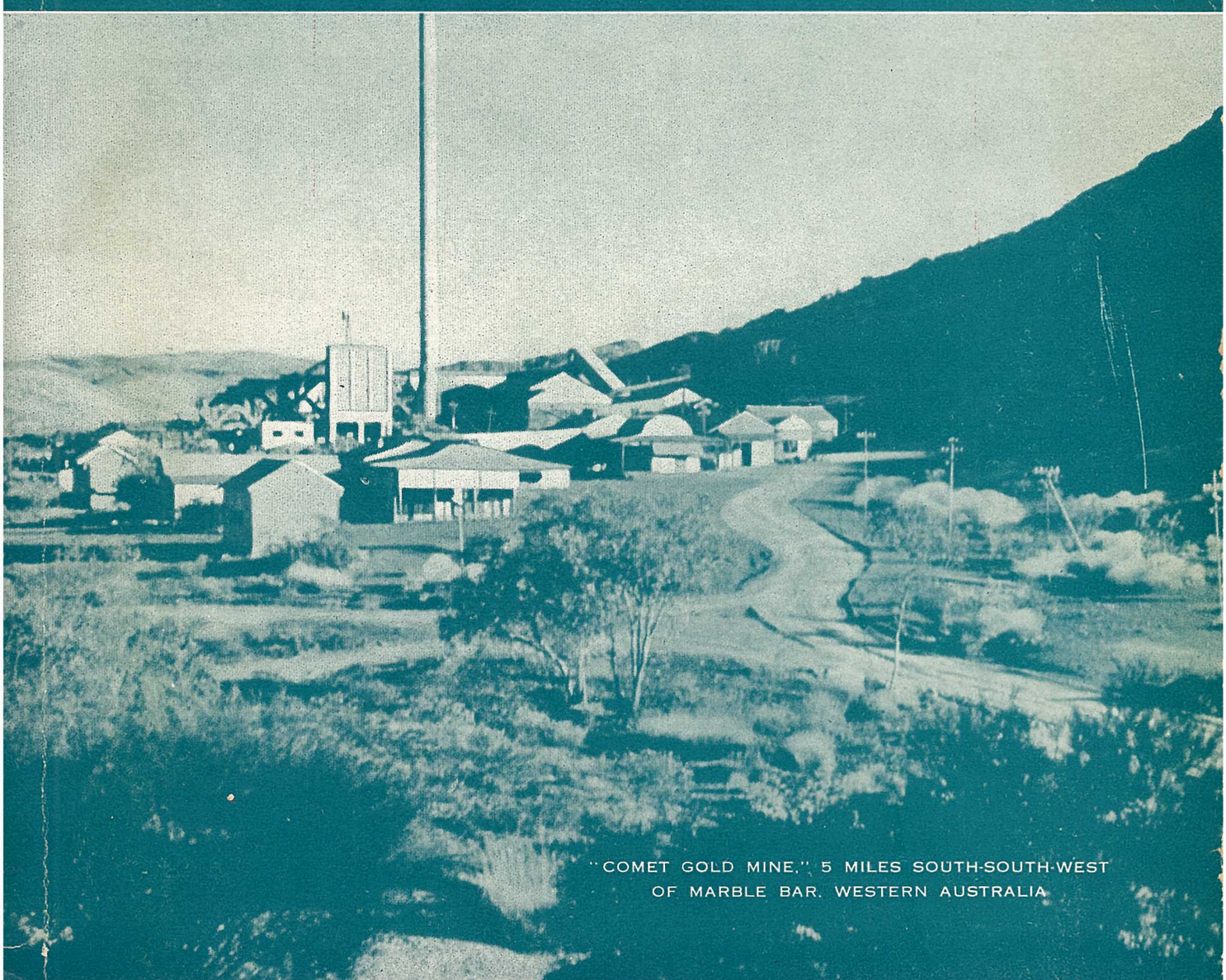
1952



"COMET GOLD MINE," 5 MILES SOUTH-SOUTH-WEST OF MARBLE BAR, WESTERN AUSTRALIA

Report of the

DEPARTMENT OF MINES

WESTERN AUSTRALIA

PRESENTED TO BOTH HOUSES OF PARLIAMENT BY HIS EXCELLENCY'S COMMAND

1954

WESTERN AUSTRALIA.

REPORT

of the

Department of Mines

FOR THE YEAR

1952

PERTH:
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ANNUAL REPORT OF THE DEPARTMENT OF MINES, WESTERN AUSTRALIA, 1952.

TABLE OF CONTENTS.

DIVISION I.

DIVISION II.

DIVISION III.

DIVISION IV.

DIVISION V.

DIVISION VI.

DIVISION VII.

DIVISION VIII.

DIVISION IX.

DIVISION X.

STATE OF WESTERN AUSTRALIA.

Report of the Department of Mines of the State of Western Australia for the Year 1952.

To the Honourable Minister for Mines.

Sir,—I have the honour to submit the Annual Report of the Department for the year 1952, together with reports from the officers controlling sub-Departments and comparative tables furnishing statistics relative to the Mining Industry.

I have etc.,

A. H. TELFER,
Under Secretary for Mines.

Perth, 30th June, 1953.

Division I.

The Honourable the Minister for Mines:

I have the honour to submit, for your information, a report on the Mining Industry for the year 1952.

The estimated value of the mineral output of the State for the year was £8,379,324 (calculating gold at £4 4s. 11.45d. per fine oz.), an increase in value of £2,731,805 compared with the preceding 12 months. The estimated value of the exchange premium paid to gold producers amounted to £A8,207,824, added to which, the overseas gold sales premium of £A539,358 received by the Gold Producers' Association Ltd. from sales of West Australian gold up to July 1952, brought the gross value of all minerals to a new record of £A17,126,506, an increase of £A4,420,278 compared to the 1951 production. The previous highest figure being £A13,228,660 for 1940.

There were increases in quantities and values of antimony, asbestos, barytes, bentonite, chromite, cupreous ore (fertiliser), corundum, dolomite, felspar, fergusonite, fullers earth, glass sand, iron-ore (export), kaolin, lead ores and concentrates, magnesite, pyrites, scheelite, silver talc, tantalo-columbite, tin, vermiculite and wolfram. Decrease in quantity and value were recorded for bismuth, clays, diatomaceous earth, glauconite, gypsum, ochre, soapstone and zinc ore (fertiliser), whilst lower production but higher value were recorded for beryl, coal, copper-ore, iron-ore (pig) and manganese.

The estimated value of gold received at the Perth Branch of the Royal Mint and exported in gold-bearing material was £A11,308,559, but with the additional overseas gold sales premium mentioned above, totalled £A11,847,917 (and equalled 69.17 per cent. of all minerals). (See footnote to Table 1 (a), Part II.)

Other minerals realised: Coal, £2,457,296; lead, ores and concentrates, £935,200; asbestos, £595,116; pyrites, £422,029; iron-ore (pig), £226,844; iron-ore (export), £203,238; silver, £80,125; tin, £68,716; wolfram, £46,018; antimony, £43,397; manganese, £35,634; gypsum, £33,257; cupreous ore (fertiliser), £21,595; clays, £18,184; talc, £14,683; beryl, £14,562; chromite, £11,100; felspar, £10,452; tantalo-columbite, £10,010; glauconite, £7,305; glass sand, £5,629; scheelite, £3,691; ochre, £3,252, magnesite, £2,842; dolomite, £2,423; bentonite, £2,036; kaolin, £1,303; copper ore, £1,188; vermiculite, £744; corundum, £380; fergusonite, £165; fullers earth, £125; and barytes, £50.

Dividends paid by mining companies amounted to £1,079,371, an increase of £78,902 when compared with the previous year (see Table 6, Part II).

To the end of 1952, the total amount distributed by gold mining companies was £48,307,803.

To the same date the progressive value of the mineral production amounted to £269,090,361, of which gold accounted for £232,861,333 based on normal values; but the premium on sale of gold during years 1920-1924, payments under the Gold Bounty Act, 1930, further exchange premiums by virtue of enhanced value since 1930, plus the additional premium from overseas sales distributed during the year, increase the total value of gold and mineral products by £103,971,680, making a gross value of £A373,062,041.

GOLD.

The quantity of gold reported as being received at the Perth Branch of the Royal Mint (720,366.44 fine oz.), together with that contained in gold-bearing material exported for treatment (9,608.62 fine oz.), totalled 729,975.06 fine oz., and exceeded that of the previous year by 102,195.97 fine oz. (*vide* Table 1 (a) of Part II).

Similarly, the total gold yield for the year reported directly to the Department by the producers was 727,467.84 fine oz., which constituted an increase of 79,233.03 fine oz. in comparison with the previous year's figures (*vide* Table 3 of Part II).

The slight variation of the two totals mentioned above, is principally due to the fact that the gold reported as being received at the mint and exported for treatment, is not all necessarily produced during the calendar year under review, a certain quantity being in the transitory stage from the producer at the end of the year. The former total is accepted as the official production of the State on account of its realised monetary value, whilst the latter is utilised mainly in tracing the gold back to its source, i.e., individual mine production to which a respective ore tonnage can be applied.

The calculated average value per ton of ore treated in the State as a whole increased from 22.281s. per ton in 1951 to 23.529s. per ton in 1952, calculating gold at the old rate of £4 4s. 11.45d. per fine ounce, but the exchange premium rate, which remained unchanged throughout the year (264.70 per cent.), would alone more than treble this estimate. For the East Coolgardie Goldfield (which produced 62.5 per cent. of the State's yield of gold), the calculated average value of the ore treated increased from 22.180s. to 22.480s. per ton. The estimates for Murchison (Big Bell Mines Ltd. and Hill 50 G.M. N.L.), Mt. Margaret (Sons of Gwalia Ltd.), Coolgardie (New Coolgardie G.Ms. N.L.), Dundas (Central Norseman Gold Corporation N.L.), were 13.842s. (13.258s.); 25.979s. (24.676s.); 45.353s. (46.961s.); and 42.027s. (25.072s.) respectively. Figures for 1951 being shown in parentheses.

The tonnage of ore reported to have been treated in 1952, viz., 2,626,612 tons, was 154,932 tons or 6.26 per cent. more than the previous year, and constituted 61.2 per cent. of the State record tonnage established in 1940.

The following tonnage increases were reported from the respective Goldfields—Ashburton 6, Peak Hill 36,090, Murchison 55,897, Mt. Margaret 8,094, North Coolgardie 14,521, North-East Coolgardie 256, East Coolgardie 16,202, Yilgarn 29,828 and Dundas 7,338; those fields showing a reduction in tonnage being Pilbara 5,627, West Pilbara 5, East Murchison 344, Yalgoo 1,759, Broad Arrow 850, Coolgardie 4,616 and Phillips River 100 tons.

East Coolgardie Goldfield recorded a net gain of only 16,200 tons despite the fact that four of the seven principal companies showed an aggregate improvement of 62,000 tons, mainly due to the 50,600 ton increase effected by the Great Boulder Pty. Ltd., and to a lesser extent by the Kalgoorlie Enterprise Mines Ltd. (6,820), Gold Mines of Kalgoorlie (3,760) and North Kalgurli (1912) Ltd. (725 tons).

Lake View & Star Ltd., Boulder Perseverance Ltd., and South Kalgurli Cons. Ltd., failed to reach their 1951 output by 4,600, 3,940, and 3,634 tons respectively whilst the contribution from the tributers on the Mt. Charlotte (Kalg.) G.Ms. Ltd. and Paringa Mining and Exploration Co. Ltd., was 23,000 tons less than when those companies were operating in the previous year.

The Anglo-Westralian Mining Pty. Ltd., in the Peak Hill Goldfield, commenced crushing in June and was responsible for the 36,000 ton increase, while the Great Western Consolidated played a similar role in the Yilgarn Goldfield with its initial run of 30,000 tons in December.

Credit for the increased output of 56,000 tons in the Murchison Goldfield was shared by Big Bell Mines Ltd. (31,150) and Hill 50 G.M. N.L. (24,450 tons).

The slightly increased tonnages treated by Sons of Gwalia Ltd. Central Norseman Gold Corporation Ltd., and Western Mining Corporation (New Callion) Leases, were reflected in the improved figures recorded in the Mt. Margaret, Dundas and North Coolgardie Goldfields respectively.

Coolgardie Goldfield showed a slight regression of 4,616 tons which approximated the reduction shown by the New Coolgardie G.M. N.L. at Hampton Plains.

The lower output which was revealed by the remaining Goldfields appeared to be of a general nature, and was most noticeable in the Pilbara field where the deficit totalled 5,600 tons.

West Australian gold included in the sales on open dollar markets by the Gold Producers' Association Ltd., from November 1951, to July 1952, totalled 515,009.08 fine oz. (or 98.03 per cent. of the State's production for the period); the extra premium received therefrom, in excess of the mint value, amounted to £A539,358, an average of 20.945s. per fine oz. This amount, less expenses of a few pence per oz., was distributed to the producer members during June, August and October.

Comparative Mineral Statistics.

	1951.	1952.	Variation.
Gold—			
Reported to Department :—			
Ore (tons)	2,471,679	2,626,612	+ 154,932 tons
Gold (fine ozs.)	648,245	727,468	+ 79,233 fine ozs.
Average Grade (dwts.)	5·245	5·539	+ 0·294 dwts.
Men employed	6,766	6,394	— 372 men
Dividends	£A1,000,469	£A1,079,371	+ £A78,902
Mint and Export :—			
Gold (fine ozs.)	627,779	729,975	+ 102,196 fine ozs.
Estimated value	£A9,725,343	£A11,847,917 (Including overseas sales premium)	+ £A2,122,574
Coal—			
Reported to Department :—			
Tons	848,475	830,461	— 18,014 tons
Value	£A1,716,788	£A2,457,296	+ £A,740,508
Men employed	1,125	1,281	+ 156 men
Other Minerals—			
Value	£A1,264,097	£A2,281,293	+ £A1,017,196
Men employed	765	964	+ 199
All Minerals—			
Value	£A12,706,228	*£A17,126,506	+ £A4,420,278
Men employed	8,656	8,639	— 17

* New Record (previous highest in 1940 = £A13,228,660.)

PART II.—MINERALS.

TABLE 1.—*Quantity and Value of Minerals, other than Gold and Silver, produced and/or exported during Years* 1951 *and* 1952.

Description of Minerals.	1951.		1952.		Increase or Decrease for year, compared with 1951.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Tons.	£A.	Tons.	£A.	Tons.	£A.
Antimony Ore and Concentrates	*Nil*	*Nil*	264·58	43,397	+ 264·58	+ 43,397
Asbestos—Chrysotile	726·55	29,301	652·35	37,255	— 74·20	+ 7,954
Crocidolite	1,392·61	196,338	2,940·09	557,861	+ 1,547·48	+ 361,523
Barytes	5·00	18	9·00	50	+ 4·00	+ 32
Bentonite	449·00	1,347	586·00	2,036	+ 137·00	+ 689
Beryl Ore	90·77	11,174	85·29	14,562	— 5·48	+ 3,388
Bismuth (lb.)	187·00	84	*Nil*	*Nil*	— 187·00	— 84
Chromite	*Nil*	*Nil*	773·00	11,100	+ 773·00	+ 11,100
Clays—Kaolin	12·00	19	267·75	1,303	+ 255·75	+ 1,284
Fireclay	8,134·00	5,770	9,608·00	9,520	+ 1,474·00	+ 3,750
Pottery (ceramic)	1,100·00	3,300	780·00	3,000	— 320·00	— 300
Cement	38,313·00	11,598	15,310·10	5,664	— 23,002·90	— 5,934
Coal	848,474·86	1,716,788	830,461·20	2,457,296	— 18,013·66	+ 740,508
Corundum	*Nil*	*Nil*	54·00	380	+ 54·00	+ 380
Copper Ore	43·13	758	15·51	1,188	— 27·62	+ 430
Cupreous Ore (Fertiliser)	1,337·05	16,104	1,643·59	21,595	+ 306·54	+ 5,491
Diatomaceous Earth	198·00	2,700	*Nil*	*Nil*	+ 198·00	+ 2,700
Dolomite....	124·25	599	555·25	2,423	+ 431·00	+ 1,824
Felspar	1,806·50	7,390	2,503·50	10,452	+ 697·00	+ 3,062
Fergusonite	*Nil*	*Nil*	·17	165	+ ·17	+ 165
Fullers Earth	*Nil*	*Nil*	25·00	125	+ 25·00	+ 125
Glass Sand	6,172·59	4,417	7,669·12	5,629	+ 1,496·53	+ 1,212
Glauconite	506·00	15,033	230·00	7,305	— 276·00	— 7,728
Gypsum	77,923·00	46,726	50,331·56	33,257	— 27,591·44	— 13,469
Iron Ore—(For Pig)	19,122·27	181,136	17,703·45	226,844	— 1,418·82	+ 45,708
(Exported)	10,384·00	10,297	204,945·00	203,238	+ 194,561·00	+ 192,941
Lead .... Silver-Lead .... Ore and concentrates Silver-Lead-Zinc	2,538·67	240,176	7,448·98	935,200	+ 4,910·31	+ 695,024
Magnesite	762·25	1,969	1,054·67	2,842	+ 292·42	+ 873
Manganese	5,256·52	33,789	5,044·80	35,634	— 211·72	+ 1,845
Ochre—Red	627·70	7,051	296·55	3,252	— 331·15	— 3,799
Yellow	60·00	840	*Nil*	*Nil*	— 60·00	— 840
Pyrites	46,615·00	296,988	53,577·00	422,029	+ 6,962·00	+ 125,041
Soapstone	38·40	125	*Nil*	*Nil*	— 38·40	— 125
Talc	651·17	7,663	1,223·61	14,683	+ 572·44	+ 7,020
Tantalite (Tant/Col. Ore and Conc.)	2·06	2,350	7·02	10,010	+ 4·96	+ 7,660
Tin	61·10	39,493	97·80	68,716	+ 36·70	+ 29,223
Tungsten—Scheelite (lb.)	317·00	215	5,139·00	3,691	+ 4,822·00	+ 3,476
Wolfram (lb.)	11,038·00	9,585	60,352·00	46,018	+ 49,314·00	+ 36,433
Vermiculite	54·50	491	62·00	744	+ 7·50	+ 253
Zinc Ore (Fertiliser)	10·70	50	*Nil*	*Nil*	— 10·70	— 50
Total	....	2,901,682	....	5,198,464	....	+ 2,296,782

TABLE 1 (a).—*Quantity and Value of Gold and Silver exported and minted during Years* 1951 *and* 1952.

	Fine Oz.	£A.	Fine Oz.	£A.	Fine Oz.	£A.
Gold (exported and minted)	627,779·09	*9,725,343	729,975·06	*11,847,917	+ 102,195·97	+ 2,122,574
Silver (exported and minted)	196,743·32	79,222	199,153·41	80,125	+ 2,410·09	+ 903
Total	....	9,804,565	....	11,928,042	....	+ 2,123,477

*Included in the value of Gold shown are the following estimated Mint premiums :—1951, £A7,058,709 ; 1952, £A8,207,824 ; and further Gold Sales Premiums received from the Sales of Gold on Overseas markets by Gold Producers Association Ltd.—1952, £A539,358.

TABLE 2.—*Value and Percentage of Mineral Exports in relation to the Value of Total Exports from Western Australia.*

Year.	Total Exports. †	Mineral Exports (exclusive of Coal).	Percentage.
	£	£	
1902	9,051,358	7,530,319	83·20
1903	10,324,732	8,727,060	84·53
1904	10,271,489	8,625,676	83·98
1905	9,871,019	7,731,954	78·33
1906	9,832,679	7,570,305	76·99
1907	9,904,860	7,544,992	76·17
1908	9,518,020	7,151,317	75·13
1909	8,860,494	5,906,673	66·66
1910	8,299,781	4,795,654	57·78
1911	10,606,863	7,171,638	67·61
1912	8,941,008	5,462,499	61·09
1913	9,128,607	4,608,188	50·48
1914	8,406,182	3,970,182	47·23
1915	6,291,934	2,969,502	47·19
1916	10,878,153	6,842,621	62·92
1917	9,323,229	5,022,694	53·87
1918	6,931,834	2,102,923	30·34
1919	14,279,240	6,236,585	43·67
1920	15,149,323	3,096,849	20·44
1921	10,331,405	1,373,810	13·30
1922	11,848,025	2,875,402	24·27
1923	11,999,500	3,259,476	27·16
1924	13,808,910	1,424,319	13·24
1925	13,642,852	173,126	1·27
1926	14,668,184	1,597,698	10·89
1927	15,805,120	472,041	2·99
1928	16,911,932	996,099	5·88
1929	16,660,742	1,802,709	10·82
1930	19,016,639	6,370,396	33·49
1931	14,266,650	4,333,421	30·37
1932	16,771,465	5,657,870	33·74
1933	18,098,214	5,328,869	29·44
1934	16,784,705	5,759,324	34·31
1935	17,611,547	5,698,721	32·36
1936	19,564,716	7,130,381	36·45
1937	21,594,942	9,026,313	41·80
1938	24,220,864	10,417,458	43·01
1939	23,244,509	11,969,562	51·49
1940	25,800,562	12,480,721	48·37
1941	24,536,777	12,411,316	50·58
1942	20,681,284	8,476,622	40·99
1943	18,014,340	6,539,295	36·30
1944	19,453,001	(a) 1,282,867	6·59
1945	20,170,624	(b) 205,587	1·02
1946	26,342,125	(b) 211,890	0·80
1947	42,389,125	(c) 4,162,892	9.82
1948	57,779,996	(b) 342,646	0·59
1949	58,197,775	(b) 465,124	0·80
1950	78,804,864	(b) 531,245	0·67
1951	*115,880,457	(a) 7,479,601	*0·64
1952	101,620,138	(d) 7,952,834	0·78
Total since 1902	1,112,392,794	261,277,266	23·48

Exclusive of Arsenic prior to 1935. * Amended figure. † Including Ships' Stores. (*a*) Only small proportion of gold production for year exported. (*b*) No gold bullion exported. (*c*) Approximately 50 per cent. of gold production for year exported. (*d*) Most of gold production for year exported

Comparative Statistical Diagrams

showing:

OUTPUT AND VALUE OF GOLD AND OTHER MINERALS, LANDS LEASED FOR GOLD MINING IN WESTERN AUSTRALIA

and the

GOLD PRODUCTION OF AUSTRALASIA FOR THE YEAR 1952

Fig. 1 Output of Gold from various Goldfields as reported to Mines Dept.

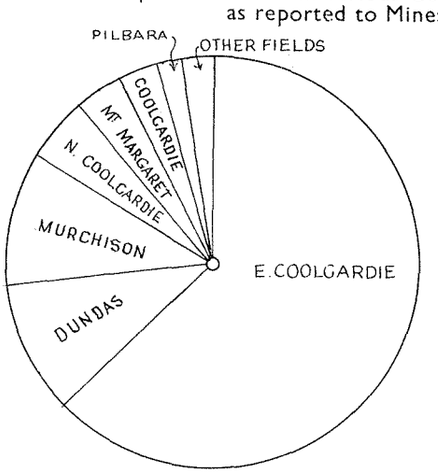


Fig. 2 Gold produced from various Goldfields as given by the Export and Mint Returns

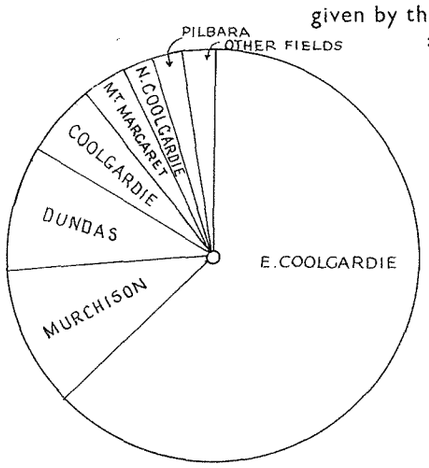


Fig. 3 Value of Gold and other Minerals

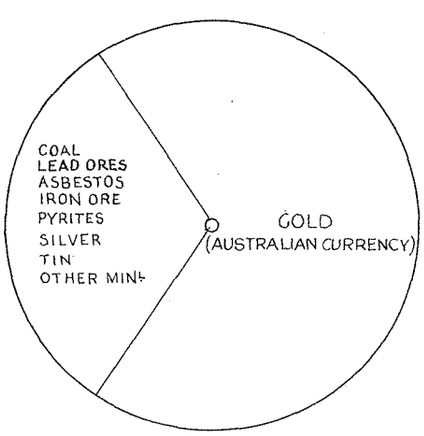


Fig. 4 Value of Minerals other than Gold

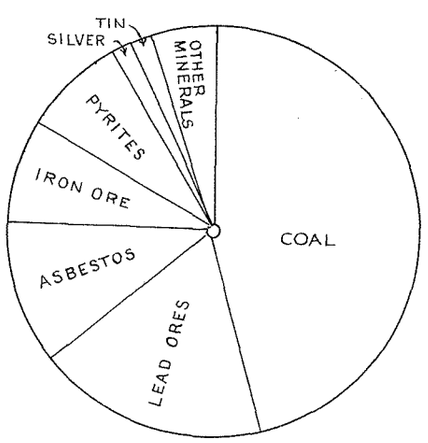


Fig. 5 Areas of land leased for Goldmining on various Goldfields

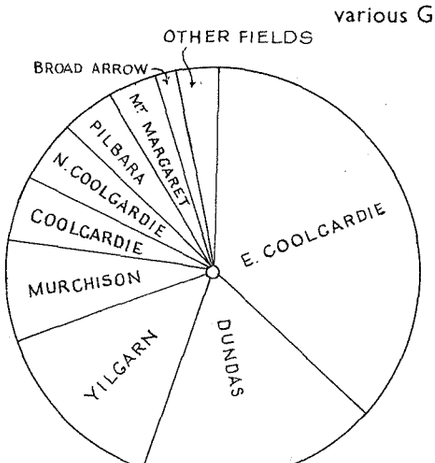


Fig. 6 Output of Gold in the States of Australia

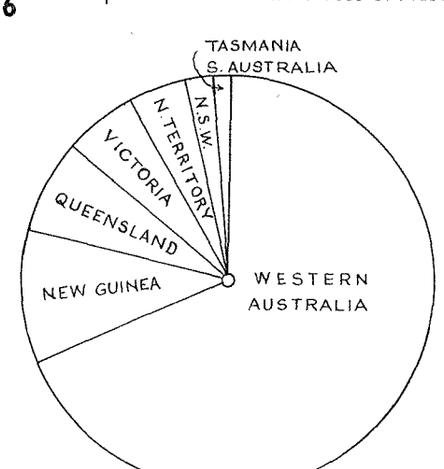


DIAGRAM OF GOLD OUTPUT

Showing Tonnage Treated (as reported to Mines Dept); the Total Output of Gold Bullion, Concentrates etc., entered for export and received at the Perth Mint, and the Estimated Value thereof, in Australian Currency.

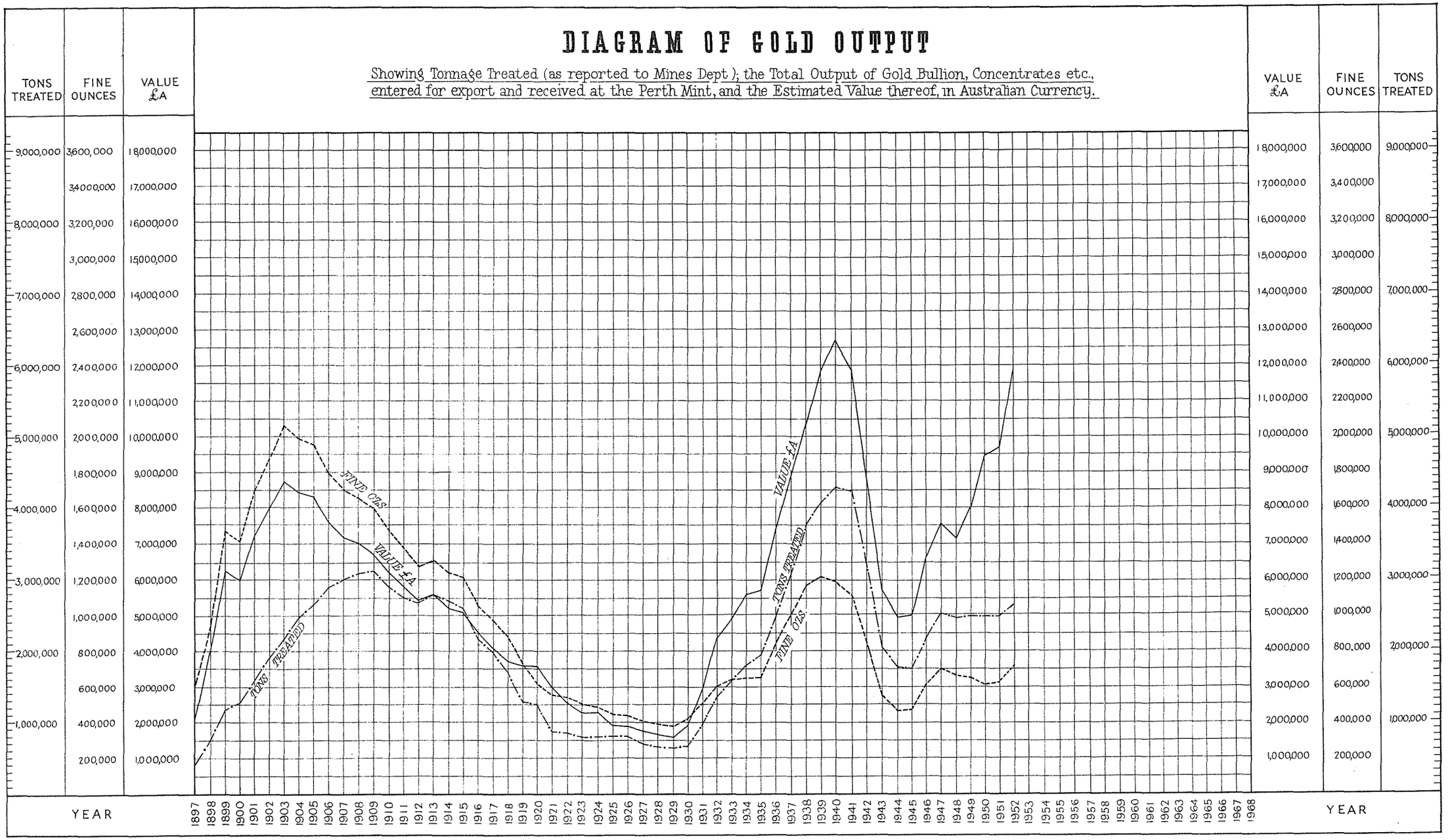


TABLE 3.

Showing for every Goldfield the amount of Gold reported to the Mines Department as required by the Regulations, also the percentage for the several Goldfields of the total reported, and the average value of the yield of Gold per ton of ore treated.

Goldfield.	Reported Yield.		Percentage for each Goldfield.		Average Value per ton of Ore Treated. (Gold at £4 4s. 11.45d. per fine oz.).	
	1951.	1952.	1951.	1952.	1951.	1952.
	Fine ozs.	Fine ozs.	%	%	Shillings.	Shillings.
1. Kimberley	119	391	·018	·054	....	....
2. West Kimberley	....	....	....	....	....	....
3. Pilbara	9,154	12,938	1·412	1·779	45·759	96·695
4. West Pilbara	21	15	·003	·002	71·864	65·110
5. Ashburton	6	18	·001	·002	....	243·872
6. Gascoyne	....	....	....	....	....	....
7. Peak Hill	271	5,603	·042	·770	49·970	15·758
8. East Murchison	890	1,350	·137	·186	91·495	237·960
9. Murchison	63,419	75,319	9·783	10·354	13·258	13·842
10. Yalgoo	1,657	454	·256	·062	63·009	72·076
11. Mt. Margaret	24,228	27,982	3·737	3·846	24·676	25·979
12. North Coolgardie	24,265	34,830	3·743	4·788	49·707	52·845
13. Broad Arrow	3,471	3,225	·536	·443	52·098	61·544
14. North East Coolgardie	345	950	·053	·131	32·133	69·030
15. East Coolgardie	444,629	454,932	68·590	62·536	22·180	22·480
16. Coolgardie	26,229	22,867	4·046	3·143	46·961	45·353
17. Yilgarn	5,180	7,480	·799	1·028	41·905	15·756
18. Dundas	44,274	78,914	6·830	10·848	25·072	42·027
19. Phillips River	63	189	·010	·026	53·894	....
20. Outside Proclaimed Goldfields	24	11	·004	·002	....	....
Totals and Averages	648,245	727,468	100·000	100·000	22·281	23·529

The total yield of the State is shown in Table 1, being the amount of the gold received at the Royal Mint, the gold exported in bullion and concentrates, and alluvial and other gold not reported to the Mines Department.

When comparisons are made as to the yield from any particular Field with the preceding year, the figures reported to the Department are used.

TABLE 4.

Average Quantities of Gold Ore raised and treated, and Gold produced therefrom, per man employed on the several Goldfields of the State, during 1951 *and* 1952.

Goldfield.	1951.				1952.			
	Tons of Gold Ore raised and treated.		Fine ounces of Gold produced therefrom.		Tons of Gold Ore raised and treated.		Fine ounces of Gold produced therefrom.	
	Per man employed underground.	Per man employed above and underground.	Per man employed underground.	Per man employed above and underground.	Per man employed underground.	Per man employed above and underground.	Per man employed underground.	Per man employed above and underground.
	Tons.	Tons.	Fine ozs.	Fine ozs.	Tons.	Tons.	Fine ozs.	Fine ozs.
1. Kimberley	....	....	11·09	2·77	....	....	....	78·11
2. West Kimberley	....	....	....	....	....	....	....	....
3. Pilbara	236·03	106·21	127·13	57·21	155·70	63·85	177·22	72·68
4. West Pilbara	12·50	4·17	10·58	3·52	20·00	6·66	15·33	5·11
5. Ashburton	....	....	....	3·26	....	....	....	....
6. Gascoyne	....	....	....	....	....	....	....	....
7. Peak Hill	38·33	8·21	22·55	4·83	3,322·81	514·80	509·35	78·91
8. East Murchison	59·00	14·00	63·54	15·08	37·07	9·64	103·85	27·00
9. Murchison	1,188·19	563·61	185·43	87·96	1,566·97	746·78	255·31	123·29
10. Yalgoo	208·51	69·50	150·63	50·21	59·44	24·31	50·43	20·63
11. Mt. Margaret	443·67	204·44	128·87	59·38	598·07	258·49	182·89	79·04
12. North Coolgardie	246·85	118·83	144·43	69·53	368·36	177·75	229·14	110·57
13. Broad Arrow	62·17	30·42	38·15	18·66	60·09	28·61	40·31	19·20
14. North-East Coolgardie	65·23	27·67	24·67	10·47	53·16	22·49	43·19	18·27
15. East Coolgardie	903·95	475·84	236·00	124·23	977·39	501·38	258·63	132·67
16. Coolgardie	232·59	130·71	128·57	72·53	231·53	135·54	123·60	72·36
17. Yilgarn	75·01	29·09	37·00	14·29	268·85	97·88	49·86	18·15
18. Dundas	634·09	377·62	184·47	109·86	712·13	411·13	352·29	203·38
19. Phillips River	25·00	6·67	15·86	4·23	....	....	94·52	15·75
20. Outside Proclaimed Goldfields	....	....	....	....	....	....	....	....
Total Averages	729·54	366·61	191·33	96·15	839·44	410·79	232·49	113·77

TABLE 5.

Output of Gold from the several States of Australia, the Northern Territory, Papua, the Mandated Territory of New Guinea, and the Dominion of New Zealand, during 1952.

State.	Output of Gold.	Value.*	Percentage of Total.	
			Output of Commonwealth.	Output of Australasia.
	Fine ozs.	£	%	%
1. Western Australia	729,975	3,100,735	65·798	62·456
2. Victoria	66,777	283,650	6·019	5·713
3. New South Wales	39,030	165,789	3·518	3·339
4. Queensland	84,642	359,536	7·629	7·242
5. Tasmania	16,072	68,269	1·449	1·375
6. South Australia	437	1,856	0·042	0·039
7. Papua & Mandated Territory of New Guinea	127,580	541,925	11·499	10·915
8. Northern Territory	44,894	190,697	4·046	3·841
9. New Zealand	59,373	252,200	....	5·080
Total	1,168,780	4,964,657	100·000	100·000

* At £4 4s. 11·45d. per fine ounce.

TABLE 6.

Dividends, etc., paid by Western Australian Mining Companies during 1952, *and the Total to date.*

(Mainly compiled from information supplied to the Government Statistician's Office by the Chamber of Mines of Western Australia.)

Goldfield.	Name of Company.	Dividends Paid.	
		1952.	Grand Total to end of 1952.
		£	£
Pilbara	Various Companies	....	26,513
Peak Hill	do. do.	....	199,305
East Murchison	do. do.	....	1,914,053
Murchison	Hill 50 Gold Mine, N.L.	28,125	296,876
	Various Companies	....	2,764,945
Mt. Margaret	Sons of Gwalia, Ltd.	....	2,075,050
	Various Companies	....	958,286
North Coolgardie	do. do.	....	712,551
Broad Arrow	do. do.	....	92,500
North-East Coolgardie	do. do.	....	129,493
East Coolgardie	Boulder Perseverance, Ltd.	21,076	(*a*) 2,656,654
	Golden Horseshoe (New), Ltd.	11,458	(*b*) 4,090,212
	Gold Mines of Kalgoorlie (Aust.), Ltd.	96,055	971,111
	Great Boulder Proprietary G.M's., Ltd.	62,500	7,434,400
	Kalgoorlie Enterprise Mines Ltd.	....	287,375
	Lake View & Star, Ltd.	437,500	(*c*) 6,087,000
	North Kalgurli (1912), Ltd.	85,938	1,643,124
	Paringa Mining & Exploration Co., Ltd.	....	347,040
	South Kalgurli Consolidated, Ltd	11,719	1,218,473
	Various Companies	....	10,754,854
Coolgardie	do. do.	....	388,700
Yilgarn	do. do.	....	(*d*) 1,205,556
Dundas	Central Norseman Gold Corporation, N.L.	325,000	1,267,500
	Various Companies	....	786,162
	Totals	1,079,371	48,307,803

(*a*) Also £45,091 in bonuses and profit-sharing notes in years 1935–36. (*b*) Also £55,000 Capital returned in year 1932 and £42,000 in bonuses and profit-sharing notes in year 1934. (*c*) Also £75,000 in bonuses and profit-sharing notes and £93,750 Capital returned in years 1932–35. (*d*) Also £67,725 Capital returned in 1948 by Edna May (W.A.) Amalgamated, N.L.

TABLE 7.

Quantity and Value of Minerals, other than Gold and Silver, reported to the Mines Department during 1952.

Goldfield, District or Mineral Field.	1952.		Increase or Decrease as compared with 1951.	
	Quantity.	Value.	Quantity.	Value.
	Tons.	£A.	Tons.	£A.
ANTIMONY ORE AND CONCENTRATES—				
Pilbara (Nullagine)	264·58	43,397	+ 264·58	+ 43,397
ASBESTOS (Chrysotile)—				
Pilbara	192·72	3,084	+ 83·22	+ 1,223
West Pilbara	459·63	34,171	— 157·42	+ 6,731
ASBESTOS (Crocidolite)—				
West Pilbara	2,940·09	557,861	+ 1,547·48	+ 361,523
BARYTES—				
Murchison (Meekatharra)	9·00	50	+ 9·00	+ 50
Outside Proclaimed Goldfield	....	....	— 5·00	— 18
BENTONITE—				
Outside Proclaimed Goldfield	586·00	2,036	+ 137·00	+ 689
BERYL ORE—				
Pilbara	69·69	11,541	+ 4·51	+ 3,568
Coolgardie	14·03	2,737	— 2·11	+ 446
Outside Proclaimed Goldfield	1·57	284	— 7·88	— 626
BISMUTH—	lb.		lb.	
Outside Proclaimed Goldfield	....	....	— 187·00	84
CHROMITE—	Tons.		Tons.	
Peak Hill	773·00	11,100	+ 773·00	11,100
CLAYS (including Kaolin)—				
Murchison	41·75	207	+ 41·75	207
Outside Proclaimed Goldfield	25,924·10	19,280	— 21,634·90	— 1,407
COAL—				
Collie	830,461·20	2,457,296	— 18,013·66	+ 740,508
COPPER ORE, ETC.—				
Pilbara	15·51	1,094	+ 2·21	1,017
Ashburton	....	....	— 23·70	493
Mt. Margaret	....	....	— 1·30	50
Phillips River (Copper precipitates)	....	94	— 4·83	— 44
CORUNDUM—				
East Murchison (Lawlers)	54·00	380	....	....
CUPREOUS ORE (Fertiliser)—				
Pilbara	91·71	637	....	....
West Pilbara	910·19	6,933	+ 11·98	— 3,538
Ashburton	1·75	31	— 37·91	— 463
Peak Hill	229·04	7,080	+ 207·04	+ 6,420
East Murchison	340·05	5,496	+ 71·12	+ 2,417
Yalgoo	....	....	— 40·00	— 240
Mt. Margaret	6·85	96	— 5·70	— 29
Phillips River	64·00	1,322	+ 8·30	+ 287
DIATOMACEOUS EARTH—				
Outside Proclaimed Goldfield	....	....	— 198·00	— 2,700
DOLOMITE—				
Murchison (Mt. Magnet)	555·25	2,423	+ 431·00	+ 1,824
FELSPAR—				
Coolgardie	2,503·50	10,452	+ 697·00	+ 3,062
FERGUSONITE—				
Pilbara (Marble Bar)	·17	165	+ ·17	+ 165
FULLERS EARTH—				
Outside Proclaimed Goldfield	25·00	125	+ 25·00	+ 125
GLASS SAND—				
Outside Proclaimed Goldfield	7,669·12	5,629	+ 1,496·53	+ 1,212
GLAUCONITE (recovered)—				
Outside Proclaimed Goldfield	230·00	7,305	— 276·00	— 7,728
GYPSUM—				
Yilgarn	34,054·00	21,692	— 29,762·00	— 14,879
Dundas	21·00	53	+ 14·00	+ 34
Outside Proclaimed Goldfield	16,256·56	11,512	+ 2,156·56	+ 1,376

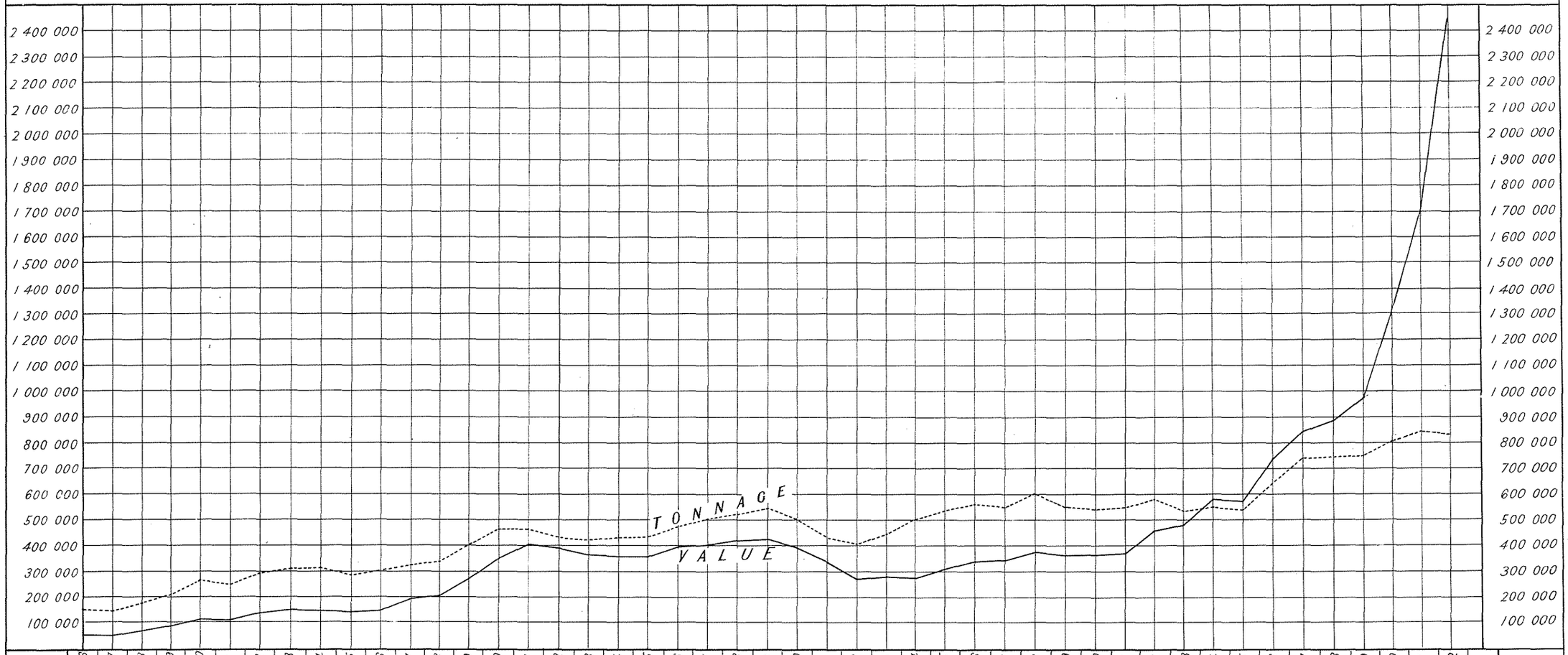
TABLE 7—*continued.*

Quantity and Value of Minerals, other than Gold and Silver, reported to the Mines Department during 1952—*continued.*

Goldfield, District or Mineral Field.	1952.		Increase or Decrease as compared with 1951.	
	Quantity.	Value.	Quantity.	Value.
IRON ORE (for Pig Iron)—				
Yilgarn	12,994·90	179,405	— 634·18	+ 40,190
Outside Proclaimed Goldfield	4,708·55	47,439	— 784·64	+ 5,518
IRON ORE (exported)—				
West Kimberley	204,945·00	203,238	+ 194,561·00	+ 192,941
LEAD ORES AND CONCENTRATES—				
Northampton	5,699·39	783,186	+ 4,177·77	+ 635,118
Kimberley	2·73	291	+ 2·73	+ 291
Pilbara	420·30	36,827	+ 118·58	+ 11,135
West Pilbara	30·79	3,176	+ 12·65	+ 887
Ashburton	979·20	96,977	+ 331·04	+ 35,418
West Kimberley	316·57	14,743	+ 267·54	+ 12,175
MAGNESITE—				
East Coolgardie	....	....	— 418·00	— 1,099
Coolgardie	1,054·80	2,842	+ 710·55	+ 1,972
MANGANESE—				
Peak Hill	5,044·80	35,634	— 211·72	+ 1,845
OCHRE (Red)—				
West Pilbara	....	....	— 15·60	— 234
Murchison	296·55	3,252	— 315·55	— 3,565
OCHRE (Yellow)—				
Murchison	....	....	— 60·00	840
PYRITES ORE AND CONCENTRATES—				
Dundas	53,577·00	422,029	+ 6,962·00	125,041
SOAP-STONE—				
Outside Proclaimed Goldfield	....	....	— 38·40	— 125
TALC—				
East Coolgardie	68·25	273	+ 13·55	+ 41
Outside Proclaimed Goldfield	1,155·36	14,410	+ 558·89	+ 6,979
TANTALO/COLUMBITE ORE AND CONCENTRATES—	lb.		lb.	
Greenbushes	8,126·00	6,056	+ 3,512·00	+ 3,706
Pilbara	3,071·00	1,555	+ 3,071·00	+ 1,555
Coolgardie	4,523·00	2,399	+ 4,523·00	+ 2,399
TIN—	Tons.		Tons.	
Greenbushes	35·88	23,962	+ 13·44	6,108
Kimberley	·06	42	— ·11	— 75
West Kimberley	·15	120	....	+ 5
Pilbara	59·85	43,305	+ 21·54	+ 21,916
West Pilbara	1·86	1,287	+ 1·83	+ 1,269
TUNGSTEN (Scheelite)—	lb.		lb.	
East Murchison	141·00	52	+ 141·00	+ 52
Mt. Margaret	2,911·00	2,255	+ 2,827·00	+ 2,204
Coolgardie	2,087·00	1,384	+ 1,854·00	+ 1,220
TUNGSTEN (Wolfram)—				
Pilbara	46,883·00	37,686	+ 38,604·00	+ 30,294
Murchison	12,177·00	7,537	+ 9,418·00	+ 5,344
Yalgoo	1,292·00	795	+ 1,292·00	+ 795
VIRMICULITE—	Tons.		Tons.	
Outside Proclaimed Goldfield	62·00	744	+ 7·50	+ 253
ZINC ORE (Fertiliser)—				
Pilbara	....	....	— 10·70	— 50

GRAPH OF COAL OUTPUT

Showing Quantities and Values as reported to Mines Dept.



YEAR	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	YEAR
VALUE £A	57998	55158	75694	90965	113699	111154	135857	153614	148684	137589	147823	191822	204319	270355	350346	407117	381555	368949	363255	363203	394400	407967	420145	426706	394758	336178	270630	289806	278704	318013	331565	340444	375083	362811	364500	389278	461495	489721	583075	572896	730104	840249	880236	972245	1287749	1716788	2457296	VALUE £A
TONS	149765	142373	175248	214302	262166	249890	295079	313818	319210	286666	301526	326550	337039	401713	462021	468817	438443	420714	421864	437461	474819	501505	528420	544719	501425	432400	415719	458389	500343	537188	565075	553510	604783	557535	539427	556574	581176	531546	558322	543363	642287	730506	732938	750594	814351	848475	830461	TONS

GRAPH SHOWING
ANNUAL TREND IN OUTPUTS

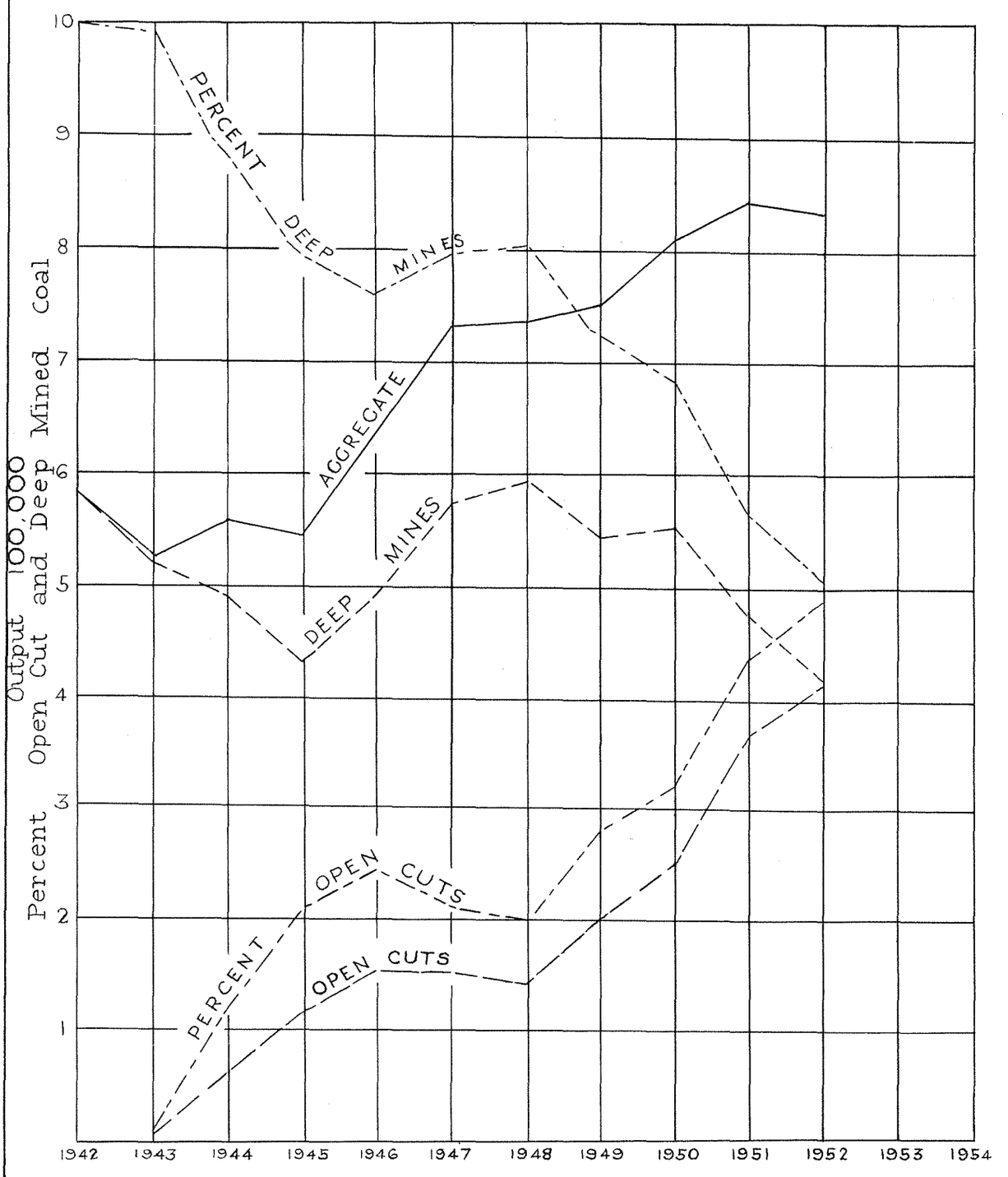


TABLE 8.

Total Coal output from Collie Coalfield during 1951 *and* 1952, *estimated Value thereof, Number of Men employed, and Output per Man as reported Monthly.*

Year.	Total. Output.	Estimated Value.	Men Employed.			Output per Man Employed.		
			Above ground.	Under ground.	Above and under ground.	Above ground.	Under ground.	Above and under ground.
	tons.	£A.	No.	No.	No.	tons.	tons.	tons.
Deep Mining—								
1951	480,145	987,189	264	689	953	1,819	697	504
1952	419,117	1,291,968	309	717	1,026	1,356	584	408
Open Cut Mining—								
1951	368,330	729,599	172	....	172	2,141	....	2,141
1952	411,344	1,165,328	255	....	255	1,613	....	1,613
Totals—								
1951	848,475	1,716,788	436	689	1,125	1,946	1,231	754
1952	830,461	2,457,296	564	717	1,281	1,472	1,158	648

PART III.—LEASES AND OTHER HOLDINGS UNDER THE VARIOUS ACTS RELATING TO MINING.

TABLE 9.

Total Number and Acreage of Lease, Mineral Claims and Prospecting Areas held for Mining on the 31*st December,* 1951 *and* 1952.

Leases and Other Holdings.	1951.		1952.	
	No.	Acreage.	No.	Acreage.
Gold Mining Leases on Crown Lands	1,410	25,939	1,451	27,617
Gold Mining Leases on Private Property	26	624	25	600
Minerals Leases on :—				
(a) Crown Lands	260	43,586	251	43,294
(b) Private Property	20	1,770	21	2,079
Mineral Claims	284	18,279	244	19,638
Prospecting Areas	*451	7,850	†513	12,565
Totals	2,450	98,048	2,305	105,793

* Includes 61 Prospecting Areas for Minerals of a total of 1,413 acres.

† Includes 97 Prospecting Areas for Minerals of a total of 5,297 acres.

PART IV.—MEN EMPLOYED.

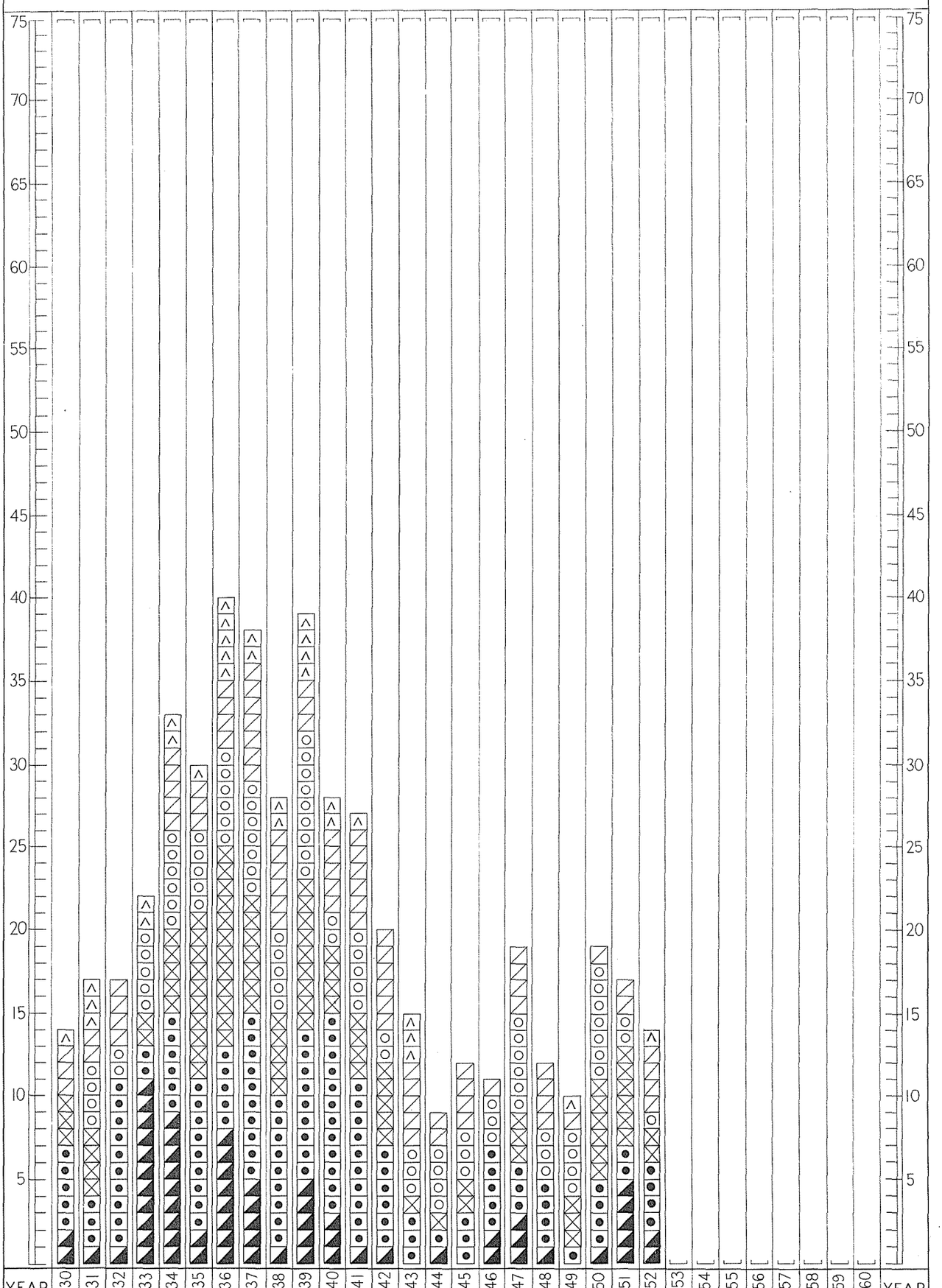
TABLE 10.

Average number of Men reported as engaged in Mining during 1951 *and* 1952.

Goldfield.	District.	Reef or Lode.		Alluvial.		Total.	
		1951.	1952.	1951.	1952.	1951.	1952.
Kimberley		8	5	....	....	8	5
West Kimberley		....	....	....	....	....	....
Pilbara	Marble Bar	80	85	....	....	80	85
	Nullagine	80	93	....	....	80	93
West Pilbara		6	3	....	....	6	3
Ashburton		2	....	....	....	2	....
Gascoyne		....	....	....	....	....	....
Peak Hill		56	71	....	....	56	71
East Murchison	Lawlers	12	14	....	....	12	14
	Wiluna	36	26	....	....	36	26
	Black Range	11	10	....	....	11	10
Murchison	Cue	518	439	....	....	518	439
	Meekatharra	53	39	....	....	53	39
	Day Dawn	29	14	....	....	29	14
	Mt. Magnet	121	127	....	....	121	127
Yalgoo		33	22	....	....	33	22
Mt. Margaret	Mt. Morgans	43	35	....	....	43	35
	Mt. Malcolm	295	265	....	....	295	265
	Mt. Margaret	70	54	....	....	70	54
North Coolgardie	Menzies	172	160	3	5	175	165
	Ularring	80	78	3	3	83	81
	Niagara	29	24	....	....	29	24
	Yerilla	68	43	2	2	70	45
Broad Arrow		186	163	3	5	189	168
North-East Coolgardie	Kanowna	24	40	3	4	27	44
	Kurnalpi	9	6	2	2	11	8
East Coolgardie	East Coolgardie	3,561	3,408	5	6	3,566	3,414
	Bulong	18	12	3	3	21	15
Coolgardie	Coolgardie	328	298	....	....	328	298
	Kunanalling	35	18	....	....	35	18
Yilgarn		361	412	....	....	361	412
Dundas		403	388	....	....	403	388
Phillips River		15	12	....	....	15	12
State Generally		....	....	....	....	....	....
Total—Gold Mining		6,742	6,364	24	30	6,766	6,394
MINERALS OTHER THAN GOLD.							
Asbestos		179	228	....	....	179	228
Bentonite		2	4	....	....	2	4
Beryl		6	11	....	....	6	11
Clays (including Kaolin)		9	9	....	....	9	9
Coal		1,125	1,281	....	....	1,125	1,281
Copper Ore		....	2	....	....	....	2
Cupreous Ore (Fertiliser)		13	18	....	....	13	18
Diatomaceous Earth		1	....	....	....	1	....
Dolomite		2	1	....	....	2	1
Felspar		6	10	....	....	6	10
Glass Sand		4	4	....	....	4	4
Glauconite		3	2	....	....	3	2
Gypsum		36	43	....	....	36	43
Iron Ore		124	127	....	....	124	127
Lead		189	250	....	....	189	250
Magnesite		3	3	....	....	3	3
Manganese		1	2	....	....	1	2
Ochre—Red and Yellow		3	2	....	....	3	2
Pyrites		138	188	....	....	138	188
Talc		5	5	....	....	5	5
Tin		33	36	....	....	33	36
Tungsten Ore (Scheelite)		2	5	....	....	2	5
Tungsten Ore (Wolfram)		4	12	....	....	4	12
Vermiculite		2	2	....	....	2	2
Total, Other Minerals		1,890	2,245	....	....	1,890	2,245
GRAND TOTAL		8,632	8,609	24	30	8,656	8,639

DIAGRAM OF ACCIDENTS

Showing the number of Deaths, arranged in Six Classes, in the Mines of Western Australia, from 1930 onwards



PART V.—ACCIDENTS.

TABLE 11.

MEN EMPLOYED IN MINES KILLED AND INJURED IN MINING ACCIDENTS DURING 1951 AND 1952.

A.—*According to Locality of Accident.*

Goldfield.	Killed.		Injured.		Total Killed and Injured.	
	1951.	1952.	1951.	1952.	1951.	1952.
1. Kimberley	....	....	....	....	....	....
2. West Kimberley	....	....	5	3	5	3
3. Pilbara	....	....	1	6	1	6
4. West Pilbara	....	....	12	8	12	8
5. Ashburton	....	....	....	1	....	1
6. Gascoyne	....	....	....	....	....	....
7. Peak Hill	....	....	2	4	2	4
8. East Murchison	....	....	....	....	....	....
9. Murchison	2	1	41	37	43	38
10. Yalgoo	....	....	....	....	....	....
11. Mount Margaret	3	1	16	11	19	12
12. North Coolgardie	....	1	12	16	12	17
13. North-East Coolgardie	....	....	....	....	....	....
14. Broad Arrow	....	....	....	....	....	....
15. East Coolgardie	9	8	358	305	367	313
16. Coolgardie	....	....	23	17	23	17
17. Yilgarn	1	....	23	17	24	17
18. Dundas	....	2	25	50	25	52
19. Phillips River	....	....	1	....	1	....
Mining Districts—						
Northampton	....	....	7	25	7	25
Greenbushes	....	....	....	....	....	....
Collie	2	2	151	103	153	105
South-West	2	1	8	6	10	7
Totals	19	16	685	609	704	625

From the above Table it will be seen that the number of fatal accidents for the year 1952 was 16 as against 19 in 1951. The number injured showed a decrease of 76. These accidents (excluding coal) are classified according to their causes in the report of the State Mining Engineer, Division II.

B.—*According to Causes of Accidents.*

Cause.	1951.		1952.		Comparison with 1951.	
	Fatal.	Serious.	Fatal.	Serious.	Fatal.	Serious.
1. Explosives	5	2†	2	6	— 3	4
2. Falls of Ground	4	62‡	5	50	1	— 12
3. In Shafts	6	13	2	17	— 4	4
4. Miscellaneous Underground	2	443	2	403	....	— 40
5. Surface	2*	165	4§	129‖	2	— 36
6. Fumes	....	....	1	4	1	4
Totals	19	685	16	609	— 3	— 76

* Fatal accidents in quarries. † Includes 1 serious accident in a quarry. ‡ Includes 1 serious accident in a quarry. § Includes 1 fatal accident in a quarry. ‖ Includes 6 serious accidents in quarries.

Generally speaking the mining industry experienced a reasonably successful year. Gold producers benefited by the premium obtained through disposal on the open market, and mineral producers found markets generally buoyant.

There was not the scarcity of labour experienced in previous years, while stores, plant and machinery were also more readily obtainable.

Costs continued to rise however and this constitutes a continuous anxiety for gold producers, which will be accentuated should any sustained drop in premium sales occur.

As I write also the mineral and metal markets in regard to certain items have shown a tendency to fall and this position will be very closely watched by all producers.

It is however, a "metal" age, and with the exciting new discoveries in the field of science and metallurgy in the world today, the demand for minerals and metals must extend. Our own State now being developed on modern lines is an example of the present day many uses for metals and minerals, as a survey of industry, transport, power, building and even the domestic scene will show.

The Mines Department has the facilities and is anxious to examine, identify and test any samples which prospectors and miners may obtain during the course of their operations and which may be unfamiliar to them.

There are demands today for minerals not previously used, and for many of the rarer ones which are difficult for the prospector to identify.

The Department during the year commenced the erection of a treatment plant at Northampton. It is primarily designed to treat lead, which is the main deposit in this district, but is capable of handling also such ores as those of tin, tantalite, columbite, scheelite and wolfram from which concentrates can be produced, while the plant will also crush copper ores to the required fineness for use in fertilisers for which a considerable market exists in Western Australia today. It is anticipated that the mill will recover over 90 per cent. of lead from a reasonably clean lead ore, and 80 per cent. from wolfram, scheelite and similar ores.

This plant should offer encouragement to prospectors to produce these ores.

The Department continued its diamond drilling operations at Collie with two drills, and at Koolyanobbing with one drill.

The results in both instances were excellent. New seams of coal have been located at Collie, and a fine iron and pyrite ore-body disclosed at Koolyanobbing.

At Collie mechanisation and development of the deep mines proceeded, and the lag in coal production as compared with demand was being gradually corrected.

The search for oil was actively pursued in the North-West Cape area, a number of geological and geophysical survey parties being employed. In this regard the year 1953 will see the commencement of deep drilling by the company concerned, and the results will be awaited with very great interest, as the discovery of oil in economic quantities would be of inestimable benefit to the State.

ASSISTANCE UNDER THE MINING DEVELOPMENT ACT, 1902.

The following statement shows the sums advanced during the year 1952 under this Act:—

		£ s. d.
1.	Advanced in aid of mining work and equipment of mines with machinery	286,390 19 10
*2.	Subsidies on stone crushed for public, being amounts paid to owners of plants crushing at fixed rates.	
3.	Providing means of transport, equipment and sustenance for prospectors	3,073 4 8
4.	Other assistance	404 13 11
		289,868 18 5

* Now C.R.F.

The receipts under this Act, exclusive of interest payments amounted to:—

		£ s. d.
1.	Refunds of advances	44,156 7 1
2.	Prospecting refunds	624 6 9
		44,780 13 10

For the year 1951, the amount of assistance advanced under this Act was £171,358 4s. 9d.

PART VI—STATE AID TO MINING.

(a) State Batteries.

The number of State batteries existing at the end of the year was 19, and there were no leased mills. Towards the end of the year a start was made in the erection at Northampton of a plant to treat lead and other base metal ores. From inception to the end of 1952 gold, tin and tungsten ores to the value of £15,214,287, including gold premium estimated at £4,895,299, have been put through State batteries. Additional premium paid to the prospector from sales of gold by the Gold Producers Association Ltd., amounts to £28,851, and is included in the above total figure. Of this amount £15,103,212, came from 2,968,952 tons of gold ore, £94,455 from 81,810 tons of tin ore and £16,620 from 3,595 tons of tungsten ore.

During the year 42,270 tons of ore were crushed for 20,502 oz. of bullion estimated to contain 17,386 oz. of fine gold or 8 dwt. 3.5 gr. of gold per ton of ore. The average value of sands before cyanidation was 3 dwt. 19 gr., making the average head value 11dwt. 22.5 gr. 6,712 oz. of fine gold were produced from cyanide plants giving a total estimated production for the year of 24,098 fine oz., which realised £402,214, including Gold Producers' premium. In addition 3,183 tons of tungsten ores were crushed for 21,157 lb. of concentrates which yielded £13,224. Thus the grand total monetary yield from all operations was £415,438.

The working expenditure for all plants was £148,448, and the revenue was £76,580, so that the working loss was £71,868 which does not include depreciation or interest. The capital expenditure since inception of the scheme has been £601,107 7s. 4d., made up of £427,609 11s. 4d. from the General Loan Fund, £131,089 14s. 7d. from Consolidated Revenue, £28,621 13s. 5d. from Assistance to the Gold Mining Industry and £13,786 8s. from Commonwealth Assistance to Metalliferous Mining.

Head office expenditure including insurance under the Workers' Compensation Act and Pay Roll Tax was £13,352 12s. 5d. as against £11,266 10s. 1d. for 1951.

The working expenditure from inception to the end of the year exceeds revenue by £397,745 19s. 11d.

(b) Geological Survey of Western Australia.

The principal work of the Geological Survey for the year 1952 is covered by the following reports published in Division IV of this report:—

Koolyanobbing Iron Ore Deposits—Examination for radioactive minerals.
Report on Radioactivity at Wilgie Mia Cave—Mineral Claim 26.
Wongong Brook, S.-W. Division—Proposed dam site.
Report on Diamond Drilling Ahead of Existing Collieries, Collie Mineral Field, W.A.—II. Wyvern Colliery.
Report on Diamond Drilling Ahead of Existing Collieries, Collie Mineral Field, W.A.—III. Stockton Colliery.
Report on Further Prospecting on a Portion of Prospecting Area No. 53 (now Western No. 1 Colliery), Collie Mineral Field, W.A.
Report on Exploratory Drilling for Water, Esperance Plain.
Geraldton Water Supply—Report on the Wicherina Basin.
Report on the Northampton Mineral Field.
Report on P.A. 6668 (Paris Group), Coolgardie G.F.
Notes on a Talc Deposit near Bolgart.

Report on Water Supply on Binneringie Station.

Notes on "Coodawa" Talc Deposit.

Report on Water Supply on Warroora Station.

Report on Bentonite on M.C. 456H, Marchagee, South-West Division.

Report on Bentonite Deposit on M.C. 452H, Marchagee, South-West Division.

Report on Silica Sands on M.C. 453H,, two miles East of Donnybrook, South-West Division.

Report on some Manganese Deposits in the North-West Division, Western Australia.

Progress Report on the Geological Survey of the Ravensthorpe District, Phillips River G.F., W.A.

Report on Cattlin Creek Spodumene Pegmatite, Phillips River G.F., W.A.

Report on the Cattlin Mining Group, Ravensthorpe, Phillips River G.F., W.A.

During the year the following publications were issued:—

Annual Progress Report of the Geological Survey of Western Australia for 1949.

Bulletin No. 103: Geology of Portion of the Mt. Margaret Goldfield, by R. A. Hobson, B.Sc. (Hons.), and K. R. Miles, D.Sc. Atlas No. 1 (text already issued).

Bulletin No. 95 (Third Edition): The Physiography of Western Australia, by J. T. Jutson, B.Sc., LL.B.

Bulletin No. 105: The Collie Mineral Field, Part I, by J. H. Lord, B.Sc.

The following publications are still in the Press:—

Annual Progress Report of the Geological Survey of Western Australia for 1950 and 1951.

Bulletin No. 103: Atlas No. 2 (Text and Atlas No. 1 already issued).

Bulletin No. 107: A re-survey of the Coolgardie District, W.A., by J. C. McMath, B.Sc., and N. M. Gray, B.Sc.

Geological and Economic Maps of the Metropolitan Area.

The following reports have been compiled and await publication:—

Mineral Resources of Western Australia Bulletin No. 6: Silver, Lead and Zinc, by W. Johnson, B.Sc. (Hons.).

Mineral Resources of Western Australia Bulletin No. 7: Vermiculite, Talc and Soapstone, Fuller's Earth, Bentonite and Diatomite, by W. Johnson, B.Sc. (Hons.).

Bulletin No. 108: The Geology of the Irwin River and Eradu Coal Basins, by W. Johnson, B.Sc. (Hons.), J. S. Gleeson, B.Sc., and L. E. de la Hunty, B.Sc.

In course of preparation:—

Mineral Resources of Western Australia Bulletin No. 8: Gypsum, by L. E. de la Hunty, B.Sc., and G. H. Low, B.Sc.

Officers of the survey have rendered varied types of practical assistance to individuals, syndicates and companies, as well as other Government Departments who have been concerned with the exploration of mineral and water resources in all parts of the State.

PART VII—INSPECTION OF MACHINERY.

The Chief Inspector of Machinery reports that the number of useful boilers registered at the end of the year totalled 6,641 against 6,427 total for the preceding year, showing an increase after all adjustments of 214 boilers.

Of the total 6,641 useful boilers, 3,512 were out of use at the end of the year, 2,797 thorough and 907 working inspections were made and 3,139 certificates were issued.

Permanent condemnations totalled 38 and temporary condemnations 6. Three boilers were transferred beyond the jurisdiction of the Act.

The total number of machinery groups registered was 30,230 against 28,260 for the previous year, showing an increase of 1,970.

Inspections made total 25,883 and 5,378 certificates were granted.

The total miles travelled for the year were 85,839 against 71,228 miles for the previous year, showing increase of 2,078 miles. The average miles travelled per inspection were 3.31 as against 2.91 miles per inspection for the previous year.

Three hundred and four applications for engine drivers' and boiler attendants' certificates were received and dealt with, and 265 certificates, all classes were granted as follows:—

Winding Competency (including certificates issued under regulation 40 and section 60)	6
First Class Competency (including certificates issued under regulations 40 and 45, and sections 60 and 63)	14
Second Class Competency (including certificates issued under regulation 40 and section 60)	16
Third Class Competency (including certificates issued under regulations 40 and 45 and sections 60 and 63 of the Act)	24
Locomotive Competency (including certificates issued under regulation 40 and section 60)	1
Internal Combustion Competency (including certificates issued under regulation 40 and section 60)	52
Crane and Hoist Competency (including certificates issued under regulation 40 and section 60)	76
Boiler Attendants' Competency (including certificates issued under regulation 40 and section 60)	75
Copies	7
Total	271

The total revenue from all sources during the year was £12,492 17s 1d. as against £13,844 1s 4d. previous year, showing a decrease of £1,351 4s. 3d.

The total expenditure for the year was £20,962 2s. 3d. against £18,273 9s. 10d. for the previous year, showing an increase of £2,688 12s. 5d.

PART VIII—THE GOVERNMENT CHEMICAL LABORATORIES.

The total number of samples received during the year for examination was 21,115. This figure is slightly less than last year's 22,409 and covered a great variety of materials for either analysis or for examination and report from the following Departments:—Mines, Agriculture, Public Health, Metropolitan Water Supply, Sewerage and Drainage, Public Works, Police, Factories, State Housing, Industrial Development, Government Stores and Tender Board, Charcoal Iron and Steel Industry, Main Roads, War Service Land Settlement and Forests. Samples were also received from various Commonwealth Government Departments and the general public.

The number of samples allotted to each of the five divisions was as follows:—

Food, Drugs and Toxicology	14,483
Mineralogy and Mineral Chemistry	1,880
Agriculture, Forestry, Water Supplies	3,882
Fuel Technology	673
Industrial Chemistry	197

The very much larger number of samples recorded in the Food, Drugs and Toxicological Division is due to the fact that a large number of field tests are included. These were taken in connection with corrosion tests on sewers for the Metropolitan Water Supply, Sewerage and Drainage Department.

The chief sources of samples for analyses and chemical examination received by this division were from the Public Health Department, Police Department, Department of Agriculture, Milk Board of W.A. and Water Supply Department and embraced a wide variety of products including human and animal toxicological exhibits, criminal investigation exhibits, drugs and medicines, liquors, trade wastes, insecticides and fungicides, paints, oils, explosives, river and harbour pollution samples and a number of miscellaneous products. The programme of work on sewer corrosions undertaken in co-operation with the Water Supply, Sewerage and Drainage Department continues. Most of this work is done at the annexe laboratory, Lincoln Street,

The chief sources from which samples were received by the Mineral Division were the Government Geologist, State Batteries and the general public. Its activities are largely concerned with the development of the mineral industry in this State. Apart from general analyses and assaying a large number of minerals and ores of potential economic value were examined. Metals, alloys and building materials were also examined for their susceptibility to corrosion and for compliance with specifications. Many specimens and ores were tested for radio-activity both departmentally and for the general public. Samples are tested free to assist the search for radio-active minerals in this State.

Of the 3,882 samples handled by the Agricultural Division 2,166 were examined for the Department of Agriculture. These include soils, pastures, cereals, various plant and tree products and miscellaneous elements of fertilising value as required by its various branches, plant nutrition, plant pathology, horticulture, dairying, entomology, animal health and nutrition, poultry, wheat and sheep, vegetable, irrigation and tobacco, etc. Chemical research into the properties of Western Australia tobacco continues in co-operation with the Tobacco Officer in Manjimup. A number of fertilisers and feeding stuffs for compliance with the respective acts were analysed. Many water samples were analysed for bona fide farmers and advice given as to their suitability for domestic, irrigation and stock purposes. The routine examinations of existing water supplies to cities and towns both metropolitan and country have been continued. Water samples were also examined for the War Service Land Settlement Scheme.

The Fuel Technology Division has systematically sampled and examined coal samples from the Collie field with a view to advising as to the best types and the best methods of utilisation in industry. A systematic survey of the working faces of each mine was also made as development proceeds. By this means any variation in the composition and ash content can be detected and a check kept on the quality of coal mined. The problem of developing a successful coked briquette from Collie coal as a coke substitute has now almost passed the successful laboratory scale and has proceeded to a larger unit process scale in co-operation with the Department of Industrial Development. A number of coal core samples were examined for the Government Geologist as a result of the drilling programme being undertaken at Collie. Coal samples have also been examined for private industry. The laboratory investigation on the washing of Collie coal was completed at the Collie annexe laboratory towards the end of the year and a report issued.

The work of the Industrial Chemistry Division was again limited by the lack of proper facilities but the erection of the unit process building is well in hand and should be ready for occupation next year. All the plant has been ordered and received with the exception of two items which are expected in time for the completion of the building. Notwithstanding much valuable work has been done in consolidating a proposed programme of work. Again this year assistance was given to industry and to Government Departments by the provision of technical information and literature. A number of analyses has been carried out for the Government Geologist which has laid a foundation for future operations on a unit plant scale.

PART IX—SCHOOL OF MINES.

(a) Kalgoorlie.

The total number of students enrolled for 1952 was 421, an increase of 33 by comparison with 1951.

Three hundred and seventy-four samples or specimens were received at the school for mineral examination or assay for the mining public.

The metallurgical laboratory was kept fully occupied and issued 51 reports, 20 of which referred to gold, and the remainder to other metals or non-metallics.

(b) Norseman.

The enrolment increased to 63, 11 more than in 1951. In addition classes in general science were arranged for 10 State school children.

(c) Bullfinch.

During the year the Department undertook the provision of a new branch of the School of Mines at this centre. Arrangements were completed to open it in February, 1953.

PART X—EXPLOSIVES.

During 1952 a much greater volume of explosives was imported into the State the particular categories being:—

	lb.
Gelignite	5,499,550
Gelatine dynamite	288,850
Permitted explosives	257,950
Blasting powder	4,500
Detonators	3,931,943
	Yards.
Fuse	5,368,000

The bulk of this was used in gold mining operations. Tests were made of all shipments at the Woodman's Point Explosives Reserve before it was permitted to be distributed throughout the State.

In addition to this work, the staff inspected country magazines, rendered advice on magazine construction and generally on handling and use of explosives.

Amongst these activities was also the testing of fireworks before sale of same was permitted.

PART XI—MINERS' PHTHISIS ACT AND MINE WORKERS' RELIEF ACT.

In 1952 all Goldfields were visited with the exception of Ashburton, Gascoyne, Kimberley, Pilbara, Phillips River, West Kimberley and West Pilbara.

The number of examinations conducted was 5,359, compared with 4,942 for the previous year.

PART XII—CHIEF COAL MINING ENGINEER.

The Chief Coal Mining Engineers report sets out the progress of development and mechanisation in regard to the collieries and open-cuts operating at Collie. Although the year's coal output was

greatly affected as a result of the reduction of rail transport during the year, because of industrial trouble, 830,461 tons was mined which was almost equal to the 1951 production. Considerable progress in regard to the development of the new collieries, viz., Western Nos. 1 and 2, Centaur and Neath, was made during the year.

STAFF.

I would like to take this opportunity of publicly thanking all members of the staff for the loyal and efficient way in which they carried out their duties during the year.

One major staff change was the appointment of Mr. E. E. Brisbane as State Mining Engineer *vice* Mr. J. S. Foxall, retired. Mr. Foxall's retirement followed a long and able period of service with the Department, noted for efficient administration particularly in regard to safety precautions in the underground mines.

Mr. Brisbane had been succeeded by Mr. L. C. Olive, who however died very shortly after taking up his appointment. Mr. K. Lloyd of the Kalgoorlie inspection staff has since been appointed to the position.

In dealing with the various activities I have commented only on the principal items. Divisions II to X of this publication contain the detailed reports of the responsible officers.

(Sgd.) A. H. TELFER,
Under Secretary for Mines.

Department of Mines,
Perth, 30th June, 1953.

(2)—73981

Division II.

Report of the State Mining Engineer for the Year 1952.

The Under Secretary for Mines:

Sir,

I have the honour to submit for the information of the Hon. the Minister for Mines, my Annual Report on this branch of the Mines Department for the year 1952.

The details of mining activities in the State during the year 1952 have been compiled from information supplied by the Statistician and Inspectors of Mines.

An account of rescue operations on the Hannans Star Mine directed by Senior Inspector Verran is appended.

STAFF.

Following the retirement of Mr. J. S. Foxall early this year, Mr. E. E. Brisbane was appointed State Mining Engineer on the 1st March, 1952.

Mr. L. C. Olive, District Inspector of Mines, was appointed Assistant State Mining Engineer on the 10th June, 1952, which position he held till his sudden death at Collie on the 26th June, 1952.

Mr. J. K. N. Lloyd, District Inspector of Mines, was appointed to the position of Assistant State Mining Engineer on the 21st October, 1952.

To replace vacancies in the inspectorate at Kalgoorlie, Mr. J. M. Faichney was promoted from Assistant to District Inspector of Mines on the 27th October, 1952, and Mr. F. W. G. Power commenced duties as District Inspector of Mines on the 24th November, 1952.

ACCIDENTS.

Fatal and serious accidents in metal mines and quarries reported to the Department are shown below. The corresponding figures for 1951 are shown in brackets.

There were 14 (17) fatal and 506 (534) serious accidents.

In gold mines there were 12 (15) fatal and 447 (493) serious accidents. The number of men employed in such mines was 6,394 (6,766). The accident rate per 1,000 men employed was thus 1.88 (2.22) for fatal accidents and 69.91 (72.86) for serious accidents.

A pyrite mine and a quarry were the scenes of the two remaining fatal accidents.

A classification of serious accidents showing the nature of the injuries is given in Table "A."

TABLE A.

SERIOUS ACCIDENTS FOR 1952.

Class of Accident.	Kimberley and West Kimberley.	East Coolgardie.	Peak Hill.	Yilgarn.	Coolgardie.	Dundas.	Broad Arrow.	Mt. Margaret.	North Coolgardie.	Phillips River.	Murchison.	Pilbara.	West Pilbara.	South-West.	Northampton.	Ashburton.	TOTAL.
Major Injuries—Exclusive of Fatal—																	
Fractures :																	
Head	....	1	....	1	....	1	....	....	....	....	....	....	....	....	....	....	3
Shoulder	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Arm	....	....	....	1	....	1	....	....	....	....	....	....	....	....	....	....	2
Hand	....	7	....	....	2	2	....	....	....	....	....	....	2	....	....	....	13
Spine	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Rib	....	4	....	....	2	1	....	1	....	....	....	....	....	....	....	....	8
Pelvis	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Thigh	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Leg	1	7	....	....	1	....	....	....	....	....	1	....	....	....	....	....	10
Ankle	....	3	....	....	....	....	....	1	....	....	....	....	....	....	....	....	4
Foot	....	10	1	....	....	1	....	....	....	....	....	....	....	....	....	....	12
Amputations :																	
Arm	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Hand	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Finger	....	3	....	....	....	....	....	....	....	....	....	1	....	....	2	1	7
Leg	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Foot	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Toe	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	1
Loss of Eye	1	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	2
Serious Internal	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Hernia	1	4	....	....	1	1	....	....	....	....	....	....	....	....	1	....	8
Dislocations	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	1
Other Major	....	5	....	....	....	2	....	....	....	....	....	....	....	....	....	....	7
Total Major	3	47	1	3	6	9	....	2	....	....	2	1	2	....	4	1	81
Minor Injuries—																	
Fractures :																	
Finger	....	7	1	1	3	1	....	1	....	....	2	....	....	....	1	....	17
Toe	....	9	....	....	1	1	....	....	....	....	....	....	....	....	....	....	11
Head	....	6	....	1	1	....	....	....	1	....	....	....	1	....	....	....	10
Eyes	....	9	....	1	....	4	....	2	1	....	....	....	....	....	1	....	18
Shoulder	....	6	....	....	....	1	....	....	2	....	....	....	....	....	....	....	9
Arm	....	14	....	2	....	3	....	1	....	....	....	....	....	....	3	....	23
Hand	....	77	....	1	3	6	....	3	5	....	13	....	....	1	4	....	113
Back	....	42	1	3	2	9	....	1	2	....	3	....	....	2	3	....	68
Rib	....	5	....	....	....	1	....	....	1	....	1	....	....	....	....	....	8
Leg	....	32	1	3	1	5	....	1	4	....	5	1	2	3	3	....	61
Foot	....	43	....	1	....	4	....	....	....	....	4	1	....	....	4	....	57
Other Minor	....	8	....	1	....	6	....	....	....	....	7	3	3	....	2	....	30
Total Minor	....	258	3	14	11	41	....	9	16	....	35	5	6	6	21	....	425
Grand Total	3	305	4	17	17	50	....	11	16	....	37	6	8	6	25	1	506

Table "B" shows the fatal, serious and minor accidents reported and the number of men employed classified according to mineral mined.

TABLE B.

Mineral.	Men Employed.	Accidents.		
		Fatal.	Injured.	
			Serious.	Minor.
Asbestos	228	....	8	44
Copper	2	....	....	....
Gold	6,394	12	447	1,636
Iron (Pig)	36	....	....	....
Iron Ore	91	....	3	10
Lead, Zinc, Silver	250	....	26	42
Pyrite	188	1	16	100
Tin, Wolfram, Tantalite	48	....	....	....
Other Minerals	121	....	....	....
Quarries	Not Available.	1	6	13
Total	7,358	14	506	1,845

Accidents classified according to causes for the various districts are shown in Table "C".

TABLE C.

Fatal and Serious Accidents showing Causes and Districts.

District	Explosives.		Falls of Ground.		In Shafts.		Fumes.		Miscellaneous Underground.		Surface.		Total.	
	Fatal.	Serious.	Fatal.	Serious.	Fatal.	Serious.	Fatal.	Serious.	Fatal.	Serious.	Fatal.	Serious.	Fatal.	Serious.
1. Kimberley and West Kimberley	....	1	....	....	....	....	....	....	....	2	....	....	....	3
2. East Coolgardie	2	2	3	25	1	4	....	2	....	215	2	57	8	305
3. Peak Hill	....	....	....	....	....	1	....	....	....	....	....	3	....	4
4. Yilgarn	....	....	....	....	....	2	....	....	....	9	....	6	....	17
5. Coolgardie	....	....	....	3	....	....	....	....	....	10	....	4	....	17
6. Dundas	....	....	....	2	....	5	1	2	....	27	1	14	2	50
7. Broad Arrow	....	....	....	....	....	....	....	....	....	....	....	....	....	....
8. Mt. Margaret	....	....	1	1	....	1	....	....	....	7	....	2	1	11
9. North Coolgardie	....	....	....	3	1	....	....	....	....	9	....	4	1	16
10. East Murchison	....	....	....	....	....	....	....	....	....	....	....	....	....	....
11. Murchison	....	2	....	2	....	1	....	....	1	25	....	7	1	37
12. Pilbara	....	....	....	1	....	2	....	....	....	1	....	2	....	6
13. West Pilbara	....	....	....	2	....	1	....	....	....	4	....	1	....	8
14. South West	....	....	....	....	....	....	....	....	....	....	1	6	1	6
15. Northampton	....	1	....	2	....	....	....	....	....	13	....	9	....	25
16. North-East Coolgardie	....	....	....	....	....	....	....	....	....	....	....	....	....	....
17. Yalgoo	....	....	....	....	....	....	....	....	....	....	....	....	....	....
18. Greenbushes	....	....	....	....	....	....	....	....	....	....	....	....	....	....
19. Phillips River	....	....	....	....	....	....	....	....	....	....	....	....	....	....
20. Ashburton	....	....	....	....	....	....	....	....	....	....	....	1	....	1
21. Gascoyne	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Total for 1952	2	6	4	41	2	17	1	4	1	322	4	116	14	506
Total for 1951	5	2	2	45	6	13	....	....	2	341	2	133	17	534

FATAL ACCIDENTS.

A brief description of fatal accidents reported during the year is given below—

Name and Occupation.	Date.	Mine.	Details and Remarks.
Sonc, Stanislav (Miner)	10–1–52	Big Bell G.M.	The circumstantial evidence and the man's known movements suggest that he lowered some explosives down a winze in the kibble and fell from the ladders as he was climbing down a little later. Death was due to a fractured skull.
Vanek, Jaromir (Bogger)	14–1–52	Sons of Gwalia	Vanek died in the 1830 stope on the 31 level of the mine when struck by a fall of rock whilst bogging. Death was due to a fractured spine at the lower lumbar region, multiple injuries and crushing.
McCafferty, Patrick Bryan (Miner)	5–2–52	Great Boulder G.M.....	This man came by his death as a result of injuries received when he was struck by a fall of earth at the cross lode No. 1 west branch stope of the 900 ft. level of the main shaft.
Roberts, Hone Anderson (Miner)	23–2–52	Iron King Mine, Norseman	Death was due to asphyxia, Roberts having been overcome by fumes in a 230 ft. winze below the 500 ft. level.
Brown, William Henry (Machine Miner)	4–4–52	North Kalgurli Mine	Death was due to a fractured skull, as a result of being struck by a fall of earth at the 900 ft. level.
Lamattina, Ignazio (Machine Operator)	19–4–52	White Rock Quarries, Gosnells	Men were using lifting gear to lift a bowl from a 4 ft. Symons Crusher when the chain sling snapped and the bowl rolled 60 ft. down the quarry face striking Lamattina causing fatal injuries.
Bond, Herbert Theodore (Machine Miner)	25–4–52	Daisy Gold Mine, Mt. Monger	This accident was caused by Bond boring into explosive left in the butt of a hole which had previously been fired.
Rule, Jack (Machine Miner)	29–4–52	Enterprise Gold Mine, Kalgoorlie	Bored into a charge of fracteur and an explosion resulted, inflicting fatal injuries.
Ducrow, Patrick (Skipman)	10–6–52	Central Norseman G.M. Regent Shaft	The winder driver, under the impression that the north side skip was at the surface, made a mistake and pulled the south side skip almost to the sheave wheel. Ducrow was thrown out of the skip when it was in the tipping position and received fatal injuries.
Johnson, Albert Victor (Trucker and Shoveller)	18–7–52	North Kalgurli G.M.	Johnson came by his death from multiple injuries received when he was struck by a fall of earth on the 200 ft. level "A" lode stope of the Kalgurli Shaft.
Hassell, Harry Hayworth (Labourer)	19–7–52	Ivanhoe dump, Lake View and Star	Both men died from suffocation when a wall of the Ivanhoe slime dump caved in and completely buried them.
Hefron, Michael Lancelot (Plant Foreman)			
Riseberry, John Osmond (Platman)	30–7–52	South Kalgurli G.M.	Riseberry, in company with two others was travelling up from the 18 level. He himself rang the cage away from that level and after the cage had moved, his mates found that he was not in it. His body was later recovered from the bottom of the shaft. How he came to get into the shaft remains a complete mystery.
Hart, George (Sampler)	6–11–52	Timoni G.M.	Received chest injuries when he became caught between the cage and the shaft timber on the main shaft. The injured man died soon after being brought to the surface.

WINDING MACHINERY ACCIDENTS.

Twenty-four accidents involving winding machinery were reported during the year and are briefly as follows:—

Overwinds (12).—Errors of judgment accounted for nine overwinds. Three overwinds were brought about by the winding engine being started in the wrong direction. One man was killed at the Regent Shaft, Norseman, when he was thrown from a skip that was pulled to the top of the headframe when the engine was started in the wrong direction.

Skip Derailments (2).—Both these accidents occurred in the Sons of Gwalia mine. One skip was derailed when the driver accidentally released the brake on a declutched drum. The second derailment was possibly caused by misalignment of timbers brought about by the previous derailment.

Cages Hung Up (8).—Skip bouncing in lower levels caused grippers to operate in two shafts, namely, Chaffers and South Kalgurli. About 500ft. of rope lowered on to held up skip in each case before accident noticed. Three cages were hung up when ore trucks carried in the cages fouled shaft timbers. These accidents occurred in the Victoria Shaft, Kalgoorlie Enterprise (2) and the Boulder Perseverance Gold Mine (1). A skip was hung up at Edwards Shaft, Great Boulder Gold Mine when the chute discharge at the tipping station became blocked. A descending cage at the Victoria Shaft fouled a studdle which became dislodged and caused some damage to shaft between the 22 and 23 levels. At Hamilton Shaft, Great Boulder Gold Mine, the bull of the east cage caught on north wall plate about 10ft. below the 600ft. level plat.

Mechanical Failures.—No failure of a winder or rope was reported.

Miscellaneous Accidents (2).—A skipman in the South Kalgurli Mine received head injuries when the skip moved whilst he was levelling off the dirt on top of the overfull skip. On a windy day, at the Barbara Shaft, Coolgardie, a braceman pushed a truck into the wrong compartment. The falling truck did some damage to the rope and cage.

PROSECUTIONS.

Three prosecutions, involving four men, for breaches of the Mines Regulation Act were successful.

Two men were prosecuted for carrying out blasting operations outside the prescribed times. For having used a stage that was unsafe, a machine miner was successfully prosecuted. One man was prosecuted for having bored in a butt of a hole in which a charge of nitro-glycerine compound had been previously exploded.

SUNDAY LABOUR PERMITS.

Five permits were issued during the year, three of which were for shaft timbering at Norseman. Two hundred and twenty-two man shifts were worked on the above operation. A total of 28 man

shifts were worked on Sundays on two other mines during the year. One permit was for the removal of mullock from an underground crib room and the other permit for one Sunday was for the completion of diamond drilling operations.

CERTIFICATES OF EXEMPTION (Section 46).

Four certificates were issued as compared with seven in 1951.

AUTHORISED MINE SURVEYORS.

The Survey Board issued 10 certificates during the year.

ADMINISTRATIVE.

Regulations under the Mines Regulation Act have been amended as follows:—

A new regulation, No. 131A, has been inserted. This regulation deals with the annealing or replacement every six months of the connections between rope and cage or skip. A proper record shall be kept of the annealing of all chains, links, bars and bolts used in connecting the rope to the cage, skip or other means of conveyance.

Regulation 31 has been amended to provide for training in first aid by applicants for the Underground Supervisor's Certificate.

Sections 122, 123, 124 of the Mining Act have been amended to provide for treatment and realisation charges in tribute agreements. The maximum amount to be charged against a tributer for treatment and realisation together shall not exceed 60s. per ton of ore treated.

Form No. 57 in the Schedule of Forms and Fees has been amended to provide for an increase in survey fees.

VENTILATION.

Ventilating standards have been maintained and ventilation officers on the mines co-operate fully with ventilation inspectors in matters requiring their attention. Air surveys have been made by departmental officers for Kalgoorlie Enterprise Mines Ltd., Norseman Gold Mines, and the Great Boulder Pty. Ltd.

Several mines have increased the primary ventilation underground by replacing existing ventilation machines with larger ones or placing two or more fans in series or parallel.

Primary ventilation has been improved on the North Kalgurli and Iron King mines by the sinking of new main shafts, primarily intended for servicing and haulage of ore.

A 2in. diameter pipe line from a diamond drill hole on the 2,650ft. level of Hamilton Shaft to 20ft. above the surface was constructed to dispose of methane gas escaping from the drill hole. On completion of drilling an attempt was made to seal the drill hole but it was unsuccessful and some leakage of gas still occurs. This is "bled off" and conveyed to the surface through the pipe line.

Secondary ventilation in the mines has shown some improvement due mainly to the lesser use of venturi blowers and increased use of air driven or electric fans in development ends.

Dust counts taken in underground working places and treatment plants visited are shown in the tabulation below:—

YEARLY TABULATION OF DUST COUNTS, 1952.

Development.		Stoping.		Level.		Surface.		No. of Places showing 1000 + p.p.c.c.			
No. of Samples.	Average Count.	No. of Samples.	Average Count.	No. of Samples.	Average Count.	No. of Samples.	Average Count.	Development.	Stope.	Level.	Surface.
193	212	352	205	26	225	37	160	9	10	4	2

ALUMINIUM THERAPY.

Prophylactic treatment with aluminium powder is administered in most underground workers' change rooms at present. Twenty-eight change rooms are equipped and 2,387 men are licensed to receive the treatment.

During the year aluminium therapy treatment was commenced at Great Western Consolidated at Bullfinch, the Timoni Mine at Mt. Ida, and at the Sons of Gwalia. New change rooms are being built at Norseman Gold Mines at the new main shaft, and should be ready for use early in 1953.

Filter paper samplers have been supplied to most mines and regular sampling of the powder concentration in the change rooms is carried out.

Records being kept by this Department show the medical classification of all persons engaged in the mining industry. These records also show whether a man avails himself of the aluminium therapy or otherwise.

GOLD MINING

The ore produced during the year amounted to 2,626,612 tons, slightly higher than the amount of 2,471,679 tons produced in 1951.

The gold recovered was 727,468 fine oz., which compares favourably with the previous year's production of 648,245 fine oz.

A slight increase in grade to 5.54 dwt. per ton (1951—5.25 dwt.) was brought about by the larger companies mining higher grade ore in an effort to offset rising costs.

Total recovery of gold during 1952 was the highest for the post war period although production has not reached the 1939 figure of 1,188,286 fine oz. recovered from 4,095,257 tons of ore.

The number of men employed in the industry, based on monthly averages, was 6,394, which number is 372 less than last year's total. Nearly half the reduction in labour force, required in the industry, has taken place in the East Coolgardie Goldfield where increased efficiency has resulted from the introduction of tungsten tipped steel, light air leg rock drills, and short delay blasting underground.

The calculated value of the gold produced was £A11,809,047, which includes £539,358 distributed by the Gold Producers' Association from the sale of 515,009 fine oz. of gold at an average premium of 20.945s. per fine oz. The mint value for gold throughout the year was £15 9s. 10d. per fine oz.

The average production of ore per man for the year was 410.79 tons valued at 89.92 shillings per ton (1951—365.31 tons valued at 81.26s. per ton). Gold recovery per man amounted to 113.77 fine oz. as compared with 95.81 fine oz. in the previous year.

The increased returns from treatment of higher grade ore, premium sales, and manpower efficiency have been balanced by increased cost of production, and the position of most of the larger mines has remained stable.

Statistics relating to the gold mining industry are tabulated as follows:—

Table "D"—Gold Production Statistics.
Table "E"—Classification of Gold Output by Goldfields and Districts.
Table "F"—Classification of Gold Output, 1948-1952.
Table "G"—Mines Producing 5,000 oz. and over for the past five years.
Table "H"—Development Footages.

TABLE D.

Gold Production Statistics.

Year.	Tons Treated. (2,240 lb.)	Total Gold Yield.	Estimated Value of Yield.	Value of Yield per ton.	Number of Men Employed.	Average Value of Gold per oz.	Average Yield per ton of ore.
	tons.	fine ozs.	£A.	shillings A.		shillings A.	dwts.
1929 ...	628,400	372,064	1,580,426	50·30	4,108	84·96	11·84
1930 ...	645,344	419,767	1,874,484	58·09	4,284	89·33	13·01
1931 ...	982,163	518,045	3,042,019	61·94	5,961	117·44	10·55
1932 ...	1,327,021	599,421	4,358,989	65·70	8,695	145·44	9·03
1933 ...	1,588,979	636,928	4,884,112	61·48	9,900	153·36	8·01
1934 ...	1,772,931	639,871	5,461,004	61·60	12,523	170·69	7·22
1935 ...	1,909,832	646,150	5,676,679	59·45	14,708	175·71	6·77
1936 ...	2,492,034	852,422	7,427,687	59·61	15,698	174·27	6·84
1937 ...	3,039,608	1,007,289	8,797,662	57·99	16,174	174·68	6·64
1938 ...	3,759,720	1,172,950	10,409,928	53·38	15,374	177·50	6·24
1939 ...	4,095,257	1,188,286	11,594,221	56·62	15,216	195·14	5·80
1940 ...	4,291,709	1,154,843	12,306,816	57·35	14,594	213·15	5·38
1941 ...	4,210,774	1,105,477	11,811,989	56·10	13,105	213·70	5·25
1942 ...	3,225,704	845,772	8,840,642	54·81	8,123	209·04	5·24
1943 ...	2,051,011	531,747	5,556,756	54·185	5,079	209·00	5·185
1944 ...	1,777,128	472,588	5,966,451	55·89	4,614	210·18	5·32
1945 ...	1,736,952	469,906	5,025,039	57·86	4,818	213·87	5·41
1946 ...	2,194,477	618,607	6,657,762	60·70	6,961	215·25	5·64
1947 ...	2,507,306	701,752	7,552,611	60·25	7,649	215·25	5·59
1948 ...	2,447,545	662,714	7,132,748	58.28	7,178	215.25	5.42
1949	2,468,297	649,572	7,977,200	64.64	6,800	245.62	5.26
1950 ...	2,463,423	608,633	9,428,745	76·55	7,080	309·83	4·94
1951	2,471,679	648,245	10,042,392	81·26	6,766	309·83	5·25
1952	2,626,612	727,468	11,809,047	89·92	6,394	324·66	5·54

TABLE E.

Classification of Gold Output for 1952 by Goldfields and Districts.

Goldfield or District.	Unclassified, Sundry Claims, Alluvial, etc. (fine ozs.)	Under 100 ozs.		100–500 ozs.		500–1,000 ozs.		1,000–2,000 ozs.		2,000–3,000 ozs.		3,000–4,000 ozs.		4,000–5,000 ozs.	
		No. of Producers.	Gold (fine ozs.).	No. of Producers.	Gold (fine ozs.).	No. of Producers.	Gold (fine ozs.).	No. of Producers.	Gold (fine ozs.).	No. of Producers.	Gold (fine ozs.).	No. of Producers.	Gold (fine ozs.).	No. of Producers.	Gold (fine ozs.).
Kimberley Goldfield	390	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Ashburton Goldfield	18	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Pilbara Goldfield—															
Marble Bar	152	7	236	3	466	2	1,275	....	....	....	....	1	3,635	....	....
Nullagine	24	2	88	2	567	....	....	....	....	....	....	....	....	....	....
Peak Hill Goldfield	24	10	152	....	....	....	....	....	....	....	....	....	....	....	....
East Murchison Goldfield—															
Lawlers	....	2	101	1	122	....	....	....	....	....	....	....	....	....	....
Wiluna	42	3	141	2	312	....	....	....	....	....	....	....	....	....	....
Black Range	....	....	....	....	....	1	632	....	....	....	....	....	....	....	....
Murchison Goldfield—															
Meekatharra	81	17	427	6	1,948	....	....	....	....	....	....	....	....	....	....
Cue	109	5	97	2	803	1	521	....	....	....	....	....	....	....	....
Day Dawn	27	....	....	....	....	....	....	1	1,160	....	....	....	....	....	....
Mt. Magnet	126	8	179	1	393	....	....	....	....	....	....	....	....	....	....
Yalgoo Goldfield	3	7	177	2	274	....	....	....	....	....	....	....	....	....	....
Mt. Margaret Goldfield—															
Mt. Margaret	48	4	115	5	1,237	1	525	1	1,757	....	....	....	....	....	....
Mt. Malcolm	111	6	194	....	....	....	....	....	....	....	....	....	....	....	....
Mt. Morgans	68	7	159	....	....	....	....	....	....	....	....	....	....	....	....
North Coolgardie Goldfield—															
Menzies	51	7	198	4	1,322	....	....	....	....	....	....	....	....	....	....
Ularring	10	3	123	3	561	2	1,160	....	....	....	....	....	....	....	....
Niagara	2	2	89	....	....	1	568	1	1,239	....	....	....	....	....	....
Yerilla	10	1	12	1	447	1	528	....	....	1	2,135	....	....	....	....
Broad Arrow Goldfield	456	10	250	8	1,123	2	1,396	....	....	....	....	....	....	....	....
North-East Coolgardie Goldfield—															
Kanowna	274	3	61	....	....	1	616	....	....	....	....	....	....	....	....
Kurnalpi	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
East Coolgardie Goldfield—															
East Coolgardie	629	23	818	7	1,460	....	....	2	2,713	....	....	1	3,655	....	....
Bulong	19	3	93	....	....	....	....	....	....	....	....	....	....	....	....
Coolgardie Goldfield—															
Coolgardie	489	18	394	3	769	2	1,519	....	....	....	....	....	....	....	....
Kunanalling	258	1	50	....	....	....	....	....	....	....	....	....	....	....	....
Yilgarn Goldfield	341	22	674	4	901	1	964	....	....	2	4,600	....	....	....	....
Dundas Goldfield	26	4	59	2	588	....	....	....	....	....	....	....	....	....	....
Phillips River Goldfield	2	1	186	....	....	....	....	....	....	....	....	....	....	....	....
West Pilbara Goldfield	7	1	8	....	....	....	....	....	....	....	....	....	....	....	....
West Kimberley Goldfield	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Gascoyne Goldfield	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
State Generally	11	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Totals	3,808	177	5,081	56	13,293	15	9,704	5	6,869	3	6,735	2	7,290	....	....

Goldfield and District.	5,000–10,000 ozs.		10,000–20,000 ozs.		20,000–30,000 ozs.		30,000–40,000 ozs.		40,000–50,000 ozs.		50,000–100,000 ozs.		Over 100,000 ozs.	
	No. of Producers.	Gold (fine ozs.).	No. of Producers.	Gold (fine ozs.).	No. of Producers.	Gold (fine ozs.).	No. of Producers.	Gold (fine ozs.).	No. of Producers.	Gold (fine ozs.).	No. of Producers.	Gold (fine ozs.).	No. of Producers.	Gold (fine ozs.).
Kimberley Goldfield	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Ashburton Goldfield	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Pilbara Goldfield—														
Marble Bar	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Nullagine	1	6,494	....	....	....	....	....	....	....	....	....	....	....	....
Peak Hill Goldfield	1	5,427	....	....	....	....	....	....	....	....	....	....	....	....
East Murchison Goldfield—														
Lawlers	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Wiluna	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Black Range	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Murchison Goldfield—														
Meekatharra	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Cue	....	....	....	....	....	....	....	....	....	....	1	53,610	....	....
Day Dawn	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Mt. Magnet	....	....	1	15,839	....	....	....	....	....	....	....	....	....	....
Yalgoo Goldfield	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Mt. Margaret Goldfield—														
Mt. Margaret	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Mt. Malcolm	....	....	1	23,768	....	....	....	....	....	....	....	....	....	....
Mt. Morgans	....	....	....	....	....	....	....	....	....	....	....	....	....	....
North Coolgardie Goldfield—														
Menzies	....	....	1	11,680	....	....	....	....	....	....	....	....	....	....
Ularring	....	....	1	14,697	....	....	....	....	....	....	....	....	....	....
Niagara	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Yerilla	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Broad Arrow Goldfield	....	....	....	....	....	....	....	....	....	....	....	....	....	....
North-East Coolgardie Goldfield—														
Kanowna	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Kurnalpi	....	....	....	....	....	....	....	....	....	....	....	....	....	....
East Coolgardie Goldfield—														
East Coolgardie	2	17,616	1	18,826	1	23,617	1	30,578	1	47,286	2	161,366	1	146,256
Bulong	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Coolgardie Goldfield—														
Coolgardie	....	....	1	19,387	....	....	....	....	....	....	....	....	....	....
Kunanalling	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Yilgarn Goldfield	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Dundas Goldfield	....	....	....	....	....	....	....	....	....	....	1	78,241	....	....
Phillips River Goldfield	....	....	....	....	....	....	....	....	....	....	....	....	....	....
West Pilbara Goldfield	....	....	....	....	....	....	....	....	....	....	....	....	....	....
West Kimberley Goldfield	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Gascoyne Goldfield	....	....	....	....	....	....	....	....	....	....	....	....	....	....
State Generally	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Totals	4	29,537	6	104,197	1	23,617	1	30,578	1	47,286	4	293,217	1	146,256

TABLE F.

Classification of Gold Output, 1948–1952.

Range of Output.	1952.			1951.			1950.			1949.			1948.		
	No. of Producers.	Production.	Percentage of Total.	No. of Producers.	Production.	Percentage of Total.	No. of Producers.	Production.	Percentage of Total.	No. of Producers.	Production.	Percentage of Total.	No. of Producers.	Production.	Percentage of Total.
		Fine ozs.			Fine ozs.			Fine ozs.			Fine ozs.			Fine ozs.	
Over 100,000	1	146,256	20·1	1	155,044	23.9	1	126,749	20·9	1	132,984	20·5	1	137,502	20·7
50,000 to 100,000	4	293,217	40·3	2	146,381	22.6	2	139,252	22·9	3	202,381	31·2	3	190,031	28·8
40,000 to 50,000	1	47,286	6·5	3	140,437	21.7	3	131,549	21·6	2	87,936	13·5	1	40,412	6·1
30,000 to 40,000	1	30,578	4·2	1	33,126	5.1	....	....	....	1	32,529	5·0	3	74,814	11·3
20,000 to 30,000	1	23,616	3·3	2	45,340	7.0	3	71,291	11·7	2	44,227	6·8	1	22,508	3·4
10,000 to 20,000	6	104,197	14·3	3	47,485	7.3	4	59,421	9·8	5	70,922	10·9	7	107,634	16·2
5,000 to 10,000	4	29,537	4·1	2	14,116	2.2	3	22,527	3·7	2	15,306	2·4	1	5,798	0·9
4,000 to 5,000	....	....	....	1	4,283	0.7	....	....	....	....	....	....	1	4,225	0·6
3,000 to 4,000	2	7,290	1·1	1	3,327	0.5	....	....	....	1	3,743	0·6	1	3,174	0·5
2,000 to 3,000	3	6,735	0·9	5	12,522	1.9	3	6,770	1·1	3	6,275	1·0	3	7,438	1·1
1,000 to 2,000	5	6,869	0·9	6	8,517	1.3	8	10,592	1·7	7	10,089	1·5	7	11,300	1·7
500 to 1,000	14	9,704	1·3	15	10,222	1.6	15	10,596	1·7	24	14,933	2·3	18	11,335	1·7
100 to 500	56	13,293	1·8	71	16,208	2.5	76	17,620	2·9	70	15,734	2·4	96	20,812	3·1
Under 100	177	5,081	0·7	175	5,277	0.8	211	5,890	1·0	194	6,132	0·9	206	6,503	1·0
Sundry Claims, etc.	....	3,808	0·5	....	5,960	0.9	....	6,376	1·0	....	6,381	1·0	....	19,254	2·9
Total	275	727,467	100·0	288	648,245	100.0	329	608,633	100·0	315	649,572	100·0	349	662,740	100·0

TABLE G.

Mines Producing 5,000 ounces and upward for the Past Five Years.

