DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

REPT.BK.NO. 83/11
MOONTA-WALLAROO MINING FIELD - PRODUCTION STATISTICS 1860-1938

GEOLOGICAL SURVEY

by

D.J. FLINT
GEOLOGIST

MINERAL RESOURCES SECTION

FEBRUARY, 1983

DME. No. 464/82

CONTENTS

TABLES

FIGURES

Fig. No.	Title	Plan No.
1.	Location Plan - Moonta Mines, Wallaroo Mines and Wallaroo Smelters.	82-663
2.	MOONTA MINES: Location of mines, shafts and lodes.	82-664
3.	WALLAROO MINES: Location of mines, shafts and lodes.	82-665
4.	Surface plan of the WALLAROO SMELTING WORKS	82-666

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

Rept. Bk. No. 83/11
D.M.E. No. 464/82
Disk No. 136

MOONTA-WALLAROO MINING FIELD - PRODUCTION STATISTICS 1860-1938

ABSTRACT

The major mines at Moonta and Kadina operated continuously from 1860 to 1923, and then sporadically until 1938. About 9.1 million tonnes of crude ore were raised and 2.5 million tonnes of dressed ore were produced. Between 1890-1923, crude ore from Moonta and Wallaroo mines averaged 3.39 and 3.61% copper respectively.

Output from Moonta-Wallaroo mining field totalled about 336 000 tonnes of copper and 1 682 kg of fine gold; some of the gold was obtained from purchased ore, including some from Western Australia and Tasmania. Most of Wallaroo Smelters' output of 16 986 kg of fine silver was from purchased ore. From 1904 until 1923, an average of 0.34 g/tonne of fine gold and 0.56 g/tonne of fine silver were recovered from combined Moonta and Wallaroo crude ore. Grades are not available from 1860 to 1889, and are confused by accounting procedures and purchased gold and silver ores between 1890 and 1903.

Since 1969, further flotation of tailings dumps from the old Devon Concentration Plant has yielded an additional 187 tonnes of copper metal and 6.22 kg of gold.

INTRODUCTION

Wallaroo Mines and Moonta Mines were discovered in 1859 and 1861 respectively, and became significant events in the early history of South Australia, evident by:

- Moonta was the largest population centre in South Australia except for Adelaide and had a population of 12 000 people in 1875.

- Moonta Mining Co. was the first mining company in Australia to pay dividends totalling £1 000 000 and achieved this feat in 1876.
- the value of copper produced from Wallaroo-Moonta district from 1860 to 1917 exceeded the total mineral production from other mining operations in the state since foundation until 1917.

Details of the social and cultural factors associated with life on an early Australian mining field are available from Pryor (1962) and Dunlop (1970). Principal references for details of extractive and concentration processes are Annual Reports of Wallaroo and Moonta Mining and Smelting Co. Ltd and that company's publication 'Wallaroo and Moonta Mines and Smelters' (1920). Geological information is summarised in Jack (1917) and Dickinson (1942), while Drexel (1982) presents a pictorial history of mining.

This report collates mining and smelting statistics on the major mines in the Moonta-Wallaroo mining field for the chapter in Drexel (1982). Most statistics are derived from Annual Reports (1890-1923) of Wallaroo and Moonta Mining and Smelting Co. Ltd.

PREVIOUS ESTIMATES

The total amount of crude ore mined has been estimated at 6-6.5 million tonnes with copper produced at 330 000 - 340 000 tonnes (Ward 1933, Dickinson 1942 and 1953, Dunlop 1970). Dunlop (1970) has estimated that copper produced from each of the mining districts has been:

Moonta	1860-1889	91 000	tonnes
	1890-1923	71 000	tonnes
Wallaroo	1860-1889	61 000	tonnes
	1890-1923	104 000	tonnes
Purchased ore	1890-1923	16 800	tonnes

Dickinson (1953) reported that gold and silver recoveries corresponded to 4.3 and 5.0 g/tonne respectively for crude ore mined between 1908 and 1916. However, figures compiled during the present study show that gold and silver recovered were only 0.34 and 0.56 g/tonne respectively for crude ore mined between 1904-1923; results for 1908-1916 are similar.

Unfortunately, many of the early records are unobtainable and some of the available statistics are contradictory.

HISTORICAL BACKGROUND

Operating Companies

Following the discovery of mineralisation in the Moonta and Kadina areas, numerous companies were floated. Many were successful between 1860 and 1875 but few outlasted the low copper prices from 1875 until after 1900. The largest mines at Moonta and Kadina were operated by Moonta Mining Co. and Wallaroo Mining and Smelting Co. respectively; the latter also ran the only smelters at Wallaroo which treated all ores from the district (Fig. 1). Although these had been very successful companies prior to 1875, they struggled to pay dividends between 1875 and 1889 and were forced to amalgamate. The newly formed Wallaroo and Moonta Mining and Smelting Co. operated successfully for another 33 years until 1923. Annual reports were published from 1890 to 1923 and provide invaluable production data, but much of the history for the first 30 years is lost.

Smaller syndicate-controlled mines were worked sporadically throughout the life of the mining fields e.g. Wandilta, Kurilla, Yelta and Parramatta (Figs. 2 and 3).

Smelting

Smelters were constructed at Wallaroo by Wallaroo Mining and Smelting Co. in 1861 to treat ore from their Kadina sources (Wallaroo Mines), and became a focal point for ores from throughout the Moonta-Wallaroo district (Fig. 4). All ores, including those of Moonta Mining Co. and numerous smaller operators were treated at Wallaroo.

Before construction of the smelters, 8 100 tonnes of hand-dressed ore from Moonta averaging 25% copper were shipped to smelters at Swansea, Wales.

Low-grade ore from Moonta and Wallaroo was smelted from 1867 to July 1882 at Hunter River, New South Wales where fuel costs were lower; ships backloaded with coal for boilers at Wallaroo. Hunter River Smelting Works treated 318 000 tonnes of Moonta-Wallaroo ore which yielded 40 000 tonnes of copper metal.

