DEPARTMENT OF MINES AND ENERGY

GEOLOGICAL SURVEY

SOUTH AUSTRALIA

REPORT BOOK 92/73

SOIL AIR CO_2/O_2 PROJECT PROGRESS REPORT IV, WIRRDA WELL PROSPECT STUART SHELF

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INTRODUCTION

Soil air carbon dioxide (CO_2) and oxygen (O_2) measurements as a guide to oxidising sulphide have been assessed by several researchers and government geological surveys in the United States, Ireland, Africa and Saudi Arabia (Lovell et al 1983; Hinkle and Dilbert, 1984; Reid and Rasmussen, 1990; Ball et al, 1990 and McCarthy, Jr and Bigelow, 1990). The rationale is that sulphide oxidation in the presence of water and oxygen will produce sulphuric acid which in turn will attack any carbonates present to produce CO_2. Oxygen is consumed in the process. Both CO_2 and O_2 are easily measured to an acceptable accuracy in the field with portable equipment.

The soil air CO_2/O_2 project is being conducted jointly between Dr I G Watmuff and the South Australian Department of Mines and Energy (SADME). The aim of the project is to test the technique over areas of known mineralization in a variety of geological and geographical settings. Progress Reports 1, 2 and 3 detailed testing in the Mount Lofty Ranges (Watmuff, 1992), Moonta District (Watmuff and Morris 1992a) and Mt Gunson Area (Watmuff and Morris 1992b). This report details trials at the Wirrda Well Prospect.

The cooperation of Western Mining Corp Ltd in allowing access to mineralized areas is greatly appreciated.

CASE HISTORY

Wirrda Well Prospect

Wirrda Well Prospect lies 20 km SSE of Roxby Downs township (Fig. 1). Olympic Dam-style mineralization occurs within basement rocks under 355 m to 436 m of flat lying, unmineralized Adelaidean Wilpena Group sediments. It extends from the basement surface downward for over 200 m and is about 1 km wide and several km long. Published grades from drill hole WRD9 are 215 m at 0.8% Cu from 419 m to 634 m (including 14 m at 2.1% Cu from 426 m to 440 m). (MIQ 27).

Arcoona Quartzite outcrops and suboutcrops over most of the prospect site. Relatively narrow east-west longitudinal sand dunes up to several kilometres long separate broad swales and gibber plains of desert loam soil. The open savanna has light tree cover, mainly mulga and to a lesser extent myall. Hop bush (acacia) and native pine tend to occur on the dune ridges. The gibber plains are treeless with sparse, less than 0.5 m high salt bush and other succulents. A fine spear grass 5-30 cm high and usually covering less than 40% of the ground surface is universal to all terrain. Green broadleaved round species up to 30 cm high occur locally and may be relatively dense over small internal drainage flats within the dune and swale country.

Survey Objectives

In previous soil air CO_2/O_2 surveys, a response has been sought from active sulphide oxidation. The Wirrda Well mineralization is far too deep for active oxidation to occur, hence primary crustal CO_2 rather than supergene CO_2 was sought. A north-south traverse (traverse 1) was sampled at 20 m intervals along grid line 50800 mE, between 5200mN and 6300mN, over mineralized and non or weakly mineralized basement to see if a corresponding anomaly response could be observed. An east-west traverse (traverse 2) was similarly sampled along grid line 10000mN between 50370mE and 52270mE over a planar gravity gradient steeply dipping to the northeast, to see if a respone could be obtained defining a zone of deep fracturing. The gravity gradient has been interpreted to indicate a sharp contrast in cover rock thickness over basement, possibly caused by a downfaulted block of basement to the northeast. Traverse 2 lies to the north of the main mineralized zone.

Results

The data are plotted in Figs. 2, 3 4 and 5 and tabulated in Tables 1 to 4.

Traverse 1 along Grid Line 50800mE

Sampling revealed no broad anomaly associated with mineralization (Fig. 2), however sites of relatively high $C0_2$ values at 5480mn, 5800mN and 6170mN were followed up with shorter spaced sampling and parallel traverses (Table 2).

No clear cause of the high $C0_2$ value at 5480mN could be established. It was repeatable however (Fig. 2) and values 5 m east and west of 5480mN were slightly elevated (Table 2). There was no apparent correlation with vegetation density.

The high level of $C0_2$ in the soil air at 5800mN near the collar of drill hole WRD9 is believed to be the result of contamination rather than a plume of $C0_2$ rising to the surface outside of the drill hole casing. A sample grid about this site showed good correlation between higher $C0_2$ values and areas of surface diesel spillage (Fig. 3). Bacterial and/or chemical oxidation of the diesel may be expected to generate $C0_2$. The result of two profile samplings under bare soil surface are also plotted in Fig. 3 - profile 1 inside an area of diesel spillage,and profile 2 in uncontaminated soil. If $C0_2$ was coming up from below, the values may be expected to increase with depth of sampling, but the reverse is true for profile 1 determined within the area of diesel spillage. A sample of air taken 1.2 m down the drill hole yielded 0.13% $C0_2$ and 20.6% O_2. The origin of the $C0_2$ (0.09% above the atmospheric level) is difficult to determine without stable isotope analysis. It may be significant, since gases tend to equilibrate rapidly in an open static system.

The third soil air $C0_2$ peak at 6170mN at the northern edge of the sand dune (Fig. 2), is probably vegetation related. Mulga, acacia bush and relatively lush spear grass occur here. Parallel traverses 20 m west and about 35 m east did not detect any similar high $C0_2$ values (Table 2, Fig. 2).

Traverse 2 along Grid Line 10000mN

A possible fault related anomaly was sought here. Faults can act as conduits for crustal $C0_2$ to escape to the surface - a feature used to monitor seismic activity in the USSR (Fridman, 1990).

