line 12400E over the quartzites are shown overleaf in Table 2.

TABLE 2

ROCK CHIP SAMPLES ALONG LINE 12400E

(J.E. MARTIN, 1966)

Location		Cu	Pb	Zn	Co	Ni
11485N - 11500N	Quartzite	20	330	1400	11	20
11500N - 11520N	Quartzite	18	172	4900	911	29
11660N - 11680N	Quartzite on W. wall of trench	18	112	6800	26	38
11800N - 11880N	Quartzite	9	18	940	14	29
11770N - 11800N	Quartzite	13	107	680	11	26
11800N - 11920N	Quartzite	9	70	910	11	23
11985N - 12012N	Quartzite	13	143	2000	14	26
12095N - 12105N	Quartzite	11	185	320	6	14
12195N - 12205N	Quartzite	28	180	1200	26	40

The wagon drilling showed that anomalous zinc persists at depth in the quartzites and is higher close to the lodes (holes LW 29 and 31) than further away (Holes LW 30 and 32).

Stream sediment sampling over the diapir indicates that the average zinc content is 40 p.p.m. with a range of 20-80p.p.m. The results show a relatively even distribution of zinc over the diapir and rim rocks with the exception of the Avondale Mine area.

The recent examination of the limestone outcrops revealed no recognizeable zinc minerals. Several samples of unusual rock were submitted for analysis. One sample of yellow dolomite from outcrop at 10800N 12800E contains 230p.p.m. lead and 2,200 p.p.m. zinc.

The anomalous zinc in the rocks of the Avondale Mine area could owe its origin to either or both epigenetic zinc-lead veining or to original syngenetic deposition with the BurraGroup sediments. Wagon drilling around the Avondale Mine showed that the zinc is probably a primary dispersion feature related to the epigenetic veining. Insufficient work has been done in the dolomites, to the south and south east, to determine the reason for their high zinc content. Further soil and rock sampling of the dolomite outcrops is therefore recommended, especially along lines 13,200E and 14,000E.

Diorite Outcrops

Wagon and diamond drilling at Lyndhurst has revealed that the copper mineralization in breccia is closely related to basic igneous intrusives. It is thought that slow cooling and differentiation of these intrusives resulted in the collection of iron, copper and silica in the residual fluids at the top of the plugs. This low temperature fluid moved upwards and outwards into the breccia forming a cap over the plug of stockwork veins of micaceous haematite with minor copper and iron sulphides, now oxidized.

The known outcrops of basic igneous rock have been re-examined and fresh, unweathered rock chips collected all over each outcrop for assay for Cu, Pb, Zn, Co and Ni. Sixteen outcrops of basic rock are known within the diapir and their positions are shown on plan S 7037.

A brief description of each outcrop is given in the summary below. The rock have been divided into microdiorites, with a grain-size of less than ½ mm. and diorites with grain-size greater than ½mm.

LY Rock 3 — A 150ft. diameter plug of fresh massive diorite (grain-size ½ - 1mm). The plug has produced a thin skarn zone in several adjacent limestone blocks. The skarn contains scattered micaceous haematite, pyrite and has chalcopyrite grains up to 1cm. in diameter.

LY Rock 4 — The eastern edge of this 250 feet diameter outcrop consists of massive microdiorite (LY ROCK 4A) with thin veins of micaceous haematite along joints. Uphill, to the west, the rock grades into altered diorite (LY ROCK 4 B) with a grainsize of ½ - 1mm. The diorite contains much secondary mica, is very friable and veined with micaceous haematite.

LY Rock 5 — This outcrop, 500ft. long by 200ft. wide, consists of coarse to medium-grained diorite with plagioclase laths up to 3 by 1 mms, abundant epidote grains and 1-2mm quartz grains. Grainsize varies from ½ to 3mms. The rock is disseminated with flakes of micaceous haematite and in places contains small scattered spots of chrysocolla. Together with LY Rock 7, the rock is the coarsest-grained diorite in the diapir.

The eastern edge of this diorite is exposed in several pits. The margin rock is a fine-grained, chilled? rock with 1-5mm. diameter vesicles filled with chlorite, earthy and micaceous haematite and quartz. The breccia against the diorite shows no contact metamorphic effects, possibly because of post-basic intrusion movement of the breccia.

Pits and shafts have been sunk on 6-12 inch wide, quartz-jasper veins carrying micaceous haematite, chalcocite, malachite and siderite boxworks. These veins fill shears or joints within the diorite plug.

LY Rock 6 A hill of massive microdiorite, 900ft. long by 350ft. wide. A pit in the centre of the plug contains traces of malachite in thin micaceous haematite veining.

LY Rock 7 A 50ft. ?wide dyke of fine to medium grained, ferruginous diorite which is extremely altered and friable. The rock is vesicular in places with 2-5mm. diameter vesicles lined with drusy quartz. The rock is spotted with 1-2mm. size grains of malachite and is cut by a stockwork of 1-4 inch thick, earthy and micaceous haematite veins carrying malachite. The rock is probably in very altered version of LY Rock 5.

LY Rock 10 A 80ft. diameter plug of massive, fresh microdiorite with a slightly coarser grained core. The core rock (LY Rock 10B) is more altered and friable than the margin rock (LY Rock 10A). The plug has produced a thin skarn zone containing micaceous haematite in the adjacent limestone.

LY Rock 11 A large hill, 1,000 ft. long by 400ft. wide of massive fresh microdiorite.

LY Rock 12 A plug, 200ft. in diameter of massive, fresh diorite (grain-size 1-1½mms.) A small pit in shaley limestone on the southern margin of the diorite contains abundant malachite stains.