Purchased ore is common in company records - not only from other Moonta-Wallaroo deposits but also of gold ore from South Australia and Western Australia, copper-silver ore from Tasmania and silver-lead-zinc ore from Broken Hill. Purchased ore was reduced substantially after 1904. Unfortunately, production statistics for purchased ore rarely are distinguished from those of local ore. During World War I, all Australian copper ore had to be refined in Australia; 3 929 tonnes of copper were produced at Wallaroo during 1917-1919 from ore from Mount Cuthbert, Queensland.

Wallaroo and Moonta Mining and Smelting Co. went into voluntary liquidation on 1 November 1923, but some smelting of accumulated ore and precipitate continued while affairs were wound up and equipment salvaged and sold. Wallaroo smelters ceased operations on 29 October 1926 but production details after 1923, when annual reports ceased to be published, are not known. After selling all assets, the company was able to pay a final dividend of one shilling per share in 1928.

PRODUCTION 1860-1923

Production records for mining and smelting before 1890 are poor, and are often quoted in monetary value rather than amount of ore or metal. Fortunately, all ores were sold to the company operating Wallaroo smelters and this enables total production to be calculated. Before 1890, annual production might be obtained by searching newspaper records. Table 1 summarises mining and smelting data for 1860-1923; production from Hunter River smelters is included but not ore sent in 1860-1861 to Swansea, Wales. Copper produced from Mount Cuthbert ore, Queensland is also included. Statistics are from Moonta Mining Co., Wallaroo Mining and Smelting Co., and following their amalgamation in 1889, of Wallaroo and Moonta Mining and Smelting Co.

TABLE 1

SUMMARY OF MINING AND SMELTING PRODUCTION - 1860-1923

1860-1889

	CRUDE ORE		DRESSED ORE		COPPER-Smelters
	tonnes	grade %Cu	tonnes	grade %Cu	tonnes
Moonta Mines	2 897 000 -	n.a.*	538 000 -	19	144 000
Wallaroo Mines	1 327 000 -	n.a.	499 000 -	11	

1890-1923

Moonta Mines	1 898 000 -	3.39	352 518	16.7	188 492
Wallaroo Mines	2 868 000 -	3.61	1 096 280	10.27	
TOTALS (1860-1923)	8 990 000		2 485 000		332 492

* n.a. = not available

Until 1901, Moonta Mines were the most significant producer but after 1901, Wallaroo Mines consistently outproduced the ailing Moonta Mines. Throughout the life of the mines, Wallaroo crude ore had a higher copper grade than Moonta ore whereas Wallaroo dressed ore was consistently lower in grade because of higher pyrite content.

Production details of Wallaroo and Moonta Mining and Smelting Co. from 1890 to 1923 have been extracted from their Annual Reports and are presented yearly from Moonta Mines (Table 2), Wallaroo Mines (Table 3) and Wallaroo Smelters (Table 4).

Explanatory Notes

1. Until the end of 1897, all ore was measured in tons where 1 ton = 21 hundred weight; presumably this allowed for the weight of bags.

2. Wallaroo and Moonta Mining and Smelting Co. switched from calendar year to financial year for their Annual Reports during 1919.
3. Ore 'hoisted to surface' is distinguished by the company from ore 'handled'; presumably this allowed for re-treatment and inclusion of purchased ores. Often, the company provided only one set of data.
4. From 1890 to 1898 inclusive, only dressed ore tonnages and not crude ore tonnages were quoted; crude-ore figures listed in Tables 2 and 3 have been estimated by using the average crude: dressed ore ratio.
5. From 1890-1900 inclusive, data are only available from Directors' Reports but afterwards, data are available from the Directors' as well as the General-Manager's Report for each Annual Report. In Tables 2 and 3, figures from Directors' Reports are used to 1900 whereas from 1901, figures are obtained from the General Manager's Report as these are more comprehensive.
6. For dressed ore in Table 2 and 3, the figure quoted for percentage recovery of copper from crude ore does not have the same basis. From 1890-1910 inclusive, percentage recovery is of copper from all dressed ore, regardless of source. From 1911, the percentage recovery refers only to dressed ore from the mines and specifically excludes retreatment of tailings and slimes.
7. Dressed ore totals in Tables 2 and 3 include that obtained from retreated tailings and slimes.
8. During the declining years of 1920/21 and 1921/22, Annual Reports have not distinguished much of the data from Moonta Mines or Wallaroo Mines and therefore figures for each mine can only be estimated.

9. 'Ore smelted' in Table 4 includes ore from all sources i.e. other local ore, purchased ore, and locally-produced precipitate from the Cementation Works.

10. Refined copper produced in Table 4 includes that produced from Mount Cuthbert, Queensland which was:

1917	1 359	tonnes
1918	2 302	"
1919	267	"

11. Up to and including 1902, 'ore smelted' in Table 4 was only available from the Balance Sheet in each Annual Report. From 1907, there are discrepancies in the amount of ore smelted between the Balance Sheet, Directors' Report and Smelting Manager's Report. From 1903, 'ore smelted' is not obtained from the Balance Sheet but from either the Directors' Report, Smelting Manager's Report or General Manager's Report.

12. Cementation (or leaching) of tailings and slimes at Wallaroo Mines was discontinued after installation of a flotation plant at the Devon Concentration Plant in 1911; this improved recoveries which exceeded 90% for the first time.

13. In most cases, the percentage of fine copper in dressed ore in Tables 2 and 3 is not derived from the same source as the adjacent figures for total dressed ore and contained fine copper, and hence the percentage copper is often at slight variance.