Four distinct patterns of soil air $C0_2$ levels were recognised:

(1) Less than 0.1% $C0_2$

With the exception of only one point at 52230mE, values less than 0.1% $C0_2$ in soil air always occurred under a bare ground surface or areas where the speargrass is in poor condition and less than 10 cm tall. The gibber plain at the far eastern end of the traverse also consistently yielded values in this low range (Fig. 4, Table 3).

(2) 0.1 to 0.22% $C0_2$

Much of the traverse yielded values in this range (Fig. 4). They consistently occur under relatively healthy speargrass cover growing between 15 and 25 cm tall (Table 3).

(3) Very high values of $C0_2$

Soil air $C0_2$ values in excess of 1% were encountered in a small internal drainage pan between 51400 and 51460mE. Ground cover consisted of a diversity of green broadleaved plants and speargrass up to 30 cm tall and the percentage of bare ground is relatively small (Table 3). A parallel traverse was made at

about 10020mN outside the limit of the drainage pan and green vegetation. Very low CO_2 values were measured here which fall into categories 1 and 2 above (Table 4).

(4) Grouped values exceeding 0.22% CO_2 between 51880 and 52180mE.

These values could be explained by the occurrence of a very weakly developed green broadleaved component in the predominantly speargrass terrain. They could also correlate with a zone of deep cover rock and basement fracturing. A parallel traverse 115 m south of 10000mN between 51770 and 52030mE and within the same swale failed to detect similar CO_2 values despite the presence of relatively lush speargrass (Table 4). North-south traverses were completed to form a closed rectangular loop 115 m wide and 260 m long (Fig. 5). No clear northwest trend of high values appears to cut the rectangle. The verdict on the cause of the high values must remain open, but a vegetation related cause is considered most likely. Interestingly this group of high values occurs at the margin of the gibber plain (Fig. 4).

CONCLUSIONS

Although no apparent anomaly was detected over mineralization at Wirrda Well, the empirical relationship between vegetation and soil air CO_2 levels is becoming better understood. Arid zone green broadleaved ground species appear to consistently generate much higher soil air CO_2 levels than the even more lush green grasses and broadleaved plants of the temperate zone (eg at Moonta) at the same time of the year. Hence, even arid zone sampling may be best performed in the warmer months after the green winter ground species have died off. Again myall trees were observed to generate more CO_2 than mulga and other acacias.

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TABLE 1

SOIL AIR CO_2/O_2 VALUES, WIRRDA WELL, STUART SHELF, SOUTH AUSTRALIA

Traverse 1 along Grid Line 50800mE 25/8/92

Coordinates	CO_2(%)	O_2(%)	Depth(cm)	Comments
5200Mn	0.18	20.8	75	100% leaf litter cover; drip line of acacia bush.
5200	0.09	20.75	75	5% green and dry speargrass cover ≤15 cm tall.
220	0.08	20.75	75	
240	0.18	20.7	75	25% green and dry speargrass cover ≤15 cm tall.
260	0.17	20.7	75	25% as above.
280	0.16	20.8	75	30% as above.
5300	0.09	20.8	75	15% as above.
320	0.11	20.75	75	15% as above.
340	0.11	20.8	75	15% as above.
360	0.10	20.8	75	15% as above.
380	0.09	20.8	75	20% as above.
5400	0.09	20.8	75	5% as above.
420	0.10	20.8	75	24% as above.
440	0.18	20.7	75	25% as above.
460	0.08	20.8	75	15% as above.
480	0.25	20.7	75	20% as above.
5500	0.14	20.7	75	25% as above.
520	0.11	20.8	75	10% as above.
540	0.12	20.8	75	15% as above.
560	0.12	20.75	75	10% as above. 6m from 6m tall mulga.
580	0.14	20.8	75	15% as above. 3.5 m from 5 m tall mulga.
5600	0.12	20.8	75	5% as above. 6 m from 6 m tall mulga.
620	0.11	20.8	75	15% as above. 5.5 m from 5 m tall mulga.
640	0.13	20.7	75	15% as above.
660	0.12	20.8	75	15% as above.
680	0.13	20.8	75	15% as above.
5700	0.15	20.8	75	15% as above.
720	0.19	20.7	75	20% as above.
740	0.14	20.8	75	15% as above.
760	0.23	20.7	75	Bare ground.
780	0.12	20.9	75	Bare ground.
5800	0.38	20.7	75	Bare ground.
5800	0.34	20.6	75	Bare ground.
820	0.11	20.7	75	15% green and dry speargrass cover ≤15cm tall.

Air reading = 20.9% O_2

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TABLE 1 (Continued)

25/8/92

Coordinates	CO_2(%)	O_2(%)	Depth(cm)	Comments
5840mN	0.13	20.7	75	20% green and dry speargrass cover ≤15 cm tall.
860	0.13	20.9	75	5% as above. Edge of acacia bush 3m away.
880	0.18	20.8	75	Bare ground. Circled by large acacia bushes 2.5m high and 4m away.
5900	0.13	20.8	75	Bare ground. Acacia bushes 3m away.
920	0.15	20.8	75	5% green and dry speargrass cover ≤15cm tall.
940	0.18	20.8	75	5% as above. 5m from 5m+ tall native pine.
960	0.21	20.7	75	5% as above. 6.5m from 8m tall native pine.
980	0.20	20.8	75	10% as above.
6000	0.12	20.8	75	15% as above.
020	0.12	20.8	75	20% as above.
040	0.12	20.8	75	20% as above. 4m from 4m tall mulga.
060	0.11	20.8	75	20% as above.
080	0.14	20.8	75	5% as above.
6100	0.06	20.9	75	Bare blown sand dune crest.
120	0.06	20.8	75	Bare blown sand dune crest.
140	0.12	20.8	75	Bare blown sand dune crest.
160	0.28	20.8	75	5% green and dry speargrass cover ≤15cm tall.
180	0.16	20.8	75	20% as above. 6m from 6m high mulga.
6200	0.12	20.7	75	15% as above. Gypsum mounds.
220	0.13	20.8	75	10% as above. Gypsum mounds.
240	0.15	20.8	75	25% as above.
260	0.16	20.8	75	20% as above.
280	0.13	20.8	75	20% as above.
6300mN	0.14	20.8	75	10% as above.

