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SML 214

SPRING CREEK

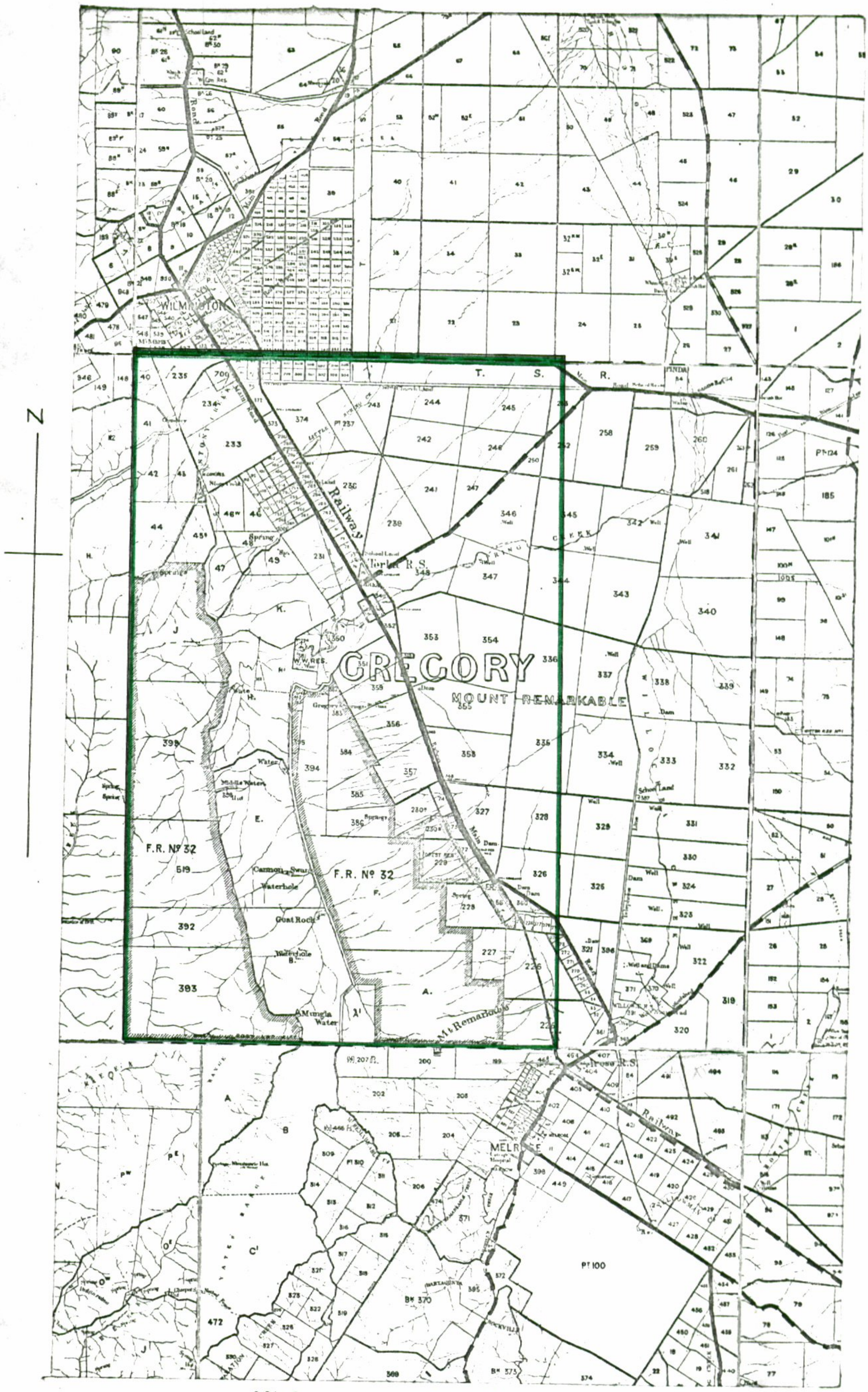
PROGRESS REPORTS TO LICENCE EXPIRY/RENEWAL FOR THE PERIOD 15/7/1968 TO 14/7/1970

Submitted by
RMC Minerals Pty Ltd and Australian Blue Metal Pty Ltd
1970

Enquiries: Customer Services Branch
Minerals and Energy Resources
7th Floor
101 Grenfell Street, Adelaide 5000

Telephone: (08) 8463 3000
Facsimile: (08) 8204 1880

Government of South Australia
Primary Industries and Resources SA



SCALE : 1 INCH = 2 MILES

AUSTRALIAN BLUE METAL

D.M. 1434/67

S.M.L. 214

S.M.L. 159 and 214

Progress Report to
15 January, 1969

C O N T E N T S

S.M.L. 159 and 214 - Progress Report

to 15 January, 1969

S.M.L. 159 (MT TAYLOR)

Following execution of an option agreement on 14th October, 1968, with R.M.C. Minerals Pty. Ltd., field work was begun in this lease of 140 square miles on 16th October, 1968. Stream sediment geochemical sampling of drainages in the lease was carried out on a regional scale, followed by reconnaissance sampling of the eastern two-thirds of the area. The remaining portion, being covered by Recent alluvium, was not further sampled.

A stream sediment sampling survey was also carried out for orientation purposes around Robinson's copper prospect, the main working in S.M.L. 159. Detailed geological mapping of the mine area was completed, and showed that copper mineralisation is confined to a narrow band of chloritic schist 10-15 feet wide in an area consisting chiefly of quartzite. The strike length of mineralisation exposed at the surface is about 1,200 feet, and the surrounding quartzites are wholly barren.

Results to date do not indicate any very significant areas for follow-up work. Some further analyses are awaited, and until their completion no active field work will be carried out on this property.

S.M.L. 214 (SPRING CREEK)

Field work in this lease of 65 square miles was commenced on 17th October, 1968, being concentrated initially in the area of the Spring Creek Copper Mine, where [illegible] laid out using the [illegible]

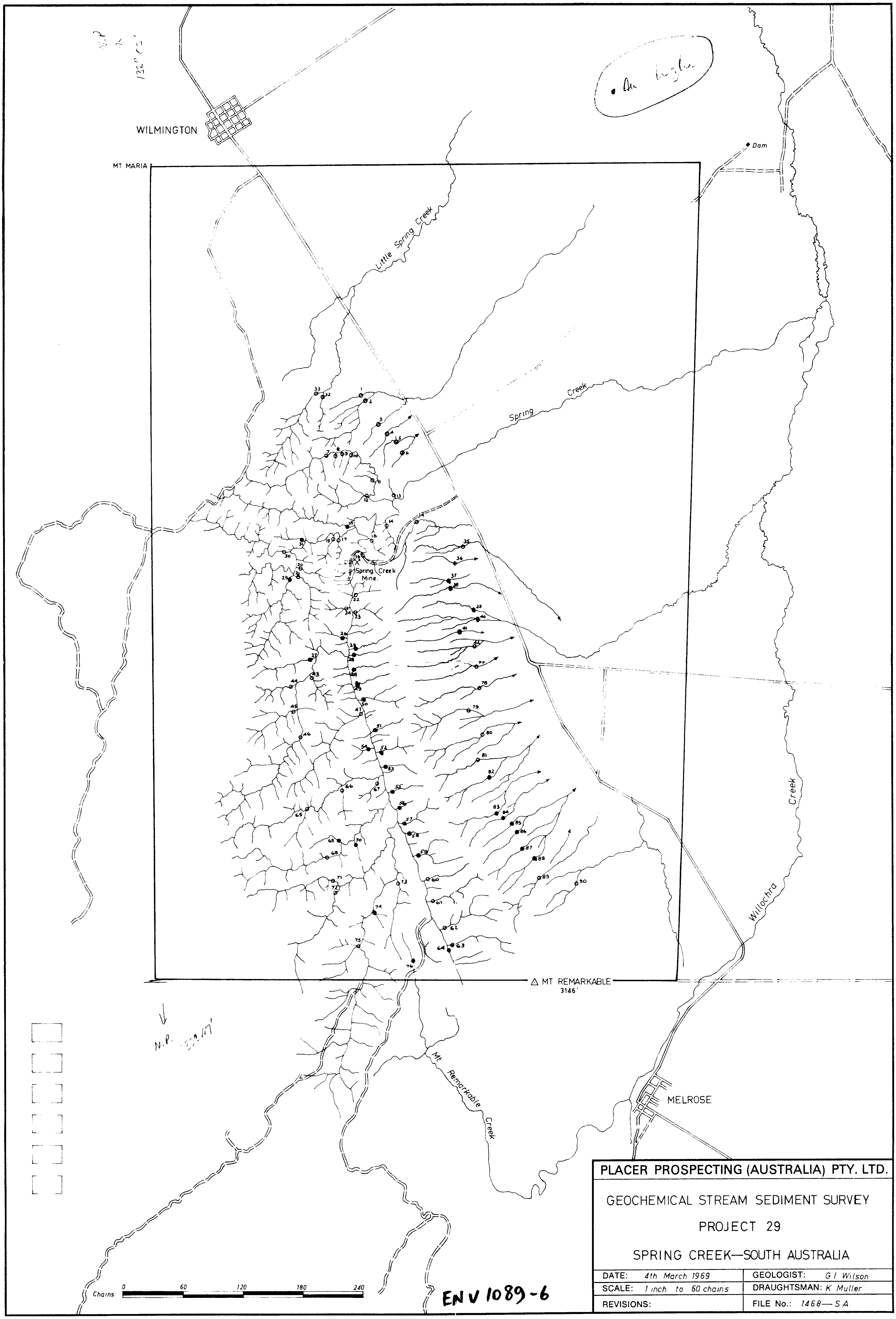
Abney level [illegible] A top[illegible] prepared, and used as a base for recording subsequent [illegible].

Detailed geological [illegible] of the mine area has defined a surface [illegible] mineralisation about 300 feet wide, appro[illegible] a quartz-[illegible] zone associated with faulting. No evidence has been found of sulphides or leached sulphides in the massive quartzite east of this zone, but re-interpretation of I.P. survey carried out in 19[illegible] has indicated an anomaly [illegible] of it. It is proposed to test this anomaly by diamond drilling.

Because of the topography of the area, only a limited geochemical soil sampling programme was considered feasible. Traverses were made along lines A, B, [illegible], N[illegible], N104, N106, N108, and [illegible], [illegible] being taken at intervals of 100 feet, reduced to 50 feet in [illegible] areas. Results are inconclusive [illegible] further soil sampling [illegible].

A stream sediment sampling programme [illegible] analyses are awaited. The results [illegible] mineral [illegible].

* page 5 - Expenditure Statement extracted and placed in DM. 1434/67



PLACER PROSPECTING (AUSTRALIA) PTY. LTD.

GEOCHEMICAL STREAM SEDIMENT SURVEY

PROJECT 29

SPRING CREEK—SOUTH AUSTRALIA

DATE: *4th March 1969*	GEOLOGIST: *G I Wilson*
SCALE: *1 inch to 60 chains*	DRAUGHTSMAN: *K Muller*
REVISIONS:	FILE No.: *1468—S.A.*

ENV 1089-6

16/22

DUCK STREET, AUBURN, N.S.W 2144

023

AREA* Project 29, South Australia. ANALYST J. Wilson.

S.M.L. 214, Spring Creek. DATE Nov. Dec. 1968. PAGE No. 1

ENV 1089

Geochemical Stream Sediment Samples.

SAMPLE No.		PPM IN SOIL OR SEDIMENT							
		Mo	Cu	Zn	Pb	Co	Ag	Au	
I 54-1	1	2-	15	67	43	24	.1-	.02-	
	2	2-	10	67	45	27	.1-	.02-	
	3	2-	10-	33	27	16	.1-	.02-	
	4	--	no	sample	---				
	5	2-	10	142	29	16	.1-	.02-	
	6	2-	10-	67	21	20	.1-	.02-	
	7	2-	100	35	93	18	.1-	.02-	
	8	2-	60	50	37	20	.1-	.02-	
	9	2-	120	49	29	19	.1-	.02-	
	10	2-	60	43	32	16	.1-	.02-	
	11	2-	110	42	32	13	.1-	.02-	
	12	2-	55	37	35	16	.1-	.02-	
	13	2-	55	55	40	20	.1-	.02-	
	14	2-	50	37	32	13	.1-	.02-	
	15	2-	95	50	64	16	.1-	.02-	
	16	2-	95	50	56	20	.1-	.02-	
	17	2-	25	66	61	18	.1-		
	18	2-	10	50	48	16	.1-	.06	
	19	2-	10-	48	53	13	.1-		
	20	2-	10-	48	43	18	.1-		
	21	2-	10	87	53	20	.1-		
	22	2-	10	32	51	18	.1-		
	23	2-	10	32	51	18	.1-		
	24	2-	15	100	48	11	.1-	NSF	
	25	2-	15	60	43	10-	.1-	.040	
	26	2-	20	128	59	18	.1-	.056	
	27	2-	10-	63	40	11	.1-	.048	
	28	2-	10-	62	53	11	.1-	.140	
	29	2-	10	84	43	14	.1-	.112	
	30	2-	15	75	32	10-	.1-	.02-	
	31	2-	10	70	45	13	.1-	.100	
	32	2-	20	60	21	10-	.1-	.02-	
	33	2-	25	102	37	10-	.1-	.02-	
	34	2-	25	90	35	18	.1-	.02-	
	35	2-	40	65	37	10-	.1-	.02-	
	36	2-	35	63	48	13	.1-	.02-	
	37	2-	75	87	83	24	.1-	.052	
	38	2-	70	107	93	29	.1-	NSF	
	39	2-	90	125	91	31	.1-	NSF	
	40	2-	60	90	51	10-	.1-	.032	
	41	2-	50	92	35	10-	.1-	.056	
	42	2-	50	83	59	10-	.1-	.02-	
	43	2-	55	50	29	10-	.1-	.020	
	44	2-	40	83	40	10-	.1-	.02-	
								NSF	

DUCK STREET, AUBURN, N S W 2144

ANALYST 024 J. Wilson.

AREA . Project 29, South Australia.

S.M.L. 214, Spring Creek. DATE Nov. Dec. 1968. PAGE No. 2

ENV 1089

Geochemical Stream Sediment Samples

SAMPLE No.		PPM IN SOIL OR SEDIMENT						
		Mo	Cu	Zn	Pb	Co	Ag	Au
I 54-1	46	2-	45	53	46	11	.1-	.02-
	47	2-	60	130	40	10-	.1-	NSF
	48	2-	30	75	48	10-	.12	.032
	49	2-	40	83	80	10-	.1-	.02-
	50	2-	20	67	64	10-	.1-	.088
	51	2-	50	53	51	13	.1-	.048
	52	2-	60	47	51	10-	.1-	.036
	53	2-	45	50	72	10-	.1-	.080
	54	2-	43	60	57	10-	.1-	.076
	55	2-	40	100	123	10-	.1-	.056
	56	2-	25	67	53	10-	.1-	.072
	57	2-	30	58	56	10-	.1-	.040
	58	2-	60	67	69	11	.1-	.076
	59	2-	25	67	56	10-	.1-	.028
	60	2-	20	53	40	10-	.1-	.020
	61	2-	10-	53	67	10-	.1-	.02-
	62	2-	10-	68	69	10-	.1-	.020
	63	2-	10	87	75	10-	.1-	.048
	64	2-	70	120	75	13	.1-	.052
	65	2-	15	97	48	10-	.1-	.02-
	66	2-	30	67	32	10-	.1-	.02-
	67	2-	40	100	83	10-	.1-	.02-
	68	2-	70	58	43	10-	.1-	.02-
	69	2-	10	50	37	10-	.1-	.02-
	70	2-	45	109	37	29	.1-	.084
	71	2-	30	163	75	18	.1-	.02-
	72	2-	20	117	51	13	.1-	NSF
	73	2-	35	108	29	10-	.1-	.02-
	74	2-	40	113	32	16	.1-	.040
	75	2-	20	83	35	11	.1-	.02-
	76	2-	30	117	43	18	.1-	.060
	77	2-	10-	53	20-	10-	.1-	.02-
	78	2-	10-	65	24	10-	.1-	.02-
	79	2-	10	100	59	11	.1-	.02-
	80	2-	10-	67	29	10-	.1-	.02-
	81	2-	15	75	37	11	.1-	.02-
	82	2-	15	58	21	10-	.1-	.024
	83	2-	10	50	32	10-	.1-	.02-
	84	2-	10-	75	40	11	.1-	.064
	85	2-	20	67	37	11	.1-	.056
	86	2-	15	72	32	10	.1-	.080
	87	2-	15	63	27	10-	.1-	.040
	88	2-	10	67	24	10-	.1-	.060
	89	2-	45	50	27	10-	.1-	.020
	90	2-	10-	47	21	10-	.1-	.02-

010

SML 214

PROGRESS REPORT TO

15 JULY, 1969

CONTENTS

OEL

S.M.L. 214 PROGRESS REPORT

TO JULY 15, 1969

This lease of 65 square miles is located south of the town of Wilmington on the eastern flank of Mount Remarkable. Work began in October 1968 comprising stream sediment sampling, soil sampling, detailed geological mapping in the Spring Creek Mine area, re-interpretation of the I.P. survey carried out in 1967, and a three hole diamond drill programme around the mine which is still in progress.