14. All figures were converted from the original Imperial units by the following factors:-

1 ton	=	1.016 tonne
1 troy oz.	=	.0311 kg

TABLE 2

PRODUCTION STATISTICS MOONTA MINES 1890--1923

	CRUDE ORE				DRESSED ORE					CEMENTATION		
	Hoisted to Surface (tonnes)	Total quantity handled (tonnes)	Fine Cu content (tonnes)	% Cu	Total Quantity (tonnes)	Fine Cu content (tonnes)	% Cu	% Recovery	Crude: Dressed ore	Precipitate (tonnes)	Contained Cu (tonnes)	% Cu
1890	86 000				18 142	3 586	19.75					
1891	66 000				13 627	2 653	19.5					
1892	84 000				16 896	2 810	16.62					
1893	81 000				16 247	3 081	19					
1894	71 000				14 213	2 978	21					
1895	66 000				13 123	2 623	20					
1896	71 000				13 760	2 616	19					
1897	81 000				15 939	2 984	18.75					
1898	74 000				14 843	2 531	17.05					
1899	105 774	112 341			12 588	2 113	16.78		8.40			
1900	101 028	111 752			12 518	2 152	17.19		8.07			
1901	97 993	102 628	2 852	2.778	11 828	2 184	17.11	76.59	8.28	633	462	73.04
1902	50 626	56 773	2 332	4.107	9 807	1 933	18.69	82.91	5.16	1 065	867	81.4
1903	54 598	62 189	2 284	3.672	10 724	1 929	16.99	84.48	5.09	922	745	80.81
1904		66 569	2 297	3.616	11 883	1 850	16.66	80.6	5.60	977	797	81.5
1905		48 962	1 697	3.465	8 257	1 303	14.52	76.77	5.93	868	689	79.36
1906		56 873	2 362	4.154	10 614	1 729	15.35	73.2	5.36	1 008	801	79.44
1907		78 940	2 739	3.470	17 643	1 972	10.66	72	4.47	841	673	79.8
1908		49 409	1 996	4.04	11 859	1 485	11.86	74.4	4.17	724	597	82.5
1909		43 939	1 765	4.02	9 771	1 355	13.04	76.8	4.50	683	547	80.1
1910		44 932	1 632	3.63	8 276	1 257	14.08	77.0	5.43	687	555	80.8
1911	37 372	39 310	1 675	4.26	9 094	1 412	13.85	84.3	4.11	734	603	82.3
1912		33 206	1 195	3.60	7 222	906	11.58	75.9	4.60	873	691	79.2
1913		29 224	986	3.37	6 102	819	12.29	83.1	4.79	964	756	78.4
1914	28 672	39 476	1 273	3.22	6 926	1 171	15.37	93.8	4.14	957	766	80.0
1915	39 419	42 443	1 491	3.51	7 398	1 382	16.82	92.7	5.33	954	728	76.4
1916	57 793	60 725	1 633	2.69	9 730	1 433	13.71	87.8	5.94	892	675	75.6
1917	55 620	59 127	1 558	2.63	8 489	1 381	15.89	88.6	6.55	759	527	69.5
1918	54 105	57 364	1 496	2.61	8 692	1 344	14.73	89.9	6.22	803	577	71.9
1919	7 128	7 909	172	2.17	967	152	15.47	88.8	7.37	171	125	73.2
19/20	8 473	9 047	233	2.57	1 490	203	13.53	87.3	5.69	660	474	71.8
20/21	*81 603	*87 422	*2 902	*3.32	5 291	537	10.15	*94.0	*2.97	435	301	69.2
21/22	*48 226	*51 583	*1 917	*3.72	3 946	526	13.3	*94.5	*2.95	288	196	68.0
22/23	25 116	26 775	808	3.02	4 613	698	15	86.4	5.45	376	268	71.4
TOTALS	1 898 000				352 518	59 088	16.76			17 274	13 420	77.7

* Figures refer to total weight or average percentage, where appropriate, for Moonta and Wallaroo ore.

TABLE 3

PRODUCTION STATISTICS WALLAROO MINES 1890-1923

	CRUDE ORE				DRESSED ORE					CEMENTATION		
	Hoisted to Surface (tonnes)	Total Quantity Handled (tonnes)	Fine Cu in Crude Ore (tonnes)	% Cu	Total Dressed Ore (tonnes)	Fine Cu in Dressed Ore (tonnes)	% Cu (fine)	% Recovery	Crude: Dressed Ore	Precipitate (tonnes)	Contained Cu (tonnes)	% Cu
1890	42 000				14 081	1 825	13					
1891	42 000				13 761	1 603	11.6					
1892	26 000				8 863	1 144	12.9					
1893	38 000				12 660	1 698	13.4					
1894	38 000				12 656	1 801	14.2					
1895	48 000				15 914	2 236	14					
1896	51 000				16 534	2 262	13.6					
1897	52 000				17 376	2 170	12.5					
1898	71 000				23 157	2 657	11.5					
1899	71 989	75 849			23 727	2 452	10.3		3.03			
1900	93 862	101 323			23 063	2 420	10.4		4.07			
1901	101 355	106 835	4 343	4.06	28 985	3 461	10.9	79.7	3.50			
1902	78 728	86 278	3 388	3.93	24 490	2 799	11.2	82.6	3.21			
1903	100 879	105 314	4 428	4.30	32 238	3 662	10.8	81.8	3.13	7	4	60.6
1904	68 441	89 590	3 157	3.52	23 169	2 468	10.7	78.2	2.95	27	22	81.5
1905	113 433	127 063	4 554	3.58	37 435	3 566	9.3	78.5	3.03	62	47	76.0
1906	139 494	149 545	5 511	3.68	46 081	4 383	8.9	79.5	3.03	53	42	78.8
1907	145 327	154 409	4 642	3.65	57 665	4 950	8.0	87.8	2.52	37	27	75
1908	87 759	120 132	4 364	3.63	42 281	3 798	8.1	87.0	2.08	56	40	70.9
1909	89 745	111 815	4 587	4.10	42 506	4 076	8.8	88.8	2.11	31	25	79.0
1910	88 953	90 939	3 779	4.2	36 842	3 377	8.4	89.4	2.41	52	39	74.5
1911		116 269	5 003	4.3	47 410	4 479	8.7	89.5	2.45	45	31	71.0
1912	122 408	152 447	5 885	3.9	59 806	5 243	8.3	90.8	2.05	36	23	65.7
1913	135 240	188 873	6 311	3.3	62 322	5 834	8.5	93.9	2.17	16	12	72
1914	119 180	196 756	6 177	3.1	58 082	5 802	9.3	95.8	2.05			
1915	138 980	215 052	6 505	3.0	58 262	6 072	9.6	95.3	2.39			
1916	146 465	194 370	6 147	3.2	58 546	5 696	8.9	93.9	2.50			
1917	142 406	181 495	5 874	3.2	59 086	5 486	8.5	94.1	2.41			
1918	140 063	166 027	5 677	3.4	54 343	5 288	8.9	94.2	2.58			
1919	29 756	33 307	1 323	4.0	10 781	1 260	9.3	95.5	2.76			
19/20	65 365	70 100	2 376	3.4	22 570	2 250	8.9	94.7	2.90			
20/21	*81 603	*87 422	*2 902	3.3	22 811	2 022	8.9	*94.0	*2.97			
21/22	*48 226	*51 583	*1 917	3.7	12 163	1 152	9.5	*94.5	*2.95			
22/23	36 517	44 642	1 674	3.7	16 614	1 539		93.1	2.20			
TOTALS	2 868 000				1 096 280	110 891	10.3			422	312	74.0