Mine.	1952.			1951.			1950.			1949.			1948.		
	Tons Treated.	Ounces Gold.	Dwts. per Ton.	Tons Treated.	Ounces Gold.	Dwts. per Ton.	Tons treated.	Ounces Gold.	Dwts. per ton.	Tons treated.	Ounces Gold.	Dwts. per Ton.	Tons Treated.	Ounces Gold.	Dwts. per Ton.
Big Bell Mines, Ltd.	400,563	53,610	2·68	369,412	49,726	2·69	359,082	47,592	2·65	424,525	56,071	2·64	424,584	51,770	2·44
Blue Spec Mining Co., N.L.	6,819	6,494	19·05	....	....	....	....	....	....	....	....	....	....	....	....
Boulder Perseverance, Ltd.	131,840	30,578	4·64	135,474	33,126	4·89	114,443	24,455	4·27	133,000	32,529	4·89	135,832	32,324	4·76
Callion (Western Mining Corporation, Ltd.)	25,214	14,697	11·66	....	....	....	....	....	....	....	....	....	....	....	....
Central Norseman Gold Corporation, N.L.	158,447	78,241	9·88	151,322	43,868	5·80	155,822	42,475	5·45	132,930	46,865	7·05	118,763	39,150	6·59
Gold Mines of Kalgoorlie	171,659	47,286	5·51	167,899	46,843	5·58	163,829	41,482	5·06	163,552	41,071	5·02	161,516	40,412	5·00
Great Boulder Pty. Gold Mines, Ltd.	376,564	96,111	5·10	325,924	96,985	5·34	331,739	79,827	4·81	333,109	83,259	5·00	326,685	81,457	4·99
Hannan's North (Broken Hill Pty., Ltd.)	....	273	....	9,324	3,327	7·13	39,166	9,256	4·73	42,490	13,027	6·13	42,963	12,878	6·00
Hill 50 Gold Mines, N.L.	53,803	15,839	5·89	28,352	7,557	5·33	44,632	11,517	5·16	49,230	13,128	5·33	50,771	13,417	5·22
Horseshoe (Anglo Westralian Mining Pty., Ltd.)	35,602	5,428	3·05	....	....	....	....	....	....	....	....	....	....	....	....
Kalgoorlie Enterprise, Ltd.	62,869	18,826	5·99	56,050	16,897	6·03	46,940	14,417	6·14	52,489	16,981	6·47	53,884	16,692	6·20
Lake View and Star, Ltd.	610,111	146,256	4·79	614,051	145,681	4·75	525,924	122,083	4·64	501,261	130,169	5·19	502,534	131,387	5·23
Mountain View Gold, N.L.	1,434	1,160	16·18	805	489	11·98	1,655	2,332	28·18	3,638	6,007	33·02	1,395	5,798	83·12
New Coolgardie Gold Mines, N.L.	37,436	19,387	10·36	41,756	20,914	10·02	32,154	16,429	10·22	24,062	9,299	7·73	....	....	....
North Kalgurli (1912), Ltd.	256,040	65,255	5·10	255,315	59,395	4·65	241,365	59,425	4·92	231,836	63,051	5·44	211,784	56,804	5·36
Paringa Mining and Exploration, Ltd.	1,493	204	2·73	8,231	2,311	6·83	96,488	17,058	3·54	91,811	17,782	3·87	100,642	22,508	4·47
South Kalgurli Consolidated, Ltd.	93,992	23,616	5·03	98,594	24,426	4·96	90,094	21,279	4·72	84,785	20,654	4·87	77,395	19,037	4·93
State Batteries	42,270	17,386	8·23	48,959	19,578	8·00	50,871	20,390	8·02	41,171	22,555	10·96	40,634	24,451	12·03
The Sons of Gwalia	85,263	23,768	5·58	73,825	19,186	5·20	88,745	25,558	5·76	81,395	23,573	5·79	60,093	18,139	6·03
Timoni (Moonlight Wiluna G.M., Ltd.)	23,410	11,680	9·98	23,976	11,402	9·51	11,211	5,610	10·00	....	....	....	....	....	....
Total	2,574,829	676,095	5·251	2,409,269	592,211	4·92	2,394,160	561,185	4·69	2,391,284	596,021	4·99	2,309,475	566,224	4·90
Other Sources (excluding large retreatment plants)	51,783	27,046	10·44	62,410	32,078	10·28	69,262	25,115	7·25	77,013	31,162	8·09	138,070	62,162	9·00
Total (excluding large retreatment plants)	2,626,612	703,141	5·35	2,471,679	624,289	5·05	2,463,422	586,300	4·82	2,468,297	627,183	5·08	2,447,545	628,386	5·13
Golden Horseshoe Sands Retreatment	....	9,767	....	....	6,559	....	....	7,661	....	....	10,004	....	....	9,982	....
Lake View and Star Retreatment	....	7,848	....	....	9,384	....	....	4,665	....	....	2,815	....	....	6,113	....
Wiluna Gold Mines Retreatment	....	....	....	....	....	....	....	503	....	....	3,743	....	....	11,820	....
State Batteries Tailing Treatment	....	6,712	....	....	7,511	....	....	7,150	....	....	5,827	....	....	6,440	....
Meekatharra Sands Retreatment	....	....	....	....	522	....	....	2,345	....	....	....	....	....	....	....
Grand Total	2,626,612	727,468	5·54	2,471,679	648,245	5·25	2,463,422	608,633	4·94	2,468,297	649,572	5·26	2,447,545	662,741	5·42

TABLE H.

Development Footages Reported by the Principal Mines.

Gold or Mineral Field.	Mine.	Shaft Sinking.	Driving.	Cross Cutting.	Rising and Winzing.	Diamond Drilling.	Total.
Gold—		Feet.	Feet.	Feet.	Feet.	Feet.	Feet.
Pilbara	Comet	....	90	50	30	180	350
	Blue Spec	80	38	126	24	....	268
	Barton	100	20	....	....	....	120
	McKinnon's	....	40	....	40	....	80
Murchison	Big Bell	....	2,076	841	874	1,468	5,259
	Mountain View	69	116	27	149	....	361
	Caledonian	....	....	40	45	....	85
	Hill 50	....	956	974	478	1,118	3,526
Mt. Margaret	Sons of Gwalia	....	525	120	331	2,399	3,375
North Coolgardie	Yilgangie Queen	....	115	....	147	....	262
	Callion	140	551	32	377	....	1,100
	Timoni	....	943	349	735	1,497	3,524
East Coolgardie	Boulder Perseverance, Ltd.	....	2,263	....	1,922	11,438	15,623
	Kalgoorlie Enterprise, Ltd.	81	1,632	34	1,052	8,110	10,909
	Gold Mines of Kalgoorlie	....	5,750	2,181	2,392	18,645	28,968
	Great Boulder Proprietary	....	8,225	2,485	2,449	7,703	20,862
	Lake View and Star, Ltd.	....	16,646	2,359	7,480	7,381	33,866
	North Kalgurli (1912), Ltd.	424	5,568	749	3,478	8,743	18,962
	South Kalgurli Consolidated	....	3,238	1,018	1,279	4,545	10,080
	Haoma	65	245	195	214	....	719
	Daisy	60	50	106	28	....	244
Coolgardie	New Coolgardie Gold Mines, N.L.	150	2,794	1,174	1,056	6,606	11,780
Dundas	Central Norseman Gold Corporation	685	7,013	206	2,184	10,051	20,139
Yilgarn	Great Western Consolidated	....	214	520	460	6,194	7,388
	Sunshine Reward Amalgamated	....	120	34	50	....	204
	Radio	65	245	195	219	....	724
	Frances Furness	50	150	....	90	....	290
	Marjorie Glen	100	60	....	....	....	160
	Total in Gold Mines	2,069	59,683	13,815	27,583	96,078	199,228
Pyrite—							
Dundas	Norseman Gold Mines, N.L.	700	3,238	1,018	1,279	4,545	10,780
Lead—							
Ashburton	Ridge Lead Mine	68	35	....	....	....	103
	June Audrey	125	55	....	....	....	180
	Gift Lead Mine	35	130	....	127	....	292
	Dingo Lead Mine	63	90	8	27	....	188
Northampton	Protheroe Lead Mine	223	1,021	138	301	5,661	7,344
	Paringa Wheal Fortune	296	231	273	420	45	1,265
	Maguire's Lead Mine	16	45	12	....	....	73
	Springvale	....	....	....	....	476	476
	Baddera	....	....	....	160	....	160
	Gurkha Syndicate	82	65	....	....	....	147
	May Bell Lead Mine	66	54	5	....	....	125
	Total in Lead Mines	974	1,726	436	1,035	6,182	10,353
Asbestos—							
West Pilbara	Australian Blue Asbestos	....	4,629	7,374	343	....	12,346
	Nunyerri	70	60	....	85	....	215
	Total in Asbestos Mines	70	4,689	7,374	428	....	12,561
	Total in all Mines	3,813	69,336	22,643	30,325	106,805	232,922

OPERATIONS OF THE PRINCIPAL MINES.

East Coolgardie Goldfield.

The total ore treated in this goldfield amounted to 1,719,238 tons and the gold yield of 454,932 fine oz. is an average of 5.29 dwt. per ton. This production is equal to 62.5 per cent. of the total production for the State. In the previous year 1,703,035 tons of ore, averaging 5.22 dwt., were treated for a recovery of 444,629 fine oz. of gold.

The number of men employed was 3,429 as compared with 3,587 in the previous year.

Mining activity in the *Bulong District* was at a low ebb, this district producing only 112 oz. of gold for the year. In the *East Coolgardie District* 454,820 fine oz. were recovered from 1,718,598 tons of ore, the principal producers being as under.

Lake View and Star with a production of 610,111 tons of ore for a return of 146,256 fine oz. of gold at an average of 4.79 dwt. per ton was the State's leading producer. Retreatment of tailings yielded an additional 7,848 oz.

The figures for the previous year were 614,051 tons averaging 4.75 dwt. for 145,681 fine oz. and 9,364 oz. from retreatment.

Development footage amounted to 23,231ft., being 1,365ft. more than in the previous year. Ore reserves have been maintained at 3.8 million tons at average mine grade.

Substantial increases in tonnage broken per man shift have been brought about by the introduction throughout the mine of light air leg machines using tungsten carbide tipped steel. An average of 24.5 tons of ore are broken per machine shift.

Great Boulder treated 376,564 tons averaging 5.10 dwt. for a return of 96,111 fine oz. of gold. During the previous year 325,924 tons of ore yielded 96,985 fine oz. at an average grade of 5.34 dwt. per ton. From the above figures it will be seen that the throughput of the mill has been increased by over 4,000 tons per month over the last 12 months.

Filled stopes supplied about one quarter of the total ore mined. They are flat backed, hydraulically filled with classified mill tailings, sent down via 4in. cement lined pipes from the surface and distributed through 2in. pipes to the stopes. The balance of the ore was mined on the shrinkage stope system.

Within the next few months the power station housing nine diesel alternators will be put into operation to supply the mine with its own power. Up to date the Kalgoorlie Electric Power and Lighting Corporation has supplied the one and a quarter million units used per four weeks on the mine.

South Kalgurli Consolidated with a production of 93,992 tons of ore averaging 5.03 dwt. per ton for a return of 23,616 fine oz. was a little below last year's figures of 98,594 tons for 24,426 fine oz. at an average of 4.96 dwt. per ton.

Good developments have been obtained and the proved ore reserves stand at 208,500 short tons at 5.16 dwt.

Depleted shrink stopes between the No. 8 and No. 12 levels have been filled with mill tailings.

Boulder Perseverance Limited milled 131,840 tons for a return of 30,578 fine oz., the average grade being 4.64 dwt. per ton. In the previous year 135,474 tons yielded 33,126 fine oz., the average grade being 4.89 dwt. per ton. High grade ore has been opened up on the El Oro Lode at the 400ft. level and on the West Branch of the Perseverance Lode at the 500ft. level.

Kalgoorlie Enterprise Mines Ltd. treated 62,869 tons at an average of 5.99 dwt. per ton for a return of 18,826 fine oz. The tonnage treated is above the figure of 56,050 tons for the previous year, which was of similar grade (6.03 dwt. per ton) and returned 16,897 fine oz. of gold. Victoria Shaft was sunk to 2,633ft. and the plat for the 26 level was commenced. Payable ore has been developed over a length of 240ft. at the 24 level and has been tested by winzing to the horizon of the 26 level.

Gold Mines of Kalgoorlie also reported an increased tonnage, the figure for the year being 171,659 tons as against 107,899 tons in the previous year. Grade was slightly lower, 5.51 dwt. as against 5.58 dwt. per ton, and the gold recovered 47,286 fine oz. as against 46,843 fine oz.

Open cut operations on the *Australia East* is now confined mainly to the removal of pillars. Stope filling is also obtained.

During the year this company purchased the main leases of the Paringa Mining and Exploration Company.

North Kalgurli (1912) Ltd. Ore treated for the year was 256,040 tons as compared with 255,315 tons in the previous year. The average grade of 5.10 dwt. per ton is slightly above the figure of 4.65 dwt. per ton for the previous year and there has been a consequent increase to 65,255 fine oz. in gold won from the 59,395 fine oz. won in the previous year.

The new main shaft is now completed to a depth of 1,632ft. The main loading stations are at 1,170ft. and 1,576ft. The shaft was placed in commission in August.

Additions have been made to the air-compressor station.

Developments have been satisfactory.

Good returns were also obtained from the *Daisy* with 1,131 fine oz. from 1,348 tons and the *Haoma* with 3,655 fine oz. from 3,198 tons. Both these mines are at Mount Monger.

Dundas Goldfield.

The production of 78,914 fine oz. of gold from the treatment of 159,519 tons of ore at an average of 9.89 dwt. per ton places this goldfield second on the list. The production is equal to 10.9 per cent. of the State's total.

In the previous year 44,274 fine oz. were obtained from the treatment of 152,180 tons of ore, averaging 5.82 dwt. per ton.

The number of men employed was 388 as against 403 in the previous year.

The principal producer was *Central Norseman* with 78,241 fine oz. from the treatment of 158,447 tons at an average of 9.88 dwt. per ton.

In the previous year 43,868 fine oz. of gold were obtained from the treatment of 167,899 tons of ore, averaging 5.80 dwt. per ton.

Operations from the Phoenix shaft have been discontinued and the greater part of the tonnage treated was hauled through the Regent Shaft. High grade ore from the Princess Royal workings helped to maintain the exceptionally high grade.

The *Sun* Mine, with 426 fine oz. from 736 tons, was the only other producer of consequence.

Murchison Goldfield.

This goldfield, which produced 75,319 fine oz. representing 10.4 per cent. of the State total, was only a little behind the Dundas Goldfield but the ore treated, amounting to 462,258 tons, was three times as great. The average grade of 3.26 dwt. per ton, although above last year's figure, is still the lowest of all the goldfields.

In the previous year 63,419 fine oz. of gold were obtained from the treatment of 406,631 tons of ore averaging 3.12 dwt. per ton. The number of men employed was 619, the corresponding figure for the previous year being 721.

Cue District produced 55,141 fine oz. of gold from the treatment of 401,618 tons of ore at an average of 2.75 dwt. per ton.

In the previous year 51,701 fine oz. of gold were obtained from the treatment of 371,427 tons of ore averaging 2.78 dwt. per ton.

Big Bell Mines Ltd. obtained 53,610 fine oz. of gold from the treatment of 400,563 tons of ore averaging 2.68 dwt. per ton. In the previous year the yield from 369,412 tons of ore was 49,726 fine oz., the average being 2.69 dwt. per ton.

The filling of depleted stopes has been placed in hand. Most of the development work done has been in the nature of stope preparation.

Among the smaller mines were *Table Top* with 397 fine oz. from 220 tons of ore and *Winston* with 521 fine oz. from 295 tons of ore.

Meekatharra District produced 2,455 fine oz. from the treatment of 4,673 tons of ore averaging 10.51 dwt. per ton. In the previous year the figures were 3,033 fine oz. from the treatment of 5,102 tons of ore, the average being 11.89 dwt. per ton.

Day Dawn District produced 1,186 fine oz. of gold from the treatment of 1,451 tons of ore at an average of 16.36 dwt. per ton. In the previous year 576 fine oz. of gold were produced from the treatment of 935 tons of ore at an average of 12.32 dwt. per ton.

Almost all of this year's production was obtained from the Mountain View Mine.

Mount Magnet District with 16,537 fine oz. of gold from 54,517 tons of ore averaging 6.07 dwt. per ton was well above last year's figures of 8,108 fine oz. from 28,898 tons of ore averaging 5.61 dwt.

The principal producer was *Hill 50*. Alterations to the plant have brought the capacity of the mill to about 7,000 tons per month and good grade ore has been developed. Returns indicate 15,839 fine

oz. of gold from the treatment of 53,803 tons of ore averaging 5.89 dwt. per ton, compared with 7,557 fine oz. from 28,352 tons averaging 5.33 dwt. per ton in the previous year.

North Coolgardie Goldfield.

A considerable increase in production is again recorded here. Gold amounting to 34,830 fine oz. being recovered from 55,992 tons of ore averaging 12.44 dwt. per ton as compared with 24,265 fine oz. from 41,471 tons at an average of 11.70 dwt. per ton in the previous year.

The number of men employed was 315 as compared with 357 in the previous year.

The steady increase in production from this goldfield over the last three years is encouraging.

Menzies District—The principal producer was the *Timoni* mine operated by Moonlight Wiluna Gold Mines at Mount Ida, where 11,680 fine oz. of gold were won from the treatment of 23,410 tons of ore averaging 9.98 dwt. per ton, practically the same as for the previous year when 11,402 fine oz. was obtained from the treatment of 23,976 tons at an average of 9.51 dwt. per ton.

Tributers on the *First Hit* obtained 489 fine oz. from the treatment of 430 tons of ore.

In the *Yerilla District* the most successful were *Yilgangie Queen* with 2,135 fine oz. from 2,392 tons and the *Margaret* at Yarri with 447 fine oz. from 1,173 tons.

Niagara District was very quiet, the only return of note being 568 fine oz. from 609 tons recorded by the *Altona* at Kookynie.

The principal producer in the *Ularring District* was the *Callion* mine at Davyhurst, which reported gold amounting to 14,697 fine oz. from the treatment of 25,214 tons of ore at the Western Mining Corporation's plant at Coolgardie. The shaft has been sunk to 482ft.

There are several small mines in this district which produce ore of good grade, the more important being the *Ajax West* with 655 fine oz. from 845 tons at Mulline and the *Oakley* with 505 fine oz. from 300 tons at Mulwarrie.

Mount Margaret Goldfield.

In this goldfield 27,982 fine oz. of gold were obtained from the treatment of 91,506 tons of ore at an average of 6.12 dwt. per ton, a little above the figures for the previous year, when 24,228 fine oz. were obtained from the treatment of 83,411 tons of ore at an average of 5.81 dwt. per ton.

The number of men employed was 354 as against 408 in the previous year.

There was very little work in the *Mount Morgans District,* the total production amounting to only 227 fine oz.

The *Mount Malcolm District* produced 24,073 fine oz. from the treatment of 86,801 tons of ore averaging 5.55 dwt per ton. The only contributor of note was the *Sons of Gwalia,* which produced 23,768 fine ounces of gold from 85,263 tons of ore, averaging 5.58 dwt. per ton, thus recording some advance on the figures of 19,186 fine ounces from 73,825 tons of ore at an average of 5.20 dwt. per ton in the previous year.

Ore of good grade has been discovered in the footwall at the 4, 6 and 8 levels.

The *Mount Margaret District* produced 3,682 fine oz. from the treatment of 4,430 tons at an average of 16.62 dwt. per ton. Over half of this gold came from sands retreatment. The remainder was from small mines, the best return being 312 fine ounces from 180 tons reported by the *Boomerang* at Burtville.

Coolgardie Goldfield.

This goldfield produced 22,867 fine ounces from the treatment of 42,833 tons of ore averaging 10.68 dwt. per ton, somewhat below the figures for the previous year when 26,229 fine oz. of gold were obtained from the treatment of 47,450 tons of ore averaging 11.06 dwt. per ton.

The number of men employed was 316 as compared with 363 in the previous year.

The *Coolgardie District* was very active, returns being made by 24 different operators.

Interest in the district was no doubt stimulated by the discovery of *Brown's El Dorado* in the Camel Paddock, which yielded 935 fine ounces, including 498 fine ounces of specimen gold, from 86 tons of ore. The principal mine, *New Coolgardie,* obtained 19,387 fine ounces of gold from the treatment of 37,436 tons of ore at an average of 10.36 dwt. per ton. In the previous year 20,914 fine ounces were obtained from the treatment of 41,756 tons at an average of 10.02 dwt. per ton.

There was little activity in the *Kunanalling District,* the total gold won being 308 fine ounces.

Pilbara Goldfield.

In the *Pilbara Goldfield* 12,937 fine ounces of gold were obtained from the treatment of 11,367 tons of ore at an average of 22.76 dwt. per ton. In the previous year 9,154 fine ounces were obtained from the treatment of 16,994 tons at an average of 10.77 dwt.

The number of men employed was 178 as compared with 160 in the previous year.

The principal producer in the *Marble Bar District* was the *Comet Mine* with 3,635 fine ounces of gold from the treatment of 2,126 tons.

In the *Nullagine District* the *Blue Spec Mine* produced 6,494 fine ounces of gold besides 130 tons of antimony from the treatment of 6,819 tons of ore. At the *Barton* gold amounting to 328 fine ounces was obtained from the treatment of 783 tons.

Yilgarn Goldfield.

In this goldfield 7,480 fine ounces of gold were obtained from the treatment of 40,329 tons of ore at an average of 3.71 dwt. per ton. This is considerably above the previous year's production of 5,180 fine oz. from 10,501 tons, averaging 9.87 dwt. per ton.

The increase is due principally to the operation of *Great Western Consolidated* at Bullfinch, which came into operation during the latter part of the year, and won 2,134 fine oz. from the treatment of 30,143 tons of ore. The low recovery is due partly to the absorption of gold by the plant and partly to low grade ore which was put through the mill in the initial stages.

The consistent *Radio* obtained 964 fine oz. from the treatment of 1,060 tons of ore, and *Edwards Find* obtained 2,466 fine oz. from the treatment of 6,364 tons of ore.

Peak Hill Goldfield.

This goldfield returned 5,603 fine oz. of gold from the treatment of 36,551 tons of ore at an average of 3.07 dwt. per ton. In the previous year production was only 271 fine oz. and the increase is due to the operations of the *Horseshoe Mine.*

Broad Arrow Goldfield.

This goldfield produced 3,225 fine oz. from the treatment of 4,808 tons of ore averaging 13.42 dwt. per ton. In the previous year 3,476 fine oz. were obtained from the treatment of 5,658 tons of ore at an average of 12.29 dwt. per ton.

East Murchison Goldfield.

The East Murchison Goldfield was practically at a standstill and produced only 1,350 fine oz., the principal contributor being the *North End* leases in the *Black Range District* with 632 oz. from 230 tons.

North-East Coolgardie Goldfield produced 950 oz. from the treatment of 1,170 tons of ore averaging 16.25 dwt. per ton. This is the best return for many years. The new find *Wall's Reward,* which returned 616 fine ounces from the treatment of 367 tons was mainly responsible for the improvement.

The *Kimberley Goldfield* reported 391 fine ounces; *Phillips River Goldfield* 189 fine oz; *West Kimberley Goldfield* 18 fine oz. and *West Pilbara Goldfield* 15 fine oz.; and 11 fine oz. is credited to other areas. There was no reported production in the *Gascoyne Goldfield.*

MINERALS OTHER THAN GOLD OR COAL

The production of minerals other than gold and coal for 1951 and for 1952 is shown in the table below.

PRINCIPAL MINERALS OTHER THAN GOLD AND COAL.

Mineral.	1951.		1952.	
	Tons.	Value. £A.	Tons.	Value. £A.
Antimony Ore and Concentrate	....	....	264·58	43,397
Asbestos—				
Chrysotile	726·55	29,301	652·35	37,255
Crocidolite	1,392·62	196,338	2,940·09	557,861
Barytes	5·00	18	9·00	50
Bentonite	449·00	1,347	586·00	2,036
Beryl Ore	90·77	11,174	85·29	14,562
Bismuth (lb.)	187·00	84	....	....
Chromite	....	....	773·00	11,100
Clays—				
Kaolin	12·00	19	267·75	1,303
Fireclay	8,134·00	5,770	9,608·00	9,520
Pottery	1,100·00	3,300	780·00	3,000
Cement	38,313·00	11,598	15,310·10	5,664
Corundum	....	....	54·00	380
Copper Ore	43·13	758	15·51	1,188
Cupreous Ore (Fertiliser)	1,337·05	16,104	1,643·59	21,595
Diatomaceous Earth	198·00	2,700	....	....
Dolomite	124·25	599	555·25	2,423
Felspar	1,806·50	7,390	2,503·50	10,452
Fergusonite	....	....	·17	165
Fullers Earth	....	....	25·00	125
Glass Sand	6,172·59	4,417	7,669·12	5,629
Glauconite	506·00	15,033	230·00	7,305
Gypsum	77,923·00	46,726	50,331·56	33,257
Iron Ore (For Pig)	19,122·27	181,136	17,703·45	226,844
Iron Ore (Exported)	10,384·00	10,297	204,945·00	203,238
Lead, Silver-Lead, Silver-Lead Zinc Ore and Concentrates	2,538·67	240,176	7,448·98	935,200
Magnesite	762·25	1,969	1,054·67	2,842
Manganese	5,256·52	33,789	5,044·80	35,634
Ochre				
Red	627·70	7,051	296·55	3,252
Yellow	60·00	840	....	....
Pyrites	46,615·00	296,988	53,577·00	422,029
Silver (Fine oz.)	196,743·32	79,222	199,153·41	80,125
Soapstone	38·40	125	....	....
Talc	651·17	7,663	1,223·61	14,683
Tantalite (Tant/Col. Ore and Concentrate)	2·06	2,350	7·02	10,010
Tin	61·10	39,493	97·80	68,716
Tungsten-Scheelite (Lb.)	317·00	215	5,139·00	3,691
Tungsten-Woolfram (Lb.)	11,038·00	9,585	60,352·00	46,018
Vermiculite	54·50	491	62·00	744
Zinc Ore (Fertiliser)	10·70	50	....	....
Total	....	1,264,116	....	2,821,293

The increase in production of lead ores has continued and lead is now the most important of all the minerals mined. Among the base metals significant quantities of iron and tin were obtained and among the industrial minerals the most important were crocidolite and pyrites.

Brief notes on the various minerals are given below:—

Antimony.

The Blue Spec mine at Nullagine treated 6,819 tons of ore for a recovery of 6,494 fine oz. of gold. The market for antimony has been dull and there is a considerable quantity of concentrates at the mine. The sale of 265 tons realised £43,397. A re-organisation of the mine and treatment plant aimed at the recovery of a bigger proportion of the gold at the mine and the production of antimonial concentrate more suitable to buyers' requirements is now in progress.

Asbestos.

The mine at Nunyerri produced 460 tons, including some recovered from dumps, and 193 tons from the Lionel were also treated. The strong demand for the shorter grades for use in the manufacture of tiles has provided an outlet for otherwise waste material. A fiberising and grading plant has been established at Perth.

Australian Blue Asbestos stepped up the production of crocidolite from 1,393 tons in 1951 to 2,940 tons valued at £557,861 in the current year.

Barytes.

Some interest has been shown in the Cranbrook deposit which is reported to be developing well. Only nine tons were marketed.

Bentonite.

The Marchagee deposits produced 586 tons valued at £2,036.

Beryl.

Production for the year amounted to 85.29 tons containing 1,046 units of beryllium oxide and valued at £14,562. Pegmatites in the vicinity of Spargoville yielded 14 tons, the remainder being obtained mainly in the Pilbara area.

Chromite.

The Coobina deposits yielded 773 tons valued at £11,100.

Clays.

Clays used in the manufacture of cement, pottery, refractory products and sundry other items totalled 25,698 tons valued at £18,184.

Copper.

Fertilisers absorbed 1,643 tons of carbonate ore valued at £21,595. The average price for this ore, with an average grade of 10.7 per cent. copper, was thus about £13 per ton. A parcel of 15½ tons of ore from Spinaway Well, which assayed 50.7 per cent. copper, was exported for treatment.

Corundum.

A parcel of 54 tons from Kathleen Valley in the East Murchison district realised £380.

Dolomite.

The production from the Mount Magnet deposit amounted to 555 tons as compared with 124 tons in the previous year. The price remained steady, the amount realised being £2,423.

Felspar.

The Londonderry Quarry produced 2,503 tons, well ahead of the previous year's output of 1,806 tons. At prices comparable with those obtained in the previous year this realised £10,452.

Fergusonite.

A small parcel (0.17 tons) from Cooglegong realised £165.

Fullers Earth.

Fullers earth for use in oil refining is obtained from Marchagee and used locally. Production for the year amounted to 25 tons valued at £125.

Glass Sand.

Glass sand from the Lake Gnangara deposits amounted to 7,669 tons valued at £5,629 all of which was used locally.

Glauconite.

The Gingin deposits yielded 1,380 tons of greensand from which 230 tons of glauconite valued at £7,305 was recovered.

Gypsum.

Owing to the decline in export trade there has been a considerable reduction in the production of gypsum. Apart from one small parcel from Norseman operations were confined to the central part of the State. The total production amounted to 50,332 tons valued at £203,238.

Iron Ore.

The export of iron ore from Cockatoo Island has attained considerable proportions, the total for the year being 204,945 tons valued at £203,238.

Ore for the Wundowie charcoal iron blast furnace was obtained from Koolyanobbing where 12,995 tons averaging 60.9 per cent. iron valued at £179,405 were mined and from Wundowie where 4,709 tons averaging 43.6 per cent. iron and valued at £47,439 were obtained.

Lead.

Ore and concentrates exported during the year amounted to 7,449 tons as compared with 2,539 tons in the previous year. The price of lead was steady at high levels and an average price of £125 per ton was received for concentrates, the total value being £935,200. Silver in lead concentrates was valued at £3,544. The principal producing area was Northampton with 5,699 tons. The Ashburton produced 979 tons, Pilbara and West Pilbara 451 tons and Kimberley and West Kimberley 319 tons.

Magnesite.

The Coolgardie deposits yielded 1,055 tons valued at £2,843.

Manganese.

Two deposits in the Peak Hill area are producing manganese ore for metallurgical purposes. The production for this year amounted to 5,045 tons, much as for the previous year. Similar prices were obtained and the value is placed at £35,634.

Ochres.

Comparatively little ochre has been mined, the year's production being 297 tons all from the Weld Range and valued at £3,252.

Pyrites.

The Iron King mine at Norseman railed 53,577 tons of ore and concentrate to superphosphate works in the metropolitan area. This is slightly above the figure for the previous year, and the value, £422,029, is considerably above last year's figure on account of increases in the unit price. The sinking of the new shaft and development of the No. 6 level are well advanced. The new shaft should be in operation during the coming year.

Silver.

The total silver produced was 199,153 fine oz. valued at £80,125. The gold mining industry produced 186,441 fine oz., the remainder coming from lead and copper ores.

Talc.

The demand for talc appears to be increasing. This year's production of 1,224 tons being nearly double that for the previous year. The price remains steady at about £12 per ton. The value of the year's output was £14,683.

Tantalite (and Columbite).

The production of tantalite and columbite amounted to seven tons of which a little over half was obtained from Greenbushes in tin concentrates. The remainder was obtained from eluvial deposits in the Pilbara and from the Spargoville pegmatites.

Tin.

Amalgamated Tin at Greenbushes with 31 tons and J. A. Johnston & Sons at Cooglegong with 44 tons have been the principal contributors to a total of 97.8 tons valued at £68,716.

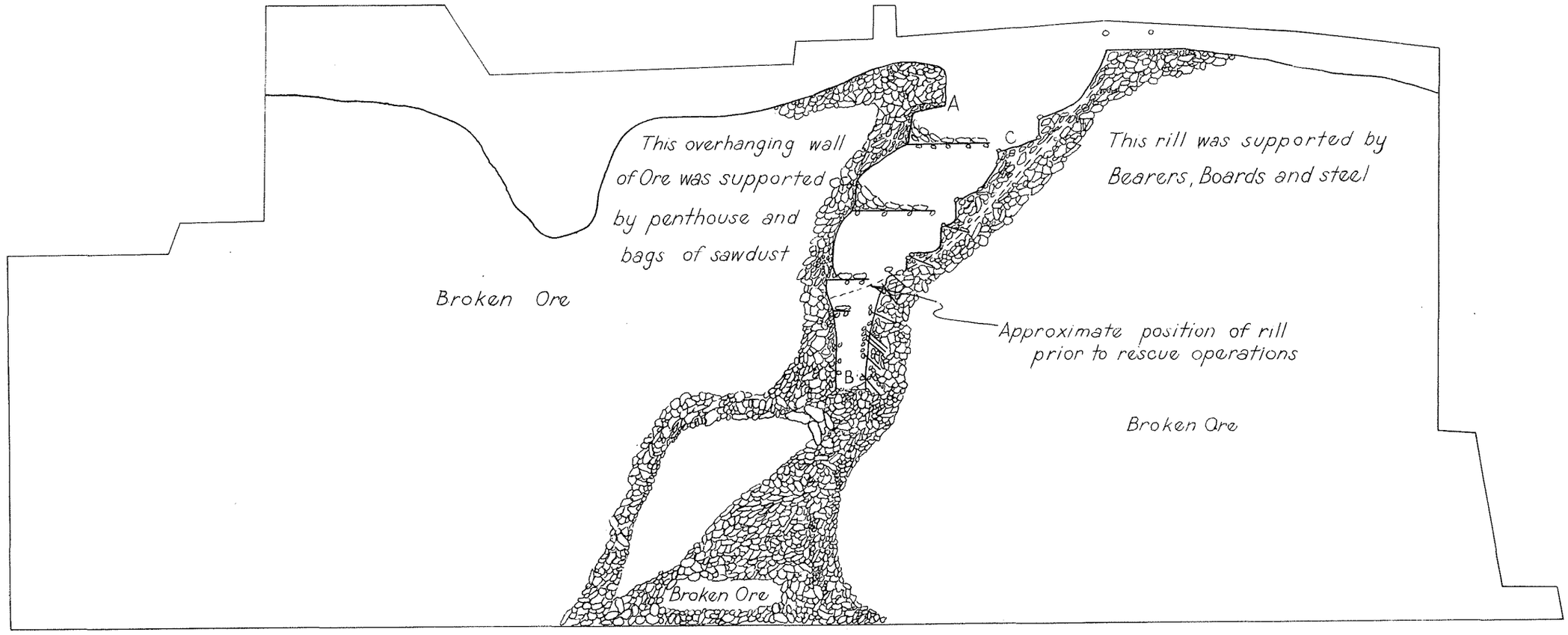
Tungsten.

The high price offering for tungsten ore stimulated wolfram mining. Some 30 tons of tungsten ore realised £49,709.

Vermiculite.

Perth Modelling Works obtained 62 tons from the Young River deposits.

E. E. BRISBANE,
State Mining Engineer.



LONGITUDINAL SECTION

SCALE

20 0 20 40 60

MINES DEPARTMENT

Accident to P. Nichols on 11-2-1952

HANNANS STAR MINE

300' LEVEL MIDDLE LODE

EAST BRANCH

Appendix No. 1.

REPORT ON ACTIVITIES OF EXAMINERS FOR UNDERGROUND SUPERVISORS' AND MINE MANAGERS' CERTIFICATES FOR 1952.

School of Mines,
Kalgoorlie,
29th December, 1952.

The Chairman, Board of Examiners for Mine Managers' and Underground Supervisors' Certificates, Mines Department, Perth, W.A.:

I hereby submit the annual report on the work of the Board of Examiners for Mine Managers' and Underground Supervisors' Certificates for the year 1952.

Mr. J. S. Foxall, who had been chairman of the Board of Examiners since its inception in May, 1949, retired from his position as State Mining Engineer in February, 1952, and his successor, Mr. E. E. Brisbane, assumed the position of Chairman of the Board of Examiners.

Mine Manager's Certificates of Competency.

Applications for Mine Managers' Certificates of Competency totalled 14, of which 13 were approved and one refused. The names of the successful applicants are as follows:—

Morris, L. W.	Baster, L. R.
Champness, P. A.	Abotomey, J.
Sweet, F. B.	Hurse, J. P.
Manners, J. E. L.	Tow, H. A.
Eddy, J. G.	Manners, M. D. L.
Hooper, R. W.	Smailes, J. P.
Braham, P. G.	

Mine Manager's Certificate of Service.

One duplicate Certificate of Service was issued during the year.

Examination in Mining Law.

An examination in Mining Law was held on April 28th, the results of which were as follows:—

Number entered	24
Number passed	16

Following are the names of the successful candidates:—

Abotomey, J.	Eddy, J. G.
Baster, L. R.	Harper, D. G.
Burrows, N. L.	Ibbotson, A. W.
Braham, P. G.	Manners, J. E. L.
Boyd, J. P.	Manners, M. D. L.
Crawford, J. H.	Smailes, J. P.
Champness, P. A.	Sweet, F. B.
Denham, K. E.	Tow, H. A.

Underground Supervisors' Examination.

An examination for Underground Supervisors' Certificates was held on 22nd September, 1952.

Applications were received from the following centres:—

Kalgoorlie	21
Norseman	5
Big Bell	1
Nullagine	1
Wittenoom Gorge	3
Bullfinch	1

The results of the examination were as follows:—

Number entered	32
Number passed	25

Following are the names of the successful candidates:—

Anderson, H. W.	Larsen, E. M. A.
Bean, F.	Mitchell, E. J.
Bridge, S.	Murphy, T. R.
Clark, J. W.	McDermott, J. C.
Colgan, B. H.	O'Connell, J. C.
Edlington, W. B.	Rosenius, J. A.
Finucane, K. J.	Steel, W. D.
Forster, E. T.	Tow, H. A.
Hall, H. H.	Timoney, E. G.
Holtzman, V. R.	Visala, J.
Holmes, R. B.	Watson, D.
Kelly, J.	Webster, M.
Kennedy, F. B.	

Members of the Board were very pleased with the improved standard of work shown by the candidates at this examination.

One duplicate Underground Supervisor's Certificate was issued during the year.

Underground Supervisors' Certificates.

Amendment to Mines Regulation Act, Regulation No. 31.—A recommendation made by the Board of Examiners that Regulation 31, paragraph 3, of the Mines Regulation Act, be amended to provide that evidence of satisfactory training in First Aid shall be produced by applicants for Underground Supervisors' Certificates was approved.

(Sgd.) G. M. LUMB,
Secretary,
Board of Examiners.

Appendix No. 2.

Mines Department,
Kalgoorlie.

ACCIDENT TO P. NICHOLS, HANNAN STAR SHAFT 300ft. LEVEL, 11/2/1952.

On the above date Nichols, with his mate, went into the 300 Middle Lode E. Branch stope to run the ore which had hung up as shrinking was being carried out. On viewing the position they decided to fire the hung up ore at point marked "A" on attached drawing. Nichols' mate went for fracteur, and, on his arrival back at the stope, found that the rill had run and carried Nichols down to point marked "B." He immediately went for assistance. The time would be approximately 10.30 a.m. on the 11th February.

I arrived at the mine at 12.15 p.m. On entering the stope I found that the Assistant Manager, Mr. R. Buckett, and the Underground Manager, Mr. J. McCahon, with other staff men and miners had started to make the rill safe at point "C" on the sketch. The rill at this time was very steep, so bearers were placed across the stope (width about 6ft.) and 8in. x 2in. x 8ft. planks placed as stages and to hold back the rill. During the time of the rescue party's entry into the stope and intermittently throughout the rescue work Nichols was heard talking.

The broken ore was overhanging in the back of the stope at point "A," for approximately 15ft. The width at that point was between 7ft. and 8ft., and on the face of that no rescue work could be carried out nearer to the buried man.

Mr. McCahon and I came to the conclusion that there was a chance if the overhanging broken rock could be held up or made safe to work under. Morrie Marin worked with me and we put the first bearer across the stope in front of the rill at point "C." Getting this bearer in was fairly

easy, the second bearer was placed in by working off a 12ft. oregon ladder, which was lashed to No. 1 bearer and stayed with a light one just over it. The time would then be about 2.30 p.m.

Mr. M. Ryan, District Inspector of Mines, and Mr. A. McGillivray, Workmen's Inspector, arrived and assisted in getting the material required into the stope. In getting the bearers in position one could not take the risk of trying to cut a hitch, as any vibration may have started the ore falling from the back. They were placed in the most accessible position where they would hold in safety. No. 1 and No. 2 bearers were set and lagged over. This gave us a good platform to work off. The ladder was then advanced and lashed as before. The stope at that point would be about 4ft. 6in. wide.

No. 3, No. 4 and No. 5 bearers were placed in position by the above procedure and I am pleased to state that we had no great difficulty in getting the bearers in as the walls were good and we were fortunate in finding suitable positions on both walls for the bearers. When the whole of the bearers were lagged over, they were packed by bags of saw dust. This was to act as a cushion should the ground come away. No. 2 pent house, marked "D," was also a very difficult job. A bearer was placed across the stope and the ladder rested on it. Then, by climbing the ladder, a measurement was obtained and the next bearer set in position. At times the man on the ladder had to be let out to the side of the ladder to place the timber in position.

I was attached to a safety belt.

At the completion of the second pent house, after 7½ hours, I went to the surface after handing over to Mr. Ryan, who placed in two more short pent houses and then started to drive steel and shift ore. This ore had to be handled up the various stages that were built against the rill, and it entailed very heavy work and great care had to be taken, so that the ore did not get away. All through the long hours of heavy work the men engaged in it showed great courage, ability, patience and a high sense of responsibility. The team work was excellent and at no time was there any shortage of material or men.

The dampness of the broken ore was the greatest thing in our favour and everything held in such a way that it was the greatest help in a successful rescue operation. Very little stone fell during the whole of the time spent at the job, (23½ hours).

The danger of going into shrink stopes to run them without being attached to a safety belt is apparent. Nichols had a rope, which was found down the rill, but he was not using a safety belt. Had he been attached to a belt he would probably have been out of danger in a few minutes.

Another case of a man being carried away in a shrink stope rill was that of J. McCarthy on the 8th April, 1939, at the North End Mine. McCarthy did not have a rope or a safety belt and the rescue work took 14 hours. Unfortunately, McCarthy died after being freed and brought to the level.

J. Donovan, Oroya South Gold Mine, on the 11th October, 1945, went into the fine ore bin to make it run, did not have a safety belt on and was buried. He lost his life.

Although the wearing of safety belts is compulsory under the Mines Regulation Act for certain work, there is a great lack of thought by the men who neglect to use the safety belt.

(Sgd.) J. H. VERRAN,
Senior Inspector of Mines.

Index to State Mining Engineer's Annual Report for 1952.

(3)—73981

LIST OF TABLES.

Division III.

Report of the Superintendent of State Batteries.

The Under Secretary for Mines:

Sir,—For the information of the Honourable Minister, I submit my report on the operation of State Batteries for the year ending 31st December, 1952.

CRUSHING.

One 15-head, seven 10-head and eight five-head mills crushed 42,270½ tons of ore made up of 520 separate parcels, an average of 82.105 tons per parcel. The bullion produced amounted to 20,502 oz. which is estimated to contain 17,386 fine oz. of gold, or 8 dwt. 3.5 gr. of gold per ton of ore.

The cost of crushing including administration was 40s. 4d. per ton as against 34s. 2d. for the previous year, a rise of 6s. 2d. per ton. Kalgoorlie, the only 15-head mill which operates continuously, had the best cost figure at 21s. 2d. per ton.

The average assay value of all the ore after amalgamation but before cyanidation was 3 dwt. 19 gr. Thus the total head value of the ore was 11 dwt. 22.5 gr. which is .5 gr. more than the previous year's figure.

Values in this ore before cyanidation can be segregated as follows:—

	Tons.	%
Over 2 dwt. 8 gr. per ton	23,939	56.6
1 dwt. 18 gr. to 2 dwt. 8 gr. per ton	4,871	11.5
Under 1 dwt. 18 gr. per ton	12,890	30.5
Refractory	570½	1.4
	42,270½	100.0

CYANIDING.

Twelve plants handled 45,936 tons of crushed ore for a production of 6,712 fine oz. worth £104,183. The average content of this tonnage was 3 dwt. 21 gr. before treatment while the residue contained 23.5 gr. The theoretical extraction by cyanidation was therefore 74.8 and the actual extraction 74.7 per cent.

The cost of cyanidation was 26s. 5d. per ton, an increase of 2s. 7d. per ton on the previous year Kalgoorlie and Yarri showed the best figures with 20s. 7d. and 22s. 2d. respectively, whilst Laverton was 22s. 3d.

ESTIMATED OVERALL RECOVERY.

With the average extraction in all cyanide plants at 74.7 per cent. and the average grade before cyanidation at 3 dwt. 19 gr. the average cyanidation recovery would be 2 dwt. 21.4 gr. Figures for estimated recovery would then be:—

	Dwt.	Gr.	%
Head value	11	22.5	100
Amalgamated recovery	8	3.5	68.24
Cyanidation recovery	2	21	24.08
Total recovery	11	0.5	92.32

The estimated value of production since inception excluding the value of gold tax paid to the Commonwealth is:—

	1952.	Grand Total.
Par Production—		
Crushing	73,809	8,154,670
Cyanidation	28,609	2,024,392
Gold Premium—		
Crushing	195,372	3,746,266
Cyanidation	75,573	1,149,033
Open Market Premium—		
Crushing	15,262	21,809
Cyanidation	5,610	7,042
Tin Production—		
Ore	—	93,883
Residues	—	572
Tungsten Production—		
Concentrates	13,224	16,620
	407,459	15,214,287

FINANCIAL.

	Tons.	Expenditure.	Receipts.	Profit.	Loss.
					£
Crushing	42,270½	87,632	21,890	—	65,792
Cyaniding	45,936	60,766	54,690	—	6,076
		148,448	76,580	—	71,868

The loss of £71,868 is an increase of £10,849 on the previous year and does not include depreciation or interest.

Capital expenditure was incurred as below:—

		General Loan Fund £ s. d.	Consolidated Revenue Fund. £ s. d.
Boogardie	Sundries	....	1 15 10
Lake Darlot	Mill Building	....	106 17 3
Laverton	Portable Conveyor....	....	659 4 0
Marble Bar	Berryman Loader	219 4 9	....
Meekatharra....	Berryman Loader	219 4 9	....
Northampton	Erection of Battery	1,539 0 0	4,920 11 11
Nullagine	Building	....	188 10 7
Ora Banda	Berryman Loader	219 4 9	4 0 3
Paynes Find....	Wilfrey Table and Diesel Engine	....	1,828 3 6
Yarri	Buildings	....	475 18 9
	Horses	....	64 0 0
		£2,196 14 3	£8,249 2 1

Cartage Subsidies:

	Tons.	Cost. £
On ore carted to State plants	12,895	5,894
On ore carted to private plants	607	372
	13,502	6,266

Comparative figures for the last three years are:—

	State Plants.			Private Plants.			
	Tons Crushed	Tons Subsidised	% Subsidised	Cost.	Tons Crushed	Cost.	Total Cost.
1950	50,871	18,278	35·9	7,719	1,247	528	8,246
1951	48,589	12,489	25·7	6,049	844	314	6,363
1952	42,270	12,895	30·5	5,894	607	372	6,266

STAFF.

There were no changes during the year. Circuits with their respective managers are as follows:—

Marble Bar, Bamboo Creek, Nullagine—H. A. G. Ball.
Mekatharra, Peak Hill—E. J. Clemesha.
Cue, Wiluna—J. E. Sturman.
Boogardie, Sandstone, Payne's Find—K. D. Mack.
Marvel Lock—J. W. Chegwidden.
Coolgardie, Norseman—J. G. Young.
Kalgoorlie—F. J. Breustedt.
Ora Banda—W. J. Crew.
Yarri—R. G. Sanfead.
Laverton—C. C. Ross.
Lake Darlot—R. A. Howard.

ADMINISTRATION.

Expenditure amounted to £13,352 12s. 5d., as against £11,266 10s. 1d. for 1951 and was equivalent to 3s. per ton of ore crushed and cyanided as against 2s. 5d.

Details are as follows:—

	1951. £ s. d.	1952. £ s. d.
Salaries	5,973 4 3	5,687 10 2
Pay Roll Tax	2,078 17 6	2,361 12 2
Workers' Compensation	2,349 4 4	3,041 5 2
Travelling and inspection	639 11 0	917 5 0
Sundries	225 13 0	1,344 19 11
	11,266 10 1	13,352 12 5

GENERAL REMARKS.

Continually rising costs during the year brought about a further increase in our working losses. With cyanide costs at 26s. 5d. per ton and allowing for an extraction of 75 per cent, it requires a head value of 2 dwt. 7 gr. for cyanide plants to break even. By regulation we are required to pay out on all sands over 2 dwt. 8 gr., so that towards the end of the year arrangements were made to segregate ore below 2 dwt. 8gr. into special dams for future treatment in the event of a rise in the price of gold.

A start was made with the construction of a plant specially designed to treat lead and other base metal ores, and located at Northampton the centre of one of the State's most productive mineral fields. Due to the difficult financial situation, progress has been slow, but it is hoped that the plant will be brought into operation late in the coming year. Besides lead it will treat trial parcels of such minerals as tin, tantalite, columbite, scheelite and wolfram, on which a cartage subsidy will be paid from any part of the State. It will also crush copper ore to the required fineness for use as an additive to fertilisers. As there is already a superphosphate works in Geraldton and much light land in the area which will ultimately produce regular crops, it is expected that increasing amounts of copper will be both mined and crushed in the district.

C. ADAMS,
Superintendent of State Batteries.

SCHEDULE 1.

Number of Parcels Treated, Tons Crushed and Head Value for the Year ended 31st December, 1952.

No. of Parcels Treated.	Battery.	Tons Crushed.	Yield by Amalgamation. (Bullion).	Yield by Amalgamation. (Fine Gold).	Tailings Gross @ 100%	Total Contents of Ore. (Fine Gold).	Average per Ton (Fine Gold).	Gross Value per Ton at £4 4s. 11½d. per Ounce.
			Ozs. Dwts.	Ozs. Dwts.	Ozs. Dwts.	Ozs. Dwts.	Dwts. Grs.	£ s. d.
14	Bamboo Creek	595½	470 8	398 18	146 13	545 11	18 8	3 17 11
19	Boogardie	669½	194 15	165 3	158 13	323 16	9 16	2 1 1
90	Coolgardie	5,449½	2,779 13	2,357 3	1,120 15	3,477 18	12 18	2 14 2
37	Cue	2,549½	2,322 8	1,969 8	600 13	2,570 1	20 4	4 5 8
137	Kalgoorlie	14,921½	4,157 7	3,525 8	2,269 17	5,795 5	7 18	1 12 11
8	Lake Darlot	999	241 9	204 15	201 11	406 6	8 3	1 14 6
39	Laverton	4,792½	1,763 15	1,495 13	1,485 8	2,981 1	12 11	2 12 11
11	Marble Bar	706	175 6	148 13	253 19	402 12	11 10	2 8 6
30	Marvel Loch	1,336½	679 8	576 3	224 13	800 16	12 0	2 11 0
25	Meekatharra	1,742½	1,531 7	1,298 12	326 15	1,625 7	18 16	3 19 4
12	Norseman	1,071½	519 14	440 14	95 9	536 3	10 0	2 2 6
3	Nullagine	98	111 18	94 18	18 15	113 13	23 5	4 18 7
39	Ora Banda	1,909	1,763 15	1,495 13	487 17	1,983 10	20 19	4 8 4
12	Paynes Find	511	325 3	275 14	43 3	318 17	12 11	2 12 11
15	Peak Hill	885½	175 1	148 9	65 8	213 17	4 20	1 0 7
29	Yarri	4,034	3,291 1	2,790 16	491 9	3,282 5	16 7	3 9 2
520	....	42,270½	20,502 8	17,386	7,990 18	25,376 18	12 0	2 11 0

Average Tons per Parcel .... 82·105
Average Yield by Amalgamation per ton (fine gold).... .... 8 dwts. 3·5 grains.
Average Value by Amalgamation per ton (fine gold).... .... £1 14s. 7d. Australian £6 6s. 1d.
Average Head Value of Tailings (fine gold) .... 3 dwts. 19 grains.
Average Value of Tailings per ton .... 16/1 Australian £2 18s. 7d.

SCHEDULE 2.

Details of Extraction—Tailing Treatment, 1952.

Battery.	Tons Treated.	Head Value.	Contents.	Tail Value.	Contents.	Recovery.	Call.	Recovery.	Shortage.	Surplus
		Dwts. Grs.	Dwts.	Dwts. Grs.	Dwts.	%	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Bamboo Creek	1,706	4 5	7,200	1 0	1,700	77	1,170 11 8	1,161 15 7	8 16 1	....
Boogardie	1,931	4 12	8,700	1 3	2,160	75	1,391 4 3	1,409 19 0	....	18 14 9
Coolgardie	4,199	3 5	13,400	22	3,920	71	2,014 0 11	1,948 16 6	65 4 5	....
Cue	1,680	5 12	9,240	1 8	2,240	76	1,486 4 6	1,514 4 9	....	27 10 3
Kalgoorlie	12,570	3 8	42,040	18	9,680	77	6,875 5 7	6,976 1 4	....	100 15 9
Laverton....	6,920	6 4	42,650	1 7	8,800	79	7,189 7 7	7,288 13 8	....	99 6 1
Marvel Loch	3,516	2 8	8,280	23	3,320	60	1,082 16 5	988 15 5	94 1 0	....
Meekatharra	3,330	3 19	12,660	1 8	4,400	65	1,754 8 4	1,744 0 1	10 8 3	....
Norseman	1,600	2 23	4,760	20	1,360	71	722 10 6	699 13 1	22 17 5	....
Ora Banda	3,012	4 21	14,750	1 6	3,740	75	2,340 15 8	2,300 1 4	40 14 4	....
Sandstone	684	4 11	3,040	1 2	740	76	489 7 2	461 2 9	28 4 5	....
Yarri	4,788	2 9	11,280	14	2,860	75	1,794 7 3	1,807 3 10	....	12 16 7
	45,936	3 21	178,000	23 5	44,920	74·8	28,311 9 10	28,300 7 4	270 5 11	259 3 5

Net shortage: £11 2s. 6d.

Head Value .... 3 dwts. 21 grains.
Tail Value .... 23·5 grains.
Theoretical Recovery .... 74·8%
Actual Recovery .... 74·7%.

SCHEDULE 3.

Cyanide Yield, 1952.

Battery.	Tons.	Fine ozs.	Value.	Premium.	Total.
Bamboo Creek	1,706	281·38	1,204·201	3,163·710	4,367·911
Boogardie	1,931	336·11	1,429·815	3,779·140	5,208·955
Coolgardie	4,199	469·91	1,996·351	5,284·387	7,280·738
Cue	1,680	362·46	1,535·340	4,064·113	5,599·453
Kalgoorlie	12,570	1,641·40	6,976·670	18,455·514	25,431·581
Laverton	6,920	1,696·87	7,282·038	19,088·663	26,370·701
Marvel Loch	3,516	261·87	1,112·948	3,065·178	4,178·126
Meekatharra	3,330	419·51	1,784·455	4,723·536	6,507·991
Norseman	1,600	161·92	699·652	1,820·610	2,520·262
Ora Banda	3,012	542·67	2,305·639	6,101·704	8,407·343
Paynes Find	....	·92	3·889	10·300	14·189
Sandstone	684	108·56	461·137	1,220·658	1,681·795
Yarri	4,788	428·24	1,817·627	4,795·981	6,613·608
	45,936	6,711·82	28,609·159	75,573·494	104·182,653

SCHEDULE 4.

Statement of Receipts and Expenditure for Year ended 31st December, 1952.

MILLING.

Batteries.	Tonnage Crushed.	EXPENDITURE.								RECEIPTS.		Profit.	Loss.
		Management.	Wages.	Stores.	Total Working Expenditure.	Cost per Ton.	Repairs and Renewals.	Sundries.	Gross Expenditure.	Cost per Ton.	Receipts.	Receipts per Ton.		
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	s. d.	£ s. d.	£ s. d.	£ s. d.	s. d.	£ s. d.	s. d.	£ s. d.	£ s. d.
Bamboo Creek	595·5	383 10 3	1,061 1 4	319 19 9	1,764 11 4	59 3·1	536 19 8	143 11 11	2,445 2 11	82 1·4	323 12 1	10 10·4	....	2,121 10 10
Boogardie	669·5	356 13 2	910 7 6	274 6 11	1,541 7 7	46 0·5	139 10 9	325 1 4	2,005 19 8	59 11	357 15 8	10 8·2	....	1,648 4 0
Coolgardie	5,119	740 0 1	4,099 13 2	2,990 8 1	7,830 1 4	30 7·1	3,082 16 0	1,448 6 5	12,361 3 9	48 3·5	2,362 4 2	9 2·7	....	9,998 19 7
Cue	4,809·25	560 7 6	4,798 17 5	1,701 11 6	7,060 16 5	29 4·3	1,259 18 7	990 9 5	9,311 4 5	38 8·6	3,119 10 0	12 11·6	....	6,191 14 5
Kalgoorlie	14,595·5	1,398 17 0	6,099 5 0	4,234 19 10	11,733 1 10	16 0·9	591 7 3	3,125 1 5	15,449 10 6	21 2	6,102 17 0	8 4·3	....	9,346 13 6
Lake Darlot	1,109	788 6 2	2,016 5 9	583 8 0	3,387 19 11	61 1·2	795 13 9	519 14 5	4,703 8 1	84 9·8	553 19 7	9 11·9	....	4,149 8 6
Laverton	4,792·25	547 4 11	3,857 3 1	1,484 0 9	5,888 8 9	24 6·8	1,132 1 8	1,144 2 3	8,164 12 8	34 0·8	2,571 13 2	10 8·7	....	5,592 19 6
Marble Bar	576	470 2 10	1,155 9 8	599 7 1	2,224 19 7	77 3	305 11 8	261 14 9	2,792 6 0	94 11·4	269 7 8	9 4·2	....	2,522 18 4
Marvel Loch	1,336·25	594 1 2	2,259 1 4	598 18 11	3,452 1 5	51 8	278 13 8	458 2 11	4,188 18 0	62 8·3	782 7 1	11 8·5	....	3,406 10 11
Meekatharra	1,742·5	569 9 1	2,228 8 10	858 15 7	3,656 13 6	41 11·5	686 16 8	410 3 1	4,753 13 3	54 6·7	991 4 3	11 4·5	....	3,762 9 0
Norseman	871·5	....	1,689 10 4	521 16 3	2,211 6 7	50 8·9	550 9 3	275 5 2	3,037 1 0	69 8·3	542 0 9	12 5·2	....	2,495 0 3
Northampton	....	....	....	....	....	....	....	....	....	....	2 10 0	....	2 10 0	....
Nullagine	98	169 7 6	326 12 4	132 12 1	628 11 11	128 3·4	339 4 7	38 1 10	1,005 18 4	205 3·4	61 4 8	12 5·9	....	944 13 8
Ora Banda	1,770	261 8 10	1,500 0 11	1,213 2 3	2,974 12 0	33 7·3	922 6 11	434 0 5	4,330 19 4	48 11·2	937 9 11	10 7·1	....	3,393 9 5
Paynes Find	408·75	33 13 4	1,164 3 6	464 3 7	1,662 0 5	81 3·8	723 19 5	322 7 3	2,708 7 1	132 6·2	562 19 4	27 6·4	....	2,145 7 9
Peak Hill	885·5	....	759 2 0	463 12 6	1,222 14 6	27 7·3	489 5 1	306 15 0	2,018 14 7	45 7·1	336 14 3	7 7·2	....	1,682 0 4
Sandstone	....	....	10 10 11	....	10 10 11	....	....	24 15 4	35 6 3	....	16 4 7	....	....	19 1 8
Yalgoo	....	....	....	....	....	....	....	....	....	....	15 0 0	....	15 0 0	....
Yarri	4,102	518 10 6	4,515 12 5	1,627 2 4	6,661 5 3	32 5·7	692 16 0	1,015 6 9	8,369 8 0	40 9·6	1,981 7 3	9 7·9	....	6,388 0 9
	43,480·5	7,391 12 4	38,451 5 6	18,068 5 5	63,911 3 3	29 4·7	12,527 10 11	11,242 19 8	87,681 13 10	40 3·9	21,890 1 5	10 1	17 10 0	65,809 2 5
Total Loss	....	....	....	....	....	....	....	....	....	....	....	....	....	65,791 12 5

SCHEDULE No. 5.

Statement of Receipts and Expenditure for Year ended 31st December, 1952.

TAILING TREATMENT.

Batteries.	Tons Treated.	EXPENDITURE.									RECEIPTS.		Profit.	Loss.
		Management.	Wages.	Stores.	Total Working Expenditure.	Cost per Ton.	Repairs and Renewals.	Sundries.	Gross Expenditure.	Cost per Ton.	Receipts.	Receipts per Ton.		
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	s. d.	£ s. d.	£ s. d.	£ s. d.	s. d.	£ s. d.	s. d.	£ s. d.	£ s. d.
Bamboo Creek	1,706	187 12 9	1,102 16 3	459 13 5	1,750 2 5	20 6·2	79 6 4	783 9 9	2,612 18 6	30 7·5	2,111 14 8	24 9	....	501 3 10
Boogardie	1,931	610 17 4	952 1 0	617 9 5	2,180 7 9	22 6·9	116 9 6	685 14 11	2,982 12 2	30 10·7	2,092 19 8	21 8·1	....	889 12 6
Coolgardie	4,199	567 13 5	3,858 2 6	1,828 16 7	6,254 12 6	29 9·4	143 15 6	1,009 2 11	7,407 10 11	35 3·3	3,941 5 2	18 9·2	....	3,466 5 9
Cue	1,680	393 8 5	941 1 5	823 7 4	2,157 17 2	25 8·2	163 6 8	573 7 5	2,894 11 3	34 5·5	2,791 16 8	33 2·8	....	102 14 7
Kalgoorlie	12,570	825 13 0	7,086 8 8	3,725 19 8	11,638 1 4	18 6·2	81 15 2	2,202 13 0	13,922 9 6	22 1·8	16,259 18 11	25 10·4	2,337 9 5	....
Laverton	6,920	543 1 0	3,828 16 6	1,909 14 6	6,281 12 0	18 1·8	92 6 7	1,335 2 11	7,709 1 6	22 3·4	11,827 19 2	34 2·2	4,118 17 8	....
Marble Bar	....	....	....	179 4 11	179 4 11	....	6 0 0	554 0 8	739 5 7	....	....	....	....	739 5 7
Marvel Loch	3,516	537 15 7	2,355 6 0	744 4 6	3,637 6 1	20 8·2	24 10 3	702 15 8	4,364 12 0	24 9·9	2,363 15 3	13 5·3	....	2,000 16 9
Meekatharra	3,330	562 13 5	2,003 19 9	817 17 4	3,384 10 6	20 3·9	55 12 3	765 11 7	4,205 14 4	25 3·1	2,445 0 2	14 8·2	....	1,760 14 2
Mt. Ida	....	....	....	....	....	....	....	....	....	....	83 11 9	....	33 11 9	....
Norseman	1,600	....	1,691 5 1	360 14 0	2,051 19 1	25 7·7	132 16 4	77 1 2	2,261 16 7	28 3·2	924 19 6	11 6·7	....	1,336 17 1
Ora Banda	3,012	629 4 11	2,227 9 8	1,142 2 5	3,998 17 0	26 6·6	475 15 0	706 2 5	5,180 14 5	34 4·8	3,612 16 11	23 11·8	....	1,567 17 6
Sandstone	684	82 10 0	497 17 8	245 11 4	825 19 0	24 1·8	438 4 9	282 13 1	1,546 16 10	45 2·7	665 19 10	19 5·6	....	880 17 0
Yarri	4,788	535 1 5	2,220 14 5	1,031 6 3	3,787 2 1	15 9·8	148 19 8	1,001 15 8	4,937 17 5	20 7·5	5,568 7 1	23 3·1	630 9 8	....
	45,936	5,475 11 3	28,765 18 11	13,886 1 8	48,127 11 10	20 11·4	1,958 18 0	10,679 11 2	60,766 1 0	26 5·5	54,690 4 9	23 9·7	7,170 8 6	13,246 4 9
	....	....	....	....	....	....	....	....	....	....	....	....	....	7,170 8 6
Net Loss	....	....	....	....	....	....	....	....	....	....	....	....	....	£6,075 16 3

Note.—Six months Interest £780 only paid to Treasury this year, Revenue shown above is the net figure, after the Interest had been deducted.

ANNUAL PROGRESS REPORT OF THE GEOLOGICAL SURVEY BRANCH OF THE MINES DEPARTMENT FOR THE YEAR 1952.

Contents.

List of Plates.

List of Figures.

Division IV.

Annual Progress Report of the Geological Survey of Western Australia for the Year ended 31st December, 1952.

The Under Secretary for Mines:

Sir,—I have the honour to submit, for the information of the Honourable the Minister for Mines, my report on the operations and progress of the Geological Survey for the year ended 31st December, 1952.

STAFF.

The active strength at the end of the year was as follows:—

Professional—Ellis, H. A., B.Sc., A.O.S.M., Government Geologist; Lord, J. H., B.Sc., Geologist, Grade 1; Berliat, K., D.Sc., Geologist, Grade 2; de la Hunty, L. E., B.Sc., Geologist, Grade 2; Sofoulis, J., B.Sc., Geologist, Grade 2; Low, G. H., B.Sc., Geologist, Grade 2; Noldart, A. J., B.Sc., Geologist, Grade 2. Total, 7.

Clerical—Connolly, R. R., Clerk; White, Miss S., Typist; McNamara, T. H., Trainee Junior Clerk. Total, 3.

Laboratory—Fimmell, L. H., Laboratory Assistant. Total, 1.

Promotions, Resignations, New Appointments.

There were no promotions during the year.

Miss M. E. Redman, B.Sc., Temporary Technical Assistant, who was engaged on the compilation of a comprehensive index of W.A. geological and mining literature, resigned on 20th March to accept an appointment as Technical Librarian with the Commonwealth Department of Supply and Development, Canberra. She was not replaced, and the work is not finished.

Mr. N. M. Gray, B.Sc., resigned on 9th May to accept an appointment with the Sydney Metropolitan Water Board. He was replaced on 4th August by Mr. A. J. Noldart, B.Sc., who came to the Department from a private mining company in Tasmania.

Mr. J. C. McMath, B.Sc., Senior Geologist, resigned on 10th October to take up a posting with the French Government in Madagascar. His position had not been filled at the end of the year.

Mr. T. H. McNamara commenced duties on 25th Feburary as a Trainee Junior Clerk.

Professional Staff.

Efforts were continued throughout the year, but without success, to fill the vacancies for two geologists with at least five years' experience, which were created in early 1950.

The office and storage accommodation, under construction during 1951 at the corner of Museum and Francis Streets, was completed and occupied during the year.

The approved establishment for professional officers as at 31st December, is as follows:—

Government Geologist—H. A. Ellis.
Senior Geologist—Vacant.
Geologist, Grade 1—J. H. Lord.
Geologist, Grade 2—K. Berliat.
Geologist, Grade 2—Vacant.
Geologist, Grade 2—Vacant.
Geologist, Grade 2—L. E. de la Hunty.
Geologist, Grade 2—J. Sofoulis.
Geologist, Grade 2—G. H. Low.
Geologist, Grade 2—A. J. Noldart.

Systematic regional geological surveying cannot be undertaken in a State with an area of 975,920 square miles with a staff of this size, and professional officers, including myself, were hard put to it to cope with only some of the demands for geological work during the year.

The following tabulated statement shows the relations between the area of the State and the availability of geologists during the year:—

Period.	No. of Geologists available, including Government Geologist.	Area of State.	Square miles per Geologist.	Population of State
1952.		sq. miles. 975,920		611,000
Jan.-May	8		121,990	
May-Aug.	7		139,410	
Aug.-Oct.	8		121,990	
Oct.-Dec.	7		139,410	

Activities of Professional Officers.

H. A. Ellis, Government Geologist.

In addition to head office duties, the following field work was undertaken:—

Places Visited.	Purpose of Visit or Matters Investigated.	Period.
Mica Hill (Eucla Division)	Sillimanite occurrence	Jan.
Esperance District	Water Supply	
Kendenup	Vermiculite occurrence	
Nannup	Coal	Feb.
Collie	Coal	
Edwards' Find	Gold	
Nevoria	Diamond Drilling for gold	March.
Esperance District	Water Boring operations	
Collie	Coal boring	
Koolyanobbing	Iron ore	April.
Kathleen Valley	Copper and Scheelite	
Norseman	Iron pyrites	
Nevoria	Diamond Drilling for Gold	May.
Kendenup	Inspection of Government Reserve	
Koolyanobbing	Location of Bore Sites	June.
Busselton	Water Supply	
Comet Vale	Scheelite	
Norseman	Iron Pyrites	
Nevoria	Drilling for gold	July.
Edwards' Find	Gold	
Ravensthorpe	Inspection; Ravensthorpe Survey	
Coolgardie	Alleged Uranium Discovery	Aug.
Wilgie Mia	Uranium	Sept.
Norseman	Iron Pyrites	
Koolyanobbing	Radioactive Reconnaissance	Oct.
Ravensthorpe	Inspection; Ravensthorpe Survey	
Cue District	Radioactivity....	Nov.
Collie	Coal	
Norseman	Iron Pyrites	Dec.
Koolyanobbing	Diamond Drilling	

J. C. McMath, Senior Geologist.

January-October: Organisation, administration, supervision, and field duties in connection with the geological survey of the Ravensthorpe Region, Phillips River Goldfield. Resigned 10th October.

J. H. Lord, Geologist, Grade 1.

January-December: Supervised drilling operations on the Collie Mineral Field with a BBS-4, Failing 1500 and percussion plant. Planned future drilling programmes for the following areas:—Co-operative Colliery, vicinity of Centaur Colliery, Stockton Colliery and on Western Collieries Ltd. leases. Commenced a regional survey of an area within a 15-mile radius of Collie.

K. Berliat, Geologist, Grade 2.

January: Mapping and lay-out of drilling programme at Mt. Caudan, Yilgarn Goldfield.

March-June: Supervision Esperance Plains water boring programme.

August: Investigation Wicherina area for Geraldton water supply.

September: Inspection of the Northampton Mineral Field.

October-December: Miscellaneous mine inspections and water supply investigations.

N. M. Gray, Geologist, Grade 2.

January-May: Field duties in connection with the geological survey of the Ravensthorpe region, Phillips River Goldfield. Resigned 9th May.

L. E. de la Hunty, Geologist, Grade 2.

January: Survey and location of bore sites at Mt. Caudan with K. Berliat.

February: Examination and sampling of bentonite at Coorow and silica sands at Donnybrook.

March-August: Mapping and sampling of gypsum deposits throughout the State with G. H. Low.

September-October: Investigation of manganese deposits in the Pilbara and Peak Hill Goldfields.

November-December: Radiometric survey at Wilgie Mia with G. H. Low.

J. Sofoulis, Geologist, Grade 2.

January-October: Field duties in connection with the geological survey of the Ravensthorpe region, Phillips River Goldfield.

October-December: In charge of Ravensthorpe geological survey.

G. H. Low, Geologist, Grade 2.

January-February: Kalgoorlie ore sampling.

March-August: Field mapping and sampling of gypsum deposits throughout the State with L. E. de la Hunty.

October: Reports on Swan River and Natural Resources of W.A.

November: Indexing Coolgardie Bulletin. Wilgie Mia radiometric survey with L. E. de la Hunty.

December: Report writing for gypsum survey.

A. J. Noldart, Geologist, Grade 2.

August-December: Group inspection and mapping in connection with the geological survey of the Ravensthorpe region, Phillips River Goldfield.

FIELD WORK.

Major Field Work completed during the year and in progress as at 31st December.

(1) Field work in connection with the investigation of the gypsum deposits of the State was commenced and completed.

(2) Supervision of deep drilling and shallow percussion drilling on the Collie Coal Field continued throughout the year.

(3) The collection of a representative suite of samples of gold-bearing ore from various depths on the principal lodes of the main operating gold mines of the Golden Mile, Kalgoorlie, was completed.

(4) The extensive water boring campaign on the Esperance Plain in the vicinity of Gibson was commenced and completed.

(5) Work in the Ravensthorpe district continued throughout the year.

(6) Diamond drilling of the iron ore deposits at Koolyanobbing commenced towards the end of the year.

Field Work for 1953.

(1) Continuation of the Ravensthorpe district geological survey.

(2) Geological survey of Linden Mining District.

(3) Geological survey of Mt. Ida Mining District.

(4) Geological survey of Mt. Magnet Mining District.

(5) Continuation of the Collie Coal Field exploratory boring.

TRANSPORT.

Tabulated details of transport at present in use by the geological survey are as follows:—

Vehicle W.A.G.	Make and Type.	Load.	Mileage as at 31–12–52.	Mileage for 1952.	Date Vehicle Purchased.	Remarks.
		cwt.				
1175	Ford Utility	18	66,111	10,294	1946 (new)	Mileage includes 912 miles without speedometer.
1194	Ford Utility	18	79,000	12,785	1946 (new)	Including 4,000 miles without speedometer.
1307	Chevrolet Utility	15	108,765	7,726	1947 (used)	Reconditioned 1951.
1413	Chevrolet Utility	15	62,397	6,195	1947 (new)	Undergoing complete overhaul as at 31–12–52.
1421	Chevrolet Utility	15	53,569	7,361	1947 (new)	
2044	Dodge Utility	18	25,183	7,396	1950 (new)	Including 530 miles without speedometer.
2393	International Utility	14	16,137	6,574	1950 (new)	
2412	International Utility	14	33,335	18,689	1950 (new)	
2608	International Utility	14	19,996	11,896	1951 (new)	

Total miles: 88,916.

SERVICE TO THE GENERAL PUBLIC, MINING INTERESTS, AND GOVERNMENT DEPARTMENTS.

Much information, both written and oral, was given to a variety of applicants during the year, and our publications were frequently sought.

ACTIVITIES OF THE COMMONWEALTH BUREAU OF MINERAL RESOURCES.

Commonwealth geological and geophysical parties operated in the Kimberley Division during the year, and a geological party worked in the North-West Division. All of these parties were working on sedimentary areas with an emphasis on possible oil bearing areas.

West Australian Petroleum Pty. Ltd. commenced intensive geophysical prospecting on the Exmouth Gulf structures and landed a large consignment of drilling equipment. No suitable bore site had been located up to the end of the year.

PUBLICATIONS.

Issued during 1952.

Annual Progress Report of the Geological Survey of Western Australia for 1949.

Bulletin No. 103: Geology of Portion of the Mt. Margaret Goldfield, by R. A. Hobson, B.Sc. (Hons.), and K. R. Miles, D.Sc. Atlas No. 1. (Text already issued.)

Bulletin No. 95 (Third Edition): The Physiography of Western Australia, by J. T. Jutson, B.Sc., LL.B.

Bulletin No. 105: The Collie Mineral Field, Part I, by J. H. Lord, B.Sc.

In the Press.

Annual Progress Report of the Geological Survey of Western Australia for 1950 and 1951.

Bulletin No. 103: Atlas No. 2 (Text and Atlas No. 1 already issued).

Bulletin No. 107: A Re-survey of the Coolgardie District, W.A., by J. C. McMath, B.Sc., and N. M. Gray, B.Sc.

Geological and Economic Maps of the Metropolitan Area.

Compiled and awaiting Authority to Print.

Mineral Resources of Western Australia Bulletin No. 6: Silver, Lead and Zinc, by W. Johnson, B.Sc. (Hons.).

Mineral Resources of Western Australia Bulletin No. 7: Vermiculite, Talc and Soapstone, Fuller's Earth, Bentonite and Diatomite, by W. Johnson, B.Sc. (Hons.).

Bulletin No. 108: The Geology of the Irwin River and Eradu Coal Basins, by W. Johnson, B.Sc. (Hons.), J. S. Gleeson, B.Sc., and L. E. de la Hunty, B.Sc.

In Course of Preparation.

Mineral Resources of Western Australia Bulletin No. 8: Gypsum, by L. E. de la Hunty, B.Sc., and G. H. Low, B.Sc.

H. A. ELLIS,
27th February, 1953. Government Geologist.

KOOLYANOBBING IRON ORE DEPOSITS.

Examination for Radio-active Minerals.

By H. A. ELLIS, B.Sc., A.O.S.M.,
Government Geologist.

In the course of the examination of these deposits as potential sources of iron ore during 1938, many hundreds of samples of surface ore were taken and a large number of specimens of iron ore and country rock were collected by the writer and his colleagues.

All of this material was examined by the Mineral Section of the Government Chemical Laboratories under the supervision of Dr. Simpson, who took a keen personal interest in the material submitted.

None of the secondary or primary uranium bearing minerals were detected in the suite of samples and specimens examined, and owing to the attractive colour of most secondary uranium bearing minerals, it was a reasonably safe conclusion that the failure to detect them in the outcrop of the ore bodies indicated their absence from the Koolyanobbing iron ore bodies.

Following upon the discovery last month of a secondary radio-active mineral in the Wilgie Mia ochre caves 43 miles North-North-West of Cue, associated with banded iron formations and lenses of heamatite iron ore in a manner apparently similar to that of the occurrence of banded iron formations and haematite iron ore lenses at Koolyanobbing, the writer decided to examine the Koolyanobbing Iron Deposits with a Geiger counter.

On 3rd & 4th October the four main iron ore lenses at Dowd's Hill and in the vicinity of Koolyanobbing Trig. Station M.Y.I. (Ore bodies A, C, D & E, Plate 1. G.S.W.A. An. Rep. 1945) were examined with a portable Austronic Rate Meter, Type P.R.M. 200, Series No. 55.

Using the most sensitive setting of the instrument, 5 min x 5, carrying the instrument 6in. above ground level, and wearing the head phones, zig-zag traverses were made along each ore body from hanging-wall to foot-wall. The foot-wall and hanging-wall country was also examined at frequent intervals. The background count at the above setting was 20 pulses per minute; and throughout the traverses no alteration in this rate was detected either by the earphones or on the meter.

Outcrop conditions over the ore bodies were very good, and frequent exposures of both hanging-wall and foot-wall were found.

It can be said then that an extensive surface sampling campaign involving the taking of many hundreds of samples right across the ore bodies at intervals of 100ft. along the ore bodies, together with the collection of specimens of all types of mineralisation seen during the 1938 survey, failed to reveal the presence of either secondary or primary uranium bearing minerals. In confirmation of this negative mineralogical result, we now have the negative radio-activity results from the Geiger Rate Meter traverses recently carried out by the writer.

It would appear therefore that no radio-active minerals are associated with the outcrop rocks or outcrop ore of the Koolyanobbing Iron Ore Deposits.

In the course of diamond drilling operations now about to commence, all core will be tested for radio-activity.

REPORT ON RADIOACTIVITY AT WILGIE MIA CAVE, MINERAL CLAIM 26.

Forty-three Miles by Road N.N.W. of Cue,

Murchison Goldfield, Western Australia.
Approximate Latitude 26° 56′ S.
Approximate Longitude 117° 42′ E.

By H. A. ELLIS, B.Sc., A.O.S.M.,
Government Geologist.

CONTENTS.

History.

Late in August 1952, Mr. R. H. Stowe, a Perth Chartered Accountant, whilst holidaying in the Cue district, visited the Wilgie Mia ochre cave, situated in the foothills of the Weld Range some 43 miles by road north-north-west of Cue. He was accompanied by Mr. L. Arrigoni, a small mine-owner and prospector resident in Cue, and he took with him a small portable Geiger Counter, being interested in minerals and recent aids in their detection such as Ultra Violet lamps and Geiger Counters. Whilst walking over the surface of the outcropping iron ore close to the cave-opening, he made comparative watch-timed readings of the ear-phone clicks registered by the Geiger Counter, and noticed that in a certain part of the outcrop the intensity of the radioactivity very noticeably increased.

Investigating this occurrence further, he walked along a tunnel driven into the hill in a north-westerly direction through country rock and the iron ore to the bottom of the cave, and noticed that at a point near the junction of the country rock and the iron ore, the radioactivity was markedly higher than normal background, and much higher than at any other part of the tunnel. The junction of the country rock and iron ore was then examined on the surface, a little to the west of the tunnel-line, and about 50ft above the tunnel intersection. This locality was also found to be markedly radioactive.

On returning to Perth he reported the occurrence to the Under Secretary for Mines, and the writer was requested to examine the occurrence as soon as possible. This examination was made on 5th and 6th September, with the aid of an "Austronic" Portable Rate-Meter Geiger Counter, Type P.R.M. 200, made by the Austronic Engineering Laboratories, 420 William Street, Melbourne, Victoria.

Situation and Access.

The Wilgie Mia ochre cave is contained in Mineral Claim 26 of five acres, situated in the more southerly of the two lines of hills comprising the Weld Range, the centre of which lies 35 miles air-line N.15°W. of Cue. It is reached in 43 miles by road travelling via the Big Bell Road to the Berringarra Station turn-off, thence along the Berringarra Station Road to the Wilgie Mia turn-off, 33.4 miles from Cue. M.C.26 is reached in a distance of 9.2 miles from the turn-off. The road surfaces were good at the time of inspection, and the road was adequately sign-posted.

M.C.26 is pegged in the name of Zaddow and Cassidy and worked for red ochre by a syndicate known as Murchison Minerals Ltd. The demand for Wilgie Mia ochre is not steady, and the claim is worked only intermittently. M.C.26 was pegged as a Prospecting Area for Uranium and Thorium minerals by Messrs. Stowe and Arrigoni, immediately after the discovery of the radioactivity on the claim, and after objections to the granting of the prospecting area were heard in the Warden's Court at Cue, they were granted the prospecting rights for radioactive minerals. The Murchison Minerals Syndicate has since come to a working arrangement with Messrs. Stowe and Arrigoni with respect to future prospecting operations.

Geology.

The Weld Range consists of two sub-parallel lines of hills from two to four miles apart composed of interbedded banded iron formations (jaspilites), tuffaceous sediments and greenstones of extrusive and probably intrusive origin. The area has not been geologically surveyed in detail. The strata have a general north-easterly trend, very steep dips, and the topography is controlled by the more resistant jaspilite horizons. The surrounding country is flat to undulating, and consists of granite or gneiss. The granite is intrusive into the jaspilite-greenstone complex, which in places carries auriferous quartz reefs, though no quartz reefs or granitic intrusions are known near the Wilgie Mia cave.

Much of the gneiss is of replacement origin, representing granitised rocks of the Greenstone Series, but the exact origin of all of it is unknown. The rocks of the Weld Range are older than the granite, but their relationship to all of the gniess is unknown.

The whole rock assemblage of the district for hundreds of square miles is of the same pre-Cambrian age, (probably Archaean) and contains the same rock types as occur in the other Goldfields of the State. The jaspilites are much the same in general appearance in this district as they are for instance in the Yilgarn and Mt. Margaret Goldfields, situated many hundreds of miles distant.

The southern line of hills of the Weld Range contains a central core of jaspilites in which are developed over a length of several miles, five lenses of high grade laminated, granular haematite iron ore, varying in length from 700ft. to 1900ft., and in width from 30 to 120ft. These jaspilite bands with their associated iron ore lenses are interbedded with fine grained clastic rocks, which in their much weathered outcrops appear to be shales and tuffs. Basic igneous rocks also occur in the succession, but there is no clear evidence of their intrusive nature, and they are, most likely, lava flows.

Some of the iron ore lenses become ochreous in places, and consist of rapidly alternating thin bands (as thin as ¼in. or less) of grey shale and granular haematite, with considerably larger local developments of shale which weathers in a cavernous manner and becomes red ochre due to impregnation with migrating iron oxide. The Wilgie Mia cave first developed in one of these more shaley sections of the longest iron ore lens by natural processes, being subsequently enlarged by the mining operations of Natives and Europeans.

The iron ore is hard and black at the outcrop, consists predominantly of haematite and shows a pronounced laminated structure. It is highly inclined (dip about 85°) and in many places has been extensively folded into steeply plunging drag-folds. Underground, to a vertical depth of about 70ft. below the outcrop, the deepest point at which it has been exposed, it is much softer and granular and is certainly more intermixed with clay minerals, though still maintaining its laminated structure.

The Radioactive Occurrences.

The area surrounding Wilgie Mia cave was geologically surveyed at a scale of 100ft. = 1in. (see Plate I) and a Radiometric Survey on a 100ft. by 50ft. grid (see Plate II) was carried out by Messrs de la Hunty and Low during December, 1952.

When the writer first examined the deposit on 5th and 6th September, using a portable "Austronic" Rate-Meter Geiger Counter, Type P.R.M. 200, prominent radioactivity was detected in four places; at the junction of the iron ore and hanging wall tuffs in the adit, in some loose pieces of mixed granular haematite ore interlaminated with grey shale and red ochre lying on the floor of the cave about 30ft. N. 40° E. from the chute at the end of the adit, on the hanging wall of the iron ore where it outcrops on the adit line and at a spot about 100ft. south-west along the hanging wall from the last point.

The detailed radiometric survey located one other prominently radioactive spot, namely, at the north-eastern end of an iron ore lens about 400ft. south-west of the adit line.

The mineral responsible for the radioactivity has so far (December, 1952) been identified at one spot only, viz., as a secondary mineral occurring in cavities and cracks on the loose iron ore specimens found by the writer on the floor of the cave 30ft. N. 40° E. from the chute at the end of the adit. All the other radioactive anomalies are associated with hard massive limonitic iron ore, occurring at or near the hanging wall margin of the outcropping iron ore, or in the decomposed hanging wall tuffaceous rocks in the adit at or very near the junction with the iron ore.

The mineral identified was first located in highly radioactive specimens of iron ore first detected by the Geiger counter during a slow walking traverse of the very uneven cave floor by the writer, and selected underground entirely on their relative de-

grees of radioactivity. In all, some 40 lb. of specimens and fines was collected, and approximately 30 lb. of this material was submitted to the Mineral Section, Government Chemical Laboratories, for investigation.

The iron ore containing the radioactive mineral consisted of laminated, fine granular haematite and grey shale, with soft red ochre associated with the shale laminae. The laminae varied in thickness from 1/32 to ¼ of an inch, and the specimens were very friable, much jointed, and some of them partly foliated. On very careful scrutiny, extremely small concentrations, about the size of a pin head, of a dull grey or very faintly yellow material were discernible on the exposed inter-laminar surfaces, but on opening up a strongly radioactive specimen by using a knife in the planes between the laminae, numerous small clusters of a radioactive mineral are revealed. This mineral occurs as encrustations in joint planes, in small cavities in the iron ore of the specimens, and on the interlaminar surfaces. It varies in colour from colourless through light yellow, to sulphur yellow to orange, the latter colour being confined to the hemispherical centre of some of the better defined small, rosettes of needle-shaped crystals.

Appendix 1. contains the Government Mineralogist's report on this mineral and other samples, and it has been determined as a hydrated uranium silicate, containing approximately 69 per cent uranium oxide expressed as U_3O_8.

The mineral is unquestionably of secondary origin, and has been deposited in and on small open spaces in the impure iron ore. Extensive searches were made inside the large cave looking for this radioactive ore *in situ*, but without success, nor was any similar ore discernible in the radioactive patches located in the course of the grid radiometric survey. All other radioactivity at Wilgie Mia is so far associated with hard, massive, limonitic iron ore in which it has not been found possible to identify the radioactive mineral.

The massive, limonitic iron ore occurs plentifully along the hanging wall of the iron ore lens, but it is radioactive in small patches only, and over narrow widths. Sometimes one face of a slab 6in. thick shows marked radioactivity, while the opposite face is only weakly radiocative. The most radioactive limonitic ore found on the surface contained 0.015 equivalent uranium, but examination failed to indicate the radioactive mineral.

Plate II shows the results of a detailed radiometric traverse of the hanging wall of the iron ore outcrop, the results being recorded in terms of background radiometric readings. The 0.015 equivalent uranium result was obtained from a sample from a spot which gave a 4.7 times background reading. It will be seen from this plan that the radioactive material has a very limited distribution, the maximum length over which noticeable increases in radioactivity were recorded being 130 feet, approximately 65ft. on each side of the adit line.

The whole radiometric grid survey clearly reveals that notable radioactivity is confined to the hanging wall of the iron ore on the surface and underground in the vicinity of the adit, opposite the south-western end of the cave. There is another small patch a few hundred square feet in area at the northern end of an iron ore lens situated some 400ft. south-west of the adit line but there is clearly no general distribution of radioactivity throughout the mass of iron ore.

The iron ore in which the Wilgie Mia Cave is situated and which has been cut in the adit, is cut off by a fault at a comparatively shallow depth below the adit as shown in Plate I, and this fault would displace the radioactive section of the hanging wall some 70ft. to the south-east, limiting the depth of an exploratory winze from the adit to about 40ft., if such work were undertaken.

Origin of the Radioactive Mineral.

No evidence was found suggesting a hydrothermal origin for the radioactive mineral or minerals, despite a very careful search by three geologists. There is no quartz associated with the mineralisation, and no visible traces of any metallic minerals other than iron could be found. The red ochre does not occur in shear planes, and there is no marked concentration of radioactivity associated with the fault plane. Existing evidence points to the radioactive material being confined to the massive brown limonitic iron ore at or near the hanging wall of the granular haematite lenses, and there is no suggestion of any shearing or movement having taken place along this wall.

The specimens containing the identifiable hydrated uranium silicate found on the floor of the cave some 90ft. in from the hanging wall of the iron ore lens, could not be traced to their source in situ, though one would think from their position that they came from somewhere in the ore body higher up than the level of the adit tunnel and well inside the ore body from the hanging wall.

It is generally accepted by modern geologists that banded iron formations and their associated iron ore lenses are formed in close association with colloidal precipitation in sedimentary deposits, and since uranium minerals are also known to occur widely in sedimentary formations, it seems likely that the source of the radioactivity at Wilgie Mia is some secondary, extremely finely divided uranium bearing mineral, deposited at the base of the hanging wall tuffs in the upper limonitic section of the haematite lens.

There is a complete absence of any of the brightly coloured oxidation products of uraninite or pitchblende, and laboratory methods failed to isolate any heavy uranium bearing or radioactive minerals in the range of representative samples collected by the writer. The presence of some uranium compound in the ore capable of being taken into solution by circulating ground water and re-deposited is demonstrated by the occurrence of the identified, clearly secondary, hydrous uranium silicate mineral found in the material on the cave floor. The manner in which this mineral occurs leaves no doubt whatever that it has been deposited as a secondary mineral from circulating groundwater.

If this radioactive mineral did not originate in the banded iron formations as a secondary mineral deposited with the ferruginous sediments, then it could have come from two other sources. Firstly, it could have been introduced in hydrothermal solutions derived from the granitic magma which invades the greenstone complex of the district, and which has produced gold bearing quartz reefs elsewhere in the area. If so, then this mode of origin has left none of the usual phenomena associated with it, and easily detectable in all other instances. Secondly, it could have been derived by solution and deposition under circulating groundwater conditions from an overlying sedimentary formation, such as the Nullagine Series for instance, since completely eroded away.

The writer prefers to regard the potential source of origin of the radioactivity as belonging to some unidentified mineral or minerals, some of which contain uranium (as evidenced by the proved occurrence of a secondary mineral containing 69 per cent. of U_3O_8) deposited as a secondary mineral with the sedimentary banded iron formations and associated haematite lenses. In other words that we have at Wilgie Mia, a syngenetic radioactive deposit containing at least one unidentified uranium bearing mineral and one identified secondary uranium bearing mineral.

The problem of identifying the mineral or minerals responsible for radioactivity in a mineral deposit is not confined to this instance from Wilgie Mia. In a recent publication, "Canadian Deposits of Uranium and Thorium (Interim Account)" by A. H. Lang, Geological Survey of Canada, Economic Geology Series No. 16, 1952, p. 9, the author has the following to say about the problem:—

> One of the facts learned from the intensive search for, and study of, uranium deposits in Canada is that many primary deposits contain uranium dispersed so finely that uranium minerals cannot be seen by eye, and that their detection by laboratory methods may be dif-

GEOLOGICAL SURVEY OF WESTERN AUSTRALIA

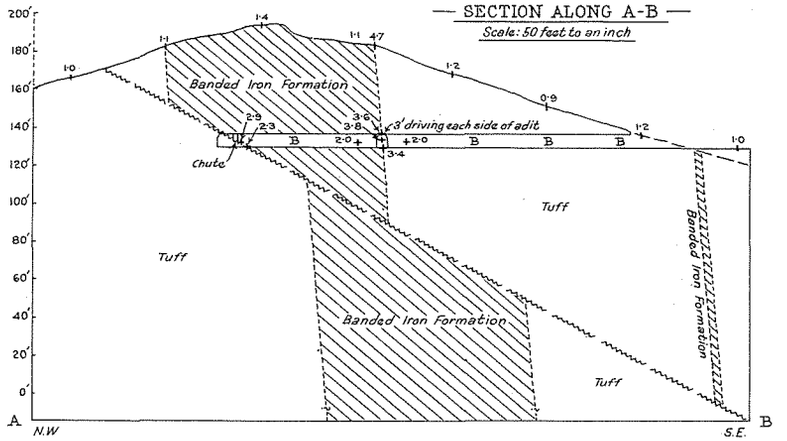
PLAN OF GEOLOGICAL AND RADIOMETRIC SURVEY WILGIE-MIA, WELD RANGE

Scale: 200 feet to an inch

Plane table, telescopic alidade, tape and Abney level survey by L. de la Hunty and C. Low, Dec., 1952.
Radiometric measurements by Portable "Austronic" Geiger Rate Meter, Type P.R.M. 200, Serial No 117.

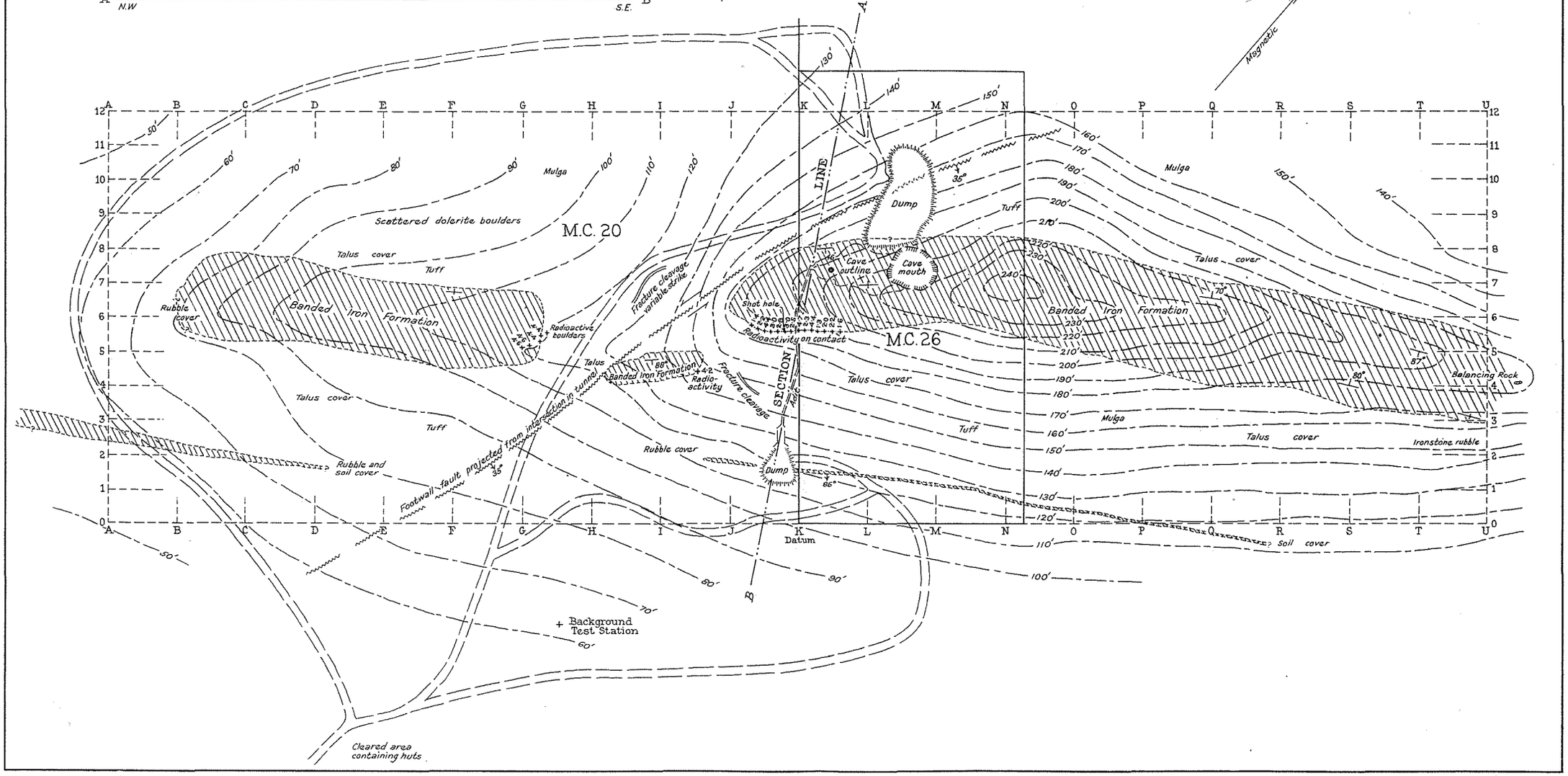
SECTION ALONG A-B

Scale: 50 feet to an inch



LEGEND

- Approximate geological boundaries
- Strike and dip of bedding
- Strike of vertical bedding
- Fault, showing dip
- Contours
- Tracks
- Mineral Claim boundary
- Spot at which radioactive mineral identified
- Readings of highest radioactivity (Strengths expressed as Multiples of Background)
- Grid
- Tuff
- Banded Iron Formation



GEOLOGICAL SURVEY OF WESTERN AUSTRALIA

GRID AND HANGING WALL TRAVERSES
RADIOMETRIC SURVEY
WILGIE-MIA, WELD RANGE

by

L. de la Hunty and G. Low, Dec., 1952

• Spot at which radioactive mineral identified

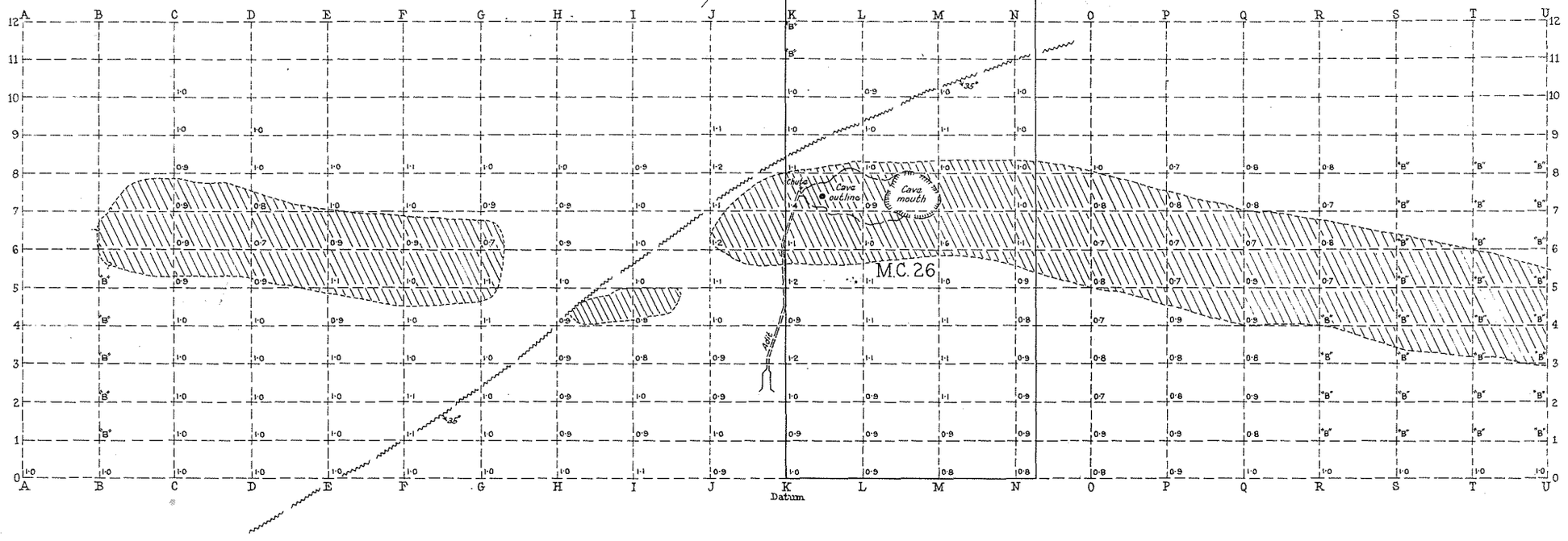
Counts expressed as multiples of Background Count

"B" is approximately equal to Background - read on slow walking traverse. Other counts read over 5 minute intervals.

Measurements by Portable "Austronic" Geiger Rate Meter, Type P.R.M. 200, Serial No 117.

PLAN OF GRID TRAVERSE

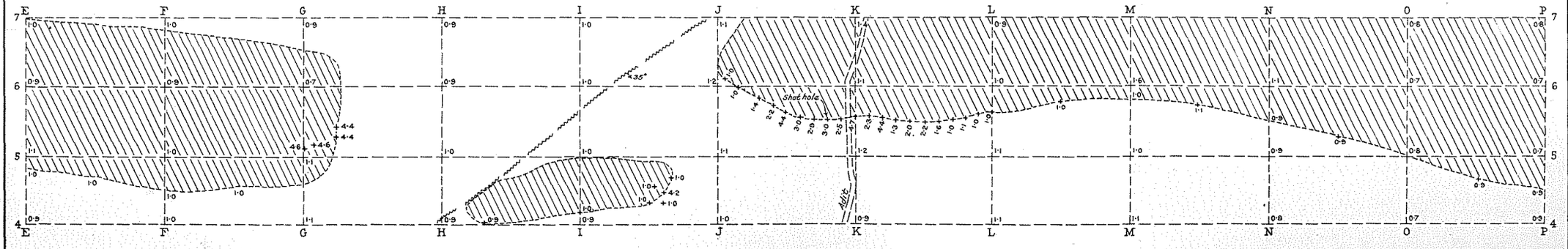
Scale: 200 feet to an inch



"B" Background
Test Station

PLAN OF HANGING WALL TRAVERSE

Scale: 100 feet to an inch



ficult or impossible. Samples from some such deposits have yielded very fine grained uraninite and other radioactive minerals, but samples from a few other deposits, which showed significant contents of uranium by chemical analysis, have defied the most modern identification techniques.

Prospecting Recommendations.

As this is the first recorded occurrence of a uranium bearing mineral in rocks other than pegmatites in Western Australia, and as it occurs in association with one of the most widely distributed and easily recognised rock types, namely, the jaspilites or banded iron formations (frequently called jasper bars by prospectors), it is worth finding out as much as possible about its manner of occurrence.

The necessity exists for obtaining some fresh, unoxidised radioactive material, but owing to the deep oxidation zone and some faulting in the banded iron formation, this is not going to be obtained cheaply.

The best approach seems to be to attack the problem by concentrating effort on a known radioactive spot situated as deep below the surface as possible. The only exposure so far available is that at the junction of the iron ore and hanging wall tuffs exposed at a distance of 130ft. in from the adit portal.

Unfortunately, geological indications are that the radioactive zone will be cut off in depth by a fault long before it reaches the unoxidised rock, and further underground work will be necessary to locate the radioactive horizon below this fault.

Despite this structural interference in depth, it would still be desirable to do this exploratory work, and it is suggested that the following initial prospecting work be carried out:—

(a) Drive both ways from the adit intersection of the iron ore for 20ft. each way, keeping the junction of the friable iron ore and hanging wall tuff in the centre of the drive.

(b) Sink a winze at the most radioactive spot encountered in this work, keeping the ore and wall junction in the centre of the winze.

About 100ft. of exploration may be obtainable in this way, though the winze is not likely to reach a depth of 60ft. The results of this work should reveal sufficient information to enable a decision to be reached as to whether further work is warranted, and may provide some useful information on the manner of occurrence of the radioactive mineral.

Conclusions.

(1) Radioactivity attributable to an uranium bearing mineral has been found for the first time in Western Australia in rocks other than pegmatites, as a result of the discovery by Messrs. Stowe and Arrigoni in August of 1952 of radioactivity in hard massive limonitic iron ore occurring at or near the hanging wall of the large granular haematite iron ore lens in which is located the Wilgie Mia Cave in the Weld Range, 43 miles by road North-North-West of Cue in the Murchison Goldfield.

(2) A radioactive mineral was found by the writer occurring as a visible secondary mineral deposited in joint planes, in small cavities in bands of granular haematite iron ore, and on interlamellar surfaces of laminated grey shale and granular haematite, occurring as loose pieces on the floor of the cave. This mineral was determined by the Mineral Section, Government Chemical Laboratories, as a hydrated uranium silicate containing 69 per cent. of U_3O_8. No ore showing this mineral was found *in situ*.

(3) Hard massive limonite ore showing marked radioactivity occurs principally on the hanging-wall side of the main granular haematite lens over a length of about 130ft. and a width of about 12in. and probably persists in the direction of dip for at least 55ft., where it is cut in the adit tunnel. The richest sample of this surface material contained 0.015 per cent equivalent uranium, and the richest sample from underground ore *in situ* contained 0.0075 per cent. uranium by chemical analysis. The mineral responsible for this radioactivity has not been identified.

(4) There are none of the usual oxidation products associated with the decomposition of the primary uranium ores to be seen either on the surface, in the large cave, or in the decomposed zones penetrated by the adit level, and laboratory methods have failed to isolate any heavy radioactive or uranium bearing minerals. This leads to the next conclusion.

(5) The radioactive mineral, as yet not identified, probably occurs in an extremely fine state of division and was precipitated from aqueous solution in the colloidal precipitation processes associated with the formation of the sedimentary banded iron formations and granular haematite iron ore lenses.

(6) The detailed geological survey and the radiometric grid survey, clearly show that this is not a large radioactive deposit containing uranium bearing minerals in readily recoverable form. They show rather, the existence of an unusual type of radioactive mineralisation associated with rocks of Archaean age, and one that on present indications does not appear to be of commercial importance.

(7) The association of radioactivity with the banded iron formations is one of considerable importance however, on account of the widespread distribution of this rock type in Western Australia, and although the radioactive mineral in this particular deposit has not yet been able to be either isolated or identified, some other parts of the banded iron formations in the Weld Range district may contain higher concentrations of an identifiable radioactive mineral.

Appendix I.

Government Chemical Laboratories, No. 3501/52, 18th November, 1952.

Report on Fifteen Samples from Wilgie Mia for the Government Geologist, Perth.

Fifteen sampes of radioactive material from Wilgie Mia have been examined with the following results.

Lab. No.: 16345-16349/52.

Mark: Sample Nos. 1-5.

Description: Channel samples from adit.

Radiometric Count:

Lab. No.....	16345	16346	16347	16348	16349
Sample No.	1	2	3	4	5
Description	Iron Ore 15″-25″ N. of junction	Iron Ore 5″-15″ N. of junction	On junction 5″ each side.	Country Rock 5″-15″ S. of junction	Country Rock 15″-25″ S. of junction
Equivalent U† %	·001	·001	·008*	·007	·003

*Note.—.0075 U by chemical analysis.

Examination of samples from the adit failed to show any recognisable uranium-bearing mineral.

Lab. No.: 16350/52.

Mark: Sample No. 6.

Description: From hanging wall of iron ore lens at surface.

Radiometric count of most active portion indicated .015 E.U., but examination failed to indicate the radioactive mineral.

Lab. No.: 16351/52.

Mark: Sample No. 7.

Description: From best of ochreous ore in floor of larger cave.

† Interpolated from assay value of No. 3 sample.

The yellow radioactive material occurred as rosettes of fine needles encrusting the surfaces of open joints and small cavities in the ore. The needles possess parallel extinction, positive elongation, N. parallel to length 1.691, N. normal to length 1.663, G. > Clerici Solution (4.25).

Exhaustive hand picking followed by magnetic separation and washing yielded approximately .25 gram of material which was still contaminated with iron oxide. The mineral is readily soluble in dilute nitric acid, with separation of gelatinous silica. Analysis indicates that the mineral is a hydrated uranium silicate containing approximately 69 per cent, uranium oxide expressed as U_3O_8.*

* In optical properties it is close to Soddyite $5UO_3$ $2SiO_2$ $6H_2O$, the refractive indices of which are $\alpha = 1{,}650$, $\beta = 1.685$, $\theta = 1.712$, the dominant crystal form of which however is the dipyramid (111), although flat blades or fibres in fissures have been observed.

American Mineralogist 37, May-June, 1952. p.386.

Spectroscopic analysis showed traces only of Pb, Cu, Ca, Mg, K, Na, and V.

No sulphate or phosphate was detected by chemical test.

Radiometric count of a specimen showing the yellow mineral indicated E.U. = .08 per cent. and of a specimen with no yellow mineral detectable E.U. = .06 per cent., indicating the possible presence of a second finely disseminated radioactive mineral.

Lab. No.: 16352-16355/52.

Mark: Specimens A-D.

Description: From hanging wall of adit.

Radiometric Count:

Lab. No.	16352	16353	16354	16355
Mark	A.	B.	C.	D.
Description	5″ of ore adjoining H.W.	5″ of H.W. adjoining ore	Hard 2″ of ore 1′ below No. 3	Most radio-active material 2′ below No. 3
Equivalent U per cent.	·007	·008	·005	·011

Examination of sample failed to detect any recognisable uranium-bearing mineral.

Lab. No.: 17288/52.

Mark: Sample No. 2.

Description: Iron ore from cave approximately 10ft. above floor level.

No significant radioactivity.

Lab. No.: 17289/52.

Mark: Sample No. 3.

Description: Shale from inside the cave, approximately 10ft. above floor level.

Very slight radioactivity, E.U. .001 per cent. approximately.

Lab. No.: 17290/52.

Mark: Sample No. 4.

Description: Shale from near the surface, approximately 18in. under the surface—from a small road cutting north-east of the adit mouth.

No significant radioactivity.

Lab. No.: 17291/52.

Mark: Sample No. 5.

Description: Surface iron ore from the top of the ridge over the cave.

No significant radioactivity.

C. R. LEMESURIER,
Deputy Government Mineralogist.

WONGONG BROOK—S.W. DIVISION.
Proposed Dam Site.

By J. C. McMATH, B.Sc., Senior Geologist.

1.—Location.

The relevant section of the Wongong Brook (a tributary of the Canning River) lies in Canning Locations 387-517-542 and is accessible via Bedfordale on the Albany Highway.

2.—Previous Work.

The site has been the subject of a previous Geological Survey Report. As part of the investigation, exploratory shafts and costeans (now caved or otherwise inaccessible) were sunk. These works established bedrock profiles, wholly or in part, along tentative centre lines.

3.—Present Work.

The present work was carried out in the latter part of 1950 during the course of an economic geological survey of the metropolitan area (1950-51) in order to amplify previous work and to provide a geological fact map for further constructional studies. Mapping, using plane table and telescopic alidade, to a scale of 40ft. to 1in., was carried out by Temporary Geologist A. Glance, B.Sc. Petrological determinations were by the Honorary Petrologist to the Geological Survey, Professor R. T. Prider, D.Sc., of the University of W.A. Contouring was by personnel of the M.W.S. & D. Dept.

4.—References.

A.P.R. G.S.W.A., 1922, p. 9—A. G. D. Eason.

M.W.S. & D. Dept. Plan 4447 (drawings Nos. 6,7,9,10).

M.W.S. & D. Dept. Plan 7516—Geological Fact Map—(40ft.=1in.) compiled from G.S.W.A. field sheets by A. Glance, B.Sc.

5.—Appendices.

I.—Petrological determinations of rock types, Prof. R. T. Prider, D.Sc., Dept. of Geology, University of W.A.

II.—Geological Fact Map (100ft.=1in.)—A. Glance, B.Sc., G.S.W.A. (Plate III).

6.—Outcrop Conditions.

Outcrop is plentiful but critical exposures are largely lacking by reason of soil and talus material. Hence the geological fact map is capable of more than one interpretation with regard to the forms of quartz-doleritic minor intrusives.

7.—Geology.

The terrain forms portion of the pre-Cambrian Darling Peneplain and is comprised dominantly of granitic gneisses and, subordinately, of minor intrusives of quartz-dolerites (ref. Appendix 1).

(a) *Granitic Gneisses.*—These rocks are well jointed with two dominant joint trends noted:—

I.—N. 20°-30° W. with usually a high easterly dip.

II.—N. 70° E. with usually a high southerly dip.

— REFERENCE —

- Granitic Gneiss
- Talus with little or no outcrop
- Fine medium-grained uralitised quartz-dolerite
- Talus with little or no outcrop
- Coarse-grained uralitised quartz
- Talus with little or no outcrop
- Joint pattern
- Relative direction of shearing movement
- Strike and dip of cleavage
- Contours at 10' intervals

Approx. position of bridge.

Talus

Small scattered outcrops

Mostly outcrop

Talus

Costean

Mostly outcrop

A LINE

B LINE

E LINE

Occasional boulders

Costean

Narrow shear

CANNING PIPE LINE

WUNGONG BROOK

8" Pegmatite

Soil

Covered

TRACK

C LINE

Soil

Covered

Mostly talus

Covered by dolerite talus

Near contact, dolerite contains granite xenoliths

Narrow pegmatite displaced 4"

D LINE

Lateritic rubble

Soil

Covered

Joints vertical

Mostly talus

Outcrop and talus

Soil

Covered

Scattered laterite boulders

GEOLOGICAL SURVEY OF WESTERN AUSTRALIA

GEOLOGICAL FACT MAP
PROPOSED DAM SITE
WUNGONG BROOK
— BYFORD —

Scale : 100 feet to an inch

Geology, plane table and telescopic alidade survey by A. Glance, B.Sc., Sept. 1950.

Topography by Metropolitan Water Supply Sewerage & Drainage Department.

A third joint trend, N. 20° E., has been noted in the north-east corner of the Area. The two major joint trends show a tendency, in the south of the Area, to swing further west and south respectively. Gneissosity, in some parts well defined, varies N. 20°-50° W. with, usually, a high westerly dip. Within these rocks small east-west shear zones have been noted. Excepting for the possibility of concealed shear zones along, or adjacent to, any selected centre line these granitic gneisses do not, in the light of present information, appear to offer any abnormal constructional features.