Drill hole No. 1/29 was drilled westerly to determine the extent of mineralization within the shatter zone down dip from the existing mine workings. An intersection of secondary copper mineralization was made by hole No. 1/29 as shown on the appended section and described in the appended drill log.

Drill hole No. 2/29 was drilled eastward on the south side of the shatter zone to determine if mineralization had flooded along the siltstone-quartzite contact from the shatter zone toward the sub-economic mineralization indicated by RDHSC 3.75S. This hole did not indicate any economic mineralization as indicated on the attached section and drill log.

Drill hole No. 3/29 is being drilled southerly from 10150N 10275E to check for a pipelike zone of both primary and secondary mineralization beneath the existing mine workings. This hole is now in progress and the core has not yet been sampled or logged.

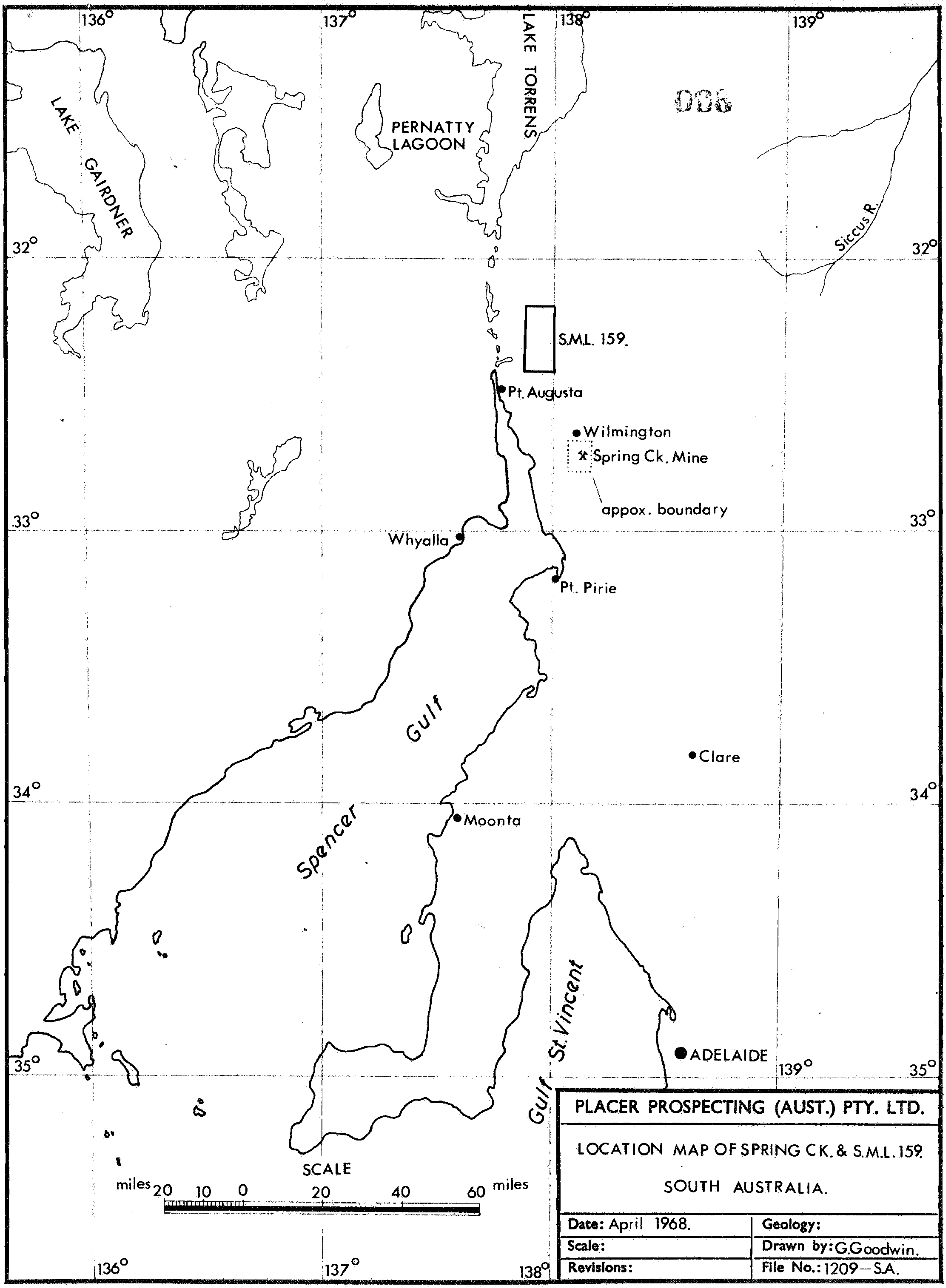
The general indication from this drill programme is that the copper mineralization is restricted to the section of the east-west shatter zone within the brecciated siltstone and that mineralization does not spread laterally along this siltstone horizon or penetrate into the less brecciated quartzite.

C.C. Rennie

C.C. Rennie
for Placer Prospecting (Aust) Pty.Ltd.

CCR.MG69/856

P.4. Expenditure statement extracted & placed in DM1434/67.



Repro 1M 11/67

859

015

RESEARCH FOR INDUSTRY

THE AUSTRALIAN MINERAL DEVELOPMENT LABORATORIES

CONYNGHAM STREET - FREWVILLE - SOUTH AUSTRALIA 5063
TELEPHONE 791662 · TELEGRAMS 'AMDEL' ADELAIDE

Please address all Correspondence to the Director.

Our reference: AN3/115/2/0
1517/68
Your reference:

15th November, 1967

The Exploration Manager,
Australian Blue Metal Pty, Ltd,
82 East Terrace,
ADELAIDE, S.A. 5000.

REPORT AN1517/68

YOUR REFERENCE:	Order No. 35, dated 10/11/67
IDENTIFICATION:	As listed
DATE RECEIVED:	10/11/67

Enquiries quoting AN1517/68 to Officer in Charge please.

Spectrographic analysis by: N.V. Johnston

Officer in Charge, Analytical Section: A.B. Timms

P.A. Young
Director.

kp:9

THE AUSTRALIAN MINERAL DEVELOPMENT LABORATORIES

REPORT AN 1517/68

SEMI-QUANTITATIVE SPECTROGRAPHIC ANALYSIS

016

C.P.8216 (= Spring Creek line 1.5 West.)

Page 1

Sample No.		Cu	Pb.	Zn.	Co.	Ni.	Sn.	Bi.	Ag.	Cr.	V.	Mo.	Be.
SC 1.5 W	0'-5'	10,000	20	30	250	200	8	5	1.0	500	800	10	3
FIRST HOLE	5'-10'	8,000	20	50	250	150	8	50	2.	500	1,000	10	3
"	10'-15'	250	20	30	50	150	8	3	0.1	200	600	15	3
"	15'-20'	200	30	20	50	100	8	3	0.3	200	600	10	3
"	20'-25'	200	50	20	50	100	8	3	0.3	300	600	20	3
"	25'-30'	200	40	50	100	150	8	3	1.0	300	800	20	3
"	30'-35'	200	50	20	100	150	8	3	0.3	300	800	15	1
"	35'-40'	200	40	20	100	150	6	3	0.4	300	600	15	1
"	40'-45'	150	20	<20	100	100	5	3	0.1	300	600	15	3
"	45'-50'	200	40	"	80	100	5	3	0.3	300	800	15	3
"	55'-60'	200	20	50	30	50	3	3	0.2	300	600	15	3
"	60'-65'	200	50	50	150	150	8	3	0.8	300	600	15	<1
"	65'-70'	250	50	30	150	150	8	3	0.6	300	600	20	"
"	70'-75'	150	30	<20	100	100	8	3	0.4	300	600	20	1
"	75'-80'	200	50	30	150	200	8	3	0.4	300	800	30	1
"	80'-85'	150	50	30	150	200	8	3	0.8	300	800	20	1
"	85'-90'	150	50	30	100	200	8	3	0.6	300	800	20	<1
"	90'-95'	150	50	<20	100	200	8	3	0.5	500	1,000	30	"
"	95'-100'	200	50	"	100	150	6	3	0.5	500	600	30	1
"	100'-105'	200	80	20	100	150	8	5	0.8	300	600	20	1

016

C.P.8216

Sample No.		Ga.	Ge.	Mn.	As.	Nb.
SC1.5W	0'-5'	40	2	300	800	< 50
″	5'-10'	40	2	150	300	″
″	10'-15'	40	2	2,000	100	″
″	15'-20'	40	2	2,000	100	″
″	20'-25'	40	2	3,000	100	″
″	25'-30'	40	2	3,000	100	″
″	30'-35'	40	2	3,000	100	″
″	35'-40'	40	1	3,000	100	″
″	40'-45'	40	1	3,000	100	″
″	45'-50'	40	1	3,000	100	″
″	55'-60'	40	1	3,000	100	″
″	60'-65'	80	2	3,000	150	″
″	65'-70'	80	2	5,000	150	″
″	70'-75'	40	1	5,000	100	100
″	75'-80'	80	2	5,000	100	< 50
″	80'-85'	80	2	3,000	100	″
″	85'-90'	80	2	3,000	150	″
″	90'-95'	100	2	500	150	″
″	95'-100'	80	2	500	150	″
″	100'-105'	80	3	500	150	″

SEMI-QUANTITATIVE SPECTROGRAPHIC ANALYSIS

C.P.8216

Sample No.	Cu	Pb	Zn	Co	Ni	Sn	Bi	Ag	Cr	V	Mo	Be
SC1.5W 105'-110'	150	5	30	100	150	8	3	0.5	500	1,000	20	1
" 110'-115'	150	8	20	150	150	8	3	0.8	500	800	20	<1
" 115'-120'	150	4	<20	250	150	8	8	0.8	500	600	20	3
" 120'-125'	600	5	"	400	200	8	8	1.0	500	800	30	1
" 125'-130'	600	5	"	250	150	8	5	0.8	500	800	20	1
" 130'-135'	600	80	"	1,000	250	8	5	1.0	500	1,000	20	1
" 135'-140'	600	80	"	2,500	400	8	10	1.0	500	800	20	1
" 140-145'	600	100	30	2,000	400	8	30	1.0	500	800	20	1
" 145'-150'	2,000	10	20	500	250	8	30	1.0	500	600	20	1
" 150'-155'	2000	10	30	250	150	8	30	2.	500	800	20	1
" 155'-160'	>10,000	10	50	2,500	400	8	50	2.	500	800	20	1
" 165'-170'	>10,000	10	30	3000	400	5	20	2.	500	300	10	<1
" 170'-175'	3000	20	30	400	100	5	10	0.8	500	600	5	3
" 175'-180'	2,000	10	50	200	80	5	10	0.5	500	600	3	3
" 180'-185'	2,000	10	100	300	150	5	10	0.5	500	600	6	3
" 185'-190'	3,000	10	30	200	80	8	10	0.5	300	150	3	3
" 190'-195'	1,500	10	40	200	150	8	10	0.2	500	600	3	3
" 195'-200'	2,500	10	20	200	100	8	5	0.3	500	600	3	5
" 200'-205'	2,500	30	60	300	150	10	8	0.8	500	600	3	1
" 205'-210'	10,000	10	20	300	150	6	8	0.8	700	500	30	[illegible]
"												

TO PAGE 5

THE AUSTRALIAN MINERAL DEVELOPMENT LABORATORIES

REPORT AN 1517/68

SEMI-QUANTITATIVE SPECTROGRAPHIC ANALYSIS

C.P.8216

Sample No.		Ga.	Ge.	Mn.	As.	Nb.
SC1·5W	105'-110'	100	1	3,000	150	<50
"	110'-115'	100	2	500	150	"
"	115'-120'	80	1	500	150	"
"	120'-125'	150	1	500	150	"
"	125'-130'	150	1	500	150	"
"	130'-135'	50	2	100	150	200
"	135'-140'	50	1	500	150	< 50
"	140'-145'	80	2	500	300	"
"	145'-150'	80	1	500	1,000	"
"	150'-155'	150	1	500	150	"
"	155'-160'	150	1	300	400	"
"	165'-170'	20	1	150	1,000	"
"	170'-175'	20	2	150	150	"
"	175'-180'	20	2	150	100	"
"	180'-185'	20	2	150	150	"
"	185'-190'	20	3	150	150	"
"	190'-195'	150	3	150	150	"
"	195'-200'	100	2	150	100	"
"	200'-205'	200	2	150	100	"
"	205'-210'	50	2	150	100	"

C.P.8216

Sample No.		Cu	Pb.	Zn.	Co.	Ni	Sn.	Bi.	Ag.	Cr.	V.	Mo.	Be
SC1/5W	210'-215'	6,000	10	30	300	150	8	10	0·8	700	600	10	3
"	215'-220'	2,000	10	20	250	80	8	10	0·2	700	600	3	5
"	220'-225'	600	10	30	250	150	8	10	0·1	700	600	3	5
"	225'-230'	2,000	50	50	500	250	8	10	0·3	700	600	3	3
"	230'-235'	1,500	10	20	400	250	8	10	0·2	700	600	3	8
"	235'-240'	2,000	30	30	300	200	8	10	0·3	500	600	3	3
"	240'-245'	3,000	10	50	200	200	6	10	0·5	500	600	3	3
"	245'-250'	1,000	50	20	60	50	6	10	0·2	500	400	3	3
"	250'-255'	2,500	250	100	60	80	6	10	1·0	500	600	8	1
"	250'-258'	1,500	250	150	100	80	6	4	1·0	700	600	15	1
3·75 South	0'-5'	80	50	50	50	80	6	1	0·2	500	600	5	<1
COND OLE)	5'-10'	100	50	<20	30	100	6	2	0·4	500	600	8	"
"	10'-15'	100	80	"	50	100	6	3	0·4	500	600	8	1
"	15'-20'	100	80	30	50	80	6	3	0·4	500	800	50	1
"	20'-25'	100	80	20	20	150	6	3	0·8	300	500	20	3
"	25'-30'	150	30	20	80	100	6	3	0·8	500	800	50	<1
"	30'-35'	150	50	20	50	100	6	3	0·8	500	600	20	"
"	35'-40'	150	30	<20	50	100	6	3	0·8	300	600	20	"
"	40'-45'	100	50	20	50	100	6	3	0·8	300	600	20	"
"	45'-50'	150	50	50	50	100	6	3	0·8	300	600	20	1

020

THE AUSTRALIAN MINERAL DEVELOPMENT LABORATORIES

REPORT AN 1517/68

021

SEMI-QUANTITATIVE SPECTROGRAPHIC ANALYSIS

C.P.8216

Sample No.		Ga.	Ge.	Mn.	As.	Nb.
SC1·5W	210'-215'	150	3	150	100	<50
"	215'-220'	150	3	150	100	"
"	220'-225'	150	3	150	100	"
"	225'-230'	200	3	150	100	"
"	230'-235'	150	3	150	150	"
"	235'-240'	150	3	300	150	"
"	240'-245'	100	3	300	150	"
"	245'-250'	100	2	300	150	"
"	250'-255'	150	1	500	100	"
"	250'-258'	50	1	2,000	100	"
SC3·75S	0'-5'	50	1	3,000	150	"
"	5'-10'	100	1	2,000	150	"
"	10'-15'	100	2	2,000	150	"
"	15'-20'	100	2	2,000	150	"
"	20'-25'	50	2	2,000	150	"
"	25'-30'	50	1	2,000	150	"
"	30'-35'	100	2	2,000	200	"
"	35'-40'	100	1	2,000	200	"
"	40'-45'	50	1	2,000	300	"
"	45'-50'	50	1	2,000	200	

REPORT AN 1517/68 022

SEMI-QUANTITATIVE SPECTROGRAPHIC ANALYSIS

C.P.8216

Sample No.		Cu	Pb.	Zn.	Co.	Ni.	Sn.	Bi	Ag.	Cr.	V.	Mo.	Be
SC3·75S	50'-55'	100	50	20	30	100	6	3	0.8	300	800	20	1
"	55'-60'	100	50	30	50	100	6	3	0.8	300	600	15	<1
"	60'-65'	150	50	30	50	100	6	3	0.8	300	600	15	"
"	65'-70'	300	50	50	80	150	6	8	0.8	300	800	20	"
"	70'-75'	1,000	50	30	80	100	6	10	0.6	300	600	15	"
"	75'-80'	2000	50	20	200	100	6	10	0.4	500	600	5	3
"	80'-85'	3000	50	<20	200	100	6	10	0.8	500	600	8	3
"	85'-90'	2,000	50	20	200	150	6	5	0.6	500	600	8	3
"	90'-95'	2,000	30	20	200	15	6	4	0.2	800	600	15	5
"	95'-100'	1,500	30	20	200	15	6	4	0.8	800	600	8	5
"	100'-105'	2,000	30	<20	100	30	6	4	0.5	1,000	600	10	<1
"	105'-110'	1,000	15	"	150	50	6	3	0.5	800	600	15	"
"	110'-115'	1,500	15	30	200	100	6	3	0.8	500	600	8	"
"	115'-120'	1,500	100	20	100	30	3	3	0.2	500	600	5	3
"	120'-125'	1,500	50	25	100	10	3	3	0.2	200	50	3	<1
"	125'-130'	1000	250	25	30	10	3	3	0.2	200	50	3	"
"	130'-135'	1,500	250	30	250	80	6	5	0.8	500	400	8	3
"	135'-140'	1,500	250	30	80	30	6	6	0.8	500	400	8	6

Elements not detected:- Cd. Au. W. Pd. In. Pt. Os. Ir. Rh. Ru. Sb. Ta.