* Figures refer to total weight or average percentage, where appropriate, for Moonta and Wallaroo ore.

TABLE 4

PRODUCTION WALLAROO SMELTERS 1890-1923

DATE	ORE SMELTED (tonnes)	REFINED CU (tonnes)	ELECTROLYTIC CU (tonnes)	GOLD (kg, fine)	SILVER (kg, .996 fine)	H_2SO_4 (tonnes)	$CuSO_4$ (tonnes)	People Employed
1890	27 136	5 410						1 776
1891	37 119	4 256						n.a.
1892	25 441	3 954						1 718
1893	32 287	4 778						1 813
1894	30 712	4 779						1 908
1895	33 116	4 860						1 803
1896	29 844	4 878						2 000
1897	36 485	5 154						2 128
1898	38 216	5 188						2 340
1899	43 081	4 565						2 418
1900	53 172	4 572						2 419
1901	53 402	5 911		235.02	9 128.78	739	565	2 439
1902	44 848	6 153	567	131.16	3 600.13	3 680	389	2 130
1903	45 170	6 203	622	151.63	2 382.22	4 092	91	2 206
1904	39 619	5 928	524	39.19	222.30	3 488	184	2 054
1905	50 760	6 605	609	51.20	148.71	5 397	345	2 318
1906	56 776	7 682	889	72.35	256.60	5 208	332	2 753
1907	76 877	8 765	911	62.49	181.80	5 465	228	1 620
1908	61 332	6 551	774	60.65	230.66	5 032	204	1 695
1909	53 415	5 380	673	56.57	155.36	4 834	304	1 634
1910	45 695	4 933	779	40.31	62.55	4 558	213	1 575
1911	59 452	6 176	1 194	38.01	43.54	4 701	185	1 397
1912	66 975	6 388	1 243	54.65	63.61	5 176	104	1 567
1913	71 802	7 226	1 394	67.21	31.10	5 692	14	1 641
1914	66 513	7 134	1 340	84.04	91.32	6 035	4	1 683
1915	68 486	7 775	1 374	94.15	89.70	6 061	2	1 717
1916	73 199	8 730	1 466	96.42	93.75	7 041		2 000
1917	71 099	8 702	1 662	92.38	52.10	6 289		1 870
1918	69 290	9 540	1 477	93.06	50.01	6 853		1 969
1919	14 363	1 497	304	25.97	13.69	1 310		n.a.
19/20	24 110	2 339	339	9.36	n.a.	2 469		n.a.
20/21	30 626	3 257	685	49.77	43.54	2 897		n.a.
21/22	16 381	2 009	207	27.34	25.54	536		n.a.
22/23	22 020	1 213	158	31.38	19.19	1 422		n.a.
TOTALS	1 568 819	188 492	19 191	1 664.31	16 986.20	98 975	3 164	

* People Employed (all classifications) by the Wallaroo and Moonta Mining and Smelting Co. Ltd.

n.a. Figures not available.

PRODUCTION 1923-1938

Small-scale mining, leaching of tailings dumps and further prospecting continued in the late 1920s and early 1930s. Production was low with only about 1 000 tonnes of hand-dressed concentrate being despatched to Electrolytic Refining and Smelting Co. (ER&S) at Port Kembla, New South Wales.

A flotation concentration mill operated between 14 August 1933 and August 1938 during a Commonwealth and State government subsidised mining scheme. This enable 47 000 tonnes of Moonta and Wallaro crude ore to be processed which produced 3 967 tonnes of concentrate. Smelting at E.R.&S., yielded 1 121.5 tonnes of copper and 18.24 kg of gold.

Total production for 1860-1938 from all sources is estimated and summarised in Table 5. This includes ore sent to Swansea, Wales and Hunter River, New South Wales as well as any purchased ore, including that from Mount Cuthbert, Queensland.

TABLE 5

TOTAL ESTIMATED PRODUCTION

MOONTA-WALLAROO DISTRICT - 1860-1938

CRUDE ORE (tonnes)	DRESSED ORE (tonnes)	COPPER (tonnes)	GOLD (kg)
9 100 000	2 499 000	336 000	1 682.54

Retreatment since 1969 of slimes dumps from the old Devon Concentration Plant has yielded an additional 187 tonnes of copper metal and 6.22 kg of gold; tenements ML 3541 and MPL 2 were current in 1982 but low metal prices have caused cessation of production.