(b) *Quartz dolerites.*—Both coarse and fine grained types occur, the latter as small intrusives or as chilled margins of the coarser grained bodies. With the exception of certain basic rocks in the vicinity of the gauging weir which shows some schistosity, these quartz-dolerites are more closely jointed than the granitic gneisses. Two main joint sets, both vertical, were noted:—

I.—N. 20° W.

II.—N. 70° E.

(c) *Relations of Basic Intrusives to Country Rock.* Except in a few cases and over short distances only, sharp contacts between country rock and basic intrusives are few. On any interpretation of the fact map (ref. Appendix II) the majority of boundaries would be assumed, few approximate, and still less observed. Evidence suggests that these intrusive bodies have a dyke form.

There is no evidence, in any particular instance, as to whether—

(a) the angular relation between intrusive and country rock is vertical or inclined;

(b) the intrusive occupies a shear zone, has been controlled by joint trends, or gneissosity. In some instances a parallelism to joint trends and gneissosity may be seen;

(c) the junction between intrusive and country rock is relatively impermeable or no, whether shattered or otherwise constructionally a weak point. Granitic xenolithic material in some of these basic intrusives suggests that the latter may apply in some cases.

(d) *The Stream Course.*—The relevant position of the Wongong Brook lies in a narrow steep sided youthful valley, approximately 200ft. in depth, incised in the pre-Cambrian terrain of the Darling Peneplain.

Its general course trends about N. 30° W. and is north flowing. The course is divisible into two elements:—

I.—Between the bridge and the gauging weir.—In this position the course is approximately parallel to:—

(a) Gneissosity of the country rock.

(b) One set of joints in the granitic gneiss.

(c) Small shear zones in the granitic gneiss.

II.—South of the gauging weir.—Here the stream pattern appears to be controlled by the joint system of the granitic gneiss. Precise knowledge of the nature of the controlling factor or factors in I, above, is a prerequisite no matter what centre line be adopted.

8.—Selection of Centre Lines.

Geological considerations affecting selection of a centre line are:—

(a) Uniformity of rock type, or as few rock types (and consequent junctions) as possible.

(b) Soundness of rock type.

Within these terms:—

I.—No tentative centre line is confined to one rock type—all transect granitic gneiss and quartz dolerite intrusives. Line D shows an east-west sequence of quartz-dolerite, gneiss, quartz-dolerite, gneiss. The eastern quart-dolerites show some schistosity in places.

II.—With the exception of line D, all other lines transect gneisses and quartz dolerites which are normally jointed and, upon such evidence as is available, sound.

From the above, line D is considered the least favourable line geologically. There appears to be no valid reason to guide selection as between lines A, B, C and E; any such selection being contingent upon the nature of the ultimate structure and the economics thereof.

9.—Information Sought.

Regardless of the centre line finally adopted, the following basic information is necessary:—

I.—The structural nature of the stream channel between the gauging weir and the bridge.

II.—The bedrock (to fresh rock) profile along the selected line. This information is available (but requires checking in situ) for centre lines A, B and D, but only partially so for centre lines C and E.

III.—The angular and physical relationships at the junction of the basic intrusives and granitic-gneisses.

10.—Suggested Initial Exploratory Programme.

I.—Reference paragraph 9 (I) above—three depressed diamond drill holes intersecting the line of the stream channel at an approximate depth of 50ft.-75ft. below bottom of stream. These holes to be carried across the stream and terminated in sound rock. It is suggested that these holes be sited on centre lines B, E and C approximately 40ft. from the centre line of the stream channel—i.e., a depression angle of 30° below the horizontal. It is essential that core-logging be by a geologist.

II.—Reference paragraph 9 (II) above—the checking and, where necessary extending, bedrock (to fresh rock) profiles along the selected line. This will involve cleaning out and reconditioning of existing trial shafts or costeans and carrying these, where necessary, to fresh rock. It is essential that the shaft or costean sections be recorded by a geologist.

III.—Reference paragraph 9 (III) above—the angular and physical relationships of basic intrusives and granitic gneiss junctions can be ascertained during the course of determining bedrock profiles by trial shaft or costean.

11.—Summary.

The project is in a pre-Cambrian terrain of granitic gneisses with minor basic intrusives. In general both rock types are well jointed; the granitic gneisses show minor shear zones. The physical and angular relations between intrusives and country rock are not known, neither is the structural nature of the stream channel between the gauging weir and the bridge. Five tentative centre lines were selected in 1922. Line D is not recommended on geological grounds; there are no valid apparent geological reasons for preferring any one of the remaining four to the other—the selection will be contingent upon nature of dam structure and the economics thereof. It is desirable to ascertain certain structures and relationships in and between the basic intrusives and the country rock, and to re-examine the bedrock profiles and extend them where necessary. An initial exploratory programme is suggested.

Appendix I.

By Professor R. T. PRIDER, D.Sc., Dept. of Geology, University of W.A.

I have examined the slides and hand specimens Nos. G1-10 from the Armadale area which you forwarded for examination on October 17 and my report on them is as follows:—

G.1 Medium-grained quartz epidiorite (= completely uralitised quartz dolerite) with acid granophyre segregations. Typical of the uralitised quartz dolerite dykes of Nullagine or later age of the

Darling Range area. Texture is sub-ophitic, tending to be masked by recrystallisation of marginal parts of uralitised pyroxene to a blue-green amphibole. Constituent minerals:—Blue-green and uralitic hornblende and plagioclase (with some epidotic alteration) are the essentials with accessory leucoxenised ilmenite and end-stage quartz. The light coloured segregations have a granophyric texture and consist essentially of plagioclase, quartz and a micrographic intergrowth of quartz and felspar. These acid segregations most probably represent an end-stage product of the dolerite magma but may be completely metasomatised granitic xenoliths.

Origin.—Basic igneous dyke rock of late Nullagine (or later) age.

G.2 Granitic gneiss.—Constituents are quartz, highly epidotised and sericitised plagioclase (original species undeterminable because of extensive alteration), fairly clear plagioclase (oligoclase) and minor amounts of greenish brown biotite and yellow epidote which occur in clotted aggregates

Origin.—Probably a granitised original sediment but may be derived from an original granite.

G.3 Medium-grained quartz epidiorite (= completely uralitised quartz dolerite) with angular inclusions of white felspathic rock (no slide available of these white areas). Constituents of this epidiorite are blue-green and uralitic amphibole and plagioclase with smoky brownish colour and accessory quartz (often in micropegmatitic intergrowth with felspar), apatite needles, and leucoxenised ilmenite, and some secondary granules of epidote.

Origin.—Basic igneous dyke rock of late Nullagine (or later age)—typical of basic dyke suite of Darling Range.

G.4 Granitic gneiss.—The texture is even grained, granoblastic and there is a marked gneissic structure visible in hand specimen. The mineral constituents are: Slightly kaolinised oligoclase, some highly epidotised plagioclase, quartz, and minor amounts of brown biotite in clotted aggregates with granules of epidote. Similar in all respects to G.2 with the exception that the plagioclase is not so highly epidotised.

G.5 Amphibole-epidote rock.—Consisting almost entirely of a medium-grained aggregate of yellow epidote with a minor amount of very pale green to colourless amphibole. A little accessory fine granular ? sphene occurs in aggregates scattered throughout the rock.

Origin.—Most probably a completely epidotised epidiorite in which the pale coloured amphibole is relict from the uralite of the parent epidiorite and the fine granular ? sphene aggregates are relicts of original ilmenite. It is possible however that this is an epidote vein (of the type genetically related to the quartz dolerite magma) but the absence of quartz is contrary to this possibility.

G.6 Highly contorted plagioclase-bearing biotite-chlorite schist.—The structure is fine-grained contorted schistose with larger porphyroclasts of plagioclase (to 1mm. diameter) in a schistose matrix consisting of greenish biotite, green chlorite (predominant), and granules of epidote.

Origin.—A chlorite schist derived by intense shearing from a parent basic igneous rock (such as the epidiorites described above). This is the type of rock that we get from the intense dynamic metamorphism of narrow basic dykes in the Darling Range area.

G.7 Basic pegmatite with an intrusion of medium to coarse-grained quartz epidiorite (=uralitised and somewhat recrystallised quartz dolerite). The epidiorite part of the specimen is that occupying the slide provided and it is similar in all respects to G.3, even to containing the smoky brown coloured plagioclase. One of the large felspar (andesine) crystals of the pegmatitic part of the specimen is present on the edge of the slide provided—it is the same smoky brown plagioclase and towards the centre it is altered to a coarse granular aggregate of epidote.

Origin.—Pegmatitic epidiorite with medium-grained epidiorite—from a basic dyke of late Nullagine (or later) age. The association of pegmatitic and normal phases of epidiorite in the one specimen may be similar to the pegmatite-aplite association found amongst the acid pegmatites. Another slide of the coarser-grained pegmatitic material is desirable to get any further with this rock—at the present I feel that it is not an unassimilated granitic xenolith as suggested by Mr. Glance from the field occurrence.

G.8 Medium to coarse-grained quartz epidiorite (=completely uralitised and slightly recrystallised quartz dolerite). Coarser-grained but otherwise similar in all respects to the matrix of G.3 Smoky felspars characteristic.

Origin.—Basic igneous dyke rock of late Nullagine (or later) age—typical member of Darling Range basic dyke suite.

G.9 Medium-grained quartz epidiorite (= completely uralitised and slightly recrystallised quartz dolerite)—finer grained and darker coloured than G.8 but otherwise similar in all respects. Smoky felspars characteristic.

G.10 Coarse-grained quartz epidiorite (= uralitised and partly recrystallised quartz gabbro)—slice shows an angular patch of quartz-plagioclase-hornblende rock with stout prisms of appatite—this patch may be an altered granite xenolith but is more probably a pegmatitic segregation. This rock belongs to the Darling Range basic dyke suite of late Nullagine (or later) age.

It will be seen that all these specimens with the exception of G.2 and G.4 belong to the group of late Nullagine basic dyke rocks of the Darling Range.

REPORT ON DIAMOND DRILLING AHEAD OF EXISTING COLLIERIES, COLLIE MINERAL FIELD, W.A.

II.—Wyvern Colliery.

By J. H. LORD, B.Sc., F.G.S.

A drilling programme to prove the eastern extension of the Wyvern Colliery was carried out by contractors, McCallum Bros. and Grill, between September, 1951, and January, 1952, under the direction of the Geological Survey of Western Australia.

This report describes the three holes drilled at sites shown on the locality plan (Fig. 1).

Drilling Procedure.

The drilling machine (Boyles Bros. BBS-4), equipment and rig used were similar to that described in previous reports on drilling at Collie.

At each site a 65ft. tubular steel tower was erected allowing the rods to be broken in 50ft. lengths.

Bentonite mud was successfully used as the drilling fluid and no casing was required in any of the holes. No drilling hazards, such as cavities, artesian water, jammed rods, etc., were encountered in any of these holes.

After the completion of the first hole a shale shaker was inserted in the mud circuit. In this machine the return mud passes over a vibrating screen on which is retained and discarded the coarser cuttings, while the mud with some finer cuttings passes through to be used again. After the insertion of the shale shaker the following improvements were noted and may be attributed to its use:—(a) Longer life for each batch of mud, (b) less stoppages and wear on the mud pumps and (c) longer life for the diamond bits. It can be concluded that a shale shaker is a necessity when drilling this type of strata with mud.

The distribution of the shifts on the various operations is set out in Table I. When drilling, two 12-hour shifts were worked. Once again, the percentage of man-shifts expended on setting-up and dismantling the plant shows that this type of plant is not suitable for short holes.

The rate of drilling per man-shift (eight hours) for the whole programme was 5.7ft., the best rate being on No. 3 hole, namely, 6ft. This is better than the best rate of 5.3ft. on the Proprietary programme and 4.7ft. of Australian Drillers.

Table II is a study of operations on shifts when drilling took place. After reducing the 12-hour shifts to an eight-hour basis, the average rate of drilling for the three holes was 15.9ft. per shift, as compared with 14.8ft. on the Proprietary programme and 19.0ft. of Australian Drillers. As previously stated in the Proprietary programme's report[1] the lower footage is due to fatigue produced by the 12-hour shift and to higher core recovery.

[1] 1951 Lord, J. H.: Report on Diamond Drilling Ahead of Existing Collieries, Collie Mineral Field, W.A. 1. Proprietary Colliery. *G.S.W.A. Annual Report, 1950.*

Table I.

TIME DISTRIBUTION FOR DRILLING AHEAD OF THE WYVERN COLLIERY.

Operation.	Hole No. 1 (655 ft.).			Hole No. 2 (1,211 ft.).			Hole No. 3 (1,207 ft.).		
	Shifts.*	Man-Shifts.*	Percentage of Man-Shifts.†	Shifts.	Man-Shifts.	Percentage of Man-Shifts.	Shifts.	Man-Shifts.	Percentage of Man-Shifts.
Drilling	23	49	63	54	109	74	52	104	77
Break-downs, mud-mixing, maintenance, etc.	....	....	....	5	10	7	2	2	1
Setting-up and dismantling plant	11	44	37	9	42	19	12	44	22
Fishing for lost tools	....	....	....	....	....	....	....	....	....
Total	34	93	....	68	161	....	66	150	....
	....	(117)†	....	....	(220)†	....	....	(202)†	....

* All shifts and man-shifts are of 12 hours duration when drilling. † All shifts adjusted to 8-hour shifts for percentage purposes.

Table II.

TIME DISTRIBUTION WHILE DRILLING, AND CORE RECOVERY.

Driller.	Number of Shifts* Drilling.	Total Footage Drilled.	Average Footage per Shift.	Below 100 feet.		Percentage Core Recovery for whole Hole.
				Core Recovered (feet).	Percentage Core Recovery.	
Wyvern Hole No. 1.						
McCallum, K.	10	279	27·9	156	55·9	....
Grill	10	279	27·9	163	59·1	....
Miscellaneous	3	97	32·3	....	....	....
Total	23	655	28·5	319	57·5	53·7
Wyvern Hole No. 2.						
McCallum, K.	25	465	18·6	275	61·5	....
Grill	28	723	25·8	426	64·5	....
Miscellaneous	1	23	23·0	....	....	....
Total	54	1,211	22·4	701	63·1	58·4
Wyvern Hole No. 3.						
McCallum, K.	25	506	20·2	329	71·5	....
Grill	27	701	26·0	419	64·8	....
Total	52	1,207	23·2	748	67·6	63·3

* 12-hour shifts.

Core Recovery and Log.

As shown in Table II the core recovery in Nos. 1, 2 and 3 holes was 54, 58 and 63 per cent. respectively, giving an average of 58 per cent. This is lower than the recovery in the Proprietary programme (62 per cent.) but still better than Australian Drillers (52 per cent.).

Fig. 2 shows the core recovery graph for the three holes.

The strata encountered were typical of the soft Permian coal measures at Collie. In the detailed log the terms "soft" and "hard" are used only to indicate a variation from the average at Collie. A summarised log of each hole showing sediments and coal seams (3in. and thicker) is attached as Appendix I. These logs are shown as columnar sections in Fig. 3.

Complete detailed logs of each hole have been prepared and are available at the Geological Survey.

Geology.

The Wyvern Colliery, which extracts the No. 1 seam of the Collie Burn horizon or formation, encountered a major fault approximately 20 chains down the dip, with an upthrow to the south. As the boundary of the coal measures is only a quarter of a mile to the south, mining was abandoned in that direction as it is considered that the area would be considerably faulted. Westwards along the strike the coal is also approaching the boundary of the basin. In consequence, this drilling was located to the south-east of the existing workings in order to prove the extent of the seam in that direction, the only one available for the future development of the colliery.

The No. 1 hole was sited (see Fig. 1) to intersect the seam at a shallow depth, but south of the fault in the top left-hand workings. This hole intersected the No. 1, Wyvern, seam at approximately 225ft., but the core recovery was poor. The No. 2 seam was intersected at 286ft. with similar recovery, but the No. 3, Phoenix, and No. 4, Griffin, seams were intersected approximately where anticipated, namely, 347 and 637ft. respectively, with good recovery.

The No. 2 hole was sited (Fig. 1) down the dip from No. 1, to be as near the main dip fault as possible. Apparently it was very close to this fault because the dip of the strata encountered was variable from 30 to 45 degrees and the shales showed many slip planes. The coal seams were at a greater depth than anticipated and the thickness of sediments between each was greater. Good core recovery however provided positive identification of the seams No. 1 to No. 4 at depths of 647, 725, 815 and 1,199ft. respectively.

In this hole a 6ft. 11in. seam was intersected at 338ft. some 300ft. above the No. 1 seam of the Collie Burn horizon. This seam can be correlated with a similar seam located in Bore 51 on Prospecting Area 54[2]. Owing to its resemblance to the Cardiff type rather than Collie Burn type of coal it can be used as the marker for the bottom of the Collie Cardiff formation. No number or name will be given to this seam until the strata between it and the No. 2, Neath, seam have been satisfactorily drilled.

The No. 3 hole was sited (see Fig. 1) some distance to the south-east of the previous two holes, but it did not locate definitely the Collie Burn seams. Near a depth of 352ft. the strata appeared similar to the roof strata of the No. 1, Wyvern seam, but only a 6in. seam of coal existed (no core loss). At a depth of 448ft. a 5ft. 8in. seam resembling the No. 2 seam was intersected, while a 6ft. 8in. at 670½ft. resembled the No, 3, Phoenix, seam, but the No. 4, Griffin, seam was not located and drilling was stopped at 1,207ft. The strata in this hole were more settled than in No. 2 hole and dips varied from 10 to 15 degrees.

There is no obvious reason for the non-existence of all the Collie Burn seams in this hole. It could be explained by a suitably placed fault. A similar problem was experienced when drilling at site L[3] on lease 152 (see Fig. 1). Also old shallow bores westwards from the abandoned Collie Burn Colliery have not established the existence of the seam.

Although this area between the Wyvern and the Collie Burn Collieries has often been quoted, by uninformed authorities, as a desirable colliery site, this limited drilling shows that the area requires systematic drilling with a suitable mobile plant to establish the behaviour of the seams.

The drilling just completed has proven a narrow strip of coal from the present workings to bores Nos. 1 and 2, containing nearly 700,000 tons of coal for extraction by the Wyvern Colliery, assuming the seam to average 9ft. in thickness. At the same time it has proved considerable extensions to the Phoenix and Griffin Collieries.

If only 50 per cent. of this coal is extracted it represents a life of five years for the Wyvern Colliery at the 1951 production rate of 70,000 tons.

QUALITY OF COAL.

The detailed analyses carried out on samples submitted to the Government Chemical Laboratories are shown in Table III.

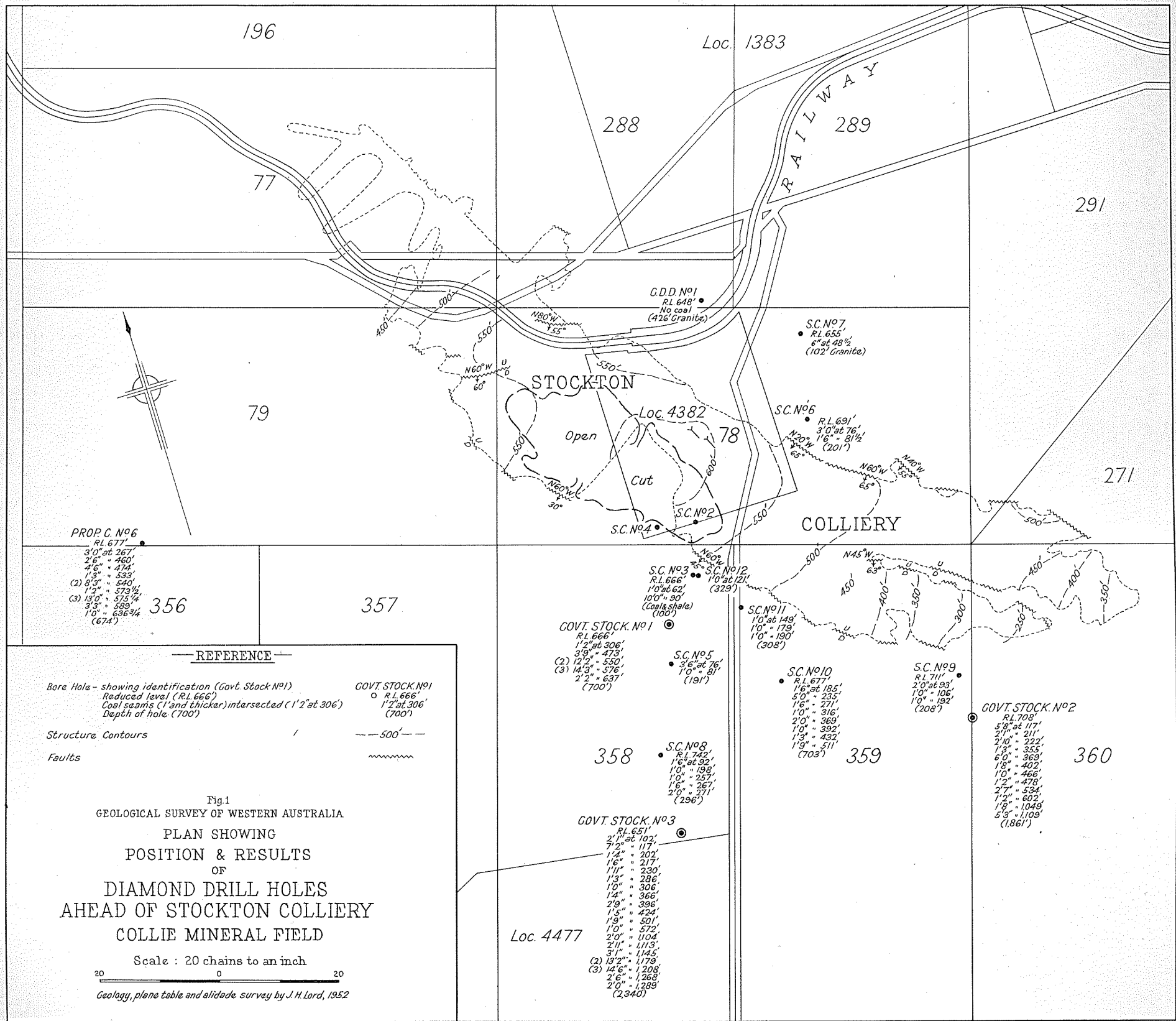
[2] 1950. Lord, J. H.: Report on the Exploration of the Southern Portion of Prospecting Area 54, Collie Mineral Field, W.A. *G.S.W.A. Annual Report, 1950.*

[3] 1950. Lord, J. H.: Progress Report on Diamond Drilling, Collie Mineral Field, W.A. (2) Bore No. 2—Site L. *G.S.W.A. Annual Report, 1950.*

Table III.

Proximate Analyses of the Thicker Seams Intersected while Drilling Ahead of the Wyvern Colliery.

Chem. Lab. No. (1951)	Depth.	Thickness of Sample.	Formation, Identification of Seam and Thickness Proven.	As Received.					Dry and Ash Free.		Ash Dry Basis.	Colour of Ash.
				Moisture.	Ash.	Vol. Matter.	Fixed Carbon.	Calorific Value.	Vol. Matter.	Calorific Value.		
			Diamond Drilling Bore No. 1.									
	Feet.	ft. in.	COLLIE BURN	%	%	%	%	B.Th.U.	%	B.Th.U.	%	
18025	223	1 0	Portions of No. 1, Wyvern	20·0	4·95	32·3	42·75	9,630	43·0	12,840	6·2	Fawn
18026	225	1 8		20·0	3·9	33·25	42·85	10,185	43·75	13,390	4·9	Brown
18027	347	3 10	No. 3, Phoenix, 5 ft. 1 in.	20·0	9·05	26·75	44·20	9,225	37·75	13,020	11·3	Brown
18028	352	1 9		10·0	42·9	....	....	....	....	....	....	
18261	637	3 9	No. 4, Griffin, 8 ft. 3 in.	20·0	5·3	27·9	46·8	9,925	37·4	13,280	6·6	Red-brown
18262	641	2 9		20·0	5·8	28·55	45·65	9,670	38·5	13,040	7·25	Red-brown
			Diamond Drill Bore No. 2.									
18822	338	6 11	CARDIFF	20·0	8·8	24·7	46·5	9,275	34·7	13,020	11·0	Off-white
			COLLIE BURN									
20329	646	2 9	No. 1, Wyvern, 9 ft. 0 in.	20·0	4·0	29·4	46·6	9,965	38·65	13,120	5·0	Red-brown
20330	650	3 9		20·0	4·4	30·35	45·25	10,070	40·02	13,320	5·5	Red-brown
20331	725	5 6	No. 2, 6 ft. 0 in.	20·0	5·65	28·05	46·30	9,870	37·65	13,270	7·05	Red-brown
20550	815	4 2	No. 3, Phoenix, 6 ft. 7 in.	20·0	4·3	27·85	47·85	10,000	36·75	13,220	5·4	Brown
20551	819	2 5		20·0	7·55	27·75	44·70	9,520	38·3	13,160	9·7	Brown
21914	1,199	7 1	No. 4, Griffin, 7 ft. 1 in.	20·0	5·5	29·2	45·3	9,980	39·2	13,400	6·9	Red-brown
			Diamond Drill Bore No. 3.									
(1952)			COLLIE BURN									
255	448	4 9	No. 2 (?), 5 ft. 8 in.	20·0	4·95	27·15	47·90	9,950	36·2	13,250	6·2	Red
1136	670	3 2	No. 3 (?), 6 ft. 8 in.	20·0	2·8	29·4	47·8	10,160	38·1	13,150	3·5	Red
1777	1,072⅝	2 4		20·0	5·3	27·4	47·3	9,855	36·65	13,180	6·6	Salmon



REFERENCE

Bore Hole - showing identification (Govt. Stock No1) — COVT. STOCK. No1
Reduced level (R.L. 666') — R.L. 666'
Coal seams (1' and thicker) intersected (1'2" at 306') — 1'2" at 306'
Depth of hole (700') — (700')

Structure Contours — 500'

Faults

Fig.1
GEOLOGICAL SURVEY OF WESTERN AUSTRALIA

PLAN SHOWING POSITION & RESULTS OF DIAMOND DRILL HOLES AHEAD OF STOCKTON COLLIERY COLLIE MINERAL FIELD

Scale : 20 chains to an inch

20 0 20

Geology, plane table and alidade survey by J. H. Lord, 1952

Fig 2

PERCENTAGE CORE RECOVERY

Diamond Drilling Ahead of Wyvern Colliery, Collie, W.A.

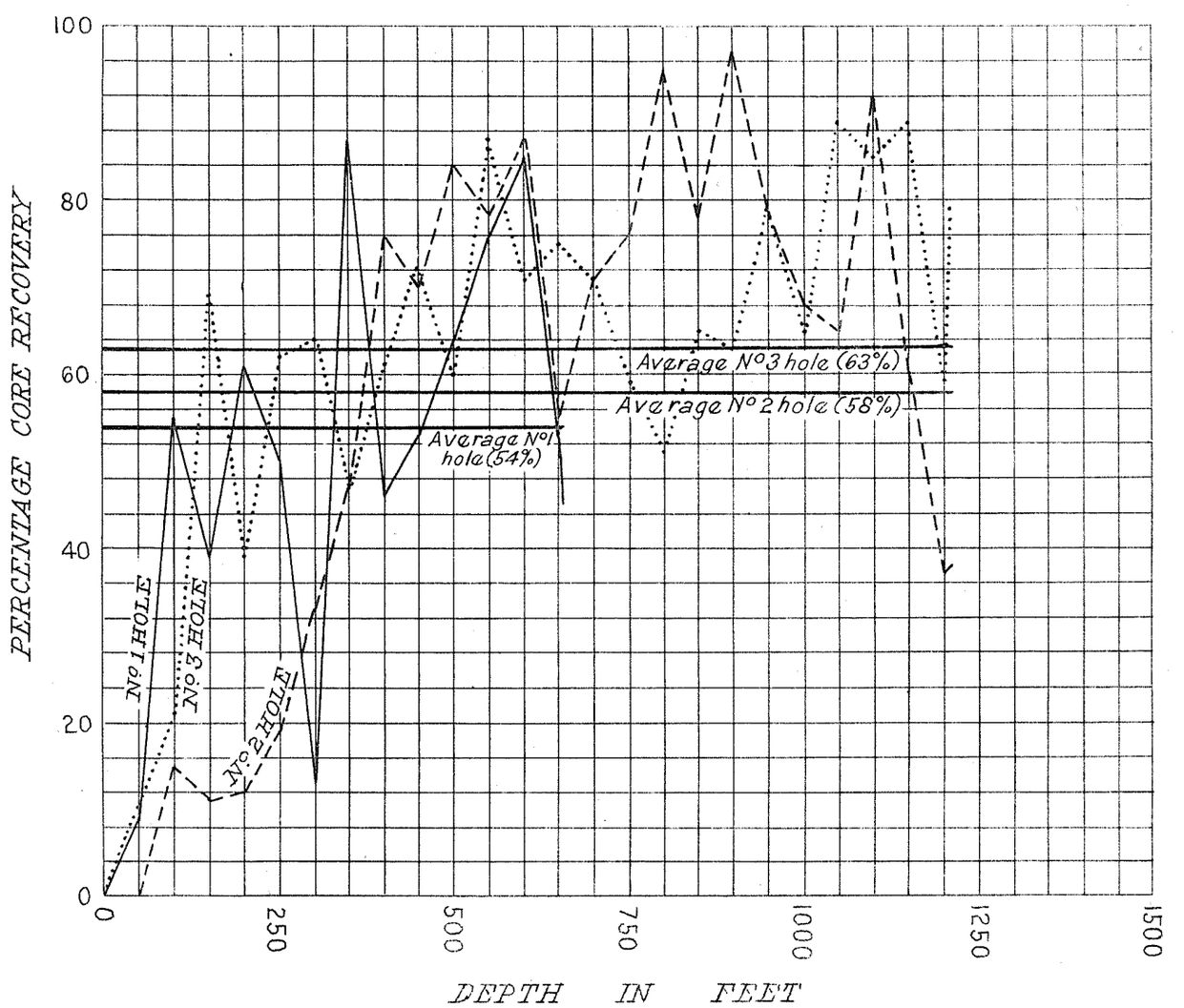
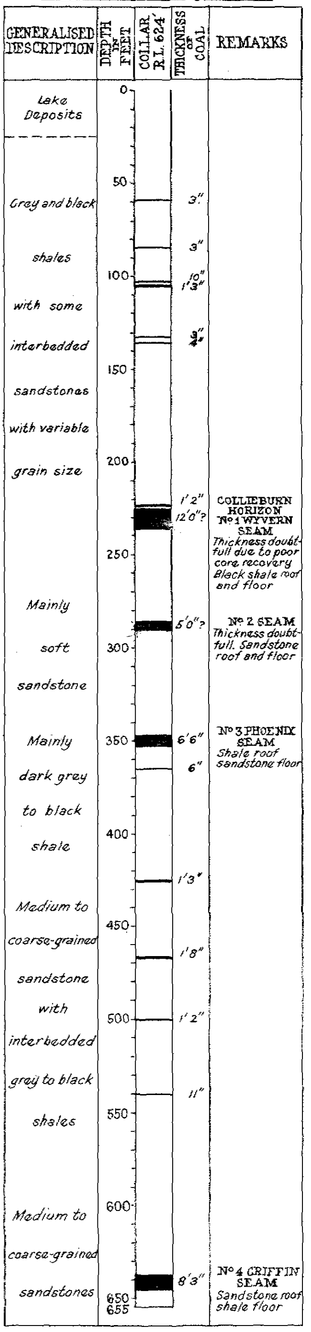


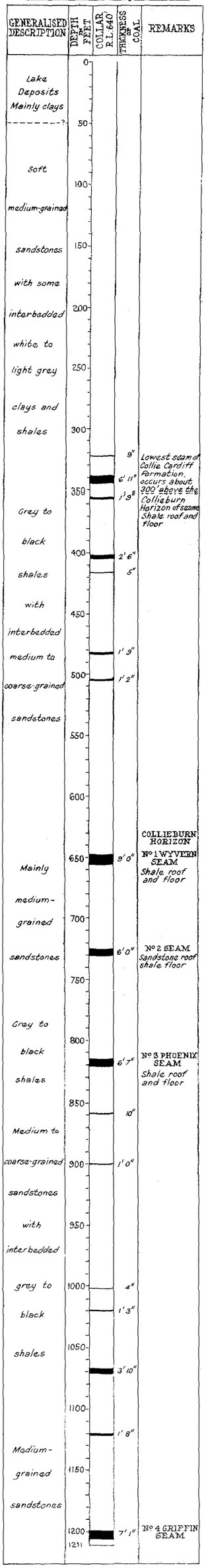
Fig. 3

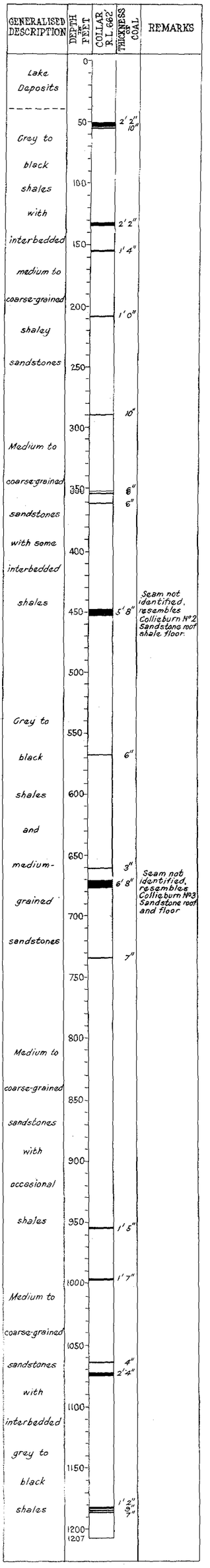
COLUMNAR SECTIONS OF GOVERNMENT DIAMOND DRILL HOLES AHEAD OF WYVERN COLLIERY

COLLIE MINERAL FIELD

Drillers: McCallum Bros. & Grill
Supervised and logged by J.H. Lord







The samples submitted as No. 1, Wyvern, seam analysed typically for that seam with low ash, 4.2 per cent, in Bore No. 2, and a calorific value of 10,000 B.Th.Us. on a 20 per cent. moisture basis.

The analyses of the No. 3, Phoenix, seam were more variable due to the mixture of coal and carbonaceous shale bands near the floor of the seam.

The No. 4, Griffin, seam which averaged 7ft. 8in. in thickness in the two intersections had a calorific value of approximately 9,800 B.Th.Us. with 5.5 per cent. ash on a 20 per cent. moisture basis.

CONCLUSION.

The drilling ahead of the Wyvern Colliery showed that the seams may only have a limited extent in the only remaining direction possible for development, namely, to the south-east. The Wyvern seam has some 700,000 tons of coal available, while the Phoenix and Griffin seams were shown to exist below.

The quality of the coal is similar to that being extracted from the collieries concerned at the moment.

It is recommended that the area between the Wyvern and the abandoned Collie Burn Colliery be systematically drilled with a suitable mobile plant.

Appendix I.

Government Drilling ahead of Collieries.

Hole: Wyvern No. 1 (M.L. 350).

Drilled by: McCallum Bros. & Grill.

Logged by: J. H. Lord.

Commenced: 24th September, 1951.

Completed: 9th October, 1951.

Depth (feet).	Summarised Log.
0 - 25(?)	Lake deposits.
25 - 58¾	Sediments.
58¾ - 59	COAL (3in.).
59 - 84¼	Sediments.
84¼ - 84½	COAL (3in.).
84½ - 102⅜	Sediments.
102⅜ - 103½	COAL (10in.).
103½ - 103¾	Sediments.
103¾ - 105	COAL (1ft. 3in.).
105 - 132	Sediments.
132 - 132¼	COAL (3in.),
132¼ - 135⅜	Sediments.
135⅜ - 136	COAL (4in.).
136 - 222¾	Sediments.
222¾ - 224	COAL (1ft. 2in.).
224 - 225	Sediments.
225 - 237(?)	COAL. (No. 1, Wyvern, seam, but poor core recovery).
237(?)-286(?)	Sediments.
286(?)-291(?)	COAL. (No. 2 seam, only a few chips recovered).
291(?)-347	Sediments.
347 - 353½	COAL (6ft. 6in.). (No. 3, Phoenix, seam).
353½ - 364½	Sediments.
364½ - 365	COAL (6in.).
365 - 425	Sediments.
425 - 426¼	COAL (1ft. 3in.).
426¼ - 466½	Sediments.
466½ - 468	COAL (1ft. 8in.).
468 - 499⅓	Sediments.
499⅓ - 500½	COAL (1ft. 2in.).
500½ - 540	Sediments.
540 - 541	COAL (11in.).
541 - 637	Sediments.
637 - 645¼	COAL (8ft. 3in.). (No. 4, Griffin, seam).
645¼ - 655	Sediments.

Hole: Wyvern No. 2 (M.L. 318).

Drilled by: McCallum Bros. & Grill.

Logged by: J. H. Lord.

Commenced: 20th October, 1951.

Completed: 28th November, 1951.

Depth (feet).	Summarised Log.
0 - 50(?)	Lake deposits.
50 - 322¾	Sediments.
322¾ - 323½	COAL (9in.).
323½ - 338	Sediments.
338 - 345	COAL (6ft. 11in.).
345 - 354¾	Sediments.
354¾ - 356½	COAL (1ft. 9in.).
356½ - 402¾	Sediments.
402¾ - 405¼	COAL (2ft. 6in.).
405¼ - 416½	Sediments.
416½ - 417	COAL (5in.).
417 - 482	Sediments.
482 - 483¾	COAL (1ft. 9in.).
483¾ - 504	Sediments.
504 - 505¼	COAL (1ft. 2in.).
505¼ - 647	Sediments.
647 - 656	COAL (9ft.). (No. 1, Wyvern, seam.)
656 - 725	Sediments.
725 - 731	COAL (6ft.). (No. 2 seam.)
731 - 815	Sediments.
815 - 821½	COAL (6ft. 7in.). (No. 3, Phoenix, seam.)
821½ - 859	Sediments.
859 - 859¾	COAL (10in.).
859¾ - 900½	Sediments.
900½ - 901½	COAL (1ft.).
901½ -1002	Sediments.
1002 -1002⅓	COAL (4in.).
1002⅓ -1019	Sediments.
1019 -1020¼	COAL (1ft. 3in.).
1020¼ -1068⅜	Sediments.
1068⅜ -1072¼	COAL (3ft. 10in.).
1072¼ -1120⅓	Sediments.
1120⅓ -1122	COAL (1ft. 8in.).
1122 -1199	Sediments.
1199 -1206	COAL (7ft. 1in.). (No. 4, Griffin, seam.)
1206 -1211	Sediments.

Hole: Wyvern No. 3 (M.L. 350).

Drilled by: McCallum Bros. & Grill.

Logged by: J. H. Lord.

Commenced: 17th December, 1951.

Completed: 29th January, 1952.

Depth (feet).	Summarised Log.
0 - 40	Lake deposits.
40 - 51	Sediments.
51 - 53¼	COAL (2ft. 2in.).
53¼ - 54¼	Sediments.
54¼ - 55	COAL (10in.).
55 - 132½	Sediments.
132½ - 134¾	COAL (2ft. 2in.).
134¾ - 154	Sediments.
154 - 155⅓	COAL (1ft. 4in.).
155⅓ - 208	Sediments.
208 - 209	COAL (1ft. 0in.).
209 - 290	Sediments.
290 - 290¾	COAL (10in.).
290¾ - 352½	Sediments.
352½ - 353	COAL (6in.).
353 - 360½	Sediments.
360½ - 361	COAL (6in.).
361 - 447¾	Sediments.
447¾ - 453½	COAL (5ft. 8in.). (No. 2 seam (?).)
453½ - 567	Sediments.
567 - 567½	COAL (6in.).
567½ - 660¾	Sediments.
660¾ - 661	COAL (3in.).
661 - 670½	Sediments.
670½ - 677¼	COAL (6ft. 8in.). (No. 3 seam (?).)
677¼ - 734½	Sediments.
734½ - 735	COAL (7in.).
735 - 953½	Sediments.
953½ - 955	COAL (1ft. 5in.).
955 - 995¾	Sediments.
995¾ - 997⅓	COAL (1ft. 7in.).
997⅓ - 1063⅓	Sediments.
1063⅓ - 1063⅔	COAL (4in.).

Depth (feet).	Summarised Log.
1063⅜- 1072⅜	Sediments.
1072⅜- 1075	COAL (2ft. 4in.).
1075 - 1181	Sediments.
1181 - 1182¼	COAL (1ft. 2in.).
1182¼- 1183¾	Sediments.
1183¾- 1184½	COAL (9in.).
1184½- 1185½	Sediments.
1185½- 1186	COAL (7in.).
1186 - 1207	Sediments.

REPORT ON DIAMOND DRILLING AHEAD OF EXISTING COLLIERIES, COLLIE MINERAL FIELD, W.A.

III.—Stockton Colliery.

By J. H. LORD, B.Sc.

A drilling programme to determine the attitude of the coal seams on the south-west side of the Stockton Colliery was carried out by contractors, McCallum Bros. and Grill, between February and November, 1952, under the direction of the Geological Survey of Western Australia. The position of the three holes drilled is shown on the locality plan (Fig. 4).

The machine and equiment used was similar to that described in the previous report[4] on drilling.

In the No. 2 hole it was necessary to case to 300ft. due to loss of fluid from the hole. Later the rods became stuck at a depth of 1,861ft. When fishing operations were abandoned 520ft. of drill rod and core barrel with a diamond bit and reamer remained in the hole.

The No. 3 hole, the deepest on the coalfield, was abandoned at 2,340ft. because the mud-pumps were unable to operate satisfactorily. It was intended to drill this hole through to the basement to serve as the proposed bore at site J in the deep drilling programme.

Core Recovery and Log.

Fig. 5 shows the core recovery graph for the three holes, which was 47, 67 and 82½ per cent. for Nos. 1, 2 and 3 holes respectively, giving an average of 71½ per cent. This is the best core recovery obtained at Collie with this drill.

A summarised log of each hole giving sediments and coal measures (3in. and thicker) is attached as Appendix I. This is shown also as a columnar section in Fig. 6.

A detailed log of each hole has been prepared and is on file at the Geological Survey.

Geology.

The south-west boundary of the Stockton Colliery, which extracts the Nos. 2 and 3 seams of the Collie horizon, is a down-throw fault of hitherto unknown displacement. Seven calyx bores were drilled some years ago by the company to locate the displaced seams, but without any success.

The No. 1 hole was drilled at a site as shown on Fig. 4 and intersected the Collie horizon. The No. 1 seam was only 3ft. 9in. thick; the No. 2 seam was 12ft. 2in. at a depth of 550ft., while the No. 3 seam was 14ft. 3in. thick at a depth of 576ft. The hole was continued to a depth of 700ft. but no further seams of economic interest were intersected.

This hole indicates that the fault has a down-throw of some 450ft.

The No. 2 hole was drilled at a site as shown on Fig. 4. This hole intersected two seams 5ft. 8in. and 6ft. at 117 and 370ft. respectively, which appear to belong to the Collie Burn horizon. Analyses confirm this idea. At a depth of 1,109ft. a 5ft. 3in. seam was intersected, but immediately below it a fault zone was encountered. No further significant seams were found.

[4] 1952. Lord, J. H.: Report on Diamond Drilling Ahead of Existing Collieries, Collie Mineral Field. II. Wyvern Colliery. *G.S.W.A. Annual Report, 1952.*

This seam is thought to be the No. 1 seam of the Collie horizon, the No. 2 and No. 3 seams having been displaced by the fault. This fault is not thought to be the one forming the boundary of the Stockton Colliery, but an additional parallel fault producing a total displacement between the colliery workings and this hole of at least 650ft.

The No. 3 hole was drilled at the position shown on Fig. 4. It intersected several seams of the Collie Burn horizon before encountering the Collie horizon at depth. The No. 1 seam of this horizon could not be identified but the No. 2 seam was present at 1,180ft., being 13ft. 2in. thick, while the No. 3 seam was at 1,208ft., being 14ft. 6in. thick.

This hole (No. 3) is situated down the anticipated dip from the No. 1 hole and the results show that the dip between these two holes is 15½ degrees (1 in 3.6), which is considered rather steep. In consequence it is considered that there is a fault between these two holes which may be identical with that encountered in No. 2 hole.

At 1,380ft. and 1,572ft. in No. 2 and No. 3 holes respectively, an interesting formation consisting of very fine-grained sandstones, siltstones, shales and mudstones, was intersected. Neither hole penetrated the formation but proved a thickness of 481 and 768ft. respectively.

The siltstones were white to light grey and the shales greenish to bluish-grey but both tended to become brownish-grey at depth.

In the formation occasional calcareous bands were found both in the siltstones and shales. As sufficient carbonate reaction was found in some sections it was logged as limestone. The Government Chemical Laboratory analysed some samples:—

Lab. No.: 10743 (No. 2 Hole at depth of 1,512ft.).

	Per cent.
Silica, SiO_2	71.48
Magnesia, MgO	0.48
Lime, CaO	5.56
Carbon dioxide, CO_2	3.94
equal to $MgCO_3$	1.00
$CaCO_3$	7.78
Note: Lime in excess, CaO	1.20

Lab. No.: 10744 (No. 2 Hole at depth of 1,671ft.).

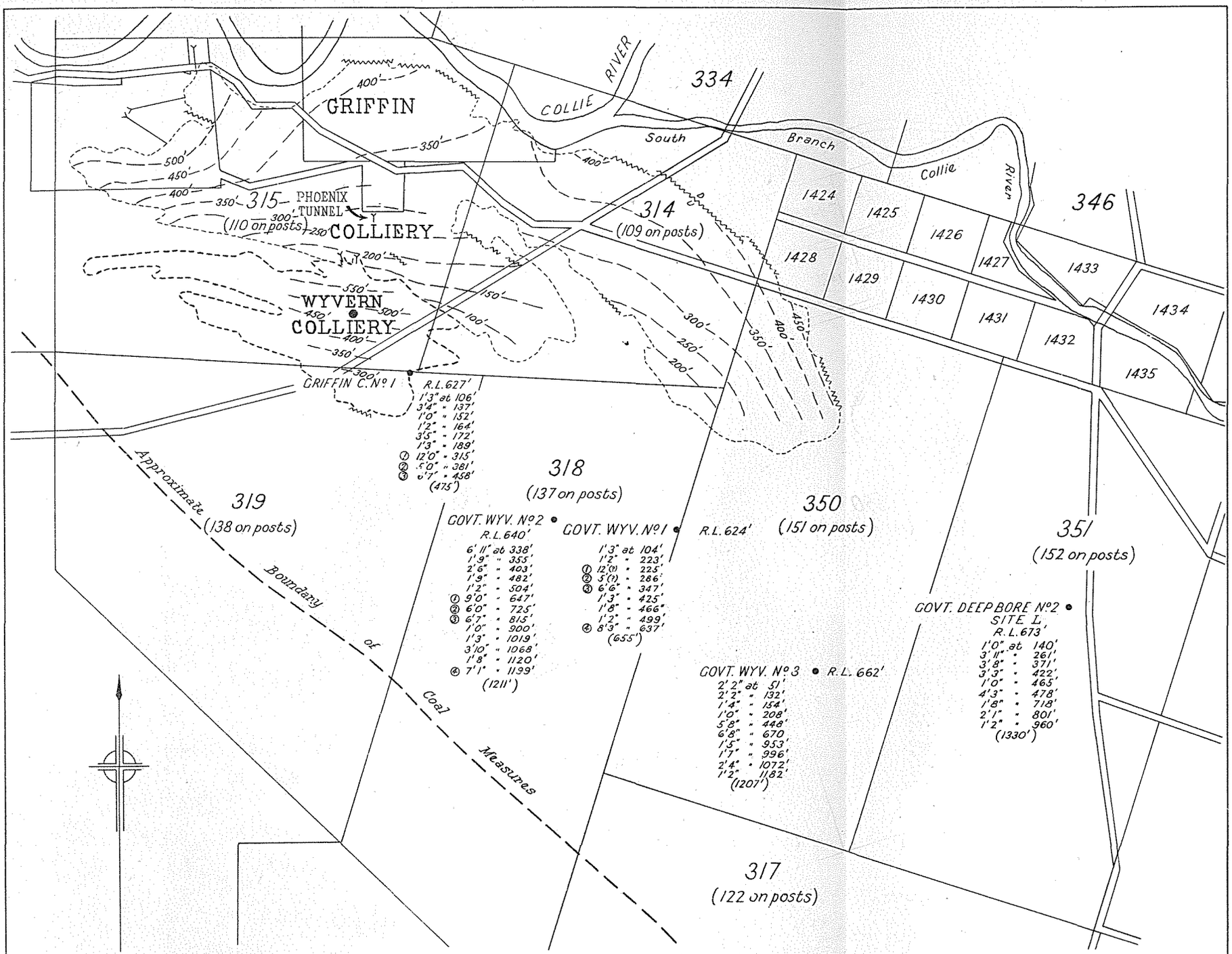
	Per cent.
Silica, SiO_2	47.73
Magnesia, MgO	0.54
Lime, CaO	19.56
Carbon dioxide, CO_2	15.47
equal to $MgCO_3$	1.13
$CaCO_3$	33.84
Note: Lime in excess, CaO	0.6

Another sample from hole No. 3 at 2,123ft showed approximately 60 per cent calcium carbonate.

The calcium carbonate was of chemical origin, having been precipitated in the strata. Near these calcareous bands occasional veins of cacite were present, cutting across the strata.

No fossils were found during the logging of this formation except for occasional minute fragments of plant remains. Thirty-nine samples from the No. 2 hole were submitted to Miss I. Crespin of the Bureau of Mineral Resources for microfossil determination. Unfortunately no fossil evidence was found.

The most remarkable feature of this formation was its structure. This formation of shales, mudstones, siltstones and fine-grained sandstones had been subjected to severe slumping during its deposition. This had resulted in intense complicated minute folding and faulting as shown in Fig. 7 (samples Nos. 2 and 4). Intraformational breccia (known also as "glide breccia" or "edgewise conglomerate") had also been developed. An example of this breccia is shown in Fig. 7 (sample 3).



— REFERENCE —

Bore Hole – showing identification (Govt. Wyv. N°1)
Reduced level (R.L. 624')
Coal seams (1' and thicker) intersected (1'3" at 104')
Depth of hole (655')
Identification of seam ①

GOVT. WYV. No 1
R.L. 624'
1'3" at 104'
(655')

Faults

Structure contours — — 500' — —

Fig. 4

GEOLOGICAL SURVEY OF WESTERN AUSTRALIA

PLAN SHOWING
POSITION & RESULTS
— OF —
— DIAMOND DRILL HOLES —
AHEAD OF WYVERN COLLIERY
COLLIE MINERAL FIELD

Scale : 20 chains to an inch

20 0 20

Compiled by J. H. Lord, B.Sc., Feb. 1952

Fig. 5

PERCENTAGE CORE RECOVERY

Diamond Drilling Ahead of Stockton Colliery, Collie, W.A.

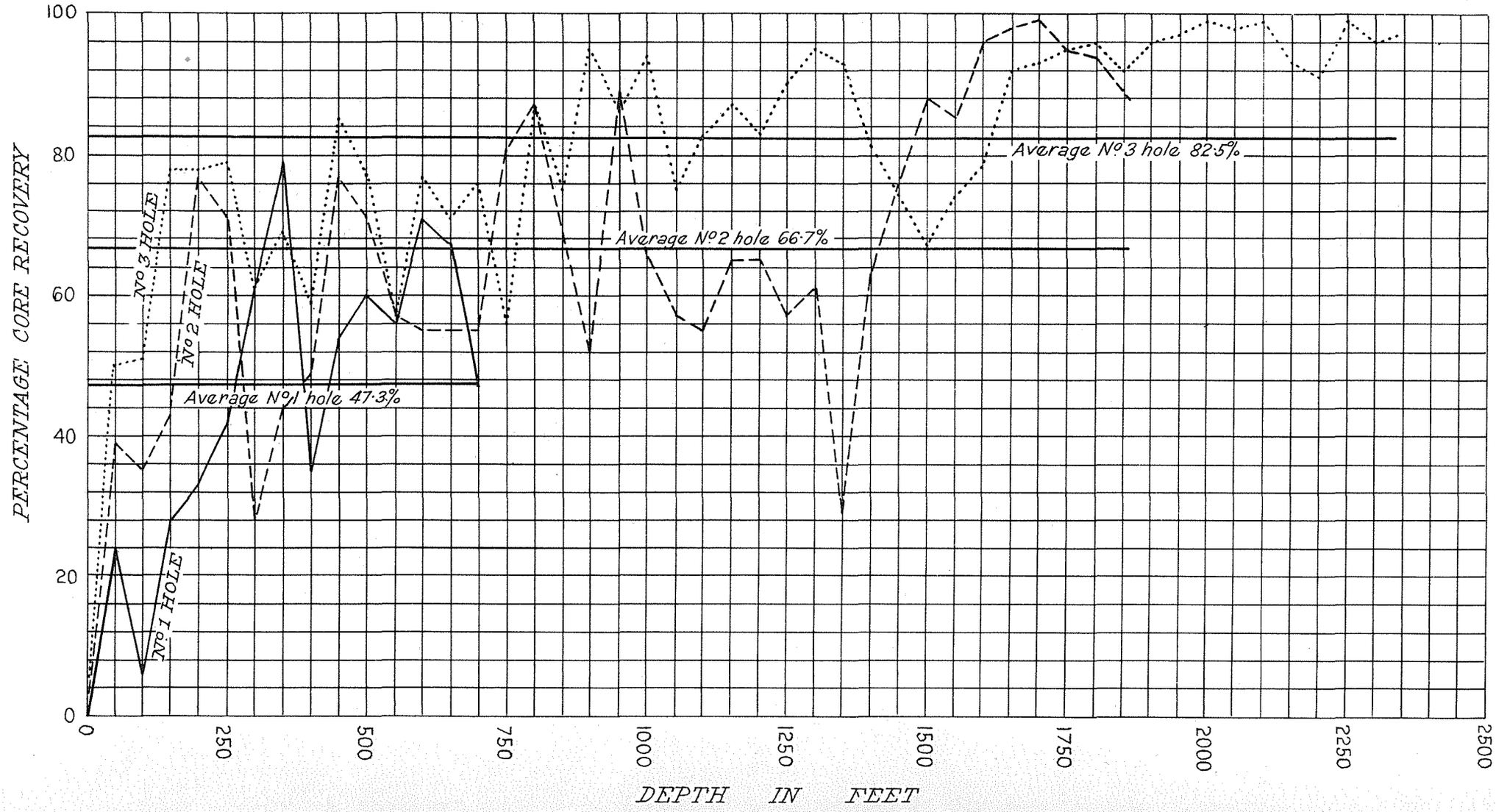
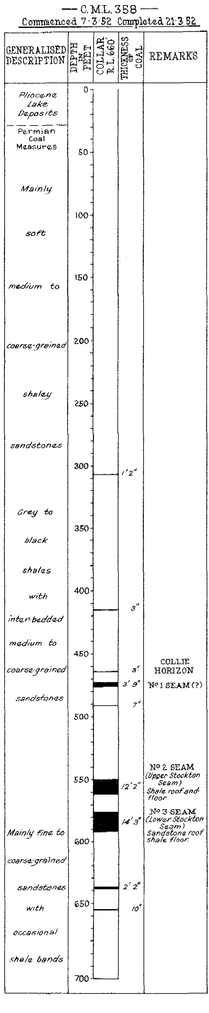


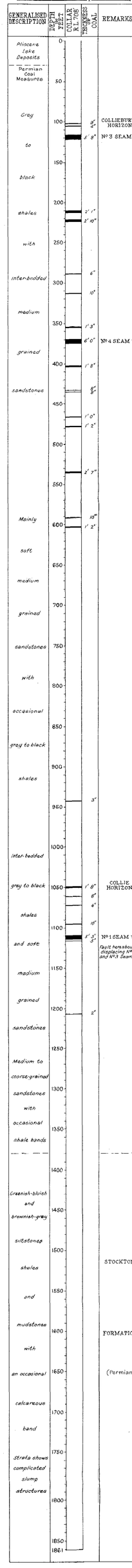
Fig 6

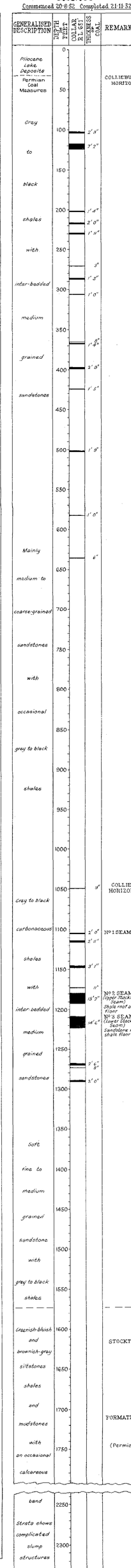
COLUMNAR SECTIONS OF GOVERNMENT DIAMOND DRILL HOLES AHEAD OF STOCKTON COLLIERY

COLLIE MINERAL FIELD

Drillers : McCallum Bros. & Grill
Supervised and logged by J.H. Lord







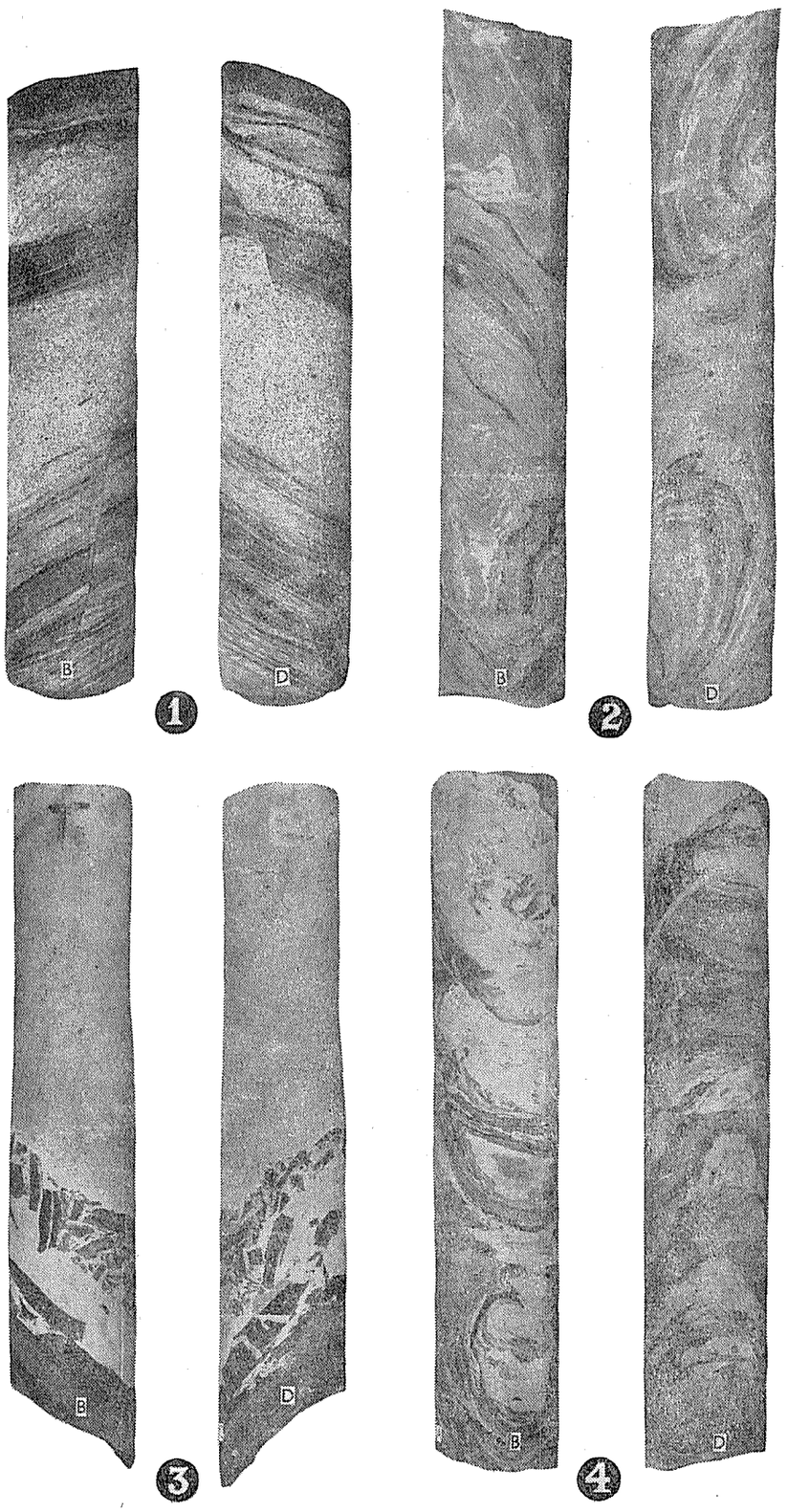


FIG. 7.—Photographs of Core from Stockton No. 2 hole, Collie Mineral Field, showing two views of each specimen.

No. 1.—Depth 1,205 ft.: Small fault in Coal Measures.

No. 2.—Depth 1,432 ft.: Fluvial-glacial sediments of the Stockton Formation showing slump structures.

No. 3.—Depth 1,444 ft.: Intraformational Breccia formed at the junction of siltstone and shale in the Stockton Formation.

No. 4.—Depth 1,519 ft.: Fluvial-glacial sediments of the Stockton Formation showing slump structures.

Sandstone dykes and slump-ball structures were also observed.

This formation has been encountered previously in bores at Collie but, as it did not show such structures nor was it so thick, it was not studied closely. A thin section of this formation, which was encountered in bores at Site C and E in the north-eastern basin[5] near the basement was underlain by what was logged as conglomerate, which on closer examination proved to be a tillite. Unfortunately the basement was not reached in the Stockton holes Nos. 2 and 3 where this formation was encountered in the main basin. Until this is done it is impossible to define the bottom of this formation, or to prove if tillite is present between it and the granite basement.

It would appear that at this stage in the Permian period there were retreating mountain glaciers in the vicinity of the Collie basin. The tillite was deposited and later as the glaciers retreated only the melt waters carrying the fine-grained sediment (rock flour) reached the basin. These sediments, which were deposited on a steeply sloping surface, built up this formation in which intense slumping took place. It may be found later that in the centre of the main basin there was no slumping in this formation and that the thickness deposited was not so great, as was the case in the north-eastern basin. This new formation supports the present idea of the origin of this coal basin.[6]

Although there is no distinct break between the top of this formation and the coal measures, there is a transition from sediments produced by ice erosion to sediments produced by water erosion.

It is suggested that these silts and shales of fluvio-glacial origin should be known as the Stockton Formation.

[5] 1950. Lord, J. H.: Progress Report on Diamond Drilling, Collie Mineral Field. (1) Bore No. 1—Site C. (2) Bore No. 3—Site E. *G.S.W.A. Annual Report, 1950.*

[6] 1952. Lord, J. H.: Collie Mineral Field. *G.S.W.A. Bulletin 105,* p. 106-7.

Quality of Coal.

The detailed analyses carried out on samples submitted to the Government Chemical Laboratories are shown in Table I.

Table I.

Proximate Analysis of the Thicker Seams Intersected while Drilling Ahead of the Stockton Colliery.

Chem. Lab. No. (1952)	Depth.	Thickness of Sample.	Horizon, Identification of Seam and Thickness Proven.	As Received.					Dry and Ash Free.		Ash Dry Basis.	Colour of Ash.
				Moisture.	Ash.	Vol. Matter.	Fixed Carbon.	Calorific Value.	Vol. Matter.	Calorific Value.		
			Diamond Drill Bore No. 1.									
	Feet.	ft. in.		%	%	%	%	B.Th.U.	%	B.Th.U.	%	
7088	473	3 9	COLLIE HORIZON, No. 1 Seam	20·0	10·4	22·6	47·0	8,890	32·5	12,780	13·0	Brown
7089	550	6 7	No. 2 Seam, 12 ft. 2 in.	20·0	12·9	22·0	45·1	8,430	32·7	12,540	16·0	Brown
7090	556¾	5 5		20·0	12·9	22·4	44·7	8,510	33·4	12,680	16·2	Salmon
7091	576	10 0	No. 3 Seam, 14 ft. 3 in.	20·0	15·4	20·7	43·9	8,230	32·1	12,720	19·2	Brown
7092	586	4 3		20·0	7·0	23·3	49·7	9,370	32·0	12,840	8·8	Brown
			Diamond Drill Bore No. 2.									
8136	116¾	5 8	COLLIE BURN HORIZON	20·0	3·8	30·6	45·6	9,730	40·2	12,770	4·7	Buff
8289	370	6 0		20·0	3·7	26·1	50·2	9,760	34·2	12,790	4·6	Brown
9439	1,109	5 3	COLLIE HORIZON, No. 1 Seam	20·0	10·4	21·5	48·1	9,190	30·9	13,210	13·1	Brown
			Diamond Drill Bore No. 3.									
16479	102	2 1	COLLIE BURN HORIZON	20·0	4·35	27·3	48·35	9,710	36·1	12,830	5·4	Red
16480	117	7 2		20·0	3·2	29·4	47·4	9,900	38·25	12,900	4·0	Red
16481	396	2 9		20·0	4·05	26·3	49·65	9,800	34·6	12,900	5·05	Red
16644	1,104	2 0	COLLIE HORIZON	20·0	8·8	24·0	47·2	9,365	33·7	13,160	11·0	Red
16645	1,113½	2 11		20·0	9·4	22·8	47·8	9,260	32·3	13,110	11·75	Red
16646	1,145	3 1		20·0	12·3	21·95	45·75	8,670	32·45	12,800	15·4	Red
16908	1,179½	4 0	No. 2 Seam, 13 ft. 2 in.	20·0	19·0	20·7	40·3	7,500	33·8	12,300	23·7	Dark fawn
16909	1,183½	4 0		20·0	12·1	22·4	45·5	8,650	33·0	12,740	15·1	Dark fawn
16910	1,187½	5 2		20·0	13·9	21·8	44·3	8,460	33·0	12,820	17·4	Dark fawn
16911	1,208½	4 0		20·0	6·0	22·7	51·3	9,745	30·7	13,180	7·5	Dark fawn
16912	1,212½	4 0	No. 3 Seam, 14 ft. 6 in.	20·0	8·8	22·6	48·6	9,285	31·7	13,040	10·9	Dark fawn
16913	1,216½	3 0		20·0	8·7	23·1	48·2	9,240	32·4	12,940	10·8	Drak fawn
16914	1,219½	3 6		20·0	5·9	23·1	51·0	9,860	31·1	13,300	7·4	Dark fawn
16915	1,268	2 6		20·0	12·6	21·7	45·7	8,910	32·1	13,220	15·7	Dark fawn

The samples from the seams encountered in the upper portions of the No. 2 and No. 3 holes analysed typically with the Collie Burn horizon, e.g., low ash content.

Of the Collie horizon seams intersected, the No. 2 seam, which averaged 13½ft. thick, had an average calorific value of 8,300 B.Th.Us. with 14 per cent. ash on a 20 per cent. moisture basis. The No. 3 seam, which averaged 14¼ft. thick, had an average calorific value of 9,050 B.Th.Us. with 10 per cent. ash on a 20 per cent. moisture basis.

These results are in keeping with previous knowledge for the complete seams. If selected portions of the seams were mined the quality could be improved.

Conclusion.

The drilling to the south-west of the Stockton Colliery showed that the displacement of the seams by the boundary fault is at least 450ft. and that additional parallel faults may exist. Additional drilling is required, particularly to the north-west, before the mining possibilities in this area can be assessed.

The seams encountered were similar in thickness and quality to those being extracted at the Stockton Colliery.

Appendix I.

Government Drilling ahead of Collieries.

Hole: Stockton No. 1 (M.L. 358).

Drilled by: McCallum Bros. & Grill.

Logged by: J. H. Lord.

Commenced: 7th March, 1952.

Completed: 21st March, 1952.

Depth (feet).	Summarised Log.
0 - 28	Lake deposits.
28 - 306	Sediments.
306 - 307¼	COAL (1ft. 2in.).
307¼ - 415	Sediments.
415 - 415¼	COAL (3in.).
415¼ - 464	Sediments.
464 - 464¼	COAL (3in.).
464¼ - 473	Sediments.
473 - 476⅜	COAL (3ft. 9in.).
476⅜ - 491	Sediments.
491 - 491½	COAL (7in.).
491½ - 550	Sediments.
550 - 562¼	COAL (12ft. 2in.—including 2in. iron concretion—Stockton upper seam).
562¼ - 576	Sediments.
576 - 592¼	COAL (14ft. 3in.—Stockton lower seam).

Depth (feet).	Summarised Log.
592¼- 637¼	Sediments.
637¼- 639⅓	COAL (2ft. 2in.).
639⅓- 654⅜	Sediments.
654⅜- 655⅔	COAL (10in.).
655⅔- 700	Sediments.

Hole: Stockton No. 2 (M.L. 359).

Drilled by: McCallum Bros. & Grill.

Logged by: J. H. Lord.

Commenced: 2nd April, 1952.

Abandoned: 1st August, 1952.

Depth (feet).	Summarised Log.
0 - 30	Lake deposits (Pliocene).
30 - 101¼	Sediments (Permian coal measures).
101¼- 102	COAL (9in.).
102 - 105	Sediments.
105 - 105½	COAL (4in.—poor quality).
105½- 116⅜	Sediments.
116⅜- 122⅓	COAL (5ft. 8in.).
122⅓- 211¼	Sediments.
211¼- 213½	COAL (2ft. 1in.—poor quality).
213½- 221¾	Sediments.
221¾- 224⅝	COAL (2ft. 10in.—poor quality).
224⅝- 289	Sediments.
289 - 289½	COAL (6in.—poor quality).
289½- 313¼	Sediments.
313¼- 314	COAL (10in.—poor quality).
314 - 354¾	Sediments.
354¾- 356	COAL (1ft. 3in.).
356 - 369¼	Sediments.
369¼- 375¼	COAL (6ft.).
375¼- 402½	Sediments.
402½- 404	COAL (1ft. 8in.—poor quality).
404 - 433½	Sediments.
433½- 434¼	COAL (8in.).
434¼- 435½	Sediments.
435½- 436¼	COAL (8in.).
436¼- 466¼	Sediments.
466¼- 467¼	COAL (1ft.).
467¼- 478½	Sediments.

Depth (feet).	Summarised Log.
478½- 479¾	Coal (1ft. 2in.).
479¾- 534	Sediments.
534 - 536½	Coal (2ft. 7in.).
536½- 591¾	Sediments.
591¾- 592	Coal (10in.).
592 - 601¾	Sediments.
601¾- 603	Coal (1ft. 2in.—contains thin shale bands).
603 - 942	Sediments.
942 - 942¼	Coal (3in.).
942¼-1,049	Sediments.
1,049 -1,050⅝	Coal (1ft. 8in.).
1,050⅝-1,061¾	Sediments.
1,061¾-1,062½	Coal (8in.).
1,062½-1,071½	Sediments.
1,071½-1,072	Coal (6in.).
1,072 -1,095¼	Sediments.
1,095¼-1,096	Coal (10in.).
1,096 -1,109	Sediments.
1,109 -1,114¼	Coal (5ft. 3in.).
1,114¼-1,116½	Sediments.
1,116½-1,116¾	Coal (5in.).
1,116¾-1,206¾	Sediments.
1,206¾-1,207	Coal (2in.).
1,207 -1,861	Sediments.

Hole: Stockton No. 3 (Deep Drill Site J) (M.L. 358).

Drilled by: McCallum Bros. & Grill.

Logged by: J. H. Lord.

Commenced: 20th August, 1952.

Abandoned: 21st November, 1952.

Depth (feet).	Summarised Log.
0 - 32	Lake deposits (Pliocene).
32 - 102	Sediments (Permian Coal Measures—sandstones and shales).
102 - 104⅓	COAL (2ft. 3in.).
104⅓- 117	Sediments.
117 - 124¼	COAL (7ft. 2in.).
124¼- 201⅜	Sediments.
201⅜- 203	COAL (1ft. 4in.—poor quality).
203 - 216½	Sediments.
216½- 218½	COAL (2ft.—poor quality).

Depth (feet).	Summarised Log.
218½- 229¾	Sediments.
229¾- 231¾	COAL (1ft. 11in.—poor quality).
231¾- 270¾	Sediments.
270¾- 271	COAL (3in.).
271 - 286	Sediments.
286 - 287¼	COAL (1ft. 3in.).
287¼- 306	Sediments.
306 - 307	COAL (1ft.—poor quality).
307 - 365⅓	Sediments.
365⅓- 366	COAL (8in.—poor quality).
366 - 366½	Sediments.
366½- 367¾	COAL (1ft. 4in.—poor quality).
367¾- 396	Sediments.
396 - 398¾	COAL (2ft. 9in.).
398¾- 424	Sediments.
424 - 425½	COAL (1ft. 5in.).
425½- 501	Sediments.
501 - 502¾	COAL (1ft. 9in.).
502¾- 572	Sediments.
572 - 573	COAL (1ft.—poor quality).
573 - 635½	Sediments.
635½- 636	COAL (6in.).
636 -1,048½	Sediments.
1,048½-1,049¼	COAL (9in.—poor quality).
1,049¼-1,104	Sediments.
1,104 -1,106	COAL (2ft.).
1,106 -1,113½	Sediments.
1,113½-1,116½	COAL (2ft. 11in.).
1,116½-1,145	Sediments.
1,145 -1,148	COAL (3ft. 1in.).
1,148 -1,172¼	Sediments.
1,172¼-1,173¼	COAL (11in.).
1,173¼-1,179½	Sediments.
1,179½-1,192⅜	COAL (13ft. 2in.—Top Stockton seam).
1,192⅜-1,208½	Sediments.
1,208½-1,223	COAL (14ft. 6in.—Bottom Stockton seam).
1,223 -1,268	Sediments.
1,268 -1,270½	COAL (2ft. 6in.).
1,270½-1,273	Sediments.
1,273 -1,273⅜	COAL (8in.).
1,273⅜-1,289½	Sediments.
1,289½-1,291½	COAL (2ft.).
1,291½-1,572	Sediments.
1,572 -2,340	Sediments (siltstones, shales and mudstones, occasionally calcareous, showing slump structures).

REPORT ON FURTHER PROSPECTING ON A PORTION OF PROSPECTING AREA No. 53 (NOW WESTERN No. 1 COLLIERY) COLLIE MINERAL FIELD, W.A.

By J. H. LORD, B.Sc., F.G.S.

In the previous report on Prospecting Area 53[7], which is taken as read, it was suggested that the extraction of coal to the north-east of Shotts, if it were considered possible, should be preceded by closer boring. This boring has been carried out and the additional information gained is recorded in this report, together with any alteration to ideas previously stated.

Since the last report was prepared the ownership of the area concerned has passed from the Goldfields Coal Sydnicate to a new company known as Western Collieries Ltd. This company is developing a colliery, known as Western No. 1, in this area (see Plate IV) approximately one and a half miles east of Shotts. Twenty-one additional percussion bores have been put down to define more closely the mineable coal seams. As a result of this drilling it has been found necessary to produce new plans and sections of the area.

Geology.

In the previous report, it was suggested that, in the North-Eastern Basin where this area is situated, there may be another horizon of coal seams at a greater depth. This has been proved correct by a diamond drill hole[8] put down at

[7] 1948. Lord, J. H.: Report on Prospecting Area 53 at Collie, W.A. *G.S.W.A. Annual Report*, 1948, p. 41.

[8] 1950. Lord, J. H.: Progress Report on Diamond Drilling, Collie Mineral Field. No. 1—Site C. *G.S.W.A. Annual Report, 1950.*

Site C on C.M.L. 415 (see Plate IV), which not only penetrated the Premier Horizon (Formation) but also the Ewington Horizon (Formation) containing three seams between 1,499 and 1,601ft. The hole encountered the basement granite at 1,857ft.

In this additional percussion boring the extent and attitude (see Plate VI) of the Premier Horizon (Formation) has been defined more closely. An important feature disclosed by the drilling is the reversal of dip towards the north-western end of the area which causes the seams to outcrop again on location 2447.

There still appears to be a fault between the south-western edge of the seams and the old Premier Colliery workings, while on the north-eastern side the seams do not turn up to the surface but lense into the wall of the basin (see Plate V—Section No. 1 and 3). At the northern end between the "G" bores and "F" bores there may be a fault.

Where the seams have been intersected by this additional drilling there do not appear to be any faults which could hamper mining operations seriously.

Details of all additional bores are shown in Table I and on Plate IV.

Quality of the Coal.

There has been no drastic change in the quality of the coal. The only alteration is a slight increase in the ash content towards the north-west, which causes a slight lowering of the calorific value.

All the additional analyses, as reported by the W.A. Government Chemical Laboratories, are shown in Table II.

Carbonisation assays have been carried out on all coal analysed and are available at the Geological Survey.

An ultimate analysis has been made of sample No. 8258/52, which was a channel sample from No. 2 seam where intersected by the tunnel. The details are:—

ULTIMATE ANALYSIS.

	As received.	Dry Ash Free.
	%	%
Carbon	53.5	75.9
Hydrogen	3.3	4.7
Nitrogen	1.1	1.6
Sulphur	0.5	0.7
Oxygen	—	17.1
		100.0

ASH FUSION POINT (Reducing Atmosphere).

	Degrees C.
Softening	1,090
Blobbing	1,140
Fluid	1,310

Coal Reserves.

The coal reserves have been re-estimated using the new information available. The method adopted was the same as in the previous report and the details of the coal blocked out are shown on Plate VI in Figs. 1, 2 and 3 for seams Nos. 2, 3 and 4 respectively.

Table III below sets out the details of the reserves. It should be noted that the estimates given represented the total coal in the seams. Most of the coal reserves are now classified as "measured coal," while the total coal blocked out has been increased from 15 to 26 million tons. The percentage of this tonnage which can be extracted will depend on the ability of the mining engineer to extract these thin coal seams associated with soft strata.

TABLE III.—COAL RESERVES FOR WESTERN NO. 1 COLLIERY.

Seam No.	Average Thickness.	Measured Tonnage.	Indicated Tonnage.	Inferred Tonnage.	Total.
	ft. ins.				tons.
2	6 0	6,500,000	....	1,400,000	7,900,000
3	5 11	7,300,000	....	1,400,000	8,700,000
4	6 8	7,200,000	....	2,200,000	9,400,000
2, 3 and 4	....	21,000,000	....	5,000,000	26,000,000

TABLE I.—CORRELATION OF COAL SEAMS INTERSECTED BY ADDITIONAL BORING ON P.A. 53.

Bores.			No. 1 Seam.		No. 2 Seam.		No. 3 Seam.		No. 4 Seam.		No. 5 Seam.		No. 6 Seam.	
No.	Reduced. Level. feet.	Depth Feet.	Thickness. ft. ins.	Depth Feet.	Thickness. ft. ins.	Depth Feet.	Thickness. ft. ins.	Depth Feet.	Thickness. ft. ins.	Depth Feet.	Thickness. ft. ins.	Depth Feet.	Thickness. ft. ins.	Depth Feet.
B 5	745	153	....	(a)	5 6	92½	5 9	130	7 6	144	....	(b)	....	(b)
B 11	784	147	....	(a)	6 6	139	....	(b)	....	(b)	....	(b)	....	(b)
B 11a	768	199	....	(a)	7 6	129	6 6	162½	6 6	191	....	(b)	....	(b)
B 12a	775	250	....	....	....	....	5 6	180	6 0	197	....	....	....	....
B 13	785	71	No Coal Measures.—Pre-Cambrian Complex.											
E 3	732	60	....	(a)	....	(a)	5 6	54½	....	(b)	....	(b)	....	(b)
E 4	737	33	....	(a)	5 0	27½	....	....	....	....	....	....	....	....
E 5	....	106	....	(a)	4 0	49	6 0	80½	7 0	97	....	(b)	....	(b)
F 1	710	300	....	(a)	....	(a)	....	(a)	....	(a)	3 6	168	3 0	174
F 2	736	200	....	(a)	....	(a)	....	(a)	....	(a)	3 0	136½	5 6	145
G 1	792	223	3 0	85	6 9	215	....	(b)	....	(b)	....	(b)	....	(b)
G 2	758	203	....	(a)	7 0	134	6 0	180	7 0	195	....	(b)	....	(b)
G 3	717	92	....	(a)	5 0	33	6 6	59½	Missing.	....	....	(b)	....	(b)
H 1	737	122	....	(a)	7 0	56	5 9	101½	7 0	114½	....	....	....	....
H 2	732	71	....	(a)	....	(a)	5 9	48½	7 0	63½	....	....	....	....
H 3	773	210	....	(a)	6 0	141½	5 6	177½	7 0	201½	....	(b)	....	(b)
H 4	....	75	No Coal Measures.—Pre-Cambrian Complex.											
Z 3	722	78	....	....	....	....	....	....	....	....	....	....	....	....
Z 4	757	60	No seams intersected.											
Z 5	780	128	....	(a)	5 6	65½	6 0	97	7 6	116	....	(b)	....	(b)
Z 6	760	154	....	(a)	5 6	92½	6 0	130½	6 9	146	....	(b)	....	(b)

(a) = Bore commenced below this seam stratigraphically. (b) = Bore stopped before reaching this seam.

PLATE IV

Loc 4088

Loc 1639

Loc 2315

Loc 2980

Loc 1715

Loc 1416

Loc 1619

Loc 2133

Loc 2447

275

273

469

470

471

413

414

415

416

417

418

420

421

422

F.2. R.L. 736'
⑤ 3'0" at 136'0"
⑥ 5'6" " 145'0"
(200')

H.4.
(2) No Coal Measures
(70')

F.1. R.L. 710'
④ 3'6" at 168'0"
⑤ 3'0" " 174'0"
(300')

H.3. R.L. 773'
② 5'0" at 141'6"
③ 5'6" " 177'6"
④ 7'0" " 201'6"
(210')

N.39°W.

G.3. R.L. 715'
② 5'0" at 33'0"
③ 6'6" " 59'6"
(92')

G.2. R.L. 758'
② 7'0" at 134'0"
③ 6'0" " 180'0"
④ 7'0" " 195'0"
(203')

G.1. R.L. 792'
① 3'0" at 85'0"
② 6'9" " 215'0"
(223')
Hole lost

3¼° ② ②

SECTION No 1

SECTION No 2

SECTION No 4

N.E.

A.8. R.L. 744'
② 6'6" at 110'0"
③ 3'0" " 142'0"
(145')
Hole lost in Coal

H.4. R.L. 737'
② 1'0" at 56'0"
③ 5'9" " 101'6"
④ 7'0" " 114'6"
(122')

H.2. R.L. 732'
③ 5'9" at 48'6"
④ 7'0" " 63'6"
(71')

4° ④

A.6. R.L. 754'
① 4'0" at 48'6"
② 6'6" " 173'0"
③ 6'0" " 203'0"
④ 6'0" " 219'0"
(230')

2¼° ③

S.W.

GOVT. D.D. SITE C. R.L. 785' ④

1¼°

A.4. R.L. 762'
① 3'0" at 30'0"
② 5'0" " 147'0"
③ 5'6" " 189'0"
④ 6'9" " 204'0"
(216')

① 2'3" at 64'
② 4'7" " 179'
③ 4'0" " 224'
④ 7'0" " 238'
⑤ 3'4" " 389'
⑥ 3'10" " 397'
4'9" " 692'
4'3" " 1251'
12'9" " 1499'
2'2" " 1566'
4'7" " 1569'
8'9" " 1601'
(1872')
Granite

A.2. R.L. 766'
⑤ 4'6" at 258'0"
⑥ 5'0" " 266'0"
(300')

1¼° ③

Z.1. R.L. 817'
① 3'0" at 72'6"
② 6'0" " 179'6"
③ 5'9" " 218'0"
④ 7'0" " 231'0"
(250')

B.10. R.L. 787'
② 6'6" at 144'0"
③ 6'9" " 176'0"
④ 6'0" " 200'0"
(214')

B.13. R.L. 785'
No Coal Measures
(68')

B.12A. R.L. 775'

B.12
No Coal
(100')

③ 5'6" at 180'
④ 6'0" " 197'
(250')

B.11. R.L. 784'
② 6'6" at 139'
(147')

B.11A. R.L. 768'
② 7'6" at 129'0"
③ 6'6" " 162'6"
④ 6'6" " 191'0"
(199')

A.1. R.L. 786'
④ 4'6" at 76'9"
⑤ 3'6" " 246'6"

1.A. R.L. 778'
4'0" at 122'6"
6'9" " 163'6"
(206')

S.W.

To Collie

Station

SHOTTS TOWNSITE

PREMER COLLIERY
(CLOSED)

Z.6. R.L. 760'
② 5'6" at 92'6"
③ 6'0" " 130'6"
④ 6'9" " 146'0"
(154')

B.8. R.L. 787'
② 6'3" at 122'0"
③ 6'0" " 165'6"
④ 7'0" " 184'6"
(250')

1½° ③

WESTERN No 1 TUNNELS

Z.2. R.L. 794'
② 6'0" at 102'0"
③ 5'6" " 132'0"
④ 7'6" " 149'0"
(157')

E.1. R.L. 744'
③ ② 6'0" at 35'3"
½° ③ 5'9" " 73'0"
1'0" " 82'0"
(130')

E.4. R.L. 736'
② 5'0" at 27'6"
(33')

E.3. R.L. 732'
③ 5'6" at 54'6"
(60')

B.6. R.L. 773'
② 5'6" at 121'6"
③ 5'9" " 156'0"
④ 6'6" " 174'0"
(184')

No 3

B.5. R.L. 745'
② 5'6" at 92'6"
③ 5'9" " 130'0"
④ 7'6" " 144'0"
(153')

SECTION

B.3. R.L. 729'
2'6" at 37'0"
2'0" " 48'0"
(217')

S.W.

Z.5. R.L. 780'
② 5'6" at 65'6"
③ 6'0" " 97'0"
④ 7'6" " 116'0"
(128')

E.2. R.L. 772'
③ 5'6" at 60'0"
④ 5'6" " 83'0"
(150')

Z.3. R.L. 763'
4'9" at 71'0"
(78')

Z.4. R.L. 757'
1'3" at 60'0"
(70')

1¾° ④

S39°E

E.S. R.L. 770'
② 4'0" (Smut) at 49'0"
③ 6'0" " 80'6"
④ 7'0" " 97'0"
(106')

Granite

Calyx Bore
① 3'0" at 82'0"
2'6" " 155'0"
② 6'0" " 199'0"
③ 5'4" " 250'0"
④ 6'4" " 268'0"
1'6" " 355'0"
⑤ 4'0" " 430'0"
⑥ 5'0" " 445'0"
(500')

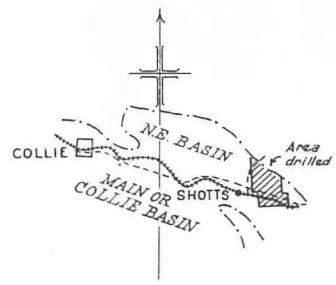
—LEGEND—

Coal Measures

Pre Cambrian Rocks
(Granite, Greenstone etc.)

—REFERENCE TO SIGNS—

- Approximate Boundary of Coal Measures
- Approximate Boundary of Colliery Workings
- Lease and Location Boundary
- Line of Section
- Fault (U = upthrow side, D = downthrow side)
- Borehole drilled by Goldfields Coal Syndicate, showing identification (B.6) reduced level (R.L. 773') significant coalseams intersected (5'6" at 121'6") and depth of borehole (184') — B.6. R.L. 773' / 5'6" at 121'6" (184')
- Borehole drilled by previous Companies, showing similar detail where available
- Strike and Dip of Coal Seam from borehole data — 5°
- Number of Seam to which coal intersected is correlated, or to which dip & strike refers — ④
- Outcrop of Pre-Cambrian Rocks



—LOCALITY MAP—
— Scale 8 Miles - 1 Inch —

GEOLOGICAL SURVEY OF WESTERN AUSTRALIA

—PLAN OF—

WESTERN No 1 COLLIERY
AND ITS ENVIRONS

C.M.L^s. 413 TO 418
(FORMERLY PORTION OF P.A. 53)

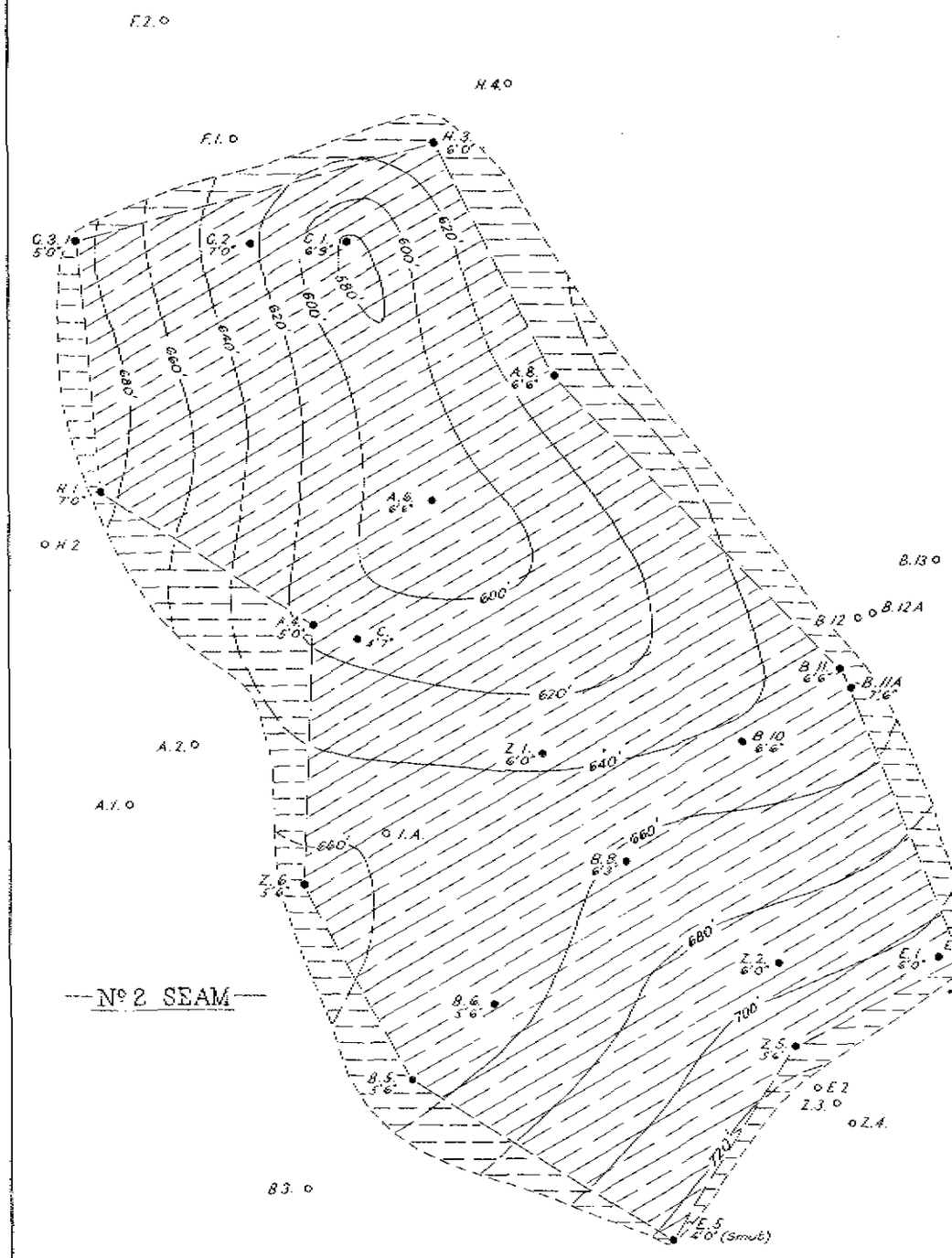
COLLIE MINERAL FIELD

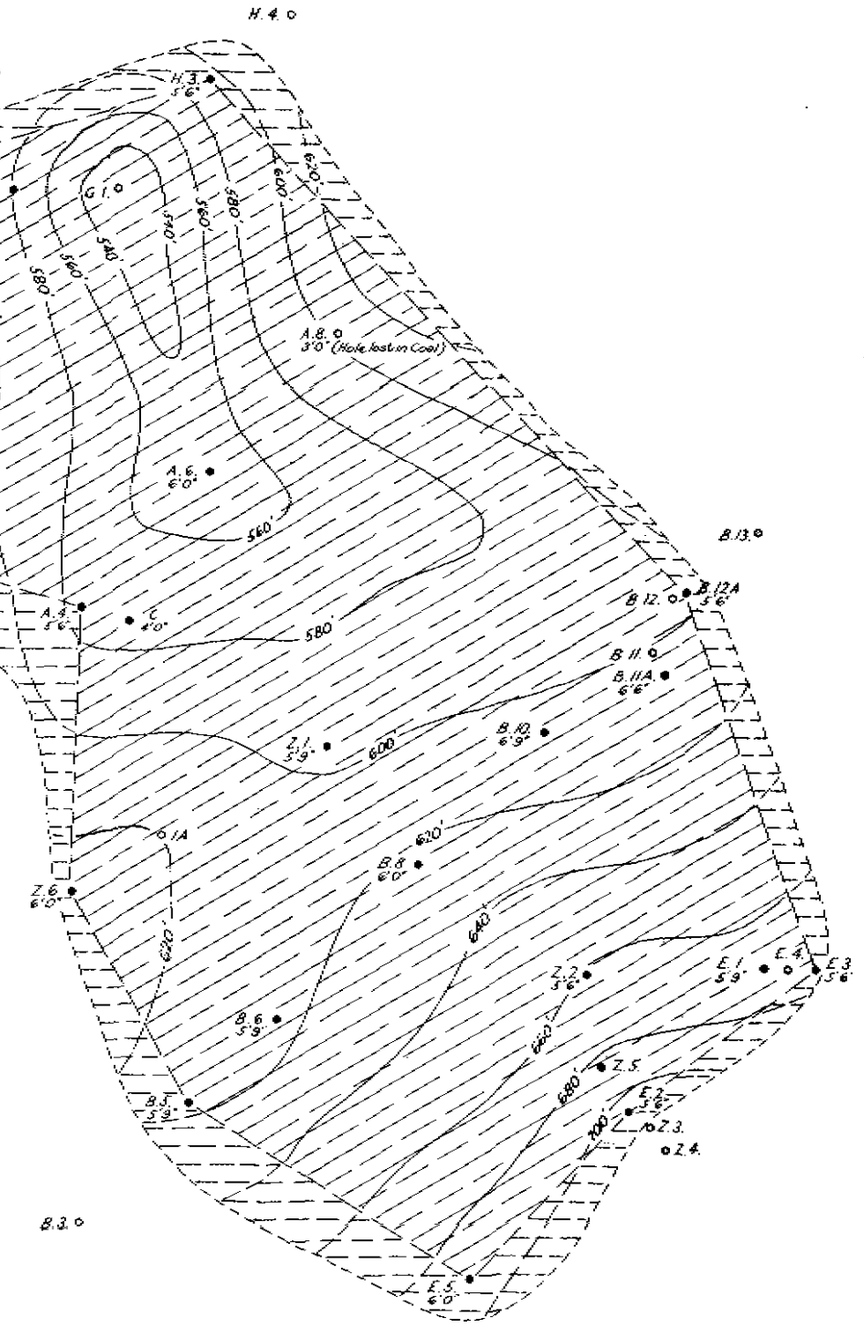
Showing Geology and Boreholes with Coal Intersected

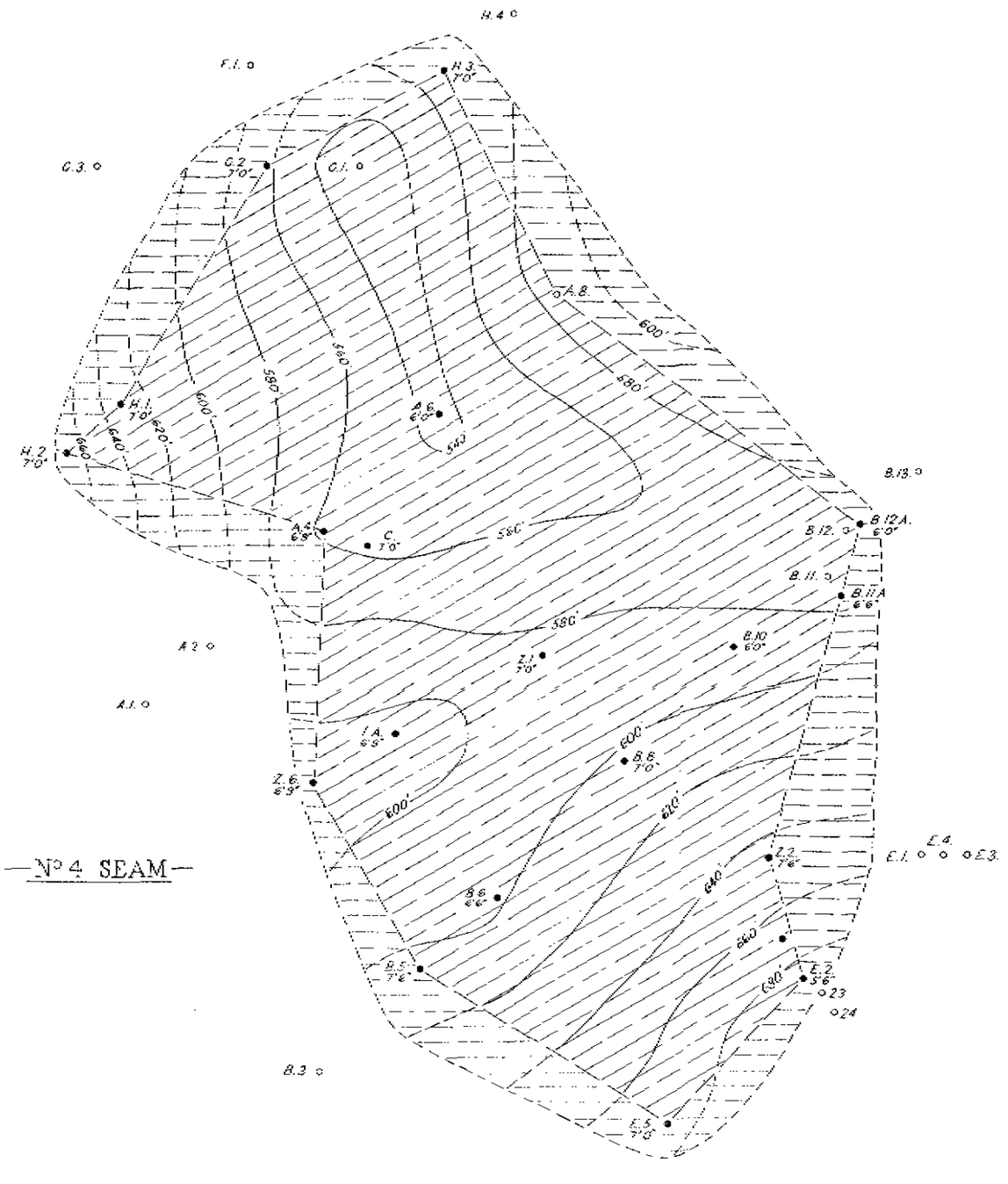
Scale 20 chains to an inch

20 0 20 40

Based on bore-logs and their positions as supplied by Goldfields Coal Syndicate, Western Collieries Ltd, together with information in the possession of the Geological Survey of W.A.
Collated and interpreted by, J. H. Lord. B.Sc., F.G.S. July. 1952.







—REFERENCE—

Coal Reserves { Measured; Inferred

Structure Contours (Height above Mean Sea Level on top of Coal Seam) { Observed — 600' —; Assumed - - - -

Borehole intersecting the Coal Seam, with number of bore and thickness of seam. ● B.10. 6'0"

Borehole, which did not penetrate or locate Coal Seam concerned. ○ A.2.

GEOLOGICAL SURVEY OF WESTERN AUSTRALIA

PLAN

OF

WESTERN Nº1 COLLIERY

AND ENVIRONS

FORMERLY PORTION OF PASS

COLLIE MINERAL FIELD

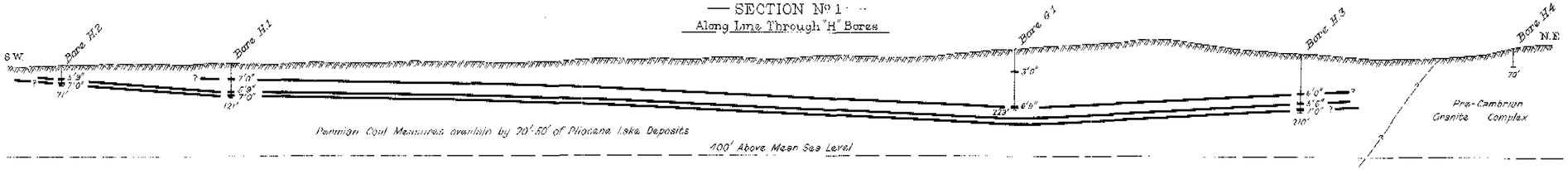
Showing Coal Reserves and Structure Contours of the Workable Coal Seams

Scale: 20 chains to an inch

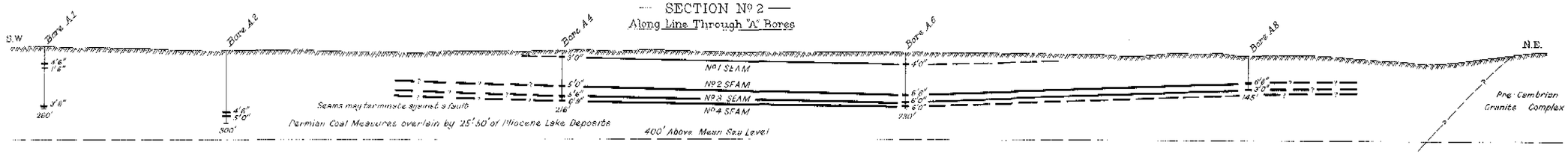
20 0 20 40

Compiled by J. H. Lord, B.Sc., F.G.S. 1952.

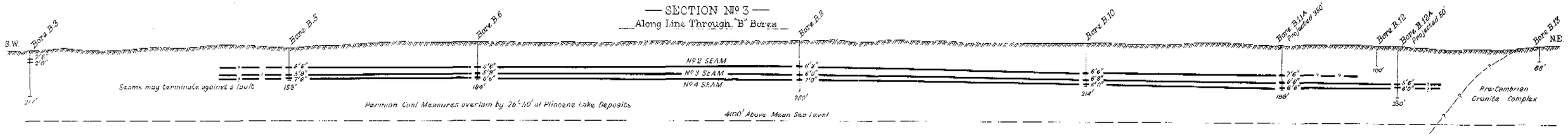
SECTION Nº 1
Along Line Through "H" Bores



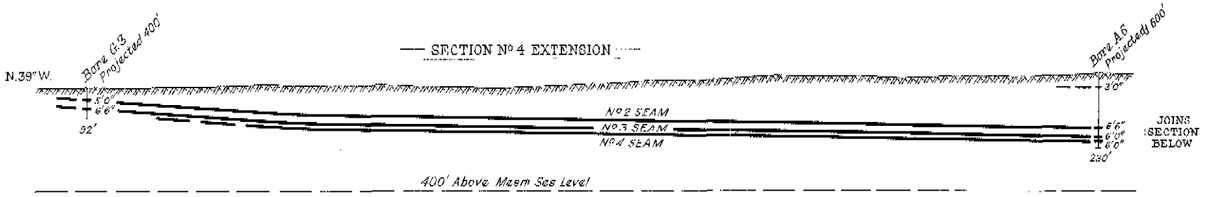
SECTION Nº 2
Along Line Through "A" Bores



SECTION Nº 3
Along Line Through "B" Bores



SECTION Nº 4 EXTENSION



REFERENCE

- Approximate surface
- Coal seams measured
- Coal seams indicated
- Coal seams inferred
- Bore hole with depth and coal seams intersected

GEOLOGICAL SURVEY OF WESTERN AUSTRALIA

GEOLOGICAL SECTIONS IN THE VICINITY OF WESTERN Nº1 COLLIERY

C.M.L^s 413 TO 418
[FORMERLY PORTION OF P.A. 53]
COLLIE MINERAL FIELD

Scale 400 feet to an inch

400 200 0 400 800

Compiled and interpreted by J.H. Lord, B.Sc., F.G.S., 1952, on assumption that bore logs and surveys are correct.

SECTION Nº 4
Along Line Through Bores Z.1 and E.2

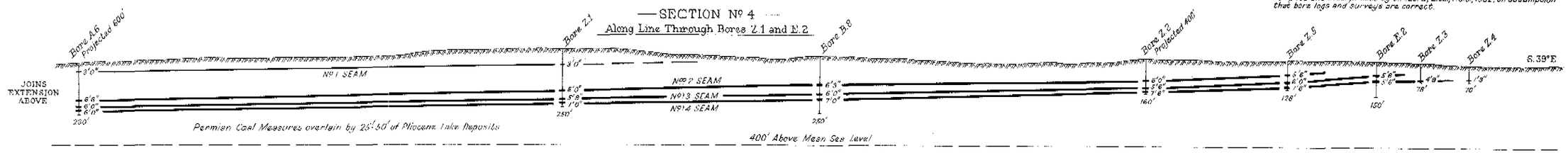


TABLE II.—ADDITIONAL PROXIMATE ANALYSES OF COAL SEAMS INTERSECTED IN BORES ON P.A. 53.

Chem. Lab. No.	Bore No.	Depth. (Feet.)	Thickness of Sample. ft. ins.	As Received. Moisture. %	Ash. %	Vol. Matter. %	Fixed Carbon. %	Calorific Value. B.Th.U's.	Dry and Ash Free. Vol. Matter. %	Dry and Ash Free. Calorific Value. B.Th U's.	Ash on Dry Basis.	Colour of Ash.
				No. 2 Seam.								
21915/51	G 3	33	5 0	20·0	2·8	30·9	46·3	9,850	40·0	12,770	3·5	Off white
21917/51	H 1	56	7 0	20·0	3·4	30·9	45·7	9,780	40·4	12,780	4·2	Off white
7594/52	B 11a	129	7 6	20·0	6·3	29·6	44·1	9,265	40·15	12,570	7·9	Off white
6213/52	H 3	141½	6 0	20·0	4·7	29·8	45·1	9,250	39·55	12,290	5·9	Brown
20333/51	G 2	134	7 0	20·0	3·95	30·9	45·15	9,570	40·7	12,590	4·95	Red-brown
20332/51	G 1	215	6 9	20·0	4·75	30·2	45·05	9,375	40·2	12,470	5·95	Red-brown
8258/52	Channel Sample at Tunnel			25·1	4·4	27·6	42·9	8,960	39·15	12,710	5·9	Dark brown
				No. 3 Seam.								
21916/51	G 3	59½	6 6	20·0	4·3	30·0	45·7	9,570	39·7	12,650	5·4	Buff
21918/51	H 1	101½	5 9	20·0	3·5	30·8	45·7	9,760	40·3	12,760	4·4	Buff
6214/52	H 3	177½	5 6	20·0	3·0	31·95	45·05	9,720	41·5	12,630	3·75	Light brown
6216/52	B 12....	180	5 6	20·0	3·8	29·6	46·6	9,570	38·8	12,560	4·75	Light fawn
20334/51	G 2	180	6 0	20·0	6·2	31·05	42·75	9,340	42·1	12,680	7·75	Red-brown
				No. 4 Seam.								
21919/51	H 1	114½	7 0	20·0	4·0	31·9	44·1	9,710	42·0	12,770	4·9	Buff
6215/52	H 3....	201½	7 0	20·0	4·0	32·7	43·3	9,520	43·0	12,510	5·0	Light brown
6217/52	B 12	197	6 0	20·0	4·35	30·6	45·05	9,480	40·4	12,530	5·45	Light fawn
20335/51	G 2	195	7 0	20·0	6·35	30·1	43·55	9,275	40·9	12,600	7·9	Red-brown

REPORT ON EXPLORATORY DRILLING FOR WATER, ESPERANCE PLAIN.

By K. BERLIAT, D.Sc.

This report embodies the results of some 2,000ft. of exploratory drilling for water in the Esperance Plain. The present and proposed development of agriculture in the district under consideration made it imperative that a clear understanding of the hydrological conditions should be obtained. To this effect it was agreed between the Government Geologist and representatives of the Departments of Agriculture and Public Works (Goldfields Water Supply) that underground water supplies for domestic or stock purposes should be systematically explored. The Department of Agriculture indicated the area to be covered by the survey, and the Geological Survey was requested to select the bore sites and to supervise the boring programme generally. The results of the drilling were passed on to the Goldfields Water Supply, P.W.D., which also called the tenders and let the drilling contract.

Esperance, situated about Long. 121° 55′ E., and about Lat. 33° 50′ S., is 580 miles by road from Perth via Coolgardie and Norseman. The area investigated lies on both sides of the main road and the railway line, between the Shark Lake and Speddingup. The Shark Lake is approximately eight miles by road north of Esperance, and Speddingup is 16 miles by road north of the Shark Lake.

It had been decided on technical grounds to start the drilling operations near the Shark Lake, in the south, and then to move gradually to the north. The bore sites were selected on purely geological grounds and located in such a manner as to give the best possible information about the ground water conditions in the whole of the district. It was entirely outside the scope of the work to obtain supplies in any particular locality. Despite attempts by interested parties to alter the programme and to turn it into a particular experiment, the original plan was eventually carried through.

Fifty-two bores, totalling 2,036ft. have been put down. The plant used was a percussion drill, powered by a 6 h.p. kerosene engine. The bore holes were of a diameter suitable for the insertion of 5in. diameter casing. Owing to the extreme shortage of casing only bores with a low salinity (up to about 150 grains of total soluble salts per gallon), and a supply of at least 1,000 gallons per day could be cased.

The boring operations commenced on 5th March, 1952, and were completed on 12th June, 1952.

Geology.

As far as can be ascertained the whole area is underlain by gneisses of presumably pre-Cambrian age. Outcrop conditions are extremely poor, the old granitic land surface being covered by an almost continuous blanket of recent or superficial deposits, and soil.

Marine miocene deposits (Plantagenet beds) overlie the gneisses in a narrow, north and south stretching belt east of Coramup Creek, about four miles east of the Shark Lake.

Topography.

Relief.

South of the area investigated, between the Shark Lake and the coastline, sand dune ridges are the prominent feature of relief. From the Shark Lake to Gibson the surface as a whole rises gently. Closer examination shows however, that there is a major depression between Caitup and the Esperance aerodrome. This depression is occupied by numerous salt lakes, swamps with paperbarks (*Melaleuca sp.*) and mudflats. North and south of this depression the details of topography show undulating country with local variations of up to 200ft. The so-called sandplain generally occupies these higher granitic areas, and carries in its natural state a rich vegetation of Banksia (*Banksia pulchella*), Christmas Tree (*Nuytsia floribunda*), Chittick (*Lambertia inernis*), and Blackboy (*Xanthorrhoea sp.*).

North of Gibson is a distinctive break in topography. The surface flattens out, becomes very broadly undulating, and gradually merges in a distinct physiographic unit, known as the Salt Lake Division of Western Australia (locally referred to as the "Mallee," according to the numerous Eucalypt species).

The general elevation of the country is between about 550ft. above sea level at the northern end and about 350ft. above sea level at the southern end.

Drainage.

In an area with an average annual rainfall ranging from about 20in. in the south to about 16in. in the north, a well defined drainage system cannot be expected to exist. In fact, with the ex-

ception of Coramup and Kateup Creeks well defined water courses are scarce and small. Drainage is essentially interior. Throughout the region there are numerous small basins of internal drainage, and lines of creeks marked by paperbark trees. Heavy rains cause a flow of water to the nearest depression, in which shallow, ephemeral lakes may be formed. The water soon evaporates, or sinks into the ground, leaving conspicuous mudflats, salt pans or swamps.

Groundwater Conditions.

In dealing with groundwater conditions in the Esperance Plain, it is important to bear in mind at the outset that there are no favourable conditions for the occurrence of artesian water. The shallow depth of the granitic bedrock precludes the possibility of a distant source of water. Supplies of pressure water may be tapped however, in restricted, shallow basins on the surface of the old rocks, in which recent deposits of sand and clay have accumulated.

Groundwater proper is of local origin and has its source in the rainfall falling in the immediate vicinity. When the rain reaches the earth part of it is returned to the atmosphere through evaporation and transpiration agencies. Another part is carried away by surface run-off. Only a third part, provided the soil and the rock types are sufficiently porous and permeable, percolates downward until it reaches the main body of the groundwater.

The second factor to come under consideration is the probable quality of the groundwater. In the Esperance Plain saline groundwater is normal and special conditions must be sought to get supplies of useful quality.

The saline material causing groundwater salinity is the so-called "cyclic salt," which occurs in the atmosphere and is brought to earth by rain. Cyclic salts are of oceanic origin; they have been lifted from the sea with the spray and have been blown inland. Their presence in rainwater has been abundantly proved by analyses in many parts of the world, and Western Australia is no exception. Obviously in an area where the rainfall is due to numerous light showers, there is more cyclic salt washed out of the air than in places where the year's rain is received in a few heavy falls.

The salinity of the groundwater at any particular place depends basically on the balance between the salts added to the groundwater by rainfall and the salts removed by groundwater movements. High groundwater increments from rainfall render the groundwater relatively fresh. Small increments are a major cause of high salinity. This is due, in the latter case, to the accumulation of salts in the soil, which after exceptionally heavy rains are dissolved by the downward percolating waters, and added to the main body of groundwater.