18X29 GEO. A1. - Results in ppm. 24 HOUR SERVICE N.V.J. 14.11.67

022

THE AUSTRALIAN MINERAL DEVELOPMENT LABORATORIES

REPORT AN 1517/68 — 023

SEMI-QUANTITATIVE SPECTROGRAPHIC ANALYSIS

C.P.8216

Page 8

Sample No.	Ga.	Ge.	Mn.	As.	Nb.
SC3-75S 50'-55'	50	2	3,000	100	<50
" 55'-60'	100	1	3,000	<50	"
" 60'-65'	100	1	3,000	100	"
" 65'-70'	100	1	3,000	<50	"
" 70'-75'	50	1	3,000	"	"
" 75'-80'	100	2	2,000	"	"
" 80'-85'	100	2	3,000	"	"
" 85'-90'	50	2	2,000	"	"
" 90'-95'	100	2	2,000	"	"
" 95'-100'	50	2	800	"	"
" 100'-105'	50	2	800	"	"
" 105'-110'	100	1	1,000	100	"
" 110'-115'	100	2	80	<50	"
" 115'-120'	20	1	500	"	"
" 120'-125'	10	3	800	"	"
" 125'-130'	10	2	500	100	"
" 130'-135'	20	1	800	150	"
" 135'-140'	50	2	800	150	"

023

PLACER PROSPECTING (AUSTRALIA) PTY. LTD.

013 HOLE NO. 1/29.

171590

FORM 2

GRID 10090 N , 9730E

LOCATION 10090 N , 9730 E
DATE COLLARED 14 - 2 - 1969
DATE COMPLETED 24 - 2 - 1969

BEARING 90° Mag
LENGTH

DIP.
ELEV.

LAT.
DEP. 80° E

LOGGED BY P. ATHERDEN + B.C. PARAM.
DATE 17-2-69 to 2-3-69

SHEET No. 1 OF 6

RECOVERY: WT. IN GRAMS CORE %	RECOVERY: WT. IN GRAMS SLUDGE %	LENGTH OF CORE	ASSAY RESULTS: SAMPLE No. CORE	SAMPLE No. SLUDGE	% CU. TOTAL (CORE / SLUDGE COMBINED)	% CU. OXIDE (CORE / SLUDGE COMBINED)	OTHER: Ag.	OTHER: Au.	GRAPHIC LOG FT.	DESCRIPTION GEOLOGY	ROCK TYPE	DRILLERS LOG	EST. GRADE
40		10'							0 to 10	Overburden - Pebbles and Cobbles up to 2" in diameter, composed of quartzite, red+grey Shale - Qz Veins 8" long.		ENV 1089	
30		10'							20	as above.			
50		10'			0.0024		.16	.02-	30	as above.			
50		10'			0.0025		.1-	.02-	40	Dark grey SHALE, indurated, broken. Almost black in color.			
60		10'			0.0041		.1-	.02-	50	Same as above, bedding or laminations visible. Traces of Pyrite. badly broken core.			
75		10'			0.0026		.1-	.02-	60	Very fine Pyrite disseminated evenly on bedding planes or lines of weaknesses. Pyrite increasing towards end of section.			
80		10'			0.0032		.1-	.02-	70	Pyrite closely following the bedding planes. Coarser Pyrites in blobs - minor Broken core. decreasing pyrite towards end of section.			
95		10'			0.0025		.1-	.02-	80	bedding planes up to 1 mm thick with Qz filled Veins carrying diss pyrite. Bedding at 45° to Core axis.			
97		10'			0.0034		.1-	.02-	90	at 83' the bedding plane is 30° to Core axis with frequent pyrite veins in section.			
100		10'			0.0036		.1-	.02-	100	as above. Shale a little friable. partings, angle at 45° to core axis. Very fine diss of Pyrite			
95		10'			0.0030		.1-	.02-	110	no change in bedding angle. 4 Qz bands 1/4 mm thick along partings carrying disseminated Py.			
95		10'			0.0029		.1-	.02-	120	as above, the Pyrite following the bedding planes except at 2 places where they fill fractures running normal to bedding.			

PLACER PROSPECTING (AUSTRALIA) PTY. LTD.

HOLE NO. 1/29

014

FORM 2

GRID 10090N. 9730E

LOCATION 10090 N , 9730 E
DATE COLLARED 14 - 2 - 1969
DATE COMPLETED 24 - 2 - 1969
BEARING 90° Mag.
LENGTH
DIP.
ELEV.
LAT.
DEP. 80°E
LOGGED BY P. ATHERDEN & B.C. PARAM.
DATE 17-2-69 to 2-3-69
SHEET No. 2 OF 6

RECOVERY WT. IN GRAMS CORE %	RECOVERY WT. IN GRAMS SLUDGE %	LENGTH OF CORE	SAMPLE No. CORE	SAMPLE No. SLUDGE	% CU. TOTAL CORE / SLUDGE COMBINED	% CU. OXIDE CORE / SLUDGE COMBINED	OTHER Ag	OTHER Au	OTHER	GRAPHIC LOG FT.	DESCRIPTION GEOLOGY	ROCK TYPE	DRILLERS LOG
95		10'			0.0024		.1-	.02-		130	Very fine pyrite all through - x'als in parting at 122'. Partings at 123' 126' 129' with Pyrite rich bands of about 1/2" long.		
95		10'			0.0028		.1=	.02-		140	Bedding angle at about 50° - Coarser pyrite in these partings. Otherwise very fine pyrite disseminated throughout evenly.		
90		10'			0.0030		.1-	.02-		150	fracture normal to core axis - Several thread like Qtz Veins parallel to bedding, all finely disseminated with Pyrite.		
90		10'			0.0036		.1-	.02-		160	as above.		
90		10'			0.0026		.1-	.02-		170	Partings along bedding planes filled with qtz and some minor pyrite. Bedding plane at 45-50°.		
85		10'			0.0034		.1-	.02-		180	as above.		
80		10'			0.0034		.24	.02-		190	broken core - distinct partings with Pyrite - xals up to 1/2 mm. - Qtz Veins in fracture.		
90		10'			0.0024		.12	.02-		200	Friable zones. partings with pyrite Veins, thread-like in nature - also qtz Veins both parallel to bedding and fracture filled which are randomly orientated.		
100		10'			0.0032		.1-	.02-		210	as above. bedding angle - 45° to core axis.		
96		10'			0.0022		.1-	.02-		220			
100		10'			0.0022		.1-	0.02-		230	Pyrite Very finely diss. along bedding planes at 45° to core axis - Minor qtz Veins.		
95		10'			0.0030		.12	.02-		240	Friable zone - as above.		

PLACER PROSPECTING (AUSTRALIA) PTY. LTD.

HOLE NO. 1/29

FORM 2 GRID 10090N, 9730E

.5. 015

LOCATION 10090N, 9730E
DATE COLLARED 14 - 2 - 1969
DATE COMPLETED 24 - 2 - 1969

BEARING 90° Mag.
LENGTH

DIP.
ELEV.

LAT.
DEP. 80° E

LOGGED BY P. ATHERDEN + B.C. PARAM
DATE 17.2.69 to 2.3.1969

SHEET No. 3 OF 6

RECOVERY WT. IN GRAMS CORE %	SLUDGE %	LENGTH OF CORE	SAMPLE No. CORE	SAMPLE No. SLUDGE	% CU. TOTAL (CORE / SLUDGE / COMBINED)	% CU. OXIDE (CORE / SLUDGE / COMBINED)	OTHER Ag.	OTHER Au.	OTHER	GRAPHIC LOG FT.	DESCRIPTION GEOLOGY	ROCK TYPE	DRILLERS LOG	EST. GRADE
95		10'			0.0035		.20	0.02<		250	Partings along bedding planes - filled with fine pyrite with occassional larger blobs of Pyrite - thread-like partings.			
95		10'			0.0030		.12	.02<		260	broken core - fractures normal to bedding filled with quartz.			
80		10'			0.0035		.1<	.02<		270	Very finely disseminated pyrite along bedding planes.			
90		10'			0.0042		.1<	.02<		280	as above.			
85		10'			0.0053		.16	.02<		290	Dentritic alteration on plane normal to bedding — frequent occurence of thread like pyritic laminations.			
95		10'			0.0032		.1<	0.02<		300				
85		10'			0.0040		.1<	.02<		310	bedding at 45°. fine pyritic laminations, minor occurrences - along bedding.			
70		10'			0.0048		.1<	.02<		320	BROKEN CORE - fractures - Same as above.			
80		10'			0.0038		.1<	.12		330	4' of broken core - diss. pyrite minor - laminations of Pyritic Veins along bedding with Qtz.			
70		10'			0.0030		.1<	.06		340	friable zone, broken core, 3/4" Pyritic Vein parallel to bedding - Other minor thread-like pyritic Veins along bedding.			
90		10'			0.0035		.1<	.02<		350	Pyritic Veins, minor, with Qtz in shale with occassional x'als to ½ mm.			
95		10'			0.0031		.1<	.02<		360	badly broken core, 1mm Pyrite xals on bedding plane - minor occurences of finely diss pyrite. Qtz on fractures with minor pyrite - friable zone. Some graphite.			

PLACER PROSPECTING (AUSTRALIA) PTY. LTD.

016

HOLE NO. 1/29

FORM 2

GRID

LOCATION 10090N 9730E
DATE COLLARED 14 - 2 - 1969
DATE COMPLETED 24 - 2 - 1969

BEARING 90° Mag
LENGTH

DIP.
ELEV.

LAT.
DEP. 80° E

LOGGED BY P. ATHERDEN + B.C. PARAM.
DATE 17.2.69 to 2.3.69

SHEET No. 4 OF 6

Recovery: Wt. in grams Core %	Recovery: Sludge %	Length of Core	Sample No. Core	Sample No. Sludge	% Cu. Total (Combined)	% Cu. Oxide (Combined)	Other: Ag	Other: Au	Graphic Log Ft.	Description Geology	Drillers Log	Est. Grade
75		10'			0.0035		.1-	.02-	370	Two planes of weaknesses along bedding filled with Qz and diss pyrite. Several minute fractures.		
80		10'			0.0031		.1-	.02-	380	broken core - friable pyritic zone - Pyrite in thread like strings and blobs.		
85		10'			0.1		0.1-	0.02-	390	Coare pyrite - laminated partings. - diss. pyrite frequent over ½" square areas in 6 places in the section.		
90		5'			0.1		0.1-	0.02-	395	disseminated minor chalcosite in black shale. Chalcosite in Qz veins at 45° to core axis - each vein is thread like in thickness.		
90		5'			0.1		0.1-	0.02-	400	CONCOIDAL FRACTURE imparted to the shale, rather characteristic - frequently diss chalcosite. 2 areas ½" square of enriched mineralisation showing chalcosite.		
85		5'			0.1		0.1-	0.02-	405	Less concoidal fracture in section. Appearances of minor graphite. Some pyrite with trace chalcosite.		
75		5'			0.1		0.1	0.02-	410	About 1' of iron staining showing, minor pyrite + chalcosite.		
75		5'			0.1		0.1	0.02-	415	Grey Shale - NO concoidal fracture - ½" calcite vein at 50° to core axis carrying finely disseminated chalcosite.		
80		5'			0.1		0.1-	0.02-	420	grey shales - a definite change in colour from dark to light grey - The pyrite tends to be in pugs + Qz veins with associated trace chalcosite.		
88		5'			0.6		0.28 / 0.38	0.02- / 0.02-	430	Frequent diss. of chalcosite + pyrite - Shows mineralisation along planes of weaknesses, along bedding planes - at 45° to core axis.		
95		5'			1.1		0.50	0.02-	435	Bedding visible - at 45° to core axis diss. chalcosite - a little friable.		
100		5'			3.7.			0.02	440	as above.		

017

HOLE NO. 1/24

FORM 2 GRID

LOCATION 10090 N., 9730 E.
DATE COLLARED 14 - 2 - 1969
DATE COMPLETED 24 - 2 - 1969
BEARING 90° mag
LENGTH
DIP.
ELEV.
LAT.
DEP. 80° E
LOGGED BY P. ATHERDEN & B.C. PARAM
DATE 17.2.69 to 2.3.69
SHEET No. 5 OF 6

RECOVERY: WT. IN GRAMS CORE %	RECOVERY: WT. IN GRAMS SLUDGE %	LENGTH OF CORE	SAMPLE No. CORE	SAMPLE No. SLUDGE	% CU. TOTAL (CORE / SLUDGE COMBINED)	% CU. OXIDE (CORE / SLUDGE COMBINED)	OTHER: Ag.	OTHER: Au.	GRAPHIC LOG FT.	DESCRIPTION GEOLOGY	DRILLERS LOG	EST. GRADE
75		5'			2.3		0.70	0.02-	445	Sandstone - light reddish yellow in colour - fairly fine grained - shows sharp contact with shale. blobs of native copper - wires of native copper.	fine grained resembling siltstone. material appears to be leached and friable. bedding at 50° to core axis.	
70		5'			1.3		0.33	0.02-	450	brecciated texture. Coarse native copper veins - 1' of cuprite material. 3 fracture planes thread like ½" long filled with native Cu. - fragmented core		
60		5'			0.8		0.40	0.02-	455	Very friable S.st. Traces of native copper in the ~~prou~~ porous rock in somewhat large blobs. badly broken core.		
65		5'			1.0		0.47	0.02-	460	Bedding at 45-50° to core axis. Native Cu frequent in wire form in veins - veins range in thickness from pencil line to ¼"		
60		5'			2.1		0.63	0.02-	465	Reddish yellow sandstone - fine wires of native Cu each about 2 mm long. Section runs into very friable material - broken core.		
60		5'			1.2		0.95	0.02-	470	Very friable tending to crumple down - not much mineralisation visible.		
75		5'			1.2		1.05	0.02-	475	hardened material - bedding at 45°. 2" long vein native Cu - other minor veins with diss native Cu.		
65		5'			1.7		1.18	0.02-	480	a little crumply - shows random orientation in veining still carrying native Cu. in large blobs up to 1/20"		
95		5'			3.1		1.15	0.02-	485	a good section - thick veins (½" long) closely spaced - containing native Cu in large blobs - material tending yellowish end of section.		
90		5'			1.3		1.67	0.02-	490	get 1' of grey shale carrying diss frequen[t] chalcosite - rest of section is fine grained S.st carrying diss native Cu in large blobs.	a characteristic feature that native Cu. occurs only in the sandstones.	
80		5'			2.7		2.77	0.02-	495	SHALE - grey in colour - carrying minor diss of chalcosite.		
98		5'			2.1		1.43	0.02-	500	Grey shale as above.		

PLACER PROSPECTING (AUSTRALIA) PTY. LTD.

018 HOLE NO. 1/29

FORM 2 GRID

LOCATION 10090N, 9730E
DATE COLLARED 14 - 2 - 1969
DATE COMPLETED 24 - 2 - 1969

BEARING 90° mag
LENGTH

DIP.
ELEV. 80°

LAT.
DEP. 80° E

LOGGED BY P. ATHERDEN & B.C. PARAM
DATE 17.2.1969 to 2.3.69

SHEET No. 6 OF 6

RECOVERY: WT. IN GRAMS CORE %	RECOVERY: WT. IN GRAMS SLUDGE %	LENGTH OF CORE	SAMPLE No. CORE	SAMPLE No. SLUDGE	% CU. TOTAL (CORE / SLUDGE) COMBINED	% CU. OXIDE (CORE / SLUDGE) COMBINED	OTHER Ag.	OTHER Au.	GRAPHIC LOG FT.	DESCRIPTION GEOLOGY	DRILLERS LOG	EST GRADE
98		5'			0.2.		0.1	0.02-	505	passes into Cong. S.st. resembling a breccia. get 2" of green Cu Staining at 502'.	FOOTWALL Rock.	
90		5'			0.1		0.1-	0.02-	510	2½' of Coarse S.st. then get fine grained S.St. reddish yellow in Colour – no mineralisation.		
80		5'			0.031		0.1-	·04-	515	broken Core, porous S.st. fairly Coarse, appearances of oxidised Cu. Veins - NO VISIBLE Copper, tending towards a breccia.		
90		5'			0.053		0.1-	·02-	520	Conglomerates of fine grained pink matrix with cobbles up to 1" embedded - Manganese Stains. NO COPPER.		
95		5'			0.066		0.1-	·02-	525	Same as above - Copper Stains - green malachite possibly.		
95		5'			0.102		0.1-	·02-	530	Shows some alteration, otherwise Same as above.		
90		5'			0.038		0.1-	·02-	535	alteration - Vugs containing fine qtz crystals - Conglomeritic S.St.		
90		5'			0.062		0.1-	·02-	540	More Vugs with some larger qtz xals in Vugs. Same rock type as above.		
95		10'			0.079		0.1-	·06	550	Same as above, at 548' get Malachite? Stains, then Arkosic Conglomerate.		
95		10'			0.038		0.1-	·03	560	Fine grained S.St at 556'. passing into buff colored Cong. at 560.		
95		16' 8"			0.090		0.1-	·06	576' 8"	Conglomeratic Sandstone - Some alteration, Qtz Veins.		
									END	OF HOLE. 173-74		

PLACER PROSPECTING (AUSTRALIA) PTY. LTD.