Air reading = 20.9% O_2

TABLE 2

SOIL AIR CO_2/O_2 VALUES, WIRRDA WELL,STUART SHELF, SOUTH AUSTRALIA

26/8/92

Traverse 1: Supplementary Sampling

Coordinates	CO_2(%)	O_2(%)	Depth(cm)	Comments
5840mN Anomaly				
50800mE				
5420mN	0.11	20.7	75	15% green and dry speargrass cover.
430	0.14	20.7	75	15% as above.
440	0.17	20.6	75	10% as above.
450	0.10	20.7	75	10% as above.
460	0.08	20.7	75	10% as above. Hard ground.
470	0.10	20.6	75	Bare ground.
480	0.25	20.5	75	15% green and dry speargrass cover.
490	0.18	20.6	75	25% as above. 3m from two 7m tall mulgas.
5500mN	0.15	20.7	75	10% as above.
50795mE				
5480mN	0.18	20.6	75	35% as above.
50805mE				
5480mN	0.21	20.6	75	35% as above.
5800mN (Drill hole WRD9) Anomaly.				
50790mE				
5800mN	0.14	20.8	75	20% as above.
805	0.12	20.8	75	15% as above.
5810mN	0.08	20.8	75	Bare ground.
50793mE				
5800mN	0.20	20.6	75	5% green and dry speargrass cover.
50795mE				
5805mN	0.13	20.8	75	5% as above.
5810mN	0.11	20.7	75	10% as above.
50798mE				
5800mN	0.18	20.8	75	Bare ground.
50800mE				
5790mN	0.15	20.7	75	Bare ground.
795	0.17	20.7	75	Bare ground.
798	0.20	20.7	75	Bare ground.
802	0.33	20.6	75	Bare ground.
805	0.46	20.4	75	Bare ground.
5810mN	0.15	20.6	75	5% green and dry speargrass cover.
50802mE				
5800mN	0.43	20.5	75	Bare ground. Diesel soaked.

Air reading = 20.9% O_2

TABLE 2 (Continued)

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Coordinates	CO_2(%)	O_2(%)	Depth(cm)	Comments
50805mE				
5795mN	0.21	20.65	75	10% green and dry speargrass cover.
801	0.48	20.2	75	Bare ground.
50805mE				
5805mN	0.24	20.7	75	Bare ground. Ant nest.
50810mE				
5795mN	0.22	20.6	75	15% green and dry speargrass cover 2m from large acacia bush.
800	0.39	20.4	75	5% green and dry speargrass cover.
805	0.16	20.8	75	Bare ground.
5810mN	0.13	20.9	75	20% green and dry speargrass cover.
50815mE				
5795mN	0.16	20.6	75	Bare ground.
50818mE				
5800mN	0.14	20.7	75	Bare ground.
50800mE				
5750mN	0.18	20.5	75	5% green and dry speargrass cover.
770	0.19	20.7	75	15% as above.
Gas in drill hole WRD 9.				**28/8/92**
50800mE				
5800mN	0.13	20.6	120	
Soil air gas profile 1				**28/8/92**
50800mE				
5805mN	0.57	20.3	25	Diesel soaked ground.
	0.52	20.3	50	Diesel soaked ground.
	0.51	20.3	75	Diesel soaked ground.
	0.50	20.3	100	Diesel soaked ground.
	0.48	20.3	125	Diesel soaked ground.
Soil air gas profile 2				**28/8/92**
50800mE				
5810mN	0.08	20.8	25	Clean bare ground.
	0.14	20.8	50	Clean bare ground.
	0.19	20.7	75	Clean bare ground.
	0.22	20.7	100	Clean bare ground.
	0.24	20.6	125	Clean bare ground.

TABLE 2 (Continued)

25/8/92

Coordinates	CO_2(%)	O_2(%)	Depth(cm)	Comments
6170mN Anomaly				
50780mE				
6160mN	0.17	20.8	75	10% green and dry speargass cover ≤15cm tall.
6170mN	0.15	20.8	"	10% as above.
6180mN	0.13	20.8	"	20% as above.
50800mE				
6150mN	0.20	20.8	"	5% as above. 4m from edge of 2m+ tall acacia.
6170mN	0.30	20.7	"	40% as above. 5m from four 6.5m tall mulgas.
50830mE				
6140mN	0.11	20.8	"	5% as above.
50833mE				
6150mN	0.14	20.8	"	10% as above.
50836mE				
6160mN	0.14	20.8	"	10% as above.
50840mE				
6170mN	0.10	20.9	"	10% as above.
50815mE				
6140mN	0.13	20.8	"	5% as above.
50822mE				
6170mN	0.20	20.8	"	40% as above. 4m from two mulgas.