The building up of salts in the groundwater is counterbalanced to a certain extent by the removal of salts through groundwater movements. Groundwater is continually in movement, however slow the movement may be. A high rate of movement keeps the groundwater relatively fresh. Salinity is due to the building up of salts in practically stagnant groundwater.

Apart from the porosity of the aquifer the rate of groundwater movement is controlled by the nature of the topographic relief. The water table is not a level surface, but is closely related to the topographic surface. Therefore, similar to a surface stream, the rate of movement of groundwater will gradually decrease down the slope from high ground to low ground. In flat country groundwater movement is so sluggish as to be practically negligible.

The question of supply, besides depending on rainfall, rock types, and topography is closely related to the configuration of the granitic surface at depth. Groundwater movement will be concentrated in depressions and channels that may exist in the bedrock. Such zones can occasionally be recognised at the surface, but in most cases a series of bores will be required to ascertain their existence and to determine their trend.

The Exploratory Bores.

In this chapter a short description is given of the various bores. Special emphasis is placed on the location of the bores in relation to topography, on salinity of the water, depth of the aquifers, and supply. Detailed logs of the 52 bores, and their approximate position are shown on the accompanying plates.

For presentation purposes it has been found necessary to re-number most of the bores. The numbers in brackets correspond with the P.W.D. bore numbers as shown in the weekly reports on the drilling supplied to the Goldfields Water Supply Branch by the Geological Survey.

No. 1 (P.W.D. No. 1):

This bore is on location 4181 (Common), some 70 chains west-south-west from the Shark Lake. It is half-way up a prominent hill, and well above the surrounding country. There is heavy sandy soil, which apart from isolated blackboys and Christmas trees carries little vegetation.

The total depth of the bore is 45ft. The water bearing strata extend from 26 to 32ft., and consist of yellow, gritty sandstones between two white clay horizons. The bore was tested (bailed) for five hours at a rate of 6,000 gallons per day. Before testing the water level was 8ft. below the surface. It could not be lowered more than 2ft.

The water contains 80 gr. of total soluble salts per gallon. Of this 69 gr. are sodium chloride. It is faintly acid (pH 6.2).

Thirty-eight feet of casing, including 20ft. of perforated casing at the bottom, have been inserted.

No. 2 (P.W.D. No. 2).

The purpose of this bore was to ascertain the possible change in salinity down the slope of the hill. The bore is in the same location as No. 1, about 500yd. further north-west, in a low-lying area at the foot of the hill. Vegetation is denser than around the previous site and consists essentially of paperbarks, blackboys, and Christmas trees.

A rich supply of water was struck in an horizon of silt and fine sand, between 32 and 41ft. As in No. 1 the water is under pressure, the rest level before bailing being at 7ft. below the surface. After four hours' bailing at a rate of 10,000 gallons per day, it sank 1ft. 6in.

Analyses of the water gave the following results:—At a depth of 33ft. the total soluble salts amounted to 30 gr. per gallon (including 26 gr. of sodium chloride). At 41ft. they increased to 79 gr. per gallon (69 gr. of sodium chloride). The water is again faintly acid, with a pH varying from 6.1 to 6.4.

As there is a marked increase in salinity with depth the bore was stopped at 42ft.

No. 3 (P.W.D. No. 3).

This bore, situated on location 1044, is on high level sandplain. There is a good catchment area to the north. The site is on cleared and cultivated land and surrounded by sandy soil. Solid granite was struck at a depth of 8ft. and the bore was abandoned.

No. 4 (P.W.D. No. 4).

The site is picked again on high level sandplain. The surface shows thick sandy soil, carrying a rich banksia vegetation. The bore bottoms in solid granite, its total depth being 45ft. The water occurs from 22 to 45ft., in decomposed granite. The total salinity is 148 gr. per gallon, 124 gr. of which are sodium chloride. The supply is at least 10,000 gallons per day. The water rest level stands at 11ft. below the surface.

The bore is cased to a depth of 30ft.

GEOLOGICAL SURVEY OF WESTERN AUSTRALIA

EXPLORATORY DRILLING FOR WATER
ESPERANCE PLAINS
SHOWING LOCALITY OF BORE HOLES

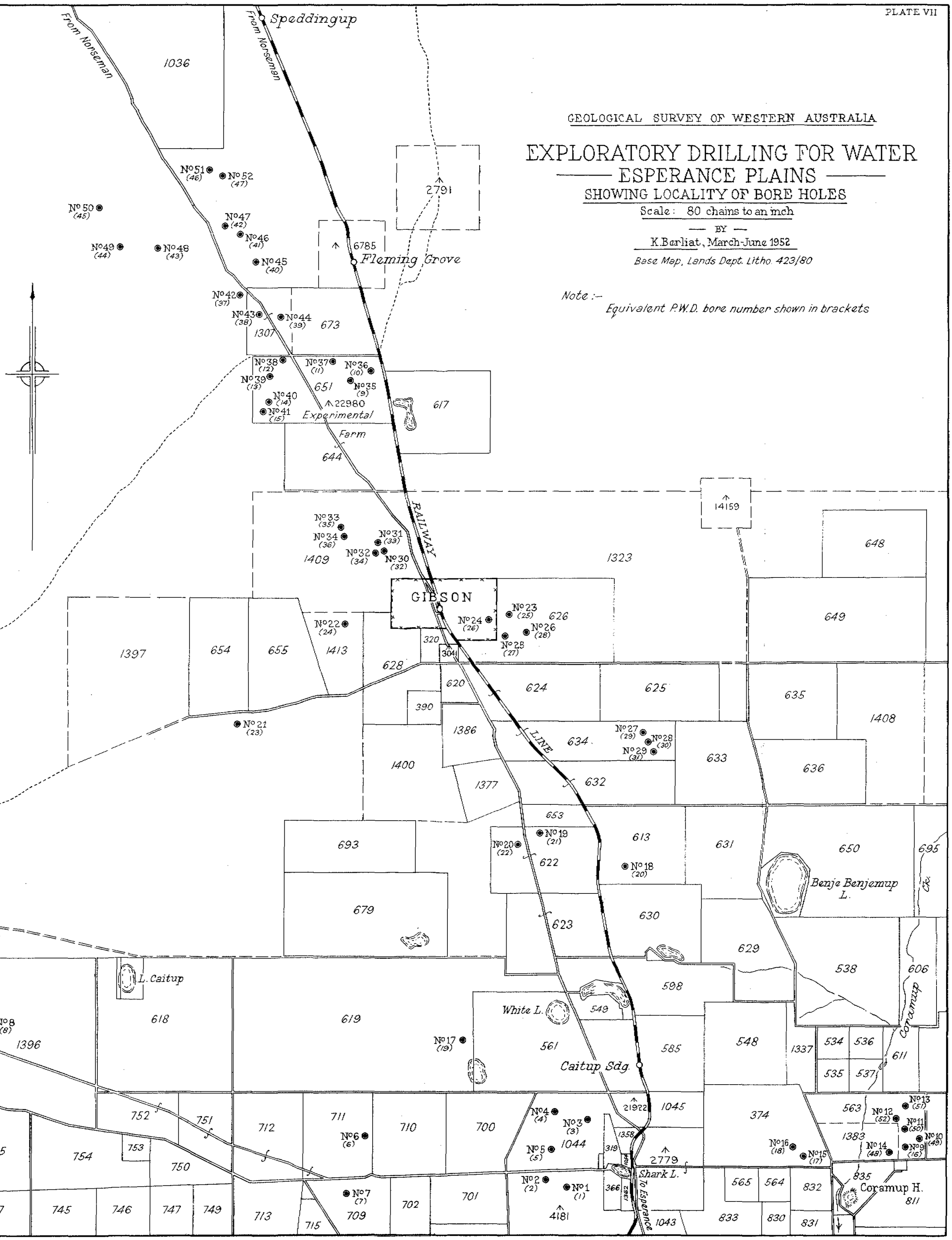
Scale: 80 chains to an inch

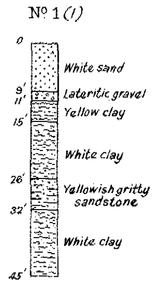
— BY —

K.Barliat, March-June 1952

Base Map, Lands Dept. Litho. 423/80

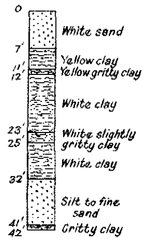
Note :–
Equivalent P.W.D. bore number shown in brackets





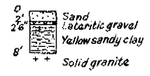
№1 (1)

Aquifer: 26'-32'
Water Rest Level 8'



№2 (2)

Aquifer: 32'-41'
Water Rest Level 7'



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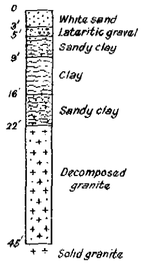
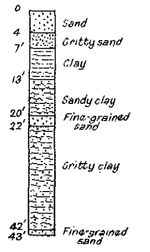


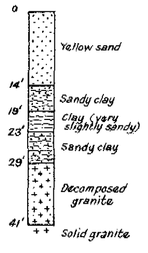
№4 (4)

Aquifer: 22'-45'
Water Rest Level 11'



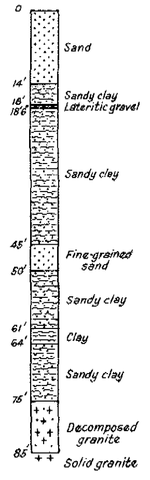
№5 (5)

Aquifers: 20'-22', 42'-43'
Water Rest Level 9'



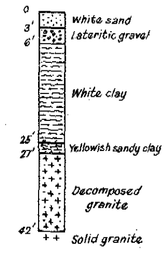
№6 (6)

Aquifer: 29'-41'
Water Rest Level 18'



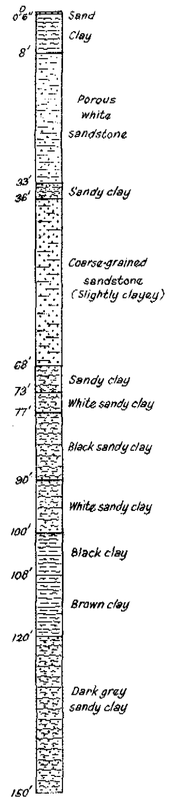
№7 (7)

Aquifers: 14'-18', 45'-50', 75'-85'
Water Rest Level 14'



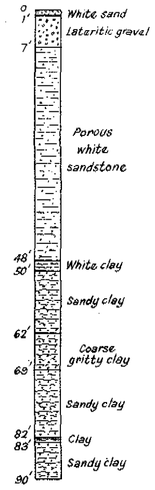
№8 (8)

Aquifer: 27'-42'
Water Rest Level 25'



№9 (16)

Aquifer: 11'-33'
Water Rest Level 12'



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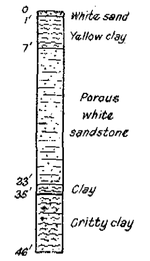
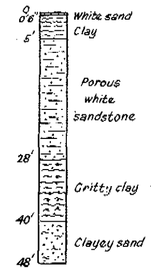
Aquifer: 36'-48'
Water Rest Level 35'



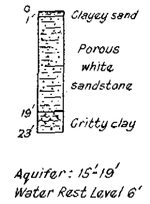
№11 (50)

Aquifer: 20'-33'
Water Rest Level 11'



№12 (52)

Aquifer: 30'-40'
Water Rest Level 28'



№13 (51)

Aquifer: 15'-19'
Water Rest Level 6'

GEOLOGICAL SURVEY OF WESTERN AUSTRALIA

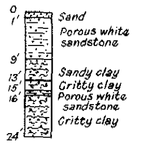
EXPLORATORY DRILLING FOR WATER
ESPERANCE PLAINS

Scale: 20 feet to an inch.

— BY —

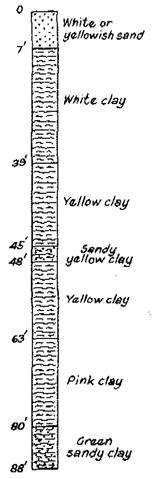
K.Berliat, March-June 1952

Note :—
Equivalent P.W.D. bore number shown in brackets



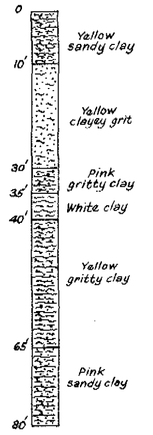
№14 (48)

Aquifer: 1'-24'
Water Rest Level 1'



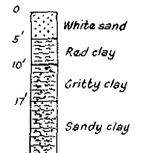
№15 (17)

Aquifers: 45'-48', 80'-88'
Water Rest Level 30'



№16 (18)

Aquifer: 65'-80'
Water Rest Level 38'



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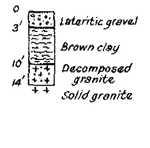
Aquifer: 29'-34'
Water Rest Level 28'



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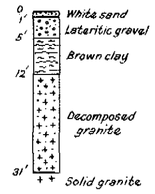

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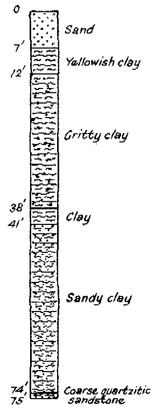
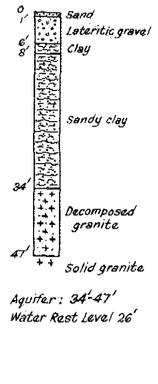


№20 (22)

Aquifer: 41'-75'
Water Rest Level 30'



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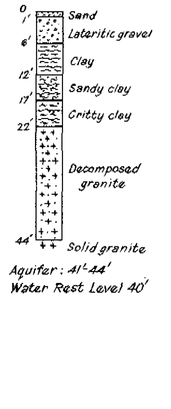
Aquifer: 34'-47'
Water Rest Level 26'



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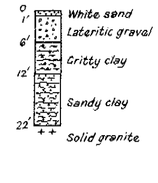
Aquifer: 41'-44'
Water Rest Level 40'



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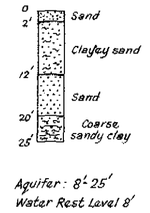

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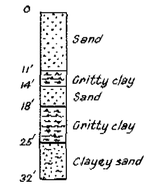
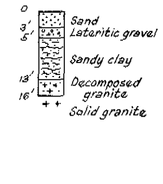
Aquifer: 8'-25'
Water Rest Level 8'



№25 (27)

Aquifer: 25'-32'
Water Rest Level 20'



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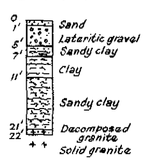

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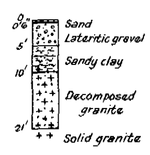

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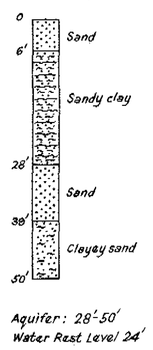
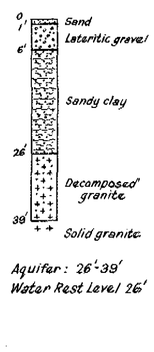
Aquifer: 16'-21'
Water Rest Level 16'



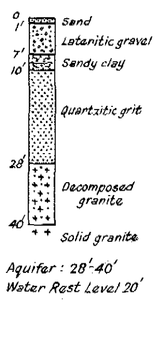
№29 (31)

Aquifer: 28'-50'
Water Rest Level 24'



№30 (32)

Aquifer: 26'-39'
Water Rest Level 26'



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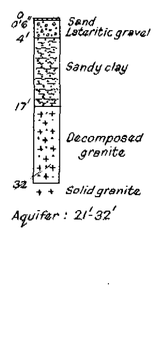
Aquifer: 28'-40'
Water Rest Level 20'



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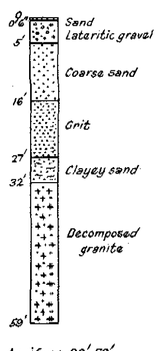
Aquifer: 21'-32'
Water Rest Level 20'



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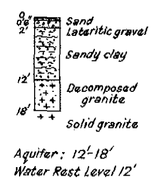
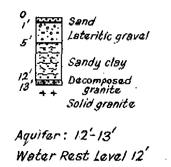
Aquifer: 32'-59'
Water Rest Level 25'



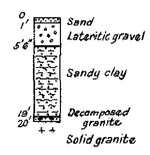
№34 (36)

Aquifer: 12'-18'
Water Rest Level 12'



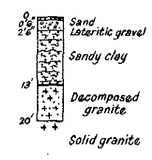
№35 (9)

Aquifer: 12'-13'
Water Rest Level 12'



№36 (10)

Aquifer: 19'-20'
Water Rest Level 19'



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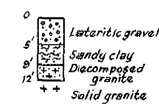

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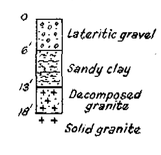

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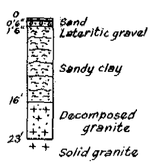


№40 (14)

Aquifer: 21'-23'
Water Rest Level 20'

№41 (15)

Aquifer: 22'-46'
Water Rest Level 22'

№42 (37)

№43 (38)

№44 (39)

Aquifer: 20'-26'
Water Rest Level 20'

№45 (40)

№46 (41)

Aquifer: 28'-32'
Water Rest Level 28'

№47 (42)

Aquifer: 24'-27'
Water Rest Level 24'

№48 (43)

№49 (44)

Aquifer: 27'-35'
Water Rest Level 27'

№50 (45)

№51 (46)

№52 (47)

Aquifer: 58'-65'
Water Rest Level 38'

Aquifer: 42'-74'
Water Rest Level 41'

J.McL

No. 5 (P.W.D. No. 5).

From the high ground in the vicinity of No. 3 and No. 4 the country gradually falls to the south. No. 5, still in location 1044, is approximately 150ft. vertical distance lower than No. 4, but still well above the low ground near the Ravensthorpe Road, west of the Shark Lake. The total depth of the bore is 43ft. There were two makes of water, between 20 and 22ft., and between 42 and 43ft. A big difference in salinity is noticeable between the two aquifers: 148 gr. of total soluble salts per gallon at 22ft., 509 gr. at 43ft. The figures for sodium chloride are 124 gr. and 420 gr. per gallon respectively.

Supply figures are as follows:—3,000 gallons per day at 22ft., 5,000 gallons per day at 43ft. The water rest level is at 9ft. below the surface.

No. 6 (P.W.D. No. 6).

The bore, situated on location 711, is half-way up the fairly steep slope between a paperbark swamp and a well-marked ridge. There is thick sandy soil, carrying predominantly banksia. A supply of at least 4,000 gallons per day was struck in decomposed granite, between 29 and 41ft. Solid granite was entered at 41ft. The water is of excellent quality, containing only 14 gr. of total soluble salts per gallon. It is faintly acid, with a pH of 6.1.

Thirty-four feet of casing have been inserted.

No. 7 (P.W.D. No. 7).

The details of topography north of the Ravensthorpe road, near No. 6 bore, show high, undulating country. To the south of the road, the low-lying, flat land surface is occupied by a series of swamps. Site No. 7 has been picked on location 709, on the flank of a broad ridge rising only little above the general low level of the ground. The bore was stopped at 85ft. at which depth solid granite was entered.

There were three makes of water, between 14ft. and 18ft., between 45ft. and 50ft., and between 75ft. and 85ft. The first two makes were encountered in sandy clay and fine grained sand, but the supply was insignificant (less than 150 gallons per day). A yield of approximately 500 gallons per day was obtained from decomposed granite at the bottom of the bore. Again there is a marked increase in salinity with depth: 287 gr. at 18ft., 314 gr. at 50ft., and 462 gr. at 85ft. These values represent the total soluble salts per gallon. The figures for sodium chloride in the same order are: 242, 264, and 385 gr. per gallon. The reaction of the water is neutral but it has a distinctive odour of hydrogen sulphide.

No. 8 (P.W.D. No. 8).

This bore, 11 miles west of Shark Lake, along the Ravensthorpe Road, is on high level, sloping ground, on location 1396. Solid granite was entered at 42ft. Decomposed granite, between 27 and 42ft., forms the aquifer. The supply is not less than 4,500 gallons per day, and the quality of the water varies from 42 to 45 gr. of total soluble salts per gallon. Of this 36 gr. are sodium chloride. The water has a faintly acid reaction with a pH of 6.2

After four hours bailing the water rest level dropped from 25ft. to 27ft. The bore is cased to a depth of 41ft. Perforated casing has been inserted from 21 to 41ft.

No. 9 (P.W.D. No. 16).

Bores No. 9-14 are similarly located as regards topography. They are high up the long, steep slope to the east of the Coramup Valley, some four miles east of the Shark Lake. There is a close relationship between the logs, all the bores being in Miocene sediments (Plantagenet beds), lying on the old granite surface.

The bore bottoms in a dark, sandy clay. Granitic bedrock has not been reached. The main aquifer is between 11 and 33ft., the water occurring in white, fine grained porous sandstones. On geological grounds the bore was put down to a depth of 150ft., but no marked increase in supply could be noticed below the sandstone horizon. Before testing, the water level in the bore was 12ft. below the surface. Bailing was carried out at a rate of 23,000 gallons per day and at this rate the rest level could not be lowered. The water is of excellent quality, containing between 38 and 60gr. of total soluble salts per gallon. Of this 24 to 38 gr. are sodium chloride. The water reacts faintly acid (pH 6.4).

The bore was originally cased to a depth of 41ft., but on account of the heavy swelling of the clay beneath the main acquifer, 20ft. of casing had to be withdrawn.

A pumping test, carried out by the Goldfields Water Supply Department, yielded a supply of 15,000 to 20,000 gallons per day. The results of this test are not quite satisfactory however, because only 17ft. of suction piping were available at the time.

Nos. 10, 11 (P.W.D. Nos. 49, 50).

With a view of exploring the possibilities of a town supply for Esperance the Miocene beds have been tested more in detail. Sites No. 10 and 11 are close to No. 9, and show identical geological and topographical features. Supplies were obtained from the same fine grained porous sandstones, between 20 and 48ft.

No. 10 Bore gave a supply of 10,000 gallons per day, and No. 11 yielded 12,000 gallons. Both figures are conservative. The water rest level is 35ft. in the first bore, 11ft in the second. Salinities are exceptionally low, 27 gr. of total soluble salts for No. 10, 35 gr. for No. 11. The content of sodium chloride is 17 and 25 gr. per gallon respectively. The water in both bores is again faintly acid, pH 6.4. Both bores have been cased, No. 10 to a depth of 40ft., No. 11 to 28ft.

No. 12 (P.W.D. No. 52).

This bore is about 15 chains north-north-west of No. 11. The fine-grained, white sandstones have been penetrated between 5 and 28ft. They are underlain by 12ft. of gritty clay, which in this case acts as the aquifer. The supply is much smaller, about 1,200 gallons per day. The rest level stands at 28ft. The water contains 30 gr. of total soluble salts, including 23 gr. of sodium chloride to the gallon.

The bore was stopped in clayey sand at 48ft. Previous experience has shown that the increase in supply is only small below the white sandstones.

Nos. 13, 14 (P.W.D. Nos. 51, 48).

These two bores, still in the sedimentary series, had to be abandoned at a shallow depth. Still high up the slope east of the Coramup Valley, they are close to a conspicuous line of soakages. The water-bearing sandstones, occurring a foot beneath the surface, are underlain by waterlogged gritty and sandy clays that made drilling excessively slow, if not impossible. No. 13 was abandoned at 23ft., No. 14 at 24ft. The water obtained in both bores is of excellent quality, its content of total soluble salts varying between 28 and 31 gr. per gallon. Sodium chloride accounts for 17 to 22 gr. The water from No. 13 bore reacts faintly acid, pH 6.2.

The rest level in No. 13 bore is 6ft., in No. 14 only 1ft. below the surface. Supplies are 2,000 and 1,000 gallons per day respectively.

No. 15 (P.W.D. No. 17).

Patches of thick sandy soil, and undulating topography are the prominent features of the country to the north of the road from Shark Lake to Coramup Creek. The site is on location 374, on a long slope, falling gently to the south-east, towards Coramup Creek. The bore has a total depth of 88ft., and the log shows predominantly clays, with some sandy intercalations. There are two water-bearing horizons, between 45 and 48ft., and between 80 and 88ft. The combined supply is hardly more than 1,000 gallons per day, and the water has a surprisingly high total salt content:

376 gr. at 48ft., 383 gr. per gallon at 88ft. The chloride fraction is 304 gr. per gallon. The water rest level stands at 30ft. below the surface.

No. 16 (P.W.D. No. 18).

Although the previous bore was more than half-way up a long, gentle slope, No. 16 was located still on higher ground. The bore was stopped at a depth of 80ft., a small supply of about 200 gallons per day having been obtained from sandy clays between 65 and 80ft. The salinity proved to be even higher than in No. 15 bore, viz., 424 gr. of total soluble salts per gallon at 70ft., 445 gr. at 80ft. (including 350 and 360 gr. of sodium chloride respectively). The water rest level stands at 38ft.

No. 17 (P.W.D. No. 19).

An extensive depression stretches from Caitup to the Esperance aerodrome. Occupied by numerous salt lakes, swamps, and mudflats, it is limited to the east and west by a line of hills and ridges. The site has been picked on a slope falling towards a conspicuous mudflat. Banksia and low scrub are the main forms of vegetation. The bore struck solid granite at 34ft. and tapped a supply in decomposed granite between 29 and 34ft. The water stands at 28ft. below the surface and contains 170 gr. of total soluble salts per gallon (122 gr. of sodium chloride).

The bore is cased to a depth of 33ft.

No. 18 (P.W.D. No. 20).

Similarly located as No. 17,this bore entered solid granite at a shallow depth of 14ft. There are 4ft. of decomposed granite, but no water.

No. 19 (P.W.D. No. 21).

This site is again roughly half-way up the fairly steep slope of a prominent ridge. Solid granite occurred at 31ft., below 19ft. of decomposed granite. The bore is dry.

No. 20 (P.W.D. No. 22).

This bore is situated on the low-lying flat area south of the Esperance aerodrome. Its total depth is 75ft. A supply of 1,250 gallons per day was obtained between 41 and 75ft. There is a marked increase in salinity with depth:—

Total soluble salts per gallon. gr.	Depth. ft.	Sodium chloride. gr./gal. gr.
225	43	188
241	55	198
269	65	223
313	75	270

From 55ft. downward the water is slightly acid, pH 6.4.

No. 21 (P.W.D. No. 23).

The bore has been picked on high ground, above a large swamp. It is on a gentle, not too heavily timbered slope, about three and three-quarter miles west-south-west of Gibson, along the Dalyup road. Decomposed granite forms the aquifer from 34 to 47ft. The water rest level stands at 26ft. and the daily supply is in the vicinity of 1,000 gallons. The total salt content amounts to 181 gr. per gallon at 37ft., to 196 gr. per gallon at 47ft. The chloride fraction is 136 and 150 gr. respectively.

Forty-four feet of casing have been inserted.

No. 22 (P.W.D. No. 24).

The bore is on high level, broadly undulating, cleared sandplain. The supply obtained from 3ft. of decomposed granite is small (200 gallons per day). Solid granite was met with at 44ft. The water contains 177 gr. of total soluble salts (130 gr. of sodium chloride). The rest level stands at 40ft.

No. 23 (P.W.D. No. 25).

This bore, situated on the flank of a ridge, rising in an easterly direction above swampy ground, entered solid granite at 22ft. No water has been obtained.

No. 24 (P.W.D. No. 26).

A good supply of excellent water was obtained further down the flank, on the edge of the swampy ground. The water-bearing strata range from 8ft. to 25ft. At this depth the bore was stopped, as more saline water was expected at depth.

The supply is not less than 6,000 gallons per day, and the salt content amounts to 88 gr. of total soluble salts per gallon. Fifty-one grains are sodium chloride. The water is faintly acid, pH 6.4.

The water rest level stands at 8ft. One length of casing (20ft.) has been inserted.

No. 25 (P.W.D. No. 27).

The somewhat unexpected occurrence of water of good quality in the last bore led to the testing of a similar site some 25 chains further south-east. The water at this place was however highly saline (1,399 gr. of total soluble salts, including 1,200 gr. of sodium chloride). The depth of the bore is 32ft., the aquifer lying between 25ft. and the bottom. The supply is only small, about 500 gallons per day.

No. 26 (P.W.D. No. 28).

This site is on gently undulating high ground, approximately 25 chains east-north-east from the previous bore. The surface is thickly covered with the "Chittick" (*Lambertia inernis*). The bore is dry, solid granite having been struck at 16ft.

Nos. 27, 28, 29 (P.W.D. Nos. 29, 30, 31).

The three sites are on a long slope, having a well marked gradient between high ground to the north-west and low-lying, swampy flats to the south-east. No. 27 is in the upper section of the slope, where solid granite was entered at 22ft.

No. 28, situated in the central part, struck granite at 21ft. A supply of 500 gallons per day was obtained from decomposed granite between 16 and 21ft. The water has a total salt content of 172 gr. per gallon (130 gr. of sodium chloride).

No. 29 is in the lower section of the slope, but still well above the level of the low ground to the south and south-east. The bore was stopped at 50ft., a good supply having been found between 28 and 50ft. The water contains 56 gr. of total soluble salts per gallon, of which 42 gr. are sodium chloride. It is faintly acid (pH 6.2) and at the bottom has a slight odour of hydrogen sulphide. The supply is 2,500 gallons per day and the rest level stands at 26ft. The bore is cased to a depth of 48ft.

No. 30 (P.W.D. No. 32).

North of Gibson a large, low-lying mudflat extends to the west of the main road in location 1409. The site has been picked on the higher, broadly undulating country rising to the west. The bore reached 39ft., at which depth solid granite was entered. Decomposed granite, forming the aquifer, was encountered from 26ft. downward. The water is of good quality (94 gr. of total soluble salts, 67 gr. of sodium chloride per gallon), but the supply is only about 150 gallons per day.

No. 31 (P.W.D. No. 33).

This bore is located further down the slope, and closer to the mudflat. Solid granite was met with at 40ft., and its decomposition products form again the aquifer. The supply is 1,400 gallons per day, but the salinity increased to 450 gr. per gallon (390 gr. of sodium chloride).

No. 32 (P.W.D. No. 34).

In order to ascertain the existence of any channels in the granitic bedrock another site was picked, at an appropriate place, close to the two previous ones. Only a small supply of 200 gallons per day was obtained however, although 15ft. of decomposed granite have been penetrated. Solid granite

was entered at 32ft. The water has a salinity of 195 gr. of total soluble salts per gallon. The chloride fraction makes up 160 gr.

No. 33 (P.W.D. No. 35).

This bore is situated about three-quarters of a mile north-west of No. 30, and shows topographically the same aspects. Its total depth is 59ft. and it bottoms in decomposed granite, which forms the aquifer. The daily supply is at least 2,000 gallons, and the water has a total salinity of 280 gr. per gallon (235 gr. of sodium chloride). The water rest level stands at 25ft.

No. 34 (P.W.D. No. 36).

The site has been picked on a surface sloping very gently towards a low-lying mudflat. Saline water, containing 780 gr. of total soluble salts (658 gr. of sodium chloride) per gallon, was met with in decomposed granite between 12 and 18ft., where solid granite was entered. The supply is approximately 1,000 gallons per day, the water rest level standing at 12ft. below the surface.

Nos. 35-52 (P.W.D. Nos. 9-15 and Nos. 37-47).

As set out in the chapter dealing with the topography, the country flattens gradually out north of Gibson. Distinctive features of relief are lacking, the surface being broadly and gently undulating. This fact, together with a substantially decreased rainfall as compared with the south, make the prospects of finding reasonably fresh water very small. Actual drilling proved this expectation to be right. Nevertheless, it was in the exploratory nature of the programme that this area should be included in the operations, if only to convince interested parties, that under similar conditions usable supplies are very exceptional.

The drilling results for the 18 bores concerned are given below in tabulated form.

Experimental Farm.

No. of Bore.	No. P.W.D.	Total Depth.	Depth of Aquifer.	Total Soluble Salts.	Sodium Chloride.	Supply.	Water Rest Level.	Remarks.
		feet.	feet.	Grains per gallon.	Grains per gallon.	Gallons per day.	Feet.	
35	9	13	12 to 13	780	650	300	12	
36	10	20	19 „ 20	904	730	300	19	Odour of Hydrogen Sulphide.
37	11	20	....	....	....	....	....	Solid granite at 20 ft.
38	12	12	....	....	....	....	....	Solid granite at 12 ft.
39	13	18	....	....	....	....	....	Solid granite at 18 ft.
40	14	23	21 „ 23	1,733	1,490	800	20	
41	15	46	22 „ 46	at 30 ft.: 673 at 46 ft.: 771	at 30 ft.: 656 at 46 ft.: 670	500	22	At 46 ft. faintly acid, pH 6·3.
42	37	28	....	....	....	....	....	Solid granite at 28 ft.
43	38	8	....	....	....	....	....	Solid granite at 8 ft.
44	39	26	20 „ 26	2,175	1,895	250	20	
45	40	11	....	....	....	....	....	Solid granite at 11 ft.
46	41	32	28 „ 32	924	800	500	28	
47	42	27	24 „ 27	896	770	200	24	
48	43	30	....	....	....	....	....	Solid granite at 30 ft.
49	44	35	27 „ 35	387	335	1,000	27	Faintly acid, pH 6·4.
50	45	23	....	....	....	....	....	Solid granite at 23 ft.
51	46	65	58 „ 65	1,082	950	200	38	
52	47	74	42 „ 74	470	405	100	41	

Conclusions.

Reviewing the results of the exploratory drilling, and keeping in mind the facts set out under the heading "Groundwater Conditions," two factors have been proved to be of outstanding significance: The nature of the topographic relief, and the configuration of the granitic bedrock.

Almost all successful bores are located on higher ground, varying distances up the sloping sides from the bottom of the valleys, salt lakes, and mudflats. Water obtained from bores on low ground, and on flat, undifferentiated country, is almost invariably highly saline. There are, however, some exceptions to this rule, which will be dealt with later.

In undulating topography the following rule generally holds: The longer and the steeper the slope, the larger the supply and the better the quality of the water. It has been found to be a good practice to locate a bore about half-way up a slope. If the water proves to be too saline a higher site may yield a better quality, although the supply will usually decrease. If, on the other hand, the water in the mid section of a slope is relatively fresh, but the supply only small, a bore lower down will yield a better supply, but as a rule the salinity will increase. In all these cases it is important to look out for a good catchment area for the rainwater above the bore site.

Due attention must also be given to the nature of the soil. Thick, porous, sandy soil will readily absorb the rainwater; heavy, clayey soil favours surface run-off. In this respect the nature of the vegetation gives in many cases valuable hints. Dense banksia populations, for instance, always grow on thick, sandy soil.

Solid granite and granite gneiss afford no room for the storage of water. As soon as the drill enters these hard bedrock formations, the hole has to be abandoned. There is a widespread belief that good water may be found after passing through a "granite bar." Insistence on such an opinion means only a waste of time and loss of money.

Abnormal occurrences—with regard to topography—of water of low salinity, is regarded as a result of irregularities existing in the granitic bedrock. The surface of the hard rocks at depth does by no means correspond with the present relief. Representing an old land surface, the presence of depressions and elevations, of valleys and ridges is naturally to be expected. The granite configuration is of immediate hydrological importance in so far as it governs to a large extent the movement of the groundwater, leading it into channels, or acting as subterranean dams.

Some exploratory bores struck good supplies of remarkably fresh water on relatively low-lying ground, while other bores higher up the slope met with more saline water or entered granite at a shallow depth. The only explanation the writer can give is that in such cases most of the groundwater is percolating towards the lower ground in distinct subterranean channels, in which concentration and a high rate of movement keep at least the top layers relatively fresh.

Other bores, although situated on sloping ground and penetrating considerable thicknesses of decomposed granite, failed to yield any supply. Here again it must be assumed that the underground drainage is concentrated in well defined depressions in the basement rocks.

Such inconsistencies as revealed by the exploratory work in the Esperance Plain have been found to occur in other granitic areas in Western Australia, and the Geological Survey, in conjunction with the Commonwealth Bureau of Mineral Resources has already approached the subject from a geophysical angle. It has been found that the depth of the decomposed zone can be accurately determined by electrical methods. Until such a time however, as we will be in a position to apply this method in everyday practice, we will be dependent on the observation of the general principles as set out in this report. The only alternative to determine the depth of the decomposed zones—grid boring a property—would be beyond the financial possibility of most of the interested parties.

The writer would give expression, in conclusion, to the firm conviction that the groundwater north of the Agricultural Research Station is highly saline, and in many cases even useless for stock purposes. On the other hand, good supplies of stock or even domestic water will in most instances be easily located on the undulating parts of the country to the south of Gibson.

GERALDTON WATER SUPPLY—REPORT ON THE WICHERINA BASIN.

By K. BERLIAT, D.Sc.

Introduction.

The town water supply for Geraldton is drawn from a number of bores in the valley of the "Wicherina Brook," a tributory of the Greenough River. Most of the bores are situated in an area lying approximately south of Wicherina Siding, on the Geraldton-Mullewa railway line, 29 miles by road from Geraldton. Since 1927 over 30 bores have been sunk by the P.W.D., but at the present time (August 1952) only seven of them are in use. Of the remainder most have been abandoned because of corroded casing, or corroded and choked screens. Other bores have been discarded owing to a gradually diminishing output or because of too high salinity. A few bores have not been developed for the only reason that they are too far away from the existing pipe-lines, and a few others are still serviceable, but for some reason or other not used at present.

A combined output of 29,000 gallons per hour (4,872,000 gallons per week) is pumped from the seven bores actually in use. This supply is adequate for the present needs of Geraldton. It is expected however, that in the not too distant future the demands will be stepped up to at least six million gallons per week. It was desirable therefore, that the past experience gained in the Wicherina basin should be reviewed in the light of further development.

The Wicherina Bores—Relevant Data.

Salinity.

The sodium chloride content of the water obtained from the various Wicherina bores varies between 26 and 147 gr. per gallon. The total salinities are on record for a very few bores only. In the following all salinity data refer to the chloride fraction.

With the exception of four or five sites all the bores lie within an area of about 207 acres. In this relatively small area changes in salinity are threefold:—

(i) Vertical Changes in Salinity.

"E[1]" (Ethel) Bore (R.L.N.S. 480ft.).*—This bore was sunk in 1951 to a depth of 152ft. A supply of 3,500 gallons per hour was obtained between 90 and 152ft. Salinities are as follows:—

Depth ft.	Per gallon gr.
90	42
102	65
110	67
118	71
125	89
135	104
145	113
152	118

"L" Well (R.L.N.S. approximately 500ft.).*—Prior to the sinking of this well a test bore was drilled to a depth of 126ft. The salinity of the water in the bore was 32 gr. per gallon. From the floor of the well a bore was sunk to a depth of 188ft. The salinity increased to 115 gr. per gallon. Later the opening was made shallower, and the casing withdrawn, with the result that the salinity decreased to 47 gr. per gallon. (The exact depth of the well is not on record, but it is over 80ft.)

"W" (William) Bore (R.L.N.S. 500ft).*—This bore was sunk to 182ft., at which depth the salinity was 42 gr. per gallon. At 120ft. it had amounted to only 34 gr. per gallon.

(ii) Horizontal Changes in Salinity.

The bores are situated along the northern and southern slopes of the Wicherina Valley, and with the exception of four or five, not more than 1,600ft. from, and 60ft. vertical distance above the creek. Generally speaking the salinity of the bores scattered over the area varies from about 30 gr. per gallon to about 80 gr. per gallon, but in one place a marked exception is noticeable.

The "E" series consists of two bores and two wells, all situated close together. They vary in depth from 111ft. to 172ft., and their salinities range from 40gr. to 70gr. per gallon. As this series had given good salinities, a new bore (E^1 "Ethel") was put down, very slightly to the west, to a depth of 152ft. The salinity at this depth, as already mentioned, was 118 gr. per gallon.

"V_2" bore, about 250ft. further west from "Ethel," has a depth of 190ft. At this place the highest salinity in the whole basin, viz., 147 gr., was met with.

The old "D" (1928) bore, located some 800ft. west-south-west from "V_2," has been sunk to 212ft. The salinity here is only half (72 gr. per gallon) of that encountered in "V_2."

All these bores and wells are in a similar topographic position, close to the Wicherina creek. The ground elevation varies from 480 to 510ft.

(iii) Increase in Salinity Owing to Prolonged or Increased Pumping.

"F" Bore.—This bore (maximum output 1,800 gallons per hour) was drilled in October, 1928. Before the bailing test the water had a salinity of 44 gr. per gallon. It increased to 47 gr. after bailing. In January, 1929, the salinity was 105 gr. and in March 118 gr. per gallon.

"S_1" Bore.—Completed in 1939, the bore had an output of 1600 gallons per hour, and a salinity of 45 gr. per gallon. In 1948, after developing the bore, a supply of 7,000 gallons per hour was obtained. At the same time the salinity increased to 63 gr. per gallon.

"A_1," "A_2" Bores.—In December, 1928, the salinity in the two bores was 68 and 65 gr. per gallon, increasing to 73 and 68 gr. respectively until April, 1929. In August 1937 the salinity in one of the bores was tested to 103 gr. per gallon.

"C" Bore.—The bore, after completion in May, 1928, had a salinity of 55 gr. per gallon, which rose to 78 gr. after a bailing test, carried out in April, 1929.

Pressure Head, Water Rest Level.

The writer has been informed that the water in the various bores rises generally about 3ft. to Rest Level. Such recorded information as is available shows a rise of 14ft. in "N" (1952) bore, and of 6ft. in "L" test bore. In "K" and "V_1" bores the water rest level coincided with the upper surface of the zone of saturation.

The impression of heavy or prolonged pumping on the water rest level is a factor of first-class importance, but only little information is on record. A five day bailing test caused a fall of 2ft. in "H" bore, and of 2ft. 8in. in "C" bore.

* Reduced Level Natural Surface.

PLATE IX

GEOLOGICAL SURVEY OF WESTERN AUSTRALIA

GERALDTON WATER SUPPLY

REPORT ON WICHERINA BASIN

BY

K. Berliat, Aug., 1952

Scale 800 feet to an inch

Proposed bore sites ⊙
Existing bores •

7019

2725

2251

From Mullewa

GREENOUGH RIVER

Invert of River Bed
R.L. 437·37

RAILWAY LINE

From Geraldton

WICHERINA SIDING

Proposed Bore Site

Proposed Bore Site

Bore A

B1

C

D (1949)

D (1928)

E 39

Bore E

Well E

E 51

V1

V2

Tube E

F

G

L

Q

R

S

O

N

W

P

T

M

U

X1

X2

X3

Reservoir

Brook

Wicherina

600
580
560
540
520
500
480

Based on P.W.D. plan No. 25438

The Wicherina Basin.

The Wicherina creek and its tributaries drain an area of approximately 7,000 acres. About half of this area is underlain by granite and granite gneiss, outcropping on the high ground to the west, and forming an excellent catchment for the surface run-off. The other half, between the Wicherina dam and the Greenough River, is underlain by a sedimentary series, consisting of sandstones, grits, clays, and shales. The porous and pervious members of this succession form the Wicherina aquifers.

The rich supplies of the Wicherina bores suggest a large continually replenishing body of ground water, and the question of the provenance of this water naturally arises. In dealing with this problem it must be kept in mind that in sedimentary country, consisting of a folded or tilted alternation of shales and sandstones the deeper zones of underground flow are governed by geological features and may be completely independent from the surface contours.

Below about 200ft. the deeper Wicherina bores entered a great thickness of dark blue, puggy shales. The writer is inclined to think that this shales represents the top member of the Permian, and that an unconformity may exist between this formation and the overlying Jurassic. He also considers that the shale forms the bottom container of the aquifers. Its attitude is therefore of great practical importance, as it governs the trend and direction of the underground flow.

The shales can be correlated with reasonable safety in the following five bores:—

Bore.	R.L. of top of shale. ft.
A_1	322
G	408
X_2	435
X_3	447
C	334

An analysis of these elevations indicates that the shales dip at a low angle to the north-east. If this is the case over a large area, then it must be assumed that the general trend of the moving underground water is in the same direction, and that the Wicherina aquifers are replenished in the main from the south-west.

The seven bores actually in use are within an area of some 125 acres. Their present output of 29,000 gallons per hour amounts to 253,244,000 gallons a year. Over the last 20 years the rainfall at Wicherina averaged 15.76in. per annum. Assuming that as much as half (8in.) of this amount of water was absorbed and goes underground, the annual increment for the area concerned would be approximately 22,622,000 gallons. If the conception of a north-easterly sloping bottom container is correct, then the increments (apart from the surface run-off) received from the granitic area in the west are only small, as most of this water, on entering the sedimentary horizons, is drained away from the productive area. This leads again to the conclusion that the aquifers are fed from some source outside the Wicherina surface drainage basin.

The Wicherina bore logs show predominantly sandstones, interbedded with some clayey horizons. No particulars are recorded regarding the exact depth at which each supply of water was struck, but the possibility that there are several independent aquifers cannot be overlooked. This would account for the variations both in salinity and supply. The high salinities in the vicinity of "V_2" and "Ethel" may be due to a locked up, more or less stagnant body of groundwater.

Conclusions and Recommendations.

In an area where extensive sandplains prohibit geological surface observations, the exact and complete recording of all sub-surface information is of overall importance.

As the motion of the water as a whole is down the dip of the bottom container, the elevation of the top of the blue shales should be carefully recorded in each bore. If there are any doubts regarding the correlation of the shales, the matter is considered important enough to recommend diamond drilling at three places forming the apices of a triangle.

Because of fluctuations of the pressure head the position of the hydraulic surface is changing almost constantly and a representation of it at any one time shows only approximately the conditions at any other time. The data acquired so far can only be regarded as approximations, as they have been made at different times, separated in some cases by intervals of many years. Furthermore the natural conditions are interfered with by the drilling of numerous bore holes in a limited area. The construction of a map representing the major features of the hydraulic surface demands much additional information, acquired simultaneously from a number of points scattered over a larger area.

Special attention must be given to the clay horizons that are interbedded with the sandstones. Such horizons may form seals between independent aquifers.

With a view to salinity problems it is essential to put on record the exact depth at which each supply was struck, including the quality of the water, and the supply obtained from each aquifer.

A completely unknown factor is the effective porosity of the Wicherina aquifers, and therefore no safe estimate as to the water in storage can be made at the present time.

Until such a time as the results of the investigatory work, as outlined above, are available, all recommendations for further development remain necessarily somewhat tentative. It is strongly felt, however, that continued exploration of the basin would repay the effort much more surely than any of the adjoining areas. It is recommended first of all to test the area near the junction of the Wicherina creek and the Greenough River, and the position of the first bore site has been marked on the attached plan. The possibility that the underflow of the Greenough River may be more highly saline than the water drawn from the Wicherina aquifers has not been overlooked.

The second area worthy of testing is limited by the old (1928) and the new (1949) "D" bores in the south, and the railway line east of Wicherina Siding in the north. The location of the first proposed bore is also shown on the accompanying plan.

The selection of further bore sites in both areas obviously depends upon the results obtained from the initial test bores.

REPORT ON THE NORTHAMPTON MINERAL FIELD.

By K. BERLIAT, D.Sc.

What has become to be known as the Northampton Mineral Field consists of an extensive, north and south stretching belt of country on both sides of the North-west Coastal Highway (Geraldton-Carnarvon). It is limited in the north by approximately Lat. 27° 40′ s., and in the south by approximately Lat. 28° 30′ S., an overall distance of about 60 miles. The town of Northampton is 31 miles north of Geraldton and lies in the southern half of the field.

Ever since 1848, when lead ore was first discovered on the Murchison River, the Northampton Mineral Field has been the chief source of supply in the State, and important mining activities have been carried out whenever the price of lead left a margin over production and transport costs. Since the 1930's the field had been practically deserted until the high post-war price offered for lead assisted in the rehabilitation of the industry Numerous prospecting areas and mineral leases have been applied for since, and the re-opening of several deserted mines has been made possible At the time of the

inspection (September, 1952) 15 claims were actually worked or prospected They are centred around two widely separated localities, viz.:—

(i) Northampton township;

(ii) Galena, on the Murchison River.

The writer was instructed to make a general inspection of the field concerning all mining activities, and to give some information on length, breadth, and depth data, and on the general geology of each deposit being worked or prospected. It was entirely outside the scope of the survey to enter into any geological details.

General Geology.

Intense, fracturing and shearing of the garnet gneisses, forming the country rocks, has taken place along north-east and south-west lines. Some of these zones of weakness, approximately coincident with the direction of the regional schistosity, have been intruded, at a later stage, by dolerite or epidiorite dykes, varying in thickness from a few feet to a maximum of 180ft. The dykes dip, with few exceptions, at high angles to the west. Gradations from normal granite gneiss into pegmatitic facies are common in the vicinity of the basic dykes. The frequent association of the ore bodies with basic dykes is not genetic in character. Lead deposition is structurally controlled, mineralisation having taken place along pre-existing zones of weakness.

Notes on Claims being Worked or Prospected at Time of Inspection.

(i) Northampton District.

PROTHEROE LEAD MINE (Victoria Location 833).
(Anglo-Westralian Mining Pty Ltd.)

The mine and township of Protheroe are situated 17 miles by road south-east of Northampton.

There are three distinct, downward converging lines of lode, striking approximately at 45°. The west lode, which has been worked in the old Narra Tarra Mine dips to the east, while both the middle and east lode are steeply inclined to the west.

Present mining operations are taking place on the middle, or Protheroe lode. There are two strong shears in a garnet gneiss that shows frequent gradations into a pegmatitic facies. Mineralisation occurs in some places along the footwall shear, in other places along the hanging wall shear. The thickness of the mineralised zone varies between 3 and 5ft.

A vertical section of the workings shows four main levels, at 108, 212, 325 and 425ft. All the ore between No. 2 level and the surface has been practically stoped out.

At present mining operations are in progress at the north end of a 700ft. long stope between No. 2 and No. 3 levels. Galena occurs predominantly in well defined seams and lenses in kaolinised granite gneiss. There is a noticeable deterioration in values towards the south end of the stope.

The distance between hanging wall shear and footwall shear in No. 3 level is about 50ft. The same distance in No. 4 level is only 8ft. It is expected that the two shears will join somewhat below that level.

Shipments from this mine between 1946 and September, 1952, amounted to 6967.31 tons of ore, containing 5462.34 tons of lead, valued at £A768,634 f.o.b., Fremantle. Concentrates shipped awaiting realisation amount to 1,050 tons and concentrates on hand awaiting shipment amount to 1,239 tons.

ISSEKA MINING PTY. LTD (Victoria Location 832).
(Richard and Graham.)

The mine is situated seven miles south of Northampton and only a few hundred yards from McGuires Siding, on the Northampton-Geraldton railway line.

Two parallel mineralised shears in garnet gneiss run through the location. They strike at 40° and are about half a mile apart.

No work is being done at present on the east lode, which dips 75° W., and can be traced by old shallow workings for about 600ft. Lode matter containing disseminated carbonate ore (cerussite) is exposed over a width varying from 18in. to 3ft.

A vertical shaft has been sunk to a depth of 63ft., slightly to the west of the West Lode, and a crosscut is now being put in to the east. It is expected to intersect the lode after 12ft. of crosscutting.

This lode too can be traced by old shallow workings for about 700ft. Its width varies between 4 and 6ft. The dip, which is 70° E., near the present shaft, is steeply to the west in an old shaft, 700ft. further south.

Carbonate ore (cerussite) produced so far, has been mined from an open-cut, 10-16ft. in depth, and about 300ft. in length. Shipments between December, 1949, and September, 1952, amounted to 48.25 tons of concentrates, containing 27.73 tons of lead and 33.18 fine oz. of silver, valued at £A3,421 f.o.b., Fremantle.

PROSPECTING AREA 74 P.P., 75 P.P., 76 P.P.

The three adjoining prospecting areas were applied for recently by Messrs. D. Dunlop and J. W. and F. W. Willers. They are situated in hilly country, near Eastbrook Hill, eight miles by road west of Northampton.

No work has been carried out on P.A. 75 and P.A. 76, but a shaft is being sunk on P.A. 74 (F. W. Willers). It was down to a depth of 21ft. at the time of inspection. The shaft is located near the central part of a fractured and brecciated basic dyke, striking at 30° and dipping 70° W. No signs of lead mineralisation are noticeable (The leases were applied for on the strength of a small isolated floater of galena on P.A. 76).

KIRTON'S MINE, M.L. 249, 250, 251.
(K. Williams.)

The mine is situated three and a half miles north-north-west of Northampton.

A strong quartz and galena filled shear striking at 30° and dipping steeply to the east has been worked by a shaft and two drives to a depth of 108ft. and over a maximum length of 90ft. A short drive at the 60ft. level exposed thin and irregular ore shoots scattered over a width of 2ft. 6in. Eight tons of ore have been produced from a stope, 50ft. long and 30ft. high. The other drive was put in at the 90ft. level. Lode matter up to 3ft. wide, with veins of solid galena along the hanging wall up to 1ft. thick has been located over a length of 90ft. Stoping was carried out to a height of 15ft., and 12 tons of ore have been produced.

A new shaft is now being sunk on M.L. 249. It is intended to sink to a depth of 300ft., and to continue operations at that level.

PARINGA WHEAL OF FORTUNE (Victoria Location 436).

The mine is situated about three miles west of Northampton.

Southerly plunging ore shoots in a strong shear zone, varying in thickness between 6 and 10ft., have been worked over a length of 500ft. and to a maximum depth of 174ft. The shears have an average strike of 50° and their dip is between 72° E. and vertical. They are intersected at various angles by pegmatite dykes. The best values are met with near the pegmatite contacts, and lower grade ore generally occurs where the walls are formed by gneiss. Rich mineralisation is also noticeable in the very steeply and vertically dipping sections of the lode.

At the time of inspection mining operations were in progress at the south end of the 174ft. level. The values are very rich in places, with seams and pockets of galena up to 6ft. wide. The ore shoots are lenticular however, and completely barren patches occur regularly about every 150ft. Prospects for payable production did not appear promising at the north end of the drive.

Shipments between November, 1949, and September, 1952, amounted to 733.30 tons of ore, containing 536.94 tons of lead and 87.73 fine oz. of silver, valued at £A85,072 f.o.b., Fremantle.

RHYHOPE (P.A. 73 P.P.) (W. Simpson & H. Hyde).

The holding is situated about two and a half miles west of Northampton.

Work has been in progress since August, 1951. A shaft was sunk to a depth of 85ft. and a drive put in at the 72ft. level. Ore has been stoped out over a length of 20ft. and a height of 33ft.

The ore body occurs in a shear zone between basic dyke rocks on the hanging wall and kaolinised granite gneisses on the footwall. The strike is about north-east, and the dip between 75° E. and vertical. The matrix is quartz, associated with barite, pyrite, and some blende. The lode varies in thickness between 18in. and 4ft. Veins of galena, up to 18in. thick have been located in the thinner and more highly inclined portions of the lode. The shaft section exposes carbonate ore to a depth of about 30ft.

Shipments between August and November, 1952, amounted to 20.65 tons of ore, containing 14.55 tons of lead and 10.32 fine oz. silver valued at £A2,073 f.o.b. Fremantle.

GURKHA SYNDICATE, M.L. 256.

This lease is six miles north of Northampton and adjoins the Northwest Coastal Highway on the west.

Lode matter and lenses of solid galena up to 2ft. thick occur in a strong, 4-6ft. wide shear zone, striking at 28° and dipping 60-75° W. Both the footwall and the hanging wall are formed by basic dyke rocks. Hard quartz, together with some barite is found along the footwall. The lode has been opened up by a shaft, 76ft. deep, and two drives have been put in at that level, 95ft. to the south and 39ft. to the north.

No returns have been submitted to the Mines Department from this lease. The writer has been informed in the field that shipments over the last 18 months amounted to 22 tons of concentrates. 95 tons of ore are on hand awaiting treatment.

MAY BELL, M.L. 227.

The lease is eight and a half miles by road north of Northampton and close to the railway line to Geraldton.

An inclined shaft is being sunk on a lode striking at 40° and dipping 80° W. At the time of inspection it had reached a depth of 120ft. It is proposed to deepen the shaft to 200ft., and then put in a drive to the south.

The lode formation is a basic dyke, and ore shoots in nearly vertical shears occur over a width of 7-8ft. Rich pockets of galena, accompanied by some quartz on the hanging wall, are being recovered from the bottom of the shaft.

Shipments from this lease between June, 1949, and September, 1952, amounted to 70.70 tons of ore, containing 49.37 tons of lead and 33.59 fine oz. of silver. Value £A4,777 f.o.b., Fremantle.

BADDERA NORTH, M.L. 31 P.P.

The mine is situated six and a half miles by road north of Northampton and a mile north of Baddera Siding.

There are two strong mineralised shears in a basic dyke. They strike at 45°-50°, and dip 80°-85° W. Along the footwall shear the ore is disseminated over a width varying from 4-15ft., whereas along the hanging wall shear galena occurs in well defined, southerly pitching shoots. Up to four seams with an overall width of 4ft. have been located. Individually the seams are 6in. to 2ft. thick. In places they converge and form one solid seam of galena.

Workings are in progress at the 160ft. level. From the main underlay shaft sunk on the footwall shear two drives have been put in, one 70ft. to the north, the other 200ft. to the south. In the south drive ore has been stoped out over a length of 170ft. and to a height of 160ft. (to the surface). The values have been poor, the ore averaging only 6-7 per cent. of metallic lead.

A cross-cut (93ft. long) was then driven to the hanging wall shear, and driving was carried out over a total length of 270ft. A stope near the south end of the drive has a length of 60ft., and a height of 10ft. Stoping is now in progress 100ft. north of the cross-cut.

Shipments from this lease between April, 1948, and September, 1952, amounted to 772.39 tons of ore, containing 496.82 tons of lead, and 507.19 fine oz. of silver, valued at £A50,152 f.o.b., Fremantle.

SOUTH BADDERA, M.L. 248.
(H. J. Cotic.)

The workings are half a mile north-west of Baddera Siding.

An inclined shaft, 120ft. in depth, has been sunk on a 3-5ft. lode, striking at 65° and dipping 70° W. Lode matter and lenticular seams of galena up to 18in. thick, occur in a matrix of brecciated basic dyke rocks. Quartz is developed in places both along the footwall and the hanging wall. Ore has been recovered from the shaft, and from short stopes and drives between 40ft. and 65ft. At the time of inspection a drive to the north was being put in from the bottom of the shaft.

Shipments from this lease between September, 1951, and June, 1952, amounted to 16.51 tons of ore, containing 9.29 tons of lead and 10.72 fine oz. of silver, valued at £A1,267 f.o.b., Fremantle.

(ii) Galena District.

MARY SPRINGS, M.L. 234.
(Th. A. Bridson.)

The lease, adjoining the North-west Coastal Highway on the west, is situated five miles north of Galena townsite.

Of six lodes, reported to have been proved by old workings, only two are mined at present. They are roughly parallel and follow strong shear zones in the eastern half of a large (160ft.) doleritic dyke, striking at 50°. Considerable pegmatisation of the country gneisses is noticeable, especially along the western margin of the dyke.

The two lodes are not more than 8ft. apart and dip between 60° and 70° E. Their thickness varies between 3 and 4ft. Only little work, consisting mainly of a short drive put in from the bottom of an old shallow shaft, has been done on the east lode.

The west lode has been opened up by an inclined shaft, and a drive, totalling 110ft. in length has been put in at the 60ft. level. Shoots of solid galena vary in thickness from 8 to 12in.

Shipments from this lease between November, 1950, and September, 1952, amounted to 50.22 tons of ore, containing 37.61 tons of lead and 22.80 fine oz. of silver valued at £A5,546 f.o.b., Fremantle.

GERALDINE NORTH, M.L. 222.
(Atkinson & Davies.)

Work on this lease, which is situated three miles south of Mary Springs, was started in February, 1949. An old shaft was cleaned out to a depth of 112ft. and a drive put in for a length of 135ft. Mineralisation has taken place in a shear in fractured and brecciated basic dyke rocks, striking at 15° and dipping to the west. Three lenticular seams of galena, 10 to 15ft. long, and up to 2ft. 6in. thick have been met with in the drive. Apart from this, mineralisation proved to be patchy and irregular. The mine has now been abandoned and is full of water, the latter being used for the mill and concentration plant.

Shipments from the mine between February, 1949, and September, 1952, amounted to 173.08 tons of ore, containing 122.29 tons of lead and 48.85 fine oz. of silver. Value £A15,066 f.o.b., Fremantle.

GREAT WESTERN, M.L. 253.
(Atkinson & Davies.)

The lease is situated two miles west-south-west from Geraldine North.

The country garnet gneisses are intruded by a 120ft. thick basic dyke, striking at 35°, and dipping 70° W. Lode matter, 14ft. wide, occurs along the hanging wall of the dyke. Isolated lenses of galena, up to 2ft. 6in. thick are developed at the contact between the gneiss and the basic dyke.

A vertical shaft, 70ft. deep, has been sunk in the southern portion of the lease, and a drive, 34ft. long, was put in to the south. Ore has been stoped out for a width of 3ft. and a height of 20ft.

Shipments finalised as at 31st August, 1952, amounted to 1.98 tons of ore, containing 1.46 tons of lead and 1.19 fine oz. of silver, valued at £A165 f.o.b., Fremantle.

GRAND JUNCTION, M.L. 255.
(Atkinson & Davies.)

Little work has been done on this mine (situated just under a mile east of Geraldine North) since it was last worked by "Wiluna Gold Mines" in 1934.

Three mineralised shears in gneiss, converging in a southerly direction, have been exposed by the old workings. Present activities are limited to the west shear, striking at 20° and dipping steeply to the west. An old open-cut, about 50ft. deep and 120ft. long, has been carried another 30ft. to the north, and carbonate ore is being mined over a width varying from 3-5ft., and to a depth of 20ft.

The eastern shear, 43ft. apart, strikes at 40°, and dips also steeply to the west.

The middle shear is exposed in an old cross-cut at the 40ft. level. It contains disseminated lode matter together with some small stringers of galena.

No returns have been submitted to the Mines Department from this lease. The writer has been privately informed that shipments from April to September, 1952, amounted to 11 tons of concentrates, containing an average of 67 per cent. of lead.

GALENA LEAD MINES, M.Ls. 205, 214.

The mine, adjoining the old workings of the Surprise Mine on the south side, is situated immediately west of Galena Townsite and about half a mile south of the Murchison River.

Galena in nearly vertical, N.-S. striking shears in a basic dyke has been worked to a maximum depth of 200ft. Driving carried at that level totals 170ft. in length. Conditions are very poor in the south, but a gradual increase in values is noticeable towards the old Surprise Mine in the north. Lode matter and irregularly distributed ore shoots up to 18in. thick are mined over a width of 6ft. The predominant gangue minerals are barite and quartz.

No production data are available.

REPORT ON P.A. 6668 (PARIS GROUP), COOLGARDIE GOLDFIELD.

By K. BERLIAT, D.Sc.

Introduction.

P.A. 6668, of 23 acres, is situated 30 miles by road east-south-east of Widgiemooltha, and is easily accessible by a track branching off from the Coolgardie-Norseman main road, four miles south of Widgiemooltha. The country in the vicinity of the Prospecting Area is flat and soil-covered, carrying a vegetation of Salmon Gum, Gimlet, Blackbutt and Saltbush. Domestic water has to be carried from Binneringie Soak, eight miles to the east.

The former G.M.L. 5311 (Lister's Gold Mine), pegged by Mr. G. Lister in 1931, was spasmodically worked up to 1950. Bulked production figures from this lease, and from the two amalgamated G.M.Ls. 5530 and 5500 to the east and west respectively, are given as 7,965 fine oz. of gold, recovered from 14,054 tons of ore.

G.M.L. 5311 and G.M.L. 5530 were abandoned by Mr. G. Lister in September, 1952, and the former is now being held, under the title P.A. 6668, by Mr. F. White. He also has an option over machinery Area 86, and G.M.L. 5500, both expiring on 28th February, 1953.

Geology.

The ore body, as exposed in the mine workings and in old shallow shafts and costeens on P.A. 6668, consists of a quartz reef, which strikes at 295°, and dips 40° S., co-incident with the enclosing greenstone country. The greenstones are generally coarse grained and massive, except in some places along the ore body, where they are schistose and highly sheared and contorted. Occasional lenses of jasperoid ironstone result from the decomposition of the more basic greenstone schists. A roughly east and west striking dyke is evidenced by small, isolated outcrops of quartz porphyry near the nothern boundary of the holding.

Sufficient factual data regarding the structural behaviour of the ore body are unobtainable because of the flooding of the mine workings below the water table (about 100ft.). Accessibility is limited to the 75ft. level, between No. 4 and No. 2 shafts. The reef is made up of westerly pitching quartz lenses, varying in thickness from 3ft. 6in. to mere stringers. The ore channel strikes at 300° and dips 40° S.W. Gold is in part free, in part associated with pyrite and chalcopyrite. Copper carbonates are visible near No. 4 shaft, both in quartz and in the hanging wall. There is evidence of synclinal and anticlinal flexures in the country rocks, 50ft. west of the shaft, near the eastern limit of a large open stope. It is said that the reef attains a maximum thickness along the axial line of the flexures. Such a control is not unlikely, but investigations along these lines were not possible.

The Workings.

The reef has been worked over a length of 420ft., and to a maximum depth of 220ft. From No. 1 shaft, located close to the western boundary of P.A. 6668, four levels have been developed, viz., at 100, 125, 175 and 220ft. Three other shafts situated further to the east, have been sunk to the 75ft. level. All the available ore between this level and the 175ft. level has been practically stoped out. Above the 75ft. level stoping has been done to a maximum height of 25ft. There is a small stope, about 50ft long, and about 10ft. high, above the 220ft. level.

Conclusions.

That secondary enrichment has taken place in the formation of the ore body is suggested by the following reported facts:—

(i) The eratic distribution of the gold throughout the quartz.

(ii) The falling off of the payable values below the top portion of the sulphide zone.

The writer is of the opinion therefore, that workable ore is limited in depth, and that the mine, such as it is now, has been worked out.

Possible extensions to the west are prohibited by the proximity of the boundary of the holding.

There is some scope for prospecting on the strike of the reef, east of the workings, but bearing in mind the westerly pitch of the ore shoots, prospecting should be done in this direction.

NOTES ON A TALC DEPOSIT NEAR BOLGART.

By K. BERLIAT, D.Sc.

The occurrence is on Location 820, nine miles by road south-south-west of Bolgart, a town on the Clackline-Miling railway, 24 miles north of

Toodyay. The property is owned by Mr. J. Butterley, and the Mineral Rights are held by Industrial Earth Minerals Pty. Ltd., Bolgart.

Between 1946 and October, 1952, 269.36 tons of talc, valued at £1,344 have been produced from a number of shallow pits and opencuts, spread over an area of about 150ft. by 250ft. The openings had been covered up by means of a "bulldozer," shortly before the inspection was made. They are said to vary in depth from 4ft. to a maximum of 10ft. One shaft, which was nearly full of water, is reported to have been sunk to 20ft.

Outcrops are completely lacking in the area of the deposit, but boulders of quartz reef can be seen about 500 yards to the south-west and to the north-west.

To judge from the numerous specimens scattered over the working area, the talc is not uniform in grade. There is a pale green, compact, fine grained variety, producing a greyish-white powder of probably cosmetic grade. Other specimens are obviously of inferior quality, having undergone only partial talcification. They are harsher to feel, darker in colour, and coarser in texture.

The exact nature of the rocks from which the talc has been formed cannot be ascertained. The general geology of the country would suggest ultra-basic rocks of pre-Cambrian age.

At this juncture it is not possible to assess either the extent or the grade of the deposit.

REPORT ON WATER SUPPLY ON BINNERINGIE STATION.

By K. BERLIAT, D.Sc.

The services of the Geological Survey were requested to assist in the location of bore sites for stock water on Binneringie Station. This property of 196,000 acres, carrying at the present time some 600 sheep, is situated east of Widgiemooltha. The homestead is on a water reserve, surrounding Binneringie Rock, and lies 38 miles by road east-south-east of that township.

The station is in flat, granitic terrain. Isolated, narrow ridges rise only little above the level of the surrounding country which is almost entirely without defined drainage lines of any length. The rainfall ranges from 8-9in. per annum.

The ground water in the flat portions of the station is too salt even for sheep. Small supplies of useful stock water could be expected along the slopes of the ridges, if there was a sufficient thickness of sandy soil or decomposed granite, in which the run-off from the crests could be received and stored.

Such conditions do not exist, the surface being underlain at a shallow depth by solid granitic rocks.

The solution of the water supply problem on Binneringie Station will depend on sources other than those of subterranean nature.

NOTES ON "COODAWA" TALC DEPOSIT.

By K. BERLIAT, D.Sc.

The talc deposit is situated on private property, on location M.839, seven and a half miles by road east-north-east of Three Springs, a town on the Perth-Geraldton Highway, 205 miles north of Perth. The mineral rights are held by the Midland Railway Company, but have been leased on a royalty basis to Universal Milling Company, Welshpool.

The occurrence was investigated by Mr. R. S. Matheson in September, 1944, and reported upon in detail in the annual report of the Geological Survey for the year 1945. The author came to the conclusion that "there are good prospects for the production of large quantities of talc suitable for cosmetic use." Up to the time of his visit 27 tons 7 cwt. had been produced from the dump of three wells, varying in depth from 52ft. 6in. to 70ft.

The following notes relate to the progress of mining operations since Mr. Matheson's inspection.

Official returns submitted to the Mines Department between October, 1948, when production started, and October, 1952, are given as 1,568.47 tons, valued at £A.21,021, fo.b., Fremantle.

The talc has been produced from a well and drives, 125ft. north-east of Mr. C. B. Barrett's homestead. Three samples from the dump of this well (No. 1 well) were collected by Mr. Matheson and submitted to the Government Chemical Laboratories for analyses and commercial tests. The talc proved to be good to high grade, giving a white powder, valuable in the cosmetic and other industries.

The well has a depth of 70ft. Driving has been carried out at 40ft. and at 60ft. At the 40ft. level two drives have been put in, to the north and to the east, for a length of 50ft. and 83ft. respectively. From the 60ft. level five radiating drives have been developed to the west, north, north-east, east and south-east. Their aggregate length is 375ft.

The talc mined in both levels is fine grained and compact, but intensively fractured. The colour at the 40ft. level is predominantly light grey, sometimes with gradations into a pale green. At 60ft. it is pale green throughout, but the talc produces a white or off-white powder. Analyses from both levels show only little variations.

It is understood that the biggest problem facing Universal Milling Company is to find suitable markets for their output, but over the last two years steady improvements have been made in this direction. The company has now signed a long term contract with a Swedish buyer for an annual shipment of 2,000 tons of cracked talc. Mill talc produced in excess of this tonnage will be shipped to the company's agents for disposal in the Eastern States.

Prices quoted by the company in October, 1952, were:—

Mill Talc: £A.16 10s. per ton, f.o.b., Fremantle.
Cracked Talc: £A.11 5s. per ton, f.o.b., Fremantle.

REPORT ON WATER SUPPLY ON WARROORA STATION.

By K. BERLIAT, D.Sc.

Warroora, a sheep station of 267,560 acres, is limited on the west by the Indian Ocean between approximately Latitudes 23° 12′ S. and 23° 33′ S., and on the east by approximately Longitude 14° 3′ E. The homestead, only two miles from the coast, and slightly to the south of the Tropic of Capricorn, is situated 124 miles by road north of Carnarvon.

Water for domestic purposes is sufficient, a good supply being drawn from a shallow sand dune well near the coast, but difficulties are experienced in obtaining stock water. Present supplies are drawn from three wells, located close to intermittent drainage channels, and from an artesian bore, 12 miles north-east of the homestead. This bore has a depth of 1,732ft. and flows at a rate of approximately 750,000 gallons per day. The water is low in salinity, but has a distinct odour of hydrogen sulphide. The bore serves a considerable portion of the property as the water is reticulated for about five miles to the north and seven miles to the south-east.

Topography and Geology.

With the exception of a narrow coastal belt occupied by sand dunes of sub-recent or recent origin, and a strip of hilly country along the eastern boundary, the topography is extremely monotonous and featureless. Defined surface drainage is almost non-existent. The gullies are short and rapidly diminish in size due to the loss of water by percolation. The best defined channels are heading in the hills to the east and south-east and are tributaries of Cardabia Creek.

Almost all of Warroora Station is underlain by porous sediments of Tertiary age. The limestones, marls and calcareous shales rich in Inoceramus, outcropping in the eastern hills, are attributed to the Cretaceous succession.

Water Possibilities.

The following notes refer entirely to the possibilities of obtaining ground water, which has its origin in the direct downward percolation of the local rainfall, and is not under pressure exceeding that of the atmosphere at its upper, free surface.

First consideration must be given to the probable quality of the ground water. That the latter is very highly saline has been proved, in almost every instance, by the numerous bores sunk in various portions of the property. The main factors responsible for this are the low rainfall (8-9in. per annum), the intense evaporation, and the undifferentiated topography.

It has been pointed out to Mr. H. C. Lockyer, manager of the station, that useful water can only occur where the conditions are exceptional. Given porous rock types, a search for such supplies involves in the main an examination of the topography to ensure quick run-off and accumulation of the rain water. The latter must collect in such quantity as to be able to force its way down to the water table, and dilute to harmless proportions the cyclic salts accumulated in the soil.

As far as conditions on Warroora Station are concerned, favourable features of this nature can only be recognised in the coastal sand dune belt, and along the intermittent water courses heading between the rounded hills to the east and south-east.

No water points were required in the coastal belt. Should ever the necessity for supplies in this zone arise, it will be important to keep in mind that the good water generally rests directly on salt water. The wells should be located above sea level, and great care must be taken not to spoil them by over-deepening or over-drawing.

With regard to the gullies in the east and south-east, the best situation to start prospecting for useful water is about half the vertical distance between the source and the main valley. The latter, or the lowest part of an area must be avoided, as the water beneath these localities will be salt.

If the supply in a bore situated half way up a gully is insufficient, but the water of good quality, a lower site should be tried. If on the other hand the first bore cuts salt water, it would be advisable to try higher up the gully.

In the extensive flat areas of the station most of the low annual rainfall, particularly when received in numerous light showers, merely evaporates, leaving its salts in the soil. Occasional heavier falls carry these salts down to the water table, where they are added to the highly saline, practically stagnant, body of ground water. Under such conditions prospecting for useful water is a hopeless proposition, a fact that has been sufficiently demonstrated by previous boring operations.

REPORT ON BENTONITE ON M.C. 456H, MARCHAGEE, SOUTH-WEST DIVISION.

Approximate Latitude 30° 4′ S.

Approximate Longtitude 115° 56′ E.

By L. E. DE LA HUNTY, B.Sc.

Location.

This deposit is about eight miles (air miles) west of Marchagee and approximately five miles south of M.C. 452H. It is about two and a half miles south of the south-west corner of location 8578 and is three-quarters of a mile east of Pinjarrega Lake.

Area.

Size of the clay pan is of the order of four to five acres.

General Information.

The deposit was approached from Coorow—a distance of some 15 miles. The last five miles were through heavy sand.

The deposit is in the form of a clay pan in a depression in the sand dunes and is grey in colour, when dry. The clay turns a greenish colour when water is added.

At a depth of 1ft. the deposit was yellow-grey in colour.

Results of Analyses.

Sample No.	Location.	Depth.	Dispersed Clay. Material.	Sadler Figure.	Soluble Sulphates.
		inches.	%	%	
MB/13	In claypan, 2½ miles south of S.W. corner peg of loc. 8578, MC 456H	0 – 3	80·7	23	*Nil*
MB/14	Below MB/13	at 12	75·6	15	Appreciable amount

The grit in these two samples was mainly quartz and kaolin. The fine clay fraction was sepiolitic in nature.

Neither of these two samples was suitable for oil clarification.

Conclusions.

The results of the Sadler's Test show these clays to be much lower in grade than other Marchagee samples which have been examined. In fact, they are too low grade to warrant beneficiation.

REPORT ON BENTONITE ON M.C. 452H, MARCHAGEE, SOUTH-WEST DIVISION.

Approximate Latitude 29° 59′ S.

Approximate Longitude 115° 56′ E.

By L. E. DE LA HUNTY, B.Sc.

Location and Access.

The deposit is about 10 miles by road and sand track south of Coorow—the last two miles being through very loose sand. Datum peg (south-east corner) of M.C. 452H is about 50 chains west-north-west of the north-west corner peg of location 8578.

Area.

The area of the deposit is about seven and a half acres—made up of two adjoining claypans. One pan is about six acres in area and is joined on its western edge by a smaller pan of one and a half acres.

Description of the Deposit.

The deposit of bentonite on M.C. 452H is similar in occurrence to other deposits near Marchagee.

The claypan, which is clear of vegetation, occurs in a slight depression in the sand plain. The sand plain is thickly covered with scrub. White quartz sand occurs at the edges of the pan and causes considerable contamination of the clay when blown on to the pan by wind. Some clay is also apparent in the scrub surrounding the deposit.

The deposit was dry at the time of sampling (February) and the surface was criss-crossed by small shallow cracks. Colour of the clay was a greenish grey and the addition of water made it quite green. When water was added, the clay seemed to swell and broke up into small round particles.

The bentonite seemed fairly consistent in character to a depth of 1ft. A marked deterioration was apparent below this depth where the colour became quite yellowish and a high percentage of quartz grains was noticed.

This particular deposit was reputed to be very useful for the filtration of oils.

Sampling.

Twelve samples were taken. Six of these were from the top two inches of the deposit and the others were made over the depth of 2in.-12in. Samples Nos. 1-10 were taken from the larger claypan and Nos. 11 and 12 from the centre of the smaller pan.

Results of Analyses.

Table shows disposition of samples and results of tests made on them by the Government Chemical Laboratories.

TABLE OF ANALYSES.

Sample No.	Location.	Depth.	Dispersed Clay Material.	Sadler Figure.	Soluble Sulphates.
		inches.	%	%	
MB/1	Centre of larger claypan—approx. 185 yards N.W. of datum peg	0 – 2	40·4	6	*Nil*
MB/2	Below MB/1	2 – 12	65·3	9	Trace
MB/3	50 yds N.E. of MB/1	0 – 2	55·5	6	*Nil*
MB/4	50 yds N.E. of MB/1	2 – 12	71·7	21	*Nil*
MB/5	50 yds S.W. of MB/1	0 – 2	45·4	*Nil*	*Nil*
MB/6	50 yds S.W. of MB/1	2 – 12	74·5	44	*Nil*
MB/7	50 yds S.E. of MB/1	0 – 2	36·7	*Nil*	*Nil*
MB/8	50 yds S.E. of MB/1	2 – 12	52·5	*Nil*	*Nil*
MB/9	50 yds N.W. of MB/1	0 – 2	45·8	10	*Nil*
MB/10	50 yds N.W. of MB/1	2 – 12	73·05	26	Trace
MB/11	160 yds N70°W of MB/1 in centre of smaller claypan	0 – 2	52·1	10	*Nil*
MB/12	Below MB/11	2 – 12	93·55	29	Trace

Note.—Grit from samples Nos. MB/1–11, mainly undispersed grain of a micaceous type of clay. No. MB/12—quartz and kaolin.

The Director of the Government Chemical Laboratories reported as follows:—

> The Sadler's Tests show these clays to be much lower grade than other Marchagee samples examined. The fine clay fraction seems to be sepiolitic in nature.
>
> None of the samples received are suitable for oil clarification. Lab. No. 2531 (MB/6), Sadler's Test 44 per cent., when activated by treatment with sulphuric acid, gave moderate clarification when the oil was heated to 300° F. Clarification at 180° F gave poor results. It does not appear, therefore, that the samples from this deposit warrant further work on beneficiation.

Conclusions.

The above results indicate, very strongly, that the claimholder would be wasting his time and money in doing any work on this deposit.

REPORT ON SILICA SANDS ON M.C. 453H, TWO MILES EAST OF DONNYBROOK, SOUTH-WEST DIVISION.

Approximate Latitude 33° 34′ S.
Approximate Longitude 115° 52′ E.

By L. E. DE LA HUNTY, B.Sc.

Introduction.

M.C. 453H includes reserve 11149, location 363 (which is Public Utility Reserve 22860) and a temporary reserve of 14 acres along the north boundary of location 363. References map is Lands Litho 414A/40.

The claim is accessible from the Donnybrook—Boyup Brook Road, either by "Sand Hills Road" (a gravel track which runs along the southern boundary of the claim) or by a sand track down the eastern boundary.

It is located about one mile south and south-east of the Flax Mill paddock, where the Hume Pipe Co. is quarrying sand.

Geology.

The deposit consists of quartz grains ranging in size from fines to grit and seems remarkably clean in places. Outcrops of a ferruginous grit are common, and these appreciably diminish the area of sand available—since iron is poison in a silica sand.

The Hume quarry (10-15ft. deep), which is in the same formation, shows well rounded quartz, quartzite and odd felspar boulders. These boulders are up to 6in. in length and occur in bands in this unconsolidated grit.

The deposit is obviously a part of the conglomerate beds which can be seen in railway and road cuttings (and even high up in the hills) between Donnybrook and Balingup. These beds are remnants of an old river system and bear no relation to the present rivers. This sand is an old river wash.

"Islands" of an orange to red coloured ferruginous grit were observed in the quarry, below the surrounding land surface. These are not remnants of a bed of ferruginous grit but are local patches of grit cemented with limonite.

Outcrops of this ferruginous grit are common in the western and northern parts of the claim.

Sampling and Analyses.

Eight samples were taken—mostly from the surface to 2ft. in depth. Surface sand was black but the sand became a good white colour at a few inches depth, in the southern and eastern parts of the claim. Sample GS/7 was taken towards the north-east corner of the claim. The top sand was similar in appearance to the rest of the claim but the sample was obviously too iron stained to be worthy of analysis.

TABLE OF ANALYSES.

Sample No.		GS/1.	GS/2.	GS/3.	GS/4.	GS/5.	GS/6.	GS/7.	GS/8.
Location		540 yards N80°W of S.E. corner peg of loc. 363.	Approximately 200 yards N.W. of N.W. corner peg of loc. 29.				30 yards S. of S.E. corner peg of loc. 3122.	120 yards W. of N.E. corner peg of loc. 363.	12 yards S. of N.E. corner peg of loc. 363.
Depth		9in.-2ft. 3in.	0ft.-1ft.	1ft.-2ft.	2ft.-3ft.	3ft.-4ft.	0ft.-2ft.	3in.-2ft. 3in.	1ft.-2ft.
Tyler Sieve.	Opening, mm.	%	%	%	%	%	%	%	%
+ 16	1·0	3·59	5·25	5·01	7·06	9·49	5·57	5·01	4·62
— 16 + 32	0·5	25·60	29·27	22·91	24·92	25·59	26·41	25·71	39·64
— 32 + 60	0·25	36·78	38·66	36·91	32·19	27·45	31·14	28·40	33·45
— 60 + 80	0·175	11·80	10·95	13·73	14·14	14·25	13·01	13·58	9·25
— 80 + 100	0·15	5·83	4·98	6·72	7·45	8·03	6·87	8·18	4·09
—100 + 115	0·125	3·28	2·67	3·70	4·17	4·43	3·87	4·75	2·23
—115	0·125	13·12	8·22	11·02	10·07	10·76	13·13	14·37	6·72
Analysis :									
Loss on Ignition		0·20	0·94	0·25	0·12	0·09	0·48	0·64	0·20
Silica, SiO_2		98·66	97·94	98·47	98·77	98·81	98·30	97·33	98·72
Ferric Oxide, Fe_2O_3		(On composite of GS/1—6* and GS/8) = 0·08%.							
Condition of grain		Sub-angular tending to angular in the finer grades, for all samples GS/1 — 8.							

* GS/7 was iron stained and not included in composite for ferric iron.

The Deputy Government Mineralogist has classified these samples as follows:—

> The grading of these sands is not good, being too widely distributed, too much material is coarser than 32 mesh or finer than 100 mesh.
>
> Ferric oxide content is too high for the manufacture of best quality glass but would be satisfactory for window glass or white bottle glass.

Requirements for Glass Sands.

The following is a list of requirements for glass sands. It has been extracted from a report issued by Avery and Anderson, Analysts, Melbourne.

(1) Chemical.

(a) High silica content—The percentage of silica present as quartz grains must be at least 99 per cent., if the sand is to be classified as first rate.

(b) Low iron content—No sand containing more than 0.04 per cent. of ferric oxide can be regarded as first class. The best of the glass sands contain 0.03 per cent. or less of ferric oxide (Fe_2O_3).

Common glass bottles can use 1 per cent. of iron oxide.

Medium quality glassware needs less than 1 per cent. of iron oxide and preferably not more than 0.5 per cent.

Even 0.1 per cent. imparts a noticeable green colour to glass.

For plate or colourless glass; not more than 0.05 per cent. of iron oxide is permissible.

Best glassware; not more than 0.04 per cent. is desirable.

Optical glass; not more than 0.02 per cent. of iron oxide.

(c) Comparative freedom from alumina, lime, magnesia, potash, soda and titanium compounds.

(2) Physical.

(a) Angularity of grain—The greater the angularity, the quicker the melting of the charge. The more the shape deviates from the rounded form, the better the sand from the glass-making viewpoint.

(b) Evenness of grade—An ideal glass sand is made up of angular quartz grains, as nearly as possible, of 0.25 mm. (1/200in.) in diameter. In practice, grains between limits 0.2-0.5 mm. are acceptable (1/250-1/100in.).

Large grains take longer to fuse but the presence of very fine material is not desirable since it usually carries impurities.

In addition, the very fine material has a tendency to entrap air in the form of very fine bubbles, during the melting of the charge.

For the best optical glass, the grains should be between 0.2 and 0.3 mm. in diameter.

(c) Freedom from minerals of high S.G.—Particles of heavy minerals do not readily dissolve in the fused glass, but remain as small black specks in the finished product.

The presence of 0.06 per cent. of heavy minerals reduces the sand value slightly, but sieving with 100 mesh (100 holes to the linear inch) removes those which are present mainly as small particles.

This sieving also tends to remove iron oxide.

Conclusions.

1. The outcrops of ferruginous grit on M.C. 453H reduce the workable area to slightly less than 100 acres.

2. The workable depth appears to be at least 4ft.

3. Patches of iron stained sand and probable islands of ferruginous grit, under the top soil, further reduce this estimate of sand available. They also mean selective quarrying.

4. There is also an appreciable amount of vegetable matter and tree roots in the sand. These are likely to prove objectionable if not sieved out.

5. Only about 40 per cent. of the sand sampled comes within the grain size specifications of a glass sand (0.2-0.5 mm.).

6. The iron content precludes the use of this sand for other than medium quality glassware. However—

7. Removal of the fines, by sieving, may also lower the iron content.

8. The silica content does not reach the required 99 per cent. but, since the lowest percentage obtained was 97.33 per cent., the sand must be considered reasonably good from this point of view and sieving may help to improve this figure.

It becomes apparent, therefore, that beneficiation is essential and handling costs under these circumstances may well prohibit the working of the deposit for glass sands.

REPORT ON SOME MANGANESE DEPOSITS IN THE NORTH-WEST DIVISION, WESTERN AUSTRALIA.

By L. E. DE LA HUNTY, B.Sc.

Contents.

General Information.

The investigation was carried out in co-operation with Mr. H. B. Owen, Senior Geologist, Bureau of Mineral Resources, Canberra. Also in the party were Mr. W. Grayden, M.H.R. and representatives from Westralian Ores Pty. Ltd. and Northern Mineral Syndicate.

Main shareholders in Westralian Ores Pty. Ltd. are Messrs. Bell Bros. and R. B. Synnott. The Northern Mineral Syndicate consists of Messrs. L. Ives, W. P. Scott, M. F. Scott, H. O. Hawkins and P. R. Fletcher.

Transport and food were supplied by the leaseholders. Westralian Ores provided a four-by-four truck, and a Landrover was supplied by Northern Mineral Syndicate.

Purpose of the work was to map, sample and estimate the tonnage of manganese ore available on deposits which had not been examined previously by the Geological Survey of Western Australia.

A request for the investigation originated from political sources in Canberra and, although no mineral holdings had been registered at the Mines Department in Perth at the time of the request, the Geological Survey agreed to make a joint in-

vestigation with the Bureau of Mineral Resources —on holdings known only to interested parties. Work was done in September and October, 1952.

The deposits visited were located at:—

(1) Area immediately south of Mt. Sydney.—approximate lat. 21° 23′ S., approximate long. 121° 11′ E.
(2) Warrie Station.—approximate lat. 22° 16′ S., approximate long. 119° 41′ E.
(3) Woodlands Station.—approximate lat. 24° 46′ S., approximate long. 118° 5′ E.
(4) Mogul Station.—approximate lat. 24° 49′ S., approximate long. 118° 26′ E.

Summary of Ore Reserves.

The following table shows the quantity and grade of each deposit examined—also the degree of reliability of these estimates. If the surface samples show anything like the true grade of the ore-bodies, there are more than 85,000 tons of ore of high manganese content contained in these deposits.

TABLE OF ORE RESERVES*.

Place.	Grade. (Percentage Mn.)	Quantity. (Long tons.)	Reliability of Estimates.	
			Grade. (Possibly excessive.)	Quantity.
1. South of Mt. Sydney :				
MC 211	50 +	1,600	Visual estimate	Measured.
MC 268	50 +	4,300	Visual estimate	do.
1½ miles North of MC 247	50 +	8,500	Surface sample	do.
MC 274	50 +	2,400	Visual estimate	do.
MC 271	30 — 45	6,200	Visual estimate	do.
MC 272	30 — 45	1,200	Visual estimate	do.
MC 273	50 +	800	Surface sample	do.
MC 247	50 +	25,100	2 Surface samples	do.
MC 269	50 +	11,100	Surface sample	do.
MC 57L	50 +	7,900	Surface sample	do.
MC 54L	50 +	2,300	Surface sample	do.
MC 56L	50 +	200	Visual estimate	do.
MC 53L	50 +	15,150	2 Surface samples	do.
	50 +	1,800	Surface sample	do.
S. boundary of Warrawagine Station	50 +	4,600	Visual estimate	do.
2. Warrie Station	20 — 30	700	Surface sample	do.
3. Woodlands Station	20 — 30	14,800	3 Surface samples	do.
4. Mogul Station	45 — 50	4,000	3 Surface samples	do.
	20 — 30	2,000	Visual estimate	do.
Total Tonnage by Grades :				
	50 +	85,750	Surface samples and visual estimates. Possibly excessive in quality.	Measured.
	45 — 50	4,000		
	30 — 45	7,400		
	20 — 30	17,500		

* See Table of Analysis and Tonnage Estimates for details.

The Manganese-bearing Areas.

(1) SOUTH OF MT. SYDNEY.

Location and Access.

Mt. Sydney (approximate lat. 21° 23′ S., approximate long. 121°11′E.) is in the Gregory Range, Pilbara Goldfield, North West Land Division. It is about two miles south-east of the Ragged Hills airstrip and half a mile east of the most northerly deposit inspected (M.C. 211). Mt. Sydney is 95 air miles from Marble Bar in the direction S. 80° 30′ E. and 181 air miles from Port Hedland in approximately the same direction. Road distance from Marble Bar to Ragged Hills airstrip is approximately 150 miles. Road distance from the strip to Porth Hedland, via the Great Northern Highway and the Coastal Highway is a total of 240 miles, approximately.

The deposits are situated in the Gregory Range, between Mt. Sydney and the southern boundary of Warrawagine Station—a distance of some 24 miles. The deposits (see location plan) include M.C.s. 211, 268, a deposit north of M.C. 247, M.Cs. 274, 271, 272, 273, 247, 269, 57L., 54L., 56L. and 53L., also a deposit near the southern boundary of Warrawagine. These were mapped by plane table and telescopic alidade, except where otherwise stated. Localities are approximate since none of the mineral claims pegged have been surveyed.

A rough track runs down the Stock Route to the west of the range from the airstrip to "Running Waters," (Tooncoonaragee Pool). It took two hours to drive this distance (about 18 miles) in the Landrover. There were no tracks to the deposits and only four wheel drive vehicles could get near them—travelling five to seven miles in an hour. One deposit (north of M.C. 247) was left unpegged because of its inaccessibility.

Water Supply and Vegetation.

The well about one and a half miles north-west of Mt. Sydney was inoperative at the time of inspection but is said to contain good water. Good permanent water is to be found at Carrawine Pool and at Running Waters in the Oakover River. The river goes underground into the sandy alluvium of its bed at Running Waters, and the pool here has only been known to dry out once (according to local information), in June 1952. It was running in September.

The area is one of extremely low rainfall and trees are mainly restricted to stream beds. The common trees are river gums and black hearts. The plains are covered with spinifex and some scrub.

Geology.

The manganese ore occurs in solid bodies sitting on top of, or in fissures in, pink to dull grey, bedded, crystalline limestone. A specimen of this limestone, from the same locality as sample GS/M/10, showed a high percentage of magnesia. Analysis of the rock gave the following results—

	%
Manganese, Mn	0.06
Iron, Fe	0.80
Lime, CaO	25.17
Magnesia, MgO	17.46

This dolomitic limestone is fairly flat dipping (variable up to 35° and dipping mainly to the east) and has a regional N.-S. strike. Secondary silica is often present in the bedding planes and in cracks and joints. Small crystals of pyrite are scattered throughout the rock, and manganese is noticeable in bedding planes. Grits, sandstones, limey shales and quartzites were seen to be interbedded with the limestone. These rocks are believed to be of Nullagine age.

Near Mt. Sydney, a thickness of 50ft. of dolomitic limestone was seen to overlie (unconformably) some vertically dipping rocks which strike N. 80° W. These rocks were very weathered and looked quite schistose with bands of indurated shale interbedded. The shale bands were about three inches thick, blue grey in colour with iron stained bands. Fine grains of pyrite were disseminated through the shale. These rocks probably belong to the Mosquito Creek Series.

Boulders and pebbles resting on the valley floors in the area include lavas and granite. Boulders of granite up to 3ft. in diameter indicate the close proximity of granite outcrops. Large outcrops of basalt were seen near the southern deposits and igneous rocks are known to occur within a few miles of the area.[9] These include granite-gneiss, porphyry, basaltic lavas and quartz veins. No manganiferous sediments, other than the dolomitic limestone, were found.

Most of the hill slopes are covered with quartzose rubble—varying in size up to 6in. diameter. This rubble includes quartzite, opaline and jasperoid silica. Mesas and breakaways to the west have a 10-12ft. cap of opaline. A heavy talus of opaline masks the underlying rocks there but rounded pebbles of lava (1-3in. diam.) and some chocolate coloured soil were seen at the base of Pulgorah Cone. This may be a weathered conglomerate of undetermined age—anywhere from Nullagine to Tertiary.

Breccias are common at the deposits. These include brecciated manganese recemented with silica, secondary silica fragments recemented with manganese, and "opaline" recemented with a secondary silica matrix.

Occurrence of the Manganese Ore.

The manganese often rests directly on a siliceous manganese base or on jasperoid silica (red or white). It may also rest directly on the limestone or a high percentage of iron may distinguish the base from the overlying ore. The base is usually well defined.

Samples taken indicate a high percentage of manganese in these deposits but the SiO_2 content is unduly high in some cases. (Deposits of obviously low grade were not included in the survey).

Good grade ore can be distinguished in the field by its colour, streak and specific gravity. (The iron oxides limonite and hematite give brown and red streaks respectively and are lighter than the oxides of manganese).

The manganese in this area is hard, tough and heavy. It is black to grey in colour and has the customary black streak. It is mostly massive, but aggregates of crystals were often seen. These crystals are in the form of long blades (up to 1in. long), radiating from centres. They may by pyrolusite.

It seems probable that these deposits are due to solution and redeposition of manganese, in a more concentrated form, from a weathering manganiferous sediment (the impure dolomitic limestone). The soluble nature of the manganese is demonstrated by the thin film deposits on vertical walls and in cracks. Meteoric water has dissolved manganese from the top of the deposit and redeposited it on evaporation—leaving a smooth, shiny enrichment.

Sampling and Grade.

Attempts to cut channel samples with hammer and moil resulted in complete failure. The moil became quite blunt after a few blows with the hammer. A method of representative chip sampling was used. The surface "skin" of approximately half-inch thickness, was chipped off with hammers and further chips were taken from underneath. These constituted the samples which were taken across an ore body or down the face (with the exception of GS/M/8, which was a grab sample from the middle of a boulder about 1ft. diameter).

The unsatisfactory aspect of this method of sampling is that the ore bodies were never penetrated and results of analyses may give an over-optimistic impression. The cores of these ore bodies may well contain a lower percentage of manganese than is indicated by the sample.

Samples were taken as representing average grade for the deposits. Good grade ore is indicated in some places but other samples show a high percentage of silica (See Table of Analyses). The analyses were made by the Government Chemical Laboratories, Perth.

Manganese ore which was obviously very high in silica was mapped as "siliceous manganese" and was not included in tonnage estimates.

TABLE OF ANALYSES.

Sample No.	Locality.	Result of Examination.			
		Mn	*Fe*	*SiO2*	*P*
	Lands Dept. Litho. 99/300	Per cent. on dry basis			
GS/M/1	MC 53L	51·54	1·74	7·70	0·15
GS/M/2	MC 53L	52·87	0·78	10·06	0·07
GS/M/3	MC 53L	49·21	1·05	17·82	0·11
GS/M/4	MC 54L	51·67	6·89	2·21	Trace.
GS/M/5	MC 57L	50·19	1·26	9·30	0·07
GS/M/6	MC 247	47·54	0·83	10·88	0·07
GS/M/7	MC 247	54·08	0·63	0·81	0·08
GS/M/8	MC 269	57·79	0·75	1·47	0·04
GS/M/9	MC 273	55·65	1·19	2·66	0·09
GS/M/10	1½ miles N. of MC 247	54·32	0·80	7·74	0·05

Tonnage.

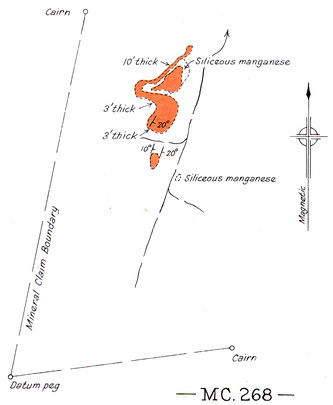
Estimates of tonnage were made using a conversion factor of nine cubic feet per long ton. Volume of ore was calculated from the product (average thickness x area of the deposit, as measured by planimeter). (See Table of Tonnage Estimates).

The theoretical conversion factor is 8 cubic feet per long ton but this does not allow for cracks and jointing.

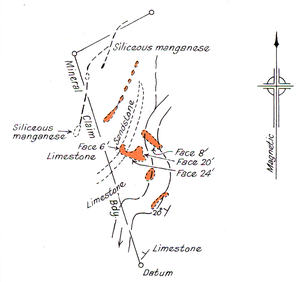
TABLE OF TONNAGE ESTIMATES.

Deposit.	Area. (Sq. ft.).	Assumed Average Thickness (ft.).	Long Tons. (9 cu. ft. = 1 ton).
MC 211	2,800	5	1,600
MC 268	1,000	9	1,000
	2,600	3	3,300
	6,400		
	800		
1½ miles N. of MC 247	8,200	9	8,200
	600	4	300
MC 274....	1,000	15	1,700
	800	8	700
MC 271....	1,400	7	1,100
	4,000	2	900
	6,400	2·5	1,800
	4,300	5	2,400
MC 272....	2,600	4	1,200
MC 273....	900	4	400
	1,800	1	200
	1,000	2	200
MC 247....	15,200	8	13,500
	700	2	800
	3,000		
	23,400	4	10,800
	900		
MC 269....	9,200	10	10,200
	2,800	3	900
MC 57L	14,900	3·6	6,000
	1,500	8	1,300
	900	6	600
MC 54L	1,100	8	2,300
	1,500		
MC 56L		Maximum of	250
MC 53L	7,300	5	4,050
	9,000	8	8,000
	3,600	4	1,600
	1,400	10	1,500
	2,000	8	1,800
S. boundary of Warrawagine Station :			
Northern body....	4,200	3	1,400
Central body	1,300	9	1,300
Southern body....	5,600	3	1,900

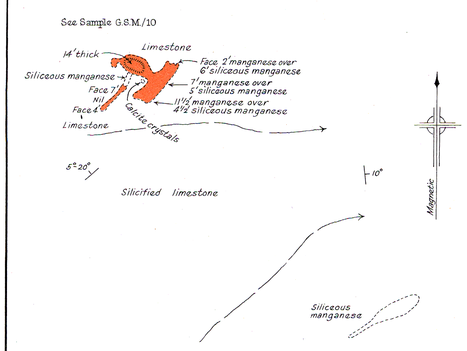
[9] 1938: Finucane, K. J.: The Braeside Lead Field. *Aerial Geological and Geophysical Survey of North Australia.* Report, Western Australia, No. 24.



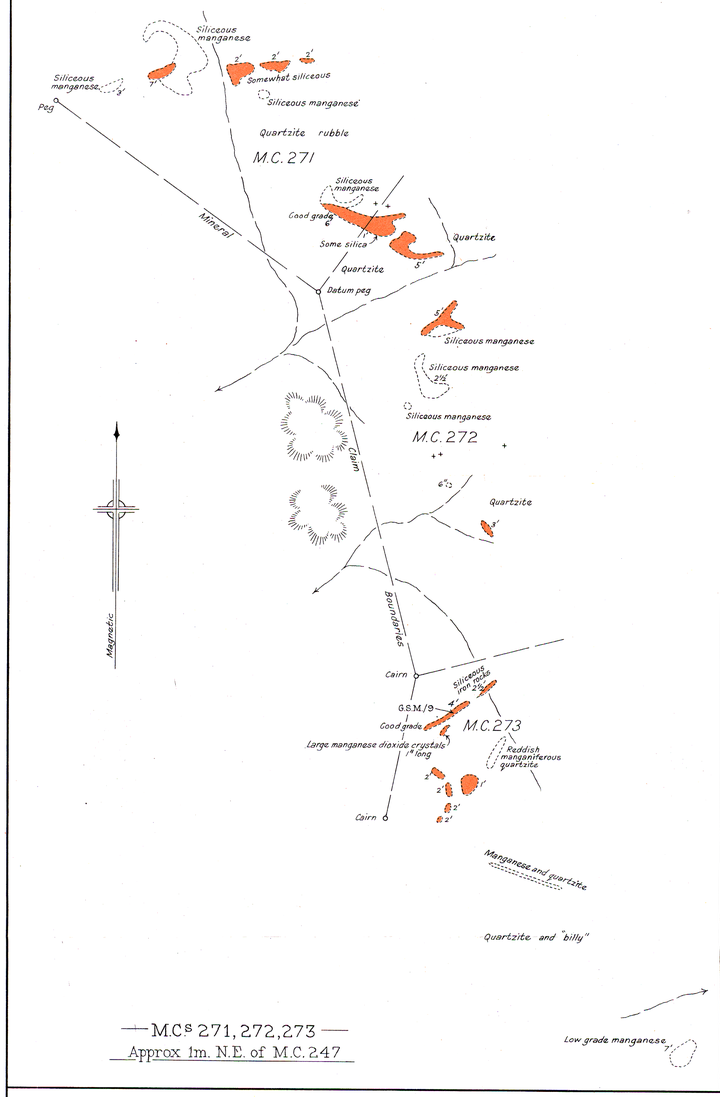
— M.C. 268 —
Approx. 4m. N. by W. of M.C. 247



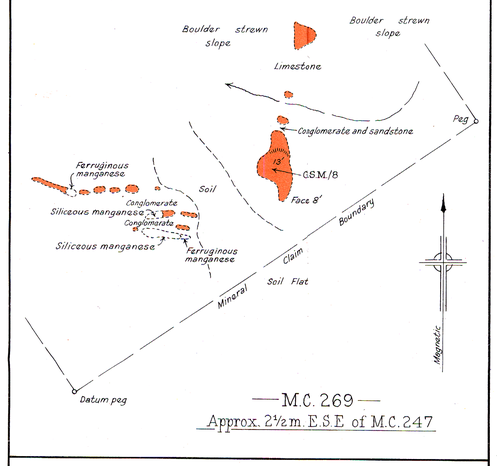
— M.C. 274 —
Approx. 1m. N.W. of M.C. 247
PILBARA G. F.



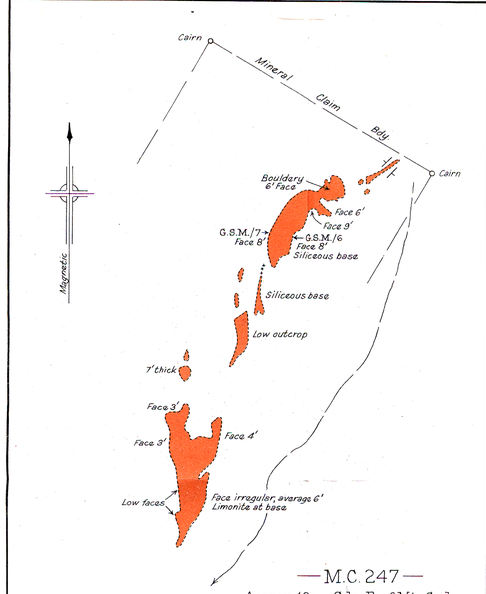
Approx 1½ m. N. of M.C. 247



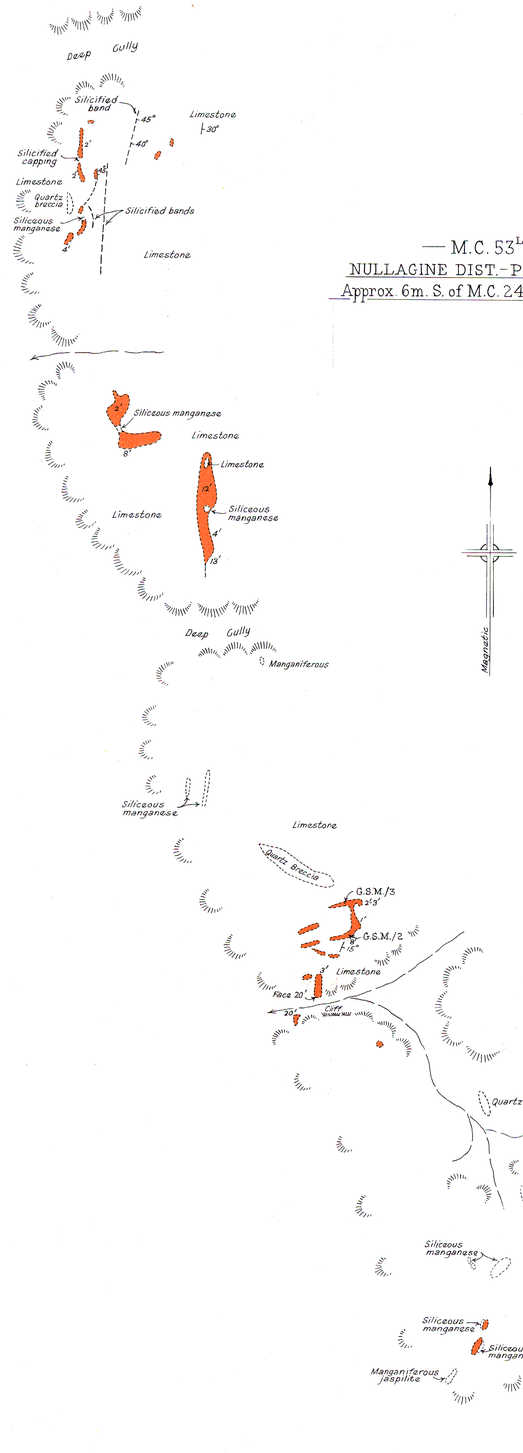
— M.C.s 271, 272, 273 —
Approx 1m. N.E. of M.C. 247



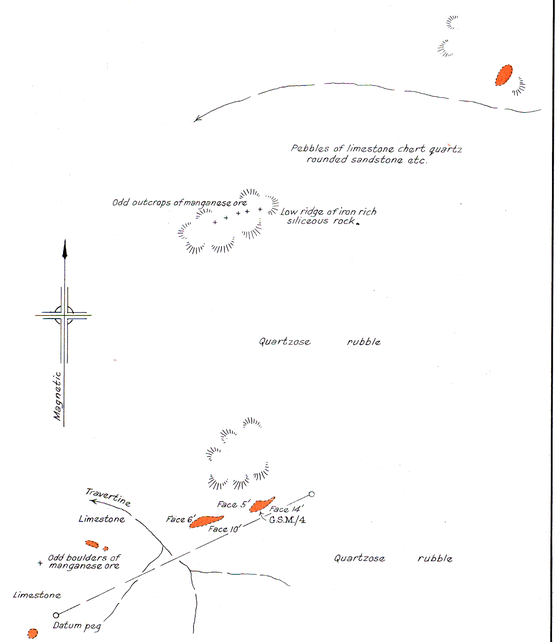
— M.C. 269 —
Approx. 2½ m. E.S.E. of M.C. 247



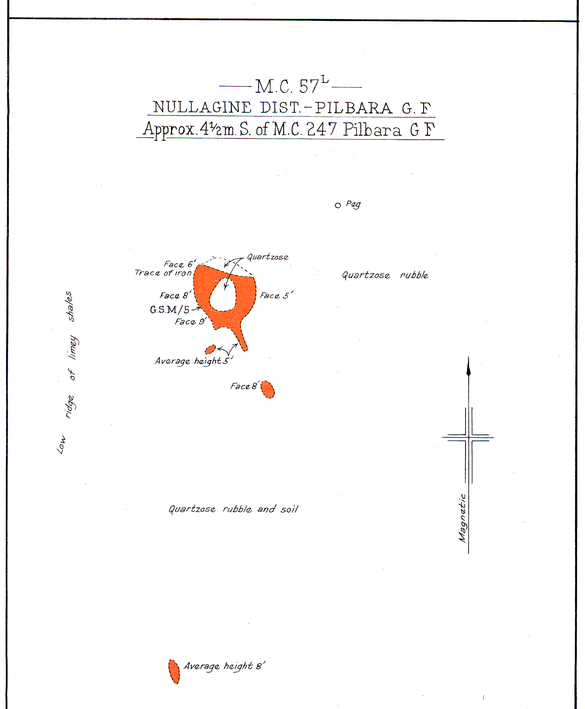
— M.C. 247 —
Approx. 19m. S. by E. of Mt. Sydney
PILBARA G. F.



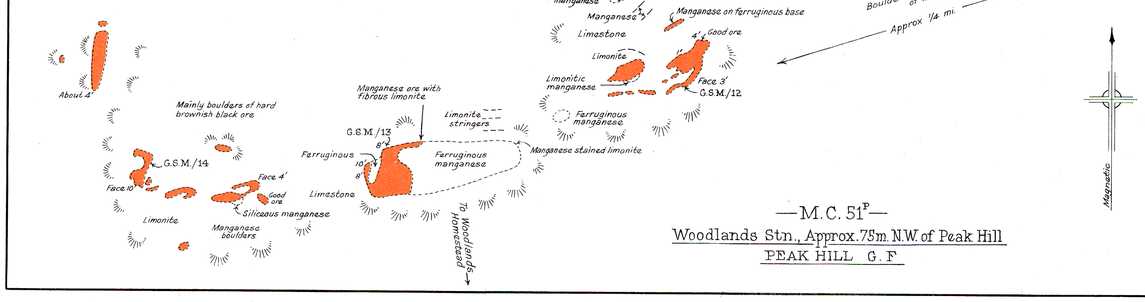
— M.C. 53L —
NULLAGINE DIST. - PILBARA G. F.
Approx. 6m. S. of M.C. 247 Pilbara G.F.



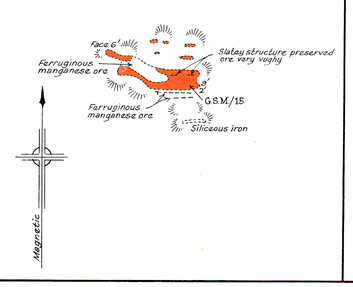
— M.C. 54L —
NULLAGINE DIST. - PILBARA G. F.
Approx. 5m. S. of M.C. 247 Pilbara G.F.



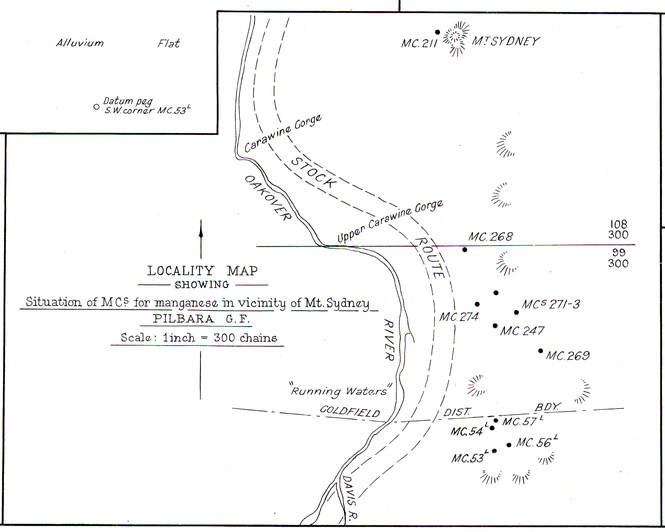
— M.C. 57L —
NULLAGINE DIST. - PILBARA G. F.
Approx. 4½ m. S. of M.C. 247 Pilbara G.F.



— M.C. 51P —
Woodlands Stn., Approx. 75m. N.W. of Peak Hill
PEAK HILL G. F.



— M.C. 49P —
Mogul Stn., Approx. 70m. N. by W. of Peak Hill
PEAK HILL G. F.