019 | HOLE NO. 2/29

ENV 1089

FORM 2 | GRID 9800N 9840E

LOCATION: SPRING CREEK. S.A
DATE COLLARED: 26-2-1969
DATE COMPLETED: 17-3-1969
BEARING: | LENGTH: | DIP: | ELEV.: | LAT.: | DEP.: 70°E
LOGGED BY: B. C. Param | DATE: 4.3.69 to 17.3.69
SHEET No. 1 OF 4

RECOVERY: WT. IN GRAMS CORE %	RECOVERY: WT. IN GRAMS SLUDGE %	LENGTH OF CORE	SAMPLE No. CORE	SAMPLE No. SLUDGE	% CU. TOTAL (CORE / SLUDGE / COMBINED)	% CU. OXIDE (CORE / SLUDGE / COMBINED)	OTHER Ag.	OTHER Au.	OTHER	GRAPHIC LOG / ASSAY / FT.	STRUCTURAL GEOLOGY	DESCRIPTION GEOLOGY	ROCK TYPE	DRILLERS LOG
0										0 to 12'		NO CORE.		
45		8'			0.004					20'		Very poor recovery. Badly broken core - difficult penetration - largely made up of boulders, large pebbles with some sand and silt.		
50		10'			0.003		·16	·02-		30'				
50.		10'			0.003		·/-	·02-		40'				
98		10'			0.003		·/-	·02-		50'		Dark Shale. No mineralisation. Bedding at 50° to core axis. Minor minute quartz veins.		
98		10			0.003		·/-	·02-		60'		4" Qtz vein with pyrite & some chalcopyrite? with quartz veins disseminated frequently. 1" square area completely diss. with pyrite. Numerous thread-like Qtz veins.		
65		10			0.003		·/-	·02-		70'		2' disturbed core broken into bits - Conchoidal fracture prominent. 3 of 1" Qtz veins - a few fractures filled with Qtz veins - decomposed.		Pyrite mineralisation only. Ground probably suffered from movements.
100		10			0.004		·/-	·02-		80'		Almost void of Qtz veins save for 2 of 1" Qtz veins at 45° to core axis. Pyrite diss ~~over~~ frequently within veins.		Loss of concoidal fracture.
98		10			0.003		·/-	·02-		90'		2' wide Qtz vein carrying minor pyrite. Other frequent Qtz veins 1/4" thick all with diss pyrite.		
95		10			0.004		·/-	·02-		100'		Sheared at 2 points with appearances of graphite & pyrite. Minor qtz veins with pyrite chalcopyrite?		
100		10			0.004		·/-	·02-		110'		Absence of thick Qtz veins - thread like pyritic veins at 45° to core axis changing to 55° at 104' and back to 45° at 106'.		
100		10			0.004		·/-	·02-		120'		Minor fractures or weak bedding planes with infillings of Qtz carrying pyrite		BEDDING at 45° to core axis.

FORM 2 GRID

LOCATION
DATE COLLARED 26 - 2 - 69
DATE COMPLETED 17 - 3 - 69.

BEARING
LENGTH

DIP.
ELEV.

LAT.
DEP. 70°E

LOGGED BY B.C. PARAM.
DATE 4-3-69 to 17.3.69

SHEET No. 2 OF 4

RECOVERY WT. IN GRAMS CORE %	SLUDGE %	LENGTH OF CORE	ASSAY RESULTS SAMPLE No. CORE	SLUDGE	% CU. TOTAL (CORE / SLUDGE COMBINED)	% CU. OXIDE (CORE / SLUDGE COMBINED)	OTHER Ag.	Au.	GRAPHIC LOG FT.	DESCRIPTION GEOLOGY	DRILLERS LOG	EST. GRADE
100		10			0.003		.1-	.02-	130'	1/4" qtz bands, pyritic, some fracturing. Qtz mainly pink in color, coarse, sugary. at 45° to core axis.		
100		10			0.004		.1-	.02-	140'	No change in qtz veining. Pyrites appear to be larger - random orientation of Qtz veins of thread-like size.		
98		10			0.003		.1-	.02-	150'	Coarse pink Qtz veining (4" wide) sugary type - Pyrite mineralisation rather frequently associated with Qtz veining.	Bedding at 45° to core axis.	
70		10			0.004		.1-	.02-	160'	Broken core, bedding at 45° to core axis 3 to 4 mm wide Qtz veins, pink, carrying disseminated pyrite.		
85		10			0.005		.1-	.02-	170'	Broken core, One 1" qtz vein carrying frequent pyrite in large blobs. Some threadlike pyrite along bedding plane		
95		10			0.004		.1-	.02-	180'	Several pyrite veins measuring 2-4 mm wide with very fine pyrite xals. Two blobs about 1mm - Orientation of veins along bedding planes and at	random - 1" coarse qtz vein with pyrite.	
95		10			0.004		.24	.02-	190'	45° to bedding, finely laminated with thread-like pyritic veins along bedding planes - 1/2 doz 1/4" qtz veins oblique to bedding, pink, sugary. and void of mineralisation save 2 smaller veins	carrying diss. pyrite parallel to bedding.	
60		10			0.004		.12	.02-	200'	Pyrite veins parallel to bedding - 45° to core axis - random orientation of qtz veins 2" Qtz with pyrite streaks.		
70		10			0.004		.1-	.02-	210'	broken core, badly fragmented - Qtz veins 1/8" thick at 45° to core axis carrying pyrite. Thread like pyritic veins along bedding planes.		
20		10			0.003		.1-	.02-	220'	as above. possible fracture zones.		
70		10			0.004				230'	Pyritic bands of 1/20" to 1/4" wide - fractures with qtz carrying minute pyrite x'als. Minor disseminations of pyrite along bedding planes.		
85		10			0.004				240'	A dozen qtz veins up to 1/20" thick carrying minor pyrite - These veins randomly orientated.		

FRASER PROSPECTING (AUSTRALIA) PTY. LTD. 021 HOLE NO. 2/29.

FORM 2 GRID

LOCATION
DATE COLLARED 26 - 2 - 69
DATE COMPLETED 17 - 3 - 69
BEARING
LENGTH
DIP.
ELEV.
LAT.
DEP. 74°E
LOGGED BY B. C. PARAM.
DATE 4.3.69 to 17.3.69
SHEET No. 3 OF 4

RECOVERY: WT. IN GRAMS CORE %	RECOVERY: WT. IN GRAMS SLUDGE %	LENGTH OF CORE	SAMPLE No. CORE	SAMPLE No. SLUDGE	% CU. TOTAL (CORE / SLUDGE / COMBINED)	% CU. OXIDE (CORE / SLUDGE / COMBINED)	OTHER: Ag	OTHER: Au	OTHER	GRAPHIC LOG FT.	DESCRIPTION GEOLOGY	DRILLERS LOG	EST GRAD
70		10			0.004					250	bedding at 45° to core axis, fairly distinct. Minor pyrite disseminated - 2 q/z Veins 1/20" wide with minor pyrite		
90		5			0.007					255	Bedding 55° to Core axis. Minor q/z Veins Some along bedding planes others randomly orientated. Disseminations of Pyrite along bedding plane common.		Tr
100		5			0.006					260	Prominent bedding - 2 q/z Veins up to 1/10" along bedding planes & disseminated with pyrite. Trace chalcocite ??		
80		5			0.047					265	Badly broken Core. decomposed or weathered fragments Evidence of graphite + pyrite mineralisation Pyrite Veins up to 1/20' along bedding with good pyrite x'als.		
70		5			0.15		·/-			270	badly broken core etc as above. 1" q/z band loaded heavily with pyrite x'als. Rest of section too crumpled too crumpled to indicate mineralisation, but at 268	observe blobs of chalcopyrite in a 1" q/z Vein.	.5
80		5			0.34		·/-			275	~~LIGHT~~ DARK SHALE to 273' - Coarse porous S.St for rest of Section. Bedding visible with minor fractures tending to displace bedding. Pyrite mineralisation along bedding with also some chalcopyrite - a 2" section carrying about 30%	Chalcopyrite. Vein 45° / Core Axis (½" Vein.)	
90		5			0.011		·/-			280	Porous S.St. - Minor disseminations of pyrite with large blobs of disseminated Chalcopyrite - fairly Siliceous, Light Shale at 278½'. Minor Chalcocite, Chalcopyrite -	Streaks of Chalcosite - Undulating bedding indicating uneven depositional environment.	
80		5			0.009		·/-			285	Very little mineralisation visible. The shale tending to carry Coarser fragments with diss. minor pyrite Specks bedding at 55° to Core axis.		Tr
90		5			0.012		·/-			290	Pyrrhotite + Pyrite mineralisation in minor quantities 2' of broken Core. Fracture filled q/z Veins carrying chalcopyrite. Light Shale Section.		
70		5			0.004		·/-			295	broken Core, friable, Coarse bedding, Pyrite mineralisation. Minor Chalcopyrite. Embedded large q/z pieces in the rock carrying frequent pyrite.		
80		5			0.004		·/-			300	Very Coarse porous S.St - Regular bedding - Diss pyrite - blobs of Chalcopyrite occasionally - f		N
75		5			0.001		·/-			305	SHALE - medium grained, light colour, Some fracture, Minute pyrite disseminations throughout rock.		

PLACER PROSPECTING (AUSTRALIA) PTY. LTD.

022

HOLE NO. 2/29

FORM 2

GRID

LOCATION
DATE COLLARED 26 · 2 · 69
DATE COMPLETED 17 · 3 · 69

BEARING
LENGTH

DIP.
ELEV.

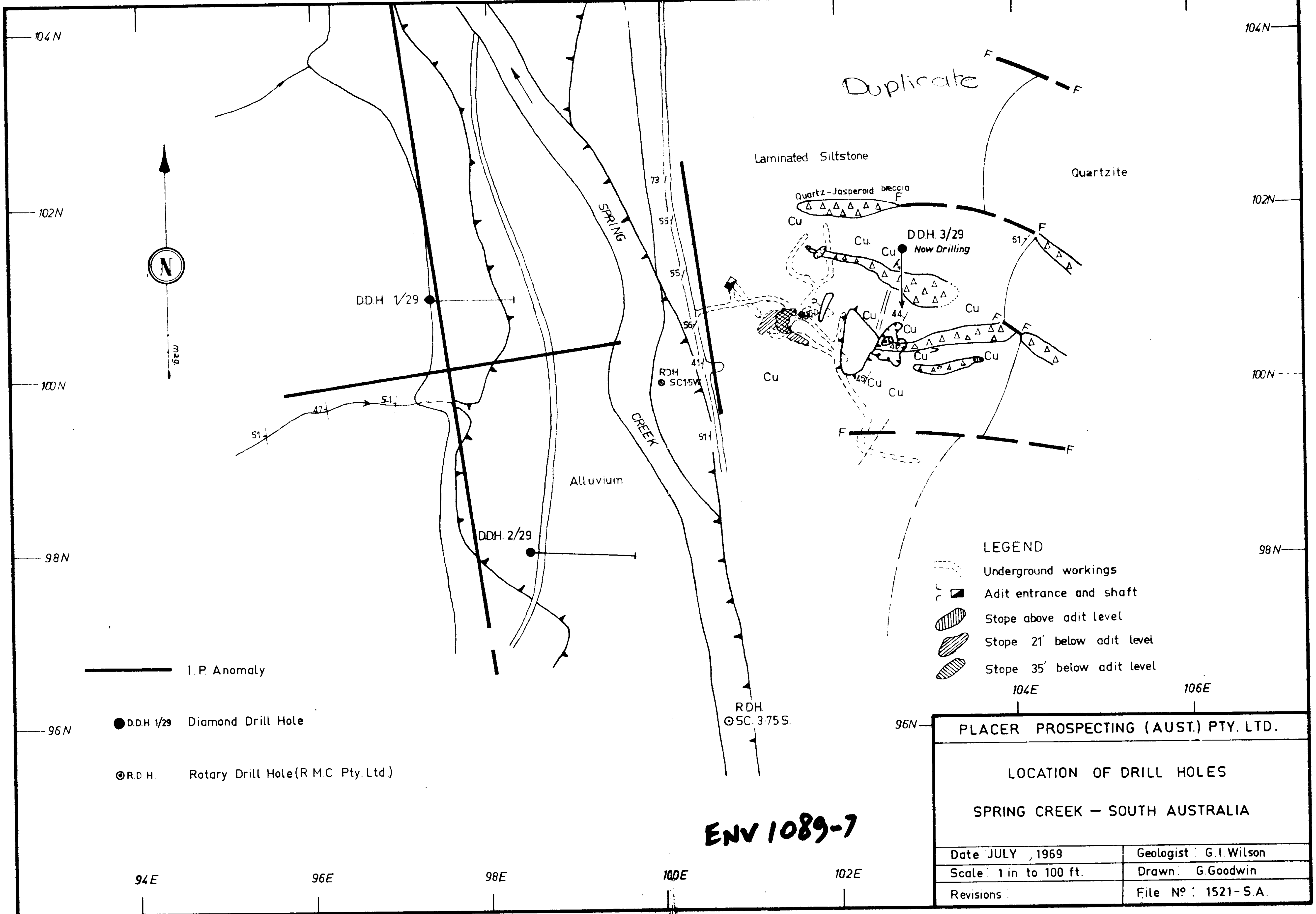
LAT.
DEP. 74°E

LOGGED BY B.C. PARAM
DATE 4·3·69 to 17·3·69

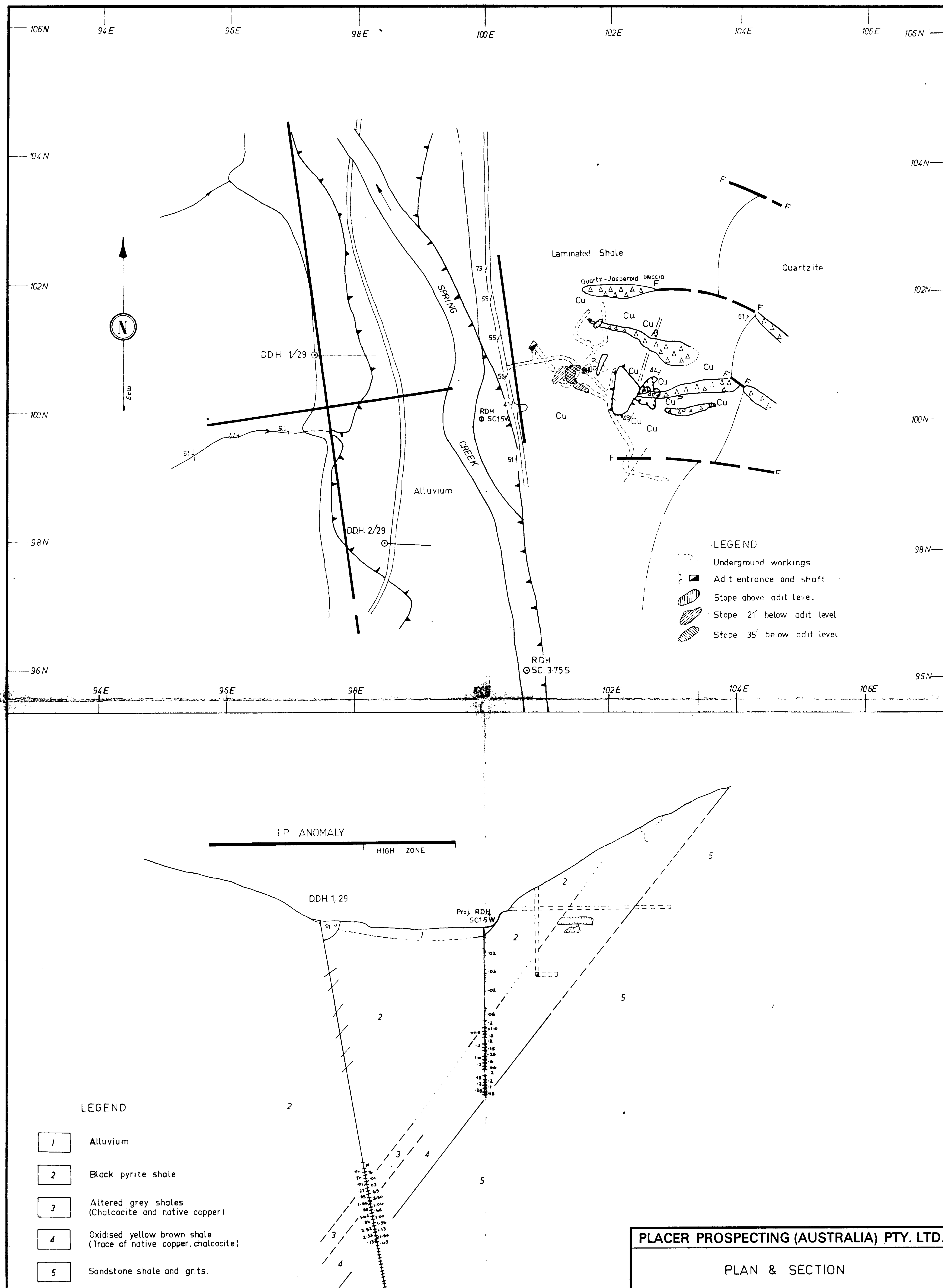
SHEET No. 4 OF 4

RECOVERY: WT. IN GRAMS CORE %	SLUDGE %	LENGTH OF CORE	SAMPLE No. CORE	SAMPLE No. SLUDGE	% CU. TOTAL (CORE / SLUDGE) COMBINED	% CU. OXIDE (CORE / SLUDGE) COMBINED	OTHER Ag.	OTHER Au.	GRAPHIC LOG FT.	DESCRIPTION GEOLOGY	DRILLERS LOG	EST. GRADE
65		5			0.002		·/–		310	Broken Core. Last 2' of porous S.St. Minute Specks of chalcopyrite. No other mineralisation visible.		Nil
60		5			0.001		·/–		315	2' of badly broken Core. Section resembling felspathic S.St with minor diss. of pyrite.		
60		5			0.014		·/–		320	A fracture normal to bedding with inclusions of Qtz + very minor pyrite. Otherwise as above.		
85		5			0.016		·/–		325	Red S.St at 323', fine grained, soft, ~~dark bands~~ deep red bands parallel to bedding possibly copper oxide. 1' of Coarse grained S.St. followed by 2' of fine grained S.St. Cross bedding with inclusions of large fragments. bedding at	70° to core axis.	Tr
100		5			0.011		·/–		330	Cross bedding showing grading. bedding 70° to Core axis Manganese stains. 2' of qtzitic S.St medium grained. No mineralisation visible. Colour change to yellow.		
100		5			0.0025				335	Quartzite - Jasperoid - almost barren of mineralisation.		
95		5			0.0083				340	as above.		N
85		10			0.0020				350	as above.		
100		10			0.0030				360	as above.		
									END	OF HOLE 109.73		