LY Rock 13 A plug, 60ft. in diameter of massive fresh diorite (grain-size ½-1 mm.

LY Rock 14 A hill, 600ft. long by 250ft. wide, of massive, fresh microdiorite (LY Rock 14A) with a coarser grained core (LY Rock 14B) Fractures in the rock are filled with thin veinlets of micaceous haematite.

LY Rock 17 — A plug, 300ft. in diameter, of massive, fresh microdiorite with a few flakes of micaceous haematite along joints.

LY Rock 18 — A plug, 200ft. in diameter, forming a low hill of massive, fresh microdiorite.

LY Rock 19 — A large hill, 900ft. long by 300ft. wide of massive, fresh microdiorite (LY Rock 19A) with a core of altered diorite (LY Rock 19B) of grain size ½ - 2mms.

LY Rock 20 — Massive, fresh diorite plug, 400ft. long by 150ft. wide. Grain-size of the diorite is 1-2mms. The rock also contains up to 10% scattered flakes of micaceous haematite.

LY Rock 21 — A 600ft. long by 150ft. wide outcrop of highly altered diorite? Grain-size is between ½-2mms.

The microdiorites, because oftheir fine grain-size, have resisted weathering and normally stand out as low to moderately high hills. Copper mineralization does not occur in association with these outcrops (except LY Rock 6). Four of them have slightly coarser grained, altered cores (LY Rocks, 4, 10, 14 and 19).

The diorite outcrops are of variable grain-size and are often very altered, either by weathering, regional metamorphism, deuteric or hydrothermal alteration. Their surface expression is normally flat and subdued.

The diorites, especially the very coarsest, may contain cupriferous, haematite and quartz-jasper veins (LY Rocks 5 and 7), and often have a halo of low grade copper mineralization in the surrounding breccia. (LY Rocks 3, 5, 12, 16, 20 and 21).

Outcrop LY Rock 3 is a excellent example of the outward migration of copper and iron from a diorite intrusion. When first examined it proved to have a medium grain-size ($\frac{1}{2}$-1 mm) and therefore belonged to the diorite type. The surrounding rock, close to the plug edges, were examined for traces of copper. An outcrop of fine-grained, grey to white limestone in the eastern edge of the plug was found to contain coarse flakes of micaceous haematite and calcite veins with small grains of pyrite, chalcopyrite and traces of malachite. Another limestone outcrop on the northwest edge of the plug proved to have a thin skarn containing micaceous haematite, pyrite and chalcopyrite grains up to 1 cm. in diameter. Prospecting uphill to the north of the plug revealed stains of malachite and chalcocite grains in irregular masses of recrystallized white limestone. A feature of the mineralization was the general absence of surface malachite coatings which were only found in and along fractures.

The outcrops required the use of the 4lb. hammers to expose the fresh surfaces with malachite staining. The deposit is beleived to be of small size but further work is justified here to determine its full extent.

The Atomic Absorption assays in parts per million of the composite, fresh chip samples taken randomly over the outcrop of each basic igneous rock are shown below in Tables 3, 4 and 5. Chip samples collected at one grid point by J.E. Martin are shown in Table 6.

TABLE 3

ASSAYS OF COMPOSITE ROCK - CHIP SAMPLES FROM MICRODIORITE OUTCROPS

	Cu	Pb	Zn	Co	Ni
LY Rock 4 A	110	25	25	50	90
" " 6	280	20	15	60	100
" " 10 A	85	25	10	15	25
" " 11	80	15	40	35	80
" " 14 A	30	10	15	30	80
17	18	15	40	30	90
18	160	15	20	30	60
19 A	45	15	15	35	70
Average Content in p.p.m.	101	18	23	36	74

TABLE 4

ASSAYS OF COMPOSITE ROCK-CHIP SAMPLES FROM DIORITE OUTCROPS

	Grain Size	Cu	Pb	Zn	Co	Ni
LY Rock 3	½ - 1mm.	150	25	30	30	75
5	½ - 3mm.	1900	20	30	60	75
7	½ - 3mm.	3,150	20	15	60	60
12	1 - 1½mm.	2350	15	30	60	75
13	½ - 1mm.	140	15	25	15	25
16	½ - 2mm.	60	10	20	50	90
20	1 - 2mm.	770	10	25	50	110
21	½ - 2mm.	1100	15	25	30	30
Average Content in Parts Per Million.		1203	16	25	44	68

TABLE 5

MICRODIORITES WITH COARSER GRAINED CORE

MARGIN ROCK	Cu	Pb	Zn	Co	Ni	CORE ROCK	Cu	Pb	Zn	Co	Ni
LY Rock 4 A	110	25	25	50	90	LY Rock 4B	50	25	25	35	110
10 A	85	25	10	15	25	10B	60	15	15	15	10
14 A	30	10	15	30	80	14B	20	15	15	35	110
19 A	45	15	15	35	70	19B	90	15	15	5	30
Average	68	19	16	33	69	Average	55	18	18	23	65

CHIP SAMPLES OF BASIC IGNEOUS ROCK (J.E. MARTIN, 1967)

MICRODIORITES	Position Sampled		Cu	Pb	Zn	Co	Ni
LY Rock 4	13600N	23600E	25	15	25	40	80
LY Rock 6	12600N	22000E	30	< 5	25	55	85
LY Rock 11	16600N	26400E	75	5	25	45	75
LY Rock 14	19800N	29600E	10	10	20	50	85
DIORITES							
LY Rock 5	13000N	24000E	470	25	30	85	75
LY Rock 12	12800N	24400E	120	18	250	50	75
LY Rock 12	12900N	24400E	1500	45	190	35	20
LY Rock 20	11270N	28000E	800	20	500	60	110
LY Rock 20	11300N	28000E	800	30	25	65	120
Decomposed diorite near wagon Hole LW2	13500N	24400E	140	10	55	80	65