Air reading = 20.9% O_2

TABLE 3

SOIL AIR CO_2/O_2 VALUES, WIRRDA WELL,STUART SHELF, SOUTH AUSTRALIA

Traverse 2 along Grid Line 10000mN. 26/8/92

Coordinates	CO_2(%)	O_2(%)	Depth(cm)	Comments
50370mE	0.07	20.7	75	10% green & dry speargrass cover <10cm tall.
390	0.05	20.8	"	5% as above.
0410	0.08	20.7	"	15% as above.
430	0.08	20.7	"	15% as above
450	0.06	20.7	"	15% as above.
470	0.07	20.75	"	10% as above.
490	0.07	20.7	"	10% as above.
0510	0.08	20.7	"	15% as above
530	0.10	20.7	"	10% green & dry speargrass cover <20cm tall.
550	0.15	20.6	"	2% as above.
570	0.22	20.55	"	5% as above. Small washaway; hard ground.
590	0.17	20.6	"	15% as above. Hard ground.
0610	0.10	20.7	"	20% as above. Hard ground. 0.5m high succulents.
630	0.20	20.55	"	40% as above.
650	0.14	20.6	"	40% as above.
670	0.14	20.7	"	35% as above.
690	0.20	20.6	"	40% as above.
0710	0.15	20.7	"	15% as above.
730	0.14	20.7	"	15% as above.
750	0.06	20.7	"	Bare ground.
770	0.31	20.7	"	Bare ground. 1m from drillhole WRD19.
770	0.13	20.7	"	Bare ground. 5m north of WRD19.
790	0.12	20.7	"	10% green & dry speargrass cover <20cm tall.
0810	0.18	20.6	"	10% as above. 5m from 3.5m tall mulga.
830	0.22	20.6	"	25% as above. 6m from 7m tall mulga.
850	0.16	20.6	"	5% as above.
870	0.14	20.6	"	5% as above.
890	0.17	20.7	"	10% as above. 9m from two 5m tall mulgas.
9010	0.15	20.7	"	20% as above. 7m from 4m tall mulga.
930	0.13	20.7	"	Bare ground.
950	0.17	20.8	"	Bare ground. Small acacia within 2m.
970	0.15	20.7	"	40% green & dry speargrass cover <20cm tall.
990	0.17	20.7	"	15% as above.
51010mE	0.09	20.8	"	20% green & dry speargrass cover <10cm tall.

Air reading = 20.9% O_2

TABLE 3 (Continued)

26, 27/8/92

Coordinates	CO_2(%)	O_2(%)	Depth(cm)	Comments
51030mE	0.06	20.8	75	10% green & dry speargrass cover <10cm tall.
050	0.22	20.8	"	5% green & dry speargrass cover <15cm tall. 12m from 12m tall myall.
070	0.16	20.6	"	Bare ground.
090	0.16	20.8	"	Bare ground (washaway). 12m from 9m tall myall - roots extend near surface, 2-3m canopy radii from butt.
1110	0.13	20.8	"	Bare ground.
130	0.20	20.8	"	20% green & dry speargrass cover. 7.5 & 12m from two 8m tall myalls.
150	0.20	20.8	"	15% green & dry speargrass cover <20cm tall.
170	0.11	20.8	"	5% as above.
190	0.18	20.8	"	Bare ground. 7m from 10m tall myall.
1210	0.10	20.8	"	Bare grouond.
230	0.13	20.7	"	Bare ground. 9m from 10m tall myall.
250	0.18	20.7	"	10% green & dry speargrass cover.
270	0.16	20.8	"	10% as above.
290	0.17	20.7	"	10% as above. 10m from 10m tall native pine. 5m from two acacia bushes.
1310	0.21	20.7	"	15% green & dry speargrass <20cm tall.
330	0.11	20.8	"	30% green & dry speargrass <10cm tall.
350	0.23	20.7	"	15% green & dry speargrass <20cm tall. 6m from 5m tall mulga.
370	0.16	20.7	"	20% green & dry speargrass cover <20cm tall.
390	0.18	20.8	"	10% as above.
1410	0.31	20.6	"	20% as above. Yellow & white daisies.
430	1.04	20.1	"	40% ground cover. 30cm tall purple daisy. 15cm tall green "wax" plant.
450	1.24	19.9	"	75% ground cover. 25cm tall speargrass, 15cm tall "wax" plant.
470	0.12	20.5	"	10% green & dry speargrass cover.
490	0.04	20.9	"	5% green & dry speargrass cover <10cm tall.
1510	0.08	20.85	"	10% as above.
530	0.13	20.8	"	15% green & dry speargrass cover <20cm tall.
550	0.16	20.8	"	15% as above.
51570mE	0.08	20.8	"	1% green & dry speargrass cover <10cm tall.

Air reading = 20.9% O_2

TABLE 3 (Continued)

27/8/92

Coordinates	CO_2(%)	O_2(%)	Depth(cm)	Comments
51590mE	0.10	20.7	75	Bare ground.
1610	0.11	20.9	"	Bare ground.
630	0.13	20.9	"	10% green & dry speargrass cover <20cm tall.
650	0.16	20.75	"	10% as above.
670	0.17	20.7	"	10% as above. 7m from 7m tall mulga, 8m from 4m tall acacia bush.
690	0.21	20.7	"	25% green & dry speargrass cover <20cm tall.
1710	0.16	20.9	"	50% as above.
730	0.04	20.9	"	Bare ground.
750	0.13	20.8	"	50% green & dry speargrass cover <20cm tall.
770	0.14	20.8	"	20% as above.
790	0.21	20.7	"	50% green & dry speargrass cover <25cm tall.
1810	0.12	20.8	"	30% green & dry speargrass cover <20cm tall.
830	0.28	20.65	"	20% green & dry speargrass cover <20cm tall.
850	0.06	20.9	"	10% green & dry speargrass cover <10cm tall.
870	0.22	20.8	"	25% green & dry speargrass cover <20cm tall.
890	0.39	20.6	"	25% as above.
1910	0.28	20.7	"	40% as above. 6.5m from 5m high mulga.
930	0.43	20.45	"	15% as above.
950	0.30	20.7	"	10% as above.
970	0.32	20.6	"	15% as above. 12m from 7m tall myall.
990	0.21	20.65	"	10% as above.
2010	0.30	20.6	"	15% as above.
030	0.09	20.75	"	10% as above.
050	0.19	20.5	"	20% as above.
070	0.19	20.8	"	20% as above.
090	0.24	20.6	"	15% as above.
2110	0.24	20.7	"	10% as above.
130	0.21	20.6	"	40% as above.
150	0.20	20.7	70	50% as above.
170	0.39	20.5	75	35% as above.
190	0.09	20.7	"	10% as above. Sparse salt bush & succulents.
2210	0.08	20.8	"	20% as above. Sparse.
230	0.055	20.8	"	5% as above. Sparse.
250	0.06	20.8	"	5% as above. Sparse.
52270mE	0.07	20.8	"	5% as above. Sparse