LOCALITY MAP
— SHOWING —
Situation of M.C.s for manganese in vicinity of Mt. Sydney
PILBARA G.F.
Scale: 1 inch = 300 chains

— REFERENCE —

Geological boundaries	
Strike and dip of bedding	40°
Small manganese outcrops	+ +
Locality and number of sample	G.S.M./2
Manganese Ore	

GEOLOGICAL SURVEY OF WESTERN AUSTRALIA

MINERAL CLAIMS — FOR — MANGANESE

PILBARA & PEAK HILL GOLDFIELDS

— BY —

H. B. Owen, Commonwealth Bureau of Min. Resources and L. de la Hunty, Geological Survey of W.A.

Scale: 200 feet to an inch

The Deposits.

All of the deposits near Mt. Sydney, which are shown on the accompanying plan (Plate X) were mapped using a plane table and telescopic alidade,

M.C. 211.

This claim (held by A. Rieck) is about 40 chains west of Mt. Sydney and is approachable by a rough and indistinct track from the Ragged Hills airstrip (past the windmill). It is approximately three and a half miles east-south-east from the strip.

The only outcrop of any size and/or quality is on the edge of a plateau about 70ft. above the valley floor. It rests directly on crystalline limestone which dips to the south at 15°. The limestone dips to the north on the north side of the west trending valley. Limestone occurring below the deposit is a little over 40ft. thick, and rests unconformably on an indurated shale, already described and believed to be a member of the Mosquito Creek Series.

The ore body is about 120ft. from east to west and has a maximum width of 30ft. at the base. The quantity of ore available is estimated at 2,800 square feet of average thickness five ft.—giving 1,600 tons. Several small deposits of 20-30 tons were also observed in this locality.

No sample was taken but the ore appears to be of a similar grade to that on M.C. 247.

M.C. 268.

Northern Mineral Syndicate.—The Landrover was driven across country to within half a mile of this deposit—there was no track. It is about four miles north by west of M.C. 247 and about 10½ miles south of Mt. Sydney.

The manganese ore rests on limestone, above and down the west slope of a gully. The limestone dips S.E. at 10-20°. "Opaline" blocks are strewn over the hills and slopes.

The deposit is divided into three bodies, two of which are separated by a zone of siliceous manganese.

Tonnage was estimated at 4,300 long tons. The ore appears to be of fairly good grade but no samples were taken.

Deposit 1½ Miles North of M.C. 247.

No claim has been pegged on this deposit owing to its inaccessibility.

The ore rests on a thick base of siliceous manganese which overlies a partly silicified dolomitic limestone. Thickness of the ore ranges from 2 to 14 ft.; average 9ft. Calculation of ore, using these figures gave a tonnage of 8,500 long tons.

Sample GS/M/10 was made up of chips from various parts of the body. Analysis gave the following grade:—

		Per cent.
Mn	=	54.32
Fe	=	0.80
SiO_2	=	7.74
P	=	0.05

M.C. 274.

Northern Mineral Syndicate.—The deposit is accessible but there is no track.

Country rock is the usual dolomitic limestone with a thin band of sandstone at this spot. There are five small ore bodies with a variety of habit. One body has a face 24ft. high—probably formed in an old joint. The southernmost body appears to be interbedded with the limestone. Limestone appears above and below it at its outcrop in the creek bank.

The ore appears to be of good grade with a total of 2,400 tons.

M.Cs. 271-3.

Northern Mineral Syndicate.—These adjacent claims are about one mile north-east of M.C. 247. The ore is scattered and only three of the bodies are considered to be of significant size.

Country rock quartzite—no limestone present. A lot of very siliceous manganese is associated with the ore bodies which are mostly very shallow.

TONNAGES.
(See Table of Estimates.)

	tons.
M.C. 271	6,200
M.C. 272	1,200
M.C. 273	800
Total	8,200

Sample GS/M/9, taken on M.C. 273 gave:—

		Per cent.
Mn	=	55.65
Fe	=	1.19
SiO_2	=	2.66
P	=	0.09

This was a representative sample across that particular ore body which appeared to be of somewhat better grade than those on M.Cs. 271, 2.

M.C. 247.

Broken Hill Pty.—This deposit is twice the size of any others in the vicinity. It is a prominent landmark and is approachable by vehicle.

The ore has a siliceous base which is seen to rest on limestone on the eastern sides of the ore bodies. Quartzite overlies the limestone in places to the north-west. It is similar in origin to the other deposits nearby, i.e., it is a residual from the weathering of the manganiferous dolomitic limestone.

The deposit is made up of two main bodies with several small outcrops.

Estimated reserves are:—

	tons.
Northern body	13,500
Southern body	10,800
Other small bodies	800
Total	25,100

Samples GS/M/6 and GS/M/7 were taken down the east and west faces respectively of the northern ore body. An average of these samples (see Table of Analyses) gives the following result:—

		Per cent.
Mn	=	50.81
Fe	=	0.73
SiO_2	=	5.84
P	=	0.07

M.C. 269.

Northern Mineral Syndicate.—This claim was approached by vehicle over rough ground. The claim contains one "large" body and several smaller ones. There is a great deal of very siliceous manganese associated with the small bodies. There was no limestone visible at the deposit—the surrounding rocks being mostly quartzite and quartzose rubble.

Sample GS/M/8 was taken from the centre of a foot diameter boulder in the large body. Analysis showed:—

		Per cent.
Mn	=	57.79
Fe	=	0.75
SiO_2	=	1.47
P	=	0.04

Tonnage of this large body, which has a maximum thickness of 13ft, was calculated as 10,200 tons. The smaller bodies added up to 900 tons—giving a total of 11,100 tons.

M.C. 57L (Former M.C. 55L).

Westralian Ores Pty. Ltd.—Claim was approached by vehicle. It lies in the Nullagine District about five miles south of M.C. 247.

The main body is a low mesa, circular in plan, about 250ft. diameter. The plan shows the patches of ferruginous siliceous rocks which outcrop on the mesa together with the manganese ore. The siliceous rocks are labelled "quartzose."

Limey shales outcrop some 4000ft. west of the deposit but the surface near the deposit is covered with quartzite and quartzose rubble.

The vertical thickness of the outer edge of the ore body averages 6.5ft. Assuming the ferruginous siliceous core to be conical in section, the mesa deposit will contain about 6,000 tons. Sum of the ore in the three small deposits south of the mesa is 1,900 tons; total 7,900 tons.

Sample GS/M/5 down the 8ft. vertical face on the south-west of the mesa gave the following percentages: —

	Per cent.
Mn .... =	50.19
Fe .... =	1.26
SiO_2 .... =	9.30
P .... =	0.07

M.C. 54L.

Northern Mineral Syndicate.—This claim contains two pod-like deposits of ore and a couple of other small patches. These pods present vertical faces of 10ft. and 14ft. on the south sides of the western and eastern body respectively. Immediately north of them is an outcrop of red jasper while the land surface to the south is covered with a quartzose rubble.

Sample GS/M/4 was taken down the south face of the eastern body. Results of analysis:—

Mn .... =	51.67
Fe .... =	6.89
SiO_2 .... =	2.21
P .... =	Trace

Tonnage for this claim was estimated as 2,300 tons.

M.C. 56L (Former M.C. 270).

Northern Mineral Syndicate.—This claim is only for two acres and encloses one small body of ore with a maximum tonnage of 250 tons (probably less).

The ore rests on siliceous rocks and no limestone was seen in the vicinity.

The manganese ore appears to be of quite fair grade.

M.C. 53L.

Northern Mineral Syndicate.—The manganese on this claim occurs in four groups on the crest of a north-south ridge.

The ridge is composed of a dolomitic limestone which has secondary silica as joint fillings and in the bedding planes. Thin bands of manganese also occur in the bedding and two of the manganese bodies occur as joint fillings 20ft. deep at their outcrop in a gorge.

The most northerly group of ore bodies has a negligible tonnage but the next group to the south shows to better advantage. Estimated reserves contained in these bodies, which appear to be of fairly good grade, are 12,100 tons.

Two samples (GS/M/2 and GS/M/3) were taken across arms of the largest body in the third group. Tonnage for the group was estimated at 3,100 tons—the largest body containing more than half of this.

The two samples indicate a high percentage of silica—10.06 and 17.82% respectively, although Mn content is fairly high and Fe is low.

Sample GS/M/1, from the southern group, gave the good figures of Mn = 51.54% and Fe = 1.74% although the silica content was fairly high—at 7.70%. Siliceous patches are common in this group but an estimated 1,800 tons of good ore are available. This is the tonnage of the main body from which the sample was taken—down a 10ft. face.

Southern Boundary of Warrawagine Station.

The deposit here occurs as three bodies lying close together about six miles south of MC 53L. Access is difficult and the deposits occur in quartzite country.

Measurements were made by pace and compass and the central body was seen to average about 9ft. in thickness. The other two bodies were about 3ft. average thickness.

The total tonnage (See Table of Tonnage Estimates) was calculated as 4,600 tons. The grade appears to be quite good.

(2) WARRIE STATION.

Location and Access.

Warrie Homestead (approximate lat. 22° 16′ S., approximate long. 119° 41′ E.) is 20 miles by a fairly rough track from the Great Northern Highway, via Bonnie Downs Station, in a direction west-south-west. Warrie can also be reached from Roy Hill on a fairly good track. It is about 30 miles north-west of Roy Hill Homstead on the Roy Hill—Port Hedland Road.

The deposit is approximately four miles south-south-west of Warrie Homestead and can be reached from the Roy Hill Road by travelling west along the southern boundary of Warrie Station. The country is rough and there is no track but it is possible to get to the deposit in a Landrover or Jeep.

Water Supply.

A well about 100 chains S. 20° W. from the deposit is said to contain good quality water.

Geology.

The area is hilly and the country rocks are fairly flat lying sediments of Nullagine age with lateritic caps.

The deposit is very small and includes a group of seven small outcrops together and another outcrop about 20 chains to the north.

The manganese ore is mainly in the form of residual boulders resting on a siliceous base or on tubular ferruginous laterite. The ore is massive and rather dull but contains some crystals of MnO_2, also some pisolitic structure. Sample GS/M/11 was taken here.

Immediately east of the Roy Hill Road where it crosses the southern boundary of Warrie Station is an outcrop of manganiferous shales with an enrichment of manganese. These shales run east-west with a 5-10° dip to the south—ending in a low breakaway to the north. This deposit is 20 chains long but appears of little consequence. It has an obviously high iron content, contains considerable dirt and grit and appears very narrow on the face and edge of the breakaway.

Tonnage and Grade.

The locality sampled has an estimated tonnage of 700 tons, on the basis of nine cubic feet per ton. Maximum thickness observed was 2ft. 3in. and the average thickness about 1ft. There were 5,000 cubic feet of ore in the main group and 1,350 cubic feet in the northern outcrop—giving a total of 700 tons. Of the main group, about 60 per cent. of the ore is contained in one outcrop. A grab chip sample from here gave the following results:—

Locality of Sample. (See Lands Dept. Litho. 98/300.)	Mn.	Fe.	SiO_2.	P.
	Percentage on dry basis.			
Approximately two miles north-east of north-west corner of loc. 394/453	27·47	27·04	2·76	0·05

(3) WOODLANDS STATION.

The deposits referred to below are the same as those reported on by Blatchford as the Teano Range Deposits, G.S.W.A., Annual Report, 1927.

Location and Access.

Woodlands Homestead is situated about 80 miles by road north-west from Peak Hill and 150 miles from the railhead at Meekatharra. Co-ordinates of the homestead are—Approximate lat. 24° 46′ S., approximate long. 118° 5′ E. The road is in reasonable condition.

The deposit, M.C. 51P, is situated 10 miles north by west of the homestead and was reached in the following manner:—Travelling five miles north-west of the homestead and turning north on an old track, just before reaching the "5-mile well," then four and a half miles cross country by car and the last two and a half miles had to be walked. The country here became very rugged. Old car tracks were found near the deposit but were not followed.

Mapping was done by pace and compass.

Water Supply.

Water in the "5-mile well" is said to be good.

Geology.

The manganese deposit here is on the crest of three peaks, about 200ft. above valley level—forming a ridge running E.-W. (see plan). It is enclosed by M.C. 51P.

It rests directly on a hard crystalline dolomitic limestone which is grey-white in colour, flat lying, and contains very small crystals of pyrite and specular haematite, visible to the naked eye. The limestone also contains "devil's dice" (pseudomorphs of limonite after pyrite) in places and an altered crystallised pyrite nodule was found weathered out of the limestone about two miles to the west of the deposit along the strike. At the deposit the limestone is broken and recemented with a calcareous travertine in places. Outcrops of a shaley ripple-marked sandstone occur in the creeks about half a mile to the south and are about 150-200ft. lower than the manganese outcrops. The sandstone has variable dips to north and south and rests on crystalline limestone. It may be interbedded with the limestone. These rocks are thought to belong to the Nullagine system.

These rocks are in angular unconformity with the underlying rocks which have an almost vertical dip. A manganese stained, bedded grit which strikes E.-W. and dips N. at 85° was noted about 30 chains north-west of GS/M/14. (Outcrop is about three chains wide.) Another member of this suite is a siliceous banded iron formation which contains limonite and manganese dioxide in places. It strikes N. 70° W. and dips to the south at 80°.

Outcrops in gullies indicate a thickness of 20ft. + of a recent conglomerate. The conglomerate is fairly compacted but not cemented. Vertical sided gullies, more than 10ft. deep, occur in it in places while small caves are a common feature. This may correspond to Johnson's "New Plateau."[10]

In the distance to the north are hills about the same height as the deposit but in between are some lower mesas with a gentle southerly dip. They vary in height from 50 to 100ft. above the valley floor and appear to be composed of Nullagine rocks.

The manganese is very patchy (see plan) in ore of high iron content. Sampling shows a high iron content but those patches mapped as "ferruginous manganese" had an iron content which was obviously much higher than that of the samples. The ore is massive and tough and has little depth.

The deposit is believed to have resulted from residual weathering of the crystalline dolomitic limestone. An analysis of the limestone below GS/M/14 gave the following results:—

	Per cent.
Manganese, Mn	0.31
Iron, Fe	1.19
Lime, CaO	27.13
Magnesia, MgO	17.50

Tonnage and Grade.

Samples GS/M/12, GS/M/13, GS/M/14 are grab chip samples over a surface of 20ft. radius and represent grades of the eastern, central and western deposits, respectively.

Even the best of these, GS/M/14, is too low in Mn and too high in iron to be considered—apart from the low tonnage of 5,800 tons.

[10] 1950 Johnson, W.: A Geological Reconnaissance Survey including parts of the Yalgoo, Murchison, Peak Hill and Gascoyne Goldfields. *G.S.W.A. Bulletin No. 106*, pp. 43-45.

Deposit.	Area Sq. ft.)	Assumed Av. Thickness (ft.)	Long Tons (9 cu. ft./ton).	Mn	Fe	SiO_2	P
				Per cent. on dry basis.			
Eastern deposit	1,100	5	600 } 3,300	23·56	32·85	2·89	0·02
	2,900 } 5,300	3	2,700 }				
Central deposit	11,400	4·5	5,700	22·96	34·90	2·01	0·03
Western deposit	4,600 } 1,000 } 1,400	4	2,500 }				
	1,600 } 2,900	3	2,000 } 5,800	27·30	28·00	2·27	0·02
	2,300	5	1,300 }				

Total ore = 14,800 tons.
Average grade—Mn = 24%, Fe = 32%.

(4) MOGUL STATION.

Location and Access.

Lands Department maps show this as "Mulgul" or "Molgul" Station but station signposts read "Mogul." The homestead (approximate lat. 24° 29′ S., approximate long. 118° 26′ E) is nearly 80 miles by road north-west from Peak Hill and lies to the east of Woodlands Station. It is just over 150 miles from Meekatharra—the nearest railhead. The road is in reasonable condition.

The deposit is 11 miles north-north-west from the homestead but is reached by a roundabout track past "Mogul Woolshed." The deposit was approached by driving three miles north-east from the woolshed to a mill, then two miles in an easterly direction, then walking two miles south. The country is extremely rugged in the neighbourhood of the deposit. Mapping was done by pace and compass.

Water Supply.

Good drinking water at the mill three miles north-east of woolshed.

Geology.

Rocks of the area are predominantly sedimentary although gabbro dykes were noticed within three miles of the deposit and a quartz vein was noticed some four to five miles to the south-west. The sediments include fairly flat lying limestones and shales with variable dip, striking generally east and west. These appear to overlie steeply dipping shales with similar regional strike, although no contact was observed.

The only deposit of any size or quality is on the cap of a knoll on M.C. 49 P (see Plan). It overlies steeply dipping shales and is grey to dull black in colour. The ore is massive in parts and concretionary in others. Some relict shaley structure is also prominent and seems to indicate a replacement of shales by managanese. This seems probable in view of nearby occurrences of manganese-coated and manganiferous shales. Some manganiferous shales to the east (on M.C. 50 P) showed definite lines of manganese but these proved to be very thin coatings (enrichment) and very narrow. These shales were the only evidence of manganese on M.C. 50 P.

Tonnage and Grade.

Samples GS/M/15 and GS/M/16 were taken on M.C's. 49 P and 50 P respectively. The results are given below with tonnage estimates:—

Deposit.	Area Sq. ft.)	Assumed Av. Thickness (ft.)	Long Tons (9 cu. ft./ton).	Mn.	Fe	SiO_2.	P.
				Per cent. on dry basis.			
MC 49P :							
Good Ore	7,000	5	4,000	46·21	3·29	2·04	0·03
Ferr. Ore	3,500	5	2,000	....	....	....	....
MC 50P	Negligible		....	34·79	16·01	2·53	0·06

Note.—The ferruginous ore on M.C. 49 P is believed to contain more iron than the sample from M.C. 50 P.

Usable ore from M.C. 49 P is 4,000 tons of 46% Mn.

PROGRESS REPORT ON THE GEOLOGICAL SURVEY OF THE RAVENSTHORPE DISTRICT, PHILLIPS RIVER GOLDFIELD, W.A.

By JOHN SOFOULIS, B.Sc.

CONTENTS.

General Information.

Area.

Area to be surveyed involves some 4,500 square miles of the Phillips River Goldfield, centred about the township of Ravensthorpe.

Previous Work.

A survey by officers of this department conducted by H. P. Woodward in 1909 was limited to a small area lying between Ravensthorpe and Kundip.

Purpose of Survey.

To investigate the hitherto imperfectly understood regional and local geology of portion of the Phillips River Goldfield, and to ascertain the mode of ore deposition and its relationship, if any, to geological structures.

The present work was commenced in October, 1951.

Literature.

The principal references for previous work are:—

Bulletin No. 5.—The Phillips River Mining District. (T. Blatchford), 1900.

Bulletin No. 35.—Gold & Copper Deposits of the Phillips River Goldfield. (H. P. Woodward), 1909.

Mines Dept. Report.—The Development of the Phillips River Auriferous Copper Mines. (A. Montgomery & M. Maclaren), 1914.

Fieldwork.

Comprises the following phases:—

(i) Mining Groups.—Mapping on a 5ch. to 1in. scale of the following Mining Groups:—

Elverdton.
Cattlin.
Kundip.
Mt. McMahon.
Hatter's Hill.

(ii) Regional Work.—Regional geological mapping of the area on a 20ch. to 1in. scale supplemented by mapping on an 80ch. to 1in. scale in the less significant areas.

(iii) Mineralised Pegmatites.—Detailed mapping of pegmatites of economic significance on 100ft. to 1in. scale.

(iv) Mineralisation Tabulation.—Checking of all mining leases past and present and the presentation in tabulated form of the nature and direction of ore bodies, production, etc.

Survey Methods.

The usual plane table and telescopic alidade and staff methods were employed for the detailed and group mapping; compass and chain, car traverses, resection methods, etc., employed for regional mapping, surveying methods varying according to conditions encountered and accuracy required.

Personnel.

Included in the field party were the following geologists:—

Name.	Grade.	Function.	Remarks.
J. C. McMath	Senior Geologist	Regional	Resigned Sept., 1952
J. Sofoulis	Geologist gr. 2	Group and Regional	
N. M. Gray	Geologist gr. 2 ...	Group and Regional	Resigned May, 1952
J. A. Noldart	Geologist gr. 2	Lease Tabulation and Group	Joined Aug., 1952

Work Done.

(i) Group.—The "Elverdton" and "Cattlin" groups and the "Cattlin Creek" pegmatite have been mapped by the writer and the reports on the latter two appear later in this progress report.

In mapping the "Elverdton" group the writer was assisted by Mr. N. Gray.

(ii) Regional.—In the geological map presented, the contributions of the geologists participating in the survey were:—

Delineation of ultrabasic unit, granite gneiss distribution and portion of the N.W. magmatic granite boundary. (Mr. J. C. McMath).

W. edge of Jaspilitic unit. (Mr. N. M Gray).

Delineation of "Kundip Series," magmatic granite boundary, jaspilitic and gneiss areas south-east of Kundip, serpentine distribution, agglomerate horizon. (Mr. J. Sofoulis).

In mapping the agglomerate horizon, the writer was assisted by Mr. J. Noldart.

It is proposed that the writer complete the regional work, whilst Mr. J. Noldart complete the lease tabulation and remaining groups of the area.

Reference Maps.

(i) Lands & Surveys Department.—300ch. to 1in.: Nos. 5, 10, 11. 80ch. to 1in.: Nos. 404, 405, 421, 422, 423, 430, 432, 443, 448. 10 mile to 1in.: Esperance Sheet 2. Topographical.

(ii) Military.—4 miles to 1in. series: Ravensthorpe, Newdegate, Bremer Bay, Hyden, Lake Johnson.

Production.

At the time of writing, a little copper ore was being mined in the Raventhorpe district, and the small gold mine which had been in operation at Kundip last year was shut down owing to equipment delays, etc.

A plant for tailings treatment was in operation at Kundip during 1952. Apart from this little activity, mining in this district is practically non existent.

Precious metal production from this goldfield prior to 1952 has been:—

(i) Gold.

Alluvial.	Dollied and Specimen.	Ore Treated.	Gold Therefrom.	Total Gold.	Silver.
Fine ozs.	Fine ozs.	Tons. (2,240 lb.)	Fine ozs.	Fine ozs.	Fine ozs.
607·11	818·28	130,485·53	103,285·53	104,710·92	16,020·14

Production for 1951 and 1952 has been:—

Year.	Dollied.	Ore Treated.	Gold Therefrom.	Total Gold.	Silver.
		Tons.	Fine ozs.	Fine ozs.	Fine ozs.
1951	....	100	63·44	63·44	1·65
To Sept. 1952	2·57	*928	84·84	87·41	5·72

* Tailing sands.

(ii) Copper.

Ore and Concentrate.	Copper.	Value.
Tons.	Tons.	£
95,924·47	8,384·22	589,373

Production for 1951 and 1952 has been: —

Year.	Ore and Concentrate.	Copper.	Value.
	Tons.	Tons.	£
1951	135·7	5·86	1,035·4
1952	65·5	4·63	1,071

Geological Sketch Map.

The accompanying geological sketch map scale one mile to an inch covering portion of the area is merely to indicate the different rock series distribution and to clarify the reading of this report.

Geological Notes.

Physiography.

The most striking topographic element in the area is the Ravensthorpe Range, trending approximately N. 25° W., extending from Mt. Short in the north, southwards to Kundip where it terminates against a younger series of pre-Cambrian rocks of E.N.E.-N.E. trend.

Highest peak in the range is Mt. Desmond which forms a dominant land mark and attains an elevation of 1,150ft.

To the south, the rugged coastal ranges of Mts. Barren and Eyre dominate the area, whilst north of Mt. Short isolated hills of granite gneiss (e.g., Mt. Madden) rise above the sand plain.

A lower erosion level on either side of the Ravensthorpe Range presents an undulating topography transversed by broad drainage valleys, headwaters of the major surface drainages, the Jerdacuttup, Steere, Phillips, West, and Hamersley Rivers.

In keeping with the general fall of the district, the trend of all drainage systems is south to the coast. Drainage patterns reflect the geological trends of the pre-Cambrian basement rocks, with jointing lineations, schistosity, and later intrusions and rock formations exercising control and influencing directions of tributaries to a marked degree.

For the greater part of the year, the rivers are intermittent and consist of disconnected pools of brackish, saline and occasionally fresh waters.

North of the area, the drainage of the salina country appears entirely internal.

Geology.

Rock types of the area are:—

A.—Tertiary—Recent.

Rocks which are obviously Tertiary-Recent in origin include alluvial and eluvial soils, laterites, quartzose conglomerates and grits, (ferruginous or otherwise) sandy limestones, clays, sands, travertine, mudstone, spongelite, and lake deposits.

Such rocks are of limited distribution and minor significance and at this juncture need not be discussed further.

B.—Pre-Cambrian Rocks.

In this goldfield, two distinct ages of pre-Cambrian are known.

(a) The older granitised and mineralised basement rocks (generally termed greenstones) which comprise the economic important rocks of the district.

(b) The non-granitised and non-mineralised sediments which from their occurrence and distribution are of considerable antiquity and are considered to be also of pre-Cambrian age but younger than the underlying basement rocks

For clarification purposes in this report, the older pre-Cambrian rocks are tentatively named "Ravensthorpe Series" whilst the younger pre-Cambrian rocks are tentatively named "Kundip Series."

Portion of the distribution of these series is shown on the accompanying plate and a brief description of each series is given below.

(a) RAVENSTHORPE SERIES.

Named after the Ravensthorpe township about which these rocks are centred.

This Series can be conveniently grouped into four fundamental units:—

(i) Volcanic and Ultrabasics.

Include the numerous variety of rocks of volcanic origin, predominantly amygdaloids, agglomerates, tuffs, fine-medium grained phorphyritic andesite lavas.

Ultrabasic rocks comprise both massive, fine grained, schisted actinolitic-tremolitic and anthophyllitic types containing some residuals of bedded metamorphosed dolomitic sediments (Coconarup and Bandalup Creek). The Ultrabasics are in the main regarded as derivatives of original dolomitic and/or calcareous argillaceous sediments and predate the volcanics.

(ii) Jaspilitic.

Grouped together for convenience are the silicified banded iron formations (Jaspilites) with associated schistose meta-sediments and the Serpentinous rocks which lie in juxtaposition on the east side of the Ravensthorpe Ranges. The mutual relationship of these rocks is not known, but is regarded as being a conformable sedimentary sequence, the division being entirely lithological. The Serpentines are thought to be of dolomitic and not magmatic origin, but this question is for the present left open.

On present mapping, the relationship between the volcanic-ultrabasic unit and the silicified banded iron formations which comprise the ranges suggests an unconformity, with the former underlying and passing beneath the banded iron sedimentary formations.

A suggestion that the banded iron and associated meta-sediments may themselves be repeated by folding remains to be clarified. Superficial soils of talus laterite and jasper fragments cover all crucial slopes of the ranges and so far no basal conglomerate for this unit has been noted.

Banded iron formations with associated meta-sediments and a graphitic schist band seen south-east of Kundip near Horner's Jerdacuttup crossing show a displacement from the original north-north-west trend but are still thought to be an extension of this Jaspilitic unit.

(iii) Granitic and Magmatic.

(a) Granitic Gneiss.—The older Ravensthorpe rocks in the peripheral portions of the structure have been altered through granitisation processes into gneisses with observable gneissosities conforming generally to the original structures, i.e. a conversion into rocks of granitic character without passing through a magmatic state. Although variable, the gneisses are in the main of acid composition and commonly biotitic.

(b) Magmatic Granite/or Granites.—Has the shape of an elongated dome, topographically south plunging, and occupies the core portion of the older rock structure.

The magmatic granites are distinguished by their variability and wide range of hybridisation consequent upon assimilation of the older rocks. The granites show occasional flow lineations and contain scattered xenoliths of darker coloured material in all stages of assimilation.

Past analyses of the granites indicate a general sodic composition.

Mapping in the "Cattlin" vicinity suggests the existence of at least two ages of granite, an acid rich and a hornblende rich, the latter being a younger or later phase of the same magma. (Discussed further by the same author in a separate report on the Cattlin Group.).

The true relationship of the magmatic granites and gneisses cannot yet be stated, but from occurrence and relationship of these rocks to the Ravensthorpe Series, the magmatic granites are thought to be the result of a gneiss palingenisis, such mobilisation forming intrusive granite bodies and mineralising the pre-existing rocks. Pegmatitic and aplitic apophyses are also associated with these magmatic granites.

(iv) Dyke Intrusives.

The following intrusives have been known to occur within the Ravensthorpe Series:—

(a) Metamorphosed Porphyritic Andesites—interbedded with and forming an integral part of the volcanic agglomerate succession.

(b) Quartz diorites.—A parallel system of fine-medium grained rocks with N.N.W.-N.W. trend.

(c) Hornblendites.—Medium-coarse grained, not as abundant as (b) (of similar trend but younger in age).

(d) Quartz Gabbros (Quartz Dolerites in finer grained version).—Youngest intrusives in the older rocks, are arranged en echelon near granite contacts and cut indiscriminately all rock types have a general N.E.-E.N.E. trend.

(e) Granite apophyses.—Pegmatites: Two distinct types (fully discussed in separate report). Aplites: Few only. Quartzite bars: Barren and of minor importance (may be fault fillings).

For further discussion on above dyke systems and age relationships see "Cattlin" group report.

(b) KUNDIP SERIES.

As some doubt exists between the relationship of these rocks to those found in the Mt. Barren ranges, to the south, the name "Kundip" Series is for the present restricted to the Kundip area where the northernmost expression of this younger pre-Cambrian series was first noted and mapped. Lithologically the "Kundip" and "Mt. Barren" Series of rocks are the same, but they differ in topographic expression and metamorphic grade (see under metamorphism).

If not identical, there is a possibility that the "Mt. Barren" Series of rocks represent either a separate unit (pre-Kundip Series but post-Ravensthorpe) or even a south-westerly extension of the Jaspilitic unit of the "Ravensthorpe" Series. Till further work is done in this vicinity, the "Mt. Barren" Series and its relationship remains undefined.

The "Kundip" Series consist of conglomerates, phyllitic schists and shales, grits, quartzites and dolomitic sediments folded upon an axis trending N. 50-70° E. and overlying the "Ravensthorpe" rocks, the relationship being one of angular (and tectonic ?) unconformity.

It is of interest to note that this "Kundip" Series trend is that of the magmatic granite front and also the young Quartz gabbro dyke intrusions of the "Ravensthorpe" Series.

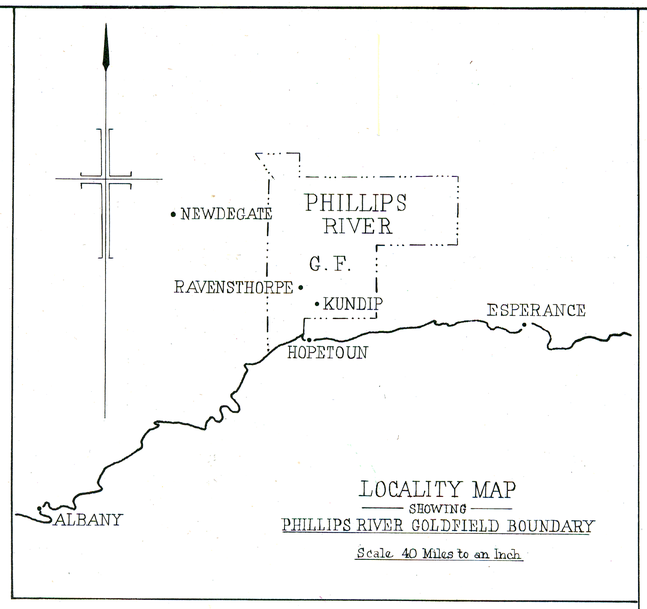
Basal Conglomerate.

Usually a siliceous rock with variable maroon, red and purple hues, 3-10ft. in thickness and composed of boulders and fragments of the older "Ravensthorpe" Series, with the more resistant siliceous banded iron (jaspilite) boulders being most prominent.

Size of boulders are extremely variable and attain their maximum dimensions of 2-3ft. blocks at the W.R. 36 damsite at Kundip, close to the western edge of the banded jaspilites. Elsewhere the jaspilite boulders are of cobble and pebble size.

Later thrusting movements have sheared and broken the conglomerate boulders giving brecciated appearance and in some places a pseudo-coral effect. Elsewhere complete resilicification has obliterated or dragged into thin whisps the jaspilite fragments, all stages of remelting and absorption being noted.

PLATE XI



LOCALITY MAP
SHOWING
PHILLIPS RIVER GOLDFIELD BOUNDARY
Scale 40 Miles to an Inch

LEGEND

TERTIARY RECENT
- Alluvium
- Soil covered areas, sand, superficial soils
- Ferruginous laterite, lateritic soils

PRE-CAMBRIAN

KUNDIP SERIES
- Conglomerates, shales, quartzites, phyllites, schists, grits dolomites etc.

RAVENSTHORPE SERIES

GRANITIC UNIT
- Magmatic granite
- Granite/gneiss

JASPILITIC UNIT
- Undifferentiated jaspilites, and associated meta sedimentary schists etc.
- Serpentines

VOLCANIC AND ULTRABASIC UNIT
- Fine-medium grained basic lavas, amygdaloids etc.
- Predominately agglomerates, with interbedded tuffs, porphyritic, amygdaloidal basic lavas etc.
- Ultrabasic rocks
- Granitised ultrabasics

REFERENCE

- Approximate geological boundaries
- Assumed geological boundaries
- Strike and dip of bedding
- Strike of vertical bedding
- Strike and dip of lineations
- Strike of vertical lineations
- Strike and plunge of dragfold
- Probable fault

GEOLOGICAL SURVEY OF WESTERN AUSTRALIA

GEOLOGICAL SKETCH MAP
OF THE
RAVENSTHORPE DISTRICT
PHILLIPS RIVER GOLDFIELD

Scale 80 chains = 1 inch

80 40 0 80 160 240

Geology by J. Sofoulis Oct. 1951 – Dec. 1952.
J. McMath Apl. 1952 – Oct. 1952.
N. Gray Oct. 1951 – May 1952.
J. Noldart Aug. 1952 – Dec. 1952.

Sediments.

Overlying the basal conglomerate are the series of quartzites, phyllitic schists and shales, grits, dolomites, etc., the regional trend of most horizons being E.N.E.-N.E., with varying dips from flat to vertical, the majority being within 15° S.-60° S. range.

Repetition by folding may well be present in this series as more than one quartzite, dolomite, conglomerate, etc., have been noted.

The blocky cross bedded massive quartzite which forms prominent mappable outcrops along the northern boundary of the series indicates its competency by showing a much lower order of dips, but as a whole, the "Kundip" Series of sediments can be assumed as a conformable set, no contrary evidence being noted.

In the phyllites, thin hornfels bands developed transverse to schistosity planes and southerly dipping are thought to be minor friction planes due to thrusting movements from the south-east. Phyllitic schists with some micaceous, are taken to be metamorphic variations of the shales due to the same thrusting movements.

On present mapping, the "Kundip" Series shows no evidence of granitisation, mineralisation or igneous dyke activity.

Secondary silica in the form of vug bands up to 2in. in thickness occurring in the phyllites are thought to be the result of crystallisation and segregation along bedding planes of colloidal silica in the original clay sediments, such segregation being pre-orogenic.

Barren quartz bars of larger dimensions are assumed to be minor fault plane fillings of a similar origin.

Structural Relationships.

On present mapping, the structure of the older "Ravensthorpe" rocks (volcanics and ultrabasics) appears as a south plunging synclinoid having a west dipping axial plane.

The Jaspilitic unit appears to unconformably overly portion of the east limb and dips steeply east to vertical.

Granitisation processes have altered the older folded rocks into gneisses around the nose and flanks of the main structure.

Magmatic granites occupy the central portion of the synclinorial structure and have apparently been intruded up the general southerly plunge, the shape being controlled by the nose and N.N.E. trend of the western flank and the N.N.W. trend of the Jaspilitic rocks.

The Jaspilitic unit shows a structural change south-east of Kundip near the Jerdacuttup (Horner's) crossing and the trend here subparallels that of the overlying "Kundip" Series with observable drag phenomena showing S.W. plunges.

Except for this structural change in the Jaspilitic unit, the structural trend of the "Ravensthorpe" Series is almost at right angles to the overlying "Kundip" Series and the major angular unconformity separating the two series may be rendered more complex by later thrusting from the south-east, such orogenic movements buckling the "Kundip" Series of sediments along N.E. axes with the thrust plane being virtually identical with the plane of unconformity.

Metamorphism.

(I) RAVENSTHORPE SERIES.

Regional Metamorphism is essentially of low grade although some chloritisation and uralitisation has taken place.

Higher grades of metamorphism have been noted with development of andalusite and garnet horizons within the schists of the Jaspilitic unit.

Thermal metamorphic effects are restricted to the immediate vicinity of the magmatic granite boundaries and andalusite crystals are developed in a few places along the granite contact. Garnetiferous zones paralleling the granite front are further stress results due to magmatic granite intrusion.

Regional dynamic metamorphism of the lavas has resulted in the development of incipient schistosity and fracture which transgresses original lava and agglomerate lineations (bedding?) and parallel the trend of the Jaspilitic unit. Relict structures of stretched amygdales are thought to be the result of flow or stress condition during formation.

The principal mineralogical changes of the "Ravensthorpe" rocks are amphibolisation and chloritisation.

Faulting.

From the present mapping and the many displacements seen in accessible shafts and plans of old workings it is apparent that this basement has been subjected to faulting.

Major displacements in the Jaspilitic unit also suggest faulting although in this instance repetition by folding may well be the cause. Minor and micro contortions and displacements in the jaspilites are thought to be preconsolidation movements whilst still in a hydrous gel form.

(II) KUNDIP SERIES.

Metamorphism in this series has been variable dependent on competency. Quartzites show little effects but in the fine clay sediments, superimposed schistosity in places completely obliterates bedding and slatey cleavage.

As a whole, the Kundip Series are low in metamorphic grade, and seldom exceed the phyllitic stage.

Ellis has commented upon the occurrence of Kyanite in the metamorphosed rocks of the Mt. Barren Series at West Beach[11] and should this series prove to be the same stratigraphic unit as the Kundip Series, then tectonic influences have been more severe in this coastal sector.

Mineralisation.

(I) RAVENSTHORPE SERIES.

The principal forms of economic mineralisation are:—

Gold-Copper—Quartz reefs and/or lodes.

Pegmatites—Tantalum and lithium suite.

Gold-Copper Mineralisation.

Field mapping has demonstrated the following facts:—

(a) The distribution of mineralisation is intimately related to that of the magmatic granite.

(b) Major workings located at or within one mile of the magmatic granite-lava contact.

(c) Mineralisation consists of parallel and en echelon lodes, the direction and trends of which are consistent with the shape of the magmatic granite front.

(d) Mineralised zones are generally associated with, and are contained in garnetiferous shear zones.

(e) Lava amygdaloids are a favourable horizon for Au-Cu mineralisation. Recorded production from the Jaspilitic unit is of a minor order and mineralisation of the ultrabasics being not as yet known.

(f) Shape of magmatic granite and granitic tongue offshoots are controlled by geological structures.

Pegmatite Mineralisation.

Restricted to small localities close to the magmatic granite front. The Cattlin Creek spodumene pegmatite forms the subject of a separate report and can be found elsewhere in this Annual Progress Report. Further zoned pegmatites were noted in the Cocanarup locality.

(II) KUNDIP SERIES.

As previously stated, no evidences of granitisation or mineralisation have been seen in the Kundip Series of rocks.

[11] 1951 Ellis, H. A.: Kyanite. *Geological Survey Report, 1949.*

This does not exclude the whole area delineated "Kundip Series" as being entirely worthless. The reappearance of the gneiss to the south and south-east of Kundip implies a limited vertical thickness for the Kundip Series and the extension of the mineralised belt at Kundip could well be at a shallow depth below the Kundip Series. An estimate by the writer (purely on topographic grounds) would be in the vicinity of 200-500 ft.

Prospecting Recommendations.

GENERAL.

It is highly probable that further mineralised areas comparable with those already worked in the district exist.

Available depth information indicates a limited vertical extent for the "Ravensthorpe" rocks and hence the maximum vertical depth for the persistance of ore bodies as estimated by the author would be in the vicinity of 800ft.-1,000ft., the goldfield possibly representing the roots of an ore system of a once much greater vertical thickness.

The repeated occurrence of "Hornblende" granite in the vicinity of past major workings may have some bearing on mineralisation. Similarly the "Quartz Gabbro" intrusives although post mineralisation, may represent a further revelation of structural weakness lines and are localised in areas where previous weakness lines now in the form of mineralised ore channels exist.

RECOMMENDATIONS.

(i) From present mapping, it is quite apparent that the area lying close to, or within a mile of the magmatic granite boundary is of major importance.

(ii) The nose portion of the magmatic granite shows a sharp boundary and all workings are located outside this granite boundary.

(iii) Flanks of the Ravensthorpe structure have been intruded by granite along bedding planes and thin greenstone lava remnants (sometimes mineralised e.g. "Jimm Dunn," "Elverdton" etc.) are often preserved. Except for these remnants, the granite proper does not warrant investigation.

(iv) Lateral prospecting from known ore channels to pick up parallel lodes is recommended.

(v) Garnetiferous schistose zones in the lava amygdaloids are strongly recommended.

(vi) Along the foothills of the western side of the Ravensthorpe Range, the Jaspilitic unit of rocks may have had some structural or localising influence, as in the past some good ore has been won here. Prospecting between the granite and the Range is recommended although normal prospecting methods would be difficult owing to talus and soil cover.

(vii) The west flank of the granite contact from Ongerup Road near Coconarup to west of Moir's farm, between the West and Phillips Rivers has had little prospecting and could show promise.

(viii) An extension of the mineralised rocks below the Kundip Series at Kundip would be worthy of a drilling prospect providing the Kundip sediments are of no great thickness.

This prospect is also suggested by the major change in structure of the Jaspilitic unit in this vicinity.

(ix) Small productions have been recorded from the Jaspilitic unit so that major structural displacements in the form of fault zones, dragfolds, etc. should not be overlooked. The supposed pyrite body at Mt. McMahon would also lie within this unit.

(x) Other goldfields of this State have shown that structural control has been an ore-localising factor and until such structural information is delineated, it is not possible at this stage to recommend areas on the east side of the Ravensthorpe Ranges. Lava amygdaloids are known to occur this side, and should they represent the extension of the Ravensthope series of lavas passing beneath the Jaspilitic unit, then this area would warrant further investigation.

Classification and Sequence of Rock Types.

	Age/Series.			Description.	Remarks.
Kainozoic	Tertiary to Recent.			Soils, alluvium, lacustrine deposits, laterite, coastal limestones, sands, clays, spongelite, grits, conglomerates, etc.	
				unconformity	No intervening record between Tertiary and Pre-Cambrian seen as yet.
	= Proterozoic Nullagine ?	Kundip Series		period of earthmovements Phyllites, conglomerates, dolomitic rocks, quartzites, shales, etc.	Mt. Barren Series may be an integral part of this Series.
				angular and ? tectonic uncomformity	
Pre-Cambrian	Ravensthorpe Series	Granitic and Magmatic unit		Quartz gabbros/dolerites Quartz diorite and hornblendite intrusives	Post granite and gneiss but pre-Kundip Series.
				igneous contact	
				Magmatic granites and pegmatites	Period of Au-Cu mineralisation.
				igneo metamorphic contact	
				Granitic gneisses and allied rocks	Granitisation of Ravensthorpe Series.
		Jaspilitic unit		Period of earth movements Serpentines, banded ferruginous quartzites (Jaspilites) pelitic schists, etc.	Conformable sedimentary.
				unconformity	
		Volcanic and Ultrabasic unit		Wide range of basic lavas, amygdaloids, agglomerates, tuffs, some interbedded intrusive fine, medium grained and porphyritic lava types. Ultrabasic rocks of sedimentary origin. ? ? ?	Conformable volcanic and sedimentary.

This classification is subject to modification as the survey progresses.

Acknowledgments.

The writer wishes to gratefully acknowledge the ever ready assistance offered to himself and colleagues by the members of the Ravensthorpe District.

REPORT ON CATTLIN CREEK SPODUMENE PEGMATITE, RAVENSTHORPE, PHILLIPS RIVER, GOLD FIELD, W.A.

Approximate Latitude 33° 35′ S.
Approximate Longitude 120° 02′ E.

By JOHN SOFOULIS, B.Sc.

Contents.

General.

Introduction.

Ravensthorpe is approximately 331 miles by road from Perth and 30 miles by road from the disused small vessel port of Hopetoun on the south coast. The nearest railhead is at Newdegate, 80 miles by road distant. The township is served twice weekly by the railway bust service from Perth.

The area mapped is approx. 1.3 miles from the Ravensthorpe Post Office along the Newdegate Road. A portion of the area is contained within the W.R. 17 location, and the remainder within the old M.L. 75 lease.

Previous Work.

A report on this same pegmatite entitled "A Spodumene Deposit, Ravensthorpe, W.A.," by the Government Geologist, H. A. Ellis, appears in the Geological Survey of W.A. Progress Report for 1943.

Geological Map and Method of Survey.

An attempt was made to delineate the areal and zonal distribution of the pegmatite with particular reference to minerals of economic importance known to be contained therein.

The geological map was constructed on a 100ft. to 1in. scale using plane table and telescopic alidade. Area was contoured at ten foot intervals, the datum peg for the survey being the N.W. corner of W.R. 17, and assumed as 730ft. This elevation based on Woodward's contours (Woodward H.P. 1909) would approximate the true elevation.

Geological boundaries can be taken as accurate, and where obscured, an approximate or assumed boundary is marked.

Zonal boundaries are approximate only, and are based on recognition of mineral assemblage in outcrops and delineation of recognisable assemblages in surface pegmatite rubble. Undifferentiated areas are left blank.

The pegmatite was mapped by the writer during May 1952.

General Geology.

Rock Types.

The pegmatite occurs in the amygdaloids of the pre-Cambrian volcanic rocks (greenstones) which make up portion of the "Volcanic and Ultrabasic Unit" of the "Ravensthorpe Series."

Included in the immediate vicinity are the greenstones, consisting of metamorphosed amygdaloidal, agglomeratic, fine and medium grained, basic lavas and tuffs. Magmatic granites are intrusive into these greenstone rocks.

The following dyke systems are also contained within the area:—

Quartz Diorites and Hornblendites: A dyke swarm of N.N.W.-N.W. trend.

Pegmatites: Of similar trend, occurring in the outer parts of the mineralising magmatic granite, and more common in the lava area fringing this granite mass.

Quartz Gabbros: N.E. trending dyke system.

Age Relationships.

The lavas have been invaded by magmatic granites. Quartz diorite and hornblendite dykes cut both lavas and granites. Hornblendites are considered late differentiates of the quartz diorite swarm.

Pegmatites cut through lavas, granites, quartz diorites, and hornblendites.

Quartz gabbros are intrusive into all the above rock types.

Note.—The pegmatites above refer to the barren pegmatites, i.e. the simple aggregate of quartz, felspar, mica, and minor accessory minerals. The pegmatite concerned in this report contains a mineral assemblage and is of possible post quartz gabbro age. (Discussed further under pegmatite geology.)

Distributions of the various rock types contained in the vicinity can be seen in Plate XIII accompanying this report. For regional distributions and Series nomenclature see plate accompanying "Progress Report" for this goldfield.

The Pegmatite.

Geology.

A blocky amphibolite completely surrounds, and in places overlies the pegmatite. Although of much larger dimensions than the normal quartz diorite dykes, the amphibolite is thought to be identical with this type of dyke, and of co-magmatic origin.

The amphibolite (quartz diorite) is bounded on the east side by an isolated body of granite, and a genetic relationship between this granite and the pegmatite is thought to exist.

Garnetisation and pyritisation were noted in this isolated granite body, but not in the nearby magmatic granite mass.

An aureole of tourmalinisation surrounds the pegmatite area. (See plate XIII).

Within the lavas enclosing the pegmatite, lineations due to alignment of amygdales have an arcuate distribution, and if representing bedding, then the pegmatite would be occupying the keel portion of an east dipping syncline.

In the granite vicinity, original amygdale fillings have been replaced by a hornblendic mineral, and where original amygdales have been elongated and dragged into thin whisps, lineation in the lavas is still retained.

A schistosity foliation seen in the lavas have the N.N.W.-N.W. trend which is the original trend of the "Jaspilitic Unit" of rocks forming the Ravensthorpe Range some three miles to the east This directional trend is also that of the quartz diorite and hornblendite dyke swarm.

Relation to Host Rocks.

A post lava, magmatic granite, quartz diorite, and hornblendite relationship has already been noted.

Two quartz gabbro dykes are shown on the accompanying plate but relationship of these dykes to the pegmatite is vague.

The northernmost quartz gabbro shown may terminate at the pegmatite boundary, whilst the southernmost exhibits a tourmalinised northern

gabbro-lava contact. Such criteria are suggestive of a pre-pegmatisation origin for the quartz gabbro intrusives.

As previously noted, the quartz gabbro dykes are known to cut through the barren type of pegmatites and are clearly post "barren" pegmatite in age.

Thus two pegmatisation phases may be represented; the earlier (pre-quartz gabbro) giving rise to the "barren" type pegmatites and the younger (post-quartz gabbro) giving rise to the "mineralised" type pegmatites.

The writer would like to point out however, that the area lies within the tourmalinised aureole, and as both quartz gabbros and lava lineations are parallel in this portion, such a tourmalinised boundary could represent a previous weakness plane tourmalinised by the pegmatite and subsequently intruded by the quartz gabbro.

Thus only one pegmatisation period (pre-quartz gabbro) may have been responsible for the formation of both "barren" and "mineralised" pegmatites, the difference in mineral assemblage being due to other causes.

It is generally believed that pegmatites carrying lithium minerals and other unusual mineral suites have been altered or replaced by later solutions and in this case pegmatite formation could be of pre-quartz gabbro age whilst the pegmatite replacement period be of post-quartz gabbro age.

The writer is inclined to a single pegmatisation period of a pre-quartz gabbro age so that the northernmost quartz gabbro shown would be intrusive into the pegmatite, and probably underlies portion of the area delineated as alluvial wash.

No tourmalinisation effects have been seen along the many quartz gabbros traversed, so the possibility that the quartz gabbro itself has been the tourmalinising medium is considered improbable. The tourmalinised aureole adjacent to the pegmatite is thought to be directly due to gaseous emanations during pegmatite formation or alteration replacement.

A genetic relationship between the soda rich pegmatite and the soda granites of the area is thought to exist.

Shape.

Field evidence indicates the shape of the pegmatite to be of a sheet like nature, similar to the flat lying tongues of pegmatite (½in. to 3ft. thick) intruding the quartz diorite in the bed of the creek at the south end of the pegmatite.

The S.E. contact showed dips varying from 90° to 15° and flatter, but the contours shown on the map would more or less reflect the upper surface shape of the pegmatite; the whole body, (neglecting surface rolls) would be dipping flatly to the east.

Idealised section indicates a pinching and swelling shape with a probable telescopement of zones in the pinching portions.

Outcrop shape has been influenced by the N.W.-N.N.W. trend prominent throughout the area and already referred to.

Extent.

It has been reported (Montgomery 1903) that two pegmatite bodies were encountered in the main shaft of the old "Lady Jessie" M.L.74 lease.

The first pegmatite was six feet in thickness where penetrated, and the lode was found above and below it. Another pegmatite layer was met at 65ft. depth, and continued to the bottom of the shaft (90ft.) so that this pegmatite is at least 25ft. in thickness.

The pegmatites contained similar mineralisation to that of the pegmatite mapped, so that the latter pegmatite encountered in the shaft is thought to be a west extension of the Cattlin Creek pegmatite, the same sheet being continuous at depth below the outcropping surface lavas.

Pegmatite shown on the map occurring on the M.L.74 lease would probably be the six foot body penetrated in the "Lady Jessie" shaft. The surface outcrop of this pegmatite showed a finer grained version but similar mineralogy to that of the mapped pegmatite and is probably another parallel sheet or tongue offshoot of the same pegmatite mass.

A possible sub-surface lateral extent for this pegmatite mass is indicated by the sporadic black tourmaline development in the greenstones and quartz diorites of this vicinity and the approximate limits of this tourmalinised "aureole" is shown on Plate II.

Further pegmatite outcrops of similar mineralisation were noted on the east side of M.H.L.28 location.

Internal Structure.

Outcrop conditions did not permit definite zonal delineations, but from occurrence and mineralogical associations, the general sequence of mineral assemblages, based on Cameron's (1949) formulated zonal sequence, appears to be:—

1.	Plagioclase-quartz-muscovite	Border Zone
3.	Quartz-plagioclase-perthite + muscovite	Wall and Intermediate Zone
4.	Perthite-quartz	
6.	Plagioclase-quartz-spodumene + muscovite	
8.	Lepidolite-plagioclase-quartz	
11.	Quartz	Core

Zones two, five, seven of the ideal sequence do not appear to be present and some flesh tinted microcline fragments between the quartz core and lepodilite zone suggest the possible presence of zones nine and/or ten.

The occurrence of quartz-cleavelandite + muscovite, and cleavelandite-quartz + muscovite, near the core is not completely understood, but thought to be of a late replacement origin.

Diagrammatic cross sections through the pegmatite suggest the pinch and swell structure. Surface mapping of the pegmatite itself shows merging and thinning out of outer zones and in some places complete absence, indicating complex telescopement and discontinuity of zonal distribution.

Component Minerals.

The following minerals are known to be contained in the pegmatite:—

Major Constituents—
- Quartz.
- Felspars: Albite, Cleavelandite, Perthite, Microcline, Orthoclase.
- Micas: Muscovite, Lepidolite, Sericite.
- Spodumene.

Minor Constituents—
- Tourmaline: Schorlite, Elbaite, Dravite varieties.
- Microlite: Bismuth bearing Stibio var.
- Amblygonite.
- Lithium bearing Beryl.
- Manganocolumbite.
- Montebrasite.
- Cassiterite.
- Columbite.

A rough volume approximation of the pegmatite composition would be:—Quartz, 40 per cent.; Felspars, 40 per cent.; Spodumene, 8 per cent.; Micas, 8 per cent.; other minerals, 4 per cent.

Zonal Occurrence and Description.

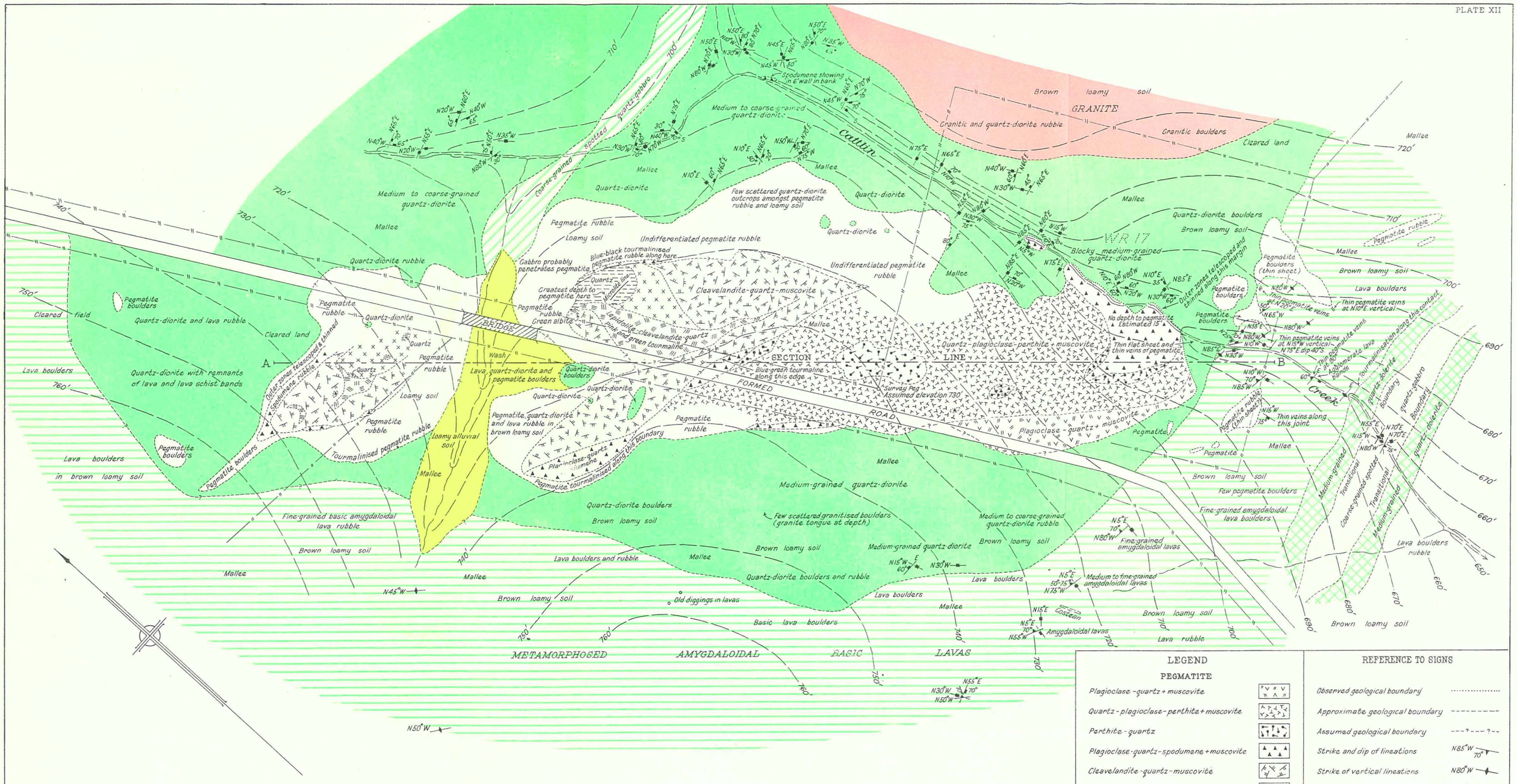
(I) ECONOMIC MINERALS.

(a) Spodumene.

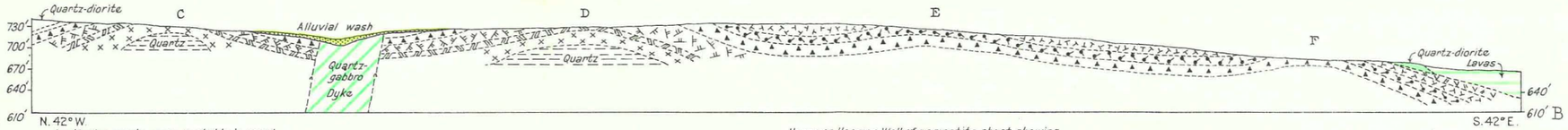
A major constituent of the plagioclase-quartz-spodumene zone. Best outcrops are on the bed and west bank of the Cattlin Creek at the south end of the pegmatite.

Spodumene occurs here as fresh apple green coloured semi-opaque crystal laths in a mosaic of albite quartz and lime green muscovite.

Crystals vary in size from 2ft. 6in. x 6in. x 4in. in the bed of the creek down to crystals of pebble size. Density of occurrence varies considerably



DIAGRAMMATIC SECTION THROUGH A-B



Lenticular quartz cores probable in zonal "swells", with probable zonal repetition on footwall of pegmatite.

Upper or Hanging Wall of pegmatite sheet showing possible zonal "swells" at C, D, E and F. Suggested sub-surface zonal extensions as shown.

LEGEND

PEGMATITE

- Plagioclase-quartz+muscovite
- Quartz-plagioclase-perthite+muscovite
- Perthite-quartz
- Plagioclase-quartz-spodumene+muscovite
- Cleavelandite-quartz-muscovite
- Lepidolite-cleavelandite-quartz
- Quartz-cleavelandite-muscovite
- Quartz

- Alluvial wash
- Quartz-gabbro
- Quartz-diorite
- Quartz-dolerite
- Metamorphosed amygdaloidal basic lavas
- Granite

REFERENCE TO SIGNS

- Observed geological boundary
- Approximate geological boundary
- Assumed geological boundary
- Strike and dip of lineations (N85°W, 70°)
- Strike of vertical lineations (N80°W)
- Strike of vertical joints (N40°W)
- Strike and dip of joints (N30°W, 60°)
- Fences
- Contours (600')

GEOLOGICAL SURVEY OF WESTERN AUSTRALIA

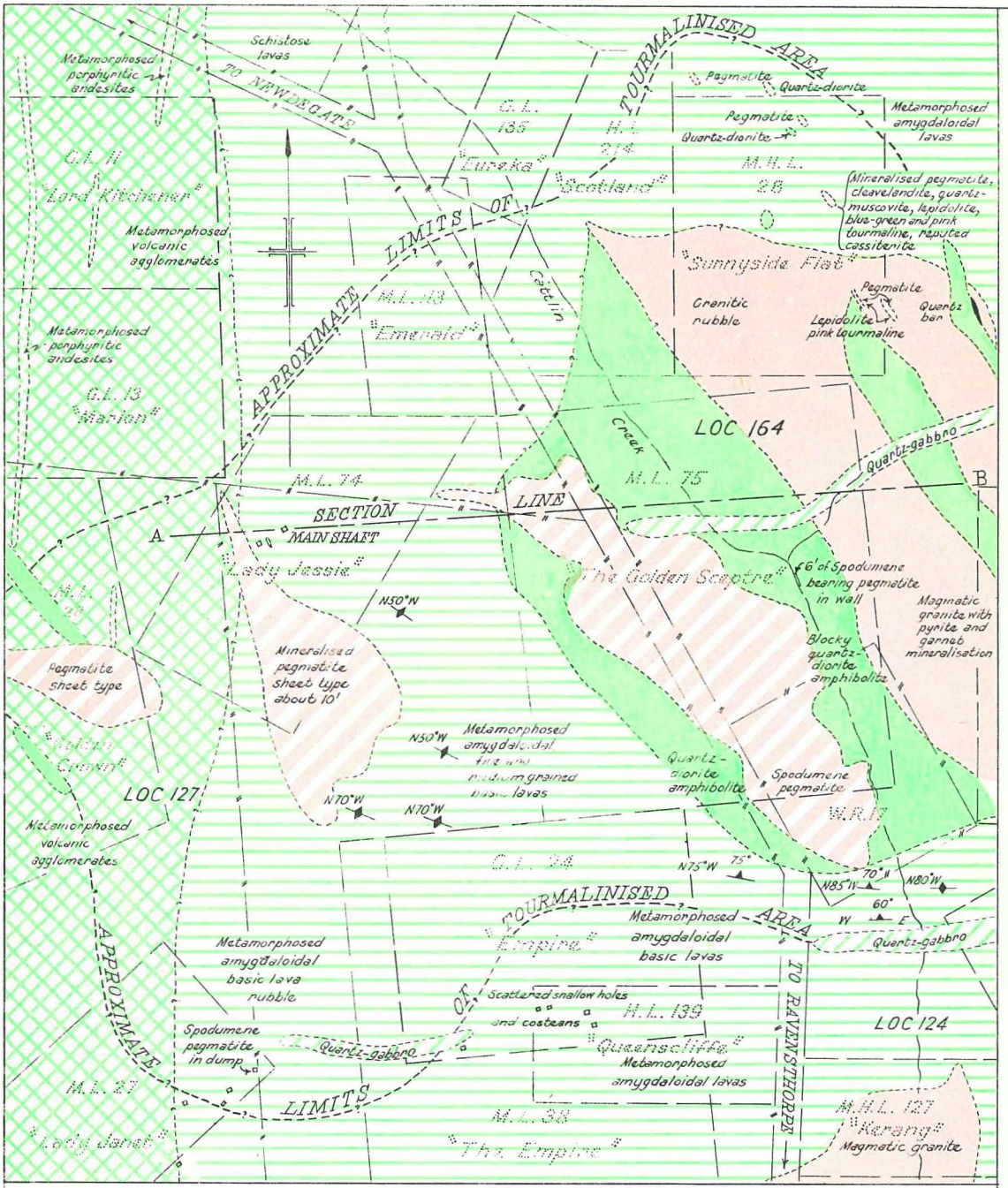
GEOLOGICAL MAP
— OF THE —
CATTLIN CREEK SPODUMENE PEGMATITE
— RAVENSTHORPE —
PHILLIPS RIVER GOLDFIELD

Scale : 200 feet to an inch

200 100 0 200

Geology and telescopic alidade survey by J. Sofoulis, May, 1952

PLATE XIII

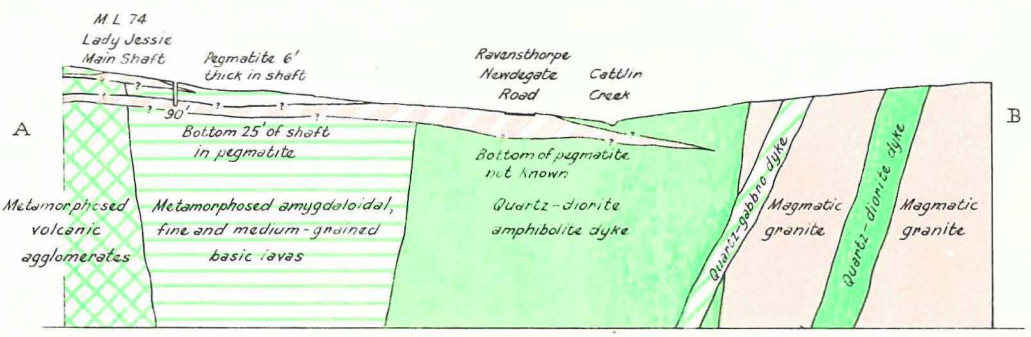


—LEGEND—

- Pegmatite
- Quartz-gabbro
- Quartz-diorite
- Granite
- Amygdaloidal lavas
- Porphyritic andesites
- Agglomerate lavas

—REFERENCE—

- Approximate geological boundaries
- Assumed geological boundaries
- Strike and dip of lineations N50°W 60°
- Strike of vertical lineations N50°W
- Shafts (disused)
- Fences
- Drainages



DIAGRAMMATIC SECTION
ALONG A—B

GEOLOGICAL SURVEY OF WESTERN AUSTRALIA

GEOLOGICAL MAP
— OF THE —
CATTLIN CREEK
PEGMATITE AREA
RAVENSTHORPE
PHILLIPS RIVER GOLDFIELD

Scale 10 chains to an inch
5 0 10

Geology and telescopic alidade survey, by J. Sofoulis, B.Sc. 1952.

over small areas, and the maximum concentration of spodumene crystals would be 20 per cent by volume. Other portions where spodumene occurs show a leaner distribution, from 5-10 per cent only.

Without knowing the true attitude and extent of the spodumene zone it is difficult to give an estimate of spodumene tonnage available for the whole pegmatite.

Ellis (1943) gives a visual estimate of spodumene available for the outcrop at the south end of the pegmatite and suggests a figure of 23,232 tons of spodumene bearing pegmatite, estimated to contain 3,014 tons of spodumene.

Quality of Spodumene.—Chemical analyses by the Government Chemical Laboratory on representative samples of spodumene taken, give the following results: —

	Per cent.
Lab. No. 9383 Lithia (Li_2O)	= 6.20
Lab. No. 16448/52 Lithia (Li_2O)	= 6.18

An analysis of spodumene from this pegmatite appearing in Bulletin Nos. 5 and 35 gives the following composition:—

SAMPLE No. 1864.

	Per cent.
SiO_2	61.94
Al_2O_3	26.48
FeO	1.82
MnO	Trace
CaO	.28
Li_2O	7.02
Na_2O	1.93
K_2O	.47
H_2O combined	.29
	100.23

Specific gravity 3.20

(b) Microlite (calcium pyrotantalate).

A thin black-green vein occurring in the quartz core has previously been worked, and the recorded production given by the Mines Statistician shows that to July, 1951, 500 lb. of microlite were won from three tons of ore.

In addition to the microlite, 16 lb. of bismuth ore (10.2 per cent.) were recorded to be won from the same ore mined.

These workings (P.A. 764) consisted of a series of shallow holes located in the quartz core, and the maximum depth of the deepest hole was said to be 6ft.

Analysis on a sample submitted to the Government Chemical Laboratories indicates a bismuth bearing stibio microlite variety. (Lab. No. 13091).

(c) Lepidolite.

A main constituent of the discontinuous lepidolite-plagioclase-quartz zone. The lepidolite occurs as bunches, rosettes, and scaly aggregates, and as a minor constituent in thin quartz veins.

Colour varies from pink to lavender hues, and dimensions of flakes seen in book form vary from 5in. x 4in. down to small flakes $\frac{1}{8}$in. x $\frac{1}{8}$in.

The lepidolite zone appears comparatively thin, and estimated to be not more than 4ft. maximum thickness.

In the same crystal book, a gradation from lepidolite to clear muscovite was noted, the lepidolite being a late replacement mineral and of a lithium bearing muscovite variety.

Quality of Lepidolite.—Analyses given by Simpson (1951) on a sample from this pegmatite and from a similar pegmatite occurring at Coconarup 10 miles to the west, give the following results:—

	Ravensthorpe.	Coconarup.
SiO_2	48.78	47.58
Al_2O_3	27.40	29.01
Fe_2O_3	.64	.58
FeO	—	.30
MnO	1.17	2.71
MgO	.42	.31
Li_2O	3.26	2.60
CaO	—	.56
Na_2O	1.00	.64
K_2O	9.20	10.94
Rb_2O	2.34	not determ.
Cs_2O	Tr.	not determ.
TlO_2	Tr.	not determ.
TiO_2	.03	.02
H_2O+	1.86	1.95
H_2O-	.24	.24
F	5.52	4.78
Total	101.86	102.22
$O+F_2$	2.32	2.01
Net total	99.54	100.21
S.G.	2.87	2.87

(II) OTHER MINERALS.

(a) Quartz.

A major constituent of all zones occurs in two varieties, a milky coloured, and a glassy variety, the latter often in vein form in places intergrown with perthite to give a graphic effect.

(b) Felspars.

Albite: The dominant felspar in the outer zones, with the curly variety cleavelandite prominent in the inner. An apple green variety of cleavelandite occurs near the north end of the main lepidolite outcrop, close to the quartz core. Cleavelandite is another mineral considered of late replacement origin.*

An analysis, appearing in Bulletin 35 (Woodward 1909) on albite taken from this pegamite, gives the following composition:—

	Per cent.
SiO_2	69.13
Al_2O_3	19.44
FeO	Nil
MnO	Tr
CaO	Nil
Li_2O	Nil
Na_2O	10.83
K_2O	.04
H_2O comb.	.17
Total	99.61
S.G.	2.63

Perthite.—Microcline is intergrown with albite to give the mineral perthite, and occurs immediately above the spodumene zone.

Orthoclase.—Impure orthoclase (buff coloured) occurs amongst the apple green cleavelandite.

Microcline.—A few weathered out white-flesh tinted microcline pieces were noted near the quartz core.

(c) Micas.

Muscovite.—Whitish silver-grey and colourless muscovite occurs in the outer zones but has a lime green tint in the intermediate zones. Of scrap size only and occurs as evenly distributed books and most prominent in the wall zone. A brown stained mica was noted near the east side of the quartz core.

A finely divided sericitic mica is often seen coating crystal faces and cleavage planes.

Where seen on the border zone the muscovite shows the typical A structure books oriented subnormal to pegmatite boundaries.

(d) Tourmalines.

Elbaite.—Two colour varieties are closely associated with one another and occur as scattered radiating prisms within the lepidolite - cleavelandite - quartz zone, and occasionally in the inner part of the spodumene zone. There are:—

Pink Tourmaline.—The rubellite variety of elbaite.

Green Tourmaline.—Elbaite variety which often envelopes a core of the pink variety and occasionally a milky white elbaite.

* Polished surfaces of large hand specimens clearly reveal the apple green cleavelandite replacing microcline felspar—H. A. Ellis, Government Geologist.

These elbaite varieties have been fully described by Simpson (1937) who gives the following partial analyses:—

	Pink Elbaite.	Green Elbaite.
SiO_2	39.07	37.92
Al_2O_3	41.25	39.18
FeO=total Fe	.19	2.14
MnO	.54	1.34
MgO	.10	.40
CaO	.29	.22
Li_2O	1.28	1.24
Na_2O	2.32	2.64
K_2O	.20	.42
	S.G. 3.00-3.02.	S.G. 3.02-3.04.

Black tourmaline (schorl var.) is concentrated along the pegmatite boundaries and also occurs within the lava amygdaloids in the tourmalinised aureole of the pegmaite.

Dravite has been noted by Simpson (1951).

(e) Amblygonite, Montebrasite.

In small rare white pockets and in vein form, occurring with the greenish cleavelandite, quartz, and lepidolite.

(f) Beryl (Lithium bearing).

Cream coloured, opaque in hand specimen, similar occurrence to amblygonite above.

(g) Manganocolumbite.

Rare constituent, often associated with the lepidolite in the inner zones of the pegmatite. (Simpson 1952).

(h) Cassiterite, Columbite.

Noted by Ellis (1943) to occur with lepidolite and amblygonite on the M.H.L. 28 lease a short distance north-east of the pegmatite mapped.

Economic Considerations.

Extent of Deposit.

The pegmatite found in this area is thought to be of a sheet like nature with a possible subsurface lateral extent as shown by the aureole of tourmalinisation.

Outcrops of similar mineralisation noted on M.H.L. 28, M.L.'s 74 and 28 leases are thought to be independent sheets or tongue offshoots of the main "Cattlin Creek" pegmatite.

A thickness of at least 25ft. of pegmatite is known.

Future Development.

Should production costs and mineral prices favour the development of this pegmatite, the following factors are worthy of note:—

(a) Freshness to the surface and consequently hardness of the pegmatite, together with intimate intergrowth with quartz and felspar would not favour hand picking or crushed ore. The relative high specific gravities of the economic minerals suggest concentration by other methods.

(b) Minerals of economic importance are concentrated in the inner parts of the pegmatite, i.e., the spodumene, lepidolite and core zones.

(c) Black minerals (excluding tourmaline) should not be neglected as in all probability they would be of the tantalite-cassiterite suite.

(d) Zonal attitudes are irregular and mineral occurrence could vary accordingly. Zonal "swells" as shown in the cross section would offer greater zonal continuity

(e) Further veins, similar to the microlite vein already worked, would be difficult to establish as the pegmatite is overlain to a large extent by a thin mantle of soil and rubble cover. This soil cover contains little or no significant accumulations of eluvial economic minerals.

(f) Concentrates would have to be bagged and freighted to Newdegate, the nearest rail head.

(g) The main Newdegate-Ravensthorpe road passes along the west side of the pegmatite, and would require diversion should the pegmatite be developed in this direction.

Conclusions.

Spodumene appears to be the only mineral available in commercial quantities to warrant further investigation.

Other minerals of lithium and tatalum suites could be of economic interest providing sufficient quantities exist.

As pegmatites are noted for their irregular behaviour with respect to zonal continuity and mineral content, a prospecting campaign for determining zonal dimensions would be necessary before any accurate estimate of available mineral bearing pegmatite can be given.

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REPORT ON THE CATTLIN MINING GROUP, RAVENSTHORPE, PHILLIPS RIVER GOLD FIELD, W.A.

Approximate Latitude 33° 35′ S.

Approximate Longitude 120° 02′ E.

By JOHN SOFOULIS, B.Sc.

Contents.

General.

Introduction.

This group was mapped in detail, with the ultimate object of a later reproduction in bulletin form. For this reason, the report is of a brief nature only, and only salient facts are given. For the same reason, the geological map prepared (scale 1in. = 5 ch.) will not be published with this report.

General.

The township of Ravensthorpe, main centre of the Phillips River Goldfield, is located approximately 330 miles by road from Perth. The disused small vessel port of Hopetoun on the south coast of W.A. (between Albany and Esperance) lies approximately 30 miles south of Ravensthorpe. A railway which had linked Ravensthorpe and Hopetoun since 1909 was abandoned in 1935. The nearest railhead is at Newdegate, 80 miles by road distant.

An hotel, post office, garage facilities and several stores are contained in the Ravensthorpe township, and the area is visited twice weekly by the Railway Bus Service from Perth.

Wheat and sheep are the chief agricultural pursuits of the district, mining activity being virtually dead. The present population of the area is approximately 200.

Area.

Approximately seven and a half square miles, lying immediately north and north-east of the Ravensthorpe townsite, the principal portions falling within locations 34, 35, 124, 127, 261 and mining reserve 21276.

Reference Maps.

Mines Dept. Lithograph L 105.

Lands and Surveys, Perth L.O. 420/80.

Fieldwork.

Area was mapped using plane table and telescopic alidade. Survey was carried out during July-September, 1952.

Previous Work.

The Cattlin Mine and vicinity has been previously mapped by Malcolm Maclaren and his report (entitled: "Geological Report on Mines of the Phillips River Gold and Copper Company Limited") is incorporated in the W.A. Dept. of Mines report by A. Montgomery on the "Development of the Phillips River Auriferous Copper Mines" (1914).

Descriptions of the geology and some of the mines contained within the area are given in the Geological Survey of W.A. Bulletins Nos. 5 (T. Blatchford 1900) and 35 (H. P. Woodward 1909) plus other sundry W.A. Dept. of Mines reports by A. Montgomery (1903 and 1910).

Water Supplies.

Unless exceptionally dry years are experienced, the area is adequately supplied with water for domestic and agricultural use. The present dams of the area are Cordingup dam of 20 million gallons capacity and the Town dam of five million gallons capacity.

Domestic supplies for household use are mostly from roof catchment and adequate stock waters are available in the agricultural areas.

Smaller dams constructed for railway and mining purposes are now in disuse.

Plentiful supplies of salt water are obtainable at depth (50-400ft.).

Timber and Firewood.

Sufficient supplies of timber for fuel and mining purposes are available in the non agricultural areas.

Geology.

Rock Types of the Area.

(I) GREENSTONES.

Consist essentially of metamorphosed amygdaloidal, agglomeratic, tuffaceous porphyritic fine and medium grained basic lavas.

The greenstone lavas were found to be two zonal belts—predominantly amygdaloidal, and predominantly agglomeratic.

A metamorphosed series of phophryitic andesite dykes occur within the agglomerates and are thought to have been intruded along bedding planes. No such dykes were noted within the amygdaloidal lavas.

(II) GRANITES.

The northern nose of the dome shaped magmatic granite mass lies within the mapped area. The granite is extremely variable in appearance, but generally of a sodic composition. The prominence of a hornblende-rich granite in the vicinity of the old Cattlin and Maori Queen leases suggests the magmatic granite as being of at least two phases (possibly more), with the hornblende granite being the economically important "mineralising" phase.

(III) DYKE INTRUSIVES.

The following dyke systems were noted:—

Quartz Diorites.

Consistes of a N.W.-N.N.W. trending swarm of dykes cutting both lavas and granites. Are generally from 40 to 150ft. in width though variations from this are present.

Within the granite area, the quartz diorites form relatively resistent bodies and prominent mappable features, their length, abundance, and remarkable parellelism being of particular note.

Due to similarity in appearance to some lava types, and relatively equal erosion qualities, the quartz diorites are not so prominent within the greenstone area, but are probably as abundant.

Past underground mining information from this area indicates that these dykes which are of a tabular nature, dip steeply to the south-west, are often faulted on a small scale (5ft.-50ft. displacement), and cut through mineralised zones.

Hornblendites.

Not as abundant as the quartz diorites, but of similar trend. The hornblendites appear younger, and are considered to be a late differentiate or phase of the same magma which gave rise to the quartz diorite swarm.

Pegmatites.

Confined to the outskirts of the granite and occur in both greenstone and granite, are tabular or lens like bodies and follow a general N.W.-N.N.E. trend.

A mineralised pegmatite phase represented by flat lying pegmatite sheets is also contained within the area. (See separate report on "The Cattlin Creek Spodumene Pegmatite" found elsewhere in this progress report.)

Quartz Gabbro Dykes.

Youngest dyke system of this area, generally occur within the granite or in the lavas fringing the granite.

These dykes are arranged en echelon N.E., a trend which corresponds to that of the granite front. The repeated occurrence of these dykes near old major workings may have some bearing on mineralisation localisation.

In the hand specimen, the quartz gabbro appears coarse grained practically to both margins of the dyke. The segregation of the ferro-magnesian constitutents into clots is responsible for this course grained appearance, and the rock type was for field purposes termed quartz gabbro. From the fine grained versions seen in rare chilled margins, a more fitting name for this rock would be quartz dolerite.

The dykes are estimated as being from 50-100ft. in thickness, and where seen on the surface, are generally in the form of large rounded outcrops and boulders, the line of which is traceable over large distances.

Age Relationships.

A chronological order for the rock types found within the area is given as:—

Quartz Gabbros (youngest)
Pegmatites
Hornblendites
Quartz Diorites
Granites
Amygdaloidal lavas
Agglomerate lavas, tuffs etc. (oldest)

Structure.

The lava area is thought to be of a south plunging synclinorial nature with magmatic granite having been intruded up the pitch and forming a dome shaped mass occupying the core or central portion of the syncline.

Area mapped includes portion of the west flank and nose of this lava structure fringing the granite mass. Granite shape has been controlled by the west flank and nose of lava structure and on the east side by the N.W.-N.N.W. trending Jaspilitic rocks which overlie the east flank of the lavas.

The axial plane of the syncline would be of N.W.-N.N.W. trend, similar to the trend of the jaspilitic rocks. Quartz diorite intrusives, and lava schistosity foliations also follow this trend.

Westerly dips of the quartz diorites and granite offshoots seen in mine workings, suggest a west dip for the axial plane of the main structure. Ore shoots also pitch in this direction.

Agglomerate lava bedding on the west flank of the structure is indicated by the interbedded porphyritic lava bands.

Other lava lineations are thought to be original bedding and flowage lineations. Such lineations are often transverse to the north-west schistosity foliation.

Pegmatite dykes generally conform to the schistosity foliation of the lavas close to the granite, and to the lineal trends of the lavas away from the granite.

Metamorphism.

Taken on a regional basis, metamorphism has been of low grade, the principal changes being amphibolisation, chloritisation and uralitisation. Higher grade metamorphic effects are indicated by garnet and andalusite development.
Dynamic metamorphism has resulted in the north-west schistosity, prominent throughout the area.

Thermal metamorphism is restricted to the immediate granite front vicinity and mineralised garnetiferous zones are developed in the lavas along shear zones which parallel this granite front.

Faulting.

The previously mentioned N.N.W.-N.W. trending quartz diorite and E.N.E.-N.E. trending quartz gabbro dyke systems are thought to have been intruded along fault zones and are responsible for the dislocation of mineralised zones.

Maclaren considers that the faulting movements of the N.N.W. trend have been lateral, and in the Cattlin mine, the relative movement has been west side displaced to the south.

For the E.N.E.-N.E. trending faults, the displacement seen in the jaspilites east of the area indicates a relative south side to the west movement.

Mineralisation.

Host Rocks.

Mineralisation is best developed in the lava amygdaloids fringing the magmatic granite mass.

Recorded production from the agglomerate horizon indicates that these rocks have been less favourable hosts and such mineralisation which has occurred is of little signficance compared with that of the amygdaloids.

Mineralised Garnetiferous Shear Zones.

Garnetiferous shear zones developed in the lavas have acted as channels for both gold and copper mineralising fluids.

With regard to such garnetiferous shear zones, the following facts are known:—

(i) They consist of small garnet crystal development along shear zones within the lavas only. Lavas are often schistose close to the shear zones, schistosity and shear lines being parallel.

(ii) Garnetiferous shear zones do not consist of a single shear, but rather a series of echelon shears, concentrated along zones at varying distances from the granite.

(iii) The direction of such shear zones is parallel to that of the shape of the granite front, being disposed along N.E. lines in the Maori Queen vicinity and E.-W. in the Cattlin area.

(iv) Past workings are aligned along such garnet shear zone trends, and garnetiferous lavas were noted in the dumps of most workings.

(v) Past workings lie within a mile of the granite front boundary.

(vi) Lack of workings in the garnetiferous shear zones found beyond this mile limit suggests that the mineralising emanations from the magmatic granite have had limited penetrating powers.

The Mines.

Except for some shallow holes and open cuts, no underground workings were inspected in this area as most shafts have been in disuse since World War I period and are now inaccessible.

The principal mines in this area have been the Cattlin, Maori Queen and Floater mines and a summary of the information given in the previously mentioned published literature, together with deductions and observations resulting from this present survey, is given below.

Cattlin.

Lode, which strikes N. 65° E. and dips 85° to the W.N.W., consists of sheared greenstones (lavas) with quartz and chalcopyrite mineralisation. Poorer portions are composed of greenstone and quartz with pyritic minerals (pyrrhotite, marcasite and chalcopyrite) in splashes or disseminated throughout the entire mass.

The greenstone is foliated and the lode walls are often smooth due to shearing movements.

A N.N.W. trending granite tongue (offshoot from the main granite mass to the south), and N.N.W.-N.W. trending quartz diorite dykes cut through the lode dividing it into several parts. As both granite tongue and quartz diorites dip to the south-west, the lode has previously been referred to as consisting of several S.W. pitching shoots.

The quartz diorites and granite tongue are later in formation than the mineralised shear zone and shoots had been difficult to connect on either side of these intrusions.

Quartz diorite dykes occupy N.W. trending lateral faults and the lode is displaced for short distances along this direction. Relative movement has been west side displaced to the south.

The deepest level in the Cattlin mine is recorded as 530 feet, with shallower levels at 400ft., 300ft., 200ft., 100ft. and 65ft. Up till the time of Montgomery's 1910 report, drive lengths for the different levels varied from 400-800ft. As this mine had been worked till the early twenties the drive, stope, and depth information given by Montgomery (1910) and Maclaren (1914) would be out of date and later development information is not available.
Lode formation for the higher levels was said to vary from 4-30ft. in width, whilst between the 300ft. and 400ft. levels, the ore body was between 5-10ft. in width, and as much as 15ft. in places.

Gold values above the 200ft. level were stated as being in the vicinity of 5 dwt. per ton, and at the 530ft. level averaged 4dwt. per ton.

A parallel lode present approximately 30ft. north of the Cattlin lode was driven on for short lengths but the quality was poor. Similar parallel lodes occur on the Andante lease (207) further east. This lease, which is closer to the granite, carried much quartz and was mainly worked for the gold content.

On the Cattlin lode, the portion carrying higher gold values was that lying to the east or footwall side of the granite tongue. As a whole, the Cattlin lode constantly varied in both copper and gold values. The oxidised zone extended downwards for only 54 feet and the primary sulphides were met without any appreciable zone of secondary enrichment.

The mine was said to make about 120,000 gallons of salt water per day, most of it encountered between the 300ft. and 400ft. levels.

Production.—Past production figures supplied by the Mines Statistician for the Cattlin (ML 15) mine give:—

Year.	Ore.	Copper.	Value.
	Tons.	Tons.	£
1902–1905	281·56	31·35	1,716
1906	1,263·76	80·26	7,646
1907	6,357·67	322·35	28,167
1909–1915	14,432·25	714·9	40,313
1915–1920	2,177·98	142·64	15,296
Total	24,513·22	1,291·50	93,138

Maori Queen.

On this mine, the lode occurred practically on the contact between the granite and lavas, near the nose of the main magmatic granite mass. Lode consisted of a quartz reef striking in a north-east and south-west direction and the workings of the old "Maori Chief" G.M.L.4 mine to the south-west are probably in the continuation of the same shear line.

The lode in the Maori Queen workings dipped at an angle of 75° to the N.W. and at the 70ft level it pitched and went down vertically. A N.W. trending quartz diorite dyke 40 feet in width and dipping S.W. cut through the lode.

In the oxidised zone which extended to a depth of 30ft., the lode was about 4ft. in width but below this it became highly mineralised and carried a little chalcopyrite with the width varying tween one and 4ft. At the bottom of the main shaft, (200ft.) the width of the lode reduced to 6-8in.

From the surface down to the water level (about 80ft.) that portion of the lode lying south of the quartz diorite dyke has been stoped for a length of 160ft., but of this only 40ft. nearest the intrusion was of high grade, and this portion only was stoped down to the 200ft. level when even this became poor.

In the workings north of the quartz diorite intrusion, the lode had been stoped to the 70ft. level for a length of 70ft. but below this only the northern section of 20ft. had been stoped down to the 100ft. level, this shoot pitching to the south-west.

Production.—For the Maori Queen workings, the following production is recorded:—

Year.	Gold Ore.	Gold Therefrom.	Remarks.
	Tons.	Fine ozs.	
1901–1905	5,070·00	4,048·94	as G.M.L. 1
1907*	2·44	51·59	as G.M.L. 119
1909–1913	754·67	501·96	as G.M.L. 153
Total	5,827·11	4,602·49	

* 13·73 tons of copper ore were also treated and yielded ·18 tons of copper valued at £14.

Floater.

The lode worked on this lease had a north-east course and went down nearly vertical. A main vertical shaft was sunk in the ore body to a depth of 236 ft. and three levels were worked. At the 60ft. level, the lode was driven on for distances of 120ft. north and 240ft. south with only 68ft. being in payable ore.

Ore above this level was mostly quartz, much ironstained, and often showing a considerable quantity of gold. Below this level, the character of the lode changed to schistose greenstone containing sulphides of iron and copper and in places a little telluride of bismuth. Quartz in the form of veins and bunches was attached to the irregular lode walls.

The ore body pitched slightly to the north-east and averaged 70ft. in length, eight and a half feet thick, and was followed down for a depth of 316 ft. It attained its maximum longtitudinal extent at a depth of 110ft. where it was 104ft. in length, below which it decreased to 64 ft. at the 236 ft. level, and only 44ft. at the winze bottom (286ft. below the surface).

Gold values which returned 1.14 ozs. per ton in the upper levels fell to .12 ozs. at the bottom.

Production.—Figures available for the Floater workings till 1908 give:—

Year.	Ore Crushed.	Gold Therefrom.	Remarks.
	Tons.	Ozs.	
1901–1906	*12,729·19	10,855·14	as G.L. 43
1907–1908	152·00	78·67	as G.L. 82
Total	12,881·19	10,933·81	

* Of this figure ·49 tons of copper were obtained. from 49·19 tons of ore.

Other Workings.

A string of old workings in a N.E. trending shear zone are located approx. 35 chns. north-west of the Maori Queen line. Highest production recorded for this string came from G.M.L. 76 (formerly Plantagenet G.M.L. 50) being up till 1905, 556 tons of ore treated for a yield of 185.92 ozs. of gold.

The reef worked on this lease underlaid slightly to the north-west and was reported fairly rich near the surface, but poor in the sulphide zone which came in below 30ft. The greenstone here became very hard and schistose, and carried a little chalcopyrite.

Further leases in this string included M. Ls. 30, 26, & G.M.L. 160.

A smaller but similar N.E. trending shear is located approximately 18 chns. north-west of the "Plantagenet" line, and the highest production recorded here came from the Grafter (G.L. 17, = G.L. 202) being up till 1907, 295.85 tons of ore crushed to yield 370.89 ozs. of gold and 1.99 tons of copper.

Other small workings of this area have been of a minor significance only, and need not be discussed further.

Conclusions.

Both gold and copper mineralisation occur in this area. Most mineralisation is connected with the shear pattern developed in the lavas. The shears of major importance are this which trend in a direction parallel to the granite front. Minor shears (as shown by the Sirdar G.M.L. 60 workings) are developed normal to the granite front.

The formation of the shear pattern and mineralisation is thought to be due directly to the granite invasion, and most mineralisation has occurred in the lavas immediately fringing this granite mass. Granitic tongue offshoots from the main granite mass are generally associated with mineralised shear zones.

Such granite tongues are thought to reflect the minor internal fold structures of the lavas, with the shape of the granite front itself reflecting the major flexures of the synclinoid, both minor and major flexures having some influence over mineral distribution.

Repeated occurrence of N.E. trending quartz gabbro dykes in the vicinity of major workings suggests a cross fold influence.

Lack of confirmative structural detail, due to poor outcrop conditions and inaccessibility of workings, make it difficult to explain the localisation of copper and gold distribution. The reported gold occurrence on the footwall side of the granite intrusion as shown in the Cattlin workings and also the lateral and vertical distance from the main granite mass may be of significance. The possibility of two granitic phases has previously been mentioned.

Taken as a whole, the mineralisation of the Cattlin Group area can be summarised as follows:—

(i) Mineralisation generally occurs in shear zones (often garnetiferous), the directions of which are parallel to the shape of the granite front in the immediate vicinity.

(ii) Shear zones are thought to consist of multiple, parallel and echelon shears, and not a single shear only.

(iii) Mineralised shear zones dip steeply away from the granite and richer portions which are lenticular in nature pitch south-west.

(iv) Mineralisation is confined to the shear zones of the lavas at, or within a mile of, the main granitic mass-lava boundary.

(v) Lava amygdaloids have been the preferred hosts for mineralisation.

(vi) Gold mineralisation is generally associated with quartz veins.

Recommendations.

It is highly probable that ores similar to those which have once been worked in the district exist.

Schistosity foliations in the lavas in directions other than the prominent N.N.W.-N.W. Jaspilite trend are good indicators of shears. Garnetiferous portions in such schistose zones are strongly recommended.

Lateral prospecting, by drilling from known or past worked shoots, is most strongly recommended.

The immediate vicinity of granite boundaries, especially areas where hornblende granite and quartz gabbros are known, could show promise.

Regardless of gold content, with the present day methods of mining and treatment, this area is a worthy copper prospect, providing the high price (at present £350 Aust. per ton) is maintained.

Index to Geological Survey Annual Progress Report for 1952.

INDEX—*continued.*

Division V.

School of Mines, Western Australia.

The Under Secretary for Mines:

Sir,—I have the honour to submit for the information of the Honourable the Minister for Mines my report for the year 1952.

1.—SCHOOL OF MINES, KALGOORLIE.

Enrolments.

The total number of enrolments received during the year was 421—an increase of 33 by comparison with 1951. The increase is partly accounted for by the increase from 49 to 53 in the number of E.G.H.S. boys taking sub-junior or junior geology, but mainly by an increase in the number of normal School of Mines students. Table I gives the individual and class enrolments for 1950, 1951, and 1952, and Table II gives the enrolments in various subjects in 1952.

TABLE I.

Enrolments: 1950, 1951, 1952.

Year.	First Term.		Second Term.		Third Term.	
	Individual.	Class.	Individual.	Class.	Individual.	Class.
1950	361	907	320	771	309	671
1951	368	794	321	652	281	550
1952	391	857	363	711	303	582

TABLE II.

Class Enrolments, 1952.

Subject.	1st Term.	2nd Term.	3rd Term.
Preparatory Chemistry	27	24	19
Chemistry IA	14	13	10
Chemistry IB	3	3	3
Analytical Chemistry I	6	5	4
Analytical Chemistry II	5	5	4
Metallurgy I	4	3	3
Metallurgy II	4	4	4
Assaying	6	6	6
Mineral Dressing	5	4	4
Metallurgy and Mineral Dressing	11	9	8
Metallography	6	4	4
Engineering Metallurgy	7	10	4
Preparatory Mathematics	41	30	26
Mathematics IA	42	34	24
Mathematics IIA	32	29	25
Mathematics IIB	7	6	6
Applied Mathematics	11	8	5
Preparatory Physics	23	17	13
Physics IA	24	22	14
Physics IB	11	11	11
Trade Mathematics I	47	45	35
Trade Mathematics II	2	2	2
Preparatory Drawing	52	33	21
Engineering Drawing I	30	22	17
Engineering Drawing and Design IIA	8	10	7
Engineering Drawing and Design IIB	5	3	3
Engineering Drawing and Design IIC	5	4	2
Surveying Drawing II	8	7	2
Mechanical Engineering I	6	4	4
Mechanical Engineering II	6	5	5
Practical Electricity	13	9	9
Electrical Engineering I	15	10	9
Electrical Engineering II	6	6	6
Internal Combustion Engines	22	17	13
Workshop Practice I	34	26	18
Workshop Practice II	12	10	8
Workshop Practice IIIA	6	4	3
Workshop Practice IIIB	3	3	3
Welding I	28	25	22
Welding II	12	10	8
Engine Driving	8	5	3
Structural Engineering I	8	8	7
Structural Engineering II	2	2	2
Hydraulics	6	5	5
Machine Design	4	4	4
Materials of Construction	12	10	9
Preparatory Geology	15	13	11
Geology IA	9	9	9
Geology IB	9	7	7
Geology IIA	14	12	11
Geology IIB	7	5	5
Geology III	2	2	2
Mining I	17	10	9
Mining II	7	4	4
Mining III	14	12	6
Surveying I	10	9	9
Surveying II	14	13	11
Preparatory English	6	5	6
Technical English	21	18	16
Preliminary English	10	6	4
Junior Geology	16	13	12
Sub-Junior Geology	37	37	36
Totals—1952	857	711	582
1951	794	652	550

The total enrolment was made up as follows:—

(1) Students paying class fees (21 years of age or over)—			
Full-time	3		
Part-time	88		
		—	91
(2) C.R.T.S. students (Class fees paid by C.R.T.S.)—			
Full-time	—		
Part-time	24		
		—	24
(3) Students paying only a registration fee of 5s. or students who pay no fees including E.G.H.S. pupils.—			
Full-time	8		
Part-time	199		
		—	207

(4) Students who are returned servicemen, and exempt from class fees (General regulation 5). Not enrolled under C.R.T.S.—		
Full-time	—	
Part-time	99	
	—	99
Total		421

Revenue.

Fees amounting to £594 3s. 4d. were received from students enrolled under groups 1, 2 and 3 above, for diplomas and certificates issued, and from the sale of official publications. Fees received for work done in the Kalgoorlie Metallurgical Laboratory, and paid into a trust fund amounted to £316 9s. 6d.

Staff.

Staff changes as indicated below occurred during the year:—

Name.	Position.	Date.	Notes.
Bialecki, G.	Laboratory Assistant	7–4–52	Appointed
Crisp, C. E.	Cadet	11–2–52	Appointed
Cundill, M.	Typist	24–11–52	Appointed
Doran, R. R. H.	Assistant	25–7–52	Resigned
Flottman, R. A.	Assistant	25–8–52	Appointed
Green, E. J.	Assistant	18–3–52	Resigned
Hughes, E. E.	Research Metallurgist	4–12–52	Resigned
Jennings, S. J.	Typist	10–10–52	Resigned
Jones, J. L.	Cadet	11–2–52	Appointed
Mason, C. S.	Junior Clerk	2–9–52	Transferred to Crown Law
Rasmussen, R.	Junior Clerk	1–9–52	Appointed
Smith, L. I.	Assistant	19–3–52	Appointed previously Laboratory Assistant.
Thompson, B. M.	Fitter/Turner	28–4–52	Appointed

Courses of Study.

During the year a lot of thought was given to existing courses, and, at the suggestion of the Advisory Committee, sub-committees were appointed to consider each of the Associateship Courses and the related Certificate Courses. These sub-committees included representatives of the Advisory Committee, of the Associates of the School, of the Australian Institute of Mining and Metallurgy, of the Institution of Engineers, Australia, together with the Lecturer-in-Charge of the Department concerned and the Director of the School. The thanks of the school are due to the members of these committees for their assistance. All sub-committees recommended that some changes should be made in the courses under consideration. These changes were approved, and the revised courses will commence in 1953. Details are to be found in the 1953 prospectus.

Annual and Supplementary Examinations.

For the annual examination 458 entries were received for individual subjects, which figure is 54 per cent. of the total class enrolments. This is a small improvement (3 per cent.) on the corresponding figure for 1951, but is lower than the corresponding figures for the previous five years. The percentage of passes at the annual examinations and at the annual plus supplementary examinations remained approximately the same as in 1951, and was again lower than that for the five years previous in 1951. Details are given in Table III.

Examination results for the various subjects are given in Appendix 1.

TABLE III.

Examination Results, 1946-1952—Kalgoorlie.

	1946.	1947.	1948.	1949.	1950.	1951.	1952.
Class Enrolments = A	1,331	1,834	1,498	1,129	946	833	856
Number of entries for Annual Examinations = B	880	1,196	1,097	750	579	434	458
B/A per cent	66	64	73	66	61	51	54
Number of passes at Annual Examinations, as a per cent of A	58	53	55	49	48	41	43
Number of passes at Annual Examinations, as a per cent of B	88	81	76	74	78	79	80
Number of passes at Annual and Supplementary Examinations, as a per cent of A	60	55	57	52	50	44	44
Number of passes at Annual and Supplementary Examinations, as a per cent of B	90	84	79	78	81	84	82

Scholarships and Prizes.

Only one entry was received for the Mines Department Scholarships. A Senior Scholarship was awarded to Garrett Michael Sainsbury of Norseman. Mr. Sainsbury will commence his studies for the Associateship Course in Mining in 1953.

Towards the end of the year attractive scholarships were offered by the Chamber of Mines with the object of encouraging students to complete courses at the school. The first awards will be made early in 1953.

Otherwise scholarships and prizes remained as for 1951, and a list of awards is given in Appendix 2.

The following Diplomas and Certificates were granted in 1952:—

Diplomas and Certificates.

Associateship Course in Metallurgy	2
Associateship Course in Mining	5
Associateship Course in Mechanical and Electrical Engineering (pre-1947 course)	2
Associateship Course in Engineering (post 1947 course)	4
Associateship Course in Mining Geology	0
Assayer's Certificate	1
Surveyor's Certificate	14
Engineering Draughtsman's Certificate	3
Electrical Engineer's Certificate	0
Mechanical Engineer's Certificate	0
Engine Operation and Maintenance	0
Industrial Chemist's Certificate (pre-1947 course)	1

In July approval was given for Diplomas and Certificates to be granted without the payment of any fees. Previously a fee of £2 2s. was required for a Diploma, and £1 1s. for a Certificate.

Commonwealth Reconstruction Training Scheme.

There are still a few students training under this scheme. In 1952 there were no full time students and only 24 part time students. Details for the past three years are:—

	1950	1951	1952
Full-time	9	2	—
Part-time	54	40	24

Classes for High School Pupils.

Classes in sub-junior and in junior geology were again held, and enrolments were as follows:—

	1950	1951	1952
Sub-junior geology	20	37	37
Junior geology	—	12	15

Of the 15 enrolled for junior geology 11 entered for the Junior Examination in that subject, and nine were successful in passing.

Services to the Public.

During 1952 the school continued to provide a number of services to the public other than its teaching activities.

More details are given in a later section of this report about the work done in the Kalgoorlie Metallurgical Laboratory.

During the year 374 samples or specimens were received at the school from prospectors or others. The majority were submitted for mineral examination or for gold assay, but other work was required on some. Details are as follows:—

Assay—gold	99
Assay—gold and other constituents	16
Analysis—metals other than gold	18
Assay or analysis plus mineral examination	22
Mineral examination	213
Rejected	6
Total	374

All assays and analyses were made in the Metallurgical Laboratory, and all mineral examinations by Mr. Cleverly, Lecturer-in-Charge of Geology. The senders were advised if the material submitted contained any minerals likely to be of value. This work is done without charge, and is a valuable service to prospectors.

As in previous years various examinations, including the Junior and Leaving Public Examinations, and University Examinations for external students, were held at the school. Various professional bodies continued to meet at the school.

Members of the staff continued to give advice and assistance when asked.

Buildings.

Generally the buildings are in satisfactory condition, but do require renovating externally, and, in part, internally. Various improvements were made during 1951, and will be referred to in more detail in the next section of this report (Requirements of the School).

Requirements of the School.

During 1952 work on the new fume cupboards in the chemical laboratories was commenced, and this will be completed in time for the opening of the school in 1953. Except for the Metallurgical Laboratory the school has now been transferred to alternating current. Thus all the major requirements of the school listed in 1947 have now been completed except for the Mineral Dressing Laboratory for student use.

During 1952 also the installation of the Aerogen petrol gas generator was commenced, and the gas will be available in the chemical laboratories during 1953. Alterations were made to the office during the long vacation, but the strong room has been deferred. This is still an important requirement.

The major requirements of the school are now as follows:—

(a) A mineral dressing laboratory for student use (estimated cost at 27/9/51, £5,775).
(b) Alterations and extensions to the Kalgoorlie Metallurgical Laboratory (estimated cost at 9/7/52, £14,550).
(c) A central library and a full-time staff (estimated cost of library at 29/5/51, £18,500).

Minor requirements are:—

(a) Improvements to the lighting in the workshop.
(b) Transfer of the Kalgoorlie Metallurgical Laboratory to A.C.
(c) A strong room for the office.

Advisory Committee.

The Advisory Committee held nine meetings and attendance was as follows:—

Mr. J. H. Verran	8
Mr. J. E. Manners	8
Mr. C. H. Warman	8
Mr. J. A. Maloney	4
Mr. W. R. Matthews	4
Mr. R. A. Hobson	9

Mr. W. R. Matthews resigned as A.W.U. representative on 30/10/52, and Mr. F. Collard was appointed in his place. The Registrar, Mr. Lumb, continued to act as secretary.

A further grant of £2,000 (£1,000, Mines Department; £1,000, Chamber of Mines) was received for the Apparatus and Equipment Trust Fund. The estimated balance in the fund at the end of the year was £386.

As mentioned in an earlier section of this report various sub-committees were appointed at the suggestion of the Advisory Committee to consider existing courses.

Kalgoorlie Metallurgical Laboratory.

During the year the staff of the laboratory was kept fully occupied, and 51 reports were issued—an increase of six by comparison with 1951. Of the 51 reports issued 20 had reference to gold, and the remainder to other metals or to non-metallics. Fourteen reports referred to tungsten ores. In addition work was commenced on 11 other samples, and 217 free assays or analyses were done for prospectors. Of the 51 reports completed 31 consisted of assays or analyses, which could not be done as free assays, and the remaining 20 were metallurgical investigations. The total number of individual metallurgical tests was 511, and the total number of assays or analyses was 3,424. Because of the number of investigations on ores other than gold ore the proportion of chemical analyses was large, and two members of the staff were fully occupied on this work.

More details of the work done during the year are given by the Senior Research Metallurgist in Appendix 3. The Senior Research Metallurgist was available throughout the year for consultation, and members of the staff visited plants to give advice and assistance, mainly in connection with problems under investigation in the laboratory.

The pilot plant equipment referred to in last year's annual report has not yet been received, but some is due to arrive in W.A. shortly, and the remainder should not be long delayed. Because of the financial position no progress was possible with the proposed alterations and extensions to the buildings. These are very desirable and should be done as soon as possible.

2.—SCHOOL OF MINES, NORSEMAN.

The total number of enrolments received during the year was 63—an increase of 11 by comparison with 1951. In addition classes were arranged in General Science for 10 State School children. One of these classes was taken by Mr. Bourke of the State School staff, and the other by Mr. Williamson of the School of Mines staff. A very pleasing feature was the small loss of students during the year. This is well shown in Table IV, which sets out the enrolments for 1950, 1951, and 1952, but does not include State School children.

TABLE IV.

Enrolments: 1950, 1951, 1952.

Year.	First Term.		Second Term.		Third Term.	
	Individual.	Class.	Individual.	Class.	Individual.	Class.
1950	50	97	46	89	41	75
1951	49	112	39	90	31	72
1952	55	139	59	142	55	138

Revenue.

The revenue received was £60 2s. 6d.

Staff.

The full-time staff remained as for 1951.

The thanks of the school are due to the following part-time instructors, without whom the school could not carry on: Messrs. J. Abotomey, R. Atkinson, D. A. Huxtable, B. W. Long, L. W. Morris, F. R. Rose.

Subjects Taught.

Twenty-one School of Mines subjects were taught at Norseman during 1952. The thanks of the school are due to Central Norseman Gold Mines for making available their workshops for classes in Workshop Practice and in Welding.

Annual and Supplementary Examinations.

The number of entries for individual subjects was 108, which is 72 per cent. of the total class enrolments. This figure is higher than the corresponding figure for 1951, and also higher than the figure for Kalgoorlie. A summary of examination results is given in Table V.

Examination results for the various subjects are given in Appendix 1.

TABLE V.

Examination Results, 1946-1952—Norseman.

	1946.	1947.	1948.	1949.	1950.	1951.	1952.
Class Enrolments = A....	80	54	130	130	78	112	149
Number of entries for Annual Examinations = B	57	47	107	81	47	68	108
B/A per cent.	71	87	82	62	60	61	72
Number of passes at Annual Examinations, as a per cent. of A	51	72	59	47	55	53	54
Number of passes at Annual Examinations, as a per cent of B	72	83	81	77	91	88	75
Number of passes at Annual and Supplementary Examinations, as a per cent of A	51	72	68	50	56	54	58
Number of passes at Annual and Supplementary Examinations, as a per cent of B	71	83	85	81	93	89	80

Scholarships and Prizes.

The Reg Dowson Scholarships based on the results of the 1952 Annual Examinations were awarded to C. J. Young and L. G. Kerr. The two students, J. K. Hall and R. W. Pettit, who were awarded these scholarships at the end of 1951 both completed a satisfactory year's work.

One of the Mining Standard prizes was awarded to Mr. D. F. O'Driscoll, who gained the highest marks in Mining I (Kalgoorlie and Norseman).

Building.

Lack of funds prevented any extensions to the existing building. As the variety of subjects available at Norseman is increased, and consequently the variety of equipment is also increased the storage problem is becoming more and more acute. The office accommodation is very poor, and the accommodation for some classes is very unsatisfactory. The proposed extensions should be completed as early as possible.

Advisory Committee.

This committee continued to meet under the chairmanship of Mr. Dutton, and thanks of the department are due to members who gave of their time to assist the school.

Classes for School Children.

Although the Director of Education had advised that the facilities made available at the School of Mines would not be required this year, it was found that the proposed science room at the State School could not be completed. Assistance was again given by the School of Mines. At the request of the Director of Education, two classes in General Science replaced classes in Chemistry, in Physics and in Geology, and one of these classes was taken by a member of the State School staff. This arrangement worked quite satisfactorily, and some children were thus enabled to complete Junior General Science.

BULLFINCH.

Towards the end of the year approval was given for a branch school at Bullfinch, and arrangements were completed for this school to open in February, 1953.

ACKNOWLEDGMENTS.

Information for sections of this report has been compiled by the Registrar at Kalgoorlie, the Registrar at Norseman, and the Senior Research Metallurgist. Thanks are due to all members of the staff for conscientiously carrying out the duties allotted to them during the year. Thanks are also due to the Advisory Committees at Kalgoorlie and at Norseman, and to members of the various subcommittees who assisted with the revision of School of Mines Courses.

R. A. HOBSON,
Director, School of Mines.

Appendix 1.

School of Mines of Western Australia.

ANNUAL EXAMINATIONS, 1952.

Pass List.

Passes are in order of merit.

* Denotes equal. † Denotes year fee scholarship.

PREPARATORY ENGLISH.

Credit—
†Ritchie, H. G.
Pass—
Thomas, R.
Jordan, A. F.
Timoney, E. G.

TECHNICAL ENGLISH.

Credit—
†Steel, W. D.
Pass—
Brownrigg, N. J.
Slade, L. K.
Smailes, J. P.
Cedro, J. A.
*{Baker, I. A.
{Field, R. V.
*{D'Alton, A. J.
{Thompson, A. F.
McRae, R. K.
*{Tanner, A. C.
{Pegler, A. V.
{Spencer, W. J.

Supplementary Examination Granted.
Timoney, E. G.

TRADE MATHEMATICS I.

Credit—
†Danahy, A. F.
Softley, W. R.
Carthew, A. E. H.
Cozins, C. F.
Pass—
Thomas, R. C.
Hansen, G. W.
Beange, J.
Kew, J. A.
Beilken, C. D.
Smith, G. C.
Stafford, J. B.
Cugley, K.
Dyson, A. L.
Douglas, D. C.
Mackay, I. D.

Supplementary Examination Granted.
Jackson, L. J.
Rowe, J. G.
McCulloch, J. A.

TRADE MATHEMATICS II.

Credit—
Shiel, S. T. J.
Genge, A. B.

PREPARATORY MATHEMATICS.

Credit—
†Crane, G. H.
Christopher, V.
Shearn, A. S.
Pass—
Bennett, V. G.
Bosustow, B. G.
Willis, J. S.
Hug, R. L.
Wolff, D. L.
Fraser, P. G.
Eade, S. W.
Terrell, R. J. H.
Wilkinson, R. H.
Trythall, W. T.
Horsham, V. J.
Beckett, R. H.
Fiegert, J.

MATHEMATICS IA.

Credit—
†Bialecki, G.
Radzikowski, S. A.
*{Murphy, A. J.
{Wallis, F. A.
Pass—
Howard, F. C.
Ward, W.
Chamberlain, H. I.
Irwin, K. S.
Budiselic, G. H.

MATHEMATICS IIA.

Credit—
†Hobson, J. (Miss).
Crisp, C. E.
Pass—
Jones, J. L.
Baker, I. A.
Ritchie, S. J. L.
Jacobs, N. M.
Warburton, J. C.
Meiklejohn, G.
McLellan, G. K.
Ion, C. E.
Miles, A. T.
Currie, E. G.
Vukobratich, S.
Love, J. O.
Edgar, K. R.
Spivak, D. R.

Supplementary Examination Granted.
Marsh, F. E.
McDermott, J. C.
Shenton, E. F.
Thompson, A. F.
Scott, S. J.

MATHEMATICS IIB.

Pass—
Meiklejohn, G.
Crisp, C. E.
Baker, I. A.
Love, J. O.
Moir, G. A.

APPLIED MATHEMATICS

Credit—
†Hooker, L. F.
Pass—
D'Alton, A. J.
Hill, J. C.
Thompson, A. F.

PREPARATORY PHYSICS.

Credit—
†Willis, J. S.

Pass—
Fraser, P. G.
*∫Bosustow, B. G.
∣Dodge, G. J.
Bailey, W. J.
Glassborow, P. D.
Thomas, R. C.
Marshall, K. R.
Pass Theory Only—
Hansen, G. W.
Pass Practical Only—
Whiteley, P. J.

Supplementary Examination Granted.

Stafford, J. B.

PHYSICS IA.