Comparison of Tables 2 and 3 shows that the average copper content of the diorites is 12 times that of the microdiorites. There is wide variation within each group but this is explained by the differences between each outcrop. For example, LY Rock 6, unlike the other microdiorites contains traces of copper in a pit in the centre of the plug. Diorite outcrop, LY Rock 16 is an extremely altered and weathered rock from which copper has probably been leached. A copper soil anomaly over this plug and the rocks to the west has been wagon-drilled (Holes LW 16, 17, 18, 21, 22, 37 and 38). A low-grade copper halo was outlined in the surrounding rocks and assays of up to 2800 p.p.m. copper are recorded from a hole drilled into the plug.

Sampling of a few of the basic rocks by J.E. Martin, shown on Table 6, indicates that both copper and zinc is enriched in the diorites. The recent sampling verified the higher copper content but revealed no increase in zinc.

A comparison of the trace element content of the core rocks against the margin rocks of 4 microdiorite outcrops is shown in Table 5. The results indicate no difference between the core and the margin rocks possibly because there has been insufficient differentation or that the outcrops are eroded, deeper portions of differential plugs. It is also possible that there has been two periods of basic intrusion with one period rich in copper.

It is recommended that outcrops LY Rocks 5 and 12 be tested by wagon drilling. Fifteen to twenty holes would adequately test these plugs and the surrounding breccia. The two outcrops are closely spaced and probably unite at depth. Outcrop LY Rock 5 contains a number of copper-bearing veins in joints and secondary copper minerals are scattered in the breccia surrounding the plugs. The overall mass of diorite and adjacent breccia may contain sufficient copper to be of economic interest. Depending on results outcrop LY Rock 7 may also warrant drilling.

CONCLUSIONS AND RECOMMENDATIONS

Diamond and wagon drilling of geochemical and geophysical anomalies at Lyndhurst has outline small tonnages of low-grade copper. Recent drilling indicates that diorite intrusions are the

the probable source of the copper mineralization in the diapiric breccia and possibly for the thin, cupriferous veining in the Yudnamutana rim rocks. The copper-rich breccia zones around these intrusions are of too low a grade, even after weathering and secondary enrichment, to be of interest by themselves. Further testing should be done on the diorite intrusions to determine if they contain copper of suitable tonnage and grade.

Further investigation of the anomalous zinc in soils and rocks of the Avondale area is recommended. The dolomite outcrops, south and southeast of the Mine, should be further sampled to determine the reason for their high zinc content.

The recent discovery of chalcopyrite grains in recrystallized limestone around the edge of diorite plug LY Rock 3 also requires further examination.

After 3 years investigation of the Lyndhust Diapir only two areas now appear to hold any promise of economic mineralization.

One area covers the group of copper-rich diorite intrusions lying to the north of the White Lead Mines. The other area covers the zinc-bearing Burra Group rocks in the vicinity of the Avondale Mine.

It is therefore recommended that these two areas remain reserved to allow further Departmental investigation. Two areas, each of about 1 square mile in area, can be defined as follows (Refer to Plan S 7074/1)

1. "An area bounded between 30°12'S to 30°13'S and 138° 34'E to 138°35'E. The area to exclude current mineral claims.

2. "An area bounded between 30°12'S to 30°13'S and 138°32'E to 138°33'E.

The remainder of the Lyndhurst reserve could then revert to the operation of the Mining Act.