RESERVES

At the close of mining, reserves at Moonta were nearly exhausted; limited reserves had been a problem during the declining years to 1923. Ward (1933) reported that reserves at Moonta (in 1923) were limited to isolated blocks at depths varying from 120 m to 420 m and totalled only 70 000 tonnes of 3.8% copper. Drilling by South Australian Department of Mines in 1930-1931 revealed three additional small ore shoots on the southern extension of Taylors Lode, which contained a total of 16 000 tonnes of 6% copper (Stillwell 1931).

However, several years production was available in proven and possible ore at Wallaroo Mines. All reserves were in the deepest workings (Ward 1933) and in 1923 consisted of:

250 000 tonnes of proved ore containing 3.87% Cu

270 000 tonnes of possible ore containing 3.81% Cu

The Wallaroo-Moonta mining district has been explored continuously since 1960 by Gold Mines of Aust. Ltd., Western Mining Corp. and North Broken Hill Ltd. Additional mineralisation has been located and is currently being evaluated.

SUMMARY

Copper

Details of production from the Moonta-Wallaroo mining field are obscured by poor preservation of information before amalgamation of the two companies in 1890. Even data for the 1890-1900 period are restricted to dressed ore, ore smelted and refined copper. Trends are easily discernible for post-1900 production. The history of the Moonta-Wallaroo field is summarised as:

- early importance and dominance of Moonta Mines but with a long slow decline,

- while Moonta Mines were declining, output from Wallaroo Mines increased and the peak in output (based on copper in dressed ore) was reached in 1915,

- output from the Wallaroo smelters was relatively uniform,

- both mines and the smelters suffered severe cutbacks in output after 1918.

Total dressed ore from Moonta declined from approximately 538 000 tonnes before 1890 to 350 000 tonnes after 1890; grade also fell from averaging 19% to averaging 16.8%. However, grade of Moonta crude ore continually and gradually decreased after 1890. Secondary enrichment resulted in higher crude ore grades during early production from Moonta Mines.

Dressed ore from Wallaroo Mines steadily increased, so much so, that post-1890 production was double that of pre-1890 production. Average grade had varied little; from 11% copper to 10.3% copper before and after 1890.

Efficiency of the smelters is obscured partly by purchased ores, but overall appears to be no more than 90-91% recovery.

Gold and Silver

Although Moonta and Wallaroo Mines are regarded as only copper mines, they contained significant amounts of gold and silver. Free gold is recorded in hand specimens from the oxidised zone (Jack, 1917). During electrolytic refining of copper from 1901 to 1923, Wallaroo smelters produced 1 664 kg of fine gold and 16 986 kg of fine silver. However, much of the silver was from purchased ore.

Gold and silver output from 1890-1903 inclusive is distorted by accounting procedures and a high level of purchased ores. Gold and silver recovered after 1903 are used to obtain an average grade for Moonta and Wallaroo crude ore. These indicate

that from 1904 to 1923 combined Moonta and Wallaroo crude ore apparently contained an average of 0.34 g/tonne fine gold and 0.56 g/tonne of 0.996 fine silver (i.e. recovered gold and silver; bullion in smelter slag not included). Extrapolating the figures back as far as 1860, suggests that the total 9.1 million tonnes of crude ore contained about 3 000 kg of gold and 5 000 kg of silver.

Drexel (1982) implied that the 17 000 kg of fine silver produced by Wallaroo Smelters between 1890 and 1923 was mostly from local ore, but the present study reveals that a maximum of 2 700 kg would have been derived from Moonta-Wallaroo ore.

D.J. Flint.

DJF:ZV

D.J. FLINT

GEOLOGIST

REFERENCES

Dickinson, S.B., 1942. The structural control of ore deposits in some South Australian copper fields. Bull. geol. Surv. S. Aust., 20: 7-39.

Dickinson, S.B., 1953. The Moonta and Wallaroo Copper Mines. In: Edwards, A.B. (ed.), Geology of Australian Ore Deposits. Australas. Inst. Min. Metall., Melbourne, pp 487-504.

Drexel, J.F. (compiler), 1982. Mining in South Australia - a pictorial history. Gov. Printer, Adelaide.

Dunlop, P.R.G., 1970. Economic importance of Moonta to South Australia. In Proceedings of History of Moonta seminar, 19-20th Sept. 1970. Yorke Peninsula Adult Education Centre and National Trust of S.A. (Moonta Branch), Adelaide, pp. 14-44.

Jack, R.L., 1917. The geology of the Moonta and Wallaroo mining district. Bull. geol. Surv. S. Aust., 6: 135 p.

Pryor, O., 1962. Australia's Little Cornwall. Rigby, Adelaide.