Strike & dip of stratigraphic bedding, laminations in siltstones, heavy mineral lamination in quartzite
Strike and dip. Prominent close spaced joint set
Strike & dip of small faults, shearing, quartz veining
Steep bank or cliff
Geological boundary, accurate, inaccurate, inferred
Fault; position accurate, inaccurate, inferred
Shearing
Gully or small creek
Topographic contour. Datum (N100 E100) Designated 100'
Shaft and dump
Open pit with depth
Adit and underground workings
Road
McPhar Geophysics I.P traverse
Rotary Drill Hole (Ready Mix Concrete)
LEGEND
PROBABLE STRATIGRAPHIC UNIT
1 Alluvium; silt with few pebble bands
2 Alluvium; boulders with some sand, silt
QUATERNARY
3 Sandstone with reddish shale partings
UPPER MEMBER WILLOCHRA FORMATION
4 Reddish shale/slate with thin sandstone interbeds; Many sedimentary structures (current bedding, ripple marks etc.)
LOWER MEMBER WILLOCHRA FORMATION
5 Thinly laminated siltstones with thin limey beds
TAPLEY HILL FORMATION
6 Massive pink spotted felspathic quartzite with heavy Mineral laminations
Sheared quartzite (bedding still recognisable)
Brecciated quartzite
"RHYNIE" SANDSTONE
Quartz-jasperoid breccia, specular haematite, ironstone fault breccia
UPPER PRE-CAMBRIAN METASEDIMENTS
GEOCHEM LINE
CREEK
SPRING
Ruins
Smoke Stack
Adit for water pipe
Specular haematite
Brecciated quartzite, veining and much specular haematite
Siltstone
SPRING CREEK MINE
Geological Plan and Vertical Projection
After S.A. Dept. of Mines Mining Review N° 98.
STRUCTURAL DATA
(EQUAL AREA NET)
Total πS
β = 45° → 306°
Contours 0.93, 5, 10, 20% per 1% area
108 Poles (most common bedding attitude marked)
Total πS₂
26 Poles (most prominent attitude marked)
Total L₂
6 Kink axes and crenulation lineations
Total L₁
9 Crenulation lineations
S = Bedding, lamination in siltstone, heavy mineral lamination in quartzite
S₂ = Shears, minor faults and close spaced prominent joint set (probably axial plane to L₂)
L₁ = Sub horizontal penetrative lineation in red shales. Often confused with non-penetrative ripple marks (probably parallel first generation fold axes)
L₂ = Down dip kink lineation in red shales (probably associated with faulting and is approx. parallel to fault/bedding intersection)
RECEIVED
10 APR 1969
DEPT. OF MINES REGISTRY
PLACER PROSPECTING (AUST.) PTY. LTD.
GEOLOGICAL MAP
SPRING CREEK COPPER MINE
WILMINGTON – SOUTH AUSTRALIA
DATE: 29-11-1968
GEOLOGIST: R.J. HOLCOMBE
SCALE: 1 inch to 100 feet
DRAUGHTSMAN: R.J. VOSS
REVISIONS:
FILE Nº: 1369-S.A.
ENV 1089-4



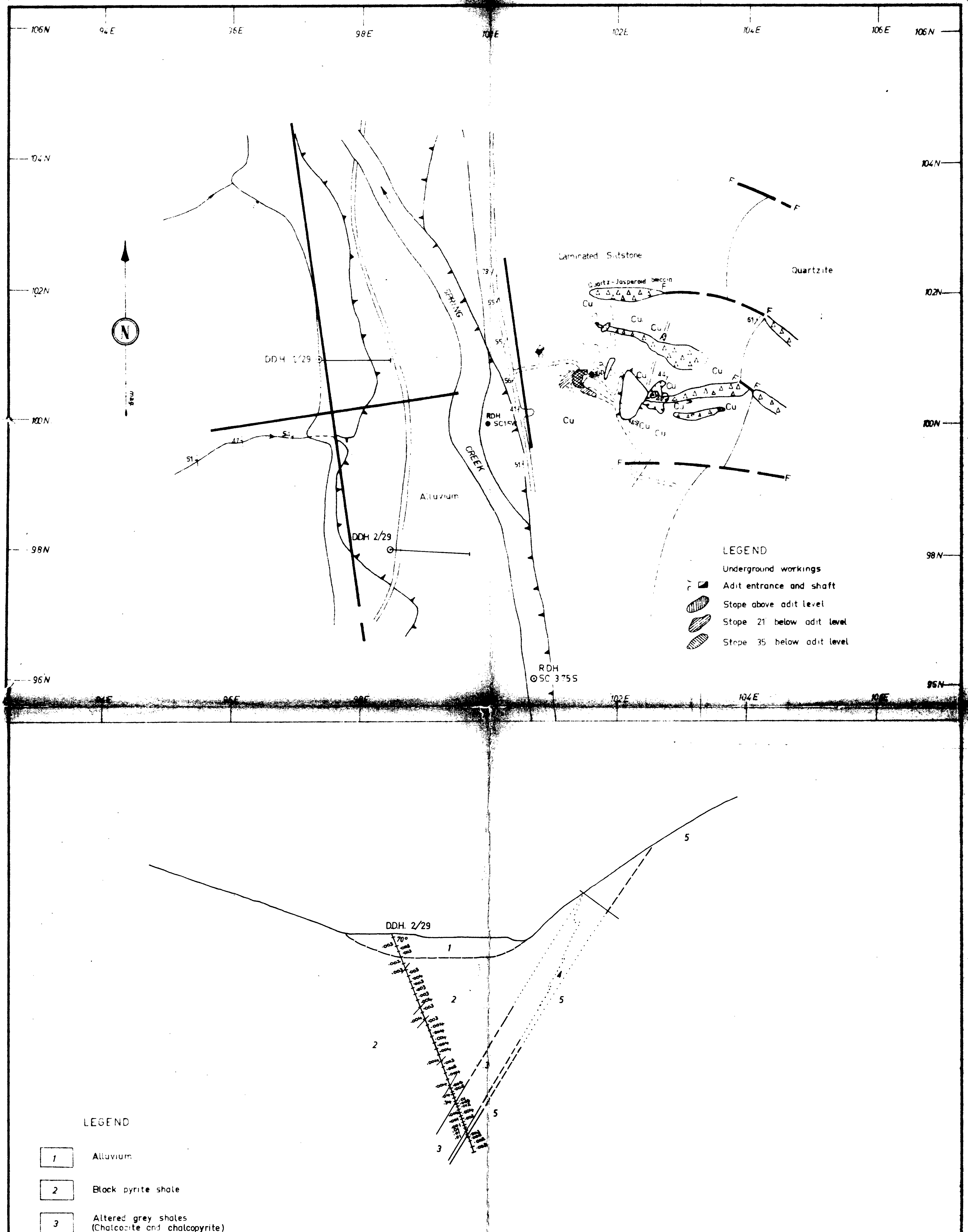
PLACER PROSPECTING (AUST.) PTY. LTD.	
LOCATION OF DRILL HOLES SPRING CREEK — SOUTH AUSTRALIA	
Date JULY, 1969	Geologist: G.I. Wilson
Scale: 1 in to 100 ft.	Drawn: G.Goodwin
Revisions:	File Nº: 1521-S.A.



PLACER PROSPECTING (AUSTRALIA) PTY. LTD.	
PLAN & SECTION D.D.H. 1/29 Spring Creek Mine – Wilmington S.A.	
DATE: 15 · 11 · 58	GEOLOGIST: B.C.P.
SCALE: 1" = 100 feet	DRAUGHTSMAN: G. J. G.
REVISIONS: 5 · 7 · 69	FILE No.: 1356 — S.A.

ENV 1089-8

16/22



PLACER PROSPECTING (AUSTRALIA) PTY. LTD.

PLAN & SECTION

DDH 2/29

Spring Creek Mine – Wilmington S.A.

DATE: 15	GEOLOGIST: B C P
SCALE: 1" = 100 feet	DRAUGHTSMAN: G. J. G.
REVISIONS: 5 3 69	FILE No.: 1538 – S.A.

ENV 1089-11

ENV 1089.

R.M.C. MINERALS PTY. LTD.

037

PROGRESS REPORT NO. 3

S.M.L.214

S P R I N G   C R E E K

Period July '69 - March '70

1. Introduction

Work conducted during the Report period consisted of -

(a) Inspection of a core from diamond drill Hole No. 1/29. (not previously reported)

(b) The reconnaissance ground Magnetometer Survey.

(c) Determination of the sulphur content of the shales for drill Hole 1/29.

2. Summary

Work conducted in this period generally involved assessment of the previous reports, results and the confirmation and clarification of them.

The diamond drill core inspection indicated that more drilling is required to determine the lateral extent and pitch of the ore body.

The ground Magnetometer Survey showed that no magnetic body was found in the limited work conducted although a minor anomaly occurred.

The sulphur content of the shales showed that the Pyrite present would account for some of the anomaly shown by the Induced Polarization and the extent of this is still to be determined.

3. Equipment Used

McPhar M700 Magnetometer

4. Procedure and Results

Individual reports attached;-

Core inspection by R.A. Laws of Geosurveys of Australia Pty. Ltd.

Ground Magnetometer Survey conducted by D.H. Tucker of the University of Adelaide.

Sulphur content of the shales for Hole No. 1/29 by S. Ludvig and I. Haddow of R.M.C. Minerals Pty. Ltd.

5. Expenditure Statement extracted and placed in DM 1434/67.

ENV 1087.

025

REPORT ON

AN INSPECTION OF

A CORE FROM A DIAMOND DRILL HOLE

AT SPRING CREEK MINE, S.M.L. 214.

for

READY MIXED CONCRETE (S.A.) PTY. LTD.

by

R. A. Laws

GEOSURVEYS OF AUSTRALIA PTY. LTD.

1969/5

On the 25th of February, 1969, a brief examination of a diamond drill core was made at Wilmington, South Australia.

DESCRIPTION OF THE CORE

0 - 390 feet — Dark grey, laminated, hard, fissile, strongly pyritic shale. The pyrite is syngenetic and occurs as veins, mostly parallel to bedding, and as finely disseminated crystals. There is some associated calcite and gypsum. Minor red-brown staining of fractures occur towards the bottom of the interval - cuprite?

390 - 421 feet — Shale as above, but becoming leached, silty and light grey in colour. Pyrite is still common.

421 - 441 feet — The shale continues to be pale grey and pyritic, but contains chalcocite, especially below 428 feet, as thin veins and blebs. Below 429 feet there are a number of reddish stained zones and voids in the bedding and along fractures which probably are oxidation products of native copper.

441 - 500 feet — Pale grey, buff, pinkish and yellow leached shale and siltstone, containing native copper (especially below 448 feet) in radiating fractures predominantly in the bedding, and associated with quartz. At 447 feet 2 inches occurs a seam of native copper 3/8" wide and over 6 inches long. Chalcocite is common as thin veins and blebs where the rock is least weathered, and in the more leached zones it appears to have been altered to a reddish brown mineral. Very minor traces of cuprite and malachite are present throughout.

500 feet to base of the core

Interbedded yellow to pinkish sandstone, leached shales as above, and conglomeratic (tillitic?) bands. Black manganese dioxide is present throughout. Chalcocite and minor green malachite staining is evident down to about 530 feet. Possible minor disseminated small blebs of chalcocite are present to the base of the core in the finer fractions. The red-brown mineral after ?chalcocite is evident down to 511 feet.

ESTIMATIONS OF COPPER PERCENTAGES

Percentages are difficult to estimate by eye for the following reasons:-

1. The very leached nature of the mineralized zone.
2. The unknown nature of the reddish to red-brown minerals staining many of the fractures especially in the interval 441 to 511 feet. These minerals are probably alteration products after chalcocite and native copper, and should assay copper.
3. It is evident that although core recoveries are high, some of the softer and more soluble fractions of the core, especially along the fractures, have been lost during coring, core recovery and washing. The lost portion of the core was most probably a copper rich fraction and assay values may probably prove to be lower than actual values.

However the following estimates are listed:-

Interval	Thickness	True Thickness (corrected for dip)	Estimate of Cu Percentage
0 - 421	421	298	Traces only
421 - 428	7	5	Less than 1%
428 - 441	13	9	Approximately 1%
441 - 448	7	5	From 1% to 2%

Interval	Thickness	True Thickness (corrected for dip)	Estimate of Cu Percentage
448 - 499	51	36	Above 2%, possibly averaging as high as 4%, with smaller intervals giving higher values.
499 - 529	30	21	Approximately 1%
529 - 570	41	29	Less than 1%

Note: A dip of 45° has been used to obtain true thicknesses.

STRATIGRAPHY

Tapley Hill Formation	0 - 500 feet
Appila Tillite?	500 feet - total depth

There is a strong possibility that the basal portion of the core is Rhynie Sandstone.

GENERAL COMMENTS

1. No primary copper mineralisation was noted.
2. The mineralization is due to supergene enrichment of an ore body probably originally hydrothermally emplaced.
3. The mineralized zone appears to maintain constant thickness with depth, i.e. from the Spring Creek Mine, through the adjacent percussion hole, to the diamond drill hole.

RECOMMENDATIONS

1. Further diamond drill holes sited to the north and south of the present hole, to drill due east at an angle of approximately 80° in order to determine the lateral extent and pitch of the orebody. The exact location of the holes should be dependent on topography and the nature and location of the secondary I.P. anomaly.

2. Attempt to define the Appila Tillite/Rhynie Sandstone unconformity, as such features are commonly preferred sites for ore localisation. Also, in this area the postulated unconformity is important with respect to the depth of weathering and the possible location of primary ore bodies.

3. Screen mud returns and bag at 10 foot intervals over the likely mineralized zone to determine whether copper rich fractions are being washed away during coring.

4. Assaying of copper content for all intervals showing signs of mineralization should be undertaken as a matter of routine.

CONCLUSIONS

On preliminary visual examination, the core from the above hole shows extremely encouraging mineralization, with possibly up to 4% copper over 36 feet, with smaller but still effective percentages over as much as 70 feet. The determination of the extent, grade and nature of the ore body by an extensive and thoughtful diamond drill programme, is the obvious following step in the exploration programme.

After inspecting the core and very briefly reviewing the geophysical information, one cannot be otherwise but optimistic that an economic copper deposit will be preliminarily outlined with perhaps only two or three further exploratory holes.

At the present time no calculation of possible ore reserves can be attempted due to lack of data.

It is further felt that Placer is exploring the mining lease in a sound geological fashion but with the reservation that a relatively small mining venture, would not greatly interest a company of their size.

R. A. Laws
GEOLOGIST.

SPRING CREEK MINE AREA

Reconnaissance Ground Magnetometer Survey

Carried out for R.M.C. Minerals

January, 1970

University of Adelaide

13:3:70

CONTENTS

Introduction:

This is a report on a reconnaissance ground magnetometer survey, carried out for R.M.C. Minerals on January 7th, 1970, in the Spring Creek Mine area, which is six miles south of Wilmington (S.A.).