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R.G. WRIGHT
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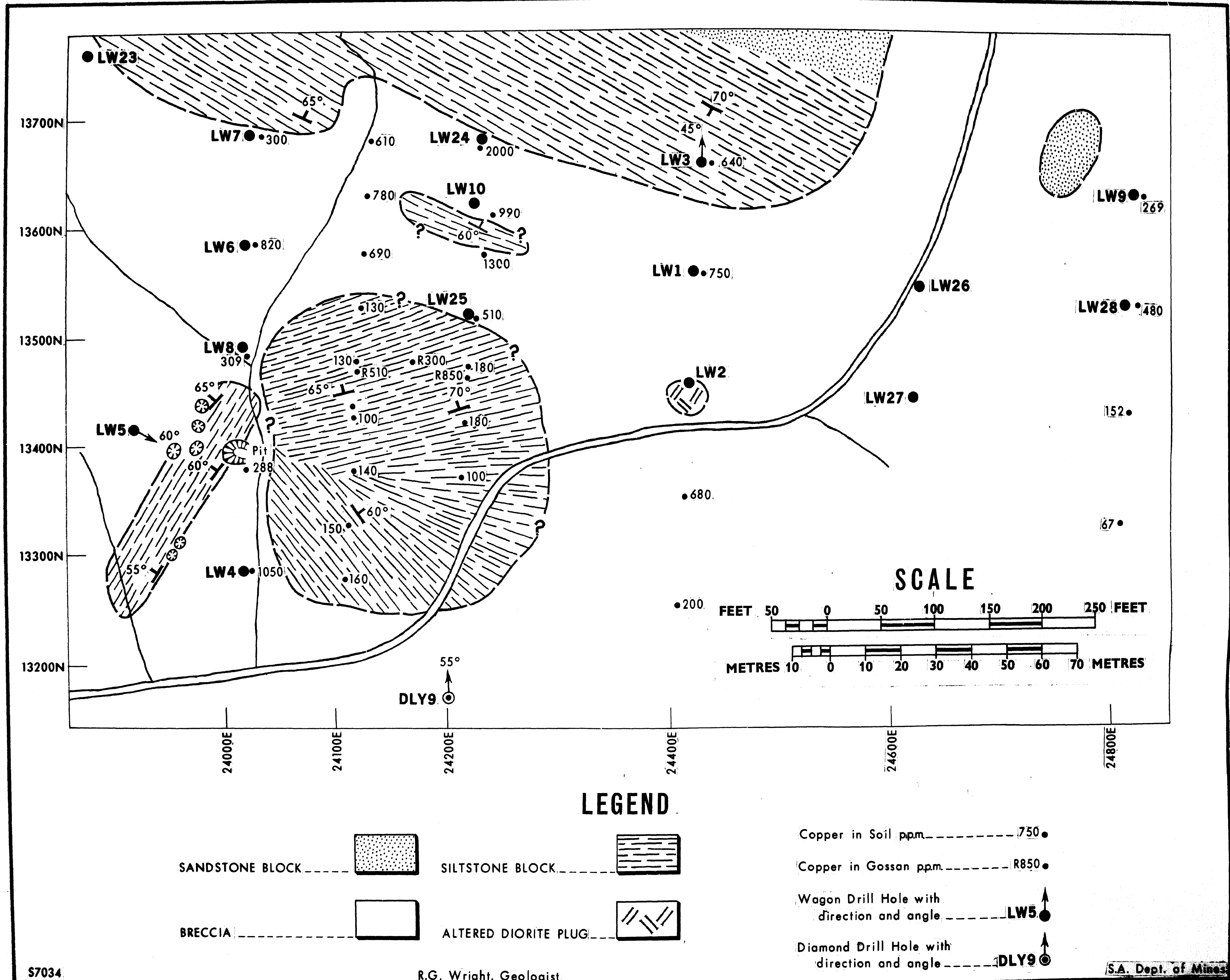
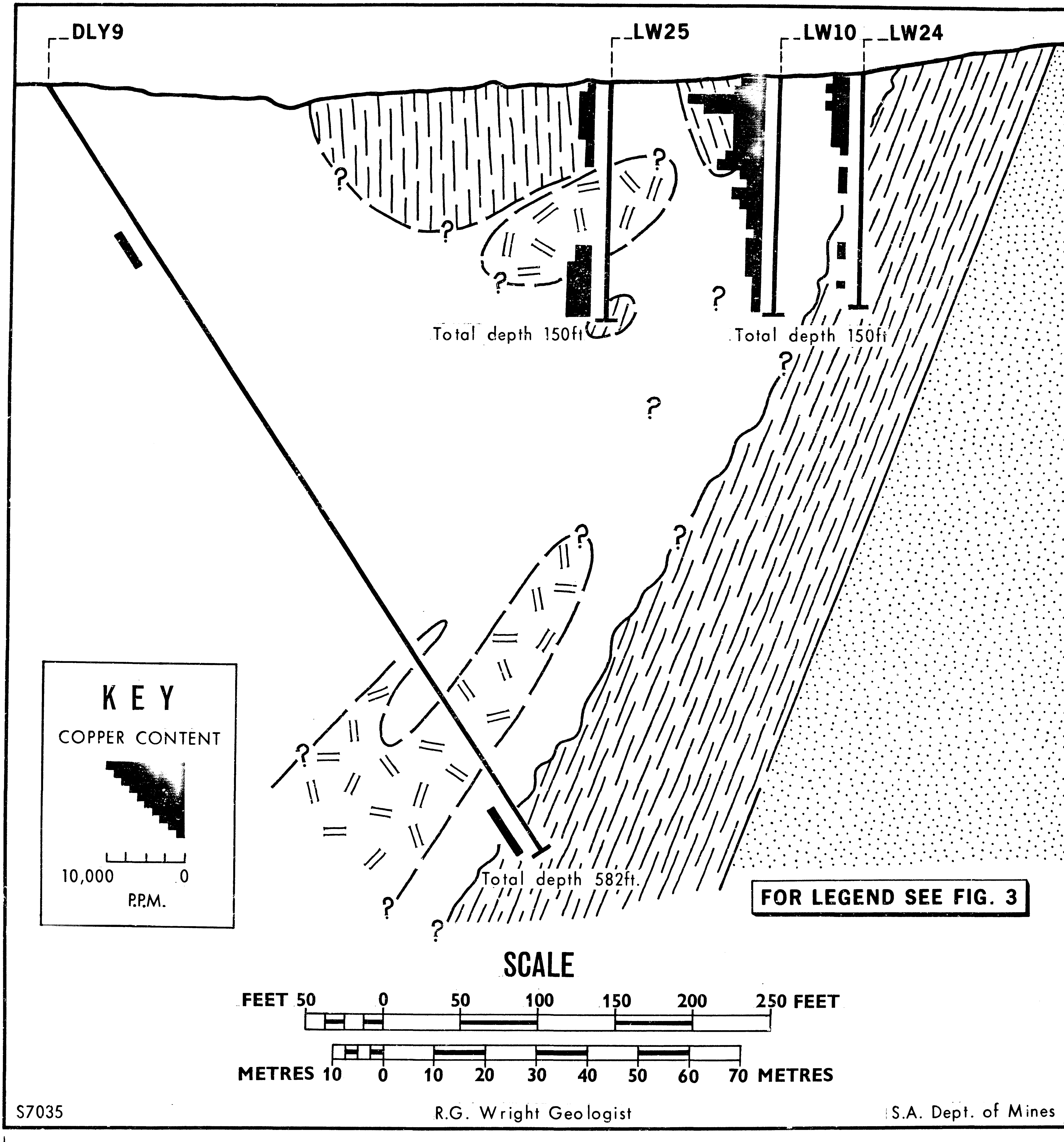
GEOCHEMICAL EXPLORATION SECTION