Pass—
Howard, F. C.
Scott, S. J.
D'Alton, A. J.
Bennett, V. G.
Pass Practical Only—
Jordan, A. F.
Sclanders, K. A.
Skates, J. B. M.

PHYSICS IB.

Pass—
Matheson, W. S.
Hobson, J. (Miss).
Field, R. V.
*∫Crisp, C. E.
∣Warburton, J. C.
Jones, J. L.
Spivak, D. R.

Supplementary Examination Granted.

Gard, R. C.

PREPARATORY CHEMISTRY

Pass—
*∫Kew, J. M.
∣Wolff, D. L.
Boddington, E. H.
Willis, J. S.
Jordan, A. F.
Clifton, D. J.
Bosustow, B. G.
McDermott, J. C.

Supplementary Examination Granted.

Fiegert, J.
Harlond, B. C.
Horsham, J.

CHEMISTRY IA.

Credit—
†Oliver, J. B.
Cedro, J. A.
Pass—
Fariss, T. W. L.
Dodge, G. J.
Taylor, S. R.
Flower, J. S.
Pass Practical Only—
Jacobs, N. M.

CHEMISTRY 1B.

Credit—
†Hobson, J. (Miss).

ANALYTICAL CHEMISTRY I.

Credit—
*∫Bower, J. K.
†∣Brownrigg, N. J.
Pass—
D'Alton, A. J.

ANALYTICAL CHEMISTRY II.

Credit—
†Gittos, A. J.
Pass—
Lynn, F. T.
McRae, R. K.
Tanner, A. C.

ENGINEERING METALLURGY.

Pass—
Turner, B. G.
Faichney, J. M.

METALLURGY I.

Pass—
Thomas, R. P.
Field, R. V.
Brownrigg, N. J.

METALLURGY II.

Credit—
†Miles, A. T
Pass—
McRae, R. K.
Pass Theory Only—
Tanner, A. C.

Supplementary Examination Granted.

Shaw, S. C.

METALLURGY AND MINERAL DRESSING.

Credit—
†Lissiman, J. C.
Darroch, I. N.
Pass—
Manners, M. D. L.
Shanahan, J. P.
Steel, W. D.
Pegler, A. V.

Supplementary Examination Granted.

Spivak, D. R.

METALLOGRAPHY.

Pass—
Shaw, S. C.
Middleton-White, K.
Moriarty, C. J.

MINERAL DRESSING.

Credit—
†Spencer, W. J.
Pass—
Thomas, R. P.
Brownrigg, N. J.
Pass Theory Only—
Field, R. V.

ASSAYING.

Credit—
†Lissiman, J. C.
*∫D'Alton, A. J.
∣Spivak, D. R.
Pass—
Dowson, J. W.
Brown, S. D.

PRACTICAL ELECTRICITY.

Credit—
†McMahon, E. J.
Moore, R. R.
Carthew, A. E. H.
Cozins, C. F.
Pass—
Genge, A. E.
Beilken, C. D.

ELECTRICAL ENGINEERING I.

Credit—
†Mathieson, W. S.
Pass—
Miles, A. T.
Crocker, R. F.
Bennet, J. M.
Shanahan, J. P.
Christopher, L. F.
McDonald, T. G. P.

Supplementary Examination Granted.

Moriarty, C. J.

ELECTRICAL ENGINEERING II.

Credit—
†Creagh, N. B.
Pass—
Wallis, F. A.
Baker, I. A.
Moir, G. A.
Fariss, T. W. L.

MECHANICAL ENGINEERING I.

Credit—
†Marsh, F. E.
Gard, L. A.
Matheson, W. S.
Pass—
Warburton, J. C.

MECHANICAL ENGINEERING II.

Credit—
†Creagh, N. B.
Pass—
Baker, I. A.
Whyte, K. G.

STRUCTURAL ENGINEERING I.

Credit—
†Gard, R. C.
Lissiman, J. C.
Pass—
Steel, W. D.
Pegler, A. V.
Amin, D. R.
Spivak, D. R.
Christopher, L. F.

STRUCTURAL ENGINEERING II.

Credit—
†Baker, I. A.
Pass—
Ritchie, H. G.

HYDRAULICS.

Pass—
McRae, R. K.
Fariss, T. W. L.
Moriarty, C. J.
Rich, H. J.

MACHINE DESIGN.

Credit—
†Gard, L. A.
Wallis, F. A.
Pass—
Harlond, B. C.
Currie, E. G.

MATERIALS OF CONSTRUCTION.

Pass—
Whyte, K. G.
Marsh, F. E.
Jones, J. L.
Crisp, C. E.
Scott, S. J.
Hill, J. C.
Bailey, W. J.
Faichney, J. M.

WORKSHOP PRACTICE I.

Credit—
†Jones, J. L.
Crisp, C. E.
Flower, J.
Pass—
Willis, J. S.
Browner, P. J.
*∫Bosustow, B. G.
∣Jacob, C. A.
Warner, N.
Harvey, R. J.
Pass Practical Only—
Armstrong, A. M.
Deeble, D. T.
McCulloch, J. A.

Supplementary Examination Granted.

Thomas, R. L.
Jackson, L. J.

WORKSHOP PRACTICE II.

Credit—
†Whyte, K. G.
Tregidgo, P. R. W.
Pass—
Nichols, L.
Dyson, A. L.
West, A. T.
Pass Practical Only—
Bolitho, K. D.

WORKSHOP PRACTICE IIIA.

Credit—
†Thompson, B.

WORKSHOP PRACTICE IIIB.

Pass—
*∫Cox, E. J.
∣Danahy, A. F.
Genge, A. B.

INTERNAL COMBUSTION ENGINES.

Credit—
†Matheson, W.
Danahy, A. F.
McMahon, E. J.
Softley, W. R.
Pass—
Crocker, R. F.
Douglas, D.
Alexander, W. I.
Beange, J.
Rucklidge, A.

WELDING I.

Pass—
Matheson, W. S.
Ritchie, H. G.
Bailey, F. D.
*∫Trythall, W. J.
∣Jacob, C. A.
∣Gazeley, F.
*∣Lillingston, H. F.
∣Taylor, C. W.
Martin, M.
Winner, E. G.
*∫Winner, E. A.
∣Genge, A. B.
Wilson, M. G.
Brown, G. W.
Naylor, A. J.
Stearne, J. F.
Purser, M. R. B.

WELDING II.

Pass—
Cox, E. J.
O'Connor, A. J.
Beavis, R. J.
Bailey, W. J.
Whitley, G. T.
*∫Munro, W. T.
∣Thompson, B. M.

ENGINE DRIVING.

Pass—
Genge, A. B.
Russell, R. G.

PREPARATORY DRAWING.

Credit—
†Blown, C. E. (Mrs.).
Bosustow, B. G.
Crane, G. H.
Pass—
Thomas, R. C.
Wolff, D. L.
Stafford, J. B.
Horsham, V. J.
Christopher, V.
Jordan, A. F.
Mills, N. J.
Stearne, J. F.
Mackay, I.
Cugley, K.
Whitley, P. J.
Carthew, A. E. H.
Fraser, P. G.
Rowe, J. G.

ENGINEERING DRAWING I.

Credit—
†Radzikowski, S. A.
Weir, D. J.
Bennet, J. M.
Hardy, R. J.
Crisp, C. E.
Jones, J. L.
Hammond, R. H.
Pass—
Thompson, B.
Ward, W. S.
Dodge, G. J.
Myers, E. O.
Ritchie, S. J. L.
Willis, J. S.
Terrell, R. J. H.
Golding, D. H.
Manners, C. R.
Newman, F. L. B.
Peake, M.
Spencer, W. J.

ENGINEERING DRAWING IIA.

Credit—
†Marsh, F.
Pryce, M. W.
Jacobs, N. M.
Bennett, G.
Crisp, C.
Zuvich, J. J.
Pass—
Jones, J.
Myers, E.
Crocker, R. F.
McDermott, J. C.

ENGINEERING DRAWING IIB.

Credit—
†Whyte, K. G.
Baker, I. A.
Pass—
Gard, R. C.

ENGINEERING DRAWING IIC.

Credit—
†Farliss, T. W. L.
Baker, I. A.
Pass—
Ritchie, H. G.
Taylor, S. R.

SURVEY DRAWING II.

Credit—
†Murphy, A. J.
Zuvich, J. J.
Pryce, M. W.
Pass—
McDermott, J. C.
Myers, E. O.
Compton, G. S.

MINING I.

Pass—
Hardy, R. J.
Oliver, J. B.
Heron, D.
Wheeler, W. E.
Rosenius, J. A.
Larsen, E. M.
Zani, V. R.
Roberts, E. J.

MINING II.

Credit—
†Compton, G. S.
Pass—
Zuvich, J. J.
Lissiman, J. C.
Pryce, M. W.

MINING IIA.

Pass—
Chamberlain, H. I.
Ritchie, S. J. L.

MINING IIIA.

Credit—
†Ibbotson, A. W.
Eddy, J. G.
Pass—
Carter, K.

MINING III.

Credit—
†Smailes, J. P.
Pass—
Christopher, L.
Pegler, A. V.

SURVEYING I.

Credit—
†Oliver, J. B.
Hardy, R. J.
*Baker, I. A.
*Jones, J. L.
Spivak, D. R.
Richardson, E. T.
*Roberts, E. J.
*Tennant, E. M.

SURVEYING II.

Pass—
Compton, G. S.
Zuvich, J. J.
Ritchie, S. J. L.
McDonald, T. G. P.
Murphy, J.
Pryce, M.
Slade, L. K.
Vukobratich, S.

PREPARATORY GEOLOGY.

Credit—
†Darroch, I. N.
Hobson, J. (Miss).
Pass—
D'Alton, A. J.
Hooker, N. R.
Bialecki, G.
Dowson, J. W.
Radzikowski, S. A.
*Christopher, V.
*Neve, H.D.

Supplementary Examination Granted.
Jordan, A. F.

GEOLOGY IA.

Pass—
Compton, G. S.
Field, R.
Creagh, N. B.
Spivak, D. R.
Amin, D.

Supplementary Examination Granted.
Shenton, E. F.

GEOLOGY IB.

Credit—
†Field, R.
Pass—
Bower, J. K.
Creagh, N. B.
Pass Practical Only—
Chamberlain, H. I.
Simmons, M. R.
Spivak, D. R. (Passed theory 1951.)

GEOLOGY IIA.

Pass—
Cedro, J. A.
Smailes, J. P.
Timoney, E. G.
Shanahan, J. P.
Manners, M.D.L.
Pass Practical Only—
Ibbotson, A. W.

Supplementary Examination Granted.
Ibbotson, A. W.

GEOLOGY IIB.

Pass—
Manners, M. D. L.
Smailes, J. P.
Pegler, A. V.
Pass Practical Only—
Myers, E. O.

GEOLOGY III.

Pass—
Kingsbury, C. J. R.
Boylen, R. S.

SUPPLEMENTARY EXAMINATIONS.

February, 1952.

The following students passed in the subjects indicated below:—

PHYSICS IA.
Spivak, D. R.

METALLURGY AND MINERAL DRESSING.
Amin, D.

PHYSICS 1B.
Currie, E. G.
Quan, L. E.
Rich, H. J.
Smailes, J. P.
Steel, W. D.

ELECTRICAL ENGINEERING I.
Pegler, A. V.
Steel, W.

GEOLOGY IA.
Stronach, B. J.

GEOLOGY IB.
Murphy, A. J.

STRUCTURAL ENGINEERING I.
Gamble, V. R.
Edlington, W. B.
Currie, E. G.

MATHEMATICS IIA.
Brownrigg, N. J.
Christopher, L. F.
Smith, C. T.
Taylor, S. R.

APPLIED MATHEMATICS.
Warburton, J. C.

ELECTRICAL ENGINEERING I.
McMullan, W. R.

TECHNICAL ENGLISH.
Cranston, A. G.

THESES ACCEPTED
SURVEYING II (Field Assignment).
Eddy, J. G.
Crawford, J. H.
Stronach, B. J.
Siggins, A. M.
Morris, L. W.
Antulov, J.
Cedro, J.
Timoney, E.
Burrows, H. L.
Manners, M. D.
O'Driscoll, D.
Coles, E. T.
Myers, E. O.

ELECTRICAL ENGINEERING II.
Dainton, R.
Saunders, N. L.
Hair, K. R.

MACHINE DESIGN.
Hair, K. R.

ASSOCIATESHIP COURSE IN MINING.
Inman, R. D.
Watson, R. J.
Crawford, J. H.
Manners, M. D.
Smailes, J. P.
Middleton-White, K.
Morris, L. W.

ASSOCIATESHIP COURSE IN ENGINEERING.
Baker, I. A.
Verran, R.
Cant, R. G.
Hair, K. R.

ASSOCIATESHIP COURSE IN ENGINEERING.
Baker, I. A.
Verran, R.
Cant, R. G.
Hair, K. R.

ASSOCIATESHIP COURSE In METALLURGY.
Green, E. J.

School of Mines—Norseman.

ANNUAL EXAMINATIONS.

Pass List.

TRADE MATHEMATICS I.

Credit—
†Kerr, L. G.
Kerr, N.
Young, C. T.
Wise, W. J.
Pass—
Templeman, F.

Supplementary Examination Granted.
Taylor, W. T.
Fleay, W. W.

PREPARATORY MATHEMATICS.

Credit—
†Berry, B. L.
Pass—
Kneebone, E. W.
Shulz, J. G.
Head, H. J.
Moffatt, B.

MATHEMATICS IIA

Pass—
Hardman, T.

Supplementary Examination Granted.
Cappa, J. J.
Lea, E. J.
Morton, J. L.

PREPARATORY PHYSICS.

Credit—
†Coles, E. T.
O'Connell, J. C.
*George, T. J. F.
*Lea, E. J.
Pass—
McHugh, P. E. H.
Pass Practical Only—
Head, H. J.
Moffatt, B.

PREPARATORY CHEMISTRY.

Credit—
†Hardman, T.
Silvester, S. W.
George, T. J. F.

METALLURGY AND MINERAL DRESSING.

Credit—
†O'Driscoll, D.
Pass—
Williamson, H. C.
Lea, E. J.
Coles, E. T.

Supplementary Examination Granted.
O'Connell, J. C.
Warne, R.

PREPARATORY GEOLOGY.

Pass—
O'Connell, J. C.
Silvester, S. W.
Cappa, J. J.

GEOLOGY IB.

Pass—
O'Connell, J. C.
Berry, B. L.
Coles, E. T.

PRACTICAL ELECTRICITY.

Credit—
†Horsham, James.
Wise, S. A.
Kerr, P. H.
Pass—
Young, C. J.
Pettit, R. W.
Hall, J. K.
Smith, D.
Horsham, John.

STRUCTURAL ENGINEERING I.

Pass—
O'Driscoll, D.
Hare, R.

WORKSHOP PRACTICE I.

Pass—
Harris, R. K.
Kerr, L. G.
Breeze, A. D.
*Fleay, W. W.
*Kerr, N.
*Taylor, W. T.
Pass Practical Only—
Turner, F.

WORKSHOP PRACTICE IIIA.

Pass—
Wise, S. A.
Kerr, P. H.
Pass Practical Only—
Wood, R.

WELDING I.

Credit—
Horsham, J. F.
Pass—
Sparrow, A. E.
Harris, R. K.
Horsham, F. J.
Hayward, F. A.
Turner, F.
Pass Practical Only—
Moir, R. R.

Supplementary Examination Granted.
Moir, R. R.

ENGINE DRIVING.

Pass—
Pettit, R. W.
Kerr, P. H.
Harris, R. K.
Wise, S. A.
Hall, J. K.
Smith, D.

PREPARATORY DRAWING.

Pass—
Kerr, L. G.
Taylor, W. J.
Kerr, N. C.
Kneebone, E. W.
Steddy, T.
Williamson, H. C.
Hare, R.
Schulz, J.

ENGINEERING DRAWING I

Credit—
†Pettit, R. W.
Pass—
Moffat, B.
Wise, S. A.

ENGINEERING DRAWING IIA.

Credit—
†O'Driscoll, D.
Pass—
Hardman, T.

SURVEY DRAWING II.

Credit—
†O'Driscoll, D.
Lea, E. J.
Pass—
Berry, B. L.

MINING I.

Credit—
†O'Driscoll, D.
Pass—
Hare, R.
Murphy, J. R.
Schulz, J.

Supplementary Examination Granted.
Holmes, R. B.

MINING III.

Credit—
†O'Driscoll, D.
Pass—
Quan, L.

MINING IIIA.

Pass—
Warne, R.
Coles, T.

SURVEYING II.

Pass—
Cappa, J. J.

SURVEYING IIA.

Pass—
Warne, R.

SUPPLEMENTARY EXAMINATIONS.

February, 1952.

The following students passed in the subject listed below:—

MATHEMATICS IIA.

Morris, L. W.
O'Connell, J. C.

DEFERRED SUPPLEMENTARY EXAMINATION.

The following student passed in the subject listed below for the Supplementary Examination deferred from February, 1952, to November, 1952.

ELECTRICAL ENGINEERING I.

Dillon, J. D.

Appendix 2.

SCHOLARSHIPS AND PRIZES.

MINES DEPARTMENT.

Entrance Scholarship—No award made.
Senior Scholarship—Sainsbury, G. M.

CHAMBER OF MINES PRIZES.

Metallurgy—No award made.
Mining—Oliver, J. B.
Engineering—Gard, L. A.
Mining Geology—No award made.

SCHOOL OF MINES STUDENTS' ASSOCIATION SCHOLARSHIP.

Matheson, W. S.

INSTITUTE OF MINING SURVEYORS PRIZE.

£10 Prize—No award made.
£5 Prize—Compton, G. S.

SOCIETY OF W.A. SCHOOL OF MINES ASSOCIATES' PRIZE.

Hardy, R. J.

REG DOWSON SCHOLARSHIPS.

Kerr, L. G.
Young, C. J.

ROBERT FALCONER PRIZES.

Bosustow, B. G.
Wolff, D. L.

C. A. HENDRY PRIZE.

Bialecki, G.

"INDUSTRIAL AND MINING STANDARD" PRIZE.

Metallurgy—Thomas, R. P.
Mining—O'Driscoll, D. F.

WESLEY LADIES' GUILD PRIZE.

Radzikowski, S. A.

Appendix 3.

KALGOORLIE METALLURGICAL LABORATORY.

By C. H. S. MEHARRY, A.W.A.S.M. (Mining and Met.), M.Aust.I.M.M.,

Senior Research Metallurgist.

Introduction.

During 1952 a total of 51 reports were issued involving 511 individual metallurgical tests and 3,424 chemical analyses and fire assays. Included in the above total are 217 fire assays and analyses carried out under the free assays for prospectors regulations.

A brief description of the more comprehensive reports is given below and two tables are included showing the complete list of reports, owners, localities, ore types, and scope of test work.

Any person wishing to obtain copies of these reports may do so by applying to the

Senior Information Officer,
Information Service,
C.S. & I.R.O.,
314 Albert Street,
East Melbourne,
Victoria

where they will be available six months after date of issue, except in special cases where a longer time is approved.

Gold Ore and Products.

A number of reports were issued on methods of treatment of gold tailings dumps.

Report 448.

Several gold tailings dumps at Lawlers, W.A., had been sampled by pattern boring and each 10ft. approximately of borings had been kept as separate samples for assay. The borehole samples were assayed for gold and one-eighth by weight of each sample was combined to form composite samples of each dump. This procedure enabled an accurate assay plan to be made and representative composite samples prepared.

Agitation cyanidation tests on the "slime" dump sample showed a recovery of 78 per cent. of gold, but this material would be difficult to handle on a plant scale. The "sand" dump gave a recovery of only 0.24dwt/ton, and the third dump was too low grade to warrant treatment tests.

Report 488.

This report details—

(a) the sampling and assaying procedure used to obtain an accurate assay plan and composite head samples of a gold tailings dump at Lakeside near Kalgoorlie;

(b) test work to develop a method of treatment of the dump material which contains considerable charcoal.

Normal cyanidation cannot be used to recover the gold in this dump and the test work in the report covers cyanidation tests with kerosene, flotation tests, roasting and cyanidation, and sizing and classification tests. The only method attempted that gave a recovery of gold was low temperature roasting in air to burn the charcoal and cyanidation of the roasted material. The low head value of the dump, 1.17dwt. per ton, would not stand the cost of this method of treatment.

Report 495.

This report covers gold and scheelite recovery tests on the Frazer's dumps at Southern Cross.

The gold recovery tests showed that about 45 per cent. of the gold in No. 1 dump could be recovered by leaching.

The scheelite recovery tests using a Wilfley table gave recoveries of 20 to 25 per cent. of the WO_3 in a very low grade concentrate (see supplementary report 495 in the Tungsten section).

Report 532.

This report and a supplementary report deals with tests carried out in the laboratory and at the treatment plant to overcome treatment difficulties being experienced in treating a sand dump at Kookynie. The dump contains pockets of "sour" material produced from the oxidation of cyanided sulphide concentrates in the original plant.

After carrying out tests in the laboratory on a sample of the sour material a metallurgist from the laboratory staff spent several weeks at the plant carrying out plant scale tests to develop a method of treating this material using the existing plant. The plant is now treating the sour material without a great deal of difficulty. Plant scale tests were also carried out on the "clean" sand of the dump and it was found that low gold recoveries were due to insufficient washing.

Lead-Zinc Ores.

Three comprehensive reports were issued on test work carried out on lead-zinc ores.

Report 506.

An oxide lead-zinc ore was the subject of this report. Gravity concentration after coarse grinding gave a low grade lead concentrate with very little recovery of silver. Flotation tests showed that only a poor recovery of lead could be expected, a typical test giving 24.7 per cent. recovery of lead in a concentrate assaying 58 per cent. lead and 90oz. of silver per ton.

Report 523.

A sample of gravity concentration plant tailings from the Protheroe lead mine, Nabawa, was subjected to grinding and flotation tests. The material contained considerable sphalerite as well as galena, and although it was a relatively simple matter to produce a bulk lead-zinc flotation concentrate this would be too low grade in lead to be readily saleable. Difficulty was experienced in separating the sphalerite and galena using the normal flotation technique of depressing the sphalerite, but it was found that dichromate depression of galena was effective. The method developed for the treatment of these tailings was, therefore, to grind sufficiently fine to free the valuable minerals, produce a bulk flotation concentrate, and then separate lead and zinc concentrates from the bulk concentrates by differential flotation using dichromate as a galena depressant.

Report 531.

Two samples of material containing lead and zinc were received from the Ragged Hills Lead Mine, Marble Bar.

(1) Oxidised lead slime. This material readily responded to sulphidising and flotation giving an 82.7 per cent. recovery of lead in a concentrate assaying 70.2 per cent. lead.

(2) A lead-zinc sulphide ore. This ore was amenable to coarse grinding, gravity concentration on jigs and tables, and flotation. After crushing to minus ¼in. and jigging 60 per cent. of the lead could be recovered in a jig concentrate assaying 75 per cent. lead. A light grind to 22 mesh B.S.S., desliming and tabling of the sand yielded a zinc concentrate. Differential flotation of the slime yielded a lead concentrate and a zinc concentrate. Overall recoveries of lead and zinc by jigging, tabling and flotation were about 90 per cent. and 70 per cent. respectively.

Tungsten Ores.

Report 495—Supplementary Report.

Scheelite recovery tests on bulk samples from the Frazer's dumps at Southern Cross. Five tons of material from these dumps were concentrated on a Humphrey spiral followed by tabling, roasting of concentrate and magnetic concentration. Saleable grade scheelite concentrates were produced but the recovery of WO_3 was only 5 per cent.

Report 533.

Pilot plant tests were carried out on a rich scheelite ore from Hampton Plains to compare the recovery of WO_3 by stamp battery crushing and tabling. Stamp battery crushing to 8 mesh B.S.S. gave a recovery of 54 per cent while rolls crushing to the same mesh gave 91 per cent. recovery.

Report 561.

A quantity of table middling about 3000 lb. weight produced from treatment of a rich scheelite ore at the Coolgardie State battery was treated in the laboratory pilot plant for the recovery of about 500 lb. of high grade scheelite concentrates.

Report 568 (incomplete).

During 1952 Mineral Recovery Ltd. built a small treatment plant for concentrating heavy minerals. Considerable assistance at the plant and in the laboratory was given to the principals of this company, in the installation and operation of jigs, tables, and humphrey spiral.

Tin Ore.

Report 485.

Comprehensive screen analysis and superpanning to determine as accurately as possible the recoverable head value of sample of tin wash and tin bearing laterite from Greenbushes.

Chemical Analyses and Fire Assays.

Thirty-one reports were issued, giving the results of analyses and fire assays carried out for various interests. The tables included in this appendix give the main details.

Two hundred and seventeen chemical determinations and fire assays were made during the year under the free assays for prospectors regulations.

Technical Assistance and Inquiries.

Several visits to treatment plants by metallurgists of the staff were made during the year and technical assistance of a practical nature was given.

The volume of inquiries for technical assistance from people engaged in the mining industry was maintained.

Table I.

Kalgoorlie Metallurgical Laboratory—Summary of Year's Work (1952).

Report No.	Owner.	State.	Locality.	Ore Type.	Type of Investigation.	Date available for publication.	No. of Metallurgical Tests.
448	A. Vickery Syndicate	W.A.	Lawlers	Gold tailings	Method of treatment	26–11–52	17
485	Goldfields Tin (New) Syndicate	W.A.	Greenbushes	Tin	Sizing tests and analysis	24–10–52	4
488	A. Vickery Syndicate	W.A.	Lakeside-Kalgoorlie	Gold tailings	Method of treatment	10–12–52	34
495	A. Vickery Syndicate	W.A.	Southern Cross	Gold-tungsten....	Method of treatment	28–11–52	23
495	(Supplementary) A. Vickery Syndicate	W.A.	Southern Cross	Gold-tungsten....	Method of treatment	7–5–53	12
506	D. C. Rogers	W.A.	Ragged Hills, Marble Bar	Lead-zinc	Method of treatment	30–1–53	9
523	Anglo-Westralian Pty., Ltd.	W.A.	Protheroe	Lead-zinc	Method of treatment	17–12–52	43
527	Western Mining Corporation	W.A.	Bullfinch	Tungsten	Analysis only	22–7–52	....
528	L. Reynolds	W.A.	Kunnanalling	Mortar sand	Test on suitability	26–8–52	3
529	Hill 50 G. Mine	W.A.	Mt. Magnet	Kaolin	Analysis only	11–8–52	....
530	A. Robustellini	W.A.	Mt. Magnet	Gold tailings	Assay only	7–8–52	....
531	R. O. Moore	W.A.	Ragged Hills	Lead-zinc	Method of treatment	25–5–53	38
532	A. Vickery Syndicate	W.A.	Kookynie	Gold tailings	Treatment difficulties	8–11–52	21
532	(Supplementary) A. Vickery Syndicate	W.A.	Kookynie	Gold tailings	Treatment difficulties	15–6–53	7

Table 1—*continued.*

Report No.	Owner.	State.	Locality.	Ore Type.	Type of Investigation.	Date available for publication.	No. of Metallurgical Tests.
533	R. K. McRae	W.A.	Block 59 Hampton Areas	Scheelite	Gravity concentration tests	1–2–53	7
534	O. J. Parker	Tas.	King Island	Scheelite	Sampling	21–1–53	....
535	Lake View & Star, Ltd.	W.A.	Fimiston	Gold	Assays only	1–11–53	....
536	Mines Department	W.A.	Marvel Loch	Gold	Assays only	28–10–52	....
537	Mines Department of W.A.	W.A.	Hope's Hill, Yilgarn	Tungsten	Analysis only	29–11–52	....
538	Mines Department of W.A.	W.A.	Binti-Binti, Kanowna	Gold	Assays only	7–11–52	....
539	Lake View & Star, Ltd.	W.A.	Fimiston	Gold	Assays only	7–11–52	....
540	Cancelled.						
541	R. K. McRae	W.A.	Block 59, Hampton Areas	Tungsten	Analysis only	26–11–52	
542	Lake View & Star, Ltd.	W.A.	Fimiston	Gold	Assays only	29–11–52	....
543	King Island Scheelite	Tas.	King Island	Tungsten	Analysis only	4–1–53	....
544	P. Mazza	W.A.	Southern Cross	Gold	Assays only	30–11–52	....
545	W. H. C. Halford	W.A.	Broad Arrow	Copper	Analysis only	5–12–52	....
546	Cock and Trundle	W.A.	Agnew	Gold	Assays only	9–12–52	....
547	Lake View & Star, Ltd.	W.A.	Fimiston	Gold	Assays only	22–1–53	....
549	Western Minerals Syndicate	W.A.	Callie Soak-Big Bell	Tungsten	Screen analysis	22–3–53	1
550	A. Greengrass	W.A.	Broad Arrow	Gold	Battery treatment	4–3–53	6
551	Linnett & Hawkins	W.A.	Davyhurst	Tungsten	Analysis only	9–1–53	....
552	A. Dally	W.A.	Kalgoorlie	Gold	Assay only	6–4–53	....
553	A. Vickery Syndicate	W.A.	Kookynie	Gold room slime	Analysis only	16–1–53	....
554	Lake View & Star, Ltd.	W.A.	Fimiston	Gold solutions	Assays only	11–2–53	....
555	Golden Horseshoe New, Ltd.	W.A.	Fimiston	Gold solutions	Assays only	11–2–53	....
556	R. Ibbotson	W.A.	Uaroo-Onslow	Lead-silver	Seller's assays	12–8–53	....
559	James Hardie & Co.	W.A.	Welshpool	Silica sand	Infrasizing	18–2–53	1
559	(Supplementary) James Hardie & Co.	W.A.	Welshpool	Silica sand	Infrasizing	4–3–53	1
560	E. E. Swinson	W.A.	Meekatharra	Gold tailings	Assays only	12–3–53	....
561	Hutchinson & Chase	W.A.	Erlistoun	Tungsten	Treatment of middling	20–4–53	1
562	E. Bassett	W.A.	Morley's Find	Gold-Tungsten	Analysis—assays	10–4–53	....
563	Wm. Barker & Co.	W.A.	Kalgoorlie	Lime	Analysis only	20–4–53	....
563	(Supplementary) Wm. Barker & Co.	W.A.	Kalgoorlie	Lime	Analysis only	31–4–53	....
564	E. Bassett	W.A.	Morley's Find	Tungsten	Recovery of scheelite	29–4–53	2
565	R. C. Barber	N.T.	Spring Hill	Tin	Analysis only	19–6–53	....
567	R. K. McRae	W.A.	Block 59, Hampton Areas	Tungsten	Seller's sample	13–5–53	....
567	(Supplementary) R. K. McRae	W.A.	Block 59, Hampton Areas	Tungsten	Seller's sample	19–6–53	....
570	Kalgoorlie Municipal Council	W.A.	Kalgoorlie	Acid effluent	Analysis only	13–5–53	....
571	L. Pitchers	W.A.	Kanowna	Gold	Visit to treatment plant	19–6–53	....
572	R. L. Jones	W.A.	Coonana	Barite	Analysis only	....	....
574	Wm. Barker & Co.	W.A.	Kalgoorlie	Lime	Analysis only	19–6–53	....
	The following investigations were incomplete or pending at 31–12–52.						
514	Vacuum Oil Co.	W.A.	....	Detergent	Determination of frothing characteristics	....	....
521	Western Mining Corporation	W.A.	Bullfinch	Tungsten	Recovery of scheelite	....	3
526	Wolfram Hill, N.L.	N.T.	Pine Creek	Tungsten-copper	Method of treatment	....	17
548	State Mining Engineer	W.A.	Marchagee	Bentonite	Comparison with imported Bentonite	....	180
557	Great Boulder Pty., Ltd.	W.A.	Fimiston	Graphitic Ore	Recovery tests	....	10
558	Norseman Gold Mine	W.A.	Norseman	Sulphur Ore	Recovery tests	....	25
566	H. D. Golding	W.A.	Ora Banda	Gold-silver-copper	Method of treatment	....	21
568	King of the Hills Syndicate	W.A.	Comet Vale	Tungsten	Pilot Plant tests	....	13
569	Department of Industrial Development	W.A.	Perth	Lime sands	Beneficiation	....	....
573	R. Ibbotson	W.A.	Uaroo	Lead-silver	Jig tests	....	4
575	Hampton Gold Mining Areas	W.A.	Mt. Marion	Spodumene	Beneficiation	....	8

Table II.

KALGOORLIE METALLURGICAL LABORATORY.

Chemical Analyses and Gold Assays Completed during 1952.

Report No.	Owners.	Number of Metallurgical Tests.	Elements, etc. Determined.																															
			Aluminium.	Antimony.	Arsenic.	Barium.	Calcium.	Chloride.	Chromium.	Cobalt.	Copper.	Cyanogen.	Ferro-cyanide.	Gold.	Iron.	Lead.	Magnesium.	Manganese.	Molybdenum.	Nickel.	Phosphorus.	Silicon and Acid Insolubles.	Silver.	Sulphur.	Tellerium.	Thiocyanate.	Thiosulphate.	Tin.	Tungsten.	Water.	Zinc.	TOTALS.
448	A Vickery Syndicate	17	....	....	....	....	....	....	....	....	....	....	....	322	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	322
485	Goldfields Tin Syndicate	4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	92	....	....	....	....	....	92
488	A. Vickery Syndicate	34	....	....	....	....	....	....	....	....	....	....	....	326	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	326
495	A. Vickery Syndicate	23	....	....	....	....	....	....	....	....	....	....	....	244	....	....	....	....	....	....	....	....	....	....	....	....	....	....	42	....	....	....	....	286
495	Supplementary Report	12	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	58	....	....	....	....	58
506	D. C. Rogers	9	....	....	....	....	....	....	....	....	2	....	....	6	3	49	....	....	....	....	....	4	22	4	....	....	....	....	....	....	....	19	109
523	Anglo-Westralian Pty., Ltd.	43	....	....	....	....	....	....	....	....	10	....	....	4	....	161	....	....	....	....	....	....	16	....	....	....	....	....	....	....	....	....	90	281
527	Western Mining Corporation	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	....	....	....	....	2
528	L. Reynolds	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
529	Hill 50 G.M.	....	2	....	....	....	2	....	....	....	....	....	....	....	2	....	2	....	....	....	....	2	....	....	....	....	....	....	....	2	....	....	....	12
530	A. Robustellini	....	....	....	....	....	....	....	....	....	....	....	....	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2
531	R. O. Moore	38	....	....	....	....	....	....	....	....	14	....	....	....	5	145	....	....	....	....	....	....	24	....	....	....	....	....	....	....	....	111	299
532	A. Vickery Syndicate	21	....	....	....	....	....	....	....	....	....	5	5	148	....	....	....	....	....	....	....	....	....	....	....	....	....	....	8	....	....	....	166
532	Supplementary Report	7	....	....	....	....	....	....	....	....	....	....	....	24	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	24
533	R. K. McRae	7	....	....	....	....	....	....	....	....	....	....	....	4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	36	....	....	....	....	40
534	O. J. Parker	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	4	....	....	....	....	....	....	....	....	....	4	....	....	....	....	8
535	Lake View and Star Ltd.	....	....	....	....	....	....	....	....	....	....	....	....	8	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	8
536	Mines Department	....	....	....	....	....	....	....	....	....	....	....	....	14	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	14
537	Mines Department	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	8	....	....	....	....	8
538	Mines Department	....	....	....	....	....	....	....	....	....	....	....	....	4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	4
539	Lake View and Star Ltd.	....	....	....	....	....	....	....	....	....	....	....	....	16	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	16
540	Cancelled	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
541	R. K. McRae	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	....	....	....	....	2
542	Lake View and Star Ltd.	....	....	....	....	....	....	....	....	....	....	....	....	44	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	44
543	King Island Scheelite Co.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	6	....	....	....	....	6
544	P. Mazza	....	....	....	....	....	....	....	....	....	....	....	....	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2
545	W. H. C. Halford	....	....	....	....	....	....	....	....	....	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2
546	Cock and Trundle	....	....	....	....	....	....	....	....	....	....	....	....	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2
547	Lake View and Star Ltd.	....	....	....	....	....	....	....	....	....	....	....	....	53	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	53
549	Western Minerals Syndicate	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	22	....	....	....	....	22
550	A. Greengrass	6	....	....	....	....	....	....	....	....	....	....	....	25	....	2	....	....	....	....	....	....	....	2	....	....	....	....	....	....	....	2	....	31
551	Linnett & Hawkins	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	....	....	....	....	2
552	A. Dally	....	....	....	....	....	....	....	....	....	....	....	....	4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	4
553	A. Vickery Syndicate	....	2	....	....	....	2	....	....	....	2	....	....	2	2	2	2	....	....	....	....	2	2	2	....	....	....	....	....	....	....	2	....	22
554	Lake View & Star Ltd.	....	....	....	....	....	....	....	....	....	....	....	....	36	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	36
555	Golden Horseshoe (New) Ltd.	....	....	....	....	....	....	....	....	....	....	....	....	8	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	8
556	R. Ibbotson	....	....	....	....	....	....	....	....	....	....	....	....	4	....	12	....	....	....	....	....	....	12	....	....	....	....	....	....	....	....	....	....	28
559	James Hardie & Co.	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
559	Supplementary Report	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
560	E. F. Swinson	....	....	....	....	....	....	....	....	....	....	....	....	4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	4
561	Hutchinson & Chase	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
562	E. Bassett	....	....	....	....	....	....	....	....	....	....	....	....	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	....	....	....	....	4
563	Wm. Barker & Co.	....	....	....	....	....	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2
563	Supplementary Report	....	....	....	....	....	4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	4
564	E. Bassett	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	18	....	....	....	....	18
565	R. C. Barber	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	4	....	....	....	....	....	4
567	R. K. McRae	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	....	....	....	....	2
567	Supplementary Report	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	....	....	....	....	2
570	Kalgoorlie Municipal Council	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
571	L. Pitchers	....	....	....	....	....	....	....	....	....	2	....	....	5	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	....	9
572	R. L. Jones	....	....	....	....	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	....	....	....	....	....	....	....	....	....	....	....	4
574	Wm. Barker & Co.	....	....	....	....	....	4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	4
	Free Assays	....	....	....	....	....	....	....	....	....	54	....	....	135	....	6	....	2	....	2	....	....	2	6	....	....	....	2	8	....	....	217
	School of Mines	....	16	....	2	....	20	....	8	2	18	....	....	51	46	20	22	30	....	14	2	28	4	20	....	....	2	....	8	....	2	315

THE FOLLOWING INVESTIGATIONS WERE INCOMPLETE OR PENDING ON 31st DECEMBER, 1952.

514	Vacuum Oil Coy.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
521	Western Mining Co.	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	38	....	....	....	....	38
526	Wolfram Hill (N.L.), Co.	17	....	....	....	....	....	....	....	....	38	....	....	2	....	....	....	....	....	....	....	....	2	8	....	....	....	....	....	2	....	....	88
548	State Mining Engineer	180	6	....	....	....	6	....	....	....	....	....	....	....	6	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	22
557	Great Boulder Pty., Ltd.	10	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
558	Norseman Gold Mines (N.L.)	25	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	84	....	....	....	....	....	....	....	....	....	84
566	H. D. Golding	21	....	12	....	....	....	....	....	....	40	....	....	106	....	....	....	....	....	....	....	....	46	20	....	....	....	....	....	....	....	....	....	224
568	King of the Hills Syndicate	13	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	42	....	....	....	....	42
569	Dept. of Industrial Development	....	4	....	....	....	4	....	....	....	....	....	....	....	4	....	4	....	....	....	....	4	....	....	....	....	....	....	....	....	....	....	....	20
573	R. Ibbotson	4	....	....	....	....	....	....	....	....	....	....	....	....	14	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	14
575	Hampton Gold Mining Areas	8	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
	Totals	511	30	12	2	2	44	....	8	2	182	5	5	1609	68	411	30	32	4	16	2	44	130	146	....	....	....	98	310	4	228	3424

Division VI.

Annual Report of the Inspection of Machinery Branch of the Mines Department for the Year 1952.

OPERATIONS UNDER THE INSPECTION OF MACHINERY ACT, 1921-1950.

ANNUAL REPORT OF THE CHIEF INSPECTOR OF MACHINERY AND CHAIRMAN OF THE BOARD OF EXAMINERS FOR ENGINE-DRIVERS FOR THE YEAR ENDED 31st DECEMBER, 1952, WITH STATISTICS.

The Under Secretary for Mines:

Sir,—For the information of the Honourable the Minister for Mines, I submit the report of the Deputy Chief Inspector of Machinery in the administration of the Inspection of Machinery Act, 1921-1950, for the year ended 1952.

E. E. BRISBANE,
Chief Inspector of Machinery.

Section 1.

INSPECTION OF BOILERS, MAINTENANCE, Etc.

(See Returns Nos. 1, 2, 3.)

Under the Act "Boiler" means and includes—

(a) any boiler or vessel in which steam is generated above atmospheric pressure for working any kind of machinery, or for any manufacturing or other like purposes;

(b) any vessel used as a receiver for compressed air or gas, the pressure of which exceeds 30 lb. to the square inch, and having a capacity exceeding five cubic feet; but does not include containers used for transport;

(c) any vessel used under steam pressure as a digester, and

(d) any steam jacketed vessel used under steam pressure for boiling, heating, or disinfection purposes.

It also includes the setting, smoke stack, and all fittings and mountings, steam and other pipes, feed pumps and injectors, and other equipments necessary to maintain the safety of the boiler.

Return No. 1.

New registrations of boilers totalled 250; this number exceeded by 44 the new registrations recorded for the year 1951.

With regard to certain types of boilers for steam generation manufactured in this State, some details in design were amended to remove objectionable features found in earlier construction, whilst in other instances distinctive changes of general design to improve evaporative capacity without undue increase to overall sizes of boilers have been prominent.

Relative to other types of vessels which were registered, of some interest is the employment of two alloys new to this State in the construction of pressure vessels—cusilman bronze, and stainless steel with molybdenum content. The former, by virtue of its superior strength, was used for autoclave inner chambers; the latter for a chemical processing vessel by reason of it being highly resistant to corrosion.

Return No. 2.

This records the numbers of useful boilers of the various types at the end of the year in proclaimed districts in the State; of these the totals of boilers out of use, though potentially useful, are indicated at the end of the table.

Return No. 3.

Therein are shown the operations of the Inspection of Machinery Branch relative to boilers during the year together with comparisons with the preceding year.

RETURN No. 1.—SHOWING THE NUMBER OF BOILERS OF EACH TYPE, AND COUNTRY OF ORIGIN OF NEW REGISTRATION FOR THE YEAR ENDED 31ST DECEMBER, 1952.

Type.	Country of Origin.					Total.
	United Kingdom.	Norway.	Eastern States.	Western Australia.	Unknown Sources.	
Cornish	....	....	....	7	....	7
Vert. Stationary	1	....	....	6	....	7
Vert. Multi. Stat.	....	....	....	1	....	1
Vertical Port	....	....	....	....	....	....
Loco. Stat. Rect. Firebox	....	....	....	....	1	1
Return Multi. Stat. Underfired	....	....	....	6	....	6
Return Multi. Stat. Interfired	1	....	....	....	....	1
Multi. Tubular (waste heat)	....	....	....	2	....	2
Water Tube	....	....	8	14	....	22
Digester	....	1	2	1	....	4
Separator	....	1	....	....	....	1
Vulcaniser	....	....	6	....	....	6
Steam Jacketed Vessel	3	....	1	11	....	15
Steriliser	....	....	8	77	....	85
Air Receiver	2	....	13	66	8	89
Gas Receiver	....	....	....	1	....	1
Horizontal (Elect. Fired)	....	....	2	....	....	2
TOTAL	7	2	40	192	9	250

RETURN No. 2.—SHOWING CLASSIFICATION OF VARIOUS TYPES OF USEFUL BOILERS IN PROCLAIMED DISTRICTS ON 31ST DECEMBER, 1952.

Types of Boilers.	Districts Worked from PERTH.	Districts Worked from KALGOORLIE.	Totals.	
			1951.	1950.
Lancashire	46	53	99	99
Cornish	156	455	611	605
Semi Cornish	11	37	48	48
Vert. Stationary	423	347	770	764
Vert. Portable	65	17	82	82
Vert. Multi Stat.	51	25	76	77
Vert. Multi Port	16	3	19	20
Vert. Pat. Tubular	48	....	48	48
Loco. Rect. F/box Stat.	89	61	150	151
Loco Rect. F/box Port.	255	64	319	319
Loco Circ. F/box Port	139	8	147	147
Locomotive	87	37	124	121
Water Tube	406	119	525	504
Ret. Multi U/Fired Stat.	223	58	281	273
Ret. Multi U/Fired Port	1	8	9	9
Ret. Multi Int. fired Stat.	48	12	60	63
Ret. Multi Int. fired Port	2	....	2	2
Egg ended and other types not elsewhere specified	471	35	506	422
Digesters	283	10	293	285
Air Receivers	1,064	530	1,594	1,520
Gas Receivers	35	....	35	34
Vulcanizers	349	10	359	363
Steam Jacketed Vessels	472	12	484	471
Total Registration Useful Boilers	4,740	1,901	6,641	6,427
Total Boilers out of use 31st December, 1952	2,012	1,500	3,512	3,469

RETURN No. 3.—SHOWING OPERATIONS IN PROCLAIMED DISTRICTS DURING YEAR ENDED 31ST DECEMBER, 1952.

Types of Boilers.	Districts Worked from PERTH.	Districts Worked from KALGOORLIE.	Totals.	
			1951.	1950.
Total number of useful boilers Registered	4,740	1,901	6,641	6,427
New Boilers registered during year	240	10	250	206
Boilers Reinstated	....	....	....	1
Boilers Converted	....	....	....	3
Boilers inspected—				
Thorough	2,396	401	2,797	2,947
Working	900	7	907	733
Boilers condemned during year—				
Temporarily	6	....	6	10
Permanently	35	3	38	37
Boilers sent to other States during the Year	3	....	3	2
Boilers sent from other States during the year	2	....	2	....
Transferred to other Departments	....	....	....	....
Transferred from other Departments	4	....	4	3
Number of notices of repairs issued during year	753	50	803	686
No. of Certificates issued including those issued under Sec. 30 during the year	2,728	401	3,129	2,959

Maintenance, etc.

There are a considerable number of boiler users who have not come to appreciate that too much care cannot be given to the maintenance and operation of vessels employed for the generation of steam and who do not ensure that such principle is put into practice.

Among such owners are those who deliberately ignore the necessity of proper maintenance as a matter of routine until forced by an inspector at an annual inspection into carrying out resultant repairs which most probably could have been otherwise avoided. Again—and this applies particularly to owners of small boilers—there are those who have only the vaguest knowledge of what is necessary in the interests of boiler maintenance and do not seem to equip themselves with knowledge from others ready to assist.

Of measures associated with maintenance, one of the simplest to execute is the complete draining of the boiler water and washing out at intervals of more or less frequency according to the quality of the feed water supply. But even this simple practice is so often disregarded.

In my last report I touched on the very important matter of proper testing of water gauge fittings.

Since then, during the past year, very extensive damage occurred to a Lancashire boiler due to a boiler attendant when coming on duty neglecting to apply correct measures to ascertain whether the gauges were in proper order.

Although investigation failed to prove it, there is much suspicion that only one of the two sets of water gauges was being utilised.

However, the boiler attendant being unaware of the actual condition of the gauges, the water level in the boiler became so low that overheating of the furnaces resulted and the crowns collapsed. Fortunately, rupture of the furnace metal did not follow as a consequence, and therefore the incident was unattended by explosion.

A question that obviously presents itself is one which relates to the fusible plugs. Why did these not operate and thereby permit the steam to extinguish the fires before the crowns were so bared of water as to become overheated?

This reveals another point which may be included with matters appertaining to maintenance.

The fusible plugs were of an old type in which a brass plug at its upper end fitted the crown of the nut or body with a fine clearance and protruded 1/32in. above the crown of the nut. This plug was sealed in position with fusible metal surrounding it where it extended down into a cavity formed in the nut.

On examination it was found that the fusible metal had escaped from both devices when the water had receded, but the plugs in both furnaces had failed to drop due to the fact that when boiler cleaners had been at work the tips of both plugs which were protruding above the nuts were scarred by chipping hammers and the ends burred over sufficiently to prevent the plugs dropping through the crowns of the nuts.

During the year it had been noted that the adoption of full automatic control devices for oil fired boilers is becoming popular among boiler owners, and it is not out of place to include here some reference to this whilst on the subject of maintenance, as automatic control bears a direct relationship with this matter.

It cannot be denied that such a system of controlling the introduction of fuel and the feed water to a boiler according to the fluctuations in demand for supply of steam tenrs towards greater economy in fuel and efficiency in output of a boiler; it also enables the services of a boiler attendant being made more available for some additional duties.

It is here that a matter of maintenance bears some important degree of relevancy and comment concerning additional duties would be appropriate.

There is a tendency of some owners to regard an automatic control system as something which may be used to usurp the responsibility of a boiler attendant in the performance of his foremost duty, that of ensuring at frequent intervals that the boiler is operating safely.

Such tendency is most improper from the viewpoint of safety. Availability of an attendant for additional duties may be afforded by installing automatic control equipment thereby relieving him of the necessity of actively attending at all times to the manipulation of the fuel and feed water units and so permit his activity with other work.

Extraneous duties, however, should not be allowed to prejudice the frequency of his attentions to the care and safe working of the boiler under his charge.

During the year a number of tubes in a Multitubular Underfired Boiler were damaged as a consequence of the feed water pump having stopped and the fuel injection continuing after the boiler water had dropped to point of low water. This was due to an undetected defect in a part of the control equipment caused by carelessness of some person.

The warning bell also failing, the boiler attendant who had been absent from the boiler on a duty in another part of the building for a considerable period was not made aware of anything being wrong until he later returned to the boiler.

Section 2.

EXPLOSIONS AND INTERESTING DEFECTS.

Case A.

An explosion of note during the year was that which occurred in the flues of a Cornish type boiler, oil fired. The severity of this explosion was such that the brickwork at the backend and the walls and roofing of the side flues were completely demolished. Fortunately no person was injured; the boiler attendant happened to be some little distance away from the boiler at the moment and there was no other person in its near vicinity.

Two grades of oil fuel had been adopted for use in this boiler—a light grade for raising steam and a heavy grade preheated to 180° F. when on load. At the time of the incident, 11.30 a.m., heavy oil was in use, the changeover of fuels having taken place half an hour earlier.

During investigation into circumstances of the mishap it was disclosed that on a previous occasion whilst on heavy oil a minor explosion in the flues had taken place and in that instance brickwork in the flues had been cracked.

Concerning the major incident it was stated that a few minutes previously the fuel system was functioning normally and then operating under automatic control.

As a result of our inquiries it is suspected that the demand for steam a little before this explosion was at a minimum and that, as a consequence, the fuel flow to burner was considerably reduced. Under such conditions it is very probable that due to fouling in the burner the small flame became extinguished.

It is conceivable that following on this, dribbles of oil escaped from the burner which on contact with hot surfaces emitted gases which grew in volume and during passage through the flues were ignited by contact with the hot brickwork.

Support is added to the supposition that flow in the burner was obstructed by the fact that it was learned the oil strainer was cleaned at intervals of not less than three weeks.

Two explosion doors had been provided in back end of brickwork but it is very evident that these were totally inadequate. As no other boilers adjoined the addition of such doors in both side flues may have been of much advantage in minimising if not wholly preventing the destruction of brickwork that occurred. These have subsequently been provided.

By good fortune, the boiler itself was undamaged by the force of the explosion. Subsequent hydraulic test indicated that no rivets or seams had been strained.

Case B.

Defective Reducing Valve.

An incident of some interest was one in which a steam jacketed copper pan used for cooking in an institution suffered severe collapse of inner shell due to an unusual defect developing in a reducing valve which was fitted in the kitchen steam line. This valve was the second of two units providing a double reduction of pressure from 120lb. P.S.I. boiler pressure to 15lb. P.S.I. working pressure at pan and other steam units.

Fortunately, the metal of the pan did not rupture and no person was injured by a custard mixture which was violently ejected.

The cook stated that she had shut off the steam to the pan while adding some more ingredients and having completed this duty again opened the stop valve to the pan. Immediately following this she had walked some little distance away when the mishap occurred; she also stated she had followed this procedure with the same pan for several years.

From further inquiries it was learned that the reducing valve in question had been unreliable, as undue fluctuations of steam pressure occurred according to demand from various items of equipment in the kitchen. It was also disclosed that diaphragms for reducing valves were improvised from motor tubes and wire gauze due to difficulty in obtaining the maker's product.

Whilst the possibility of water hammer in the steam jacketted pan being the cause of failure was not overlooked, it appeared more logical to assume that the diaphragm of the reducing valve had failed and that over-pressure was responsible for the damage to the vessel, especially in view of it coming to notice that trouble with the valve had been experienced the previous day and another diaphragm consequently fitted.

On a further examination of the reducing valve, however, it was discovered that a through cavity roughly ¼in. x ⅛in. had developed in the body adjacant to the seat thereby giving direct passage of steam from the high to low pressure side. It is suspected that there had been dross metal here which finally disintegrated.

It is possible that faulty diaphragms had been contributory to the irregularity of the valve, but there can be no doubt that the ultimate breakdown of the defect in the casting was responsible for the pan being subjected to overpressure which caused collapse.

Case C.

Failure of Proposed Air Receiver.

In my annual report 1951, I made reference to the explosion of a moderately large unregistered air receiver due to rupture around the shell in immediate vicinity of the junction to one of the end plates. To this failure was ascribed the flanging over of the shell to lap the periphery of the end plat. In the process of flanging the plate a rather sharp heel was developed, and it was around the commencement of this heel that failure occurred. Included with my comments on that occasion was the opinion that possibly the flanging was affected with insufficient heating around that part of the plate. The vessel then in question was 3ft. 6in. diameter, the shell being of ⅜in. plate.

Of interest is an incident disclosing further evidence of such undesirable construction which came to notice recently in the year just past.

This concerned the construction of a vessel intended for use as an air receiver. As it was designed not to exceed a capacity of five cubic feet there was no obligation to submit specifications to the department as it would be exempt from the provisions of the Inspection of Machinery Act. The vessel was 1ft. 3in. diameter, shell of ⅜in. plate and end plates ¼in. thickness dished concave to pressure; working pressure 150lb. P.S.I.

After completion it was being hydraulically tested when at a pressure between 250 and 300lb. P.S.I. the shell completely ruptured around the junction with one of the ends.

In this case also, the end plates were attached in position by flanging the extremities of the shell over them and then arc welding around the seams so formed. This flanging was carried out without any application of heat.

As in the former case to which I referred, rupture of the shell occurred around the sharp heel of the flanging.

It is most fortunate that the vessel failed under initial hydraulic test as there can be no doubt that had it not, it would have been only a matter of time once it was placed in service that an explosion would have resulted, attended perhaps by serious if not fatal injuries to some person or persons.

It cannot be over-emphasised, therefore, that flanging over of the shells in forming junctions with end plates in vessels of more than very low working pressure should be considered as entirely unsafe.

Section 3.

INSPECTION OF MACHINERY.

(See Returns Nos. 4, 5 and 6.)

The groups of machinery in the register at the end of the year totalled 30,230, an increase of 1,970 above those recorded at the end of the previous year, 1951.

RETURN No. 4.—SHOWING CLASSIFICATION ACCORDING TO MOTIVE POWER OF GROUPS OF MACHINERY IN USE OR LIKELY TO BE USED IN PROCLAIMED DISTRICTS AND WHICH WERE ON THE REGISTER DURING THE YEAR ENDED 31ST DECEMBER, 1952.

Classification.	Districts Worked from PERTH.	Districts Worked from KALGOORLIE.	Totals.	
			1952.	1951.
No. of Groups driven by steam engines	318	461	779	921
No. of Groups driven by oil engines	2,183	1,124	3,307	3,013
No. of Groups driven by gas engines	53	193	246	263
No. of Groups driven by Compressed air	4	62	66	62
No. of Groups driven by Electric motors	21,605	4,222	25,827	23,986
No. of Groups driven by hydraulic pressure	5	....	5	5
Totals	24,168	6,062	30,230	28,260

RETURN No. 5.—SHOWING OPERATIONS IN PROCLAIMED DISTRICTS DURING YEAR ENDED 31ST DECEMBER, 1952.

(*Machinery Only.*)

Classification.	Districts Worked from PERTH.	Districts Worked from KALGOORLIE.	Totals.	
			1952.	1951.
Total registrations useful machinery	24,168	6,062	30,230	28,260
Total inspections made	18,955	3,200	22,155	20,125
Certificates (bearing fees)	4,673	640	5,313	4,652
Certificates (steam without fees)	41	24	65	27
No. of extension certificates issued under Sec. 42 of Act	....	....	....	....
Notices issued (Mach. dangerous)	292	17	309	280

RETURN No. 6.—SHOWING CLASSIFICATION OF LIFTS ON 31ST DECEMBER, 1952.

Types.	How Driven.	Totals.	
		1952.	1951.
Passenger	Electrically driven	196	197
	Hydraulically driven	1	1
Goods	Electrically driven	103	100
	Hydraulically driven	3	3
	Belt driven	4	4
Service	Electrically driven	45	45
		352	350

Accidents to Machinery.

Case A.

Bursting of Gulleting Emery Wheel.

This was a new stone and had just been fitted when on being put into motion it burst before the maximum speed was attained.

Serious head injuries were caused to a person standing about 4ft. in front of the machine.

The wheel was 12in. diameter and the shroud washers were 3½in. diameter only, which is considered to have been inadequate; washers 6in. diameter should have been fitted. Furthermore, one of these was not of sufficient thickness and had been used for other purposes. It was also high in the centre on the inner face and consequently did not bear for its full diameter against the wheel.

According to maker's instructions, the speed was not excessive.

The actual cause of the disintegration could not be determined but it would appear that one of two factors—or both—could have been responsible, these being:—

(i) One washer not being true across the face imposed a concentrated crushing force near axis of stone.

(ii) A possible undetected flaw in the stone.

Case B.

Bursting of Emery Wheel on Portable Hand Grinder.

The machine was air driven, to which an emery wheel 8in. diameter was fitted. During some dressing operations connected with structural steel work the stone shattered.

The operator received head injuries which fortunately were not of a very serious nature.

It could not be established whether some unknown defect in the stone was contributory to the accident but it was ascertained that the speed was 4,860 r.p.m. whereas the specified speed for the grade of wheel used was 3,000 r.p.m. and this speed was branded on the machine.

On examination it was found that the air throttle on the machine had become defective thereby permitting it to operate at an excessive speed.

Section 4.

PROSECUTIONS FOR BREACHES OF THE ACT.

There were no prosecutions during the year for breaches of the Act.

Section 5.

ACCIDENTS TO PERSONS.

Of the number of reported accidents involving injuries to persons the following incidents are given prominence for the purpose of drawing attention to certain dangerous practices which by the uncommonness of resultant accidents go unknown or unheeded.

Case 1.

This concerns an instance wherein a lift attendant on returning to his duty after a meal period thoughtlessly expected the car to be at the ground floor where he had left it and due to an improper practice on his part, not confined to him alone, was able to open the enclosure door. However, the lift being used by another employee in the meantime, the car was at an upper level when he opened the door and stepped into space with the result that he fell 20ft. to the bottom of the well. Miraculously, he was not very seriously injured.

This is a passenger lift of car control (non-automatic) type and was installed many years ago. Not being automatic the enclosure door locks are designed to be unlatched by the lift operator only from inside the car.

At such times that it would be necessary to leave the lift unattended for some period it had been the custom for an attendant to station the car at the ground floor, switch off the car light and shut the enclosure door behind him. This was to ensure that during the period the lift was not attended by an authorised person the car could not be entered and driven by a member of the public, there being no orthodox means of unlatching the enclosure doors from the outside.

This naturally would preclude the attendant also from gaining entry to the car on his return to the lift excepting by resort to other and unethical means. Due to knowledge gained by familiarity with the locking system of a particular lift, attendants are able to conjure up devices for such purpose.

The use of such methods for opening enclosure doors should only be employed in case of emergency and the adoption of these means as a practice is most improper. This is not the first instance of an attendant falling down the lift well by opening doors improperly, thinking that the car from habit should be at the level where he had vacated it.

In the instances of construction whereby enclosure doors of a lift cannot be unlatched from the outside except by improper practices, owners or lessees should insist that lift attendants having occasion to leave the lift unattended at a particular floor level must firmly secure the enclosure door in an open position, and by means of the switch provided in the electrical circuit render the lift inoperative.

Case 2.

A boiler attendant received severe shock from an explosion caused by ignition of a concentration of town gas in the furnace and flues of a small multitubular internally fired boiler used for heating washroom water in a building.

The main gas valve to the burner is automatically opened or closed in accordance with the conditions of steam pressure and/or boiler water level, the system being provided with a pilot jet for re-ignition of main gas supply when gas valve re-opens.

The chimney trunking which is of light gauge iron is provided with a butterfly valve fitted near its base for duty as a damper to control the funnel draught according to atmospheric conditions.

From what could be ascertained of the circumstances leading up to the explosion a most pronounced smell of gas was noticed in a room above the boiler prior to the mishap and there were complaints of the washroom water being cold.

On hearing of the complaints respecting the water temperature the boiler attendant found that the flame at the main burner was extinguished and the pilot jet also was not alight.

He proceeded to re-light the pilot jet and on applying a match to the jet an explosion of gas from the furnace occurred and knocked him over. He was able to shut off the main gas supply, however, before receiving medical attention.

The force of the explosion destroyed several feet of the chimney trunking but no damage was done to the boiler itself.

The butterfly damper referred to previously as being fitted in the chimney was fitted in an upward bend in the trunking with its spindle supported horizontally and transverse to the direction of the bend.

It was found that soot had lodged in the bend of the trunking and banked up against the butterfly damper with the consequence that instead of there being a passage under and over the butterfly in its open position for normal draught, the passage under the damper was restricted by soot. Had there not been this restriction it is quite possible that draught would have conducted a larger quantity of gas away from the furnace and thereby reduced the concentration. In such circumstances the explosion may have been less severe.

It being necessary to retain this damper the department has directed that the butterfly spindle be supported vertically in the bend and that provision is made to ensure that it cannot be closed a greater amount than will permit a passage area 50 per cent. of the chimney area. By the vertical pivoting of the damper a repose for soot will be considerably reduced.

There cannot be too much emphasis, however, on the fact that at all times when the flame from a gas burner has been extinguished unnoticed, every caution should be taken first to free of gas all spaces under a boiler before applying a naked light.

RETURN No. 7—SHOWING NUMBER OF SERIOUS ACCIDENTS BOTH FATAL AND NON-FATAL WHICH OCCURRED IN PROCLAIMED DISTRICTS DURING THE YEAR ENDED 31 st DECEMBER, 1952.

"F" Denotes "Fatal"

Industry.	Circular Saw.	Buzzer.	Thicknesser.	Bandsaw (Wood or Metal)	Tenoner.	Sticker.	Drum Sander	Spindle Moulder (Shaper)	Printing Press	Creasing Machine.	Cardboard Box Machine.	Leather Cutting Press.	Shaving Machine	Trimmer.	Tanning Drum.	Leather Stamping Machine.	Press (Metal).	Emery Wheels.	Rolls.	Guillotine.	Ending Machine.	Lathe.	Thread Rolling Machine.	Belts and Shafting.	Conveyor (Belt and Chain).	Elevator.	Conveyor (Screw).	Dough Divider. 3	Cardboard Corrugating Machin	Lift.	Skip.	Boiler Firing System.	Air Receiver.	Flax Scutching Machine.	Fish Scaling Machine.	Confectionery Moulder.	Boring Machine.	Mixer.	Cork Disc Cutter.	Totals Per Industry.
Woodworking and Furniture.	10	8	1	....	1	1	1	....	....	....	....	....	....	....	....	....	....	1	....	1	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	1	....	....	27
Metal Working and Engineering	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	3	2	2	1	1	1	1	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	14
Leather Processing and Goods	....	....	....	....	....	....	....	....	....	....	....	2	1	1	1	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	6
Printing and Allied Industries	....	....	....	....	....	....	....	....	1	1	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3
Fertiliser Manufacturing	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	1	....	....	....	....	....	....	....	....	....	....	....	....	3
Mining	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	1 (F)	....	....	....	....	....	....	....	....	2 [1 (F)]
Match and Match Box Manufacturing	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Tobacco Processing	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Food and Drink Processing	1	1	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	....	1	2	....	....	....	....	....	....	1	2	1	....	11
Building Materials and Building	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	1	....	1	....	....	....	....	....	1	....	....	....	....	....	4
Cement Manufacturing	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	....	....	....	2	....	....	....	....	....	....	....	....	....	2
Glassmaking	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	....	....	....	....	....	....	....	....	....	2
Other	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	....	....	....	7	....	1	....	1	....	....	1	1	8
Totals per type of Machine....	11	9	1	2	1	1	1	1	1	1	2	2	1	1	1	1	3	3	3	3	1	1	1	4	6	3	2	2	2	1 (F)	1	1	1	1	2	2	1	1	84](1F)

Section 6.

EXAMINATION OF ENGINE DRIVERS, CRANE DRIVERS AND BOILER ATTENDANTS.

During the year the Board of Examiners granted 124 Engine Drivers', 76 Crane & Hoist Drivers' and 75 Boiler Attendants' Certificates.

Compared with the previous year these figures represent decrease 52, decrease 20, decrease 14 respectively.

Section 7.

AMENDMENT TO ACT.

No proposed amendment to the Inspection of Machinery Act or Regulations was submitted for consideration. Consolidation of both the Act and Regulations with past amendments was prepared however for next reprint of copies of these documents.

Section 8.

STAFF.

During the year the increase of industrial activities has naturally added much to the demands made upon the efforts of all inspection and clerical members of the Staff and I wish to express my appreciation to them for the harmonious spirit which has prevailed, and for their ready response on all occasions.

I also desire to convey my thanks to other officers of the Mines Department for assistance which has contributed in so many ways in the aim toward efficiency in the operations of the Branch.

J. F. WINZAR,
Deputy Chief Inspector of Machinery.

Annual Report of the Government Chemical Laboratories for 1952.

Contents.

Division VII.

Annual Report of the Government Chemical Laboratories.

The Under Secretary for Mines:

Sir,—I have the honour to present to the Honourable the Minister for Mines my Annual Report on the operations of the Government Chemical Laboratories for the year ending 31st December, 1952.

STAFF.

The total staff employed as at 31st December, 1952, was 62 consisting of 46 professional officers, seven clerical and nine general.

Staff changes during the year were as follows:—Resignations, 4; appointments, 9.

Miss N. L. Wilson, B.Sc., assumed duties as librarian during the year.

It is with regret I have to record the death of a loyal and efficient officer, Mr. C. E. Thomas, Laboratory Assistant.

Mr. L. Brennan, Fuel Chemist and Research Officer, continues to work at the Collie Annexe Laboratory and Messrs. E. C. Hodgson, D. P. Carter, Analysts and Research Officers, and M. Liber, Laboratory Technician at the Lincoln Street Annexe Laboratory.

ADMINISTRATION.

The laboratories as constituted consist of five Divisions under the Director as follows:—

Director: H. P. Rowledge, A.W.A.S.M., F.R.A.C.I.

Foods, Drugs and Toxicology Division: J. C. Hood, O.B.E., F.R.A.C.I., Deputy Government Analyst.

Agriculture, Water Supply and Forestry Division: L. W. Samuel, Ph.D. (Lond.), F.R.A.C.I., A.R.I.C., Deputy Government Agricultural Chemist.

Mineralogy, Mineral Technology and Geo-Chemistry: C. R. LeMesurier, A.W.A.S.M., A.R.A.C.I., Deputy Government Mineralogist.

Fuel Technology Division: R. P. Donnelly, M.A., B.Sc. (Oxon.), Fuel Technologist.

Chemical Engineering Division: A. Reid, M.A., B.Sc. (Aberd.), Chief Industrial Chemist

The volume of work handled by these laboratories has now reached such proportions that serious consideration will have to be given to further extension to accommodation particularly in the three older divisions, Foods and Drugs, Mineral Chemistry and Agriculture.

The annexe laboratory at Collie is now temporarily housed at the old laboratory of the grain distillery at Collie by arrangement with the Department of Industrial Development.

I am pleased to be able to state that early this year the commencement was made in the erection of the unit process plant for the Chemical Engineering Division. It is hoped that the building will be ready for occupation early next year when this division will be developed to its full strength and be enabled to undertake much valuable fundamental work on the study of our natural resources and development of Chemical Industry therefrom.

The laboratories have now an up-to-date and well indexed library covering the many specialised branches of the chemical profession including chemical engineering.

GENERAL.

The total number of samples for analysis, chemical and mineral examination this year was slightly less than last year, the total number received being 21,115 as against 22,409. The volume of work of advisory nature on chemical matters for Government Departments is considerable and is apart from the actual analytical work entailed in connection with the samples registered.

The source of samples was as follows:—

Mines Department	1,950
Agriculture Department	2,491
Public Health Department (Royal Perth Hospital) (208 + 31)	239
Metropolitan Water Supply, Sewerage and Drainage Department	13,112
Government Stores and Tender Board	31
Department of Industrial Development	9
Police Department	384
Commonwealth Departments	36
Other Departments—	
War Service Land Settlement Scheme, Factories, Public Works, Native Affairs, Local Governing Bodies, Railways, Main Roads, Museum, Crown Law, Milk Board	748
State Industries—	
Wundowie Wood Distillation, Charcoal Iron and Steel Industry	21
Forests	30
State Housing Commission	7
Co-operative Bulk Handling	6
Public (pay and free)	2,051
	21,115

These are classified in detail according to the source from which they were received as follows:—

TABLE I.

Samples Received During 1952.

Source.	Total.
State Mining Engineer	10
State Batteries	254
Government Geologist	983
Departmental	698
Explosives	5
Industrial Development Department	9
Wood Distillation Charcoal Iron and Steel Industry	21
Works and Labour Department	481
Metropolitan Water Supply	13,112
Public Health Department	208
Agriculture Department	2,491
Factories	10
Police and Coroner	333
Police, C.I.B.	44
Police, L.I.B.	7
Government Stores and Tender Board	31
Royal Perth Hospital	31
Milk Board of W.A.	24
War Service Land Settlement Scheme	185
Native Affairs	2
Forests Department	30
Perth Museum	1
Free	505
Pay, Public	1,546
Pay, State Housing Commission	7
Pay, Local Governing Bodies	2
Pay, West Australian Government Railways	36
Pay, Main Roads Department	3
Pay, Civil Aviation Department	2
Pay, Aeronautical Inspection Directorate	13
Pay, British Phosphate Commission	1
Pay, Commonwealth Works and Housing	13
Pay, Commonwealth Health Department	1
Crown Law Department	4
Bureau of Mineral Resources	6
Co-operative Bulk Handling	6
Total	21,115

Samples are allocated to the various Divisions according to the specialised nature of the chemical work undertaken by each Division.

Mr. E. C. Hodgson, Analyst and Research Officer visited Melbourne with the Sewerage and Drainage Engineer, Metropolitan Water Supply, Sewerage and Drainage Department to attend a meeting of the "Standing Technological Committee on Hydrogen Sulphide Corrosion."

Dr. L. W. Samuel attended various field days held by the Department of Agriculture and Mr. R. P. Donnelly visited Collie on a number of occasions during the year.

Mr. H. P. Rowledge visited Ravensthorpe in August and November to make a mineral examination of the Phillips River Goldfield in co-operation with the Geological Survey and to examine the district for radio-activity.

FOODS, DRUGS, TOXICOLOGY AND INDUSTRIAL HYGIENE DIVISION.

The total number of samples examined by this Division during the year was 14,483 and covered a considerable variety of materials both for various Government Departments and the General Public as shown in Table 2.

The major part of the chemical work required by the Department of Public Health and the Police Department is allocated to this Division but certain work of a specialised nature is also handled for other Departments such as the Department of Agriculture and the Metropolitan Water Supply, Sewerage and Drainage Department.

The examination of foodstuffs is an important function of this Division as it gives a certain measure of protection to the General Public and public institutions to ensure pure and wholesome foods are available.

In all, 232 samples of various foodstuffs were examined during the year, 84 of which were samples of milk taken by Inspectors of the Public Health Department and the Milk Board. These were examined to check composition, efficiency of pasteurisation and adulteration by addition of water.

Butter and cheese samples were examined for the Department of Agriculture to check the composition of products from various butter and cheese factories throughout the State.

331 samples were examined for various branches of the Police Department and the Coroner. These included exhibits in connection with Criminal Investigation, deaths under anaesthetics, human and animal toxicology and alcoholic liquors suspected of adulteration. Of these 160 exhibits of blood and urine were examined for alcohol in connection with deaths due to traffic accidents or other causes.

Drugs and medicines were examined for identification and purity, or conformity to the British Pharmacopoeia Standards for the Government Stores, Tender Board and Royal Perth Hospital. Of these, 32 were anaesthetic ethers.

49 samples of insecticides, including fly sprays were examined for the Department of Agriculture, Government Tender Board and the Public Health Department for composition or compliance with specifications.

Under the heading of Industrial Hygiene investigations were carried out in co-operation with officers of the Public Health Department and the Factories Department, in industries and factories to determine hazards to health. 60 samples in all were examined, 49 of these were urine samples for suspected lead poisoning of which 36 were for routine check for the Government Railways.

The collection and examination of samples from the Swan River in connection with pollution problems continues. The results show little variation from the previous year and indicate that the river generally is clean except at certain specific parts. The pollution survey was extended during the year to take in Bunbury Harbour where monthly samples are collected and examined by officers of the laboratory.

This division is responsible for the collection of samples and the chemical examination in connection with the chemical control of sewage for the

Metropolitan Water Supply, Sewerage and Drainage Department. During the year 13,411 samples in all were examined, 2,472 of which were weekly routine control samples taken in connection with the operations of the various sewage treatment works and 10,306 investigational samples. The majority of the latter were taken in connection with an Australian wide investigation on the hydrogen sulphide corrosion of concrete sewers.

A large number of miscellaneous materials were examined including explosives for the Mines Department, fluorine content of phosphatic materials, building materials such as paints for pigments, vehicles and thinners, weatherboard, pipe enamel, floor polishes, aerated waters, drinking water for contamination by poisonous substances, turpentine, sunflower and safflower seeds, linseed, lupins etc.

Table 2.

FOOD AND DRUG DIVISION, 1952.

	Public Health Department.	Agriculture Department.	Government Stores and Tender Board.	Metropolitan Water Supply, S. & D. Department.	Factories—Chief Inspector.	Police and Coroner.	Police—C.I.B.	Police—L.I.B.	Royal Perth Hospital.	Works and Labour Department.	Departmental.	Explosives Branch.	Free—Public.	Pay—Public.	Pay—W.A.G.R.	Pay—A.I.D.	Pay—Crown Law Department.	Pay—Commonwealth Works.	Pay—Milk Board of W.A.	Pay—Main Roads Department.	Pay—Commonwealth Health Department.	Pay—State Housing Commission.	TOTAL.
Foods—																							
Butter	2	20	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	22
Cheese	....	35	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	35
Self Raising Flour	....	8	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	8
Cows Milk	60	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	....	24	....	....	....	86
Lemon Butter	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2
Meat and Sausages	15	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	16
Smoked Fish	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Bread	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Pickles, Sauce and Vinegar	8	2	12	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	22
Food Product (? Egg Pulp)	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Tallow, Dripping, Lard	2	3	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	6
Esseamine	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Jam	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Pepper	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Condensed Milk	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3
Fruit (D.D.T. residue)	....	24	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	24
Canned Apples	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Pears	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Human Toxicology—																							
Exhibits—Alcohol	1	....	....	....	....	160	....	....	....	....	....	....	....	3	....	....	....	....	....	....	....	....	164
Anaesthetic	....	....	....	....	....	24	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	24
Exhibits—Human Toxicology	15	....	....	....	....	143	23	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	182
Tea (? poison)	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Animal Toxicology—																							
Specimens, death of Fowls, Pigs, Calves, Lion, etc.	....	31	....	....	....	1	6	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	38
Industrial Toxicology—																							
Rubber Solution	....	....	....	....	4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	4
Urine	12	....	....	....	....	....	....	....	....	....	....	....	....	1	36	....	....	....	....	....	....	....	49
Turpentine (Solvent)	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Methanol	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Welding Rod	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Lacquer Reducer	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Blood (CO)—Garage Worker	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Blood (Lead)	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2
Sewage—																							
Weekly Routine	....	....	....	2,472	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2,472
Investigational	....	....	....	10,306	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	10,306
Trade Waste	11	....	....	77	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	89
Swan River Pollution	4	....	....	....	....	....	....	....	....	288	....	....	....	....	....	....	....	....	....	....	....	....	292
Bunbury Pollution	....	....	....	....	....	....	....	....	....	96	....	....	....	....	....	....	....	....	....	....	....	....	96
Ocean Beach Survey	....	....	....	147	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	147
Sludge (Borax Fly Treatment)	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3
Complete Analysis	....	....	....	6	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	6
Liquors—																							
Sauterne	....	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3
Wine	....	38	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	38
Cider	....	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2
Whisky	....	....	....	....	....	....	....	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3
Gin	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1

Insecticides—										7	29													2							38
Fly Spray												11																		11
Cattle Dip											29																			29
Human Milk										20																				20
Drugs and Medicines—																														
Ether Supplies												2						30												32
White Pills																3														3
Tablets												2												1						3
Oils and Brake Fluid															1									2		7	1	2		1	14
Turpentine																										5					5
Neatsfoot Oil											2																				2
Sunflower Seed											7																				7
Safflower Seed											12																				12
Lupins											1																				1
Fruit Wraps											4																				4
Liquorice										1																					1
Wrapping Paper										1																					1
Linseed											8																				8
Fluorine in Phosphates—																															
Cowdung, Mandible, Bones, Teeth, etc.											55																				55
Criminal Cases—																															
Green Paint—Traffic Case															3																3
Homemade Bomb															1																1
Specimen of Cake																1															1
Grease Gun and Gelignite																2															2
Powdered Glass																2															2
Dust, Suit, Shoes																3															3
Bottles containing Petrol																3															3
Explosives—																							5								5
Fondu Cement—(Black Surface)													1																		1
Water—																															
For Lead																								1							1
Swimming Pool										1																					1
Fluorine										3																					3
Aerated Waters Investigation																							1								1
Flock										1																					1
Paints—																															
Pipe Enamel (Bitumen)													3																		3
Paint																										3					3
Plastic Paint										1																					1
Stain (Rosewood)														2																	2
Damp Course																														1	1
Bottle Measure and Deposit																	3														3
Carbon Dioxide										1																					1
Mallet Bark																								1							1
Weatherboard																														1	1
Lemonade Bottle (Kerosene)										1																					1
Rabbit Poison											4																				4
Barium Sulphate										1																					1
Acids																								3							3
Material from Abscess										1																					1
Wool											4																				4
Procaine and Adrenalin												2																			2
Floor Polish												2																			2
Wax-like Substance																									1						1
"Welvic" Film (Fire Hazard)										2																					2
Skin Cream										2																					2
Earth and Grass (Urine)										8																					8
Pitch-like Substance																								1							1
Urinal Trap (Corrosion)																										1					1
Wood Tar																												1			1
										199	322	31	13,012	10	333	44	7	30	384	5	5	1	12	36	13	4	6	24	2	1	2	14,483

AGRICULTURE, FORESTRY AND WATER SUPPLY DIVISION.

The activities of this division are concerned chiefly with the chemical work required by the Department of Agriculture and the examination of water samples from the metropolitan, town and country water supplies for the respective departments concerned and for the general public.

The total number of samples examined by the division during the year was 3882 as shown in table 3.

As usual a large number of water samples, 1606, were received during the year, 1178 of which were done for the public, chiefly bona fide primary producers. The latter samples are analysed to advise as to their potability and suitability for domestic, irrigation and stock purposes. 212 water samples were examined for the War Service Land Settlement Scheme and for the Department of Agriculture. The remainder were done for the Metropolitan Water Supply Department, Public Works, Government Geologist, Public Health and local governing bodies.

The routine examination of existing water supplies to cities and towns was continued this year. In this connection samples are regularly analysed from the Canning Dam, Churchmans Brook, Victoria Reservoir, Attadale Bore, Mundaring Weir, Mt. Charlotte Reservoir, Kalgoorlie, and the Wellington Dam.

In all 484 soil samples were examined, 431 of which were for the Department of Agriculture in relation to experiments in the Carnarvon banana and pineapple growing district, Tobacco Research Station Manjimup, Swan Valley vineyards, and for experiments concerned with rates of application of lime from a number of districts in Western Australia. Miscellaneous soil samples were also examined mainly for salinity and acidity.

A number of official samples of fertilisers and feeding stuffs under their respective Acts were examined during the year as well as a number of samples of a general nature.

Further analyses were carried out this year in connection with extensive trials by the Department of Agriculture on the efficiency of various types of phosphatic fertilisers, with the object of conservation of superphosphate. Thirty samples of oat plants and 27 of wheat plants were examined for their phosphorus content. Twenty samples of fodders used in connection with the beef raising experiment at the Wokalup Research Station were analysed for the Department of Agriculture to ascertain the food intake of the animals and 31 samples were received from the Bramley Research Station in connection with experiments on milk production and phosphorus intake of cows.

Plant materials from the wheat belt analysed for feeding stuffs included those from cereal grazing and recovery trials at the Wongan Hills Research Station, oats and barley from Merredin Research Station and Avondale, a vetch cutting and recovery trial at Wongan Hills and pasture samples also from this research station, in connection with a comprehensive rotation and grazing experiment. Samples from the northern pastoral area and a number of feeding stuffs of a miscellaneous nature were also examined.

Analyses of plant materials for various elements in connection with plant nutrition experiments were carried out for the Department of Agriculture mainly for (i) the study of the effect of various fertiliser treatments; (ii) the diagnosis of unhealthy plants and (iii) the effect of various fertiliser treatments in connection with unthriftiness of plants. These included apple leaves, clover, oats, vines, wheat etc.

The programme of work in conjunction with the Department of Agriculture embracing chemical work in connection with growth of tobacco plants and tobacco quality was continued.

Samples of the official Western Australian f.a.q. wheat samples for the year 1951-52 season and the flour milled from it on a Brabender experimental stone mill were analysed.

Spectrographic examination of a number of various materials were undertaken during the year by this division. Samples of Koolyanobbing iron ore, limestone, magnesite, charcoal and pig iron from Wundowie were examined to ascertain impurities which might affect the possible production of nodular cast iron. Two samples of copper metal were examined for comparison of impurities in each.

Samples of plant materials and products formed in the manufacture of sulphuric acid were examined for selenium.

The laboratory work commenced last year on the bacterial decomposition of sewage sludge in saline waters was continued this year for guidance as to the maximum salinity for water for septic tank systems. A progress report by the Deputy Government Agricultural Chemist, Dr. Samuel will be issued as a separate report.

Table 3.

AGRICULTURE DIVISION, 1952.

	Agriculture Department.	Public Health Department.	Departmental.	War Service Land Settlement Scheme.	Metropolitan Water Supply, Sewerage and Drainage Department.	Works and Labour Department.	Government Geologist.	Forests Department.	Free.	Pay—Public.	Pay—Commonwealth Works Department.	Pay—Local Governing Bodies.	Pay—Civil Aviation Department.	Pay—Co-op Bulk Handling.	Total.
Water	33	5	16	179	49	66	56	5	9	1,178	7	2	1	....	1,606
Soil	431	....	....	6	....	....	....	25	....	14	....	....	....	....	476
Soil (Kwinana)	....	....	....	....	....	8	....	....	....	....	....	....	....	....	8
Seawater (Kwinana)	....	....	....	....	....	2	....	....	....	....	....	....	....	....	2
Scale	....	....	....	....	....	....	....	....	....	1	....	....	....	....	1
Dust	....	....	....	....	....	....	....	....	....	....	....	....	1	....	1
Limesand and Limestone	6	....	....	....	....	....	....	....	3	31	....	....	....	....	40
Fowl Manure	1	....	....	....	....	....	....	....	....	3	....	....	....	....	4
Poultry Yard Scrapings	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Compost	3	....	....	....	....	....	....	....	....	....	....	....	....	....	3
Blood and Bone	....	....	....	....	....	....	....	....	....	1	....	....	....	....	1
Cave Deposit	....	....	....	....	....	....	....	....	....	5	....	....	....	....	5
Hydrolime	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Zinc Super	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Lime Super	8	....	....	....	....	....	....	....	....	....	....	....	....	....	8
Gypsum	2	....	....	....	....	....	....	....	....	....	....	....	....	....	2
Loam	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Eggshell, Paunch, Blood and Bone	....	....	....	....	....	....	....	....	....	1	....	....	....	....	1
Red Gum Ash	....	....	1	....	....	....	....	....	....	....	....	....	....	....	1
Ground Residue (abattoirs)	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Dried Bacterial Matter	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Manganese Sulphate	....	....	....	....	....	....	....	....	....	3	....	....	....	....	3
Copper Ore	....	....	2	....	....	....	....	....	....	....	....	....	....	....	2
Zinc Sulphate	2	....	....	....	....	....	....	....	....	1	....	....	....	....	3
Fertiliser	5	....	....	....	....	....	....	....	....	1	....	....	....	....	6
Fertiliser (Act)	42	....	....	....	....	....	....	....	....	....	....	....	....	....	42
Oat Plants	188	....	....	....	....	....	....	....	....	....	....	....	....	....	188
Wheat Plants	145	....	....	....	....	....	....	....	....	....	....	....	....	....	145
Oat Grain	30	....	....	....	....	....	....	....	....	....	....	....	....	....	30
Wheat Grain	33	....	....	....	....	....	....	....	....	1	....	....	....	....	34
Wheat Heads	3	....	....	....	....	....	....	....	....	....	....	....	....	....	3
Oat Straw	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Barley Plants	11	....	....	....	....	....	....	....	....	....	....	....	....	....	11
Poultry Foods	7	....	....	....	....	....	....	....	....	....	....	....	....	....	7
Calf Milk	....	....	....	....	....	....	....	....	....	3	....	....	....	....	3
Laying Mash	9	....	....	....	....	....	....	....	....	....	....	....	....	....	9
Pig Swill	....	....	....	....	....	....	....	....	....	2	....	....	....	....	2
Whale Solubles	4	....	....	....	....	....	....	....	....	....	....	....	....	....	4
Bonemeal	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Crushed Wheat	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Feeding Stuff (Mice)	4	....	....	....	....	....	....	....	....	....	....	....	....	....	4
Chick Food	....	....	....	....	....	....	....	....	....	1	....	....	....	....	1
Pig Food	4	....	....	....	....	....	....	....	....	....	....	....	....	....	4
Meatmeal	2	....	....	....	....	....	....	....	....	1	....	....	....	....	3
Meadow Hay	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Hay	2	....	....	....	....	....	....	....	....	....	....	....	....	....	2
Mill Screenings (Poultry Food)	....	....	....	....	....	....	....	....	....	1	....	....	....	....	1
Pastures	138	....	....	....	....	....	....	....	....	....	....	....	....	....	138
Lupins	13	....	....	....	....	....	....	....	....	....	....	....	....	....	13
Sudan Grass	3	....	....	....	....	....	....	....	....	....	....	....	....	....	3
Capeweed	33	....	....	....	....	....	....	....	....	....	....	....	....	....	33
Sub-clover	183	....	....	....	....	....	....	....	....	....	....	....	....	....	183
Vetch	24	....	....	....	....	....	....	....	....	....	....	....	....	....	24
Kikuyu Grass	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Blackboy Heart	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Silage	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Volunteer Grass	32	....	....	....	....	....	....	....	....	....	....	....	....	....	32
Annual Grass	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Pea Plants	6	....	....	....	....	....	....	....	....	....	....	....	....	....	6
Lucerne Tree	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Lucerne	4	....	....	....	....	....	....	....	....	....	....	....	....	....	4
Poa Annua	8	....	....	....	....	....	....	....	....	....	....	....	....	....	8
Erodium	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Feeding Stuff (Pea Bush, Buffel, Grass, spinifex, Kapoc)	6	....	....	....	....	....	....	....	....	....	....	....	....	....	6
Potato Tops	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Feeding Stuffs (Act)	80	....	....	....	....	....	....	....	....	....	....	....	....	....	80
Tobacco Leaf	387	....	....	....	....	....	....	....	....	....	....	....	....	....	387
Dried Liver—Sheep	1	.....	....	....	....	....	....	....	....	....	....	....	....	....	1
Dried Liver—Kangaroo	2	....	....	....	....	....	....	....	....	....	....	....	....	....	2
Apple Leaves	117	....	....	....	....	....	....	....	....	....	....	....	....	....	117
Vine Leaves	98	....	....	....	....	....	....	....	....	....	....	....	....	....	98
Fig Tree Leaves	4	....	....	....	....	....	....	....	....	....	....	....	....	....	4
Mandarin Leaves	9	....	....	....	....	....	....	....	....	....	....	....	....	....	9
Passion Fruit Leaves	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Banana Leaves	12	....	....	....	....	....	....	....	....	....	....	....	....	....	12
Orange Leaves	8	....	....	....	....	....	....	....	....	....	....	....	....	....	8
Cauliflower Leaves	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Selenium—															
Sludge, Soil, Pyrites residue	....	....	3	....	....	....	....	....	....	....	....	....	....	....	3
Seed	....	....	1	....	....	....	....	....	....	....	....	....	....	....	1
Soil and Plants	....	4	3	....	....	....	....	....	....	....	....	....	....	....	7
Horse Urine	....	....	2	....	....	....	....	....	....	....	....	....	....	....	2
Flour	1	....	1	....	....	....	....	....	....	....	....	....	....	6	8
F.A.Q. Wheat and Flour	2	....	....	....	....	....	....	....	....	....	....	....	....	....	2
Wheat	....	....	1	....	....	....	....	....	....	....	....	....	....	....	1
Iron Oxide	....	....	....	....	....	....	....	....	....	2	....	....	....	....	2
Bone (Fluorine)	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Beryl	....	....	....	....	....	....	....	....	1	....	....	....	....	....	1
Stock Lick (Eggshell)	....	....	....	....	....	....	....	....	....	1	....	....	....	....	1
	2,166	9	30	185	49	76	56	30	13	1,251	7	2	2	6	3,882

MINERALOGY, MINERAL TECHNOLOGY AND GEO-CHEMISTRY DIVISION.

The activities of this division are concerned chiefly with the chemical and mineralogical examination of samples, including assays for gold and base metals for the various branches of the Mines Department, Government Geologist, State Batteries, State Mining Engineer and the general public. Certain work of a specialised nature related to inorganic chemistry is also undertaken for other departments. A detailed classification of the samples handled by this division is shown in Table 4.

The total number of samples received during the year was 1,880 compared with 1,117 for the year 1951, being an increase of 763. This increase was due mainly to 575 samples received from the Government Geologist for mineral examination of a long term investigation and an increase of 146 in the number of samples examined for the general public both pay and free under the regulations.

Six hundred and eighty-eight samples received from the Government Geologist covered a wide range of ores and minerals for chemical and mineral examination and tests for radio-activity, from throughout the State.

Of the 254 samples received from the State Batteries 182 were check gold samples, 36 umpire gold assays and 21 samples for tungsten assay. Ten samples were received from the State Mining Engineer for analyses and mineral determination.

An important activity of this division is the examination of economic minerals connected with the development of the mineral industry. It is also responsible for keeping the mineral record of the State thus enabling these laboratories to answer the many inquiries regarding the mineral distribution, market potentialities and value of minerals received during the year. Apart from mineral specimens examined departmentally, 690 were received from the general public for mineral determination and analysis from many localities throughout the State. Of these 489 were examined free. This is a service provided by the Government to prospectors and others under certain conditions as assistance to development of the mineral industry and to assist in the development of areas of potential value for both gold and economic minerals. During the year the following minerals of potential economic or scientific interest were received from localities in which they have not previously been recorded:—Allanite, beryl, bismuthinite, bismuth ochre, chalcocite, columbite, cerussite, malachite, olivenite, pyrolusite, psilomelane, scheelite, stolzite and topaz.

A number of samples were received for radio-activity test of which about half were tested free for the general public as a part of a policy of assistance to the search for uranium minerals in this State. Samples collected by the Government Geologist were also tested. Officers of these laboratories visited the Phillips River Goldfield where with the co-operation of the Government Geologist many mineral occurrences and specimens were tested. No radio-active minerals of economic significance were detected.

Twenty-three samples of alloys and metals were analysed for one or more constituents for the Wundowie Charcoal Iron and Steel Industry, Department of Industrial Development and the general public.

This division studies corrosion problems and advice is given as to its cause and prevention. In this category a further 16 samples of metals and alloys of various nature were examined, ten of which were for the Public Works Department.

Twenty-seven samples of ceramic materials were examined during the year for suitability for use in the industry, 17 of these were natural clays from various localities and six were natural or prepared refractories for test.

Several natural mineral pigments were examined for the general public as to their suitability for use as ochres or red oxide. Samples of construction and building materials were examined for the State Housing Commission as well as other products of a miscellaneous nature for varied interests.

Table 4.

MINERAL DIVISION, 1952.

	Pay—Public.	Free.	State Battery.	Government Geologist.	State Mining Engineer.	Departmental.	Royal Perth Hospital.	Industrial Development Department.	Mineral Resources Bureau.	Native Affairs Department.	Metropolitan Water Supply, Sewerage, and Drainage Department.	Works and Labour Department.	Perth Museum.	Agriculture Department.	State Housing Commission.	Charcoal Iron and Steel Industry.	British Phosphate Commission.	Main Roads Department.	TOTAL
Alloys and Metals	10	....	....	....	....	....	....	1	....	....	....	....	....	....	....	12	....	....	23
Corrosion	4	....	....	....	....	....	1	....	....	....	....	10	....	....	....	1	....	....	16
Ceramics—																			
Clays	....	14	....	....	....	1	....	1	....	1	....	....	....	....	....	....	....	....	17
Shale	....	....	....	....	....	2	....	....	....	....	....	....	....	....	....	....	....	....	2
Refractories	6	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	....	....	8
Natural Mineral Pigments—																			
Ochres and Oxides	3	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	4
Metallic Ores and Minerals—																			
Beryllium	1	7	....	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	11
Chrysoberyl	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Copper Ores	18	39	....	4	....	....	....	....	....	....	....	....	....	1	....	....	....	....	62
Gold Ores	6	22	....	9	....	....	....	....	....	....	....	....	....	....	....	....	....	....	37
Gold Ore investigation	....	....	....	575	....	....	....	....	....	....	....	....	....	....	....	....	....	....	575
Gold Umpire	....	....	36	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	36
Gold Tailings	....	....	182	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	182
Heavy Sands	2	7	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	9
Iron Ores	10	4	....	....	....	....	....	3	....	....	....	....	....	....	....	....	....	....	17
Lead Ores	8	18	....	1	4	....	....	....	....	....	....	....	....	....	....	....	....	....	31
Chromite	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Manganese	1	12	....	16	....	....	....	....	....	....	....	....	....	....	....	....	....	....	29
Columbite	3	4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	7
Tantalite	....	3	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	4
Tin/Tantalite Ore	7	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	7
Tungsten	22	9	21	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	53
Tin Ore	29	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	32
Tin Concentrate	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Titanium	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Bismuth	....	4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	4
Australite	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Mica	....	4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	4
Zinc	....	1	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	2
Zircon	....	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2
Uranium	....	....	....	2	....	....	....	....	6	....	....	....	....	....	....	....	....	....	8
Yttrotantalite	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Graphite	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Lithium	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Meteorite	....	....	....	....	....	1	....	....	....	....	....	....	1	....	....	....	....	....	2
Coal Inclusion	....	....	....	2	....	1	....	....	....	....	....	....	....	....	....	....	....	....	3
Minerals for Radioactivity Test	....	29	....	16	....	10	....	....	....	....	....	....	....	....	....	....	....	....	55
Minerals for R.A. Test Phillips River Goldfield	....	....	....	....	....	60	....	....	....	....	....	....	....	....	....	....	....	...	60
Other Economic Minerals—																			
Bentonite	....	....	....	14	....	2	....	....	....	....	....	....	....	....	....	....	....	....	16
Corundum	1	1	....	2	1	....	....	....	....	....	....	....	....	....	....	....	....	....	5
Limestone	2	....	....	2	....	1	....	3	....	....	....	....	....	....	....	....	....	1	9
Gypsum	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Calcite	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	1
Barytes	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Asbestos	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Garnet	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Fluorite	....	....	....	....	....	3	....	....	....	....	....	....	....	....	....	....	....	....	3
Phosphates	....	....	....	....	....	4	....	....	....	....	....	....	....	....	....	....	....	....	4
Fluorescent Minerals	....	....	....	....	....	28	....	....	....	....	....	....	....	....	....	....	....	....	28
Mineral Specimens for determination	48	296	....	23	4	5	....	1	....	....	....	....	....	1	....	....	....	....	378
Miscellaneous—																			
Construction and Building Materials	7	3	....	....	....	....	....	....	....	1	....	2	....	....	5	....	....	....	18
Rocks	....	....	....	....	....	3	....	....	....	....	....	....	....	....	....	....	....	....	3
Soil	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Sands	1	....	....	14	....	....	....	....	....	....	....	....	....	....	....	....	....	....	15
Galvanised Iron	4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	4
Screens	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2
Riders	....	....	6	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	6
Caustic Lime	....	....	9	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	9
Fibrolite Pipe Investigation	3	....	....	....	....	2	....	....	....	....	50	9	....	....	....	....	....	....	64
Total	201	489	254	688	10	123	1	9	6	2	50	21	1	3	5	15	1	1	1,880

FUEL TECHNOLOGY DIVISION.

During the year this division has kept ahead with developments in the Collie coalfield by examination of the composition and purity of the coal and a study of its characteristics in relation to industry. In all 673 samples were received for examination and report, 549 of which were collected as a result of these laboratories' activities. A detailed classification is shown in Table 5.

Forty-four coal core samples were received and reported upon to the Government Geologist in connection with the drilling programme being undertaken at Collie.

The division's own activities have included a systematic sampling and examination of coal samples from various sources from the Collie field with a view to advising as to the best types and the best methods of utilisation in industry. A systematic survey of the working faces of each mine was continued as development proceeded. By this means any variation in the composition and ash content of the coal can be detected and a check kept on the quality of the coal mined.

Apart from analytical work undertaken a considerable amount of investigational work has been carried out in the laboratory and in industrial plants.

The major items of research undertaken during the year were:—

(1) Research on the production of coked briquettes from Collie coal as a metallurgical coke substitute. This problem has now almost passed the successful laboratory scale and 74 samples in all were examined. These embraced a study of the binders used and the physical state of the char and the finished briquettes. Research is now proceeding to a pilot plant scale in co-operation with the Department of Industrial Development. Several cupola tests of laboratory prepared briquettes were carried out.

(2) Research in connection with the coal washing investigation at the Collie annexe laboratory was continued by one of our research officers Mr. L. Brennan. Laboratory scale tests were completed during the year and a report issued. It is intended to proceed to a pilot plant scale early next year using a 20in. cone type heavy media separator. In all 420 samples were examined in connection with these tests during the year.

(3) Work was carried out relating to the more efficient use of coal or sawdust in boiler plant. In some cases it has been found possible to effect economies in fuel consumption. 62 samples in all were examined in the laboratories under this heading.

(4) The deterioration of Collie coal by weathering and storage was further investigated and a study of these properties is being continued.

Table 5.

FUEL TECHNOLOGY DIVISION 1952.

	Departmental.	Government Geologist.	Wood Distillation, Charcoal Iron and Steel Industry.	Pay.	Total.
Coal—					
Washing	420	....	....	....	420
Briquetting	74	....	....	....	74
Weathering	5	....	....	....	5
Drilling	....	44	....	....	44
Fuel Laboratory Survey	13	....	....	....	13
State Electricity Commission	11	....	....	....	11
Boiler Trials	....	....	....	62	62
Cupola Tests	3	....	....	....	3
Oxidation	1	....	....	....	1
Eastern States Coals	3	....	....	....	3
Miscellaneous	15	2	1	7	25
Refractories	2	....	....	2	4
Briquettes (Yeadons)	2	....	....	....	2
Tar	....	....	1	....	1
Methylated Wood Spirit	....	....	4	....	4
Flowmeter (Calibration)	....	....	....	1	1
	549	46	6	72	673

INDUSTRIAL CHEMISTRY DIVISION.

The work of this division was again limited by the lack of proper facilities, but the erection of the Unit Process building is well in hand and should be ready for occupation next year. All the plant has been ordered and received with the exception of one or two items which are expected in time for the completion of the building. This plant includes kettles, evaporators, filters, cetrifuges, spray and film driers, a complete small scale ore-dressing plant and an all glass distillation unit. The division will therefore be able to tackle investigations on practically any aspect of chemical process engineering.

The principal work undertaken during the year was a gypsum survey in co-operation with the Geological Survey. In all 190 samples were analysed and a report will be issued shortly.

The Information Service has functioned actively during the year when a large number of enquiries from other Government Departments and the general public were answered. These related to technical matter on the formulation and manufacture of a variety of products, sources of supply of chemical raw materials and the possibilities of marketing special products. These included: magnesium oxy chloride cements; glass enamelled equipment; uses of surplus potassium carbonate; plastic modelling compositions; casein in manufacture of wall board; prevention of bloom on cement tiles; emulsifiers for disinfectants; testing equipment for petroleum; fillers for plastics from waste paper.

In all 1075 queries were attended to.

H. P. ROWLEDGE,
Director.

Division VIII.

Annual Report of the Chief Inspector of Explosives for the Year 1952.

The Under Secretary for Mines:

Sir,—I have the honour to submit for the information of the Honourable the Minister for Mines, in compliance with Section 45 of the Explosives Act, 1895, my report on the working of the Branch for the year 1952.

The quantity of explosives imported into the State during the year is shown in Table 1, also comparison with quantities imported during the past four years.

Table 1.

Explosives.	1948.	1949.	1950.	1951.	1952.
	lb.	lb.	lb.	lb.	lb.
Gelignite	2,817,700	3,098,900	3,215,850	4,170,400	5,499,550
Gelatine Dynamite	346,650	437,500	180,300	123,850	288,850
Permitted explosives	621,600	932,500	179,800	188,450	257,950
Blasting Powder	35,500	55,000	52,300	30,500	4,500
Detonators	3,514,000	3,750,000	3,626,000	2,222,376	3,931,943
Fuse (yards)	5,085,600	4,845,600	5,324,800	5,820,000	5,368,000

The following tests were made during the year for the purpose of determining the suitability for use, chemical stability and velocity of detonation of explosives:—

Explosives	2,258
Fuse	495

The following table shows the number of licenses issued during the year:—

Magazines on Government Reserves	55
Magazines used by Government Departments and on private property	142
Store Licenses Mode A	74
Store Licenses Mode B	1
Fireworks Licenses	348
Importation Licenses	2

The quantity of explosives used in the different classes of industry for the years 1951 and 1952 is given hereunder:—

	1951	1952
Gold Mining	3,616,500	3,734,400
Coal Mining	345,700	386,700
Agriculture	100,250	125,765
Quarrying	254,550	291,700
Mining (Base Metals)	279,900	232,450
Government Departments	53,750	78,100
Miscellaneous	60,000	70,235

In addition to the usual metropolitan and country inspections, advice on magazine construction and situation was given to engineers and others whose work such as trenching for pipe-laying necessitated progressive change in locality. Small magazines serving quarries on the coastal limestone belt have been under particular surveillance as to means for preventing petty thefts rife in the district. Although storage methods in the main complied with requirements, several instances of unauthorised road transport were discovered. The inspections generally resulted in much explosive being condemned, as detailed below in a table which also lists small quantities submitted for disposal:—

Date.	Place.	Kind and Quantity.	Remarks.
1952—			
February-April	Wittenoom Gorge	1,461 cases	Severe exudation.
March	South Perth	44 detonators	On account Police: unknown history.
March	Mt. Magnet	1 case gelignite	Severe exudation.
August	Spearwood	Several broken plugs (unidentifiable	Badly deteriorated by exposure.
September	Onslow	55 cases gelignite	Severe exudation.
September	Onslow	5 cases gelatine dynamite	Exudation, deliquescence, termite attack.
December	Mundaring	30 plugs mixed explosive; dozen detonators	Deteriorated. Seized by police from boys.
December	Perth	13 eight inch plugs gelignite and monobel	Taken from alleged burglar by C.I.B.

The State's explosives requirements, comprising 121,017 cases, were met by one railage, one English shipment and 13 from the Victorian factory. Of the latter, four small consignments came north of Australia direct to Cockatoo Island, Yampi Sound. The English explosives and a shipment from Melbourne were discharged by lighter in Gage Roads, whilst the remaining supplies arrived at Woodman's Point jetty in M.V. Taranui and A.V. Wongala, a newcomer to the trade.

It is natural to inquire if dredging of channels in the Success and Parmelia Banks for the Kwinana project will render the Explosives Reserve jetty accessible to vessels of size necessitating present

anchorage in Gage Roads. The advantages of direct discharge, stressed in earlier reports, have been realised with the shallow-draft Taranui and Wongala, whose increasing use has eliminated all but two or three lighterings each year. At its existing dimensions, the Success channel is navigable in calm weather by larger ships; but the approaches to the Point are studded with shallow regions, and the jetty is neither long enough nor sufficiently robust for the usual freighters of about 23ft. laden draft and 320 ft. overall length. Even if all explosives were imported thus, the infrequency of the traffic would not justify provision of direct berthing facilities. As an alternative, one shipping authority suggested anchorage in deep water adjoining spoil grounds between the two banks. At first sight attractive, the scheme must be ruled out because the extra time in ferrying labor, equivalent to a reduced output of 18 tons daily, would more than annul any gain from shorter towage. Everything considered, a study of recent developments has not altered the former conclusion that explosives are most rationally handled by small vessels alongside Woodman's Point Jetty.

Although physical and chemical properties of explosives imported in 1952 were in the main satisfactory, incompletely-filled plugs and others where over-filling had left composition external to the wrappings were occasionally found. Both defects appeared attributable to a mechanical fault in cartridging rather than to sub-standard explosive. M.V. Wongala arrived on December 1st with 10 per cent. of its cargo affected in varying degree by seawater shipped during a stormy passage. This instance, however, was quite different from that of early 1951, when two consignments of Polar A2 Monobel were proved to be excessively damp before despatch. Indeed, few if any of last year's troubles were continued into 1952. Certainly, exudation occurred on a large scale, but it was confined to explosives manufactured about mid 1951. The cause was defined as due to inadequate reaction during gelatinisation with a new type of compressed nitrocotton then in use. Exudation, or seepage of nitroglycerin, renders the explosive distressing to handle and dangerous in use. When incipient, it may be checked by absorption treatment, as was done with a few hundred-weight of explosive under observation in Woodman's Point laboratory, but in advanced stages the only safe course is destruction. Such, unfortunately, was the fate which befell 1461 cases of gelignite at Wittenoom Gorge in March, and another 55 from an Onslow magazine last September.

For unknown reasons, no further consignments of explosives in bitumen-bonded outer containers have been received. A high standard is maintained with the conventional wooden cases, which nowadays seldom break in transit and handling. Modern practice of bulk-packing plugs vertically has resulted in less deformation than in the former horizontal disposition, where superposed weight tended to flatten the lower layers.

Several matters relating to Woodman's Point Explosives Reserve may be briefly outlined. New steel-framed gates have replaced the dilapidated wooden ones at the jetty and north entrances, but renovation of the boundary fence is still far from complete. The main road, patched up temporarily with limestone slack, will in due course require bituminising, and the advantages of its extension to the jetty must be kept in mind. Experimental mechanised traction to replace haulage by horses within the Area has not so far proven entirely satisfactory. A recent review of potential storage capacity indicates that by building more magazines a 20 per cent. to 25 per cent. increase could be readily attained. It cannot be over-emphasised, however, that this is contingent upon there being no encroachment on present safety zones, and no portion of the reserve being allowed to pass from the Explosives Department's control.

Inadequacy of railway rolling stock, aggravated by a strike earlier in the year, necessitated extensive road transport of explosives. Following settlement of the dispute, rail conveyance rapidly resumed its former magnitude. Certain innovations such as supplementing the conventional powder vans by suitable alternative vehicles, and an increased loading per train between the Reserve and Robb's Jetty siding to expedite south-bound consignments, have been sanctioned by the Commission.

Although no explosives were added to the authorised list during the year, improved blasting technique using millisecond delay detonators has become well-established at Collie and is under trial in metalliferous mining. By means of a delay composition, these detonators fire successive charges at intervals ranging from 0.025 to 0.7 seconds with greater efficiency, reduced ground vibration and less noise and flyrock than where older methods are employed.

As most of our explosives come through the Reserve at Altona, Victoria, apprehension was felt when restrictions decreased the tonnage allowed on the pier from 100 to 40. Although double the former time is required to load each ship, supplies for W.A. have not so far suffered.

The third Interstate Explosives Conference was held in Melbourne from 12th to 23rd February. Of a wide field traversed, several items from previous meetings were further discussed, and much new material introduced. At one session, representatives of the Australian and New Zealand Railways Conference, present by invitation, submitted a case for uniform regulations to govern railage of explosives. Messrs. Nobel's new factory was inspected, and "refresher" visits paid to several of the older sections. At another establishment, the process of making bituminised fibreboard explosives containers was followed through from raw materials to the finished article, and later the results of immersion and crushing tests were demonstrated. On the final conference day, delegates gave evidence before the Victorian Parliamentary Public Works Committee on problems peculiar to importations of explosives consigned from the Altona Reserve.

Display fireworks purchased by the Government for the anticipated Royal visit of March, 1952, are magazined at Woodman's Point. At first considerable loss was feared, but following the writer's inquiries from the manufacturer in Melbourne, it was determined that all lines except one variety had excellent keeping qualities. These particular fireworks, known as iron gerbs and comprising only four per cent. of the total value, contain iron filings, the progressive oxidation of which limits their life to six weeks. As the oxidation is accompanied by heating and disruption of the paper shell, the gerbs were destroyed after efforts to find an immediate market were unavailing.

Due to import restrictions, only three shipments of English and Chinese fireworks arrived. In consequence, many of the usual lines were not represented, but residual stocks supplemented by Australian-made goods appeared to avert any general shortage. All samples examined complied with departmental regulations.

Instances of home made "gumnut bombs" came under notice during the few weeks preceding 5th November. Several specimens, probably the work of chemical students, contained a balanced mixture of oxidising and reducing agents, well tamped, and fired by fuse sealed into the orifice of the "nut". There is danger in compounding and filling, as well as from material projected on explosion. The components, essentially harmless before admixture, can be purchased freely without inciting suspicion. However, ignition is difficult except by commercial safety fuse, supplies of which were therefore restricted to persons of mature age who satisfied vendors that their purpose was legitimate. This measure, along with publicity given in schools, achieved some measure of control.

To conclude, the customary but nevertheless well-deserved expressions of gratitude are extended to Mr. Wood, of Head Office, for his clerical and inspectional services. Appreciation is also recorded of the manner in which numerous departments have assisted this Branch's work, and to the staff at Woodman's Point for duties ably performed during the year.

F. F. ALLSOP,
Chief Inspector of Explosives.

Division IX.

Report of Chairman, Miner's Phthisis Board, and Superintendent Mine Workers' Relief Act.

The Under Secretary for Mines:

Sir,—I have the honour to submit for the information of the Honourable the Minister for Mines, my report on this Branch of the Mines Department for the year 1952.

Under arrangements similar to previous years, the Commonwealth Health Department continued the periodical examinations of mine workers, the work being carried on continuously by the Health Laboratory at Kalgoorlie and by a mobile laboratory which visits the mining centres in the various goldfields. The goldfields not visited during the year were the Ashburton, Gascoyne, Kimberley, West Kimberley, Pilbara, West Pilbara and Phillips River, where visits were not warranted owing to the remoteness in the case of the West Kimberley, Pilbara and West Pilbara goldfields, and very few mine workers being employed on the others.

MINE WORKERS' RELIEF ACT.

The examinations under the Mine Workers Relief Act during the year totalled 5,359, compared with 4,942 for the previous year, an increase of 417. The results of the examinations for 1952, together with those for previous years, are shown in the tables annexed hereto. A graph is also attached illustrating the trend of the examinations since their inception in 1925. In explanation of these figures, I desire to make the following comments:—

Normal, etc.

These number 5,073, or 94.60 per cent. of the men examined, and include men having first-class lives, or suffering from pneumoconiosis only, the figures for the previous year being 4,642, or 93.94 per cent.

Early Silicosis.

These number 242 of which eight were new cases and 234 had been previously reported, the figures for 1951 being 13 and 248 respectively. Early silicotics represent 4.50 per cent. of the men examined, the percentage for the previous year being 5.27. The percentage of new cases was 0.10 compared with 0.26 for 1951.

Advanced Silicosis.

Of the 35 cases reported four were men who advanced from early silicosis during the year, the other 31 having been previously reported. Advanced silicotics represent 0.60 per cent. of the men examined, the percentage for the previous year being 0.60. The percentage of new cases was 0.07 compared with 0.18 for the previous year.

Silicosis Plus Tuberculosis.

Two cases were reported, compared with six for the previous year and represents 0.03 per cent. of the men examined. The percentage for the previous year was 0.10.

Tuberculosis Only.

Seven cases were reported compared with four for the previous year, and represents 0.10 per cent. of the men examined.

Aluminium Therapy.

This process has been installed in all the large mines in the different centres and results are being watched carefully.

Mobile X-ray Unit.

The new unit continues to give satisfactory service.

MINES REGULATION ACT.

Examinations under the Mines Regulation Act totalled 1,821. This was in addition to the 5,359 examinations under the Mine Workers' Relief Act. These show a decrease of 435 compared with the previous year. The 1,821 men comprise 1,221 new applicants and 600 re-examinees for the Initial Certificate.