A single line was surveyed with a vertical field fluxgate magnetometer. The magnetometer profiles and a map showing the line location are appended to this report.

Further details on the conduct of the survey are given at the end of the report.

Conclusions:

No large highly magnetic body was crossed by the survey line at the Spring Creek Mine.

There is a minor anomaly adjacent to the mine. However in view of the fact that core samples from the mine area show extremely low magnetic susceptibility values, it is unlikely that the minor anomaly is significant.

All other anomalies east of the mine probably do not have any economic significance.

Recommendations:

As core and ore samples from the mine area are not magnetic I recommend that no further magnetometer work should be carried out.

No further magnetometer work should be carried out east of the Spring Creek Mine. However if mineralisation is found to the east the magnetic data should be reviewed and further surveys undertaken.

Discussion of Results:

There is a 5 gamma anomaly over the Spring Creek Mine, however to confirm this, further work is required with a sensitive magnetometer that can be read to 1 gamma. Survey lines parallel to line 25/70 are required to the north and south of the mine. Provision would have to be made to reduce the magnetic noise evident on the unfiltered data (see Appendix 2, Profiles 1 and 2).

The low susceptibility of core samples from the R.M.C. Minerals' holes (DDH 1/29, DDH 2/29 and DDH 3/29) offers no proof that the anomaly is related to mineralisation. The mine anomaly is of opposite polarity to that which would be expected for a sedimentary controlled orebody (Gay, 1963. See Appendix 3)

The digitally filtered profiles show that there is a broad 30 gamma anomaly over the western half of the Rhynie Sandstone (see map and profiles 3 and 4). However this anomaly is probably of no economic significance.

Further to the east there are a number of anomalies larger than that at the Spring Creek Mine, but from experience in other parts of the area these are of no economic significance.

General Information:

The base station which was 20 feet north of the R.M.C. Minerals DDH 2/29, and the ends of line 25/70, were permanently marked with steel pegs. These points were photo located.

The first of the digitally filtered profiles in Appendix 2, is the result of sampling the magnetometer data at 50 foot intervals and then using a 9 point, equal weight, averaging operator (Naidu, 1968). The second profile is the result of sampling the data at 100 foot intervals and then using the 9 point equal weight averaging operator as before.

The geology base map included as Appendix 1 is an enlargement of part of the South Australian Department of Mines 60 chain Wilmington base.

The survey work and interpretation was carriedout by Mr. D.H. Tucker for the Department of Economic Geology of the University of Adelaide.

D.H. Tucker - Curriculum Vitae

B.Sc. Hons. (Physics) - University of Adelaide - 1966

Two years geophysical experience with the Bureau of Mineral Resources in Canberra from 1966 to 1969.

One years work towards a Ph.D. in geophysics in the University of Adelaide under the supervision of Professor D. Boyd.

The information in this report has been discussed with Professor Boyd of the Department of Economic Geology.

BIBLIOGRAPHY:

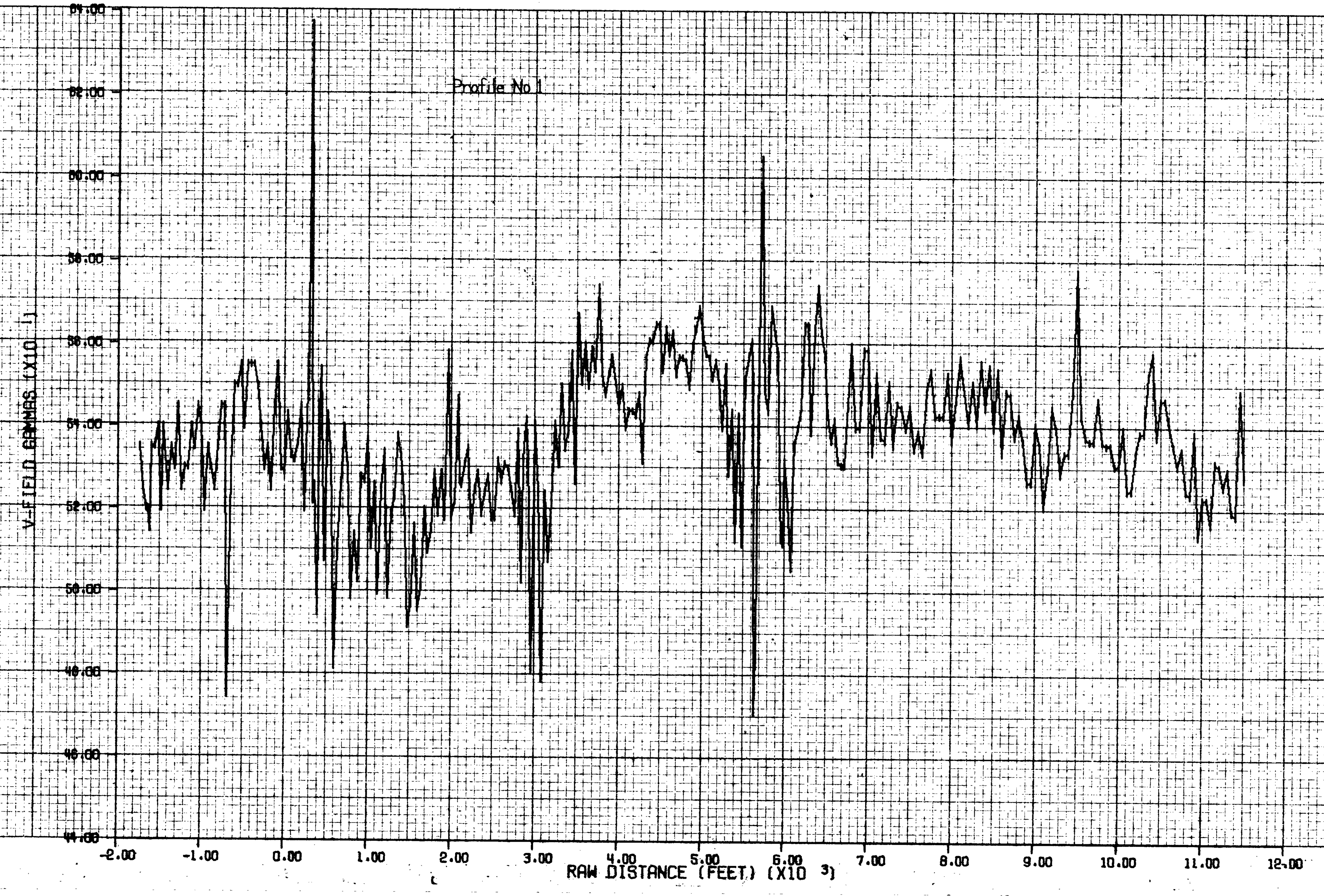
P.S. Naidu — Geophysics, Vol. 33, No. 4 (August 1968)

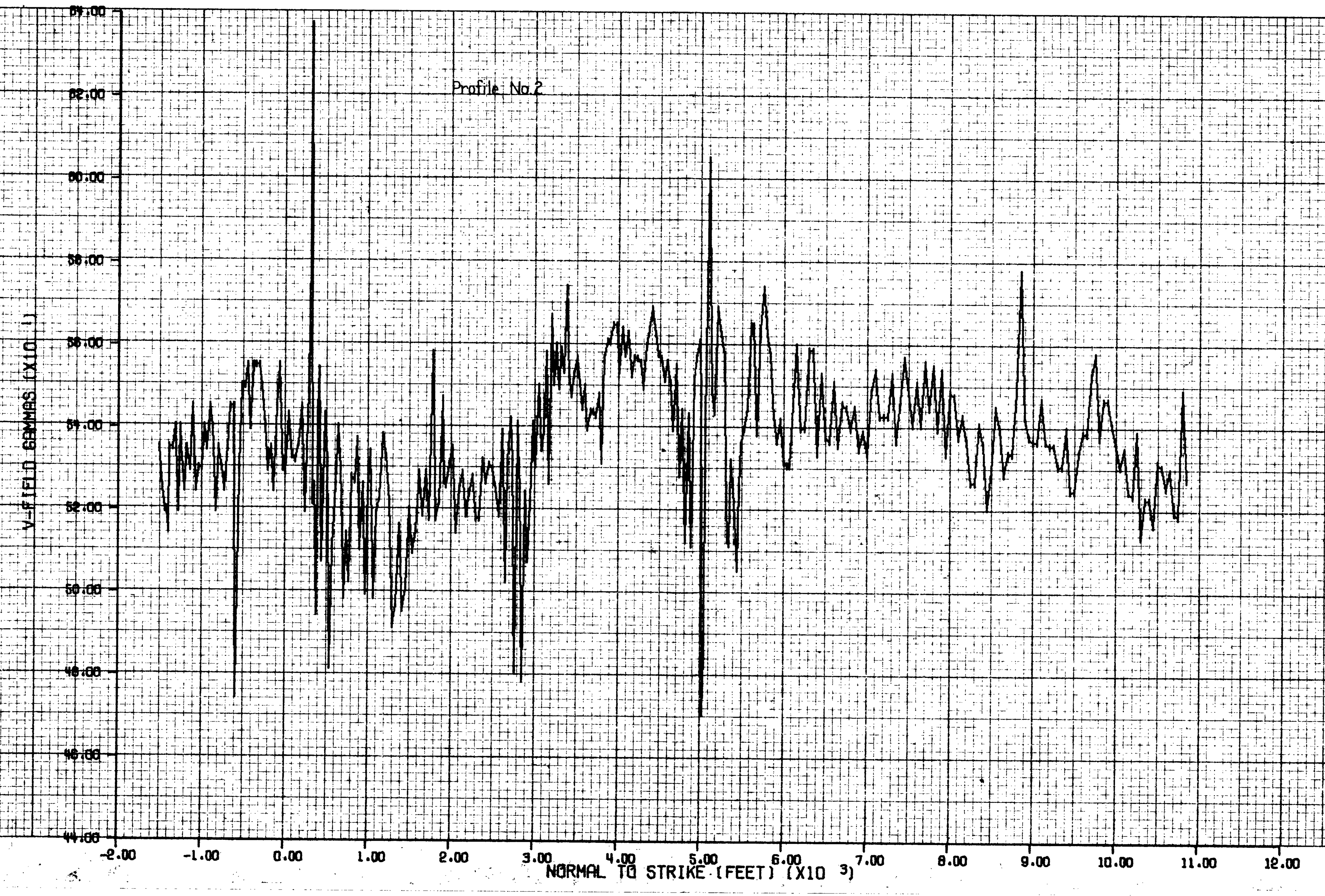
S.P. Gay — Geophysics, Vol. 28, No. 2 (April 1963)

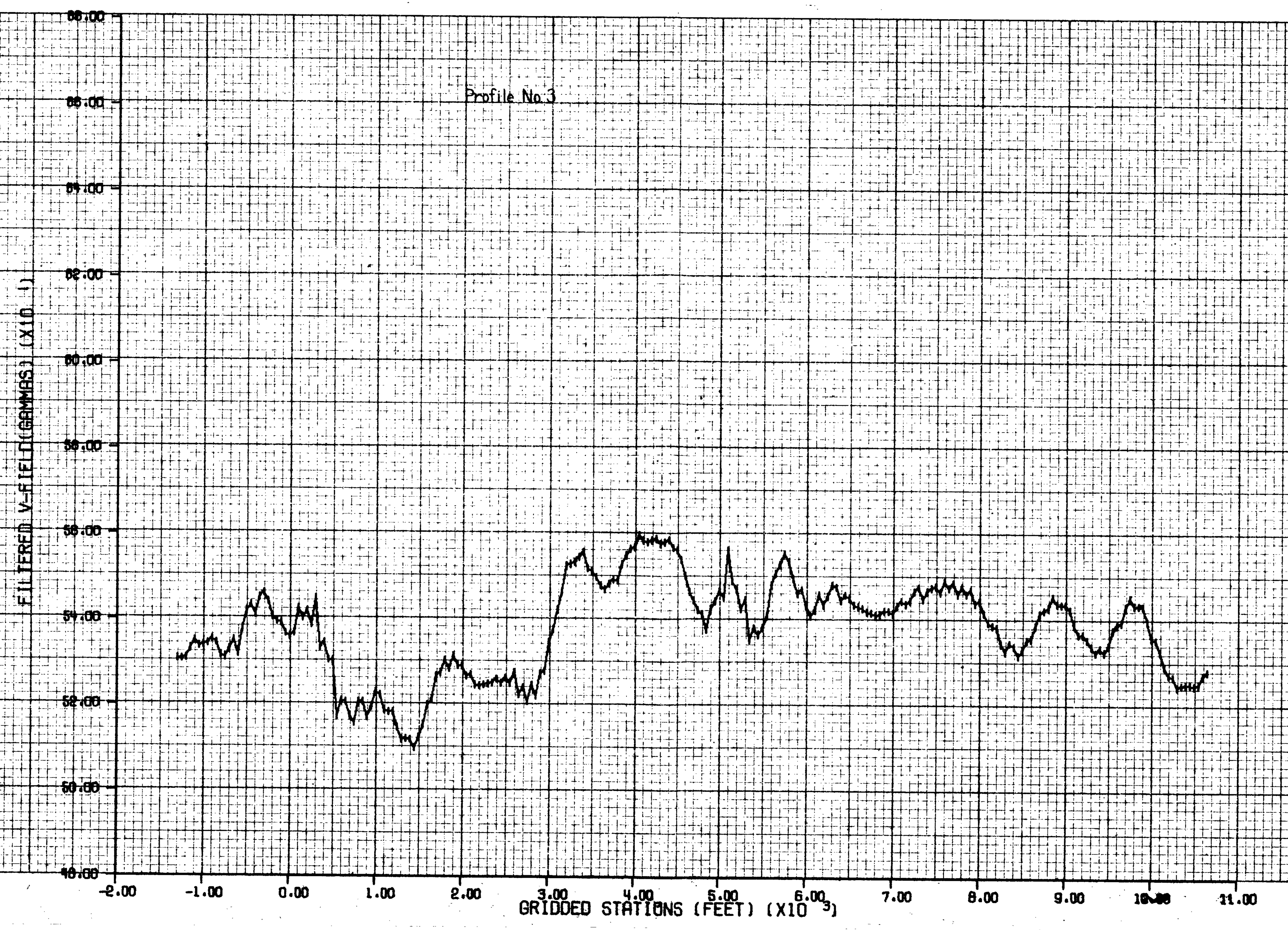
SPRING CREEK MINE AREA
MAGNETOMETER PROFILES-LINE 25-70

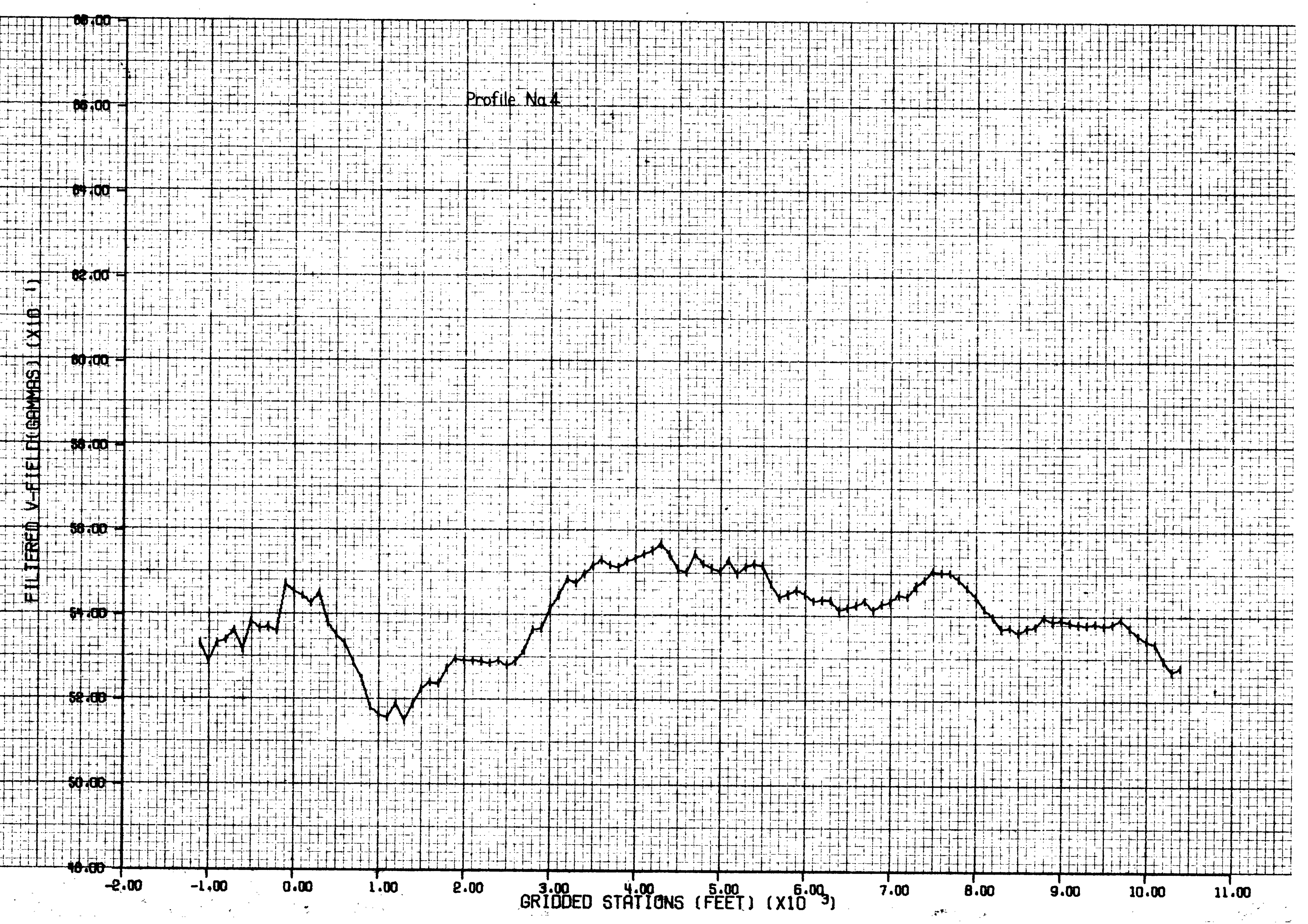
Profile No.