RGW:JKD
10.12.1968



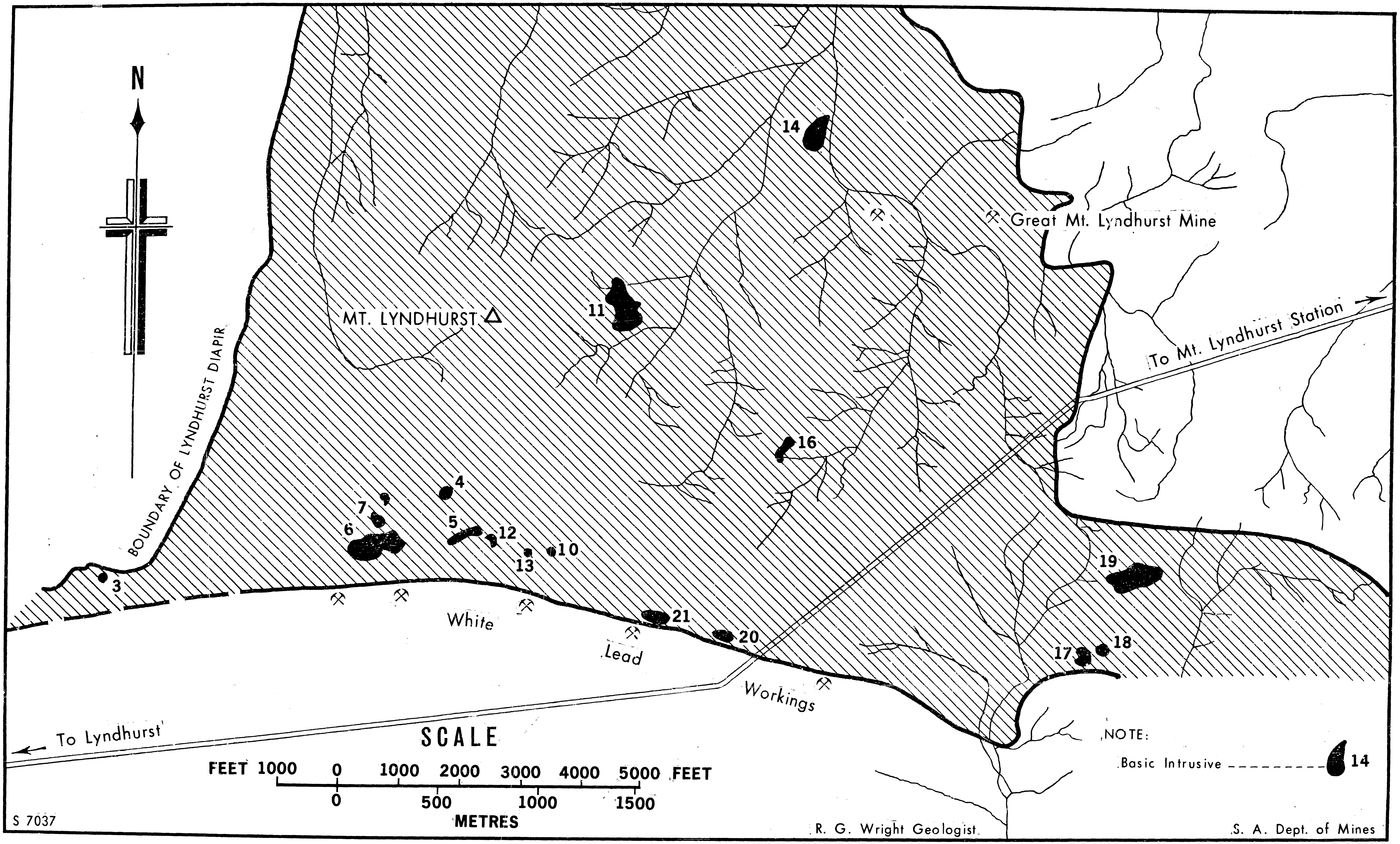
LW23
LW7 300
LW24 2000
LW3 640
45°
70°
65°
610
780
LW10
990
60°
1300
690
LW6 820
LW9 269
LW1 750
LW26
LW28 480
LW25 510
130
LW8 309
130
R510
R300
R850
180
65°
70°
100
180
LW2
LW27
152
LW5 60°
65°
60°
Pit
288
140
100
680
60°
150
67
55°
LW4 1050
160
200
DLY9 55°
13700N
13600N
13500N
13400N
13300N
13200N
24000E
24100E
24200E
24400E
24600E
24800E
SCALE
FEET 50 0 50 100 150 200 250 FEET
METRES 10 0 10 20 30 40 50 60 70 METRES
LEGEND
SANDSTONE BLOCK
SILTSTONE BLOCK
BRECCIA
ALTERED DIORITE PLUG
Copper in Soil p.p.m. 750
Copper in Gossan p.p.m. R850
Wagon Drill Hole with direction and angle LW5
Diamond Drill Hole with direction and angle DLY9
S7034
R.G. Wright. Geologist
S.A. Dept. of Mines



Reduce to 5½ inches.