Air reading = 20.9% O_2

TABLE 4

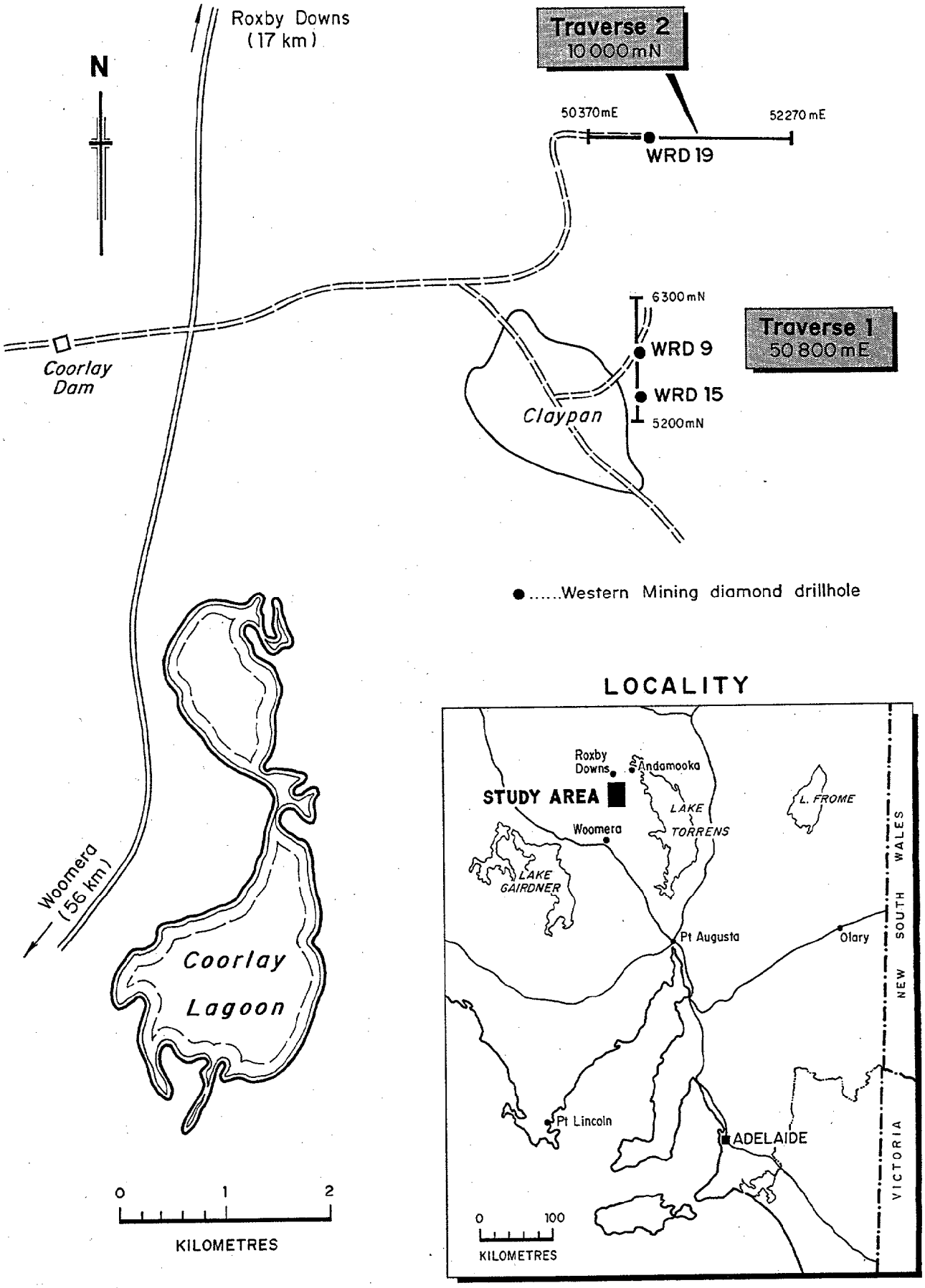
SOIL AIR CO_2/O_2 VALUES, WIRRDA WELL, STUART SHELF, SOUTH AUSTRALIA

Traverse 2: Supplementary Sampling. 27/8/92

Coordinates	$C0_2$(%)	0_2(%)	Depth(cm)	Comments
20m north of drainage pan at 51430mE.				
10020mN				
51410mE	0.13	20.8	75	15% green & dry speargrass cover <20cm tall.
430	0.08	20.8	"	5% green & dry speargrass cover <10cm tall.
450	0.07	20.8	"	5% green & dry speargrass cover <10cm tall.
51470mE	0.07	20.9	"	10% green & dry speargrass cover <10cm tall.
Rectangular loop traverse about possible fault related anomaly near 52000mE.				
9885mN				
51770mE	0.23	20.65	"	20% green & dry speargrass cover <25cm tall.
790	0.25	20.6	"	40% as above.
1810	0.17	20.7	"	20% as above.
830	0.16	20.7	"	25% as above.
850	0.12	20.8	"	15% as above.
870	0.18	20.7	"	40% as above. 7m from 4m tall mulga.
890	0.20	20.8	"	30% as above.
1910	0.14	20.8	"	25% as above.
930	0.16	20.8	"	15% as above.
950	0.11	20.8	"	Bare ground.
970	0.07	20.8	"	Bare ground.
990	0.16	20.7	"	10% green & dry speargrass cover <25cm tall.
2010	0.20	20.7	"	50% as above.
52030mE	0.25	20.6	"	25% as above.
9950mN				
51950mE	0.13	20.8	"	10% green & dry speargrass cover <20cm tall.
51970mE	0.12	20.8	"	5% as above.
52030mE				
9905mN	0.16	20.8	"	15% green & dry speargrass cover <25cm tall.
925	0.12	20.8	"	15% as above.
945	0.12	20.7	"	15% as above.
965	0.18	20.7	"	15% as above.
9985mN	0.18	20.7	"	25% as above.
51773mE				
9905mN	0.15	20.7	"	40% as above.
51777mE				
9925mN	0.20	20.7	"	50% as above.
51780mE				
9945mN	0.21	20.7	"	15% as above.
51784mE				
9965mN	0.12	20.7	"	15% as above.
51788mE				
9985mN	0.27	20.7	"	30% as above.