1. Corrected field — raw distance from base
2. Corrected field — horizontal distance from base
3. Filtered field with a 50ft. sampling grid
4. Filtered field with a 100ft. sampling grid

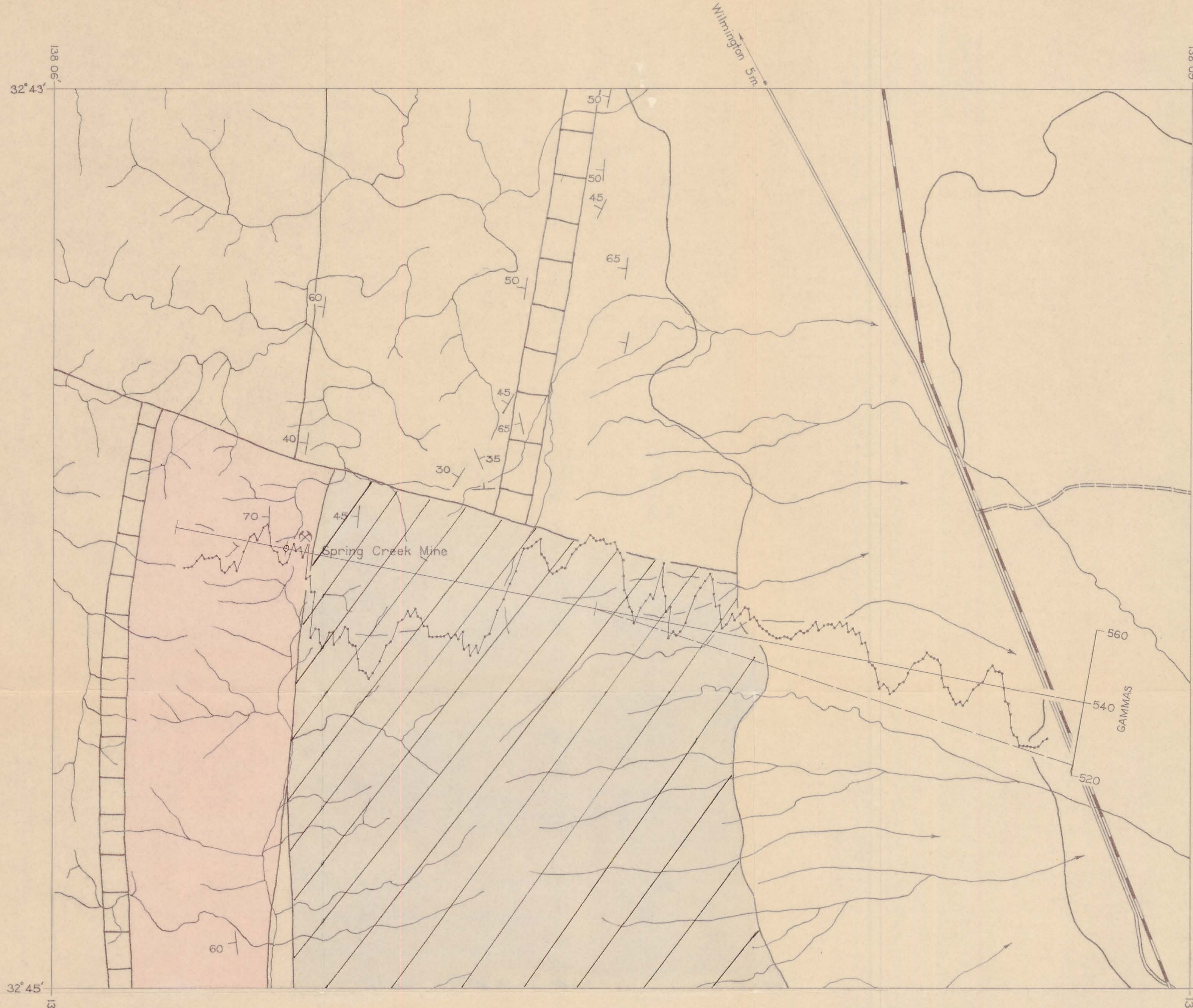








EMW 1089-5



Geology & Topography after S.A.
Dept. of Mines 60 chn. base map

SCALE 1:12,000

FEET 1000 500 0 1000 2000 3000 FEET

LEGEND

Survey line

Interpolated line

Filtered data

Tapley Hill formation

Rhynie Sandstone

DEPARTMENT OF ECONOMIC GEOLOGY
UNIVERSITY OF ADELAIDE

MAGNETIC DATA — SPRING CREEK MINE AREA

SOUTH AUSTRALIA

Geophysics by : David . H . Tucker , Jan 1970

Drawn by : Roger. H. Cammell

DETERMINATION OF SULPHUR CONTENT OF SHALES

IN DRILL HOLE NO. 1/29

SPRING CREEK

S.M.L. 214

Investigation and Report By

I. H. Haddow
S. Ludvig

Determination of Sulphur Content of Shales in Drill Hole No. 1/29, Spring Creek

Introduction

An analysis of previous work conducted by McPhar Geophysics Pty. Ltd. indicated that some of the excessively high Induced Polarization Anomaly found in the area would be due to the presence of pyrite in the upper shale material away from the mineralized zone.

Consequently sulphur determinations at 30 foot intervals were made.

Sample

Drill core produced by Diamond Drill from hole No. 1/29 0 to 400 ft.

Experimental Procedure and Results

Drill core was sampled by diamond saw, crushed and assayed for sulphur. Results are included in the drill core log sheets attached.

Conclusions

The sulphur content of the shales indicates that pyrite present would account for some of the anomaly shown by Induced Polarization.

The extent of this will be determined after submission of the results to McPhar Geophysics Pty. Ltd.

McPHAR GEOPHYSICS LIMITED

REPORT ON

INDUCED POLARIZATION TEST SURVEY

OF THE

SPRING CREEK COPPER MINES, S.A.,

FOR

AUSTRALIAN BLUE METAL PTY. LTD.

1. INTRODUCTION

At the request of Mr. A. W. Hardwicke, Regional General Manager for the Company, we have carried out a combined induced polarization and resistivity test survey at Spring Creek Copper Mine in South Australia for Australian Blue Metal Pty. Ltd. The mine was operated intermittently from 1860 to 1916 but we do not have any production figures.

No detailed geological information is available at this time but the area of interest is understood to be underlain by quartzite and siltstones. Mineralization consists of native copper, azurite and malachite in a north-south trending zone. Where exposed in the valley the lode is 20 feet wide. The purpose of the IP survey was to determine the response from the known copper deposit and to check for additional metallic mineralization in the immediate vicinity.

2. PRESENTATION OF RESULTS

The Induced Polarization and Resistivity results are shown on the following data plots in the manner described in the notes preceding this report.

Line No.	spreads	Dwg. No.
0	100'	IP 2755-1
00	100'	IP 2755-2
3W	300'	IP 2755-3

Enclosed with this report is Dwg. Misc. 3280, a plan map of the grid at a scale of 1" = 200'. The definite and possible induced polarization anomalies are indicated by solid and broken bars respectively on this plan map as well as the data plots. These bars represent the surface projection of the anomalous zones as interpreted from the location of the transmitter and receiver electrodes when the anomalous values were measured.

Since the induced polarization measurement is essentially an averaging process, as are all potential methods, it is frequently difficult to exactly pinpoint the source of an anomaly. Certainly, no anomaly can be located with more accuracy than the spread length; i. e. when using 100' spreads the position of a narrow sulphide body can only be determined to lie between two stations 100' apart. In order to locate sources at some depth, larger spreads must be used, with a corresponding increase in the uncertainities of location. Therefore, while the center of the indicated anomaly probably corresponds fairly well with source, the length of the indicated anomaly along the line should not be taken to represent the exact edges of the anomalous material.

3. DISCUSSION OF RESULTS

Line 0

There is a strong shallow IP anomaly centred at 1W to 2W, coincident with the lode. The contour pattern suggests either an enlargement at depth to the east or possibly a deep source at station 0. The western edge of the anomaly is not well defined and the traverse should be extended in order to establish the background.

Line - 00

Anomalous effects were measured throughout all of this traverse except for the extreme northern end. The abrupt decrease in the IP effects correlates with the quartzite-siltstone contact. There is a definite anomaly, with some depth to the top of the source, centred near the shaft and there appears to be a remote source at 2N (i.e. either deep or off to the side of the line). A strong complex anomaly occurs from 4S to 6S; this feature could represent two closely spaced sources. Anomalous effects were measured at the south end of the line but the pattern is incomplete and the traverse would have to be extended to permit further evaluation.

Line 3W

This line was surveyed using 300-foot electrode intervals and hence can not be compared in detail with the other two lines. Anomalous IP effects were measured from at least 6N to the south end of the line, with the strongest section at 0 to 3S.

4. SUMMARY AND RECOMMENDATIONS

The IP test survey has indicated the presence of widespread metallic mineralization in the vicinity of the Spring Creek Copper Mine. It is not clear from the limited data whether there is a single mineralized zone, which varies in depth and intensity, or a multiplicity of separate but closely spaced zones.

A strong shallow anomaly was found in the creek bed on Line 0 coincident with the lode. There is a pipeline in the vicinity which might give rise to spurious effects but if so then the anomaly should be centred farther east.

It is strongly recommended that additional traverses be surveyed before drilling, to locate the strongest part of the main zone and to remove any doubt about the pipe. Initial lines should be spaced at 200-foot intervals north and south of Line 0 and should be extended far enough to the east and west to establish the background level. Following this a few test holes could be drilled to determine the type of mineralization causing the anomaly, or anomalies. If the results are of economic interest then a more extensive reconnaissance survey would be warranted.

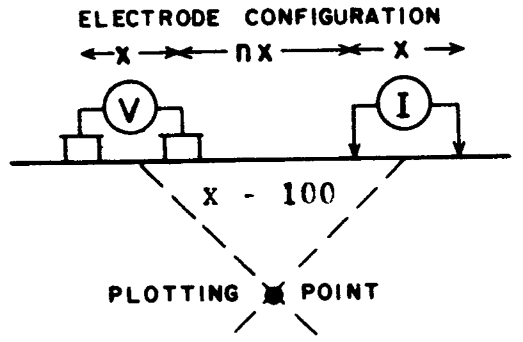
McPHAR GEOPHYSICS LIMITED

Robert A. Bell,
Geologist

Philip G. Hallof,
Geophysicist.

Dated: November 2, 1967

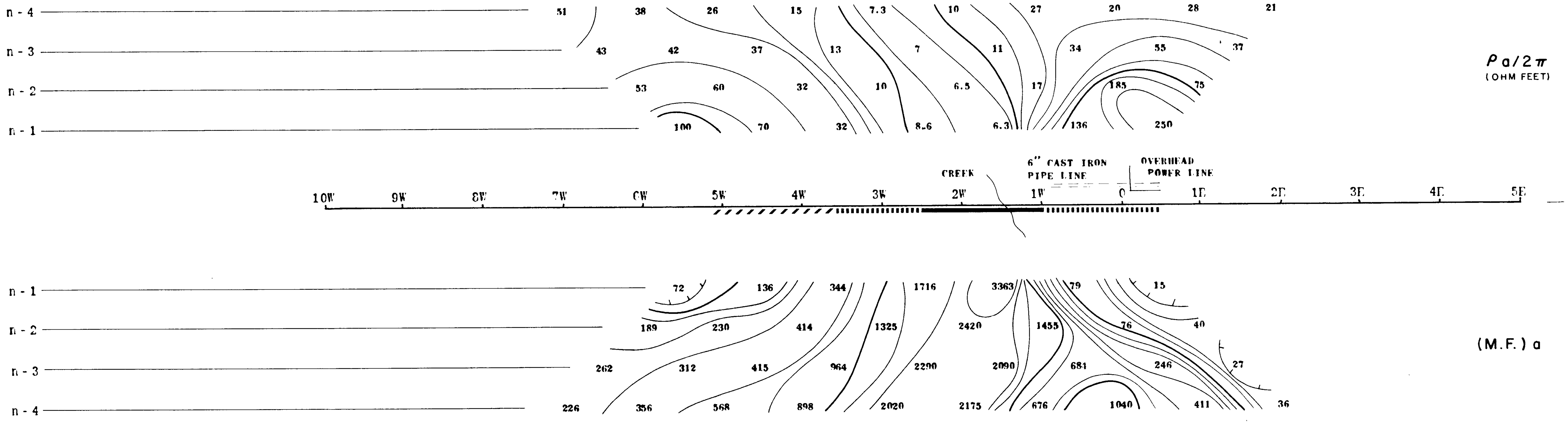
DWG. NO.–I.P.–2755–1



McPHAR GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: CONTOURS AT LOGARITHMIC MULTIPLES OF 10-15-20-30-50-75-100



LINE NO.– 0

AUSTRALIAN BLUE METAL PTY., LTD.

SPRING CREEK COPPER MINE — S.A.

Scale–One inch=100 Feet

NOTE LOGARITHMIC CONTOUR INTERVAL

SURFACE PROJECTION OF ANOMALOUS ZONES

D INITE
P OBABLE
P SSIBLE

FREQUENCY
DATE SURVEYED SEPT. 1967
APPROVED R.A.B.
DATE Oct 31 67

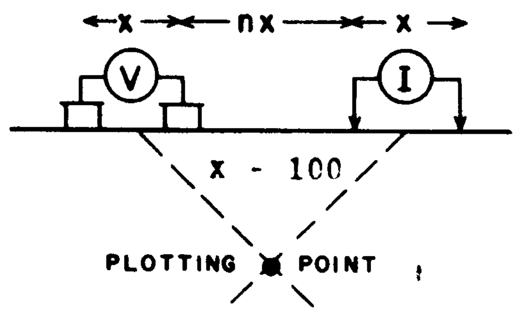
ENV 859-3

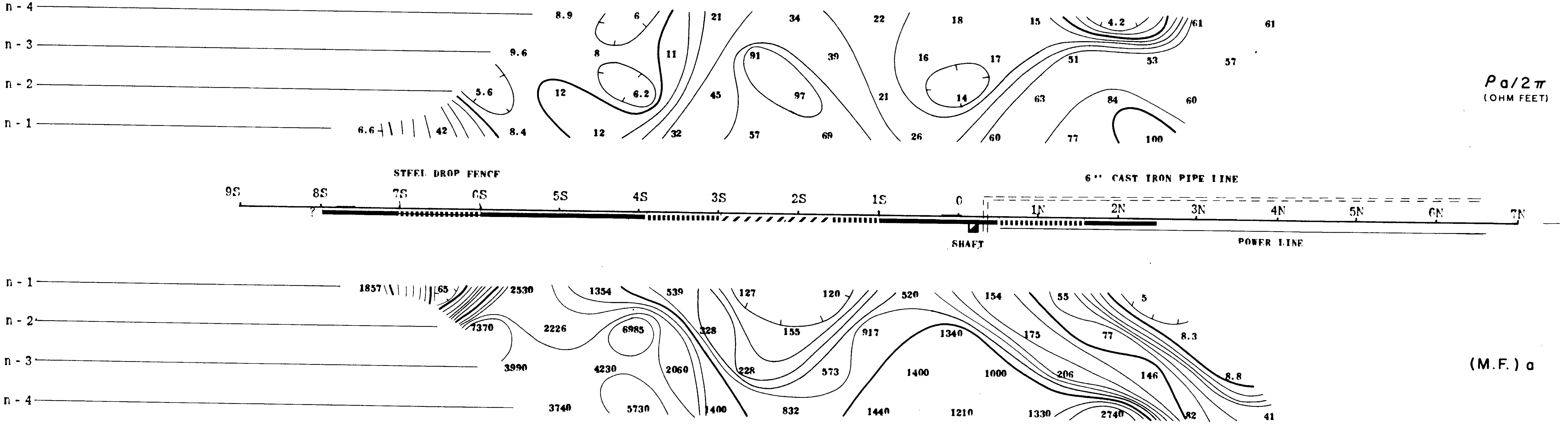
DWG. NO.-I.P.-2755-2

McPHAR GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: CONTOURS AT LOGARITHMIC MULTIPLES OF 10-15-20-30-50-75-100





LINE NO.- 00

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

AUSTRALIAN BLUE METAL PTY., LTD.