FIG. 4 LYNDHURST DIAPIR, SOUTH BRECCIA
WAGON & DIAMOND DRILLING RESULTS
SECTION ALONG LINE 24200E

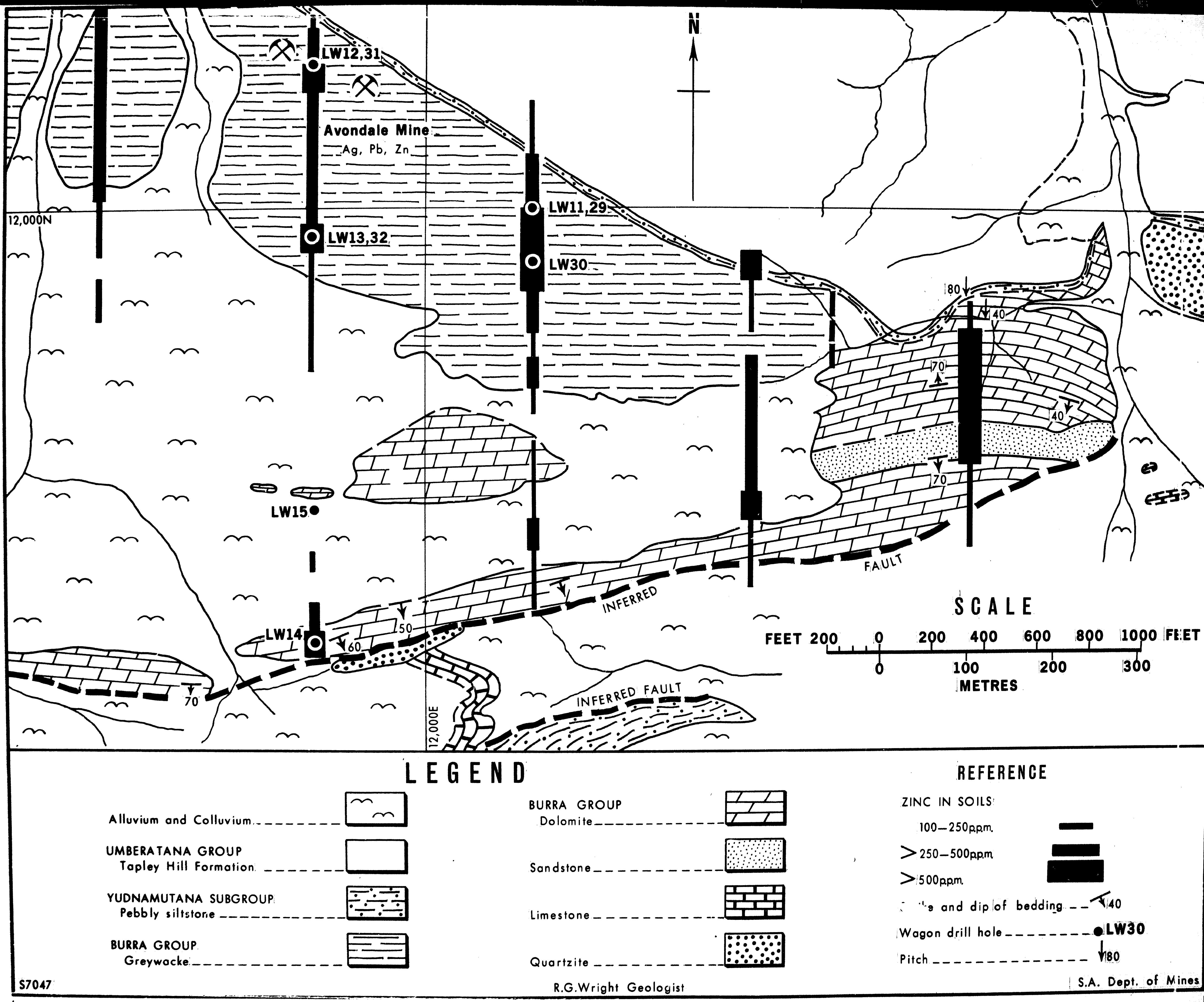
R.130
S 7035/4
Cc
27-11-69.