Air reading = 20.9% O_2

G04680.BJM



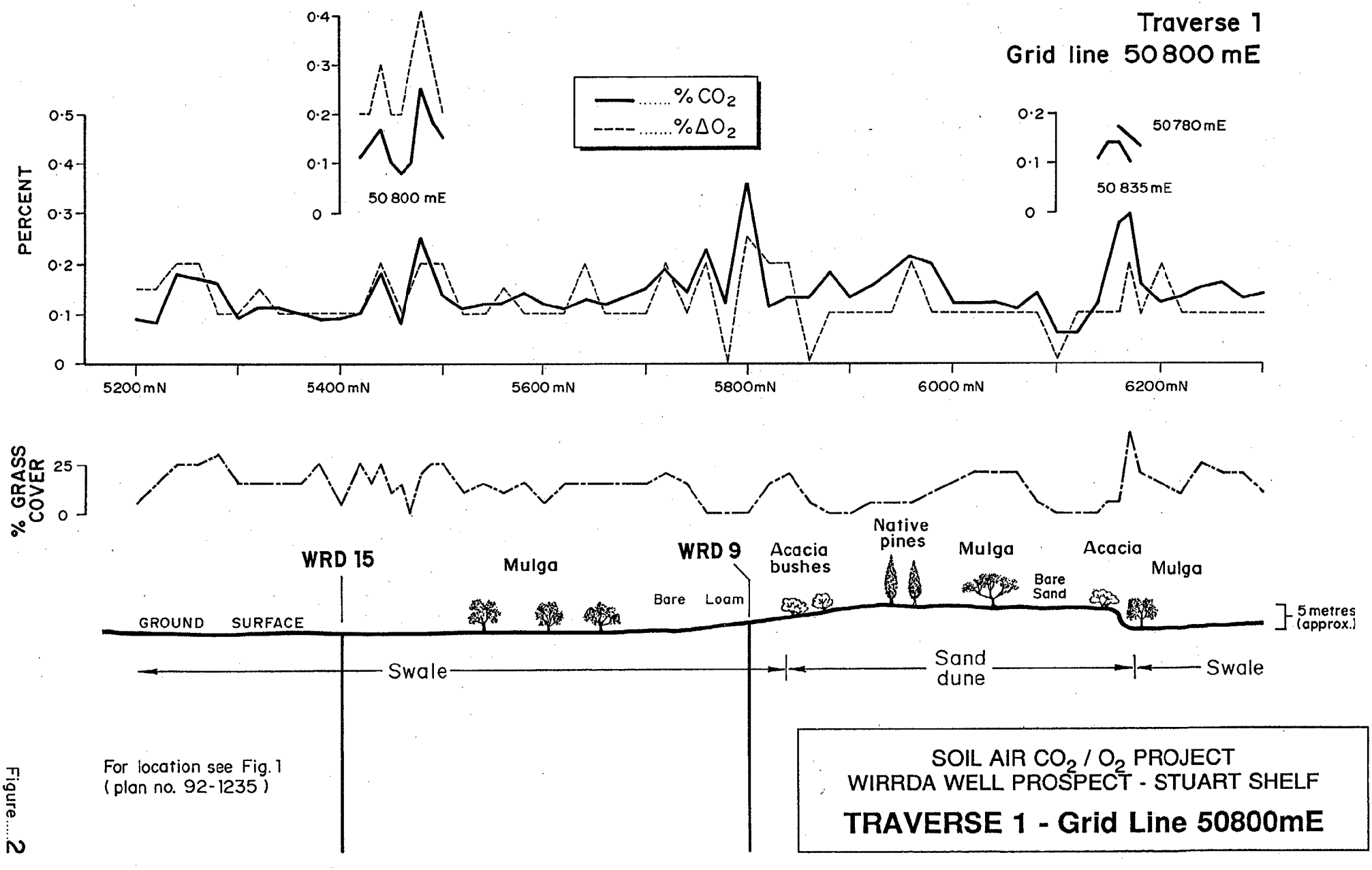
SOIL AIR CO_2 / O_2 PROJECT
WIRRDA WELL PROSPECT - STUART SHELF

LOCALITY PLAN

Figure.....1
SADME 92-1235

5706

5706

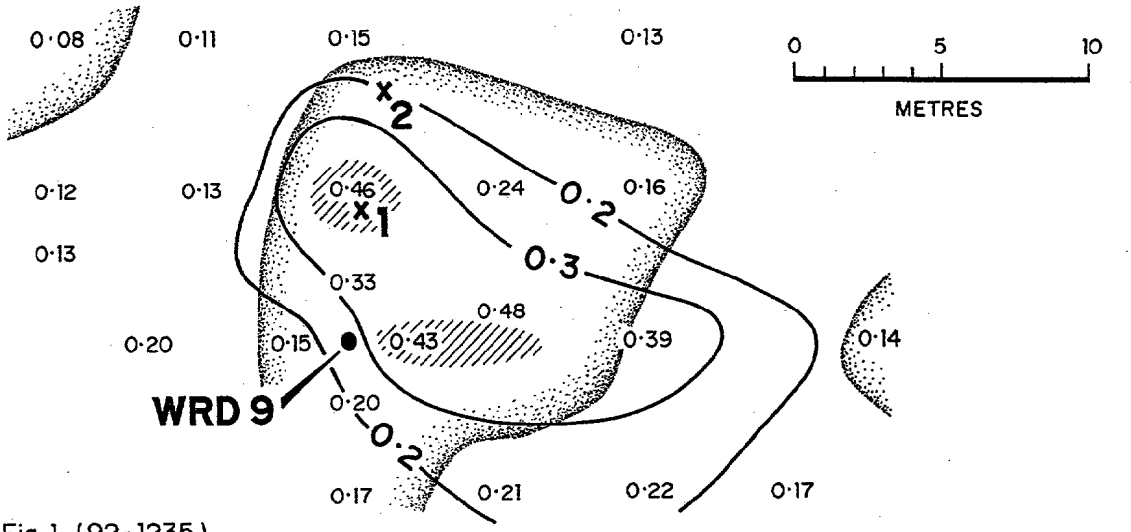


For location see Fig. 1
(plan no. 92-1235)

SOIL AIR CO_2 / O_2 PROJECT
WIRRDA WELL PROSPECT - STUART SHELF

TRAVERSE 1 - Grid Line 50800mE

Figure 2
SADME 92-1236



See Fig. 1 (92-1235) for location.