Particulars of the examinations are as follows:—

NEW APPLICANTS.

Normal	1,161
Pneumoconiosis	7
Silicosis, Early	1
Query Tuberculosis	8
Silicosis, Early, plus Query Tuberculosis	1
Other Conditions	43
	1,221

Of the above applicants for admission into the industry 1,161 received the Initial Certificate (Form 2), four received Temporary Rejection Certificates (Form 3), 53 received Permanent Rejection Certificates (Form 4), two received Re-Admission Certificates (Form 5) and in one case no certificate was issued. Thus of 1,221 applicants 1,161 or 95 per cent. were eligible for employment anywhere on a mine. The percentage of permanent rejects was 4.33.

RE-EXAMINATIONS.

Normal	441
Pneumoconiosis	89
Early Silicosis	11
Query Tuberculosis	20
Tuberculosis	2
Pneumoconiosis plus Query Tuberculosis	5
Silicosis, Early, plus Tuberculosis	1
Other Conditions	31
	600

These men had previously been examined and some were engaged in the industry prior to this examination. Four hundred and forty-one received the Initial Certificate (Form 2), three received Temporary Rejection Certificates (Form 3), nine received Permanent Rejection Certificates (Form 4), 41 received Re-Admission Certificates (Form 5), 96 received Special Certificates (Form 9) and no certificates were issued in nine cases. Thus of the 600 men examined, 482 were eligible for employment anywhere on a mine, 96 were eligible for employment only on the surface and 21 were not eligible for any employment on a mine.

Grouping the two sets of figures discloses that the following certificates were issued under the Mines Regulation Act:—

Initial certificate, Form 2	1,602
Rejection Certificate (Temporary), Form 3	7
Rejection Certificate, Form 4	62
Re-Admission Certificate, Form 5	43
Special Certificate, Form 9	96
No Certificate	11
	1,821

The percentage of men of normal health to the number examined was 87 compared with 86 for the previous years.

MINERS' PHTHISIS ACT.

The amount of compensation paid during the year totalled £24,115 2s. 8d., compared with £25,076 8s. for the previous year, a decrease of £961 5s. 4d., which can be attributed to the death of some of the beneficiaries and the attainment of the age of 16 years by some of the dependent children.

The number of beneficiaries under the Act on the 31st December, was 208, being 22 ex-miners and 186 widows.

J. THOMAS,
Chairman, Miners' Phthisis Board and Superintendent, Mine Workers' Relief Act.

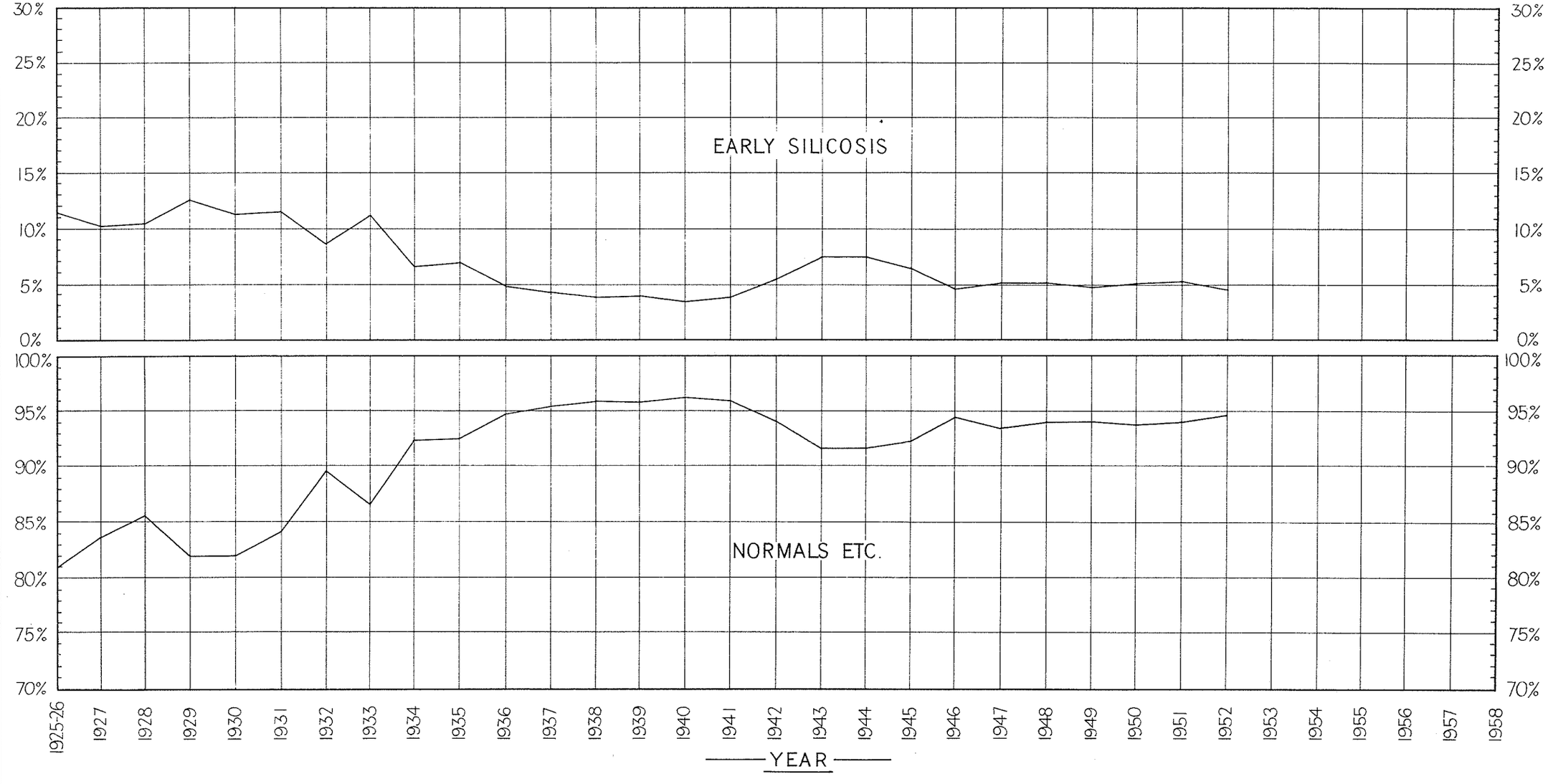
TABLE SHOWING RESULTS OF PERIODICAL EXAMINATION OF MINE WORKERS FROM INCEPTION OF EXAMINATIONS (1925).

Year of Examination.	Normal, etc.				Silicosis Early.					Silicosis Advanced.						Silicosis plus Tuberculosis.							Tuberculosis Only.				Total number of men Examined.
	Previously reported as Normal, etc.	New Cases.	Total.	Per cent.	Previously reported as Normal, etc.	Previously reported as Silicosis Early.	New Cases.	Total.	Per cent.	Previously reported as Normal, etc.	Previously reported as Silicosis Early.	Previously reported as Silicosis Advanced.	New Cases.	Total.	Per cent.	Previously reported as Normal, etc.	Previously reported as Silicosis Early.	Previously reported as Silicosis Advanced.	Previously reported as Silicosis, plus Tuberculosis.	New Cases.	Total.	Per cent.	Previously reported as Normal, etc.	New Cases.	Total.	Per cent.	
1925-1926	....	....	3,239	80·5	....	....	....	459	11·4	....	....	....	....	183	4·5	....	....	....	....	....	131	3·3	....	....	11	0·3	4,023
1927	2,290	826	3,116	83·6	....	348	33	381	10·2	....	....	85	8	93	2·5	13	27	62	....	26	128	3·4	....	....	10	0·3	3,728
1928	2,738	239	2,977	85·5	47	303	12	362	10·4	1	16	79	2	98	2·8	10	14	10	....	8	42	1·2	3	1	4	0·1	3,483
1929	2,099	21	2,120	81·9	100	224	2	326	12·6	....	34	60	....	94	3·6	8	14	19	....	....	41	1·6	7	....	7	0·3	2,588
1930	2,751	34	2,785	81·9	133	247	3	383	11·3	....	22	43	2	67	2·0	6	60	46	....	2	114	3·3	47	3	50	1·5	3,399
1931	2,530	....	2,530	84·0	94	252	....	346	11·5	....	18	35	...	53	1·8	4	35	19	....	....	58	1·9	25	....	25	·8	3,012
1932	3,835	....	3,835	89·5	35	338	....	373	8·7	....	6	47	....	53	1·2	3	9	4	....	....	16	·4	8	....	8	·2	4,285
1933	2,920	....	2,920	86·5	57	322	....	379	11·2	1	15	44	....	60	1·8	2	9	4	....	....	15	·4	3	....	3	·1	3,377
1934	5,140	....	5,140	92·4	54	315	....	369	6·6	1	24	12	....	37	·7	6	6	....	....	....	12	·2	5	....	5	·1	5,563
1935	4,437	....	4,437	92·3	35	303	....	338	7·0	....	24	2	....	26	·6	....	5	....	....	....	5	·1	2	....	2	·0	4,808
1936	6,972	....	6,972	94·7	29	323	....	352	4·8	1	15	4	....	20	·3	3	8	....	....	....	11	·1	8	....	8	·1	7,363
1937	7,487	....	7,487	95·4	15	319	....	334	4·3	....	14	4	....	18	·2	1	10	....	....	....	11	·1	2	....	2	·0	7,852
1938	6,833	....	6,833	95·7	13	266	....	279	3·9	....	15	2	....	17	·2	1	8	....	....	....	9	·1	3	....	3	·0	7,141
1939	6,670	....	6,670	95·6	18	264	....	282	4·0	....	7	3	....	10	·1	1	9	1	....	....	11	·2	2	....	2	·0	6,975
1940	7,023	....	7,023	96·2	12	245	....	257	3·5	....	10	1	....	11	·2	....	4	....	....	....	4	·0	4	....	4	·0	7,299
1941	6,840	....	6,840	95·8	32	248	....	280	3·9	....	11	3	....	14	·2	....	....	....	....	....	....	....	7	....	7	·1	7,141
1942	5,469	....	5,469	93·9	61	264	....	325	5·6	....	20	5	....	25	·4	....	2	....	....	....	2	·0	3	....	3	·1	5,824
1943	3,932	....	3,932	91·5	63	262	....	325	7·6	....	25	7	....	32	·7	....	5	....	....	....	5	·1	4	....	4	·1	4,298
1944	4,079	....	4,079	91·5	70	270	....	340	7·5	....	21	14	....	35	·8	1	7	....	....	....	8	·2	6	....	6	·1	4,468
1945	3,071	....	3,071	92·1	54	166	....	220	6·6	....	26	10	....	36	1·1	3	2	....	....	....	5	·2	2	....	2	·1	3,334
1946	5,294	....	5,294	94·4	89	172	....	261	4·7	1	36	2	....	39	·7	3	1	2	....	....	6	·1	6	....	6	·1	5,606
1947	6,021	....	6,021	93·3	101	237	....	338	5·2	....	49	9	....	58	1·0	13	11	1	....	....	25	·3	8	....	8	·1	6,450
1948	4,827	....	4,827	94·0	24	239	....	263	5·1	....	18	17	....	35	·7	1	3	....	....	....	4	·1	5	....	5	·1	5,134
1949	5,162	....	5,162	94·0	24	239	....	263	4·8	....	20	31	....	51	1·0	3	2	....	1	....	6	·1	7	....	7	·1	5,489
1950	5,077	....	5,077	93·6	14	269	....	283	5·2	....	14	41	....	55	1·0	....	1	....	2	....	3	·1	8	....	8	·2	5,426
1951	4,642	....	4,642	93·9	13	248	....	261	5·3	....	9	20	....	29	·6	....	4	1	1	....	6	·1	4	....	4	·1	4,942
1952	5,073	....	5,073	94·6	8	234	....	234	4·5	....	4	31	....	35	·6	....	2	....	....	....	2	·03	7	....	7	·1	5,359

PERIODICAL EXAMINATION OF MINE WORKERS

GRAPH No. 1

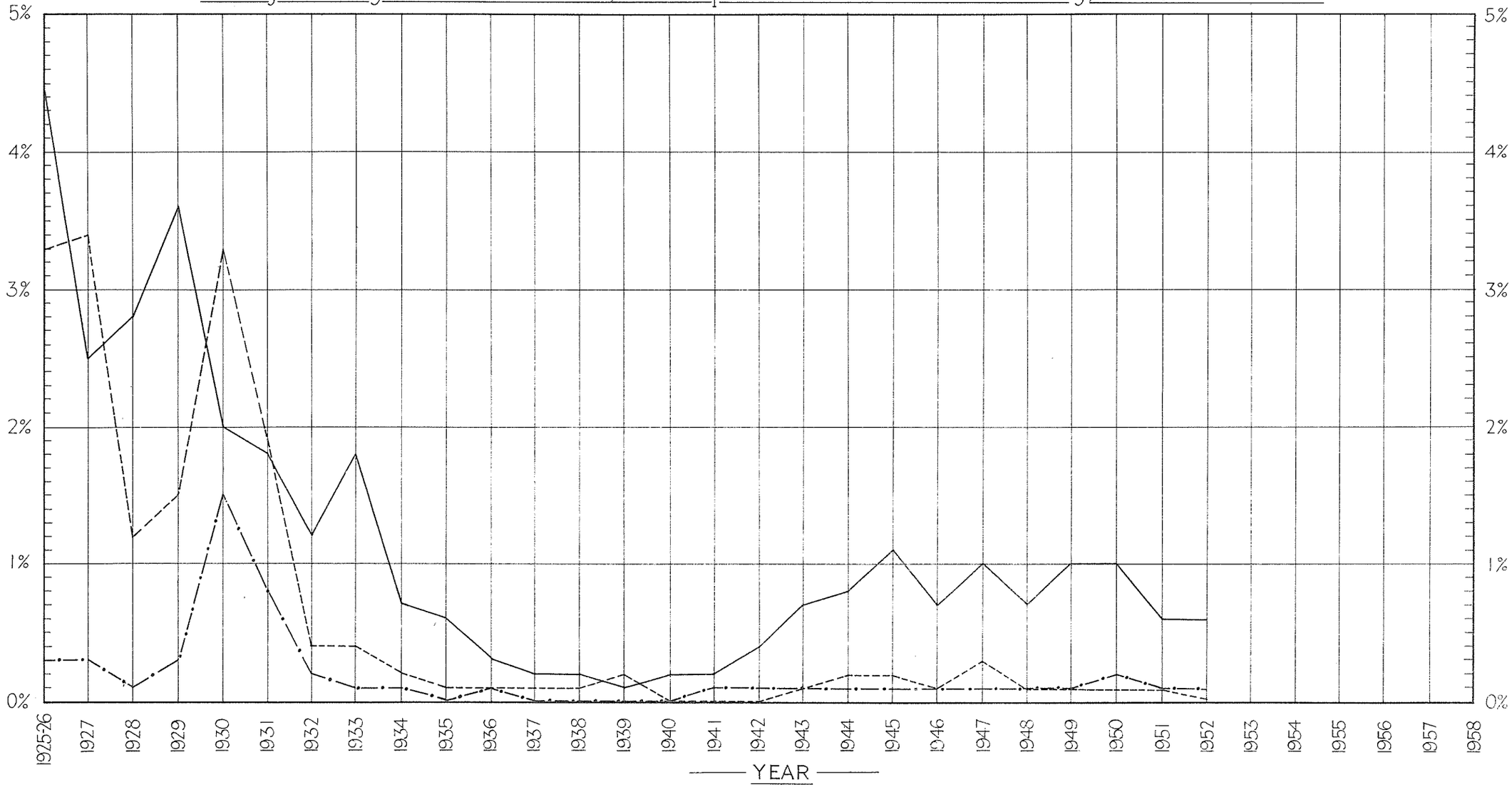
Showing Percentages of Normals and Early Silicotics from 1925-26 onwards



PERIODICAL EXAMINATION OF MINE WORKERS

GRAPH Nº 2

Showing Percentages of Silicosis Advanced, Silicosis plus Tuberculosis and Tuberculosis only, from 1925-26 onwards.



Silicosis Advanced —————— Silicosis Plus Tuberculosis – – – – – – Tuberculosis Only —·—·—·—

Division X.

Report of the Chief Coal Mining Engineer for the Year 1952.

The Under Secretary for Mines:

Sir,—I have the honour to submit to the Honourable the Minister for Mines the Annual Report on the operation of the Collie Coalfield for the year ended 31st December, 1952.

The results for the year were adversely effected by the Metal Trade Workers' strike and as a consequence an output of approximately 90,000 tons was lost.

The aggregate output sold for the year was 830,857 tons comprising 408,839 tons of open cut coal and 422,018 tons of deep mined coal. The percentages of open cut and deep mined coal to the aggregate output was 49.21% and 50.79% respectively.

It is thus observed that the aggregate output for the year would have been well over 900,000 tons had it not been for the strike. The strike did not affect the coalfield until early July and continued until late in November. The mines worked only three days per week from week ending 19th July to week ending 30th August; four days per week to week ending 4th October and five days per week to 22nd November, when normal working of eleven shifts per fortnight were resumed.

The Railway Department is to be commended on the magnificent effort made to keep the mines at work and especially on the rapidity to restore to normal working.

It was very unfortunate that advantage could not be taken of the short time working for purposes of development. It seemed an opportune time to select, say, three or four deep mines and cease production, transferring the employees to development work. However the opportunity could not be taken advantage of due to financial stringency.

The output of the individual mines, together with the estimated value, is shown on Table "A" which are not comparable with 1951 due to the adverse effect of the aforementioned strike.

The output of open cut coal shows an increase of 41.038 tons or 5,85% on the previous year. Until November the percentage of open cut coal to the aggregate remained approximately the same for the previous year. During November and December it was necessary to force the open cuts to produce more coal to provide sufficient large coal for the Railways during the miners' annual holidays.

LOSS OF OUTPUT.

Table "B" shows the loss of output that took place during the year. It is once more significant that the loss due to industrial trouble was negligible and once again all concerned are to be commended on the happy and harmonious relationship that existed throughout the year.

APPORTIONMENT OF OUTPUT.

Table "C" shows the apportionment of the output during the year.

The State Electricity Commission were the largest consumers, purchasing 377,160 tons or 45.39% of the aggregate, as against 326,742 tons or 38.28% of the aggregate in 1951.

It is anticipated that the consumption by the State Electricity Commission will increase rapidly in the near future, especially when the industrial developments now in progress are completed.

The above figures include consumption by the Collie Power Station.

The next largest consumers were the Government Railways, purchasing 298,587 tons or 35.93% of the aggregate, as compared with 373,866 tons or 44.00 per cent. of the aggregate in the previous year

The decrease in consumption, of 75,279 tons, by the Railway was due chiefly to the Metal Trade Workers' strike.

Table "D" shows the trend in consumption of Collie Coal during the five years 1948-52.

It is interesting to note that the consumption by the Collie Power Station increased from 27,586 tons during 1951 to 38,247 tons during 1952, an increase of 10,661 tons or 38.5%.

This increase is due chiefly to the programme of mechanisation at the mines as well as the commencement of new mines. As the programme of development proceeds, so also will the consumption increase at the Collie Power Station.

The trend in output 1943-52 from deep mines and open cuts is shown on Table "E" and graph.

A true comparison between 1951 and 1952 is not possible due to the adverse effect of the Metal Trade Workers' strike.

Since 1950 a sharp increase has taken place in open cut outut and an almost corresponding decrease in deep mine out put.

The decrease in deep mine output is due chiefly to the transfer of many employees from production development, especially at the Co-operative and Proprietary Mines, also the opening up of new mines such as Western No. 1, Western No. 2 and Centaur.

It must again be stressed that the life of open cut mining at Collie is definitely limited. Geological surveys up to date limit the amount of open cut coal to approximately 8,000,000 tons. Further surveys may increase this amount.

However, it is obvious that over the long future, production must ultimately come from the deep mines.

Long term planning of the deep mines is therefore essential.

DEVELOPMENT.

Considering the fact that priority is given to coal production reasonable progress was made with developments. As often previously stated, the rehabilitation of old mines is a difficult, long and tedious process and rapid progress is not possible unless the whole mine ceases production and all the employees transferred to development and re-organisation.

Although a considerable amount of development has been accomplished much remains to be done and the quickest and most economical and efficient manner of achieving same is to adopt

the above mentioned policy. No useful purpose is served in delaying same and deferring the benefit of improved working conditions and efficiencies.

During the ensuing year much development will be completed and more mines will come into full production but that does not mean that other schemes of development should be deferred. Developments must continue and be intensified until the development faces are from at least five to ten years in advance of production faces. It is only by so doing that a large and consistent output can be obtained from the deep mines. The open cut mines have a limited life. Whatever that life may be the deep mines must ultimately be in a position to replace the open cut output as well as meet the ever-increasing demand for coal.

The amount of open cut coal available at Collie is definitely limited to an infinitesimal fraction of the total amount in the Collie basin, and to exhaust such potentialities is to place the State in a precarious position in times of emergencies. To preserve an adequate amount of open cut coal is to preserve a State asset.

At present four new mines are in the process of development, viz. Western No. 1, Western No. 2, Black Diamond Tunnel and Centaur. To develop these mines on the principle that the development faces are five to ten years in front of production will take time, but however long it takes it is important to adhere strictly to the principle advocated.

There are many instances at Collie where a short term policy can be adopted to provide reasonable outputs and without interfering with the long term policy. The use of modern coal face machinery accompanied with a modern system of transport allows of good outputs from lateral headings whilst the developments are proceeding, and there is no justification for the reluctance of colliery managers to plan on this principle on a long term basis splitting the leases into large blocks or areas containing 100,000 tons of coal or more, such blocks or areas to be worked on the retreating system. Many of the new developments are arranged on this principle which accounts for some of the delay in production.

All new mines and schemes of development should be based on this principle. The width of the Collie seams admits the principle on an economic basis and the roof conditions demand it. Once the principle is introduced, the results achieved and realised, it will mean that the deep mined output will be obtained on an orthodox system for the first occasion in the history of Collie. The practice of obtaining the maximum amount of coal in the first working is entirely unorthodox and contrary to good mining practice. Much of the roof difficulties are not unconnected with such practice.

The following is a brief description of the developments now proceeding at each individual Mine.

AMALGAMATED COMPANY.

Co-operative.

During the year considerable re-organisations were made to intensify developments. A mechanical unit was put into operation and all contract mining was stopped. A considerable number of the employees were transferred from production to re-organise the main East tunnel in order to allow belts to be installed as the capacity of the existing direct haulage system was entirely inadequate to meet any further increase in output.

This re-organisation should be complete about mid 1953 and when completed it is the intention of the management to instal another two mechanical units making three in all, with a potential output of 600 tons per shift. It will be possible at a later date to instal a further two units increasing the potential output to 1,000 tons per shift.

Proprietary.

At this time the one mechanical unit in operation has not produced the desired results due chiefly to adverse roof conditions, geological disturbances in the form of faults, also some mechanical difficulties with the scraper chain conveyor due to numerous undulations in the floor causing the chains to lift out of their structures. If these floor undulations continue the management would be well advised to alter the position of the gear heads to the tail end, or thereabouts, of the conveyor. These difficulties are purely temporary and must not be allowed to divert the management from a progressive programme.

The developments to win the Nos. 1 and 2 Seams have made reasonable progress. The No. 2 Seam was passed through and the No. 1 Seam will be reached in the near future. The No. 2 Seam proved to be intermixed with many dirt bands and in the absence of a coal cleaning or washing plant cannot be considered a commercial proposition. The No. 4 Seam was reached earlier during the year and work in connection with opening up this seam is in progress.

The Amalgamated Collieries are contemplating the development of a deep mine on the Westralia leases as well as a deep mine on the Ewington leases. Considering that the Collie Burn and Black Diamond open cuts will cease production early during 1953 and the Stockton open cut has only approximately three years life, the development of the new mines referred to is essential to maintain and increase the output to meet the continual increased demand.

Neath.

This mine is still in the developing stage, and as the policy of the company is to work this seam on the retreating system it will be some considerable time before the mine will reach its potential output. At present the developments are proceeding to drive the lateral headings to divide the area into blocks, each block containing 50,000 tons of coal. The coal from these blocks will be produced on the retreating system. Two mechanical units are in use but both are used for developing purposes. Another continuous miner should be installed so that both sides of the mine are developed simultaneously.

Cardiff.

The area of coal now in production has a limited life but arrangements are in hand for proving the Bertha fault. If this area proves to be comparatively free from geological disturbances then the life of the Cardiff seam will be extended considerably. All the output from this mine is produced mechanically from one unit.

Stockton.

The drilling which was completed early in the year reveals the presence of serious faulting and further drilling is necessary before plans of a long term policy can be completed. It may well be that a new mine will be necessary to replace this mine.

Black Diamond Tunnel.

This mine is still in the development stage and will continue as such for some considerable time. The ultimate object of the company is that the new Westralia mine will join into this mine, thus making one mine known as the Westralia. Operations to commence the Westralia began in December. At present there is one mechanical unit in operation on development work. This unit would serve a better purpose if transferred to the Co-operative mine, after the belts are installed in the latter.

GRIFFIN COMPANY.

Centaur.

This mine is still in the process of development but no lateral headings are yet proceeding.

One mechanical unit is in operation, but another is on order, delivery being expected during 1953. When same is in operation a considerable increase in output should take place.

This property is inadequately bored and consequently a Government boring programme was arranged and is now in operation.

The main tunnel still has two serious falls and the management would be well advised to remove both falls in order to establish a main haulage road.

Roof control at this mine leaves much to be desired and the management would be well advised to devote much attention to this problem. The use of a 9ft. cut cannot be commended.

Wyvern.

This mine is almost completely mechanised, but no under-cutting of the coal is done.

Good results are obtained, almost the best at Collie, nevertheless the output fluctuates due chiefly to geological disturbances. The area of coal in production lies between two faults and is consequently liable to serious geological disturbances almost overnight.

Prospecting headings should be driven well ahead of the production faces as well as a drilling programme from the surface.

Griffin.

The whole of the output from this mine is now obtained by mechanical means except the coal is not undercut.

The gradients in this mine are steep and the strata heavily watered. Nevertheless good results can be obtained, especially on the retreating system.

The management of this mine would be well advised to produce the minimum outputs from the first working, that is, reduce the width of the first working to a minimum and widen out to a maximum on the retreating system of work.

Phoenix.

This mine is still in the development stages and will remain so for some time. The mine offers an excellent opportunity to work on the retreating system and no attempt should be made to bring the mine into production until the system mentioned is established.

WESTERN COLLIERIES.

Western No. 1.

Coal was reached in this mine early in the year and during the year 5,164 tons of coal were produced.

The management, immediately coal was reached and a system of ventilation established, commenced their development programme. The mine is still in its initial stages of development and it will be some considerable time before any production faces can be commenced.

The roof and floor conditions are not good. The roof is of a weak nature and will require systematic and continuous timbering. The floor is weak and water logged. Difficulties have already been experienced and it is apparent that no liberties can be taken and it is doubtful if long undercuts will ever be possible.

The mechanical unit originally purchased for this mine, out of the company's own resources, can hardly be considered to be of the right type for this seam as it is of the track type and too heavy and cumbersome. A trackless mechanical unit of a much lighter type is on order and will be in operation early in 1953.

A considerable amount of work was completed during the year on the surface in the erection of surface buildings, such as change rooms, workshops, offices, stores and screening plants.

Western No. 2.

This mine was commenced in the early part of the year and coal was reached very quickly. A system of ventilation was soon established and developments commenced.

Unfortunately the roof conditions at present are not good, and heavy and continuous timbering is required throughout. The main dips will have to advance a distance of 20 chains before better roof conditions prevail.

The tonnage produced during the year was 2,019 tons which should rapidly increase during the year. A trackless mechanical unit is in operation and is used for development work.

Mechanisation.

The relative outputs of hand mined coal and mechanically produced coal in the deep mines (excluding Western Collieries) was 272,831 tons or 67 per cent. during 1952, as compared with 206,313 tons or 43 per cent. the previous year.

In January, 1952, the relative percentages of mechanically produced and hand filled coal were 57 per cent. and 43 per cent. respectively but during the year there was a progressive increase in mechanically produced coal and a corresponding decrease in hand produced coal. At the end of the year, in December, the percentage of mechanically produced coal had increased to 76 per cent. and hand filled had decreased to 24 per cent.

This is a welcome increase, and one might say satisfactory progress, considering that it has been achieved in just over two years.

In New South Wales there are 134 deep mines in production but only 13 or approximately 10% of the total number are fully mechanised. New South Wales commenced its programme of development many years ago. However, much remains to be completed and many difficulties have yet to be faced and overcome.

STATISTICS.

Labour Disposition — Outputs Individual Mines — Output per Manshift.

Table "F" shows the persons employed at each individual mine as well as the output per manshift in each deep mine.

The output per manshift was only 1.74 tons, the same as the previous year, but one must have regard to the fact that the results were adversely effected by the Metal Trade Workers' strike.

The total number of persons employed in the Amalgamated and Griffin deep mines was 871 as compared with 981 for the previous year, a reduction of no less than 110 men.

As the Western Collieries were in the initial stages of commencing their two new deep mines the men employed on such work were not included in this table. At the end of the year 112 men were employed at these two mines driving the tunnels and employed on constructional work on the surface. Having regard to the men referred to the total number employed in all the deep mines remains approximately the same.

The number of face workers remains approximately the same—223 as compared with 225 the previous year.

The percentages of manshifts worked at the coal face was 23.94% as compared with 23.12%.

It is difficult to make a true comparison between the two years due to the effect of the strike which caused short time working between July and November, and, having regard to this fact, any comment on the efficiency would seem to be superfluous as one is not comparing like with like.

However, the fact that no decrease took place in the O.M.S. for the year is an indication of an overall improvement in efficiency as having regard to the greater amount of development undertaken and the short time worked during the strike one would have expected a considerable decrease.

Nevertheless there is considerable leeway to make up as the industry cannot be considered efficient with only an output of 1.74 tons per manshift. This must be increased to at least four tons per manshift to obtain the necessary efficiency and economy.

At present there is far too much non-productive labour. The statistics for the coalfield show that only 25.65% of the total number of men employed

are productive workers as against 74.35% non-productive. One man on production carries three men on non production. Reasonable efficiency and economy will not be obtained until the proportion is at least 50/50 or better.

An indication of the effect of a low percentage of productive labour is shown by the statistics of the Co-operative and Stockton Mines. At the Co-operative the face workers during the year produced an average of 11.40 tons as compared with 7.33 tons at Stockton. Yet the O.M.S. for all employed was 2.31 tons at the Stockton and only 1.49 tons for the Co-operative.

At the Co-operative only 22 men or 14.33% were on production as compared with 38 men or 35.06% at the Stockton. The reason for the Co-operative having such a small percentage is due to the large number of men on development and re-organisation. For the greater part of the year no less than 86 men out of a total of 155 were employed on such work. It will not be until developments are well in front of production faces that a reasonable disposition of labour can be arranged.

ROOF CONTROL AND ROOF BOLTING.

Roof control is still a matter of much anxiety and controversy. It is regrettable that no concerted effort has yet been made to ascertain the cause of the frequent falls that take place. Until this vitally important phase of coal mining receives the attention it warrants then roof difficulties will continue and possibly increase as increased mechanisation takes place.

The department has been conscious of the matter for some considerable time and early during 1952 Dr. D. W. Phillips, Professor of Mining at the Sydney University, was invited to Collie to advise on the question of Roof Control and Roof Bolting.

Dr. Phillips is regarded as one of the world's authorities and is the author of many technical papers on the subject, and he submitted a very interesting report later in the year with his recommendations for roof control and roof bolting at Collie.

All the managerial staff agreed the report and recommendations were sound and based on good mining practices.

No useful purpose is served in this report in labouring the matter other than to state that the managerial staff are well advised to give close study to the report and implement the recommendations.

It is hoped that during 1953 liberal use will be made with Convergence Recorders to establish or otherwise if "bed separation" takes place in the Collie Mines.

ACCIDENTS.

The total number of serious accidents during 1952 was 94 as compared with 148 during 1951, a decrease of 54 or 36.35% (Table "G.").

A true comparison is not possible in the number due to the difference in time worked for the two years.

The total number of 94 does not include nine accidents which occurred at the Collie Burn Open Cut, Black Diamond Tunnel, Western No. 1 and Western No. 2, as the aforementioned deep mines were only in the development stage and no record of the men employed etc. was kept.

A comparison between the accidents on the basis of tonnage produced and the manshifts worked is shown on Table "H". Reference to this table reveals that almost each mine shows a welcome decrease, the average for the coalfield having decreased from 5.38 to 3.97 per 10,000 manshifts worked or a decrease on 1951 of 26%.

Comparing on the basis of tonnages the average for the coalfield shows a decrease of eight from 30.8 to 22.8 per 100,000 tons produced or a decrease of 20.6 per cent.

Table "J" is a classification of all non-fatal accidents. A comparison with 1951 is again not possible due to the interruption of work during 1952.

The classification reveals that the accidents due to miscellaneous reasons are the most prolific type, there being no less than 285 or 58.8 per cent. of a total of 485. This compares with 316 or 72.4 per cent. out of a total of 436 during 1951 and is a decrease of 13.6 per cent.

As stated in the report for 1951 the management would be well advised to investigate this prolific source of accidents as all mines seem to be similarly effected.

During the year there were two fatal accidents, one at the Co-operative mine to E. Moore and the other at the Centaur Mine to T. H. Green.

The former was due to a fall of earth on a crowbar causing the crowbar to strike his leg resulting in a fractured heel and dislocated knee. Some time later complications set in to which he succumbed.

The latter accident was caused during the process of transferring timber from one shuttle car to another. During the transference one of the cars, which had not been immobilised, moved forward causing a timber bar to strike the deceased on the head resulting in a fractured base of the skull which proved fatal.

The use of mobile coal face machinery is often the cause of serious accidents and one cannot but emphasise the need for the umost care in their operation.

Table "K" shows the current and progressive total number of fatal accidents and it is regrettable that the progressive total shows a further increase. It is to be hoped that as mechanisation progresses that a reduction will eventuate. Such has been the experience in other coalfields.

STAFF.

Mr. J. Gillespie, Senior Inspector of Mines, tendered his resignation in November and went into retirement in December 1952. Mr. Gillespie had occupied the position since June 1940.

I would like to record my thanks to the Mines Inspectorate at Collie, the administration staff at Perth, the staff at the individual mines and the workmen's representatives for their assistance and co-operation during the year.

G. MORGAN,
Chief Coal Mining Engineer

Table " A."

TABULATED DATA AND ESTIMATED VALUE OF COAL SOLD IN 1952 FROM INDIVIDUAL MINES AS COMPARED WITH 1951.

Mines.	1951.		1952.		Increase on 1951.	Decrease on 1951.	Estimated Value, 1951.	Estimated Value, 1952.
	Output.	Percentage of Total.	Output.	Percentage of Total.				
Deep Mines—								
Co-operative	80,564	9·50	62,325	7·50	....	18,239	166,963	182,137
Proprietary	82,432	9·71	57,749	6·95	....	24,683	169,291	169,331
Cardiff	95,445	11·25	32,848	3·95	....	31,585	201,539	187,986
Neath	....	....	31,012	3·73				
Stockton	76,417	9·01	66,219	7·97	....	10,198	159,261	196,783
Black Diamond Tunnel	781	·09	2,501	·30	1,720	....	....	....
Griffin	56,046	6·61	48,450	5·83	....	7,596	112,144	161,815
Wyvern....	71,521	8·43	64,122	7·72	....	7,399	141,198	210,048
Phoenix	6,732	·79	17,037	2·05	10,305	....	13,794	59,618
Centaur	10,608	1·25	32,572	3·92	21,964	....	22,999	106,313
Western, No. 1	....	....	5,164	·62	5,164	....	....	12,622
Western, No. 2	....	....	2,019	·25	2,019	....	....	5,315
Total	480,546	56·64	422,018	50·79	....	58,528	987,189	1,291,968
Open Cuts—								
Stockton	193,408	22·80	171,707	20·67	....	21,701	401,732	499,200
Black Diamond	85,300	10·06	93,717	11·28	8,417	....	180,771	275,831
Ewington	....	....	81,909	9·86	81,909	....	....	252,181
West Coll.	89,093	10·50	61,506	7·40	....	27,587	147,096	138,116
Total	367,801	43·36	408,839	49·21	41,038	....	729,599	1,165,328
Deep Mines	480,546	56·64	422,018	50·79	....	58,528	987,189	1,291,968
Open Cuts	367,801	43·36	408,839	49·21	41,038	....	729,599	1,165,328
Grand Total	848,347	100·00	830,857	100·00	....	17,490	1,716,788	2,457,296

Table " B."

Comparison of Overall Coal Production Losses for 1951 *and* 1952 *showing where Losses Occurred.*

Year.	Pit Top Meetings.	Railway Wagon Shortage.	Strikes.	Other Causes.	Total.
1951	3,145	6,390	....	14,889	24,424
1952	2,285	280	....	15,680	18,245
Increase on 1951	....	....	....	791	....
Decrease on 1951	860	6,110	....	....	6,170

Table C

Tabulation showing Apportionment of Coal Sold during 1952.

Colliery.	Locos.	%	Trams (Power).	%	Private Large.	%	Private Small.	%	Cement Works.	%	Collie Power House.	%	Total Sold.
Co-operative													
Black Diamond O/C	70,915	42·75	34,404	20·74	24,617	14·84	1,056	·64	5,005	3·02	29,878	18·01	165,875
Black Diamond Tunnel													
Proprietary													
Ewington Open Cut	53,492	40·45	41,820	31·63	17,152	12·97	3,307	2·50	12,707	9·61	3,753	2·84	132,231
Cardiff													
Neath	....	....	47,880	74·98	212	·33	223	·35	15,545	24·34	....	....	63,860
Stockton													
Stockton O/C	125,659	52·79	77,203	32·44	9,073	3·81	901	·38	20,569	8·64	4,616	1·94	238,021
Griffin	1,560	3·22	18,798	38·80	14,864	30·68	13,228	27·30	....	....	....	....	48,450
Wyvern	7,845	12·24	43,284	67·50	6,611	10·31	6,382	9·95	....	....	....	....	64,122
Phoenix	167	·98	15,406	90·43	448	2·63	1,016	5·96	....	....	....	....	17,037
Centaur	3,356	10·30	27,306	83·01	1,082	3·32	1,098	3·37	....	....	....	....	32,572
Western Collieries	35,593	51·82	33,082	48·16	14	·02	....	....	....	....	....	....	68,689
Total	298,587	35·94	338,913	40·79	74,073	8·91	27,211	3·28	53,826	6·48	38,247	4·60	830,857

Table D.

Tabulation showing Apportionment of Collie Coal Sold during the Four Year Period 1949–1952.

Year.	Railways.	%	S.E.C.	%	Collie Power Station.	%	Cement Works.	%	Private Consumers.	%	Total.
1949	356,118	47·45	266,030	35·45	24,035	3·20	37,520	5·00	66,763	8·90	750,466
1950	371,510	45·61	276,156	33·91	32,288	3·96	41,692	5·12	92,850	11·40	814,496
1951	373,866	44·07	299,156	35·26	27,586	3·25	49,082	5·79	98,657	11·63	848,347
1952	298,587	35·94	338,913	40·79	38,247	4·60	53,826	6·48	101,284	12·19	830,857
Increase or Decrease since 1949	—57,531	....	72,883	....	14,212	....	16,306	....	34,521	....	80,391
Percent. Increase or decrease since 1949	—71·56	....	90·66	....	17·68	....	20·28	....	42·94	....	....

Table E.

Collie Coal Produced 1943–1952 (*as officially reported to the Mines Department by the Producers*).

	1943.	1944.	1945.	1946.	1947.	1948.	1949.	1950.	1951.	1952.
Open Cuts	2,308	66,779	112,781	154,392	148,345	145,948	206,650	258,310	368,330	411,344
Deep Mines	529,238	491,543	430,582	487,895	582,161	586,990	543,944	556,042	480,145	419,117
Aggregate all Mines	531,546	558,322	543,363	642,287	730,506	732,938	750,594	814,352	848,475	830,461
Percent. Open Cut to Aggregate	0·43	11·96	20·76	24·04	20·31	19·91	27·53	31·72	43·41	49·53
Percent. Deep Mines to Aggregate	99·57	88·04	79·24	75·96	79·69	80·09	72·47	68·28	56·59	50·47
Persons Employed	838	880	860	955	1,032	1,064	1,044	1,099	1,125	1,281

Table F.

Table Showing :—

1. *Average Number of Men Employed at each Deep Mine and Percentage Each Category to Total Employed.*
2. *Manshifts actually worked during Year at each Deep Mine and Percentage each Category to Total Worked.*
3. *Output per Manshift in each Category.*

1952.

Name of Mine.	Face Workers.	Haulage.	Underground Maintenance.	Pump Attendants.	Officials.	Total Underground.	Total Surface.	Total Employed.
Co-operative—								
No. of men employed	22	27	50	5	9	113	42	155
Percentage to Total Employed	14·33	16·98	32·34	3·24	5·86	72·75	27·25	100·00
Manshifts worked during year	5,468	6,688	13,186	2,045	2,843	30,230	11,534	41,764
Percentage Manshifts to total worked	13·09	16·01	31·57	4·90	6·81	72·38	27·62	100·00
O.M.S. in each category	11·40	9·32	4·72	30·48	21·92	2·06	8·40	1·49
Proprietary—								
No. of men employed	40	43	68	6	11	168	32	200
Percentage to Total Employed	19·79	21·42	34·20	2·95	5·74	84·10	15·90	100·00
Manshifts worked during year	9,321	10,692	17,555	2,432	3,545	43,545	8,726	52,271
Percentage Manshifts to total worked	17·83	20·46	33·59	4·65	6·78	83·31	16·69	100·00
O.M.S. in each category	6·19	5·40	3·28	23·74	16·29	1·32	6·63	1·14
Cardiff—								
No. of men employed	29	9	36	3	8	85	39	124
Percentage to Total Employed	23·57	7·43	28·74	2·35	6·72	68·81	31·19	100·00
Manshifts worked during year	7,759	2,404	9,635	1,204	2,678	23,680	10,612	34,292
Percentage Manshifts to total worked	22·63	7·01	28·09	3·51	7·81	69·05	30·95	100·00
O.M.S. in each category	8·23	26·56	6·62	53·04	23·84	2·69	6·02	1·86
Stockton—								
No. of men employed	38	22	15	3	7	85	25	110
Percentage to Total Employed	35·06	20·55	13·25	2·74	5·96	77·56	22·44	100·00
Manshifts worked during year	9,208	5,643	3,848	1,226	2,041	21,786	6,821	28,607
Percentage Manshifts to total worked	31·56	19·73	13·45	4·29	7·13	76·16	23·84	100·00
O.M.S. in each category	7·33	11·73	17·21	54·01	32·44	3·04	9·70	2·31

							Total Surface.	Central Workshops.	Total Employed.
Total Amalgamated Deep Mines—									
No. of men employed	129	101	169	17	35	451	138	64	653
Percentage to Total Employed	19·76	15·47	25·88	2·60	5·36	69·07	21·13	9·80	100·00
Manshifts worked during year	31,576	25,427	44,224	6,907	11,107	119,241	37,693	15,552	172,486
Percentage Manshifts to total worked	18·31	14·74	25·64	4·00	6·44	69·13	21·85	9·02	100·00
O.M.S. in each category	7·92	9·84	5·65	36·21	22·52	2·10	6·63	16·08	1·45

							Total Surface.	Total Employed.
Griffin—								
No. of men employed	31	24	22	3	7	87	28	115
Percentage to Total Employed	26·49	20·66	19·93	2·78	6·03	75·89	24·11	100·00
Manshifts worked during year	7,927	6,066	6,262	1,349	2,294	23,898	8,309	32,207
Percentage Manshifts to total worked	24·61	18·84	19·44	4·19	7·12	74·20	25·80	100·00
O.M.S. in each category	6·11	7·98	7·73	35·96	21·12	2·03	5·83	1·50
Wyvern—								
No. of men employed	33	6	23	3	5	70	15	85
Percentage to Total Employed	38·67	6·79	27·25	3·50	5·35	81·56	18·44	100·00
Manshifts worked during year	8,930	1,491	6,286	1,292	1,527	19,526	4,511	24,037
Percentage Manshifts to total worked	37·15	6·20	26·15	5·38	6·36	81·23	18·77	100·00
O.M.S. in each category	7·18	43·00	10·20	49·63	41·99	3·28	14·21	2·66
Phoenix—								
No. of men employed	11	....	6	1	3	21	9	30
Percentage to Total Employed	37·42	1·02	19·28	3·07	9·71	70·50	29·50	100·00
Manshifts worked during year	2,949	71	1,430	397	987	5,834	2,571	8,405
Percentage Manshifts to total worked	35·09	0·85	17·01	4·72	11·74	69·41	30·59	100·00
O.M.S. in each category	5·77	....	11·91	42·91	17·26	2·92	6·62	2·02
Centaur—								
No. of men employed	19	1	14	1	4	39	13	52
Percentage to Total Employed	37·02	2·45	26·04	2·89	7·12	75·52	24·48	100·00
Manshifts worked during year	5,325	332	4,032	623	1,230	11,542	3,766	15,308
Percentage Manshifts to total worked	34·79	2·17	26·34	4·07	8·03	75·40	24·60	100·00
O.M.S. in each category	6·11	98·11	8·08	52·28	26·48	2·82	8·65	2·13

Table F—*continued.*

Name of Mine.	Face Workers.	Haulage.	Underground Maintenance.	Pump Attendants.	Officials.	Total Underground.	Total Surface.	Total Employed.
Total Griffin Mines—								
No. of men employed	94	31	65	8	19	217	65	282
Percentage to Total Employed	33·28	11·02	23·20	3·05	6·41	76·96	23·04	100·00
Manshifts worked during year	25,131	7,960	18,010	3,661	6,038	60,800	19,157	79,957
Percentage Manshifts to total worked	31·43	9·96	22·52	4·58	7·55	76·04	23·96	100·00
O.M.S. in each category	6·45	20·37	9·00	44·29	26·86	2·66	8·46	2·03
Grand Total—Amalgamated and Griffin Deep Mines—								
No. of men employed	223	132	234	25	54	668	203	871
Percentage to Total Employed	25·65	15·15	26·89	2·92	6·15	76·76	23·24	100·00
Manshifts worked during year	56,707	33,387	62,234	10,568	17,145	180,041	56,850	236,891
Percentage Manshifts to total worked	23·94	14·09	26·27	4·46	7·24	76·00	24·00	100·00
O.M.S. in each category	7·27	12·35	6·62	39·01	24·05	2·29	7·25	1·74

TABLE "G."

SERIOUS ACCIDENTS—COLLIE COALFIELD 1952.

	MAJOR INJURIES—EXCLUSIVE OF FATAL.																					MINOR INJURIES.										
	FRACTURES.											AMPUTATIONS.											FRACTURES.										
MONTH 1951.	Head.	Shoulder.	Arm.	Hand.	Spine.	Rib.	Pelvis	Thigh.	Leg.	Ankle.	Foot.	Arm.	Hand.	Finger.	Leg.	Foot.	Toe.	Loss of Eye.	Serious Internal.	Hernia.	Dislocation.	Other Major.	Total Major.	Finger.	Toe.	Head.	Eyes.	Shoulder.	Arm.	Hand.	Back.	Rib.	Leg.	Foot.	Other Minor.	Total Minor.
Jan.	....	....	....	1	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	....	....	....	....	....	....	....	2	....	1	....	....	3
Feb.	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	1	....	....	....	....	....	1	3	3	....	1	1	....	9
Mar.	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	1	3	2	....	3	....	....	9
Apr.	....	....	....	1	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	2	....	....	1	....	1	2	....	....	2	1	....	7
May	....	....	....	....	....	1	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	2	....	....	1	....	....	2	2	....	1	....	1	7
June	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	....	....	....	1	1	4
July	....	....	....	2	....	....	....	....	1	....	1	....	....	....	....	....	....	....	....	....	....	4	....	....	....	1	....	....	2	....	....	2	....	1	6
Aug.	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	1	3	1	1	3	2	1	12
Sept.	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	2	1	1	4	2	....	10
Oct.	....	....	....	1	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	2	....	....	2	....	....	2	1	....	2	....	1	8
Nov.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	....	....	1	1	....	2	....	7
Dec.	....	....	1	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	....	....	....	....	....	....	1	....	....	....	2	....	3
Total	....	....	1	7	1	2	....	....	2	....	4	....	....	1	....	....	....	....	....	....	....	18	....	....	5	2	1	3	21	15	2	21	10	5	85

Table "H."

ACCIDENT RATE FOR INDIVIDUAL MINES, SHOWING COMPARISON WITH 1951 (NOT INCLUDING CENTRAL WORKSHOPS AND OPEN CUTS).

Serious Accidents.

Name of Mine.	Number of Accidents.				Total Number Accidents.		Number Employed.		Rate per 100 men Employed.		Rate per 100,000 tons Produced.		Rate per 10,000 man-shifts Worked.	
	Surface.		Underground.											
	1951.	1952.	1951.	1952.	1951.	1952.	1951.	1952.	1951.	1952.	1951.	1952.	1951.	1952.
Co-operative	9	1	29	18	38	19	167	155	22·75	12·26	47·18	30·49	7·77	4·55
Proprietary	2	1	27	23	29	24	225	200	12·88	12·00	35·19	41·56	4·62	4·59
Stockton	7	1	14	13	21	14	115	110	18·26	12·73	27·48	21·14	7·00	4·89
Cardiff-Neath	6	1	15	9	21	10	130	124	16·15	8·06	22·00	15·66	5·19	2·91
Griffin	3	3	18	6	21	9	128	115	16·40	7·83	37·47	18·58	5·88	2·79
Wyvern	2	2	11	10	13	12	92	85	14·13	14·12	18·18	18·71	4·82	4·99
Phoenix	....	....	2	1	2	1	14	30	14·28	3·33	29·56	5·87	5·32	11·90
Centaur	1	....	2	5	3	5	42	52	7·14	9·62	28·28	15·35	4·77	3·27
Total	30	9	118	85	128	94	913	871	16·21	10·79	30·8	22·80	5·38	3·97

Note.—The above does not include 6 accidents at Western No. 1 and No. 2, and Black Diamond Tunnel, and 3 accidents at Collie Burn Open Cut.

Table "J."

CLASSIFICATION OF ALL NON-FATAL ACCIDENTS (DEEP MINES).

Name of Mine.	Underground.							Surface.	Total All Accidents.
	Falls.		Haulage.	Explosives.	Machinery.	Miscellaneous.	Total.		
	Roof.	Sides.							
Co-operative	9	....	9	....	3	46	67	15	82
Proprietary	11	....	17	....	4	87	119	6	125
Cardiff and Neath	....	1	9	....	4	35	49	7	56
Stockton	1	....	13	....	2	42	58	16	74
Total Amalgamated	21	1	48	....	13	210	293	44	337
Griffin	4	....	6	....	3	30	43	6	49
Wyvern	....	....	2	....	3	16	19	5	24
Centaur	....	....	3	....	4	19	26	1	27
Phoenix	1	....	....	....	....	5	6	....	6
Total Griffin	5	....	11	....	8	70	94	12	106
Western No. 1	....	....	....	....	1	8	9	7	16
Western No. 2	....	....	....	....	....	2	2	3	5
Total Western	....	....	....	....	1	10	11	10	21
Total All Mines	26	1	59	....	22	290	398	66	464
Percentage to Total	5·60	·22	12·72	....	4·96	62·28	85·78	14·22	100·00

Table K.

TABLE SHOWING FATAL ACCIDENT RATE PER 1,000 PERSONS EMPLOYED FOR EACH YEAR AND PROGRESSIVELY SINCE 1929 TO DATE.

Year.	Men Employed.		Fatal Accident.		Death Rate per 1,000.	
	Current.	Progressive.	Current.	Progressive.	Current.	Progressive.
1929	858	858	4	4	4·66	4·66
1930	896	1,754	....	4	....	2·28
1931	752	2,506	1	5	1·33	2·00
1932	604	3,110	....	5	....	1·61
1933	626	3,736	1	6	1·59	1·61
1934	624	4,360	....	6	....	1·38
1935	689	5,049	2	8	2·90	1·58
1936	768	5,817	....	8	....	1·37
1937	723	6,540	....	8	....	1·22
1938	765	7,305	1	9	1·31	1·23
1939	752	8,057	1	10	1·33	1·24
1940	713	8,770	3	13	4·21	1·48
1941	781	9,551	2	15	2·56	1·57
1942	822	10,373	2	17	2·43	1·64
1943	838	11,211	1	18	1·19	1·60
1944	880	12,091	1	19	1·13	1·57
1945	860	12,951	1	20	1·16	1·54
1946	955	13,906	1	21	1·05	1·51
1947	1,032	14,938	....	21	....	1·40
1948	1,064	16,002	....	21	....	1·31
1949	1,044	17,046	1	22	0·96	1·29
1950	1,099	18,145	1	23	0·91	1·27
1951	1,125	19,270	2	25	1·77	1·29
1952	1,281	20,551	2	27	1·56	1·31

Coal Mines Regulation Act, 1946

ANNUAL REPORT OF THE BOARD OF EXAMINERS FOR MINE MANAGERS, UNDER MANAGERS AND DEPUTIES.

The Under Secretary for Mines:

We submit herewith for the information of the Honourable the Minister for Mines, the Annual Report of the Board of Examiners for the year 1952.

APRIL EXAMINATIONS.

There were no candidates for First Class Certificate of Competency.

There was one candidate for Second Class Certificate of Competency and he was successful and granted a Certificate.

There were four candidates for Third Class Certificate of Competency, two of whom were successful and issued with Certificates.

OCTOBER EXAMINATIONS.

There were two candidates for First Class Certificate of Competency, one of whom was successful and was issued with a Certificate.

There were no candidates for Second Class Certificates of Competency.

There were nine candidates for Third Class Certificates of Competency, six of whom were successful and were issued with Certificates.

During the year ten candidates were issued with Certificates of Competency as follows:—

First Class Certificate of Competency as Manager—
Fewster, K.

Second Class Certificate of Competency as Under Manager—
Elias, J. A.

Third Class Certificates of Competency as Deputies—
Cherry, J. G.
Davidson, J.
Dempsey, J.
Gillespie, L.
Noonan, J. E.
Ratcliffe, T. T.
Sheppard, R. A.
Smith, H.

First Class Reciprocal Certificates of Competency—
Ainge, R. F.
Brown, G. W. A.
Anderson, C. T.
Garnett, J.

Messrs. Ainge and Anderson were holders of First Class Certificates of Competency issued in New South Wales, and Messrs. Brown and Garnett holders of First Class Certificates of Competency issued by the Board of Trade, England.

Once again the Board wishes to stress the urgent need for training facilities at Collie, and we would respectfully urge the Hon. Minister to treat this matter as one of vital importance.

G. MORGAN,
Chief Coal Mining Engineer,
Chairman.

H. A. ELLIS,
Government Geologist,
Member.

ANNUAL REPORT OF THE COAL MINES ADVISORY BOARD.

The Under Secretary for Mines:

The Coal Mines Advisory Board continued its activities during the year and 11 meetings were held as well as many visits made underground.

The questions of re-organisation and mechanisation were again given priority and further schemes were discussed in addition to those already in progress.

The further reduction in deep mine output was a subject of much concern to the Board, but in view of the extensive programme of re-organisation and the need to commence further schemes, the Board were satisfied that priority should be given to re-organisation.

The matter of technical training at Collie was also frequently discussed and the Board regard the need for same as most important to the industry.

The Board are satisfied that, as the School of Mines at Kalgoorlie has had considerable experience in mining education and technical training and the qualifications of the school are recognised throughout the world, the School of Mines is the best body to train the men at Collie.

The mining syllabus at the school was established many years ago and covers all subjects necessary for coal mining except the subject of "Mining of Coal." The inclusion of this subject would complete the technical training necessary for coal mining.

Men with credentials showing that they had been technically trained and had obtained the School of Mines qualifications are more likely to obtain reciprocity than those trained by the Education Department.

The necessity for proving the fault on the left hand side of the Co-operative Mine was discussed at some length and a recommendation was made to utilise the "Failing" Drill for that purpose.

It is again stressed that the Collie miners do not make as much use of the Advisory Board as its scope allows, and the Board feel that there must be a number of matters in connection with development and re-organisation that could be usefully referred to the Board for their opinion.

G. MORGAN,
Chairman.
Coal Mines Advisory Board.

Mining Statistics to 31st December, 1952.

TABLE OF CONTENTS.

TABLE I.

PRODUCTION OF GOLD AND SILVER FROM ALL SOURCES, SHOWING IN FINE OUNCES THE OUTPUT AS REPORTED TO THE MINES DEPARTMENT DURING 1952, AND THE TOTAL PRODUCTION TO DATE.

(Note.—Lease numbers in brackets indicate that the holding was *voided* during the year.)

(*Note.*—* denotes mainly derived from treatment of tailings. † denotes mainly derived from Silver/Lead Ores and Concentrates. ‡ denotes mainly derived from Copper Ores and Concentrates.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1952.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.
Kimberley Goldfield.												
Brockman	109	Mt. Bradley	....	....	....	....	....	....	....	193·00	50·94	....
		Voided Leases	....	....	....	....	....	....	....	13,52·75	1,404·40	....
		Sundry Claims	....	....	....	....	....	7·62	7·62	2,484·00	1,871·92	....
Hall's Creek		Voided Leases	....	....	....	....	....	....	....	423·00	477·76	....
		Sundry Claims	....	....	....	....	....	27·73	....	204·55	159·68	12·64
Mary		Voided Leases	....	....	....	....	....	82·66	951·52	399·00	210·03	....
		Sundry Claims	....	....	....	....	....	....	14·36	46·85	53·66	....
Mt. Dockrell		Voided Leases	....	....	....	....	....	9·17	13·66	1,173·70	1,206·09	93·00
		Sundry Claims	....	....	....	....	....	18·89	31·31	160·00	89·64	....
Panton	114	Granite	....	....	....	....	....	....	....	8·25	1·77	....
		Voided Leases	....	....	....	....	....	....	....	34·70	138·70	....
		Sundry Claims	....	....	....	....	....	....	....	6·15	18·01	....
Ruby Creek	98	Goliath	....	....	....	....	....	....	....	120·70	103·72	....
	97	Ruby Queen	....	....	....	....	....	....	....	2,919·25	1,631·30	2·14
	100	St. Lawrence	....	....	....	....	....	....	....	10·00	11·32	....
		Voided Leases	....	....	....	....	....	....	16·05	12,771·50	9,504·78	....
		Sundry Claims	....	....	....	....	....	12·71	....	281·25	183·30	....
		From Goldfield generally :— Sundry Claims :										
		Reported by Banks and Gold Dealers	56·95	333·60	....	....	†15·08	8,571·94	1,403·90	·75	2·53	*20·98 ....
		Totals	**56·95**	**333·60**	....	....	15·08	8,730·72	2,438·42	22,589·40	17,119·55	128·76
West Kimberley Goldfield.												
Napier Range	M.C. 29	Devonian Silver Lead Mine	....	....	....	....	†2,285·91	....	....	....	....	†7,636·56
		From Goldfield generally :— Sundry claims	....	....	....	....	....	1·30	24·68	1·00	2·49	....
		Totals	....	....	....	....	2,285·91	1·30	24·68	1·00	2·49	7,636·56

Pilbara Goldfield.

MARBLE BAR DISTRICT.

Bamboo Creek	1107	Bulletin	....	....	158·00	163·13	....	....	....	615·50	335·20	....
	850	Federation	....	....	119·00	116·71	....	....	8·22	2,708·00	2,064·77	·10
	1010	Mickey	....	....	27·00	7·69	....	....	....	1,788·00	480·00	1·42
	1095, etc.	Mt. Prophecy Leases	....	....	189·00	83·41	7·09	....	....	1,247·00	618·75	17·04
	817	Prince Charlie	....	....	95·00	31·18	....	....	3·68	3,827·00	3,583·53	52·29
	1072	Princess May	....	....	20·50	6·35	....	....	....	68·50	21·36	....
	924	True Blue	....	....	....	....	....	....	....	2,093·25	85·22	....
		Voided leases	....	....	....	....	....	13·54	560·19	44,422·35	53,012·47	·75
		Sundry claims	....	....	5·00	3·40	....	8·97	307·83	5,100·85	3,002·82	4·89
Boodalyerrie	....	Voided leases	....	....	....	....	....	....	292·07	120·25	587·86	....
		Sundry claims	....	....	....	....	....	....	7·16	....	....	....
Braeside	....	Sundry claims	....	....	....	....	†2,242·74	....	....	....	....	†10,376·90
Lalla Rookh	....	Voided leases	....	....	....	....	....	....	4·78	3,612·200	4,696·33	574·01
		Sundry claims	....	....	....	....	....	....	....	7,943·00	7,675·09	....
Marble Bar	930 (956)	Alexander Leases	....	....	124·50	57·45	....	....	....	324·50	113·15	....
	1094	Blue Bar	....	....	182·00	21·09	....	....	....	361·00	51·05	....
	(927), (928) .... (934), (1014) (930), (956)	Comet Gold Mines, Ltd.	....	....	....	665·86	106·53	....	....	116,941·74	106,564·20	582·38
	(927, etc.)	Prior to transfer to present holders	....	....	....	....	....	....	....	2,195·75	1,235·42	....
	927, etc.	Halley's Comet	....	....	2,126·00	3,635·16	316·56	....	....	3,230·00	3,814·10	316·56
	912	Homeward Bound	....	....	....	....	....	....	....	6,292·25	3,111·75	....
	(1054)	Illareen	....	....	....	....	....	....	....	40·00	6·32	·36
	1089	Repeater	....	....	....	....	....	....	....	548·20	123·83	6·26
		Voided leases	....	....	....	....	....	....	199·09	40,460·55	40,719·73	·83
		Sundry claims	....	....	93·00	66·81	....	67·08	251·77	20,113·29	12,637·49	6 ·59
North Pole	1122, 1123	Normay Leases	....	....	....	*608·89	*1,122·59	....	....	....	*608·89	*1,122·59
		Voided leases	....	....	....	....	....	....	....	4,339·00	1,930·51	260·08
		Sundry claims	....	....	....	....	....	....	....	669·75	298·62	15·82
North Shaw	....	Voided leases	....	....	....	....	....	7·53	....	1,072·45	996·29	....
		Sundry claims	....	12·85	....	....	....	2·84	579·91	179·75	121·72	....
Pilgangoora	....	Voided leases	....	....	....	....	....	16·65	....	2,255·00	403·60	....
		Sundry claims	....	37·51	....	....	....	161·08	45·64	481·60	146·39	....
Sharks	(1108)	Edith Mae	....	....	....	....	....	....	....	18·75	18·57	1·16
	1081, etc.	Table Top Leases	....	....	....	....	....	....	....	237·25	120·02	14·08
		Voided leases	....	....	....	....	....	1·43	....	1,720·75	1,951·08	....
		Sundry claims	....	....	....	....	....	163·14	47·93	1,150·75	1,668·11	·97
Talga Talga	....	Voided leases	....	....	....	....	....	...	93·15	1,799·00	1,760·68	....
		Sundry claims	....	....	....	....	....	76·17	85·18	1,975·90	1,499·86	·70
Tambourah	....	Voided leases	....	....	....	....	....	....	73·90	1,576·50	1,882·29	....
		Sundry claims	....	....	....	....	....	89·52	294·75	3,742·25	2,689·78	....

Table I.—*Production of Gold and Silver from all sources, etc.*—continued.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1952. Alluvial. Fine ozs.	Dollied and Specimens. Fine ozs.	Ore treated. Tons (2,240 lb.).	Gold therefrom. Fine ozs.	Silver. Fine ozs.	Total Production. Alluvial. Fine ozs.	Dollied and Specimens. Fine ozs.	Ore treated. Tons (2,240 lb.).	Gold therefrom. Fine ozs.	Silver. Fine ozs.
PILBARA GOLDFIELD—continued.												
MARBLE BAR DISTRICT—*continued.*												
Warrawoona	1087	Town Talk	....	....	....	....	....	....	....	300·45	127·91	13·34
	1013	Trump	....	....	306·50	29·17	....	....	....	3,999·55	626·90	9·91
		Voided leases	....	....	....	....	....	....	16·99	12,748·80	18,830·50	....
		Sundry claims	....	....	....	....	....	70·98	623·67	6,632·79	4,247·38	·08
Western-Shaw	....	Voided leases	....	....	....	....	....	....	....	1,222·50	957·80	....
		Sundry claims	....	....	....	....	....	22·34	67·47	71·50	81·49	....
Wyman's Well	1084	New Copenhagen	....	....	....	....	....	....	....	350·00	72·90	·58
		Voided leases	....	....	....	....	....	....	42·86	2,977·29	1,258·44	....
		Sundry claims	....	....	....	....	....	4·47	51·52	2,604·46	1,291·29	1·47
Yandicoogina	....	Voided leases	....	....	....	....	....	....	140·76	3,159·20	6,218·83	....
		Sundry claims	....	....	....	....	....	4·32	239·89	574·50	642·82	40·96
		From District generally :—										
		Sundry Parcels treated at :										
		State Battery, Bamboo Creek	....	....	....	*186·32	*4·72	....	....	40·00	*10,667·10	*190·95
		State Battery, Marble Bar	....	....	....	*9·99	....	....	....	12·00	*10,931·11	*1·15
		Great North-Western G. Co., Ltd. Cyanide Plant	....	....	....	....	....	....	....	....	*271·37	·65
		Various Works	....	....	....	....	....	....	....	237·95	*1,629·27	....
		Reported by Banks and Gold Dealers	21·92	....	....	....	....	14,382·41	440·85	....	10·95	4·22
		Totals	**21·92**	....	**3,345·50**	**5,692·61**	**3,800·23**	**15,092·47**	**4,479·26**	**320,202·67**	**318,502·91**	**13,619·09**
NULLAGINE DISTRICT.												
Eastern Creek	276L	Rose	....	....	....	....	....	....	....	333·00	287·21	2·99
		Voided leases	....	....	....	....	....	8·96	8·19	5,261·00	9,567·00	11·77
		Sundry claims	....	....	....	....	....	....	12·74	1,409·10	1,600·71	16·90
Elsie	....	Voided leases	....	....	....	....	....	....	....	586·25	1,675·91	....
		Sundry claims	....	....	....	....	....	....	8·28	58·00	188·08	....
McPhee's Creek	....	Voided leases	....	....	....	....	....	....	....	113·00	137·92	....
		Sundry claims	....	....	....	....	....	....	....	134·00	197·09	....

Middle Creek	279L	All Nations	....	....	45·00	7·24	....	....	....	1,135·50	314·86	·15
	229L	Barton	....	....	783·00	328·01	....	1·22	....	5,707·00	2,907·32	1·63
	231L, etc.	Blue Spec Mining Co., N.L.	....	....	6,819·18	6,493·64	....	....	....	41,091·87	23,764·77	....
	300L	Middle Creek	....	....	274·00	81·13	....	....	....	310·00	91·38	....
		Voided leases	....	....	....	....	....	....	1·02	16,872·15	11,271·20	7·50
		Sundry claims	....	....	....	....	....	....	....	5,548·10	2,330·96	....
Mosquito Creek	(M.L. 51)	Hit or Miss	....	....	....	....	....	....	....	160·00	24·91	....
		Voided leases	....	....	....	....	....	1·07	30·12	8,232·30	12,814·22	....
		Sundry claims	....	....	....	....	....	....	181·64	3,702·44	3,785·88	....
Nullagine	292L	Alice	....	225·03	·10	13·97	....	....	541·08	66·10	145·36	14·35
	(297L)	Mundella	....	....	....	....	....	....	....	39·50	125·23	....
	294L	Nullagine View	....	....	....	....	....	....	289·63	41·00	397·35	23·69
	289L	Paul's Leader	....	....	....	....	....	....	269·40	25·50	348·52	12·60
		Voided leases	....	....	....	....	....	....	40·56	9,002·75	12,498·93	·20
		Sundry claims	....	....	....	....	....	315·53	668·82	5,940·55	10,294·06	5·24
Spinaway Well	M.Cs. 34L, 35L	Stubbs & Baker	....	....	....	....	‡50·72	....	....	....	....	‡50·72
Twenty Mile Sandy	256L	Bill Jim	....	....	....	....	....	....	....	2,022·50	1,036·51	....
		Voided leases	....	....	....	....	....	....	16·97	5,221·20	7,971·21	·32
		Sundry claims	....	....	....	....	....	33·10	30·50	7,654·85	6,255·56	2·76
	From District generally :—											
	Sundry Parcels treated at :											
	Barton Battery		....	....	....	....	....	....	....	....	*45·19	....
	McKinnon, W. M. (D.Cs. 10L, etc.)		....	....	....	....	....	3·89	2·23	....	....	....
	Shamrock Battery		....	....	....	....	....	....	....	....	*24·44	1·00
	20 Mile Sandy Cyanide Plant		....	....	....	....	....	....	....	12·00	*1,745·36	·37
	Various Works		....	....	....	....	....	....	....	112·50	*6,340·55	....
	Reported by Banks and Gold Dealers		23·77	....	....	....	....	9,856·52	100·89	....	29·81	5·08
	Totals		**23·77**	**225·03**	**7,921·28**	**6,923·99**	**50·72**	**10,220·29**	**2,202·07**	**120,792·16**	**118,217·50**	**157·27**

West Pilbara Goldfield.

Croydon	....	Voided leases	....	....	....	....	....	....	....	8·00	5·44	....
Hong Kong	....	Voided leases	....	....	....	....	....	....	....	331·00	442·45	....
		Sundry claims	....	....	....	....	....	21·40	·02	9·00	3·15	....
Lower Nicol	....	Voided leases	....	....	....	....	....	....	1·10	653·20	402·22	....
		Sundry claims	....	....	....	....	....	10·44	2·71	10·00	11·51	....
Mallina	....	Voided leases	....	....	....	....	....	....	....	141·60	128·44	....
Nicol	....	Voided leases	....	....	....	....	....	....	....	30·00	11·47	....
Pilbara	....	Voided leases	....	....	....	....	....	....	48·12	267·00	413·59	....
		Sundry claims	....	....	....	....	....	1·11	86·24	163·00	255·42	....

Table I.—*Production of Gold and Silver from all sources*—continued.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1952.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.
WEST PILBARA GOLDFIELD—continued.												
Roebourne	173 (174)	Corderoy Mines, Ltd.	....	....	....	....	....	....	....	1,954·50	471·13	10·79
		Voided leases	....	....	....	....	....	....	....	442·36	952·91	374·36
		Sundry claims	....	....	....	....	....	15·47	3·29	1,934·85	754·91	114·06
Station Peak	(176)	Nancy	....	....	20·00	7·94	....	....	....	80·00	40·76	·08
		Voided leases	....	....	....	....	....	177·74	41·37	10,936·00	11,347·42	....
		Sundry claims	....	....	....	....	....	....	....	86·50	77·23	....
Towranna	....	Voided leases	....	....	....	....	....	....	2·62	3,965·80	5,187·51	....
		Sundry claims	....	....	....	....	....	....	....	22·00	12·35	....
Upper Nicol	....	Voided leases	....	....	....	....	....	....	....	6·50	2·59	....
Weerianna	....	Voided leases	....	....	....	....	....	....	....	3,200·15	3,214·45	....
		Sundry claims	....	....	....	....	....	....	....	336·00	135·26	1·29
Whim Creek	....	....	....	....	....	....	....	....	....	....	....	‡883·80
		From Goldfield generally :—										
		Sundry Parcels treated at Various Works	....	....	....	....	....	....	....	....	*102·39	4·90
		Sundry Claims and Leases	....	....	....	....	†277·37	....	7·97	....	....	†462·85
		Reported by Banks and Gold Dealers	·41	6·98	....	....	....	6,087·15	177·43	103·50	228·32	·11
		Totals	**·41**	**6·98**	**20·00**	**7·94**	**277·37**	**6,313·31**	**370·87**	**24,680·96**	**24,200·90**	**1,852·24**
Ashburton Goldfield.												
Belvedere	....	Voided leases	....	....	....	....	....	....	9·88	1,560·00	435·86	176·48
Dead Finish	....	Voided leases	....	....	....	....	....	....	....	1,699·00	874·60	·03
		Sundry claims	....	....	....	....	....	....	11·89	104·25	245·08	....
Linden Station	....	Sundry claims	....	....	6·35	17·35	....	....	....	6·35	17·35	....
Melrose	....	Voided leases	....	....	....	....	....	....	....	2,704·00	840·26	213·11
		Sundry claims	....	....	....	....	....	12·41	21·88	562·00	262·78	6·40

Mt. Edith	....	Sundry claims	....	....	....	....	....	....	....	....	5·00	3·97	....
Mt. Mortimer	....	Sundry claims	....	....	....	....	....	364·63	315·64	44·50	40·25	74·47
Uaroo	....	Voided leases	....	....	....	....	....	....	....	....	....	†7,713·22
From Goldfield generally :—												
Sundry claims			....	....	....	....	†7,423·89	....	....	....	....	†22,929·76
Reported by Banks and Gold Dealers			·88	....	....	....	....	8,885·11	120·11	....	7·12	....
Totals			·88	....	6·35	17·35	7,423·89	9,262·15	479·40	6,685·10	2,727·27	31,113·47

Gascoyne Goldfield.

Bangemall	....	Voided leases	....	....	....	....	....	....	6·22	350·70	313·82	....
		Sundry claims	....	....	....	....	....	88·97	33·55	36·30	203·47	....
		From Goldfield generally :—										
		Reported by Banks and Gold Dealers	....	....	....	....	....	604·47	1·80	....	....	....
		Totals	....	....	....	....	....	693·44	41·57	387·00	517·29	....

Peak Hill Goldfield.

Bulloo Downs	....	Voided leases	....	....	....	....	....	....	....	....	....	†50·09
Egerton	556P	Egerton	1·45	....	....	....	....	1·45	193·77	2,079·00	3,738·77	....
	590P	Wyndham	....	....	....	....	....	....	....	96·00	7·08	....
		Voided leases	....	....	....	....	....	60·86	30·91	5,077·25	2,842·45	....
		Sundry claims	....	....	....	....	....	235·35	23·51	1,501·77	791·34	....
Horseshoe	568P, etc.	Anglo Westralian Mining Pty., Ltd.	....	....	35,602·00	5,427·51	415·18	....	....	35,602·00	5,427·51	415·18
		Prior to transfer to present holders	....	....	....	....	....	....	....	3,914·00	894·44	....
	575P	Labourchere Main Lode	....	....	....	....	....	....	....	535·00	60·38	....
		Voided leases	....	....	....	....	....	15·57	1,975·37	4,371·38	2,684·27	2·00
		Sundry claims	....	....	64·00	11·53	....	20·12	829·58	1,876·05	702·91	....
Jimblebar	....	Voided leases	....	....	....	....	....	....	172·75	7,526·25	2,561·95	·58
		Sundry claims	....	....	....	....	....	13·79	65·95	1,048·05	574·16	....
Mt. Fraser	....	Voided leases	....	....	....	....	....	....	....	389·50	320·96	....
		Sundry claims	....	....	....	....	....	88·28	40·61	400·75	341·14	....
Mt. Seabrook	....	Voided leases	....	....	....	....	....	....	5·05	620·25	428·26	....
		Sundry claims	....	....	....	....	....	....	....	1,089·35	803·12	....

Table I.—*Production of Gold and Silver from all sources, etc.*—continued.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1952. Alluvial. Fine ozs.	Dollied and Specimens. Fine ozs.	Ore treated. Tons (2,240 lb.).	Gold therefrom. Fine ozs.	Silver. Fine ozs.	Total Production. Alluvial. Fine ozs.	Dollied and Specimens. Fine ozs.	Ore treated. Tons (2,240 lb.).	Gold therefrom. Fine ozs.	Silver. Fine ozs.
PEAK HILL GOLDFIELD—continued.												
Peak Hill	512P	Atlantic	....	....	168·50	10·19	....	1·69	2·87	4,703·75	589·15	....
	511P	Commercial	....	....	186·00	23·07	....	....	....	3,024·75	510·97	....
	584P	Dazzle Star	....	....	....	....	....	....	....	207·00	70·21	....
	567P	Miner Bird	....	....	122·50	42·09	....	....	....	1,271·50	605·50	....
	553P	Morning Star	....	....	7·00	7·09	....	....	4·43	2,804·25	410·09	....
	587P	Murray Heath	....	....	15·00	4·15	....	....	....	15·00	4·15	....
	506P	No. 1 North	....	....	75·00	36·07	....	....	86·47	6,549·20	1,550·42	....
	492P	North Star	....	....	39·00	14·70	....	23·20	69·63	13,186·50	2,079·21	....
	593P	Swanie	....	....	97·00	3·87	....	....	....	97·00	3·87	....
		Voided leases	....	....	....	....	....	7·39	920·21	521,744·33	247,050·17	2,285·63
		Sundry claims	....	....	175·00	12·21	....	61·51	306·63	34,239·85	8,936·50	....
Ravelstone		Voided leases	....	....	....	....	....	....	101·64	4,219·85	3,117·68	....
		Sundry claims	....	....	....	....	....	....	....	553·60	283·17	....
Wilgeena	572P	O.K.	....	....	....	....	....	....	....	66·00	6·10	....
		Voided leases	....	....	....	....	....	....	23·54	128·50	146·79	....
Wilthorpe		Voided leases	....	....	....	....	....	....	....	47·00	20·93	....
		Sundry claims	....	....	....	....	....	....	....	89·00	25·71	....
Yowereena		Voided leases	....	....	....	....	....	....	....	19·50	36·46	....
		Sundry claims	....	....	....	....	....	....	....	117·25	203·16	....
	From Goldfield generally :—											
	Sundry Parcels treated at :											
		Australian Machinery and Investment Co.	....	....	....	*8·97	....	....	....	....	*1,686·20	..
		State Battery, Peak Hill	....	....	....	....	....	....	3·05	15·00	*7,168·89	....
		Various Works	....	....	....	....	....	....	....	30·00	*5,661·37	23·12
	Reported by Banks and Gold Dealers		....	....	....	....	....	2,846·65	444·36	....	12·51	....
	Totals		**1·45**	....	**36,551·00**	**5,691·45**	**415·18**	**3,375·86**	**5,300·33**	**659,255·43**	**302,357·95**	**2,776·60**

East Murchison Goldfield.

LAWLERS DISTRICT.

Kathleen Valley		Voided leases	....	....	....	....	....	....	144·85	80,503·66	49,020·54	....
		Sundry claims	....	....	....	....	....	14·37	526·03	5,583·75	2,587·62	....

Lawlers	1236	Waroonga	....	....	....	*99·40	·50	....	....	....	99·40	·50
	(1236, etc.)	Australian Gold Production, Ltd.	....	....	....	1·35	....	5·78	....	1,030·00	398·29	·15
		Prior to transfer to present holders	....	....	....	....	....	13·02	....	336,532·18	83,317·15	452·00
		Voided leases	....	....	....	....	....	6·71	692·45	1,285,355·22	491,414·15	14,350·93
		Sundry claims	....	....	....	....	....	400·21	451·61	17,347·48	9,568·69	268·34
Sir Samuel	1351	Lucky	....	....	112·00	122·02	....	....	....	112·00	122·02	....
		Voided leases	....	....	....	....	....	....	359·03	275,193·55	141,637·58	10,234·80
		Sundry claims	....	....	....	....	....	53·89	64·96	7,343·00	4,497·79	·02
	From District Generally :—											
	Sundry Parcels treated at :											
	Australian Machinery and Investment Co., Ltd (McPherson's Cyanide Plant)		....	....	....	....	....	2·12	....	12·03	*4,268·05	....
	Australian Machinery & Investment		....	....	....	....	....	....	....	5·00	*4,291·25	29·00
	Prior to transfer to present holders		....	....	....	....	....	....	....	....	*1,371·33	15·64
	Vanguard Cyanide Plant		....	....	....	....	....	....	....	4·00	*1,013·10	3·18
	State Battery Sir Samuel (leased)		....	....	....	....	....	....	....	53·50	*2,356·81	....
	Various Works		....	....	....	....	....	....	2·35	1,699·50	*26,520·71	936·21
	Reported by Banks and Gold Dealers		....	....	....	....	....	6,408·20	101·91	·05	9·84	....
	Totals		....	....	**112·00**	**222·77**	·50	**6,904·30**	**2,343·19**	**2,010,774·92**	**822,494·32**	**26,290·77**

WILUNA DISTRICT.

Coles	662J	Black Adder	....	....	120·00	39·27	....	....	....	1,809·00	1,025·87	....
		Voided leases	....	....	....	....	....	....	....	830·50	156·85	....
		Sundry claims	....	....	....	....	....	....	21·03	3,844·50	1,507·23	....
Corboy's	(680J)	Mount Fisher East	....	....	20·00	76·49	....	....	....	313·00	682·60	....
		Voided leases	....	....	....	....	....	5·24	1·25	14,633·29	10,354·11	5·00
		Sundry claims	....	....	....	39·52	....	21·58	....	8,964·35	5,173·34	....
Gum Creek	....	Voided leases	....	....	....	....	....	20·75	....	1,380·00	595·73	....
		Sundry claims	....	....	....	....	....	....	1·36	407·25	131·08	....
Mt. Eureka	....	Voided leases	....	....	....	....	....	....	....	142·25	96·36	....
		Sundry claims	....	....	....	....	....	....	....	783·75	548·56	....
Mt. Keith....	....	Voided leases	....	....	....	....	....	....	44·54	20,259·50	13,551·08	....
		Sundry Claims	....	....	....	....	....	4·81	227·29	3,862·50	2,480·03	....
New England	....	Voided leases	....	....	....	....	....	5·74	95·70	5,364·25	3,490·87	....
		Sundry claims	....	....	....	....	....	9·31	5·78	4,534·75	3,111·97	....
Wiluna	679J	Lone Hand	....	....	....	....	....	....	....	1,604·75	127·50	....
	(677J)	Lucky Hit	....	....	....	....	....	....	....	781·00	101·38	....
	(194J, etc.)	Wiluna Gold Mines, Ltd.	....	....	....	147·71	....	....	....	7,345,465·00	1,334,354·94	8,605·91
		Prior to transfer to present holders	....	....	....	....	....	....	....	341,730·57	133,457·92	89·32
		Voided leases	....	....	....	....	....	....	574·76	1,088,405·33	320,508·78	1,349·40
		Sundry claims	....	....	....	....	....	105·39	219·08	27,379·40	10,872·09	·33

Table I.—*Production of Gold and Silver from all sources, etc.*—continued.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1952.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.
EAST MURCHISON GOLDFIELD—continued.												
WILUNA DISTRICT—*continued.*												
From District generally :—												
Sundry Parcels treated at :												
Black Adder Battery			....	....	....	*164·44	....	....	....	637·00	*23,677·42	218·70
State Battery, Wiluna			....	....	....	....	....	....	....	....	*202·13	....
Wiluna East Battery			....	....	....	....	....	....	....	....	*154·02	....
H. G. Woosnam, L.T.T. 1215H.			....	....	....	*25·30	·04	....	....	....	*25·30	·04
Various Works			....	....	....	....	....	....	....	139·00	*4,807·90	12·68
Reported by Banks and Gold Dealers			2·49	....	....	....	....	52·03	56·58	....	58·49	....
Totals			**2·49**		**140·00**	**492·73**	**·04**	**224·85**	**1,247·37**	**8,873,270·94**	**1,871,253·55**	**10,281·38**
BLACK RANGE DISTRICT.												
Barrambie	....	Voided leases	....	....	....	....	....	....	22·49	18,443·92	17,355·15	125·60
		Sundry claims	....	....	....	....	....	5·07	170·20	833·55	915·51	....
Bellchambers	....	Voided leases	....	....	....	....	....	....	111·80	4,349·27	3,130·56	....
		Sundry leases	....	....	....	....	....	....	....	1,008·30	547·06	....
Birrigrin	....	Voided leases	....	....	....	....	....	....	820·68	12,042·93	15,086·09	....
		Sundry claims	....	....	....	....	....	....	179·92	2,487·55	1,238·22	....
Currans	....	Voided leases	....	....	....	....	....	18·24	222·89	7,252·25	3,116·68	....
		Sundry claims	....	....	....	....	....	....	29·38	2,158·75	827·18	....
Errolls	....	Voided leases	....	....	....	....	....	14·17	152·29	14,170·50	9,328·92	....
		Sundry claims	....	....	....	....	....	6·53	399·11	964·75	595·45	....
Hancocks	....	1074B .... Apples	....	....	....	....	....	....	443·79	975·75	3,156·49	....
		Voided leases	....	....	....	....	....	....	6,524·37	32,686·50	33,441·16	55·72
		Sundry claims	....	....	....	....	....	4·21	142·89	8,459·10	3,219·53	....
Maninga Marley	....	Voided leases	....	....	....	....	....	....	195·20	60,833·48	48,494·40	22·55
		Sundry claims	....	....	....	....	....	....	158·16	3,079·65	1,768·16	....

Montague	967B, 1100B	North End Leases	....	....	230·00	*632·11	....	....	....	39,877·95	6,480·40	....
		Voided leases	....	....	....	....	....	....	100·17	39,672·65	16,888·02	....
		Sundry leases	....	....	....	....	....	....	71·09	5,041·35	3,171·19	....
Nunngarra	....	Voided leases	....	....	....	....	....	25·94	952·34	9,509·00	3,655·49	....
		Sundry claims	....	....	....	....	....	50·27	1,458·98	7,636·40	2,953·69	....
Sandstone	959B	Atlas Gold Mines, Ltd.	....	....	....	....	....	....	....	986·75	180·56	....
		Prior to transfer to present holders	....	....	....	....	....	....	136·06	537·75	686·59	....
	1057B	Doolette South	....	....	....	....	....	....	217·54	2,114·00	2,313·45	....
	958B	Lady Mary	....	....	....	....	....	....	383·35	7,165·75	7,119·35	2·35
		Voided leases	....	....	....	....	....	4·75	4,010·09	692,614·07	444,324·11	11,754·22
		Sundry claims	....	....	....	....	....	44·95	1,421·07	15,506·95	6,820·85	....
Youanmi	....	Voided leases	....	....	....	....	....	·36	126·92	731,497·55	273,884·97	10,474·10
		Sundry claims	....	....	....	....	....	1·07	18·79	6,258·55	1,814·66	....
	From District generally :—											
	Sundry Parcels treated at :											
	State Battery, Sandstone	....	....	....	....	....	....	....	290·50	*23,007·38	59·53
	State Battery, Youanmi	....	....	....	....	....	....	....	40·00	*5,461·83	....
	North End Battery Cyanide Plant	....	....	....	....	....	....	....	....	*4,934·14	....
	Various Works	....	....	....	....	....	....	....	92·50	*6,510·12	....
	Reported by Banks and Gold Dealers	....	....	....	....	....	1,459·55	52·23	....	20·38	....
	Totals	....	....	**230·00**	**632·11**	....	**1,635·11**	**18,521·80**	**1,728,587·97**	**952,447·74**	**22,494·07**

Murchison Goldfield.

CUE DISTRICT.

Big Bell	2050, etc.	Big Bell Mines, Ltd.	....	....	400,563·00	53,609·94	21,786·56	....	....	4,715,596·00	610,065·82	217,350·43
	2050	Little Bell	....	....	....	....	....	....	4·49	579·75	60·95	....
		Voided Leases	....	....	....	....	....	....	....	401·00	422·83	....
		Sundry Claims	....	....	....	....	....	·39	6·32	382·75	357·46	....
Cuddingwarra	2266	William	....	....	9·50	·47	....	....	....	9·50	·47	....
		Voided Leases	....	....	....	....	....	10·59	132·46	102,035·16	56,141·91	100·71
		Sundry Claims	....	....	....	....	....	18·46	384·38	9,617·89	5,540·53	9·00
Cue	2262	Table Top	....	....	219·75	397·44	....	....	....	438·50	667·33	....
	2247	Victory	....	....	....	....	....	....	....	226·75	125·38	....
		Voided Leases	....	....	....	....	....	202·71	911·60	228,796·44	221,102·80	69·11
		Sundry Claims	....	....	152·35	29·60	....	252·92	894·70	44,560·84	20,203·26	....
Eelya	2241	Eagle Hawk	....	....	....	....	....	....	....	1,408·75	416·08	....
		Voided Leases	....	....	....	....	....	....	8·78	1,069·00	1,811·26	....
		Sundry Claims	....	....	66·75	5·91	....	6·20	143·81	2,068·65	1,043·36	....
Mindoolah	....	Voided Leases	....	....	....	....	....	3·07	2·54	9,380·28	5,672·31	42·97
		Sundry Claims	....	....	....	....	....	....	29·30	3,299·60	2,345·43	....

Table I.—*Production of Gold and Silver from all sources, etc.*—continued.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1952.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.
MURCHISON GOLDFIELD—continued.												
CUE DISTRICT—*continued.*												
Reedy	2253	Rand No. 3	....	....	....	....	....	....	....	4,152·25	1,356·56	....
	(2055, etc.)	Triton Gold Mines, N.L.	....	....	....	10·16	....	....	2·07	702,484·50	221,293·20	20,461·06
		Prior to transfer to Present holders	....	....	....	....	....	....	....	16,338·50	7,471·50	5·00
		Voided Leases	....	....	....	....	....	1·46	214·65	6,664·43	10,159·89	1·22
		Sundry Claims	....	....	172·00	41·88	....	170·71	137·16	6,881·25	2,646·37	....
Tuckabianna	2237	Gidgie	....	....	....	....	....	....	79·16	2,671·15	1,803·84	....
	2260	Montorio	....	....	90·25	47·83	....	....	....	221·50	139·33	....
	2244	Winston	....	384·04	294·50	137·06	....	....	634·28	624·00	239·43	2·30
		Voided Leases	....	....	....	....	....	649·70	297·68	12,908·48	7,321·43	....
		Sundry Claims	....	....	....	....	....	151·38	489·40	4,757·60	2,675·86	....
Tuckanarra	....	Voided Leases	....	....	....	....	....	85·37	3,511·10	19,490·00	22,828·99	172·77
		Sundry Claims	....	....	49·50	31·53	....	115·23	789·31	10,089·80	10,294·94	....
Weld Range	....	Voided Leases	....	....	....	....	....	....	23·64	2,169·75	1,137·11	....
		Sundry Claims	....	....	....	....	....	....	3·90	1,438·50	1,136·41	....
		From District Generally :—										
		Sundry Parcels treated at :										
		State Battery, Cue	....	....	....	*405·97	....	....	....	76·25	*25,589·98	117·35
		State Battery, Tuckanarra	....	....	....	....	....	....	....	518·50	*5,535·57	....
		R. E. Ridley, L.T.T 1243H.	....	....	....	*29·89	....	....	....	....	*29·89	....
		Various Works	....	....	....	....	....	....	....	7,340·27	*29,430·64	1,147·77
		Reported by Banks and Gold Dealers	8·79	....	....	....	....	3,404·24	107·60	....	22·62	·07
		Totals	**8·79**	**384·04**	**401,617·60**	**54,747·68**	**21,786·56**	**5,072·43**	**8,808·33**	**5,978,697·59**	**1,277,090·74**	**239,479·76**
MEEKATHARRA DISTRICT.												
Abbotts	....	Voided Leases	....	....	....	....	....	....	26·45	36,841·35	38,775·28	....
		Sundry Claims	....	....	12·25	12·32	....	....	5·29	3,769·27	2,326·32	....
Burnakura	1849N	New Alliance	....	....	....	....	....	....	....	132·25	114·39	....
		Voided Leases	....	....	....	....	....	....	3,247·59	39,040·45	30,775·77	26·90
		Sundry Claims	....	....	....	....	....	17·03	129·24	2,486·55	1,310·84	1·54
Chesterfield	1942N	Margueritta	....	....	160·00	64·76	7·74	....	....	732·00	197·73	7·74
	1946N	Marguerritta East	....	....	1,420·00	250·09	10·65	....	....	1,420·00	250·09	10·65
		Voided Leases	....	....	....	....	....	29·02	420·32	6,875·26	7,500·57	·80
		Sundry Claims	....	....	....	....	....	....	42·19	960·55	740·97	....

Cabanintha	1948N	Fortuna	....	....	786·50	268·27	....	....	....	1,114·00	582·27	....
	1725N	New Brew	....	....	....	17·32	....	....	....	4,705·10	6,201·15	....
		Voided Leases	....	....	....	....	....	11·79	38·14	24,864·50	14,929·37	815·57
		Sundry Claims	....	....	38·00	11·10	....	16·78	159·05	4,862·75	2,874·93	....
Garden Gully	(1927N)	Sabbath	....	....	....	....	....	....	....	33·75	17·03	....
		Voided Leases	....	....	....	....	....	26·36	74·91	30,238·32	21,847·71	1,102·59
		Sundry Claims	....	....	....	....	....	....	18·74	2,905·44	1,695·15	....
Gum Creek	....	Voided Leases	....	....	....	....	....	25·27	91·96	3,893·08	3,819·91	....
		Sundry Claims	....	....	....	....	....	4·37	84·86	727·25	636·85	....
Holden's	1551N	New Waterloo	....	....	....	....	....	....	·99	1,468·00	918·92	....
		Voided Leases	....	....	....	....	....	....	18·00	16,593·00	6,401·50	....
		Sundry Claims	....	....	....	....	....	164·95	49·07	425·15	279·25	....
Jillawarra	(1871N)	Werribie	....	....	....	....	....	....	128·85	451·25	749·62	....
		Voided Leases	....	....	....	....	....	....	1,134·68	1,548·55	2,815·78	....
		Sundry Claims	....	....	....	....	....	173·02	150·04	440·75	403·14	....
Meeka Pools	....	Voided Leases	....	....	....	....	....	....	....	111·58	82·27	....
		Sundry Claims	....	....	....	....	....	....	2·84	233·57	205·38	....
Meekatharra	1922N	Albury Heath	....	....	303·75	384·56	....	....	....	950·75	1,492·22	....
	1855N	Commodore	....	....	....	5·61	....	....	....	1,160·25	386·50	....
	(1553N)	Consols North	....	....	....	....	....	....	....	659·75	1,359·33	....
	1952N	Consols North	....	....	82·00	38·26	....	....	....	82·00	38·26	....
	1571N	Coolgardie Brilliant, N.L.	....	....	....	....	....	....	....	2,451·36	541·38	....
		Prior to transfer to present holders	....	....	....	....	....	....	....	8,107·50	4,907·48	....
	(1894N)	Fenian	....	....	....	75·64	....	....	....	....	178·21	....
	(1894N)	Fenian Leases	....	....	....	....	....	....	....	329,424·69	261,787·67	....
	(477N)	(Fenian)	....	....	....	....	....	....	....	8,831·75	18,289·22	....
	(1940N)	Fenian Extended	....	....	....	10·21	....	....	....	....	10·21	....
	(1944N)	Fortune Teller	....	....	....	....	....	....	....	705·00	295·21	....
	1893N	Halcyon	....	....	59·00	5·89	....	....	·78	7,882·10	1,050·48	....
	(1888N)	Haveluck	....	....	54·00	13·40	....	....	56·94	3,381·75	924·40	....
	1559N	Ingliston	....	....	....	6·40	....	....	498·32	1,846·10	1,691·61	....
	(1542N)	Ingliston Alberts	....	....	....	....	....	....	....	305·50	446·00	....
	(1542N)	(Ingliston Albert Leases)	....	....	....	....	....	....	....	2,983·70	1,283·06	....
	(1895N, etc.)	Ingliston Consuls Extended Leases	....	....	....	1·28	....	....	....	873,719·47	357,047·70	....
		Prior to transfer to present holders	....	....	....	....	....	....	....	1,536·25	4,248·25	·30
	1950N	Ingliston South	....	....	43·25	20·40	....	....	....	71·25	32·92	....
	1547N	Lady Central	....	....	....	....	....	....	19·36	96·00	51·78	....
	1547N	Lady Central Leases	....	....	....	....	....	....	11·06	2,951·42	5,198·33	....
	1547N	Meekatharra Central Gold, N.L.	....	....	....	....	....	....	5·29	4,842·25	2,463·30	....
	1577N	Mopoke	....	....	23·25	7·34	....	....	12·47	1,361·50	827·50	....
	1923N	Peter Pan	....	....	53·50	8·05	....	....	....	337·25	30·92	....
	1529N	Prohibition	....	....	....	35·06	....	....	....	3,950·00	1,888·60	·04
	1529N, etc.	Prohibition Gold Mining Co., N.L.	....	....	....	....	....	....	....	24,844·25	4,978·31	11·83
	1529N	Prior to transfer to present holders	....	....	....	....	....	....	....	29,422·00	4,971·30	....
	1934N	United	....	....	....	80·45	....	....	....	117·25	130·39	....
		Voided leases	....	....	....	....	....	3·88	1,426·89	458,070·63	264,208·56	2,454·74
		Sundry claims	....	....	150·50	38·35	....	229·71	628·85	24,975·45	9,796·93	....

Table I.—*Production of Gold and Silver from all sources, etc.*—continued.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1952. Alluvial. Fine ozs.	Dollied and Specimens. Fine ozs.	Ore treated. Tons (2,240 lb.).	Gold therefrom. Fine ozs.	Silver. Fine ozs.	Total Production. Alluvial. Fine ozs.	Dollied and Specimens. Fine ozs.	Ore treated. Tons (2,240 lb.).	Gold therefrom. Fine ozs.	Silver. Fine ozs.
MURCHISON GOLDFIELD—continued.												
MEEKATHARRA DISTRICT—*continued.*												
Mistletoe		Voided leases	....	....	....	....	....	4·15	1,000·24	417·00	486·21	....
		Sundry claims	....	....	....	....	....	119·14	71·85	19·75	2·03	....
Mt. Maitland		Voided leases	....	....	....	....	....	....	....	88·00	80·11	....
		Sundry claims	....	....	....	....	....	....	....	420·75	240·86	....
Munara Gully		Voided leases	....	....	....	....	....	....	....	13,283·50	6,559·93	....
		Sundry claims	....	....	....	....	....	....	34·23	1,009·75	373·74	....
Nannine	1872N	Blue Pedro	....	....	....	....	....	4·06	15·26	9,566·40	2,021·11	....
	1941N	Caledonia Gold Mine	....	....	755·00	281·63	....	....	....	855·00	299·29	....
	1939N	Devil's Dice	6·00	....	....	2·24	....	6·00	....	59·50	9·77	....
		Voided leases	....	....	....	....	....	37·25	828·76	116,080·98	73,399·21	167·45
		Sundry claims	....	....	....	....	....	120·08	1,248·76	6,109·43	4,658·63	....
Quinns		Voided leases	....	....	....	....	....	7·30	1,186·50	33,356·91	13,464·37	90·70
		Sundry claims	....	....	....	....	....	15·07	1,289·65	3,841·67	2,718·33	....
Ruby Well		Voided leases	....	....	....	....	....	....	43·46	7,461·00	4,046·70	....
		Sundry claims	....	....	....	....	....	1,015·87	409·39	520·25	629·60	....
Stake Well		Voided leases	....	....	....	....	....	....	200·12	21,362·00	9,566·18	....
		Sundry claims	....	....	....	....	....	31·91	34·73	1,003·60	584·54	....
Star of the East		Voided leases	....	....	....	....	....	....	....	27,244·00	20,305·40	....
		Sundry claims	....	....	....	....	....	....	....	127·62	94·97	....
Yaloginda	1853N	Blue Bird	....	....	595·00	305·42	....	....	....	7,147·00	2,199·17	....
		Voided leases	....	....	....	....	....	19·03	1,972·23	28,175·54	14,609·36	8·68
		Sundry claims	....	....	106·00	14·53	....	61·89	647·51	10,751·92	4,960·35	....
		From District generally :—										
		Sundry Parcels treated at :										
		Meekatharra Sands Treatment and Mining, N.L.	....	....	....	....	....	....	....	....	*6,696·58	....
		Rinaldi's Sluicing Plant	....	....	....	*28·47	....	....	....	....	*28·47	....
		State Battery, Meekatharra	....	....	30·50	457·58	....	....	....	130·00	*26,817·43	19·00
		Various Works	....	....	....	....	....	....	....	172·75	*6,730·59	342·17
		Reported by Banks and Gold Dealers	4·50	....	....	....	....	12,175·38	179·70	13·50	48·82	....
		Totals	**10·50**	....	**4,672·50**	**2,444·63**	**18·39**	**14,319·31**	**17,645·56**	**2,271,158·71**	**1,298,639·88**	**5,060·70**

DAY DAWN DISTRICT.

Day Dawn	573D, etc.	Mountain View Gold, N.L.	....	....	1,434·00	1,159·87	29·60	....	....	8,925·85	15,785·52	155·21
	576D	New Fingall	....	....	....	....	....	6·12	6·84	3,230·00	1,226·01	....
		Prior to transfer to present holders	....	....	....	....	....	....	94·05	10,060·78	32,623·97	....
		Voided leases	....	....	....	....	....	160·64	826·65	1,922,088·36	1,225,599·75	169,210·44
		Sundry claims	....	....	16·50	6·94	....	96·42	521·05	13,265·51	6,620·49	·41
Lake Austin	....	Voided leases	....	....	....	....	....	613·00	3,079·62	36,872·20	51,050·49	....
		Sundry claims	....	....	....	....	....	59·07	965·49	3,252·19	1,278·82	....
Mainland	....	Voided leases	....	....	....	....	....	·41	3,296·77	7,575·62	25,026·07	....
		Sundry claims	....	....	....	....	....	17·85	771·56	1,337·95	701·31	....
Pinnacles	676D	Eclipse Amalgamated North	....	....	....	....	....	....	....	159·00	13·75	....
	670D	Eclipse North	....	....	....	....	....	....	....	141·25	11·18	....
		Voided leases	....	....	....	....	....	4·90	1,213·68	18,280·00	9,915·71	....
		Sundry claims	....	....	....	....	....	62·93	509·50	4,349·42	1,757·28	....
	From District generally :—											
	Sundry Parcels treated at :											
	Various Works		....	....	....	....	....	....	16·61	988·00	1,988·33	....
	Reported by Banks and Gold Dealers		19·64	....	....	....	....	2,212·59	37·30	....	12·57	·01
		Totals	**19·64**	....	**1,450·50**	**1,166·81**	**29·60**	**3,233·93**	**11,339·12**	**2,030,526·13**	**1,373,611·25**	**169,366·07**

MOUNT MAGNET DISTRICT.

Jumbulyer	1410M	Gold Bug	....	....	9·00	2·76	....	....	2·20	632·20	207·25	....
		Voided leases	....	....	....	....	....	....	13·37	680·10	361·74	....
		Sundry claims	....	....	....	....	....	20·32	116·27	1,205·70	878·98	....
Lennonville	1308M	Empress	....	....	....	....	....	....	....	460·00	167·30	....
	(1379M)	Galtee Moore	....	....	....	....	....	....	....	6,026·00	1,583·06	·80
		Voided leases	....	....	....	....	....	....	3,226·91	145,016·55	126,817·92	458·82
		Sundry claims	....	....	57·25	15·92	....	23·30	108·82	14,036·57	5,454·91	....
Mt. Magnet	(1454M)	Cushie Doo	....	....	....	....	....	....	....	6·25	9·89	....
	1255M, etc.	Edward Carson Leases	....	....	....	5·19	....	....	....	17,890·50	12,825·08	7·76
	1455M	Evening Star	....	....	330·75	37·21	....	....	....	330·75	37·21	....
	1287M	Havelock	....	....	....	....	....	....	11·05	4,332·50	840·14	....
	1282M, etc.	Hill 50 Gold Mine, N.L.	....	....	53,803·00	15,839·24	406·29	....	....	595,340·90	169,468·38	2,346·73
	1246M	(Neptune)	....	....	....	....	....	....	829·41	8,787·65	4,122·61	·21
	1361M	Jupiter	....	....	....	....	....	....	·83	611·05	241·66	....
	1444M	Late Comer	....	....	61·25	21·79	....	....	2·53	368·50	282·10	....
	1447M	Morning Star	....	....	29·50	16·73	....	....	....	302·90	102·70	....
	(1441M)	Perseverance	....	....	....	....	....	....	....	673·50	64·49	....
	1322M	Three Boys	....	....	12·75	5·16	....	....	231·11	578·53	682·98	....
		Voided leases	....	....	....	....	....	29·26	9,580·43	833,004·03	312,004·33	851·39
		Sundry claims	....	....	169·00	58·74	....	122·27	2,626·24	60,011·90	29,543·50	4·49
Mt. Magnet, East		Voided leases	....	....	....	....	....	63·29	764·53	5,522·28	2,811·75	....
		Sundry claims	....	....	....	....	....	....	37·22	418·25	428·29	....

Table I.—*Production of Gold and Silver from all sources, etc.*—continued.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1952. Alluvial. Fine ozs.	Dollied and Specimens. Fine ozs.	Ore treated. Tons (2,240 lb.).	Gold therefrom. Fine ozs.	Silver. Fine ozs.	Total Production. Alluvial. Fine ozs.	Dollied and Specimens. Fine ozs.	Ore treated. Tons (2,240 lb.).	Gold therefrom. Fine ozs.	Silver. Fine ozs.
MURCHISON GOLDFIELD—continued.												
MOUNT MAGNET DISTRICT—*continued.*												
Moyagee	1355M	Moyagee	....	....	44·50	85·99	....	....	....	2,665·75	5,192·18	375·25
	1355M, etc.	Moyagee Leases	....	....	....	....	....	....	....	4,641·00	5,489·13	382·52
		Voided leases	....	....	....	....	....	....	23·59	5,132·35	7,617·85	....
		Sundry claims	....	....	....	....	....	14·44	176·21	1,516·25	1,746·42	....
Paynesville	....	Voided leases	....	....	....	....	....	....	1,613·34	449·77	1,116·15	....
		Sundry claims	....	....	....	....	....	3·36	540·21	882·57	1,372·00	....
Winjangoo	....	Voided leases	....	....	....	....	....	·99	191·88	72·00	69·98	....
		Sundry claims	....	....	....	....	....	....	223·32	237·53	71·58	....
	From District generally :—											
	Sundry Parcels treated at :											
		State Battery, Boogardie	....	....	....	*392·92	....	....	....	125·26	*34,402·18	4·20
		Empress Battery	....	....	....	*4·17	....	....	....	....	*46·30	....
		Various Works	....	....	....	....	....	....	....	56·06	*18,902·94	10·04
	Reported by Banks and Gold Dealers		2·95	....	....	48·20	....	2,283·54	114·28	8·00	113·15	·22
	Totals		**2·95**	....	**54,517·00**	**16,534·02**	**406·29**	**2,560·77**	**20,433·75**	**1,712,023·15**	**745,076·13**	**4,442·43**
Yalgoo Goldfield.												
Bilberatha	....	Voided leases	....	....	....	....	....	1·27	90·94	3,384·50	1,845·05	....
		Sundry claims	....	....	....	....	....	....	6·64	3,075·05	1,401·56	....
Carlaminda	....	Voided leases	....	....	....	....	....	1·28	3·39	2,056·57	862·42	3·30
		Sundry claims	....	....	....	....	....	....	....	1,368·50	600·68	....
Field's Find	1113, 1220	Field's Find Central Leases	....	....	....	....	....	....	....	10·00	8·23	·43
	1113	Field's Find	....	....	....	....	....	....	....	44·00	17·96	·10
	1220	Field's Find Central	....	....	....	....	....	....	....	5·00	3·53	....
	1119	Field's Find Central West	....	....	....	....	....	....	....	140·50	36·50	·80
	1119, etc.	Field's Find Central West Leases	....	....	....	....	....	....	....	4,625·00	1,074·53	56·69
	1207	Rose Marie	....	....	24·00	18·80	1·52	....	....	418·67	252·10	1·52
		Voided leases	....	....	....	....	....	....	226·72	45,475·96	32,547·10	....
		Sundry claims	....	....	....	....	....	5·77	188·67	5,455·85	1,775·93	....

Goodingnow	1060	Ark	....	....	50·50	107·91	....	....	1·23	2,106·50	1,665·47	....
	(1102)	Astor	....	....	....	....	....	....	....	6,325·25	3,280·85	....
	(1198)	Astor, South	....	....	....	....	....	....	....	498·50	114·17	....
	1025	Carnation	....	....	136·50	82·57	....	....	....	18,816·05	13,885·10	....
	1206	Orchid	....	....	....	....	....	....	....	157·50	33·74	....
	1145	Oversight	....	....	285·00	166·52	....	....	....	2,338·35	875·92	....
	1208	Oversight, South	....	....	....	....	....	....	8·03	2,935·00	1,214·21	....
		Voided leases	....	....	....	....	....	146·70	280·63	50,161·06	46,775·43	....
		Sundry claims	....	....	....	....	....	152·96	169·70	10,193·25	5,090·58	....
Gullewa	1189	King Solomons Mine	....	....	....	....	....	....	....	315·00	135·89	5·79
	1189, etc.	(King Solomons Mines, Ltd.)	....	....	....	....	....	....	....	5,130·10	2,101·25	26·49
		Voided leases	....	....	....	....	....	....	19·05	34,468·50	18,729·37	81·42
		Sundry claims	....	....	....	....	....	....	170·45	4,391·25	1,918·24	....
Kirkalucka	....	Voided leases	....	....	....	....	....	....	....	61·25	45·10	....
		Sundry claims	....	....	....	....	....	....	17·79	257·30	126·29	....
Messengers Patch	....	Voided leases	....	....	....	....	....	8·64	349·71	39,836·51	28,564·95	1,083·01
		Sundry claims	....	....	....	....	....	463·12	333·98	1,595·10	588·36	·07
Mt. Farmer	....	Voided leases	....	....	....	....	....	....	....	64·00	40·19	....
		Sundry claims	....	....	....	....	....	....	....	462·90	145·06	....
Mt. Gibson	....	Voided leases	....	....	....	....	....	....	6·44	526·50	888·70	....
		Sundry claims	....	....	....	....	....	1·03	44·72	1,123·35	494·25	1·00
Ninghan	....	Voided leases	....	....	....	....	....	....	....	10·00	1·41	....
		Sundry claims	....	....	....	....	....	....	....	324·75	123·28	....
Noongal	1201	Hard to Find	....	....	....	....	....	....	....	114·00	111·83	....
	1203	Revival	....	....	....	....	....	....	....	80·00	132·93	4·04
		Voided leases	....	....	....	....	....	7·88	31·96	11,069·75	5,526·90	....
		Sundry claims	....	....	....	....	....	39·32	310·31	8,499·05	3,561·25	....
Nyounda	....	Voided leases	....	....	....	....	....	....	217·63	416·00	183·91	....
		Sundry claims	....	....	....	....	....	....	30·88	829·00	206·46	....
Pinyalling	1217	Broken Doll....	....	....	2·00	15·18	....	....	219·99	7·55	148·38	....
	1223	Trump	....	....	10·00	24·63	....	....	....	10·00	24·63	....
		Voided leases	....	....	....	....	....	....	93·80	2,296·35	959·50	....
		Sundry claims	....	....	27·00	2·68	....	3·13	134·09	1,492·50	954·82	....
Retaliation	....	Voided leases	....	....	....	....	....	....	....	5,089·25	1,872·98	....
		Sundry claims	....	....	....	....	....	....	....	778·25	304·71	....
Rothsay	1216	Dollar	....	....	....	....	....	....	....	....	2·14	....
		Voided leases	....	....	....	....	....	....	24·06	40,630·75	10,775·84	....
		Sundry claims	....	....	....	....	....	....	·73	6,469·50	2,562·03	....
Wadgingarra	....	Voided leases	....	....	....	....	....	....	....	691·11	650·63	....
		Sundry Claims	....	....	....	....	....	....	....	2,131·30	559·83	....
Warda Warra	....	Voided leases	....	....	....	....	....	....	....	10,760·50	5,862·04	....
		Sundry claims	....	....	....	....	....	....	....	933·75	369·87	....

Table I.—*Production of Gold and Silver from all sources, etc.*—continued.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1952. Alluvial. Fine ozs.	Dollied and Specimens. Fine ozs.	Ore treated. Tons (2,240 lb.).	Gold therefrom. Fine ozs.	Silver. Fine ozs.	Total Production. Alluvial. Fine ozs.	Dollied and Specimens. Fine ozs.	Ore treated. Tons (2,240 lb.).	Gold therefrom. Fine ozs.	Silver. Fine ozs.
YALGOO GOLDFIELD—continued.												
Warriedar	....	Voided leases	....	....	....	....	....	....	....	13,661·50	4,607·88	7·30
		Sundry claims	....	....	....	....	....	....	2·84	8,782·85	1,892·46	....
Yalgoo	....	Voided leases	....	....	....	....	....	....	3·23	6,314·50	9,965·18	....
		Sundry claims	....	....	....	....	....	....	23·56	2,622·75	1,010·02	....
Yuin	....	Voided leases	....	....	....	....	....	....	127·12	68,139·50	27,908·57	130·13
		Sundry claims	....	....	....	....	....	....	4·70	335·50	67·53	....
		From Goldfield generally :—										
		Sundry Parcels treated at :										
		State Battery, Payne's Find	....	....	....	·92	....	....	....	38·50	*4,532·78	....
		State Battery, Warriedar	....	....	....	*27·81	....	....	....	....	*6,531·02	....
		State Battery, Yalgoo	....	....	....	*6·88	....	....	....	....	*1,200·51	....
		Various Works	....	....	....	....	....	9·42	....	664·00	*3,325·00	99·84
		Reported by Banks and Gold Dealers	....	....	....	....	....	944·94	58·32	....	48·90	·20
		Totals	....	....	**535·00**	**453·90**	**1·52**	**1,785·46**	**3,201·31**	**441,065·28**	**263,123·93**	**1,502·13**
Mt. Margaret Goldfield.												
MOUNT MORGANS DISTRICT.												
Australia United....	....	Voided leases	....	....	....	....	....	....	1,911·63	15,913·69	23,305·76	1·76
		Sundry claims	....	....	....	....	....	....	580·98	1,307·50	2,227·65	....
Eucalyptus	....	Voided leases	....	....	....	....	....	....	2,878·56	1,603·85	3,251·01	....
		Sundry claims	....	....	15·00	21·47	....	....	591·62	2,160·30	2,011·78	....
Linden	(539F)	Democrat	....	....	....	....	....	....	1·19	4,894·00	8,085·29	....
	(554F)	Devon	....	....	....	....	....	....	....	11·50	13·39	....
	553F	Local Lady	....	....	40·00	28·14	....	....	....	3,096·25	3,016·93	....
	529F	Second Fortune	....	....	....	....	....	....	....	517·00	282·05	....
		Voided leases	....	....	....	....	....	7·53	565·78	64,271·06	54,725·78	·68
		Sundry claims	....	....	100·00	26·25	....	132·11	244·96	19,242·85	13,759·18	....
Mt. Margaret	M.A. 12F	The United Aborigines Mission	....	....	....	2·36	....	113·08	18·87	403·00	135·50	·09
		Voided leases	....	....	....	....	....	12·13	1·89	8,900·39	5,291·51	12·55
		Sundry claims	....	....	....	....	....	25·22	111·18	1,779·60	658·99	....