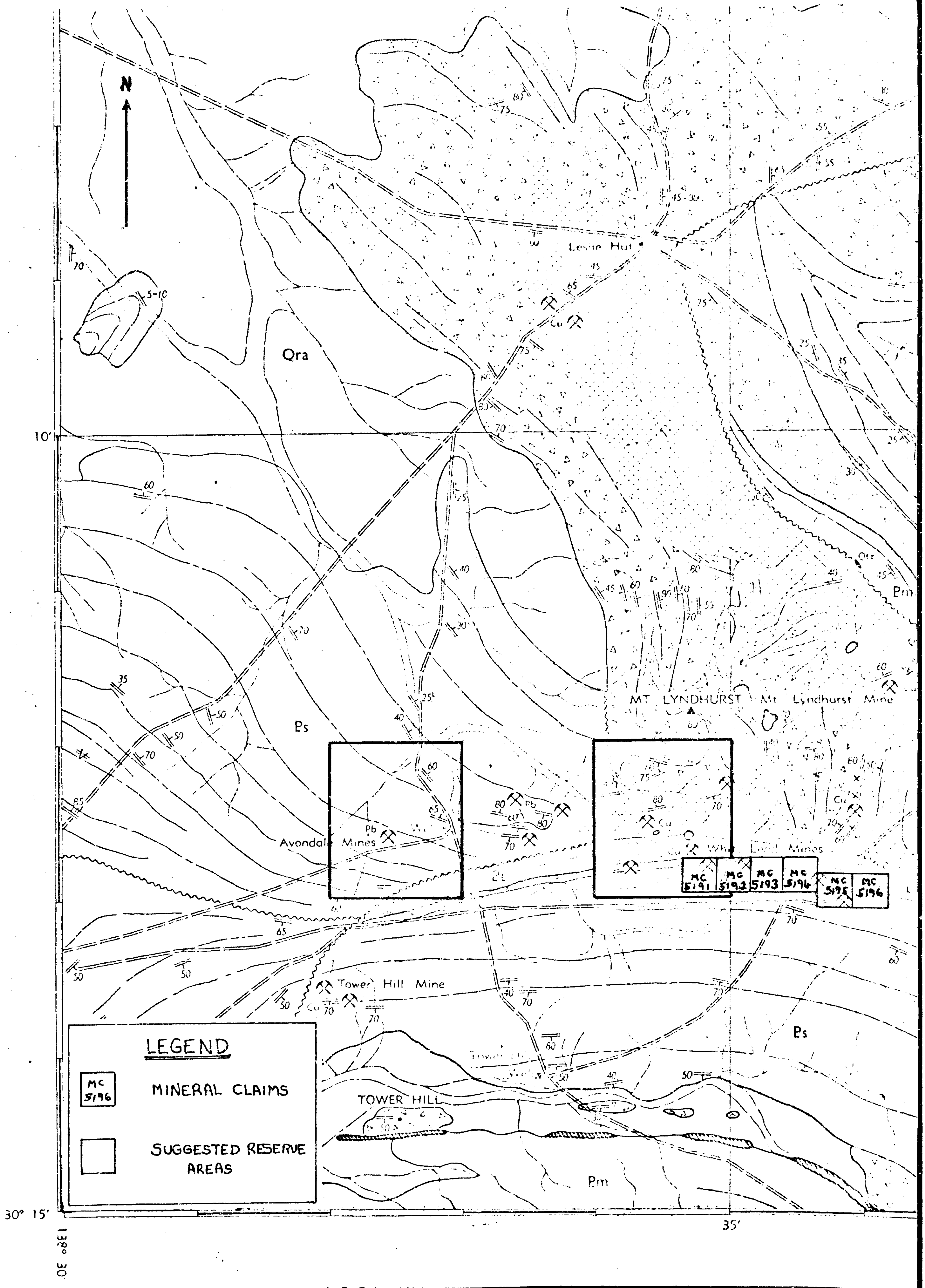


Reduce to 5½ inches

FIG.14 PLAN SHOWING POSITION OF BASIC INTRUSIVES LYNDHURST DIAPIR

J.M.H.
S 7037
Cc
Director of Mines
Date: 29-10-69


N
LW12,31
Avondale Mine
Ag, Pb, Zn
LW11,29
12,000N
LW13,32
LW30
80
40
70
40
70
LW15
FAULT
INFERRED
50
LW14
60
70
12,000E
INFERRED FAULT
SCALE
FEET 200 0 200 400 600 800 1000 FEET
0 100 200 300
METRES
LEGEND
Alluvium and Colluvium
UMBERATANA GROUP
Tapley Hill Formation
YUDNAMUTANA SUBGROUP
Pebbly siltstone
BURRA GROUP
Greywacke
BURRA GROUP
Dolomite
Sandstone
Limestone
Quartzite
REFERENCE
ZINC IN SOILS
100—250p.p.m.
>250—500p.p.m.
>500p.p.m.
and dip of bedding 40
Wagon drill hole LW30
Pitch 80
S7047
R.G.Wright Geologist
S.A. Dept. of Mines



DEPARTMENT OF MINES – SOUTH AUSTRALIA

	Drn.	Suggested Areas for Reservation	SCALE: 1" reps 1 Mile
	Tcd.		
	Ckd.	Portion of Lyndhurst	S 7074/1 Cc
	Exd.	1:63,360 Geological Map.	DATE: 6/12/1968.

APPENDIX

GEOCHEMICAL EXPLORATION SECTION
LOG OF DIAMOND DRILL HOLE NO DLY 9

Project: LYNDHURST **D:M.** 1461A/65

Location: South Breccia **Serial No.** 607/69

Collar Coords. 13200N, 24200E **Grid** LYNDHURST

Angle -55° **Bearing** 0° **Depth** 582'9"

Date Hole Commenced 23.8.68 **Completed** 3.10.68

Logged by P.J. Binks to 429'5" **On** 20.9.68 **Hirer** D.M.

R.G. Wright to 582'9" **On** 3.10.68 **Driller** K. Kruze

Object: To test, at depth, a zone of low-grade copper mineralization in diapiric siltstone breccia along the southern margin of a siltstone block.

Results: The hole intersected 466'6" of weathered breccia, with altered diorite between 429'5" - 435'6" then another 45'3" of altered diorite, 37'3" of weathered ferruginous breccia and passed 33'9" into the northern siltstone block. The rocks are oxidized to the full depth of this hole. Assays of chips taken every 6" and bagged every 10', along the core all gave less than 1,000 p.p.m. copper.

LOG: Comprises:

Geological log

Core Recovery

Atomic Absorption Assay of Chip Samples

From	To	Description - Summary Log
0	429'5"	BRECCIA Weathered and friable, consisting of fragments of pale brown to white, finegrained sandstone and green-grey to blue-grey siltstone and shale. The carbonate-rich breccia matrix contains thin veins of calcite and micaceous and earthy haematite. Weathered diorite intersected between 75'6" - 76'0", 90'2" - 90'4" and 96'3" - 97'8"

From	To	
429'5"	435'6"	DIORITE Very weathered, medium-grained and spotted with earthy haematite. Siltstone xenoliths occur between 431'10" - 434'4"
435'6"	466'6"	BRECCIA Weathered fragments and blocks of pale brown, pitted and laminated sandstone and blue-grey siltstone. The matrix consists of abundant calcite-dolomite and contains 1 - 2% scattered flakes of micaceous haematite.
466'6"	511'9"	DIORITE Medium to fine-grained, highly altered, containing about 1% scattered flakes of micaceous haematite. Rock is brecciated in part and carries many siltstone xenoliths between 466'6" - 472'3". The rock is very ferruginous between 489'6" - 496'6" and carries upto 20% micaceous haematite flakes. From 496' - 511'9" the rock is fine-grained, pale brown to white and highly altered.
511'9"	549'0"	BRECCIA Weathered fragments of sandstone and silt-stone, heavily impregnated with earthy haematite and a stockwork mass of micaceous haematite. Veining is most intense between 515'3" - 528'9" and 540'0" - 549'0".
549'0"	582'9"	SILTSTONE BLOCK Pale brown, weathered, laminated, sandy siltstone. The rock is cut by thin micaceous haematite veins which decrease in number into the block.