Diesel soaked surface

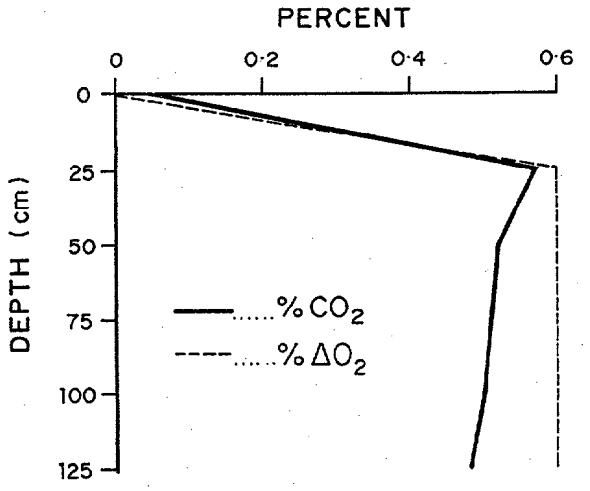
Bare ground

0·24 ..... Sample point
..... $\%CO_2$ at 75cm depth

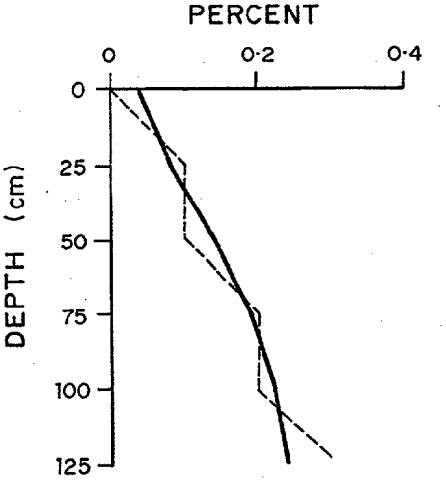
x ..... Profile site

● ..... Diamond drillhole

Profile 1
Diesel soaked soil



Profile 2
Clean soil

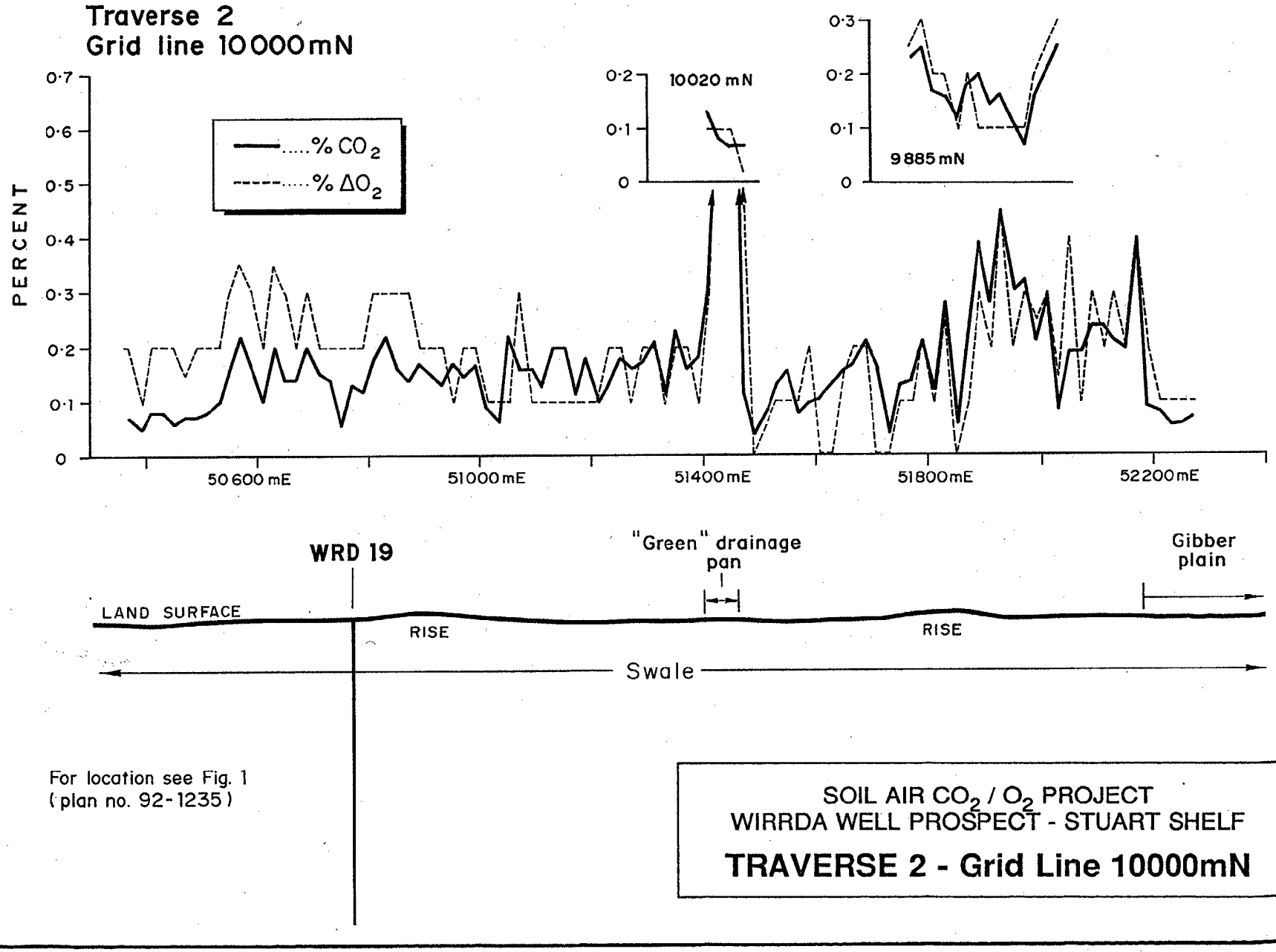


SOIL AIR CO_2 / O_2 PROJECT
WIRRDA WELL PROSPECT - STUART SHELF

TRAVERSE 1 - DETAILED SAMPLING AROUND WRD9

Figure....3