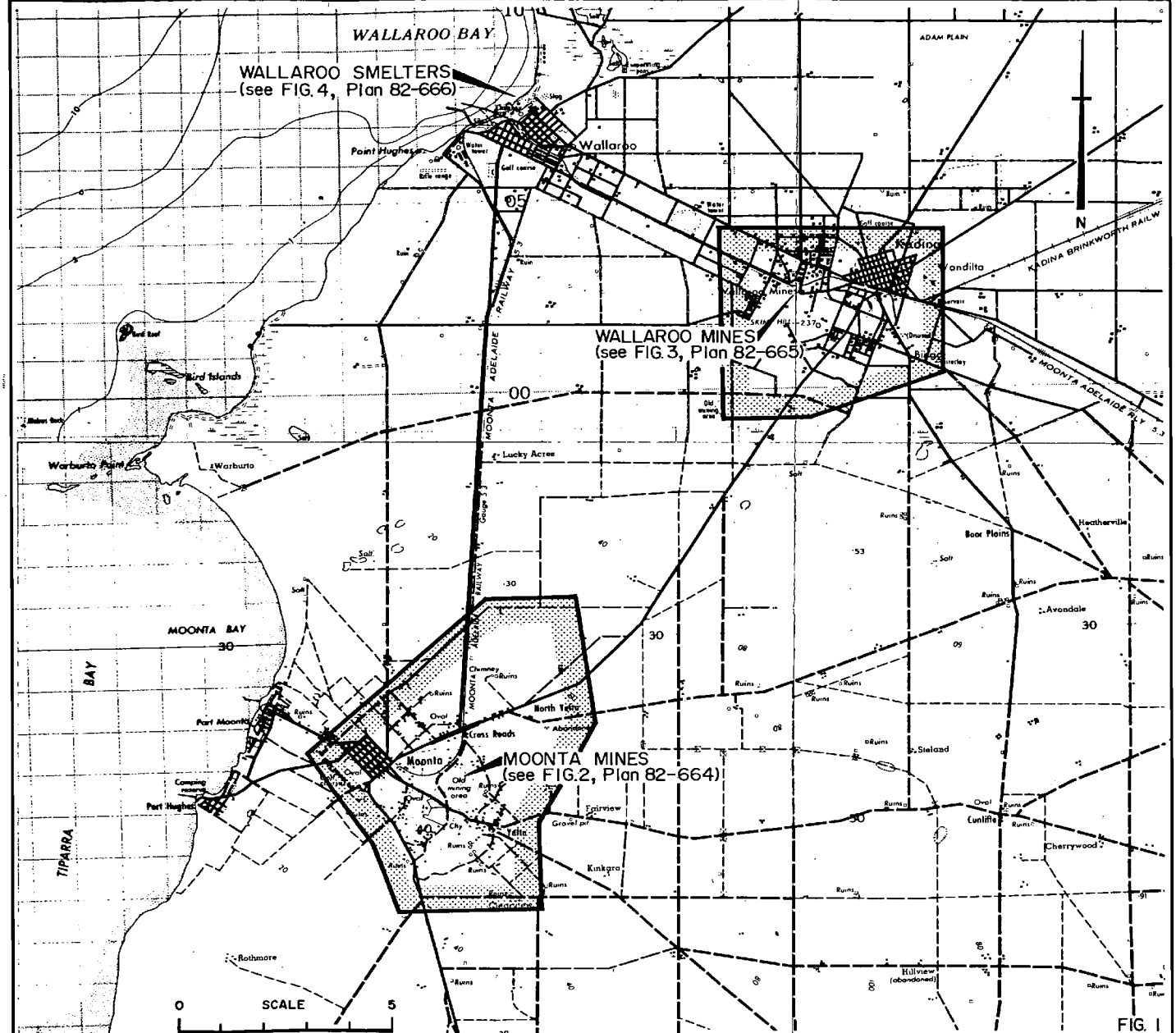
South Australian Department of Mines and Energy, 1973. The history of copper mining, Wallaroo-Moonta, 1860-1923. Mineral Information Series.

Stillwell, F.L., 1931. The southern extension of Taylor's Lode system at Moonta. Min. Rev., Adelaide, 54: 91-98.

Wallaroo and Moonta Mining and Smelting Co. Ltd., 1890-1923 Annual Reports of the company, 1890-1923.

Wallaroo and Moonta Mining and Smelting Co. Ltd., 1920. Wallaroo and Moonta Mines and Smelters. Hussey and Gillingham, Adelaide.

Ward, L.K., 1933. Copper deposits of South Australia. In: Copper resources of the world. 16th International Geological Congress, Washington, 1933.



DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

MOONTA – WALLAROO MINING FIELD

MOONTA MINES, WALLAROO MINES
WALLAROO SMELTERS

LOCALITY PLAN

COMPILED	D. Flint
DRAWN	M.F.L.
DATE	21 - 12 - 82
CHECKED	
CDO DATE	17.2.83
SCALE	1 : 100 000
PLAN NUMBER	82-663

3055

MOONTA MINES

HD WALLAROO

(MATTAPARA)
POONA MINE
POONA LODE
East Sh.
Main Sh.
West Sh.
PARRARA
PARRAMATTA
PARAMATTA LODE
CHALLA
WHEAL JAMES
Rankine's Sh.
Wheal James Sh.
No. 4 Sh.
Main Sh. (No. 3)
No. 2 Sh.
Cowling's Sh.
Andrew's Sh.
Cooper's Sh.
Bickford's Sh.
Kitto's Sh.
James Sh.
WHEAL HUGHES
MID MOONTA
MID MOONTA LODE
Main Sh.
NORTH YELTA
NORTH YELTA LODE
No. 1 Sh.
Main Sh. (No. 2)
No. 3 Sh.
EUKO LODE
EUKO
YELTA
TANK LODE OR TUXFORD'S
Wigley's Sh.
No. 7 Sh.
Central Sh.
Tuxford's Sh.
N. Tank Sh.
Main Tank Sh.
YELTA MAIN LODE
Office Sh.
Main Sh.
No. 1 Prospecting Sh.
WEARING'S LODE
Hughes Sh.
Wearing's Sh.
Carlier's Sh.
Lindsay's Sh.
Hancock's Sh.
HANCOCK'S LODE
Hancock's Sh.
Main Sh.
Andrew's Sh.
Colley's Sh.
Cooper's Sh.
MOONTA
PARK LANDS
SHOW 1691 RES
1796 ETSA RES
1724 RLY. RES
Caroline Sh.
Hancock's N. Sh.
Hancock's Sh.
Blanche Sh.
Trial Sh.
1768 SLD MEM RES
LODE RD
Footway Sh.
SCHOOL 1789 RES
Hall's Sh.
1820 RLY RES
HALL'S LODE
ALICE LODE
Trial Sh.
Alice Sh.
1777 STONE RES
Dominick's Sh.
Ryan's Sh.
Whip Sh.
DEPOT 1814 RES
MACDONNELL'S LODE
MacDonnell's Sh.
Footway Sh.
Young's N. Sh.
Young's Sh.
YOUNG'S LODE
SCHOOL 1795 REC RES
PT M S 1795
FERGUSSON'S LODE
Fergusson's Sh.
Harvey's Sh.
930
HARVEY'S LODE
SCHOOL RES
INST RES
Trial Sh.
Bower's Sh.
Whip Sh.
Simpson's Sh.
Prince Alfred Sh.
Green's Sh.
GREEN'S LODE
1720
Lloyd's Sh.
1719
Beddomes Sh.
Lloyd's S. Sh.
Fergusson Sh.
932
BEDDOME'S LODE
Musgrave Sh.
Bower's Shs.
MUSGRAVE'S LODE
No. 1
Trial Sh.
1045
No. 2 Sh.
No. 3 Sh.
HAMLEY
Treuer's Old Sh.
933
Treuer's New Sh.
Treuer's S. Sh.
TREUER'S LODE
Milne East Sh.
Milne Travelling Sh.
Milne's Sh.
Milne S. Sh.
Bennett's Sh.
931
Duncan Sh.
Waterhouse Sh.
Hughes Sh.
Elder's Sh.
Smith Sh.
ELDER'S W. LODE
ELDER'S OR TAYLOR
McCoull's Sh.
Stuckey's Sh.
956
Warmington's Sh.
Footway Sh.
Stirling's W. Sh.
Stirling's Sh.
Taylor's N. Sh.
Taylor's Sh.
955c
955
954
953
Paddock Sh.
No.1 Sh.
No.2 Sh.
1044
KARKARILLA LODE
EASTERN LODE
YORK LODE
York Sh.
Trial Sh.
No. 1 Sh
No. 2 Sh.
No. 3 Sh.
No. 4 Sh.
Eastern Sh.
Wild Dog Sh.
Schoral Sh.
EASTERN LODE
1001
1002
957
958
959
962
963
961
960
1046
1064
1147
1152
1241
1242
1243
1244
1245
1246
1216
1379
1346
1287
1288
1289
1290
1299
1000
1004
1005
1006
1007
1008
1066
2001
2000
2185
2203
2394
2395
2797
2971
2798
1292
1291
1293
1294
1670
1671
1672
1673
1674
1675
1676
1678
1680
1681
1295
1682
1679
1744
1707
2158
2397
1497
1519
1496
1451
1666
2054
2047
1061
1499
1498
MS 4158
1231
1230
1232
1240
1235
1239
1236
1238
1237
1213
1214
1215
1216
1217
1218
1212
1211
1210
1208
1207
1206
1205
1204
1203
1209
1193
1192
1191
1194
1200
1202
1195
1199
1201
1196
1198
1197
1636
1635
1634
1633
1632
1631
1630
1637
1638
1639
1640
1641
1642
1714
1715
PT M S 6686
PT M S 4085
PT M S 6687
1626
4290
KOOROONA
M S 2762
M S 3249
3952
1530
1549
WILKAWAT
7739
4104
990
1650
1529
1044
1045
1722
1721
1718
1717
1755
1756
1757
Hancock's Sh.
Metres 500 0 500 1000 Metres
N

FIG. 2

DEPARTMENT OF MINES AND ENERGY – SOUTH AUSTRALIA

MOONTA – WALLAROO MINING FIELD

MOONTA MINES

LOCATION OF MINES, SHAFTS AND LODES

	COMPILED D. Flint	DRN: [illegible]	SCALE: [illegible]	PLAN NUMBER
DIRECTOR GENERAL		CKD	DATE 14 – 12 – 82	82 – 664