SPRING CREEK COPPER MINE - S.A.

Scale - One inch = 100 Feet

NOTE LOGARITHMIC CONTOUR INTERVAL

ENV 859-4

FREQUENCY .31 - 2.5 CPS

DATE SURVEYED SEPT. 1967

APPROVED R.A.B.

DATE Oct 31/67

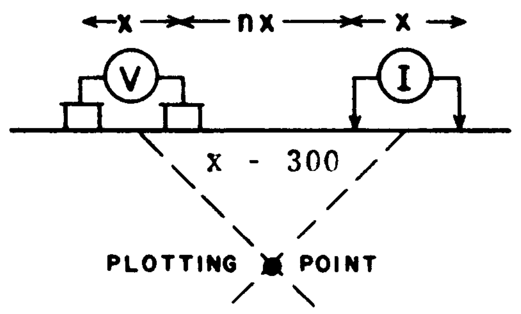
DWG. NO.–I.P.–2755–3

McPHAR GEOPHYSICS LIMITED

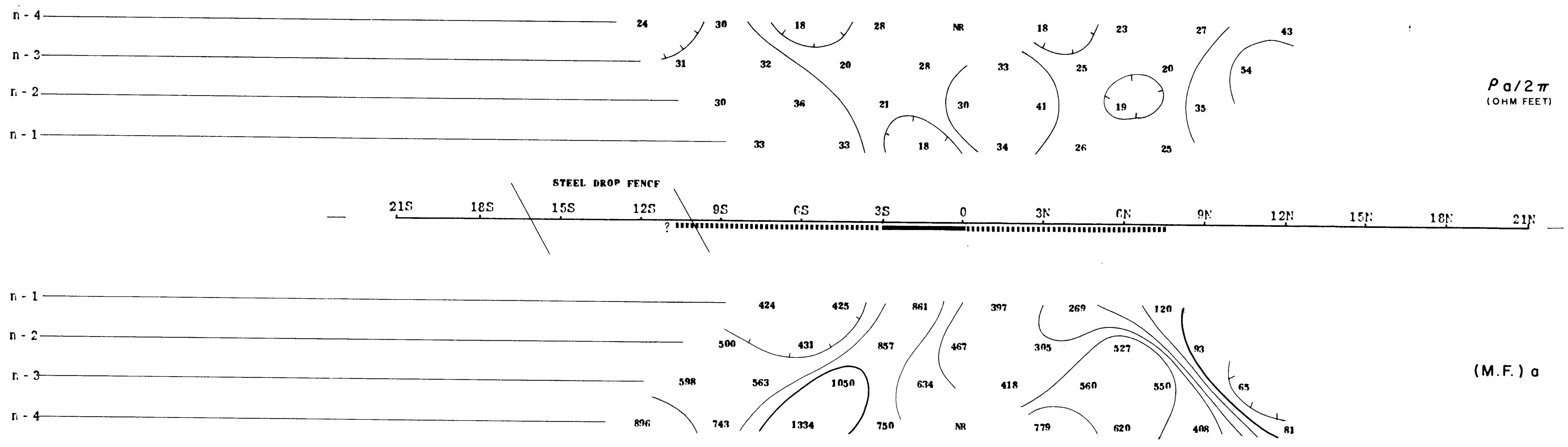
INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: CONTOURS AT LOGARITHMIC MULTIPLES OF 10-15-20-30-50-75-100

ELECTRODE CONFIGURATION



LINE NO.– 3 W



AUSTRALIAN BLUE METAL PTY., LTD.

SPRING CREEK COPPER MINE — S.A.

Scale—One inch= 300 Feet

NOTE LOGARITHMIC CONTOUR INTERVAL

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCY

DATE SURVEYED SEPT. 1967

APPROVED R.A.B.

DATE Oct 31 67

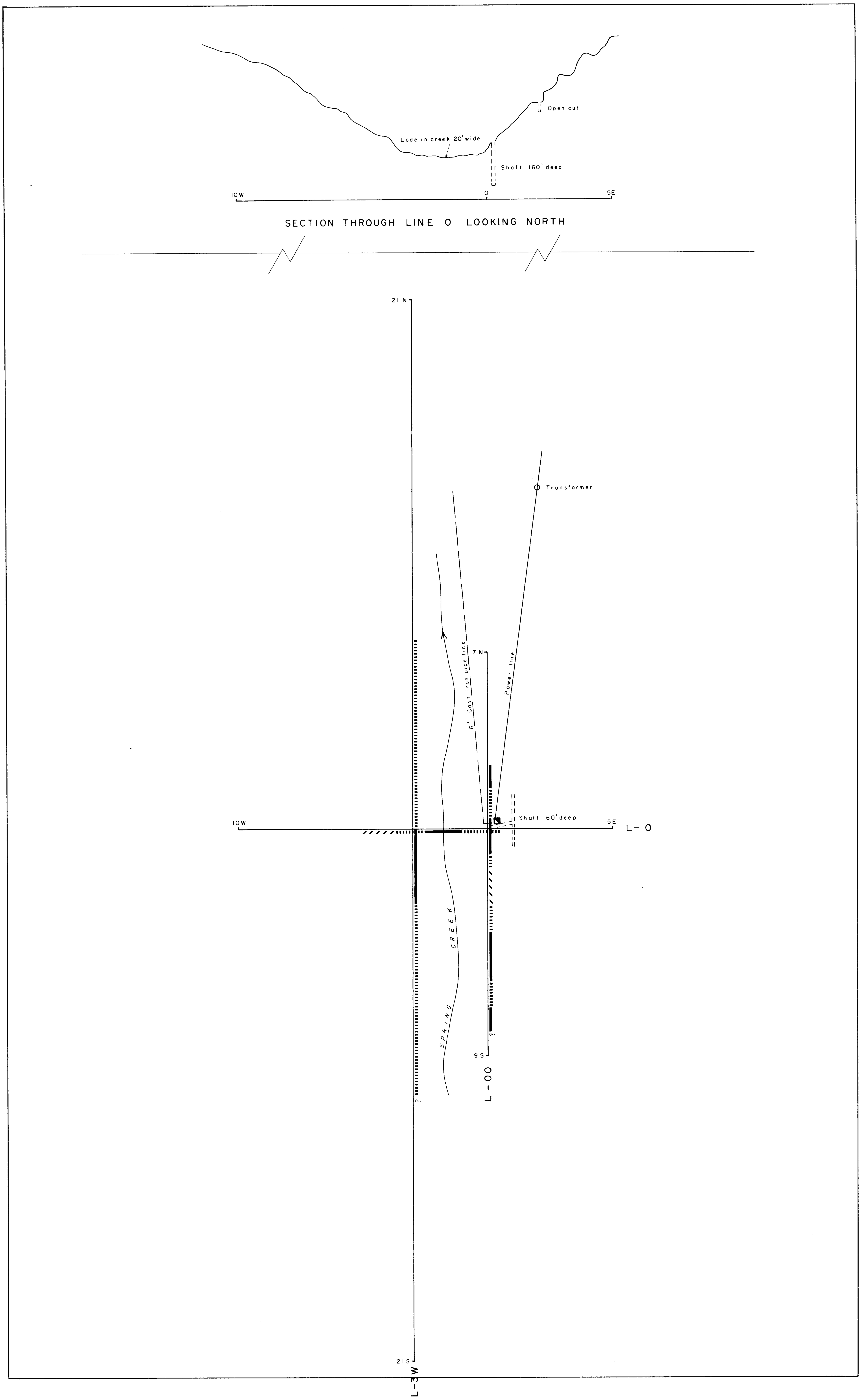
ENV 859-5

DWG. MISC. 3280

McPHAR GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY

PLAN MAP



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

Numbers at the end of the anomalies indicate spread used.

AUSTRALIAN BLUE METAL PTY., LTD.

SPRING CREEK COPPER MINE — S.A.

SCALE
One inch = 200 Feet

DRAWN: F.R.P.
DATE: NOV 1967
APPROVED: R.A. Bell
DATE: Nov. 1 /67

McPHAR GEOPHYSICS LIMITED

ENV 859-6

DWG MISC. 3280

McPHAR GEOPHYSICS LIMITED

NOTES ON THE THEORY OF INDUCED POLARIZATION AND THE METHOD OF FIELD OPERATION

Induced Polarization as a geophysical measurement refers to the blocking action or polarization of metallic or electronic conductors in a medium of ionic solution conduction.

This electro-chemical phenomenon occurs wherever electrical current is passed through an area which contains metallic minerals such as base metal sulphides. Normally, when current is passed through the ground, as in resistivity measurements, all of the conduction takes place through ions present in the water content of the rock, or soil, i.e. by ionic conduction. This is because almost all minerals have a much higher specific resistivity than ground water. The group of minerals commonly described as "metallic", however, have specific resistivities much lower than ground waters. The induced polarization effect takes place at those interfaces where the mode of conduction changes from ionic in the solutions filling the interstices of the rock to electronic in the metallic minerals present in the rock.

The blocking action or induced polarization mentioned above, which depends upon the chemical energies necessary to allow the ions to give up or receive electrons from the metallic surface, increases with the time that a d.c. current is allowed to flow through the rock; i.e. as ions pile up against the metallic interface the resistance to current flow increases. Eventually, there is enough polarization in the form of excess ions at the interfaces to effectively stop all current flow through the metallic particle. This polarization takes place at each of the infinite number of solution-metal interfaces in a mineralized rock.

When the d.c. voltage used to create this d.c. current flow is cut off, the Coulomb forces between the charged ions forming the polarization cause them to return to their normal position. This movement of charge creates a small current flow which can be measured on the surface of the ground as a decaying potential difference.

From an alternate viewpoint it can be seen that if the direction of the current through the system is reversed repeatedly before the polarization occurs, the effective resistivity of the system as a whole will change as the frequency of the switching is changed. This is a consequence of the fact that the amount of current flowing through each metallic interface depends upon the length of time that current has been passing through it in one direction.

The values of the "metal factor" or "M.F." are a measure of the amount of polarization present in the rock mass being surveyed. This parameter has been found to be very successful in mapping areas of sulphide mineralization, even those in which all other geophysical methods have been unsuccessful. The induced polarization measurement is more sensitive to sulphide content than other electrical measurements because it is much more dependent upon the sulphide content. As the sulphide content of a rock is increased, the "metal factor" of the rock increases much more rapidly than the resistivity decreases.

Because of this increased sensitivity, it is possible to locate and outline zones of less than 10% sulphides that can't be located by E. M. Methods. The method has been successful in locating the disseminated "porphyry copper" type mineralization in the South-western United States.

Measurements and experiments also indicate that it should be possible to locate most massive sulphide bodies at a greater depth with induced polarization than with E. M.

Since there is no I. P. effect from any conductor unless it is metallic, the method is useful in checking E. M. anomalies that are suspected of being due to water filled shear zones or other ionic conductors. There is also no effect from conductive overburden, which frequently confuses E. M. results. It would appear from scale model experiments and calculations that the apparent metal factors measured over a mineralized zone are larger if the material overlying the zone is of low resistivity.

Apropos of this, it should be stated that the induced polarization measurements indicate the total amount of metallic constituents in the rock. Thus all of the metallic minerals in the rock, such as pyrite, as well as the ore minerals chalcopyrite, chalcocite, galena, etc. are responsible for the induced polarization effect. Some oxides such as magnetite, pyrolusite, chromite, and some forms of hematite also conduct by electrons and are metallic. All of the metallic minerals in the rock will contribute to the induced polarization effect measured on the surface.

In the field procedure, measurements on the surface are made in a way that allows the effects of lateral changes in the properties of the ground to be separated from the effects of vertical changes in the properties. Current is applied to the ground at two points a distance (X) apart. The potentials are measured at two other points (X) feet apart, in line with the current electrodes. The distance between the nearest current and potential electrodes is an integer number (N) times the basic distance (X).

The measurements are made along a surveyed line, with a constant distance (NX) between the nearest current and potential electrodes. In most surveys, several traverses are made with various values of (N); i.e. (N) = 1, 2, 3, 4, etc. The kind of survey required (detailed or reconnaissance) decides the number of values of (N) used.

In plotting the results, the values of the apparent resistivity and the apparent metal factor measured for each set of electrode positions are plotted at the intersection of grid lines, one from the center point of the current electrodes and the other from the center point of the potential electrodes. The resistivity values are plotted above the line and the metal factor values below. The lateral displacement of a given value is determined by the location along the survey line of the center point between the current and potential electrodes. The distance of the value from the line is determined by the distance (NX) between the current and potential electrodes when the measurement was made.

The separation between sender and receiver electrodes is only one factor which determines the depth to which the ground is being sampled in any particular measurement. These plots then, when contoured, are not section maps of the electrical properties of the ground under the survey line. The interpretation of the results from any given survey must be carried out using the combined experience gained from field, model and theoretical investigations. The position of the electrodes when anomalous values are measured must be used in the interpretation.

In the field procedure, the interval over which the potential differences are measured is the same as the interval over which the electrodes are moved after a series of potential readings has been made. One of the advantages of the induced polarization method is that the same equipment can be used for both detailed and reconnaissance surveys merely by changing the distance (X) over which the electrodes are moved each time. In the past, intervals have been used ranging from 100 feet to 1000 feet for (X). In each case, the decision as to the distance (X) and the values of (N) is largely determined by the expected size of the mineral deposit being sought, the size of the expected anomaly and the speed with which it is desired to progress.

The diagram in Figure 1 below demonstrates the method used in plotting the results. Each value of the apparent resistivity and the apparent "Metal factor" is plotted and identified by the position of the four electrodes when the measurement was made. It can be seen that the values measured for the larger values of (n) are plotted farther from the line indicating that the thickness of the layer of the earth that is being tested is greater than for the smaller values of (n); i. e. the depth of the measurement is increased.

METHOD USED IN PLOTTING DIPOLE-DIPOLE
INDUCED POLARIZATION AND RESISTIVITY RESULTS

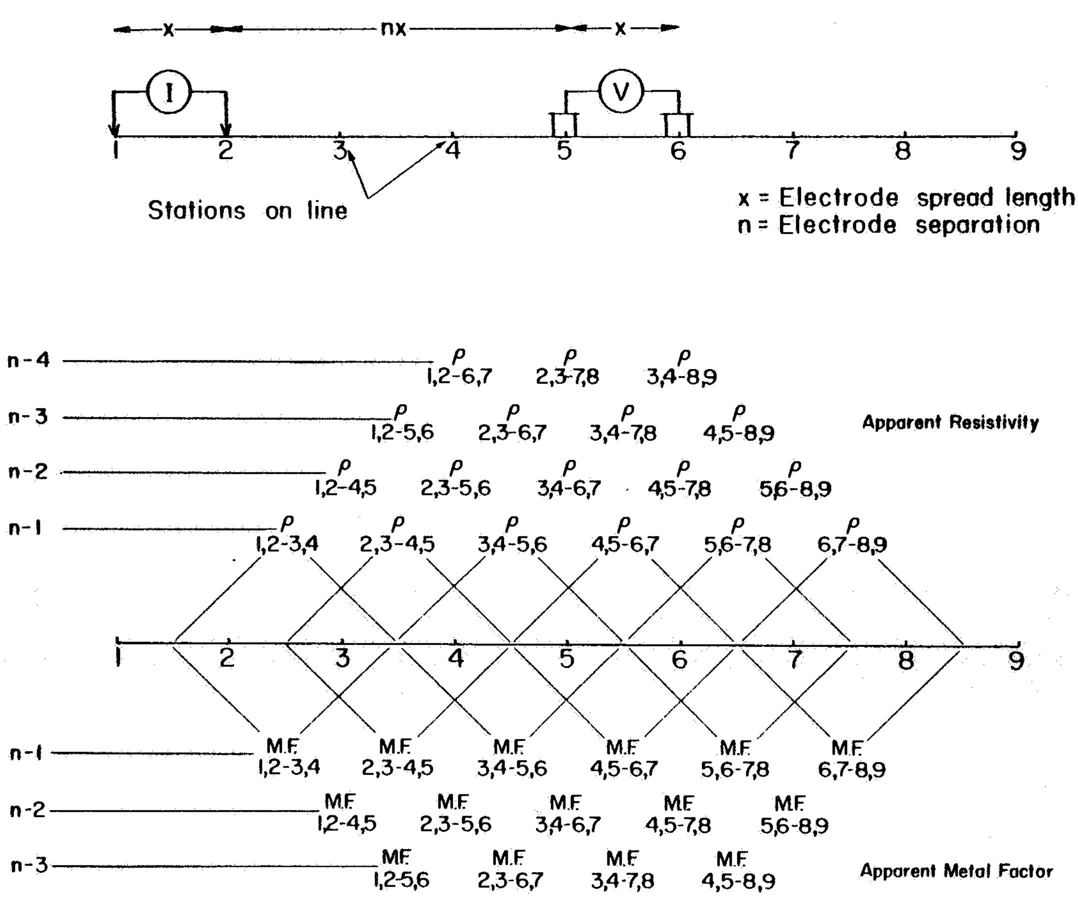


FIG. I