SADME 92-1237

5706



For location see Fig. 1
(plan no. 92-1235)

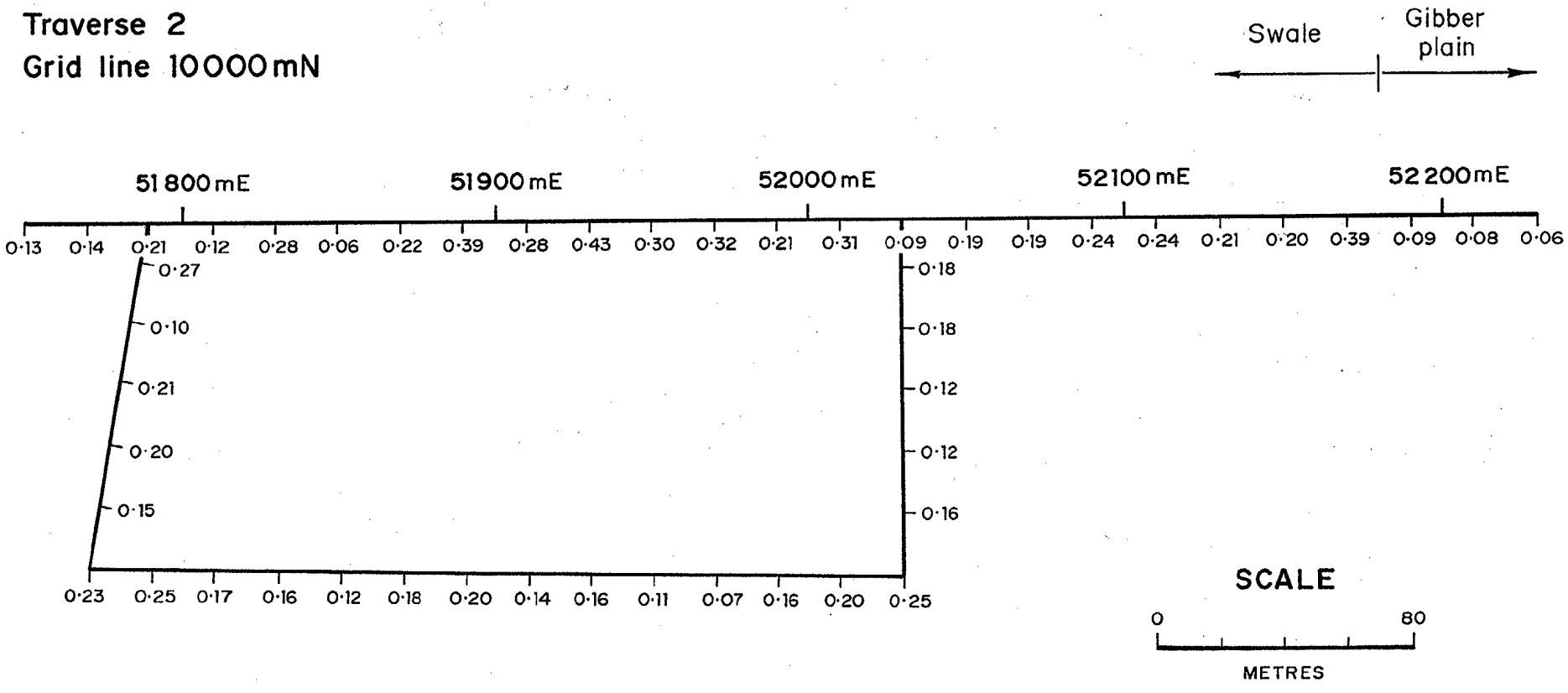
SOIL AIR CO_2 / O_2 PROJECT
WIRRDA WELL PROSPECT - STUART SHELF

TRAVERSE 2 - Grid Line 10000mN

Figure 4
SADME 92-1238

5706

Traverse 2
Grid line 10000mN



For location of Traverse 2 see Fig. 1 (92-1235)

SOIL AIR CO_2 / O_2 PROJECT
WIRRDA WELL PROSPECT - STUART SHELF

TRAVERSE 2 - DETAILED SAMPLING

Figure....5
SADME 92-1239