3055

WALLAROO MINES

HDS. WALLAROO & KADINA

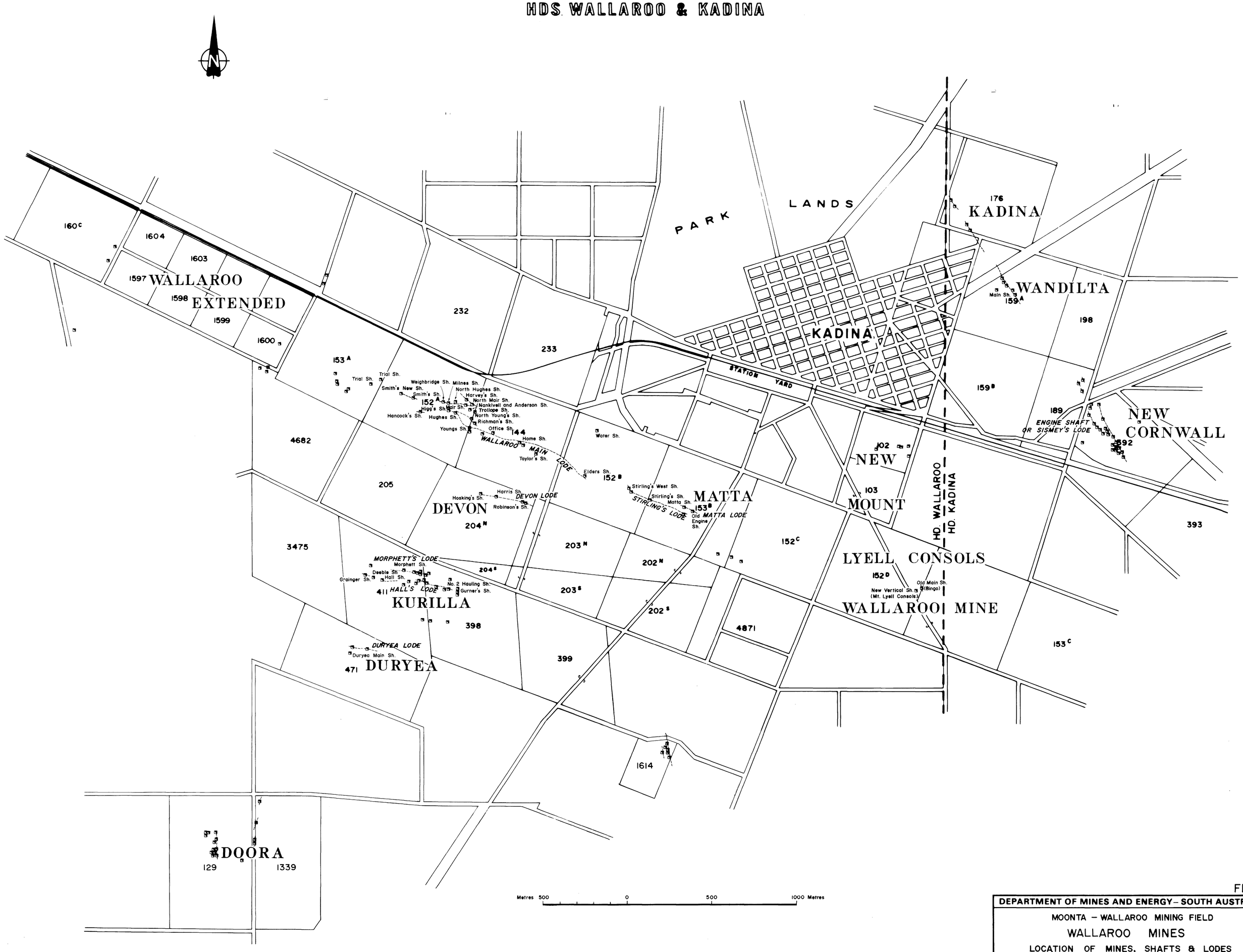


FIG. 3

DEPARTMENT OF MINES AND ENERGY – SOUTH AUSTRALIA				
MOONTA – WALLAROO MINING FIELD				
WALLAROO MINES				
LOCATION OF MINES, SHAFTS & LODES				
	COMPILED: D. Flint	DRN: T. Earl	SCALE: 1:10 000	PLAN NUMBER 82-665
DIRECTOR GENERAL		CKD	DATE: 14-12-82	

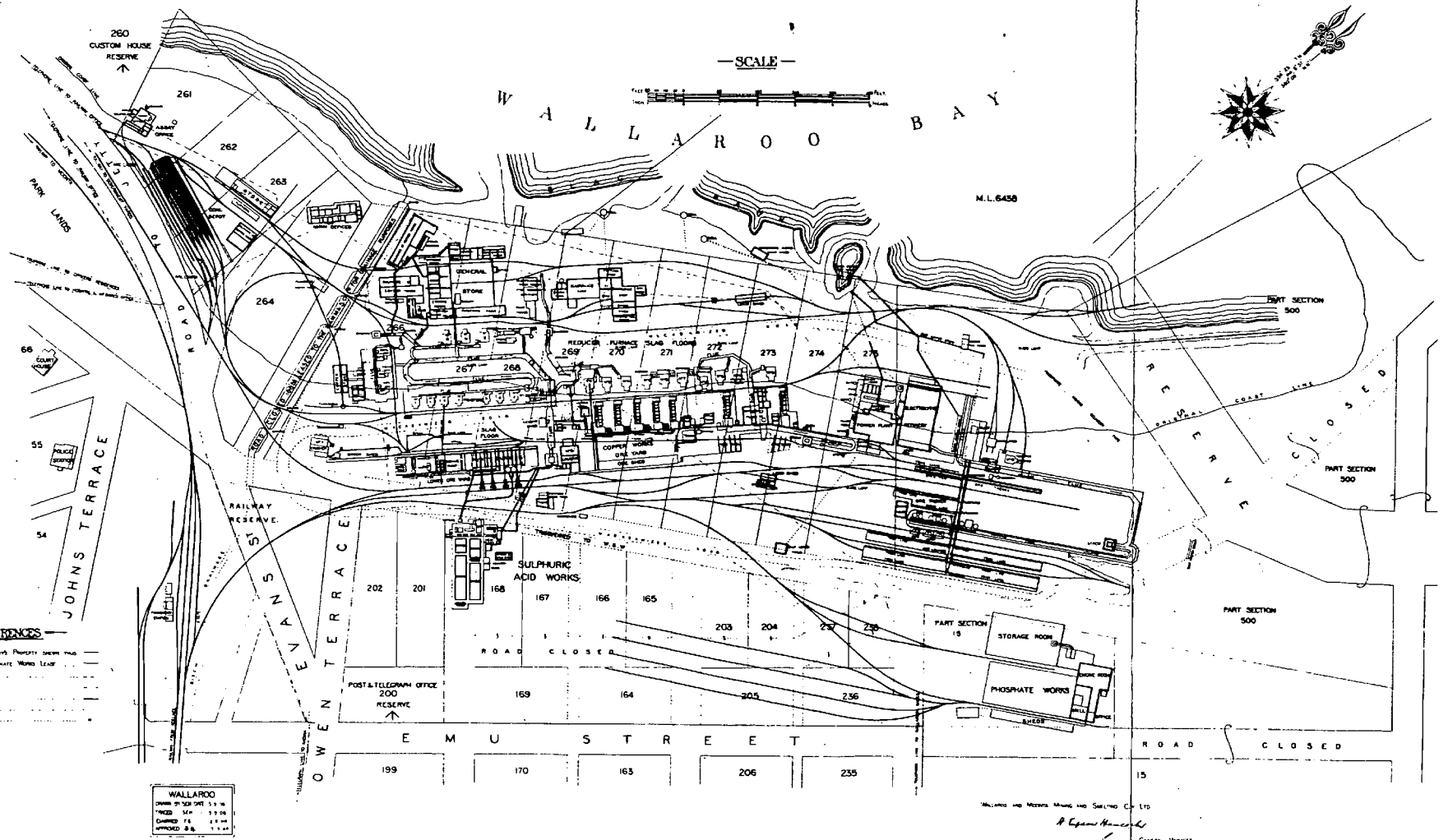
3055

WALLAROO AND MOONTA MINING AND SMELTING COY. LTD.

SURFACE PLAN

OF THE

WALLAROO SMELTING WORKS



DEPARTMENT OF MINES AND ENERGY — SOUTH AUSTRALIA

FIG. 4
82-666

3055

1874 L