DLY 9

Depth From	Depth To	Recovery Feet	Depth From	Depth To	Chip Assay for Cu p.p.m.	Pb	Zn
0'	5'	1'					
5	10'	1'					
10	15'	5'					
15	20'	4'6"					
20	25'	5'					
25	30'	5'					
30	35'	4'6"					
35	40'	3'4"					
40	45'	4'3"					
45	50'	5'					
50	55'	5'					
55	60'	5'					
60	65'	5'					
65	70'	5'					
70	75'	5'	70'	80'	240	15	10
75	80'	5'					
80	85'	5'	80	90	370	15	10
85	90	5'					
90	95'	5'	90	100	420	15	10
95	100'	5'					
100	105'	4'4"	100	110	660	15	10
105	110'	5'					
110	115'	5'	110	120	560	25	10
115	120'	4'8"					
120	125'	4'10"	120	130	530	15	10
125	130'	5'					
130	135'	2'6"	130	140	120	15	10
135	140'	3'3"					
140	145'	4'8"	140	150	110	15	20
145	150'	4'8"					
150	155'	5'	150	160	140	15	20
155	160'	5'					
160	165'	5'	160	170	250	25	10
165	170	5'					
170	175	5'	170	180	170	25	10
175	180	4'8"					
180	185	5'	180	190	320	25	10
185	190	5'					
190	195	5'	190	200	180	25	20
195	200	5'					
200	205	5'	200	210	220	25	10
205	210	5'					
210	215	5'	210	220	480	15	10

Depth From	Depth To	Recovery Feet	Depth From	Depth To	Chip Assay for Cu (p.p.m.)	Pb (p.p.m.)	Zn (p.p.m.)
215	220	5'					
220	225	5'	220	230	410	15	20
225	230	5'					
230	235	3'	230	240	260	15	10
235	240	4'3"					
240	245	5'	240	250	270	15	10
245	250	5'					
250	255	5'	250	260	100	25	10
255	260	4'4"					
260	265	4'2"	260	270'	150	15	10
265	270	4'6"					
270	275	4'9"	270	280	240	25	20
275	280	3'					
280	285	5'	280	290	220	35	10
285	190	5'					
290	295	5'	290	300	60	35	10
295	300	5'					
300	305	5'	300	310	100	35	10
305	310	5'					
310	315	5'	310	320	70	25	10
315	320	5'					
320	325	5'	320	330	50	25	10
325	330	5'					
330	335	5'	330	340	50	25	10
335	340	5'					
340	345	5'	340	350	90	15	10
345	350	5'					
350	355	5'	350	360	120	25	10
355	360	5'					
360	365	5'	360	370	120	25	10
365	370	5'					
370	375	5'	370	380	95	15	10
375	380	5'					
380	385	5'	380	390	75	15	10
385	390	5'					
390	395	5'	390	400	90	25	10
395	400	5'					
400	405	5'	400	410	70	-	20
405	410	5'					
410	415	5'	410	420	40	-	20
415	420	5'					
420	425	5'	420	425'9"	50	-	20
425	429'5"	4'5"	425'9"	430	75	15	20
429'5"	435'6"	5'7"	430	440	120	15	20
435'6"	444'5"	8'3"					
445'5"	448'5"	3'6"	440	450	40	15	20

Depth From	Depth To	Recovery Feet	Depth From	Depth To	Chip Assay for Cu p.p.m.	Pb	Zn
448'5"	453'0"	4'7"					
453'0"	456'9"	3'0"	450	460	30	5	10
456'9"	458'9"	1'6"					
458'9"	463'3"	1'6"	460	470	100	15	10
463'3"	469'6"	2'9"					
469'6"	472'3"	1'8½"	470	480	120	25	10
472'3"	479'4"	5'7½"					
479'4"	483'6"	1'8"	480	490	260	15	10
483'6"	489'6"	4'5"					
489'6"	500'	8'7"	490	500	960	15	20
500	503'6"	2'3"					
503'6"	506'3"	1'7½"	500	510	60	5	10
506'3"	508'9"	1'4½"					
508'9"	511'9"	2'2"	510	520	340	10	10
511'9"	513'9"	2'0"					
513'9"	515'9"	1'1"					
515'3"	519'3"	3'2"					
519'3"	523'3"	3'0"	520	530	430	10	10
523'3"	527'9"	3'10"					
527'9"	533'0"	2'9"	530	540	240	10	10
533'0"	536'0"	1'9"					
536'0"	540'0"	1'0"					
540'0"	545'9"	2'3"	540'	550	500	10	10
545'9"	548'9"	1'3"					
548'9"	555'9"	5'6"	550'	560'	840	10	10
555'9"	561'0"	5'3"					
561'0"	564'6"	3'6"	560'	570'	800	5	10
564'6"	570'6"	6'0"					
570'6"	579'0"	8'6"	570	580	800	10	10
579'0"	582'0"	3'9"	580	582'9"	240	10	10

True Angle of Inclination (Hydrofluoric Acid Method)

200'	-55°
400'	-55°
556'	-55°