Mt. Morgans	399F, etc.	Morgans Gold Mines, Ltd.	....	....	64·50	5·69	....	....	....	4,568·80	13,789·93	....
		Prior to transfer to present holders	....	....	....	....	....	....	16·66	779,578·43	354,225·86	5,552·63
		Voided leases	....	....	....	....	....	17·95	148·79	61,354·50	34,786·53	77·86
		Sundry claims	....	....	55·00	6·25	....	36·41	398·78	5,067·57	3,328·86	....
Murrin Murrin	....	Voided leases	....	....	....	....	....	10·43	231·35	136,940·22	104,029·97	29·60
		Sundry claims	....	....	....	....	....	51·15	557·24	6,425·33	4,433·63	....
Redcastle	557F	Trixie	....	4·46	....	....	....	....	10·05	158·00	39·31	....
		Voided leases	....	....	....	....	....	4·49	436·54	4,107·20	4,043 41	....
		Sundry leases	....	....	....	....	....	....	113·84	1,133·57	636·03	....
Yundamindra	560F	Queen of May (Linden (W.A.), Gold, N.L.)	....	....	....	71·90	....	....	....	....	71·90	....
		Voided leases	....	....	....	....	....	....	110·93	78,485·85	49,894·35	5·82
		Sundry claims	....	....	....	·27	....	3·01	271·93	6,674·35	4,789·46	....
		From District generally :—										
		Sundry Parcels treated at :										
		C. C. Crocker—Anniversary Battery	....	....	....	7·66	....	....	....	10·00	26·36	....
		State Battery, Linden	....	....	....	*39·14	....	....	9·16	293·29	*15,488·48	....
		Various Works	....	....	....	....	....	....	....	1,257·81	*8,561·39	99·97
		Reported by Banks and Gold Dealers	13·76	....	....	....	....	3,020·86	141·84	10·30	95·75	·68
		Totals	**13·76**	**4·46**	**274·50**	**209·13**	....	**3,434·37**	**9,353·77**	**1,210,166·21**	**715,006·04**	**5,781·64**

MOUNT MALCOLM DISTRICT.

Cardinia	1795C	Rangoon	....	....	80·00	9·48	....	....	6·49	330·00	178·07	....
	1805C	Wanghi	....	....	....	....	....	....	....	280·00	18·28	....
		Voided leases	....	....	....	....	....	....	....	280·00	18·28	....
		Sundry claims	....	....	....	....	....	13·87	1,591·66	4,881·74	4,027·89	....
					....	....	....	4·25	121·91	1,865·25	575·01	·66
Diorite	....	Voided leases	....	....	....	....	....	....	945·65	38,879·03	35,144·28	33·18
		Sundry claims	....	....	....	35·62	....	11·21	332·13	4,626·80	4,467·93	....
Dodger's Well	....	Voided leases	....	....	....	....	....	....	57·90	1,373·30	1,936·52	....
		Sundry claims	....	....	....	....	....	·95	28·32	1,440·25	904·23	....
Lake Darlot	(1836C)	Dragon	....	....	12·00	7·17	....	....	....	12·00	7·17	....
	1834C	Monte Christo	....	....	807·00	59·08	....	....	....	1,844·00	126·41	....
		Voided leases	....	....	....	....	....	....	4,482·18	70,916·46	52,031·46	7·56
		Sundry claims	....	....	28·00	6·23	....	67·68	557·70	8,046·34	5,308·97	2·60
Leonora	1837C	Great Gwalia	....	....	200·00	45·75	....	....	....	200·00	45·75	....
	1829C	Jessie Alma	....	....	13·00	17·87	....	....	454·52	619·50	1,823·39	....
	1788C	Little Gwalia	....	....	186·00	54·20	....	....	....	1,366·00	357·89	....
	1341C, etc.	Sons of Gwalia, Ltd.	....	....	85,263·00	23,768·02	1,943·14	....	....	5,643,358·53	2,259,609·36	160,387·62
		Prior to transfer to present holders	....	....	....	....	....	....	....	109,081·00	55,989·21	8·66
		Voided leases	....	....	....	....	....	....	1,866·86	174,799·00	90,621·56	94·57
		Sundry claims	....	....	63·00	38·71	....	37·73	358·00	18,319·25	11,664·57	....

Table I.—*Production of Gold and Silver from all sources, etc.*—continued.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1952.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.
MOUNT MARGARET GOLDFIELD—continued.												
MOUNT MALCOLM DISTRICT—*continued.*												
Malcolm		Voided leases	....	....	....	....	....	11·65	47·07	62,656·53	47,563·43	....
		Sundry claims	....	....	149·00	23·52	....	5·75	33·39	4,572·47	2,711·17	·12
Mertondale		Voided leases	....	....	....	....	....	....	....	89,024·75	60,935·32	1,497·58
		Sundry claims	....	....	....	....	....	1·82	85·74	3,216·41	2,295·52	....
Mt. Clifford		Voided leases	....	....	....	....	....	....	1,623·35	9,556·96	16,492·17	....
		Sundry claims	....	....	....	....	....	53·98	351·65	5,569·70	3,485·47	....
Pig Well		Voided leases	....	....	....	....	....	....	....	13,587·32	14,676·58	63·68
		Sundry claims	....	....	....	....	....	....	34·61	2,896·65	1,225·46	....
Randwick	1794C	Mighty Splash	....	....	....	....	....	....	7·27	771·00	82·79	....
		Voided leases	....	..	....	....	....	....	239·49	10,141·65	9,653·78	....
		Sundry claims	....	....	....	....	....	66·57	164·02	2,488·64	1,307·45	....
Webster's Find		Voided leases	....	....	....	....	....	30·30	....	22,167·50	14,377·65	....
		Sundry claims	....	....	....	....	....	36·84	695·68	2,356·15	1,530·56	....
Wilson's Creek		Voided leases	....	....	....	....	....	....	....	333·50	168·27	....
		Sundry claims	....	....	....	....	....	·70	4·24	316·00	261·12	....
Wilson's Patch		Voided leases	....	....	....	....	....	....	99·38	28,863·35	13,050·19	1·05
		Sundry claims	....	3·89	....	....	....	4·68	54·46	1,594·16	1,407·27	....
		From District generally :—										
		Sundry Parcels treated at :										
		State Battery, Darlot	....	....	....	....	....	....	....	18·00	*786·34	....
		Reefer Cyanide Plant	....	....	....	....	....	....	....	20·00	3,122·05	22·38
		Various Works	....	....	....	....	....	....	....	789·50	22,175·93	135·97
		Reported by Banks and Gold Dealers	3·58	....	....	....	....	3,470·78	252·83	21·50	51·57	....
		Totals	**3·58**	**3·89**	**86,801·00**	**24,065·65**	**1,943·14**	**3,818·76**	**14,496·50**	**6,343,200·19**	**2,742,198·04**	**162,255·63**
MOUNT MARGARET DISTRICT.												
Burtville	2446T	Boomerang	....	...	180·40	311·60	....	....	....	1,567·40	8,045·79	437·40
	2516T	Golden Bell	....	....	128·25	131·95	5·87	....	....	257·75	325·52	5·87
	2138T	Nil Desperandum	....	....	56·00	337·27	....	....	5·30	1,693·37	3,958·28	....
		Voided leases	....	....	....	....	....	4·89	413·80	70,225·58	108,449·75	480·10
		Sundry claims	....	....	49·00	27·68	....	2·65	208·27	7,400·16	5,490·71	....

Duketon	....	Voided leases	....	....	....	....	....	....	5·35	3,216·10	31,889·42	22,542·63	....
		Sundry claims	....	....	....	....	....	....	....	528·26	2,402·65	2,164·55	29·76
Eagle's Nest	....	Voided leases	....	....	....	....	....	....	....	145·34	534·50	1,238·22	....
		Sundry claims	....	....	....	....	....	....	24·07	487·05	1,046·35	360·11	....
Erlistoun	2508T	Morgood	....	....	10·25	5·69	....	....	....	....	120·25	68·38	....
	2500T	Westralia	....	....	....	*57·36	....	....	....	....	....	*122·50	....
		Voided leases	....	....	....	....	....	10·07	393·41	156,555·65	101,309·48	4,327·81
		Sundry claims	....	....	9·75	4·82	....	1,181·65	148·23	5,526·84	3,746·84	....
Euro	....	Voided leases	....	....	....	....	....	....	65·14	91,821·50	37,678·25	....
		Sundry claims	....	....	....	....	....	4·87	73·04	1,361·50	811·69	....
Laverton	2514T	Gladiator	....	....	310·25	48·47	....	....	....	326·00	52·83	....
	2245T, etc.	Lancefield Leases	....	....	3,543·50	255·53	....	....	....	29,157·50	3,842·01	15·68
	2245T	(Lancefield Extended West)	....	....	....	....	....	....	....	881·25	846·77	....
	2489T	(Wedge)	....	....	....	....	....	....	....	222·00	21·19	....
	2478T	Lancefield North	....	....	....	....	....	....	....	2,235·25	438·99	....
	(2499T)	Pinnacles	....	....	....	....	....	....	....	75·75	9·53	....
	T.L. 2T, 5T, etc.	United Gold Recoveries Pty., Ltd.	....	....	·25	*525·33	64·58	....	....	·25	*3,565·59	3,258·28
		Voided leases	....	....	....	....	....	28·59	2,028·85	2,075,562·62	813,213·32	56,923·16
		Sundry claims	....	....	43·50	14·61	....	215·58	1,475·35	17,238·25	9,122·10	....
Mt. Barnicoat	(2512T)	White Horse	....	....	64·00	200·65	....	....	....	457·00	1,233·79	....
		Voided leases	....	....	....	....	....	....	23·08	1,913·00	1,018·20	....
		Sundry claims	....	....	....	....	....	....	·68	1,309·75	1,087·77	....
Mt. Shenton	....	Voided leases	....	....	....	....	....	....	....	15·00	26·65	....
		Sundry claims	....	....	....	....	....	....	....	279·25	209·67	....
	From District Generally :—											
		Sundry Parcels treated at :										
		State Battery, Laverton	....	....	....	*1,756·74	221·26	....	....	97·50	*14,628·20	282·78
		W. Savage (L.T.T. 1233H)	....	....	35·00	3·50	....	....	....	35·00	3·50	....
		Various Works	....	....	....	....	....	....	....	159·50	*19,396·39	·24
		Reported by Banks and Gold Dealers	·72	....	....	....	....	2,516·93	108·08	....	26·76	....
		Totals	**·72**	....	**4,430·15**	**3,861·20**	**291·71**	**3,994·65**	**9,319·98**	**2,502,367·79**	**1,165,055·96**	**65,761·08**

North Coolgardie Goldfield.

MENZIES DISTRICT.

Comet Vale	5732Z	Central Coonega	....	....	....	....	....	....	....	....	92·00	25·50	....
	(5756Z)	Sand Duke	....	....	....	....	....	....	....	....	....	4·10	·31
		Voided leases	....	....	....	....	....	....	419·74	267,052·22	193,150·94	5,352·08
		Sundry claims	....	....	....	....	....	....	40·19	1,895·91	995·96	....
Goongarrie	5740Z	Gull's Blow	....	....	....	....	....	....	....	318·25	132·03	....
	5760Z	Pretty Easy	....	....	9·25	9·71	....	....	....	9·25	9·71	....
		Voided leases	....	....	....	....	....	·94	1,385·26	29,838·79	18,085·64	....
		Sundry claims	....	....	....	....	....	46·46	2,054·17	2,683·27	3,101·26	....

Table I.—*Production of Gold and Silver from all sources, etc.*—continued.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1952.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.
NORTH COOLGARDIE GOLDFIELD—*continued.*												
MENZIES DISTRICT—*continued.*												
Menzies	5543Z	Black Swan	....	....	....	....	....	....	....	1,000·63	1,633·52	9·08
	5736Z	Boddington	....	....	....	....	....	....	17·73	73·00	52·97	....
	(5761Z)	Emu	....	....	12·00	3·49	....	....	....	12·00	3·49	....
	5511Z	First Hit	....	....	430·00	489·06	....	....	....	2,765·75	6,000·54	21·25
	5511Z, etc.	(First Hit G.Ms. (1934), Ltd.)	....	....	....	....	....	....	....	68,473·70	49,060·96	6,676·23
	5542Z	Good Block Lease	....	....	98·00	204·30	....	....	7·32	1,589·00	2,523·97	....
	5747Z	Guy Fawkes	....	....	13·00	3·39	....	....	....	71·00	34·54	....
	5714Z	Lady Harriet North	....	....	....	....	....	....	....	21·00	4·01	....
	5549Z	Lady Harriet	....	....	....	....	....	....	....	548·00	164·46	....
	5520Z	Mignonette	....	....	20·00	3·09	....	....	....	538·50	367·23	....
	5749Z	Woolgar	....	....	227·00	143·28	....	....	....	553·00	386·91	....
		Voided leases	....	....	....	....	....	45·42	1,125·41	934,362·50	725,924·48	13,586·39
		Sundry claims	....	....	79·00	28·26	....	49·50	597·90	32,985·94	24,937·10	776·49
Mt. Ida	5701Z, etc.	Moonlight Wiluna G.M., Ltd.	....	....	23,409·86	11,679·67	....	....	....	58,596·86	28,691·58	787·54
	5701Z, etc.	Prior to transfer to present holders	....	....	....	....	....	....	....	31,833·25	16,021·98	891·37
		Voided leases	....	....	....	....	....	....	92·21	68,731·17	72,679·14	106·63
		Sundry claims	....	9·48	44·00	13·19	....	48·14	426·84	16,023·91	8,197·01	·12
Twin Hills	....	Voided leases	....	....	....	....	....	....	....	582·30	574·93	....
		Sundry claims	....	....	....	....	....	....	....	97·80	86·69	....
	From District generally :—											
	Sundry Parcels treated at :											
	Lady Harriet Battery		....	....	....	*484·99	....	....	....	279·50	*18,906·60	30·00
	Mt. Ida State Battery		....	....	....	*63·91	....	....	....	1,866·25	*7,303·71	·05
	B. W. Sander's Cyanide Plant		....	....	....	*30·20	....	....	....	....	*115·44	46·39
	Yundaga Treatment Works		....	....	....	*84·30	....	....	....	....	*90·18	·03
	Various Works		....	....	....	....	....	....	....	2,528·30	*38,811·38	2,985·69
	Reported by Banks and Gold Dealers		....	....	....	....	....	1,446·22	382·80	35·00	8·02	....
	Totals		....	**9·48**	**24,342·11**	**13,240·84**	....	**1,636·68**	**6,549·57**	**1,525,458·08**	**1,218,085·98**	**31,269·65**
ULARRING DISTRICT.												
Davyhurst	1016U, etc.	Western Mining Corporation, Ltd.	....	....	25,214·00	14,696·88	3,568·97	....	....	36,071·00	19,233·44	3,568·97
	1016U, 1085U	(New Callion)	....	....	....	....	....	....	....	5,293·30	2,002·37	119·67
		Voided leases	....	....	....	....	....	2·93	152·64	166,783·32	126,011·36	5,408·47
		Sundry claims	....	....	4·00	6·45	....	....	208·48	13,653·94	5,690·39	....

Morley's	1101U	Emerald	....	....	390·00	276·89	....	....	26·24	1,558·00	1,736·04	....
	1094U	First Hit	....	....	207·50	183·09	....	....	....	1,817·75	4,633·61	....
	1081U	Mabel Gertrude	....	....	25·00	44·50	....	....	....	1,364·00	1,326·43	....
	1089U	Paramount	....	1·49	104·50	67·76	....	....	1·49	2,436·00	2,336·28	....
	1078U	Rabbit	....	....	....	....	....	....	265·66	765·50	1,214·60	....
	(1074U)	Two Chinamen	....	....	....	....	....	....	3,466·48	1,589·50	3,844·90	10·54
		Voided leases	....	....	....	....	....	....	122·80	601·50	885·19	....
		Sundry claims	....	....	18·00	3·74	....	2·16	932·23	1,585·25	2,401·91	....
Mulline	1107U	Ajax West	....	....	845·00	654·77	....	....	1·37	2,821·25	3,259·09	....
	1070U	Riverina	....	....	....	....	....	....	....	267·00	61·50	....
	1070U, etc.	(Riverina Gold Mines Pty., Ltd.)	....	....	....	....	....	....	....	32,085·50	11,669·45	·07
	1154U	Shirley Patricia	....	....	....	....	....	....	....	7·00	2·23	....
		Voided leases	....	....	....	....	....	....	274·09	102,630·22	103,358·09	530·75
		Sundry claims	....	....	....	....	....	10·82	198·67	10,660·89	8,730·95	1·10
Mulwarrie	1153U	Four Mile	....	....	4·00	8·95	....	....	....	42·50	229·20	....
	1113U	Oakley	....	....	300·00	505·33	....	....	....	1,770·00	2,487·78	....
		Voided leases	....	....	....	....	....	....	165·29	19,480·68	26,369·21	38·47
		Sundry claims	....	....	....	....	....	·80	282·29	3,106·33	2,722·13	....
Ularring	....	Voided leases	....	....	....	....	....	....	563·34	9,771·60	13,907·76	....
		Sundry claims	....	....	....	....	....	....	....	671·50	309·48	....
	From District generally :											
	Sundry Parcels treated at :											
	State Battery, Mulline	....	....	....	....	....	....	....	....	639·99	*16,459·89	....
	State Battery, Mulwarrie	....	....	....	....	....	....	....	....	613·18	*6,564·16	....
	Two Chinamen Battery	....	....	....	....	....	....	....	....	30·00	*788·87	....
	Waihi Battery	....	....	....	*100·96	11·15	....	....	....	5·00	*1,075·14	11·15
	Waihi-Golden Pole Cyanide Plants	....	....	....	....	....	....	....	....	....	*936·58	....
	Prior to Amalgamation	....	....	....	....	....	....	....	....	....	*5,032·24	....
	Various Works	....	....	....	....	....	....	....	15·82	233·15	*1,806·32	....
	Reported by Banks and Gold Dealers	....	....	....	....	....	112·68	63·08	100·00	23·48	....
	Totals	....	....	**27,112·00**	**16,549·32**	**3,580·12**	**129·39**	**6,739·97**	**418,454·85**	**377,110·07**	**9,689·19**

NIAGARA DISTRICT.

Desdemona	....	Voided leases	....	....	....	....	....	....	7·12	9,809·00	7,555·81	12·04
		Sundry claims	....	1·36	....	....	....	....	10·35	2,225·45	892·48	....
Kookynie	928G	Altona	....	....	608·75	567·60	....	....	....	2,400·25	2,964·28	....
	911G	Cosmopolitan South	....	....	150·00	57·85	....	....	....	2,133·00	999·32	....
	933G	New Gladstone	....	....	100·00	30·73	....	....	....	360·00	124·47	....
		Voided leases	....	....	....	....	....	3·35	347·30	744,917·21	394,601·81	5,375·97
		Sundry claims	....	....	....	....	....	56·74	106·18	8,860·55	6,562·43	·18
Niagara	....	Voided leases	....	....	....	....	....	....	104·54	85,876·50	52,365·05	....
		Sundry claims	....	....	....	....	....	28·10	97·22	14,645·16	8,257·78	....
Tampa	....	Voided leases	....	....	....	....	....	....	41·58	50,477·57	23,287·71	174·24
		Sundry claims	....	....	....	....	....	32·60	283·40	8,041·33	4,113·02	....

Table I.—*Production of Gold and Silver from all sources, etc.*—continued.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1952.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.
NORTH COOLGARDIE GOLDFIELD—continued.												
NIAGARA DISTRICT—*continued.*												
		From District Generally :										
		Sundry Parcels treated at :										
		A. Vickery Treatment Syndicate	....	....	....	*1,239·10	....	....	....	....	*2,205·50	79·81
		Various Works	....	....	....	....	....	....	....	1,220·50	*16,406·29	41·17
		Reported by Banks and Gold Dealers	·47	....	....	....	....	1,592·34	823·66	....	63·53	....
		Totals	**·47**	**1·36**	**858·75**	**1,895·28**	....	**1,713·13**	**1,821·35**	**930,966·52**	**520,399·48**	**5,683·41**
YERILLA DISTRICT.												
Edjudina	1011R, etc.	Paget Gold Mines of Edjudina, Ltd.	....	....	....	....	....	....	....	841·50	187·51	....
		Prior to transfer to present holders	....	....	....	....	....	....	....	738·75	559·80	....
		Voided Leases	....	....	....	....	....	....	18·44	33,943·45	42,627·48	37·79
		Sundry Claims	....	....	....	....	....	....	28·52	6,892·58	4,808·40	....
Patricia	....	Voided Leases	....	....	....	....	....	....	....	4,158·50	5,396·40	25·40
		Sundry Claims	....	....	....	....	....	....	....	47·00	20·78	....
Pigin	....	Voided Leases	....	....	....	....	....	....	48·34	17,463·30	10,742·77	....
		Sundry Claims	....	....	....	....	....	....	154·86	5,642·59	3,475·75	....
Yarri	1320R	Margaret	....	....	1,173·00	447·31	....	....	....	2,321·00	818·26	....
	1327R	Nil Desperandum	....	....	69·00	11·57	....	....	....	273·00	68·79	....
	1126R, etc.	Porphyry (1939), G.M., N.L.	....	....	....	....	....	....	....	66,715·00	9,867·95	261·86
	1126R, etc.	Edjudina Gold Mining Co., N.L.	....	....	....	....	....	....	....	30,220·00	5,409·93	507·51
		Prior to transfer to present holders	....	....	....	....	....	....	....	124·50	38·89	....
		Voided Leases	....	....	....	....	....	6·30	87·08	44,324·75	21,235·42	2·00
		Sundry Claims	....	....	40·00	9·93	....	·87	5·93	16,416·05	5,978·11	·04
Yerilla	....	Voided Leases	....	....	....	....	....	....	3,107·25	16,481·43	12,925·74	13·93
		Sundry Claims	....	....	....	....	....	19·30	54·93	2,742·58	1,567·83	....
Yilgangie	1176R, etc.	Western Mining Corporation	....	....	2,392·00	2,135·17	282·40	....	....	8,632·75	8,641·34	847·19
		Prior to transfer to present holders	....	....	....	....	....	....	·85	1,244·75	1,830·28	....
		Voided Leases	....	....	....	....	....	....	9·94	2,432·75	1,500·80	....
		Sundry Claims	....	....	....	....	....	121·67	98·20	3,302·30	2,020·38	·63

From District Generally :—					....	....	....	....	....	....	....	....	
Sundry Parcels treated at :					....	....	....	....	....	....	....	....	
State Battery, Yarri					5·00	*527·53	....	....	....	276·50	*8,909·53	9·65	
State Battery, Yerilla					....	....	....	....	....	....	*43·52	....	
Various Works					....	....	....	2·17	....	642·25	*6,049·24	....	
Reported by Banks and Gold Dealers					....	....	....	1,161·60	160·08	....	23·09	....	
Totals					**3,679·00**	**3,131·51**	**282·40**	**1,311·91**	**3,774·42**	**265,877·28**	**154,747·99**	**1,706·00**	

Broad Arrow Goldfield.

Bardoc	....	Voided Leases	....	....	....	....	....	....	2,335·41	85,370·59	55,699·50	203·60	
	....	Sundry Claims	....	....	550·00	169·61	....	54·95	1,194·11	17,005·28	8,168·41	....	
	2229W....	Bellevue	....	134·40	193·50	667·96	....	....	179·20	874·00	1,949·85	....	
Black Flag	....	Voided Leases	....	....	....	....	....	27·81	405·90	48,223·79	28,152·20	....	
	....	Sundry Claims	....	....	66·00	6·75	....	712·92	251·59	7,935·46	4,808·71	....	
Broad Arrow	.... 2039W....	Golden Arrow	....	....	....	....	....	....	....	5,657·50	830·70	....	
	2554W....	Grace Darling Extended	....	....	436·25	169·11	....	....	....	1,710·75	811·30	....	
	1771W....	North Duke	....	....	65·30	42·46	....	....	1,670·51	302·10	676·81	....	
		Voided Leases	....	....	....	....	....	70·32	8,782·21	147,317·09	117,438·60	20·23	
		Sundry Claims	....	.... ·24	221·75	48·11	....	1,007·72	3,044·75	32,248·89	16,527·31	·11	
Cane Grass	....	Voided Leases	....	....	....	....	....	....	27·77	669·82	460·72	....	
	....	Sundry Claims	....	....	....	....	....	....	227·55	717·45	505·06	....	
Carnage	....	Voided Leases	....	....	....	....	....	176·04	659·31	2,402·00	2,170·67	....	
	....	Sundry Claims	....	....	....	....	....	....	6·61	1,840·08	874·56	....	
Cashman's	....	Voided Leases	....	....	....	....	....	67·51	813·76	8,172·15	7,090·91	....	
	....	Sundry Claims	....	....	....	....	....	....	40·31	1,205·12	361·74	·05	
Christmas Reef	.... 2262W....	Gull's Neck	....	....	3·00	6·58	....	....	25·31	3·00	6·58	....	
	2175W....	New Mexico	....	....	....	....	....	....	....	1,058·35	3,376·21	....	
	2253W....	New Mexico South	....	....	87·75	157·03	....	....	....	218·75	532·62	....	
		Voided Leases	....	....	....	....	....	....	29·68	794·77	216·24	....	
		Sundry Claims	....	14·48	5·25	6·02	....	....	441·85	2,887·89	2,635·29	....	
Fenbark	.... 2188W....	Golden Penny	....	....	40·25	11·10	....	....	....	2,793·75	621·53	....	
	....	Voided Leases	....	....	....	....	....	....	4·42	3,897·75	2,080·79	....	
	....	Sundry Claims	....	....	25·25	3·22	....	....	51·96	2,971·02	985·66	....	
Grant's Patch	.... 2261W....	Bent Tree	....	....	113·50	51·00	....	....	....	677·00	167·76	....	
	2242W....	Lady Agnes	....	....	29·00	22·50	....	....	2·11	1,089·50	388·36	....	
	(2227W)	Magpie	....	....	....	·04	....	....	....	657·00	668·54	....	
	1962W, etc.	Ora Banda Amalgamated Mines, N.L.	....	....	78·54	129·07	....	....	....	168,257·79	62,802·75	175·00	
		Prior to transfer to present holders	....	....	....	....	....	....	....	12,424·50	9,540·07	....	
	2208W....	Wentworth	....	....	720·75	134·97	....	....	....	2,641·50	804·73	....	
	2224W....	Whip-Pole	....	....	100·00	20·29	....	....	12·20	856·60	368·43	....	
		Voided Leases	....	....	....	....	....	....	258·52	14,783·10	4,672·25	....	
		Sundry Claims	....	....	130·00	56·88	....	....	356·66	6,045·79	3,010·91	....	

Table I.—*Production of Gold and Silver from all sources, etc.*—continued.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1952. Alluvial. Fine ozs.	Dollied and Specimens. Fine ozs.	Ore treated. Tons (2,240 lb.).	Gold therefrom. Fine ozs.	Silver. Fine ozs.	Total Production. Alluvial. Fine ozs.	Dollied and Specimens. Fine ozs.	Ore treated. Tons (2,240 lb.).	Gold therefrom. Fine ozs.	Silver. Fine ozs.
BROAD ARROW GOLDFIELD—continued.												
Ora Banda	T. A. 42W M.A. 41, etc.	Associated Northern Ora Banda, N.L.	....	....	....	7·31	....	....	....	2,786·50	464·53	21·07
		Prior to transfer to present holders	....	....	....	....	....	....	....	315,958·95	123,252·22	1,664·70
	2270W....	Gimlet South	....	....	92·50	124·69	....	....	....	1,025·25	273·66	....
	2272W....	Squanderbug	....	....	59·50	13·06	....	....	....	59·50	13·06	....
		Voided Leases	....	....	....	....	....	....	845·72	103,738·57	27,372·53	....
		Sundry Claims	....	11·06	77·25	37·63	....	....	386·91	13,044·75	4,346·81	....
Paddington	2122W....	Pakeha	....	....	758·00	139·55	8·53	....	....	4,598·65	1,578·53	13·19
	(2263W)	Try Again	....	....	....	....	....	....	....	32·75	7·19	....
		Voided Leases	....	....	....	....	....	5,566·30	463·31	189,937·41	84,579·63	18·96
		Sundry Claims	....	....	....	....	....	1,714·16	291·43	16,387·73	9,124·63	....
Riche's Find	2271W....	Merry Dance	....	....	....	....	....	....	....	4·50	98·63	....
	2257W....	Yalbalgo	....	....	9·00	124·31	....	....	....	105·00	548·90	....
		Voided Leases	....	....	....	....	....	....	7·01	7,471·59	5,363·45	71·36
		Sundry Claims	....	13·75	....	....	....	....	296·26	1,900·80	1,997·70	·13
Siberia	....	Voided Leases	....	....	....	....	....	1·07	2,649·28	28,928·97	31,751·34	....
		Sundry Claims	....	....	8·50	4·98	....	289·06	1,233·18	20,985·79	12,817·33	....
Smithfield	2264W....	King of Kings	....	....	891·00	144·51	....	....	....	1,408·75	221·88	....
		Voided Leases	....	....	....	....	....	....	....	4,700·71	1,174·69	....
		Sundry Claims	....	·92	46·00	74·29	....	....	124·29	3,088·09	1,239·87	....
		From Goldfields Generally :—										
		Sundry Parcels treated at :			....	....	....	....	....	....	....	....
		State Battery, Ora Banda	....	....	....	....	....	....	....	....	....	....
		Golden Arrow Battery	....	....	....	*593·53	....	....	....	128·05	*22,116·08	....
		Various Works	....	....	....	*75·99	....	....	....	36·00	*4,031·81	....
		Reported by Banks and Gold Dealers	4·41	3·58	....	....	....	2,275·66	1·24	16,967·02	*49,481·50	3,103·45
		Totals	**4·41**	**178·43**	**4,807·84**	**3,042·55**	**8·53**	9,985·54	134·97	61·68	90·35	....
								21,949·06	**27,255·30**	**1,317,067·14**	**721,352·09**	**5,291·85**
North-East Coolgardie Goldfield.												
KANOWNA DISTRICT.												
Gindalbie	(1540X)	Lady Betty	....	....	76·25	17·68	....	....	1,132·05	911·25	1,335·01	....
	1579X	Leader's	....	....	90·00	10·99	....	....	....	90·00	10·99	....
	1578X	Wall's Reward	....	....	366·50	615·54	....	....	....	366·50	615·54	....
		Voided Leases	....	....	....	....	....	....	19·94	44,322·53	39,596·70	38·31
		Sundry Claims	....	....	107·75	212·20	....	....	716·52	5,102·77	3,007·30	....

Gordon	....	Voided Leases	....	....	....	....	....	....	682·54	53,900·58	20,072·51	517·61
		Sundry Claims	....	....	50·00	9·08	....	....	177·38	2,155·70	1,194·71	....
Kalpini	....	Voided Leases	....	....	....	....	....	....	38·73	13,543·50	6,753·78	·07
		Sundry Claims	....	....	....	....	....	24·70	269·72	1,492·50	1,026·37	....
Kanowna	1572X	Kanowna Red Hill	....	....	77·00	32·29	....	....	....	1,257·00	399·46	....
	1574X	Snowdrop	....	....	....	....	....	....	....	21·75	19·65	....
		Voided Leases	....	....	....	....	....	24·94	4,516·76	685,535·35	380,477·71	2,482·24
		Sundry Claims	....	....	382·00	32·23	....	118·94	2,163·30	25,997·02	11,612·64	1·50
Mulgarrie	....	Voided Leases	....	....	....	....	....	....	1,216·63	6,902·26	4,197·98	....
		Sundry Claims	....	....	20·00	10·29	....	....	16·78	1,281·75	641·69	....
Six Mile	....	Voided Leases	....	....	....	....	....	....	1,603·72	559·00	767·72	....
		Sundry Claims	....	....	....	....	....	....	56·51	759·25	229·10	....
	From District Generally :—											
	Sundry Parcels treated at :											
	Various Works		....	....	....	....	....	330·42	867·52	158,935·05	153·205·89	....
	Reported by Banks and Gold Dealers		9·99	....	....	....	....	106,009·97	36·91	·50	104·96	....
	Totals		**9·99**	....	**1,169·50**	**940·30**	....	**106,508·97**	**13,515·01**	**1,003,134·26**	**625,269·71**	**3,039·73**

KURNALPI DISTRICT.

Jubilee	....	Voided Leases	....	....	....	....	....	....	145·13	2,122·50	1,465·16	....
		Sundry Claims	....	....	....	....	....	25·57	13·52	1,234·00	520·15	....
Kurnalpi	....	Voided Leases	....	....	....	....	....	371·18	3,166·80	4,052·51	3,957·71	6·27
		Sundry Claims	....	....	....	....	....	324·12	727·39	4,305·36	2,089·90	....
Mulgabbie....	....	Voided Leases	....	....	....	....	....	....	1,402·66	226·75	7,845·87	4·95
		Sundry Claims	....	....	....	....	....	8·06	2,772·71	1,327·45	2,241·18	....
	From District Generally :—											
	Sundry Parcels treated at :											
	Various Works		....	....	....	....	....	....	....	101·50	*388·63	....
	Reported by Banks and Gold Dealers		....	....	....	....	....	12,105·10	70·70	....	2·35	1·49
	Totals		....	....	....	....	....	**12,834·03**	**8,298·91**	**13,370·07**	**18,510·95**	**12·71**

East Coolgardie Goldfield.

EAST COOLGARDIE DISTRICT.

Binduli	6025E	Belle of Kalgoorlie....	....	....	....	....	....	....	....	....	692·25	80·51	....
		Voided Leases	....	....	....	....	....	....	....	....	803·10	385·19	....
		Sundry Claims	....	....	58·75	3·75	....	....	13·01	5,007·02	1,668·04	....

Table I.—*Production of Gold and Silver from all sources, etc.*—continued.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1952.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.
EAST COOLGARDIE GOLDFIELD—continued.												
EAST COOLGARDIE DISTRICT—*continued.*												
Boorara	(5486E)	Olympian	....	....	....	....	....	....	....	1,675·25	937·05	3·01
	6310E	Roma	....	....	260·25	28·12	....	....	....	563·25	67·48	....
		Voided Leases	....	....	....	....	....	....	459·07	306,930·82	171,842·83	408·36
		Sundry Claims	....	....	111·25	8·94	....	·49	145·56	3,268·34	1,466·36	....
Boulder	6145E	Boomerang	....	....	....	....	....	....	....	77·00	8·00	....
	5690E	Boulder Perseverance, Ltd.	....	....	131,840·08	30,577·86	8,781·83	....	....	2,712,689·54	996,478·08	319,659·99
		Prior to transfer to present holders	....	....	....	....	....	....	....	3,306,942·88	1,841,159·00	203,821·43
	6320E	Edith Joy	....	....	37·00	7·75	....	....	....	37·00	7·75	....
	5472E	Golden Key	....	....	....	....	....	18·27	24·33	432·25	165·02	....
	5159E, etc.	Gold Mines of Kalgoorlie (Aust.), Ltd.	....	....	171,659·00	47,286·31	7,237·84	....	....	2,135,463·30	586,591·27	149,090·55
	5466E	(South Star)	....	....	....	....	....	....	233·46	4,237·43	1,494·78	....
	5466E	Prior to transfer to present holders	....	....	....	....	....	....	5·22	1,835·75	748·78	....
	5159E, etc.	(Lake View South (G.M.K.), Ltd.)	....	....	....	....	....	....	....	62,278·38	21,536·66	....
	5692E, etc.	Prior to transfer to present holders	....	....	....	....	....	....	545·23	527,790·53	568,643·05	4,844·50
	5853E, etc.	(Paringa Junction North Leases)	....	....	....	....	....	....	7·82	1,686·79	701·11	....
	5853E	(Paringa Junction)	....	....	....	....	....	....	....	123·75	17·77	....
	5854E	(Paringa Junction North)	....	....	....	....	....	....	....	60·50	10·64	....
	5855E	(Paringa Junction South)	....	....	....	....	....	....	....	1,473·25	228·42	....
	5696E, etc.	Great Boulder Pty. Gold Mines, Ltd.	....	....	376,564·00	96,110·99	37,738·35	....	1·53	10,142,772·97	5,308,165·07	1,104,381·10
	5845E	Happy Returns	....	....	1,566·25	260·10	....	....	....	7,127·50	1,325·65	....
	5345E, etc.	Kalgoorlie Enterprise Mines, Ltd.	....	....	62,869·27	18,826·15	1,532·37	....	....	819,205·14	253,806·69	24,334·66
		Prior to transfer to present holders	....	....	....	....	....	....	....	15,320·68	8,957·01	....
	4476E, etc.	Lake View and Star, Ltd.	....	....	610,111·00	154,104·13	31,643·99	....	....	10,505,026·30	3,297,589·97	337,687·91
		Prior to transfer to present holders	....	....	....	....	....	....	8·49	15,792,500·38	9,149,223·80	1,348,055·82
	6230E	New Look	....	....	....	....	....	....	....	256·75	22·68	....
	5431E, etc.	North Kalgurli (1912), Ltd.	....	....	256,039·61	65,255·39	10,423·85	....	111·55	3,094,581·97	964,021·27	238,199·37
	5405E, etc.	North Kalgurli (1912), Ltd. Croesus Pty., G.P.	....	....	....	....	....	....	51·20	90,159·00	19,261·22	....
	5891E	(New Croesus	....	....	....	....	....	....	....	193·00	48·74	....
	5700E	Prior to transfer to present holders	....	....	....	....	....	43·99	....	4,018,436·01	2,815,911·21	97,625·03
	5429E	(North Kalgurli United Mines, Ltd.)	....	....	....	....	....	....	....	4,661·51	928·18	232·93
		Prior to transfer to present holders	....	....	....	....	....	....	....	131·74	76·74	....
	5434E, etc.	(Paringa Mining & Exploration Co., Ltd.)	....	....	1,493·25	203·55	....	....	....	1,129,179·55	261,820·15	24,040·13
		Prior to transfer to present holders	....	....	....	....	....	1·07	·79	57,618·03	24,452·83	....
	6095E	Raymond	....	....	....	....	....	....	....	255·75	49·19	....
	5695E, etc.	South Kalgurli Consolidated, Ltd.	....	....	93,991·69	23,616·40	....	....	....	3,008,137·18	1,109,314·43	26,346·12
		Prior to transfer to present holders	....	....	....	....	....	....	....	1,344,254·70	531,792·77	17,722·97

	5716E	Two Bs.	....	....	160·00	39·98	....	....	....	160·00	39·98	....		
		Voided leases	....	....	....	....	....	109·90	11,998·25	626,681·98	473,933·34	6·83		
		Sundry claims	....	....	....	....	....	24·58	210·25	11,615·74	4,289·79	....		
Cutter's Luck	....	Voided leases	....	....	....	....	....	45·87	133·58	74·50	239·19	....		
		Sundry claims	....	....	....	....	....	8·11	501·65	922·90	384·71	....		
Feysville	(6260E)	Brittania	....	....	....	....	....	....	....	302·00	30·92	....		
		Voided leases	....	....	....	....	....	....	110·93	561·30	394·24	....		
		Sundry claims	....	....	....	....	....	....	199·00	1,200·10	640·27	....		
Hampton Plains	P.P.L. 299	Block 45	....	....	....	....	....	....	....	472·00	126·49	....		
	P.P.L. 1, etc....	Consolidated Gold Areas, N.L.	....	....	605·00	48·13	....	....	....	142,389·98	37,226·58	5,835·85		
	P.P.L. 86	Golden Hope, N.L.	....	....	....	....	....	....	....	5,964·00	2,006·14	....		
	P.P.L. 192	Golden Hope North	....	....	....	....	....	....	....	353·00	201·02	....		
	P.P.L. 252	Hampton Properties, Ltd.—Mount Martin	....	....	....	....	....	....	....	14,953·75	5,574·11	....		
	P.P.L 460	Hampton Xmas Gift	....	....	33·25	5·28	....	6·72	37·57	107·00	89·44	....		
	P.P.L. 12	Junction Extended	....	....	....	....	....	....	....	3,581·75	527·74	....		
	P.P.L. 289	Mount Martin	....	....	229·50	42·07	....	....	....	529·00	119·26	....		
	P.P.L. 277	New Hope	....	....	654·25	74·05	....	....	17·23	61,468·55	11,175·94	....		
	P.P.L. 62	R. Ninnis	....	....	24·50	·79	....	....	....	33·50	1·74	....		
	P.P.L. 277	Pernatty	....	....	480·50	51·18	....	....	....	480·50	51·18	....		
	P.P.L. 96	Read, Radisich & Forrest	....	....	17·50	7·54	....	....	....	17·50	7·54	....		
	P.P.L. 40	L. Ruliyancich	....	....	7·50	6·65	....	....	....	7·50	6·65	....		
	P.P.L. 175	F. C. Schoppe	....	....	1,209·75	126·53	....	....	....	5,166·00	750·47	....		
	P.P.L. 300	J. E. Trinidad	....	....	191·75	13·57	....	....	....	191·75	13·57	....		
	P.P.L. 371	Victory	....	....	....	....	....	....	....	1,901·75	251·63	....		
		Voided leases	....	....	....	....	....	4,578·52	203·94	123,400·59	39,138·93	69·83		
		Sundry claims	....	....	....	....	....	2·68	70·85	46,386·16	8,494·60	....		
Kalgoorlie	5927E	A.I.F.	....	....	....	....	....	....	....	101·25	18·02	....		
	6048E	Auld Acquaintance	....	....	....	....	....	....	....	7·50	2·36	....		
	(5839E)	Coronation	....	....	....	....	....	....	....	40·00	9·03	....		
	5913E	Devon Consols	....	....	....	....	....	....	93·19	1,842·71	610·36	....		
	5737E	Golden Mile Channel	....	....	....	....	....	....	·97	2,677·25	207·65	....		
	(5519E), etc.	Lupa Exploration Syndicate (ex Barbican Corporation)	....	....	....	....	....	....	....	362·00	79·80	....		
	(6257E)	Jack Knife	....	....	68·50	9·67	....	....	....	68·50	9·67	....		
	5878E	Lady May	....	....	72·50	33·26	....	....	62·05	3,796·25	1,122·56	....		
	6091E	Lesanben	....	19·65	8·50	10·35	....	....	172·14	97·00	208·27	....		
	4547E, etc.	Mount Charlotte (Kalgoorlie) G.Ms., Ltd.	....	....	2,408·50	257·78	....	....	....	23,230·00	2,702·65	110·15		
		Prior to transfer to present holders	....	....	....	....	....	....	5·72	48,292·60	13,930·79	....		
	(5437E)	North End Extended	....	....	....	....	....	....	996·89	367·85	528·84	....		
	5852E, etc.	Pedestal Leases	....	....	350·50	171·86	....	....	....	1,627·75	456·85	....		
	5852E	(Pedestal)	....	....	....	....	....	....	....	1,608·75	444·93	....		
	6024E	(Trident)	....	....	....	....	....	....	....	58·75	36·67	....		
	5468E	Phar Lap	....	....	12·25	9·18	....	....	....	593·00	380·96	....		
	5415E, etc.	Return leases	....	....	....	....	....	....	5·64	3,801·25	654·34	....		
	(5933E, etc.)	Sceptre Leases	....	....	....	....	....	....	....	28·00	4·63	....		
	5449E, etc.	The Broken Hill Pty. Co., Ltd.	....	....	....	272·86	....	....	3·99	487,068·01	179,299·15	1,843·28		
		Prior to transfer to present holders	....	....	....	....	....	....	....	1,558·49	316·58	....		
		Voided leases	....	....	....	....	....	242·48	9,570·27	965,064·45	397,910·58	44,017·12		
		Sundry claims	....	....	138·25	16·62	....	232·41	1,122·17	59,852·13	23,048·83	....		

Table I.—*Production of Gold and Silver from all sources, etc.*—continued.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1952.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.
EAST COOLGARDIE GOLDFIELD—continued.												
EAST COOLGARDIE DISTRICT—*continued.*												
Wombola	6051E	Big Bull	....	....	35·75	38·79	....	....	....	485·75	386·66	....
	5688E, (5967E)	Caledonian Leases	....	....	81·50	170·51	....	....	....	970·00	659·67	....
	5688E	(Caledonian)	....	....	....	....	....	....	....	4,275·00	3,632·98	....
	(5967E)	(North Caledonian)	....	....	....	....	....	....	1·27	22·25	8·15	....
	5497E, 5500E....	Daisy Leases	....	....	1,348·00	1,130·82	....	....	....	5,002·15	3,457·24	5·92
	5497E	(Daisy)	....	....	....	....	....	....	....	6,282·25	5,031·93	....
	5500E	(Happy-Go-Lucky)	....	....	....	....	....	....	....	2,075·25	1,675·85	....
	6032E	Dry Mount	....	....	....	....	....	....	....	1,120·50	1,121·40	....
	(4766E)	Great Hope	....	....	....	....	....	....	....	96·00	28·09	....
	(4766E)	(Pericles G.Ms., Ltd.)	....	....	....	....	....	....	358·11	4,728·03	19,305·86	....
	5525E, etc.	Haoma Leases	....	....	3,198·00	3,655·06	....	....	....	16,550·50	12,892·30	....
	5689E	(Haoma)	....	....	....	....	....	....	....	2,168·00	1,948·36	....
	5525E	(Xmas Flat)	....	....	....	....	....	....	....	330·25	264·74	....
	6312E	Inverness	....	....	474·25	95·99	....	....	....	776·75	153·39	....
	6043E	Launa Doone	....	....	96·75	82·14	....	....	....	1,230·75	565·29	....
	6043E, etc.	(Launa Doone Leases)	....	....	....	....	....	....	....	32·50	42·76	....
	5798E	Maranoa	....	....	....	....	....	....	32·17	3,183·50	1,633·27	....
	5493E	New Milano, N.L.	....	....	....	....	....	....	·25	17,390·75	11,622·24	479·00
	5493E	(Milano)	....	....	....	....	....	....	....	4,012·75	11,676·72	....
	5616E	(Leslie)	....	....	....	....	....	....	....	602·00	939·10	....
	6213E	Pauline	....	....	....	....	....	....	....	195·00	196·39	....
	(6313E)	Proprietary	....	....	50·00	22·19	....	....	....	100·00	40·68	....
	5866E	Rosemary	....	....	....	....	....	....	....	53·50	84·73	....
	6255E	Spinifex	....	....	....	·31	....	....	....	282·75	75·77	....
		Voided leases	....	....	....	....	....	3·80	2,106·67	22,107·81	20,629·94	....
		Sundry claims	....	....	39·50	15·52	....	....	711·10	22,805·93	13,921·62	....
	From District generally :—											
	Sundry claims		....	....	....	....	....	11,014·57	465·61	5,440·46	2,541·10	....
	Sundry Parcels treated at :											
	"B.H.P. Kalg." (L.T.T. 1120H)		....	....	....	....	....	....	....	....	*669·71	....
	Golden Horseshoe (New), Ltd. (T.L. 101, etc.)		....	....	....	*9,767·37	7,910·25	....	....	....	*320,385·81	325,454·30
	Pericles Cyanide Plant		....	....	....	*168·25	....	....	....	....	*3,982·90	....
	State Battery Kalgoorlie		....	....	....	*1,582·16	....	....	....	360·70	*29,244·69	39·40
	Various Works		....	....	....	....	....	384·36	64·70	41,135·02	*266,103·72	14,144·46
	Reported by Banks and Gold Dealers		19·41	....	....	565·37	....	16,866·77	9,959·18	355·66	6,658·39	....
	Totals		**19·41**	**19·65**	**1,718,597·65**	**454,781·09**	**105,268·48**	**33,584·59**	**40,822·60**	**61,919,124·59**	**29,890,285·93**	**4,288,430·02**

BULONG DISTRICT.

Balagundi	(1327Y)	Homeward Bound	....	....	....	....	....	....	....	5·25	15·18	....
		Voided leases	....	....	....	....	....	....	2,408·98	1,110·68	1,473·73	12·92
		Sundry claims	....	....	13·50	1·39	....	3·51	293·52	791·01	500·10	....
Bulong	1311Y	Blue Quartz	....	....	240·25	63·05	....	....	....	1,232·50	440·84	....
	1308Y	Southern Cross	....	....	242·50	28·38	....	....	1·30	3,425·50	543·14	....
		Voided leases	....	....	....	....	....	107·54	8,524·82	104,806·80	85,230·44	....
		Sundry claims	....	....	139·75	17·23	....	1,655·86	1,607·89	15,647·48	17,589·01	....
Majestic	....	Voided leases	....	....	....	....	....	19·45	63·91	1,317·94	647·62	....
		Sundry claims	....	....	....	....	....	42·88	154·58	1,926·55	948·06	....
Morelands	....	Sundry claims	....	....	....	....	....	....	·13	308·75	81·84	....
Mount Monger	....	Voided leases	....	....	....	....	....	....	2,771·39	1,437·85	1,256·10	....
		Sundry claims	....	....	....	....	....	215·60	....	379·05	308·48	....
Randalls	....	Voided leases	....	....	....	....	....	....	60·04	33,180·35	11,100·46	....
		Sundry claims	....	....	....	....	....	20·70	8·11	4,814·31	1,211·05	....
Taurus	....	Voided leases	....	....	....	....	....	2·06	3·70	1,765·10	909·84	....
		Sundry claims	....	....	....	....	....	112·69	51·88	2,608·35	1,037·88	....
Trans Find	P.P.L. 308	Dawn of Hope	....	....	4·25	1·53	....	....	2·87	1,145·75	330·33	....
		Voided leases	....	....	....	....	....	....	....	1,098·42	876·22	....
		Sundry claims	....	....	....	....	....	....	5·93	808·25	335·33	....
	From District generally :—											
	Various Works		....	....	....	....	....	....	....	6,102·15	6,675·38	....
	Reported by Banks and Gold Dealers		·49	....	....	....	....	25,223·21	70·15	·01	28·44	....
	Totals		**·49**	....	**640·25**	**111·58**	....	**27,403·50**	**16,029·20**	**183,912·05**	**131,539·47**	**12·92**

Coolgardie Goldfield.

COOLGARDIE DISTRICT.

Bonnievale	5685	Jenny Wren	....	....	....	....	....	....	....	30·75	13·82	....
	5622	Lucky Hit	....	....	....	....	....	....	3·28	922·10	472·35	....
	4600	Melva Maie	....	....	209·25	34·13	....	....	....	2,402·40	3,577·59	2·35
		Prior to transfer to present holders	....	....	....	....	....	....	....	614·50	1,099·21	11·63
	5890	Red Ridge	....	....	10·50	19·15	....	....	....	10·50	19·15	....
	5767, 5768	Victory Explorations, N.L.	....	....	527·75	164·46	....	....	....	3,034·25	749·15	....
	5767	(Red Ridge)	....	....	....	....	....	....	....	108·00	53·63	....
		Voided leases	....	....	....	....	....	....	212·48	354,434·97	190,431·94	5·88
		Sundry claims	....	....	222·95	121·95	·04	....	163·19	7,302·63	5,087·72	·04
Bulla Bulling	. ....	Voided leases	....	....	....	....	....	....	....	776·81	668·19	....
		Sundry claims	....	....	139·00	48·71	....	5·21	15·98	1,457·26	610·00	....

Table I.—*Production of Gold and Silver from all sources, etc.*—continued.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1952.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.
COOLGARDIE GOLDFIELD—continued.												
COOLGARDIE DISTRICT—*continued.*												
Burbanks	(5677, etc.)	Burbanks Bonnievale Prospecting Co., Ltd.	....	....	....	....	....	....	....	3,722·00	1,474·19	....
	(5443)	(New Gift)	....	....	....	....	....	....	2·00	625·50	228·69	....
	5605	Burbanks Deeps	....	....	....	....	....	....	....	103·00	53·46	....
	5685	Lady Robinson	....	....	19·75	3·44	....	....	....	19·75	3·44	....
	5872	Vice Regal	....	....	14·75	4·10	....	....	....	14·75	4·10	....
		Voided leases	....	....	....	....	....	14·90	372·17	415,805·71	304,629·24	521·06
		Sundry claims	....	....	125·30	39·53	....	55·05	487·46	15,360·10	8,783·24	....
Cave Rocks	....	Voided leases	....	....	....	....	....	....	....	8,223·16	1,941·42	....
		Sundry claims	....	....	64·75	9·19	....	....	50·00	4,343·15	1,067·86	....
Coolgardie	5679	Ada	....	....	100·00	14·99	....	....	....	1,329·75	132·88	....
	5874	Cleopatra	....	....	196·25	21·48	....	....	....	196·25	21·48	....
	5297, etc.	Consolidated Gold Mines of Coolgardie, Ltd.	....	....	....	....	....	....	....	282,560·70	50,610·27	4,812·12
		Prior to transfer to present holders	....	....	....	....	....	....	4·55	1,946·35	547·45	3·22
	5875	Dugan's	....	....	20·00	·95	....	....	....	20·00	·95	....
	5868	El Dorado	....	498·20	85·95	437·04	....	....	498·20	86·45	1,018·06	....
	5878	Ellen Jean	....	....	41·50	12·73	....	....	....	41·50	12·73	....
	(5653)	Gleesons	....	....	....	....	....	....	....	1,925·00	922·37	....
	5844	Jack Pot	....	....	1,500·00	583·97	....	....	....	1,913·00	757·66	....
	5643	Lloyd George South	....	....	....	....	....	....	....	....	10·25	....
	5881	MacPherson's Reward	....	....	7·25	3·91	....	....	....	7·25	3·91	....
	5743	Moya Jan	....	....	207·25	64·64	....	....	....	2,076·00	845·48	....
	5879	Pyramid	....	88·16	19·50	52·64	....	....	88·16	19·50	52·64	....
		Voided leases	....	....	....	....	....	1,301·71	4,670·93	818,003·24	395,432·77	3·56
		Sundry claims	....	4·85	980·75	222·51	....	205·49	2,708·26	69,900·05	26,725·21	....
Eundynie	(5624)	Eundynie	....	....	....	....	....	....	....	54·00	76·35	....
	5867	Old Dodge	....	....	17·00	5·28	....	....	....	17·00	5·28	....
		Voided leases	....	....	....	....	....	3·70	16·09	31,701·98	16,449·71	1·75
		Sundry claims	....	....	....	....	....	....	82·28	694·12	468·01	....
Gibraltar	5723	Lloyd George	....	....	....	....	....	....	....	570·00	157·98	....
	5684	Winston Churchill	....	....	....	....	....	....	....	60·00	12·96	....
		Voided leases	....	....	....	....	....	....	33·97	38,592·63	20,097·49	....
		Sundry claims	....	....	....	....	....	1·39	50·76	3,270·10	1,390·47	....

Gnarlbine	....	Voided leases	....	....	....	....	....	....	13·95	2,731·75	1,341·60	....
		Sundry claims	....	....	....	....	....	....	4·90	1,186·10	504·18	....
Hampton Plains	P.P.L. 462	Bobby Dazzler	....	....	31·07	81·05	....	....	28·55	31·37	301·45	....
	P.P.L. 419	Chatanooka	....	....	....	....	....	....	....	1,267·75	295·73	1·10
	P.P.L. 338	Dry Hill	....	....	....	....	....	....	....	43·00	58·42	....
	P.P.L. 454	Golden Dollar	....	....	56·75	5·79	....	....	....	105·50	13·32	....
	P.P.L. 437	J. Jebb	....	....	32·25	9·33	....	....	....	32·25	9·33	....
	P.P.L. 319	Lady May	....	....	....	....	....	....	....	1,742·25	981·39	....
	P.P.L. 458	Mac	....	..	....	....	....	....	....	11·00	60·85	....
	P.P.L. 316, 330	New Coolgardie Gold Mines, N.L.	....	....	37,436·00	19,387·11	5,814·18	....	....	135,408·00	66,029·08	14,943·51
	P.P.L. 316	(Surprise G.M.)	....	....	....	....	....	....	....	7,189·00	3,425·59	....
	P.P.L. 330	(Barbara)	....	....	....	....	....	....	....	2,157·75	1,655·63	....
		Voided leases	....	....	....	....	....	....	451·32	13,834·09	11,015·75	....
		Sundry claims	....	....	18·00	1·08	....	1·63	132·06	1,819·50	814·69	....
Higginsville	5647	Fair Play Gold Mine	....	....	....	....	....	....	....	28,276·00	3,123·82	·02
	5293	Two Boys	....	....	....	*15·12	....	....	....	460·00	*1,292·93	·01
	5293	(Two Boys)	....	....	....	....	....	....	....	6,888·00	3,193·95	....
		Voided leases	....	....	....	....	....	....	373·93	38,141·35	17,438·49	159·50
		Sundry claims	....	....	....	....	....	....	187·25	3,638·26	1,942·64	....
Larkinville	....	Voided leases	....	....	....	....	....	22·77	54·44	2,335·16	3,256·49	....
		Sundry claims	....	....	....	....	....	....	147·20	448·53	1,029·03	....
Logans	5324, etc.	Spargo's Reward Gold Mine (1935), N.L.	....	....	....	....	....	....	....	105,397·50	26,320·67	....
		Voided leases	....	....	....	....	....	....	....	1,263·31	607·26	....
		Sundry claims	....	....	39·50	13·14	....	6·88	128·95	1,958·85	905·45	....
Londonderry	....	Voided leases	....	....	....	....	....	....	95·04	34,155·35	22,238·37	·35
		Sundry claims	....	....	34·50	9·35	....	16·68	38·72	3,400·92	2,489·57	22·42
Mungari	....	Voided leases	....	....	....	....	....	....	17·71	1,872·50	458·43	....
		Sundry claims	....	....	....	....	....	1·77	153·24	2,488·19	705·11	....
Paris	(5311), 5500	Lister's Gold Mine	....	....	....	....	....	·88	....	5,360·00	3,506·79	75·95
	(5311), 5500, (5530)	(Lister's Gold Mine)	....	....	....	....	....	....	....	8,582·00	4,423·84	....
	5500	(Paris Central)	....	....	....	....	....	....	....	113·00	24·16	....
		Voided leases	....	....	....	....	....	....	4·30	1,342·00	614·08	3·24
		Sundry claims	....	....	....	....	....	....	....	2,104·25	518·98	....
Red Hill	....	Voided leases	....	....	....	....	....	14·87	1,551·81	40,797·40	31,070·65	....
		Sundry claims	....	....	....	....	....	15·29	90·33	1,403·14	999·97	....
Ryan's Find	....	Voided leases	....	....	....	....	....	....	....	54·16	151·69	....
		Sundry claims	....	....	....	....	....	....	·44	116·44	355·83	....
St. Ives	5628, etc.	Ives Reward Leases	....	....	....	....	....	....	....	1,617·00	450·47	....
		Voided leases	....	....	....	....	....	63·34	146·87	37,701·46	15,756·31	....
		Sundry claims	....	....	19·00	5·81	....	211·25	944·85	4,177·56	1,459·39	....
Wannaway	....	Voided leases	....	....	....	....	....	....	28·61	1,831·95	1,465·70	....
		Sundry claims	....	....	....	....	....	....	193·79	1,316·37	1,300·33	....

Table I.—*Production of Gold and Silver from all sources, etc.*—continued.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1952. Alluvial. Fine ozs.	Dollied and Specimens. Fine ozs.	Ore treated. Tons (2,240 lb.).	Gold therefrom. Fine ozs.	Silver. Fine ozs.	Total Production. Alluvial. Fine ozs.	Dollied and Specimens. Fine ozs.	Ore treated. Tons (2,240 lb.).	Gold therefrom. Fine ozs.	Silver. Fine ozs.
COOLGARDIE GOLDFIELD—continued.												
Widgiemooltha	5794	Blue Bird	....	....	....	....	....	....	137·76	40·69	121·62	....
	5663	Bobs	....	....	....	....	....	....	....	16·00	4·94	....
	5834	Harpers	....	9·54	18·55	29·74	....	....	9·54	39·70	74·61	....
	5451	Host Group	....	....	1·35	40·81	....	....	12·75	1,604·15	565·02	....
		Voided leases	....	....	....	....	....	17·95	1,114·94	22,687·12	11,843·73	·17
		Sundry claims	....	....	·20	2·07	....	46·49	456·07	16,133·11	6,805·48	·07
		From District generally :—										
		Sundry Parcels treated at :										
		State Battery, Coolgardie	....	....	....	*463·66	....	....	....	771·01	*36,705·06	9·65
		McFarlane and Party, T.A. 201	....	....	....	*17·78	....	....	....	267·00	*223·49	....
		Australian Machinery and Investment Co. Cyanide Plant, T.Ls. 63, 127	....	....	....	....	....	....	....	....	*3,044·44	86·31
		Lister's Cyanide Plant	....	....	....	....	....	....	....	....	*269·23	....
		Paris Central Cyanide Plant	....	....	....	....	....	....	....	....	*77·64	....
		Various Works	....	....	....	....	....	7·75	....	3,897·61	*29,382·24	223·06
		Reported by Banks and Gold Dealers	10·76	....	....	....	....	14,880·24	718·84	48·25	74·95	·60
		Totals	**10·76**	**600·75**	**42,196·62**	**21,946·64**	**5,814·22**	**16,895·24**	**16,697·92**	**2,624,600·76**	**1,359,520·61**	**20,887·57**
KUNANALLING DISTRICT.												
Carbine	970S	Carbine	....	....	....	....	....	....	....	13,820·00	7,047·96	....
	970S, etc.	(Carbine Leases)	....	....	....	....	....	....	687·98	51,991·86	39,862·25	....
		Voided Leases	....	....	....	....	....	....	....	20,116·00	5,470·81	....
		Sundry Claims	....	....	64·35	151·75	....	136·08	93·96	6,075·13	2,177·23	....
Chadwin	....	Voided Leases	....	....	....	....	....	....	....	4,781·55	5,232·25	2·50
		Sundry Claims	....	....	....	....	....	14·28	78·02	5,924·05	2,923·42	·25
Dunsville	....	Voided Leases	....	....	....	....	....	....	828·58	17,548·85	8,657·45	....
		Sundry Claims	....	....	....	....	....	3·35	1,034·08	2,725·06	2,031·81	....
Jourdie Hills	....	Voided Leases	....	....	....	....	....	....	18·00	28,009·74	19,401·09	28·45
		Sundry Claims	....	....	88·00	6·53	....	1·86	49·81	1,767·00	831·28	1·05

Kintore	1036S	Newhaven	....	....	261·50	50·40	....	....	....	1,886·25	453·88	....
		Voided Leases	....	....	....	....	....	18·70	169·33	54,829·39	39,579·50	677·88
		Sundry Claims	....	....	....	....	....	111·91	102–70	4,522·78	2,501·41	....
Kunanalling	....	Voided Leases	....	....	....	....	....	86·13	1,734·92	130,303·61	100,812·73	40·77
		Sundry Claims	....	....	190·75	90·47	....	216·53	815·28	14,659·92	9,577·42	....
Kundana	....	Voided Leases	....	....	....	....	....	....	....	465·00	68·12	....
		Sundry Claims	....	....	31·75	8·56	....	....	....	475·25	60·38	....
	From District Generally :—											
	Sundry Parcels treated at :											
	Goldfields Aust. Dev., Cyanide Plant		....	....	....	....	....	....	....	....	*548·07	....
	Various Works		....	....	....	....	....	42·23	....	1,782·26	*5,061·33	....
	Reported by Banks and Gold Dealers		·75	...	....	....	....	866·02	17·93	....	5·85	·49
	Totals		**·75**	...	**636·35**	**307·71**	....	**1,497·09**	**5,630·59**	**361,685·70**	**252,304·24**	**751·39**

Yilgarn Goldfield.

Blackbornes	....	Voided Leases	....	....	....	....	....	....	....	1,282·50	341·37	....
		Sundry Claims	....	....	....	....	....	....	....	392·50	81·15	....
Bullfinch	3350, etc.	Great Western Consolidated, N.L.	....	....	30,143·00	2,134·44	767·32	....	....	30,143·00	2,134·44	767·32
		Prior to transfer to present holders	....	....	....	....	....	....	64·80	78,404·34	24,644·88	....
	4287	Volcano	....	....	26·00	27·82	....	....	....	87·00	98·68	....
		Voided Leases	....	....	....	....	....	....	10·14	490,361·07	185,489·03	27,958·41
		Sundry Claims	....	....	67·00	33·96	....	8·47	37·04	7,442·75	4,047·41	....
Corinthian	3398, 3425	Corinthian Leases	....	....	....	....	....	....	....	3,081·83	1,770·09	....
	3398	(Corinthian)	....	....	....	....	....	....	....	7,383·75	2,543·16	....
	3425	(Corinthian North)	....	....	....	....	....	....	....	3,951·00	1,934·78	....
	4180	Deliverance	....	....	....	....	....	....	....	480·00	167·55	....
		Voided Leases	....	....	....	....	....	....	23·46	138,241·40	33,293·21	....
		Sundry Claims	....	....	....	....	....	....	2·68	1,088·35	640·61	....
Eenuin	4020	Birthday	....	....	....	....	....	....	2·25	45·00	194·94	·01
	3936	Newfield Central	....	....	....	....	....	....	....	343·00	526·82	....
	3936, etc.	Yellowdine Gold Areas, N.L.	....	....	....	....	....	....	....	7,341·50	7,605·06	....
		Voided Leases	....	....	....	....	....	....	179·49	2,308·56	2,131·10	....
		Sundry Claims	....	....	140·00	71·46	....	2·50	73·97	2,586·60	1,790·40	....
Evanston	3868, etc.	Evanston Gold, N.L.	....	....	....	....	....	....	....	12,399·20	5,530·12	....
	3868	(Evanston)	....	....	....	....	....	....	....	48,125·30	25,848·30	10·14
	3870	(Evanston East)	....	....	....	....	....	....	....	34·00	13·59	....
	3888	(Goldies)	....	....	....	....	....	....	....	200·00	43·15	....
	3895	(Blue Peter)....	....	....	....	....	....	....	....	1,288·00	285·84	....
	(3997)	Gravel Pit	....	....	....	....	....	....	79·27	238·80	160·25	....
		Voided Leases	....	....	....	....	....	....	....	2,247·76	1,310·63	....
		Sundry Claims	....	....	....	....	....	4·98	....	638·35	159·55	....

Table I.—*Production of Gold and Silver from all sources, etc.*—continued.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1952.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.
YILGARN GOLDFIELD—continued.												
Forrestonia		Voided Leases	....	....	....	....	....	....	....	1,185·00	298·15	....
		Sundry Claims	....	....	....	....	....	....	....	372·00	141·78	....
Golden Valley	4173	Inspiration	....	....	24·00	37·86	....	....	....	183·00	277·93	....
	4247	Lilly of the Valley	....	....	210·00	45·88	....	....	....	370·00	79·38	....
	2994, etc.	Radio Leases	....	....	1,060·00	964·39	39·42	....	2·70	26,195·80	47,339·76	667·86
		Voided Leases	....	....	....	....	....	....	36·34	36,545·92	28,509·40	10·99
		Sundry Claims	....	....	....	....	....	4·58	237·85	6,631·27	4,908·99	1·02
Greenmount	72PP	Black and White	....	....	....	....	....	....	....	105·00	10·36	....
		Voided Leases	....	....	....	....	....	45·99	21·62	125,022·64	31,575·09	944·50
		Sundry Claims	....	....	8·00	1·99	....	·46	4·27	3,056·58	811·30	....
Holleton	37PP	Brittania	....	....	60·00	26·98	....	....	....	1,526·00	1,431·23	....
	4169	Holleton East	....	....	....	....	....	....	....	223·00	79·92	·15
		Voided Leases	....	....	....	....	....	....	9·33	44,700·25	13,037·52	34·53
		Sundry Claims	....	....	....	....	....	....	3·75	3,464·05	923·78	·20
Hope's Hill	(4324)	Mount Hope	....	....	....	....	....	....	....	43·00	4·53	....
	3414	Pilot	....	....	....	....	....	....	....	19,446·12	2,948·68	....
		Voided Leases	....	....	....	....	....	....	74·78	132,617·55	36,457·49	1·00
		Sundry Claims	....	....	18·50	4·12	....	18·67	44·35	4,600·52	1,417·83	....
Kennyville	3875	Victoria	....	....	65·00	9·53	....	....	....	5,084·00	1,126·96	·63
		Voided Leases	....	....	....	....	....	....	18·76	55,876·63	21,625·66	·59
		Sundry Claims	....	....	13·00	4·46	....	....	5·06	8,598·50	2,302·77	....
Koolyanobbing		Voided Leases	....	....	....	....	....	....	·99	1,768·05	972·77	....
		Sundry Claims	....	16·12	....	....	....	·26	17·33	656·10	329·20	....
Marvel Loch	(3987, etc.)	Burbidge Gold Mines, N.L.	....	....	....	....	....	....	....	185,172·00	15,191·81	....
	(3987)	(Grand National)	....	....	....	....	....	....	....	19,739·00	2,647·30	....
	4243	Christmas Gift	....	30·74	....	2·14	....	....	32·56	23·00	39·21	....
	3957	Comet	....	....	....	....	....	....	....	1,523·50	690·50	6·85
	13P.P.	Cricket	....	....	....	....	....	....	....	1,655·00	929·17	....
	4039	Cromwell	....	....	263·00	42·17	....	....	....	633·00	98·46	....
	3942, etc.	Edward's Reward Leases	....	....	6,364·00	2,465·72	....	....	....	48,881·50	22,035·76	....
	3942	(Edward's Reward)	....	....	....	....	....	....	....	2,080·00	2,016·32	....

	3943	(Sunshine)	....	....	....	....	....	....	....	3,866·00	2,384·79	....
	4034	Firelight	....	....	....	....	....	....	2·68	6,653·75	940·03	....
	(4291)	Four Threes....	....	....	79·00	4·37	....	....	....	283·00	20·61	....
	3724	Frances Firness	....	....	229·00	265·26	....	....	....	11,872·75	5,358·29	....
	4254	Golden Cube	....	....	....	....	....	....	....	79·00	17·16	....
	4336	Jacoletti	....	....	43·00	4·36	....	....	....	43·00	4·36	....
	3718	Kurrajong	....	....	....	....	....	....	....	9,221·00	3,271·73	....
	3914	May	....	....	....	....	....	....	....	145·00	45·86	....
	4230	May Queen	....	....	10·00	2·94	....	....	....	286·00	43·42	....
	3970	Mountain Queen	....	....	....	....	....	....	....	1,201·00	451·85	....
	3390, etc.	N.G.M., Ltd.	....	....	....	....	....	....	....	4,369·22	409·06	2·00
		Prior to transfer to present holders	....	....	....	....	....	....	....	2,675·00	459·60	....
	4068	Try Again	....	9·49	45·00	4·02	....	....	9·49	1,960·00	570·85	....
	4035	Undaunted	....	....	73·00	10·89	....	....	....	865·00	113·59	....
	4251	Union Jack	....	....	590·00	39·66	....	....	....	2,175·00	182·17	....
		Voided leases	....	....	....	....	....	....	1,494·77	641,868·76	186,657·79	2,466·10
		Sundry claims	....	....	184·50	27·57	....	11·35	230·20	35,071·61	13,163·73	·02
Mt. Jackson	....	Voided leases	....	....	....	....	....	....	180·85	55,166·78	39,927·52	2,313·77
		Sundry claims	....	....	....	....	....	6·44	52·87	10,935·95	4,879·54	70·74
Mt. Palmer	M.L. 4	Yellowdine Gold Dev. Pty., Ltd.	....	....	52·00	59·54	....	....	....	79·00	86·26	....
		Voided leases	....	....	....	....	....	....	....	306,408·40	158,486·81	....
		Sundry claims	....	....	....	....	....	1,643·48	18·19	450·25	387·14	....
Mt. Rankin	76 P.P.	Marjorie Glen Reward	....	....	38·00	84·06	....	....	....	38·00	84·06	....
	3555	No Trumps	....	....	....	....	....	....	....	5,562·37	853·06	....
		Voided leases	....	....	....	....	....	3·84	5·20	496·00	122·17	....
		Sundry claims	....	....	115·00	104·27	....	....	....	606·00	221·86	....
Parker's Range	(4174)	Constance Una	....	....	28·00	18·48	....	....	....	857·50	1,867·68	·06
	4341	Golden Rod East	....	....	33·00	14·65	....	....	....	33·00	14·65	....
	(4201)	Scot's Greys	....	....	....	....	....	....	....	562·50	134·92	....
	4333	Snowdrop	....	3·73	10·50	10·23	....	....	3·73	10·50	10·23	....
		Voided leases	....	....	....	....	....	·42	266·75	61,284·85	30,382·33	26·40
		Sundry claims	....	....	78·75	43·61	....	6·59	303·93	11,714·30	5,152·96	·08
Southern Cross	4082	Day Dawn	....	....	....	....	....	....	....	86·00	9·16	....
	4018	Fraser's	....	....	....	....	....	....	....	1,376·50	164·49	....
	3944	Nil Desperandum	....	....	....	....	....	....	....	1,533·00	216·77	....
	3444, etc.	Western Mining Corporation	....	....	....	....	....	....	....	568·00	92·63	....
	3444, etc.	(Three Boys Gold Mines, Ltd.)	....	....	....	....	....	....	....	10,157·00	1,392·95	1·26
	3444	(Three Boys)	....	....	....	....	....	....	....	4,180·00	727·75	....
	3934	(Three Boys, North)	....	....	....	....	....	....	....	106·00	14·66	....
	3981	(Three Kings)	....	....	....	....	....	....	....	104·00	10·01	....
	3444, etc.	(Yellowdine Options, N.L.)	....	....	....	....	....	....	....	8,074·25	2,000·29	....
		Voided leases	....	....	....	....	....	4·89	261·35	454,906·68	215,351·50	364·41
		Sundry claims	....	1·27	....	....	....	95·90	648·49	8,173·66	2,624·65	....
Westonia	4326	Consols	....	....	255·00	155·42	....	....	....	669·00	433·38	....
	4252	Corio	....	....	....	....	....	....	....	320·00	148·40	9·80
		Voided leases	....	....	....	....	....	....	4·06	595,704·64	380,726·05	5,094·27
		Sundry claims	....	....	....	....	....	9·51	64·96	4,159·76	2,715·96	·72

Table I.—*Production of Gold and Silver from all sources, etc.*—continued.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1952. Alluvial. Fine ozs.	Dollied and Specimens. Fine ozs.	Ore treated. Tons (2,240 lb.).	Gold therefrom. Fine ozs.	Silver. Fine ozs.	Total Production. Alluvial. Fine ozs.	Dollied and Specimens. Fine ozs.	Ore treated. Tons (2,240 lb.).	Gold therefrom. Fine ozs.	Silver. Fine ozs.
YILGARN GOLDFIELDS—continued.												
From District generally :—												
Sundry Parcels treated at :												
		Butcher Bird Battery (M.A. 43)	....	....	....	....	....	....	....	....	*170·06	....
		Copperhead Plant	....	....	....	....	....	....	....	....	*16,809·79	....
		W. J. Grace (L.T.T. 1235H)	....	....	....	*13·92	....	....	....	....	*13·92	....
		Holleton Cyanide Plant	....	....	....	*146·79	....	....	....	....	*880·71	48·05
		Kurrajong Battery	....	....	....	....	....	....	....	....	*409·57	....
		Pilot, Cyanide Plant	....	....	....	....	....	....	....	30·00	*3,753·59	....
		Scot's Greys Cyanide Plant	....	....	....	*40·97	....	....	....	....	*423·34	....
		State Battery, Marvel Loch	....	....	3·00	*333·24	....	....	....	29·00	*522·64	....
		Three Boys Cyanide Plant	....	....	....	*97·74	....	....	....	7·00	*3,412·09	....
		Wesley's Cyanide Plant	....	....	....	....	....	....	....	....	*1,251·05	....
		W. S. Whinfield	....	....	....	*31·69	....	....	....	....	*31·69	....
		Various Works	....	....	....	....	....	....	....	341·48	79,036·28	57·35
		Reported by Banks and Gold Dealers	1·86	....	·60	29·90	....	317·77	71·73	·60	116·72	....
		Totals	**1·86**	**61·35**	**40,328·85**	**7,416·50**	**806·74**	**2,186·10**	**4,602·04**	**3,845,480·60**	**1,713,211·30**	**40,859·23**
Dundas Goldfield.												
Buldania		Voided leases	....	....	....	....	....	....	3·02	846·05	708·99	....
		Sundry claims	....	....	....	....	....	....	39·25	1,324·27	861·36	·72
Dundas		Voided leases	....	....	....	....	....	1·88	28·02	6,103·48	2,545·38	155·02
		Sundry claims	....	....	15·00	3·29	....	·76	413·85	2,086·75	1,101·23	18·32
Norseman	1596	Abbotshall	....	....	....	....	....	....	....	2,511·45	1,096·71	754·37
	1468	Bronzewing	....	....	133·00	13·49	....	....	33·89	4,168·75	2,532·36	154·78
	1422, 1468	(Onkaparinga Leases)	....	....	....	....	....	....	....	698·00	831·67	3·62
	1617	Caesar	....	....	....	....	....	....	....	54·00	42·72	....
	1288, etc.	Central Norseman Gold Corp., N.L.	....	....	158,447·00	78,241·01	54,543·58	....	....	1,690,273·20	602,506·54	516,673·75
		Prior to transfer to present holders	....	....	....	....	....	....	1,663·32	69,819·83	47,892·08	16,508·85
	1421	Dundas Gold Mines, N.L.	....	....	....	....	....	....	....	6,544·25	3,557·41	885·72
	1421	(Empress Gold Mines, N.L.)	....	....	....	....	....	....	....	567·50	516·08	54·61
	(1721)	Hopetoun	....	....	....	....	....	....	....	269·00	29·65	....
	1718	Iron Duke	....	....	97·00	36·10	....	....	....	493·50	167·27	....
	(1835)	Mount Barker	....	....	21·00	6·74	·62	....	....	112·50	23·69	1·71
	(1719)	Mount Benson	....	....	....	....	....	....	....	11·50	2·94	....

	1315, etc.	Norseman Gold Mines, N.L.	....	....	....	....	....	....	....	964,099·00	240,900·95	353,206·54
		Prior to transfer to present holders	....	....	....	....	....	....	....	20,657·00	3,909·60	4,981·00
	1823	Sun	....	....	736·00	426·30	11·19	....	....	1,157·75	618·42	18·85
	1624	Valhalla	....	....	22·00	2·77	·31	....	....	626·00	405·90	21·77
		Voided leases	....	....	....	....	....	14·27	10,567·26	897,785·97	591,716·43	37,099·56
		Sundry claims	....	9·88	47·50	12·46	·39	1,052·09	3,402·99	47,007·45	22,148·40	199·95
Peninsula	....	Voided leases	....	....	....	....	....	....	24·29	9,603·39	6,102·61	12·20
		Sundry claims	....	....	....	....	....	....	....	217·25	119·32	·97
		From District generally :—										
		Sundry Parcels treated at :										
		State Battery, Norseman	....	....	....	*161·92	....	....	....	417·89	*25,351·51	1,051·13
		Various Works	....	....	....	....	....	....	54·52	760·64	*15,104·14	2,588·35
		Reported by Banks and Gold Dealers	....	....	....	....	....	1,181·77	48·76	47·50	18·62	·70
		Totals	....	**9·88**	**159,518·50**	**78,904·08**	**54,556·09**	**2,250·77**	**16,279·17**	**3,728,263·87**	**1,570,811·98**	**934,392·49**

Phillips River Goldfield.

Hatter's Hill	274	Beulah	....	....	....	....	....	....	....	65·00	4·10	....
	269	Jimmy Bob	....	....	....	....	....	....	....	35·00	35·87	....
		Voided leases	....	....	....	....	....	....	4·38	1,499·55	1,182·75	....
		Sundry claims	....	2·57	....	....	....	74·91	24·26	5,225·60	2,720·90	26·09
Kundip	263	Hillsborough	....	....	....	....	....	....	....	258·00	59·09	18·59
		Voided leases	....	....	....	....	....	113·28	556·17	84,866·58	60,584·54	4,008·81
		Sundry claims	....	....	....	....	....	90·27	73·02	6,434·68	1,951·87	54·65
Mt. Desmond	....	Voided leases	....	....	....	....	....	....	1·40	9·00	3,905·46	6,891·59
		Sundry claims	....	....	....	....	....	....	....	80·00	41·96	51·01
Ravensthorpe	....	Voided leases	....	....	....	....	....	....	141·80	24,723·55	26,070·94	4,384·07
		Sundry claims	....	....	....	....	....	163·96	7·68	7,261·57	3,195·67	41·12
West River	....	Voided leases	....	....	....	....	....	....	....	....	10·34	31·06
		Sundry claims	....	....	....	....	....	....	....	....	6·60	3·44
		From District generally :—										
		Sundry Parcels treated at :										
		Cordingup Copper Smelter (L.T.T. 1079H)	....	....	....	....	....	....	....	....	*46·08	8·89
		Floater Cyanide Works (T.L. 385H)	....	....	....	....	....	....	....	12·00	*245·95	....
		Hatter's Hill Cyanide Plant	....	....	....	....	....	....	....	....	*361·37	....
		Ravensthorpe Sands Pty., Ltd. (L.T.T. 1235H)	....	....	....	*186·47	5·72	....	....	....	*186·47	5·72
		Various Works	....	....	....	....	....	....	....	15·00	*2,857·28	500·82
		Reported by Banks and Gold Dealers	....	....	....	....	....	164·69	12·14	....	4·76	....
		Totals	....	**2·57**	....	**186·47**	**5·72**	**607·11**	**820·85**	**130,485·53**	**103,472·00**	**16,025·86**

Table I.—*Production of Gold and Silver from all sources, etc.*—continued.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1952. Alluvial. Fine ozs.	Dollied and Specimens. Fine ozs.	Ore treated. Tons. (2,240 lb.).	Gold therefrom. Fine ozs.	Silver. Fine ozs.	Total Production. Alluvial. Fine ozs.	Dollied and Specimens. Fine ozs.	Ore treated. Tons. (2,240 lb.).	Gold therefrom. Fine ozs.	Silver. Fine ozs.
OUTSIDE PROCLAIMED GOLDFIELD.												
Burracoppin	....	Voided leases	....	....	....	....	....	....	....	710·85	706·38	....
		Sundry claims	....	....	....	....	....	....	·98	372·75	213·97	....
Donnybrook	....	Voided leases	....	....	....	....	....	23·24	....	1,613·30	816·23	....
		Sundry claims	....	....	....	....	....	44·01	43·03	119·50	15·71	15·18
Jimperding	Avon 1PP	Hills dale	....	....	....	....	....	....	....	1,261·75	308·00	....
Northampton	....	Sundry Lead claims	....	....	....	....	†416·72	....	....	....	....	†1,501·37
Ongerup	....	Sundry claims	....	....	....	....	....	....	1·58	·33	1·74	....
	From State generally :—											
	Sundry Parcels treated at :											
	Fremantle Smelters, Ltd.		....	....	....	....	....	....	....	....	1,879·08	1,109·06
	Miscellaneous Voided Leases and Sundry Claims		....	....	....	....	....	245·83	3·07	210·35	45·19	....
	Sundry specimens		....	....	....	....	....	4·24	56·85	....	....	....
	Various Works		....	....	....	....	....	....	....	27·00	7,130·67	*30,412·67
	Reported by Banks and Gold Dealers		3·85	6·88	....	....	....	1,101·33	891·73	....	299·75	404·26
	Totals		**3·85**	**6·88**	....	....	**416·72**	**1,418·65**	**997·24**	**4,315·83**	**11,416·72**	**33,442·54**

TABLE II.

Production of Gold and Silver from all Sources, showing in fine ounces the output, as reported to the Mines Department during the year 1952.

Goldfield.	District.	District.						Goldfield.					
		Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Total Gold.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Total Gold.	Silver.
		Fine ozs.	Fine ozs.	Tons (2,240 lb.)	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.	Fine ozs.
Kimberley	....	....	....	....	....	....	....	56·95	333·60	....	....	390·55	15·08
West Kimberley	....	....	....	....	....	....	....	....	....	....	....	....	2,285·91
Pilbara	Marble Bar	21·92	50·36	3,445·50	5,692·61	5,764·89	3,800·23	45·69	275·39	11,366·78	12,616·60	12,937·68	3,850·95
	Nullagine	23·77	225·03	7,921·28	6,923·99	7,172·79	50·72						
West Pilbara	....	....	....	....	....	....	....	·41	6·98	20·00	7·94	15·33	277·37
Ashburton	....	....	....	....	....	....	....	·88	....	6·35	17·35	18·23	7,423·89
Gascoyne	....	....	....	....	....	....	....	....	....	....	....	....	....
Peak Hill	....	....	....	....	....	....	....	1·45	....	36,551·00	5,601·45	5,602·90	415·18
East Murchison	Lawlers	....	....	112·00	222·77	222·77	·50						
	Wiluna	2·49	....	140·00	492·73	495·22	·04	2·49	....	482·00	1,347·61	1,350·10	·54
	Black Range	....	....	230·00	632·11	632·11	....						
Murchison	Cue	8·79	384·04	401,617·60	54,747·68	55,140·51	21,786·56						
	Meekatharra	10·50	....	4,672·50	2,444·63	2,455·13	18·39						
	Day Dawn	19·64	....	1,450·50	1,166·81	1,186·45	29·60	41·88	384·04	462,257·60	74,893·14	75,319·06	22,240·84
	Mt. Magnet	2·95	....	54,517·00	16,534·02	16,536·97	406·29						
Yalgoo	....	....	....	....	....	....	....	....	....	535·00	453·90	453·90	1·52
Mt. Margaret	Mt. Morgans	13·76	4·46	274·50	209·13	227·35	....						
	Mt. Malcolm	3·58	3·89	86,801·00	24,065·65	24,073·12	1,943·14	18·06	8·35	91,505·65	27,955·98	27,982·39	2,234·85
	Mt. Margaret....	·72	....	4,430·15	3,681·20	3,681·92	291·71						
North Coolgardie	Menzies	....	9·45	24,342·11	13,240·84	13,250·32	....						
	Ularring	....	1·49	27,112·00	16,549·32	16,550·81	3,580·12						
	Niagara	·47	1·36	858·75	1,895·28	1,897·11	....	·47	12·33	55,991·86	34,816·95	34,829·75	3,862·52
	Yerrilla	....	....	3,679·00	3,131·51	3,151·51	282·40						
Broad Arrow	....	....	....	....	....	....	....	4·41	178·43	4,807·84	3,042·55	3,225·39	8·53
N.E. Coolgardie	Kanowna	9·99	....	1,169·50	940·30	950·29	....	9·99	....	1,169·50	940·30	950·29	....
	Kurnalpi	....	....	....	....	....	....						
East Coolgardie	East Coolgardie	19·41	19·65	1,718,597·65	454,781·09	454,820·15	105,268·48	19·90	19·65	1,719,237·90	454,892·67	454,932·22	105,268·48
	Bulong	·49	....	640·25	111·58	112·07	....						
Coolgardie	Coolgardie	10·76	600·75	42,196·62	21,946·64	22,558·15	5,814·22	11·51	600·75	42,832·97	22,254·35	22,866·61	5,814·22
	Kunanalling	·75	....	636·35	307·71	308·46	....						
Yilgarn	....	....	....	....	....	....	....	1·86	61·35	40,328·85	7,416·50	7,479·71	806·74
Dundas	....	....	....	....	....	....	....	....	9·88	159,518·50	78,904·08	78,913·96	54,556·09
Phillips River	....	....	....	....	....	....	....	....	2·57	....	186·47	189·04	5·72
Outside Proclaimed Goldfields		....	....	....	....	....	....	3·85	6·88	....	....	10·73	416·72
		....	....	....	....	....	....	219·80	1,900·20	2,626,611·80	725,347·84	727,467·84	209,485·15

TABLE III.

Return showing total production reported to the Mines Department, and respective Districts and Goldfields from whence derived, to 31st December, 1952.

Goldfield.	District.	District.						Goldfield.					
		Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Total Gold.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Total Gold.	Silver.
		Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.	Fine ozs.
Kimberley	....	....	....	....	....	....	....	8,730·72	2,438·42	22,589·40	17,119·55	28,288·69	128·76
West Kimberley	....	....	....	....	....	....	....	1·30	24·68	1·00	2·49	28·47	7,636·56
Pilbara	Marble Bar	15,092·47	4,479·26	320,202·67	318,502·91	338,074·64	13,619·09	25,312·76	6,681·33	440,994·83	436,720·41	468,714·50	13,776·36
	Nullagine	10,220·29	2,202·07	120,792·16	118,217·50	130,639·86	157·27						
West Pilbara	....	....	....	....	....	....	....	6,313·31	370·87	24,680·96	24,200·90	30,885·08	1,852·24
Ashburton	....	....	....	....	....	....	....	9,262·15	479·40	6,685·10	2,727·27	12,468·82	31,113·47
Gascoyne	....	....	....	....	....	....	....	693·44	41·57	387·00	517·29	1,252·30	....
Peak Hill	....	....	....	....	....	....	....	3,375·86	5,300·33	659,255·43	302,357·95	311,034·14	2,776·60
East Murchison	Lawlers	6,904·30	2,343·19	2,010,774·92	822,494·32	831,741·81	26,290·77						
	Wiluna	224·85	1,247·37	8,873,270·94	1,871,253·55	1,872,725·77	10,281·38	8,764·26	22,112·36	12,612,633·83	3,646,195·61	3,677,072·23	59,066·22
	Black Range	1,635·11	18,521·80	1,728,587·97	952,447·74	972,604·65	22,494·07						
Murchison	Cue	5,072·43	8,808·33	5,978,697·59	1,277,090·74	1,290,971·50	239,479·76						
	Meekatharra	14,319·31	17,645·56	2,271,158·71	1,298,639·88	1,330,604·75	5,060·70						
	Day Dawn	3,233·93	11,339·12	2,030,526·13	1,373,611·25	1,388,184·30	169,366·07	25,186·44	58,226·76	11,992,405·58	4,694,418·00	4,777,831·20	418,348·96
	Mt. Magnet	2,560·77	20,433·75	1,712,023·15	745,076·13	768,070·65	4,442·43						
Yalgoo	....	....	....	....	....	....	....	1,785·46	3,201·31	441,065·28	263,123·93	268,110·70	1,502·13
Mt. Margaret	Mt. Morgans	3,434·37	9,353·77	1,210,166·21	715,006·04	727,794·18	5,781·64						
	Mt. Malcolm	3,818·76	14,496·50	6,343,200·19	2,742,198·04	2,760,513·30	162,255·63	11,247·78	33,170·25	10,055,734·19	4,622,260·04	4,666,678·07	233,798·35
	Mt. Margaret	3,994·65	9,319·98	2,502,367·79	1,165,055·96	1,178,370·59	65,761·08						
North Coolgardie	Menzies	1,636·68	6,549·57	1,525,458·05	1,218,085·98	1,226,272·23	31,269·65						
	Ularring	129·39	6,739·97	418,454·85	377,110·07	383,979·43	9,689·19						
	Niagara	1,713·13	1,821·35	930,966·52	520,399·48	523,933·96	5,683·41	4,791·11	18,885·31	3,140,756·70	2,270,343·52	2,294,019·94	48,348·25
	Yerilla	1,311·91	3,774·42	265,877·28	154,747·99	159,834·32	1,706·00						
Broad Arrow	....	....	....	....	....	....	....	21,949·06	27,255·30	1,317,067·14	721,352·09	770,556·45	5,291·85
N.E. Coolgardie	Kanowna	106,508·97	13,515·01	1,003,134·26	625,269·71	745,293·69	3,039·73	119,343·00	21,813·92	1,016,504·33	643,780·66	784,937·58	3,052·44
	Kurnalpi	12,834·03	8,298·91	13,370·07	18,510·95	39,643·89	12·71						
East Coolgardie	East Coolgardie	33,584·59	40,822·60	61,919,124·59	29,890,285·93	29,964,693·12	4,288,430·02						
	Bulong	27,403·50	16,029·20	183,912·05	131,539·47	174,972·17	12·92	60,988·09	56,851·80	62,103,036·64	30,021,825·40	30,139,665·29	4,288,442·94
Coolgardie	Coolgardie	16,895·24	16,697·92	2,624,600·76	1,359,520·61	1,393,113·77	20,887·57						
	Kunanalling	1,497·09	5,630·59	361,685·70	252,304·24	259,431·92	751·39	18,392·33	22,328·51	2,986,286·46	1,611,824·85	1,652,545·69	21,638·96
Yilgarn	....	....	....	....	....	....	....	2,186·10	4,602·04	3,845,480·60	1,713,211·30	1,719,999·44	40,859·23
Dundas	....	....	....	....	....	....	....	2,250·77	16,279·17	3,728,263·87	1,570,811·98	1,589,341·92	934,392·49
Phillips River	....	....	....	....	....	....	....	607·11	820·85	130,485·53	103,472·00	104,899·96	16,025·86
Outside Proclaimed Goldfields		....	....	....	....	....	....	1,418·65	997·24	4,315·83	11,416·72	13,832·61	33,442·54
		....	....	....	....	....	....	332,599·70	301,881·42	114,528,629·70	52,677,681·96	53,312,163·08	6,161,494·21

TABLE IV.

Total output of Gold (Bullion and Concentrates entered for Export and Gold received at the Royal Mint, Perth), from 1st January, 1886, to 31st December, 1952; showing in Fine Ounces the quantity credited to the respective Goldfields.

Year.	Export.	Mint.	Total.	Export.	Mint.	Total.
		Kimberley.			**Pilbara.**	
	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.
Prior to 1949	22,422·06	14,576·59	36,998·65	155,028·67	356,253·08	511,281·75
1949	....	272·06	272·06	1,766·22	4,113·43	5,879·65
1950	....	1,135·94	1,135·94	1,107·45	4,341·93	5,449·38
1951	....	104·35	104·35	2,093·93	5,634·59	7,728·52
1952	....	327·57	327·57	6,790·64	8,291·93	15,082·57
Total	22,422·06	16,416·51	38,838·57	166,786·91	378,634·96	545,421·87
		(*a*) **West Pilbara.**			**Ashburton.**	
Prior to 1949	4,351·11	26,760·61	31,111·72	4,104·96	6,131·06	10,236·02
1949	....	....	....	....	60·46	60·46
1950	....	108·72	108·72	....	56·19	56·19
1951	....	13·12	13·12	....	5·75	5·75
1952	....	13·96	13·96	....	....	....
Total	4,351·11	26,898·41	31,247·52	4,104·96	6,253·46	10,358·42
		(*b*) **Gascoyne.**			(*c*) **Peak Hill.**	
Prior to 1949	304·55	1,068·17	1,372·72	41,102·76	206,321·64	247,424·40
1949	....	....	....	....	285·80	285·80
1950	....	....	....	....	398·30	398·30
1951	....	....	....	....	144·89	144·89
1952	....	....	....	....	5,296·37	5,296·37
Total	304·55	1,068·17	1,372·72	41,102·76	212,447·00	253,549·76
		East Murchison.			**Murchison.**	
Prior to 1949	259,039·03	3,011,398·29	3,270,437·32	1,574,815·88	3,178,740·73	4,753,556·61
1949	31·91	7,185·88	7,217·79	366·15	85,443·83	85,809·98
1950	110·76	2,783·23	2,893·99	432·27	70,800·19	71,232·46
1951	9·13	644·67	653·80	721·62	65,210·07	65,931·69
1952	84·50	1,160·39	1,244·89	572·80	83,400·62	83,973·42
Total	259,275·33	3,023,172·46	3,282,447·79	1,576,908·72	3,483,595·44	5,060,504·16
		(*d*) **Yalgoo.**			(*e*) **Mt. Margaret.**	
Prior to 1949	13,635·97	193,883·63	207,519·60	694,042·63	3,710,184·93	4,404,227·56
1949	....	682·09	682·09	297·27	28,609·32	28,906·59
1950	14·59	695·23	709·82	88·86	29,535·88	29,624·74
1951	....	1,175·09	1,175·09	114·35	22,475·34	22,589·69
1952	....	505·95	505·95	101·76	24,620·40	24,722·16
Total	13,650·56	196,941·99	210,592·55	694,644·87	3,815,425·87	4,510,070·74
		(*f*) **North Coolgardie.**			(*g*) **Broad Arrow.**	
Prior to 1049	263,361·69	2,002,235·50	2,265,597·19	122,570·82	425,922·06	548,492·88
1949	48·29	5,098·20	5,146·49	47·87	4,015·49	4,063·36
1950	7·21	5,274·48	5,281·69	7·26	3,384·17	3,391·43
1951	22·05	11,198·65	11,220·70	1·02	3,241·41	3,242·43
1952	50·26	18,510·84	18,561·10	166·14	3,451·59	3,617·73
Total	263,489·50	2,042,317·67	2,305,807·17	122,793·11	440,014·72	562,807·83
		(*f*) **North-East Coolgardie.**			(*f*) **East Coolgardie.**	
Prior to 1949	235,892·19	458,496·71	694,388·90	7,025,440·52	22,940,915·38	29,966,355·90
1949	1·50	96·02	97·52	792·52	445,291·23	446,083·75
1950	....	138·50	138·50	1,729·80	422,738·26	424,468·06
1951	....	162·05	162·05	2,230·79	436,962·54	439,193·33
1952	....	453·56	453·56	1,577·43	455,615·32	457,192·75
Total	235,893·69	459,346·84	695,240·53	7,031,771·06	24,701,522·73	31,733,293·79
		(*h*) **Coolgardie.**			**Yilgarn.**	
Prior to 1949	663,031·71	1,206,098·39	1,869,130·10	219,906·27	1,527,380·45	1,747,286·72
1949	118·73	13,355·55	13,474·28	172·67	6,563·75	6,736·42
1950	44·24	18,024·30	18,068·54	59·14	6,724·00	6,783·14
1951	105·46	25,991·88	26,097·34	178·96	4,482·78	4,661·74
1952	177·31	42,139·84	42,317·15	87·78	7,732·55	7,820·33
Total	663,477·45	1,305,609·96	1,969,087·41	220,404·82	1,552,883·53	1,773,288·35
		(*i*) **Dundas.**			(*j*) **Phillips River.**	
Prior to 1949	170,055·50	1,303,367·35	1,473,422·85	40,606·91	62,706·60	103,313·51
1949	257·69	42,540·32	42,798·01	3·21	34·56	37·77
1950	410·04	39,171·22	39,581·26	37·59	51·85	89·44
1951	64·16	44,067·81	44,131·97	3·11	18·41	21·52
1952	....	68,103·96	68,103·96	....	222·45	222·45
Total	170,787·39	1,497,250·66	1,668,038·05	40,650·82	63,033·87	103,684·69
		¶ **Donnybrook.**			**Outside Proclaimed Goldfields.**	
Prior to 1949	282·21	557·53	839·74	22,342·82	38,346·32	60,689·14
1949	....	....	....	269·11	604·49	873·60
1950	....	....	....	112·32	809·49	921·81
1951	....	....	....	44·87	656·24	701·11
1952	....	....	....	....	519·14	519·14
Total	282·21	557·53	839·74	22,769·12	40,935·68	63,704·80

(*a*) Prior to 1st May, 1898, included with Pilbara, and from 12th July, 1929 to 16th September, 1949, included in Outside Proclaimed Goldfields.
(*b*) Prior to March, 1899, included with Ashburton. (*c*) From 1st August, 1897. (*d*) Prior to 1st April, 1897, included with Murchison.
(*e*) From 1st August, 1897. (*f*) Prior to 1st May, 1896, included with Coolgardie. (*g*) From 1st September, 1897. (*h*) Declared 5th April, 1894, to which date included with Yilgarn. (*i*) Prior to 1893, included with Yilgarn. (*j*) Prior to 1902, included in Outside Proclaimed Goldfields. ¶ Abolished, 4th March, 1908.

TABLE V.

Total Output of Gold Bullion, Concentrates, etc., entered for Export and Received at the Perth Branch of the Royal Mint.

FROM 1st JANUARY, 1886.

Year.	Export.	Mint.	Total.	Estimated Value.
	Fine ozs.	Fine ozs.	Fine ozs.	£A.
1886	270·17	....	270·17	1,147
1887	4,359·37	....	4,359·37	18,518
1888	3,124·82	....	3,124·82	13,273
1889	13,859·52	....	13,859·52	58,871
1890	20,402·42	....	20,402·42	86,664
1891	27,116·14	....	27,116·14	115,182
1892	53,271·65	....	53,271·65	226,284
1893	99,202·50	....	99,202·50	421,385
1894	185,298·73	....	185,298·73	787,099
1895	207,110·20	....	207,110·20	879,749
1896	251,618·69	....	251,618·69	1,068,808
1897	603,846·44	....	603,846·44	2,564,977
1898	939,489·49	....	939,489·49	3,990,697
1899	1,283,360·25	187,244·41	1,470,604·66	6,246,732
1900	894,387·27	519,923·59	1,414,310·86	6,007,610
1901	923,698·96	779,729·56	1,703,416·52	7,235,654
1902	707,039·75	1,163,997·60	1,871,037·35	7,947,661
1903	833,685·78	1,231,115·62	2,064,801·40	8,770,719
1904	810,616·04	1,172,614·03	1,983,230·07	8,424,226
1905	655,098·88	1,300,226·00	1,955,315·88	8,305,654
1906	562,250·59	1,232,296·01	1,794,546·60	7,622,749
1907	431,803·14	1,265,750·45	1,697,553·59	7,210,750
1908	356,353·96	1,291,557·17	1,647,911·13	6,999,881
1909	386,370·58	1,208,898·83	1,595,269·41	6,776,274
1910	233,970·34	1,236,661·68	1,470,632·02	6,246,848
1911	160,422·28	1,210,445·24	1,370,867·52	5,823,075
1912	83,577·12	1,199,080·87	1,282,657·99	5,448,385
1913	86,255·13	1,227,788·15	1,314,043·28	5,581,701
1914	51,454·65	1,181,522·17	1,232,976·82	5,237,352
1915	17,340·47	1,192,771·23	1,210,111·70	5,140,228
1916	26,742·17	1,034,655·87	1,061,398·04	4,508,532
1917	9,022·49	961,294·67	970,317·16	4,121,646
1918	15,644·12	860,867·03	876,511·15	3,723,183
1919	6,445·89	727,619·90	734,065·79	3,618,509
1920	5,621·13	612,581·00	617,842·13	3,598,931
1921	7,170·74	546,559·92	553,730·66	2,942,526
1922	5,320·16	532,926·12	538,246·28	2,525,812
1923	5,933·82	498,577·59	504,511·41	2,232,186
1924	2,585·20	482,449·78	485,034·98	2,255,927
1925	3,910·59	437,341·56	441,252·15	1,874,320
1926	3,188·22	434,154·98	437,343·20	1,857,715
1927	3,359·10	404,993·41	408,352·51	1,734,572
1928	3,339·30	390,069·19	393,408·49	1,671,093
1929	3,037·12	374,138·96	377,176·08	1,602,142
1930	1,753·09	415,765·00	417,518·09	1,864,442
1931	1,726·66	508,845·36	510,572·02	2,998,137
1932	3,887·07	601,674·33	605,561·40	4,403,642
1933	2,446·97	634,760·40	637,207·37	4,886,254
1934	3,520·40	647,817·95	661,338·35	5,558,873
1935	9,868·71	639,180·38	649,049·09	5,702,149
1936	55,024·58	791,183·21	846,207·79	7,373,539
1937	71,646·91	928,999·84	1,000,646·75	8,743,755
1938	113,620·06	1,054,171·13	1,167,791·19	10,363,023
1939	98,739·88	1,115,497·76	1,214,237·64	11,842,964
1940	71,680·47	1,119,801·08	1,191,481·55	12,696,503
1941	65,925·94	1,043,391·96	1,109,317·90	11,851,445
1942	15,676·48	832,503·97	848,180·45	8,865,495
1943	6,408·34	540,057·08	546,475·42	5,710,669
1944	1,824·99	464,439·76	466,264·75	4,899,997
1945	5,029·38	463,521·34	468,550·72	5,010,541
1946	6,090·14	610,873·52	616,963·66	6,640,069
1947	5,220·09	698,666·29	703,886·38	7,575,574
1948	4,653·72	660,332·07	664,985·79	7,156,909
1949	4,173·14	644,252·48	648,425·62	7,962,808
1950	4,161·53	606,171·88	610,333·41	9,466,270
1951	5,589·45	622,189·64	627,779·09	9,725,343
1952	9,608·62	720,366·44	729,975·06	11,847,917
Total	11,555,871·00	43,264,325·46	54,820,196·46	336,671,565

	1951. £A.	1952. £A.
Estimated total par value of above production	229,760,598	232,861,333
Overseas Gold Sales Premium distributed by Gold Producers Association, 1920–1924	2,589,602	2,589,602
Overseas Gold Sales Premium distributed by Gold Producers Association during, 1952	....	539,358
Exchange Premium paid by Mint above par value 1930–1952 (Approximate)	92,473,448	100,681,272
Estimated Total	£A324,823,648	£A336,671,565
Bonus paid by Commonwealth Government under the Commonwealth Bounty Act, 1930	161,448	161,448
Gross estimated value of gold won	£A324,985,096	£A336,833,013

TABLE VI.—MINERALS OTHER THAN GOLD.

General Return of Ore and Minerals, other than Gold, showing the quantity produced and the value thereof as reported to the Mines Department from the respective Goldfields and Mineral Fields, during 1952, and previous years.

Period.	Abrasive Silica Stone.		Alunite (Crude Potash).		Arsenic.*		Antimony.†		
	Murchison Goldfield. (Mt. Magnet District).		Yilgarn Goldfield.		(East Murchison Goldfield. Wiluna District).		East Murchison Goldfield.		
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Conc.	Metal.	Value.
	tons.	£	tons.	£	tons.	£	tons.	tons.	£
Prior to 1949	....	....	7,540·80	170,626	†38,041·33	746,223	7,883·66	3,870·93	157,298
1949	1·50	9	1,447·80	43,417	32·75	982	....	....	....
1950	....	....	84·45	1,822	....	....	....	....	....
1951	....	....	....	....	....	....	....	....	....
1952	....	....	....	....	....	....	....	....	....
Total	**1·50**	**9**	**9,073·05**	**215,865**	**38,674·08**	**747,205**	**7,883·66**	**3,870·93**	**157,298**

* By-product by Wiluna G.Ms., Ltd. † Includes 1·13 tons Arsenic, valued at £24 from Yilgarn Goldfield.

Period.	Antimony—*continued.**						Asbestos.	
	Pilbara Goldfield.			Total.			Asburton Goldfield.	
	Conc.	Metal.	Value.	Conc.	Metal.	Value.	Quantity.	Value.
	tons.	tons.	£	tons.	tons.	£	tons.	£
Prior to 1949	855·16	346·62	24,039	†8,765·05	4,231·11	181,937	10·10	959
1949	21·68	9·49	954	21·68	9·49	954	....	....
1950	92·19	40·25	3,514	92·19	40·25	3,514	....	....
1951	....	....	....	....	....	....	....	....
1952	264·58	129·69	43,397	264·58	129·69	43,397	....	....
Total	**1,233·61**	**526·05**	**71,904**	**9,143·50**	**4,410·54**	**229,802**	**10·10**	**959**

* By-product of Gold Mining. † Includes 26·23 tons conc., containing 13·56 tons Metal valued at £600 from West Pilbara.

Period.	Asbestos—*continued.*							
	Pilbara Goldfield.		West Pilbara Goldfield.		Outside Proclaimed Goldfield.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1949	1,227·41	56,013	5,359·07	205,771	501·10	6,732	7,105·93	269,517
1949	....	....	1,297·14	125,332	....	....	1,297·14	125,332
1950	....	....	1,230·15	152,677	....	....	1,230·15	152,677
1951	109·50	1,861	2,009·66	223,778	....	....	2,119·16	225,639
1952	192·72	3,084	3,399·72	592,032	....	....	3,592·44	595,116
Total	**1,529·63**	**60,958**	**13,295·74**	**1,299,590**	**501·10**	**6,732**	**15,344·82**	**1,368,281**

Period.	Barytes.						Bentonite.	
	Murchison Goldfield.		Outside Proclaimed Goldfield.		Total.		Outside Proclaimed Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1949	....	....	*10·00	50	10·00	50	1,023·13	2,692
1949	....	....	....	....	....	....	150·00	450
1950	....	....	16·00	56	16·00	56	213·00	599
1951	....	....	5·00	18	5·00	18	449·00	1,347
1952	9·00	50	....	....	9·00	50	586·00	2,036
Total	**9·00**	**50**	**31·00**	**124**	**40·00**	**174**	**2,421·13**	**7,124**

* From North-East Coolgardie Goldfield.

Table VI.—*Minerals other than Gold*—continued.

Period.	Beryl Ore.							
	Pilbara Goldfield.		Coolgardie Goldfield.		West Kimberley Goldfield.		Outside Proclaimed Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1949	848·47	26,125	81·47	2,744	....	....	86·37	2,545
1949	....	....	....	....	3·50	297	16·95	1,200
1950	4·74	442	....	....	....	....	12·19	989
1951	65·18	7,973	16·14	2,291	....	....	9·45	910
1952	69·69	11,541	14·03	2,737	....	....	1·57	284
Total	**988·08**	**46,081**	**111·64**	**7,772**	**3·50**	**297**	**126·53**	**5,928**

Period.	Beryl Ore—*continued.*		Bismuth.		Clay (Cement, Pottery and Fireclay).		Chromite.	
	Total.		Outside Proclaimed Goldfield.		Outside Proclaimed Goldfield.		Peak Hill Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	lb.	£	tons.	£	tons.	£
Prior to 1949	*1,040·84	32,342	5,506·40	1,800	*23,631·55	16,722	....	....
1949	20·45	1,497	....	....	10,047·00	11,813	....	....
1950	16·93	1,431	....	....	6,439·00	4,936	....	....
1951	90·77	11,174	127·91	84	47,547·00	20,668	....	....
1952	85·29	14,562	....	....	25,698·10	18,184	773·00	11,100
Total	**1,254·28**	**61,006**	**5,634·31**	**1,884**	**113,362·65**	**72,323**	**773·00**	**11,100**

* Includes 24·53 tons valued at £928 from Murchison Goldfield. † Includes 1,050·80 tons valued at £738 from Collie Mineral Field.

Period.	Coal.		Copper Ore.					
	Collie Coalfield.		Pilbara Goldfield.		Ashburton Goldfield.		Peak Hill Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1949	19,850,966·31	14,817,100	46·87	866	353·07	6,431	1,043·35	32,632
1949	750,594·06	972,245	....	....	1·30	13	8·19	498
1950	814,351·53	1,287,749	....	....	....	....	....	....
1951	848,474·86	1,716,788	13·30	77	23·70	493	....	....
1952	830,461·20	2,457,296	15·51	1,094	....	....	....	....
Total	**23,094,847·96**	**21,251,178**	**75·68**	**2,037**	**378·07**	**6,937**	**1,051·54**	**33,130**

Period.	Copper Ore.						Corundum.	
	Mt. Margaret Goldfield.		Phillips River Goldfield.		Total.		East Murchison Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1949	47,860·52	230,846	95,831·64	589,040	*253,674·80	1,749,108	....	....
1949	....	....	40·00	119	49·49	630	....	....
1950	....	*107	48·00	76	48·00	183	....	....
1951	1·30	50	4·83	138	43·13	758	....	....
1952	....	....	....	†94	15·51	1,188	54·00	380
Total	**47,861·82**	**231,003**	**95,924·47**	**589,467**	**253,830·93**	**1,751,867**	**54·00**	**380**

* Value of Copper separated from 2·54 tons of Copper matte.
† Value of Copper separated from 1·31 tons Copper precipitates.
‡ Including 109·52 tons valued at £1,709 from West Kimberley Goldfield. Including 82,745·45 tons valued at £748,482 from West Pilbara Goldfield. Including 284·31 tons valued at £5,052 from East Murchison Goldfield. Including 1,042·02 tons valued at £11,290 from Murchison Goldfield. Including 82·35 tons valued at £811 from Yalgoo Goldfield. Including 6·12 tons valued at £51 from North Coolgardie Goldfield. Including 50·67 tons valued at £379 from East Coolgardie Goldfield. Including 16·00 tons valued at £77 from Yilgarn Goldfield. Including 5·11 tons valued at £56 from Outside Proclaimed Goldfields. Including 24,026·25 tons valued at £119,497 from Northampton Mineral Field. Including 171·55 tons valued at £1,889 from Yandanooka Mineral Field.

Period.	Cupreous Ore (Fertiliser).							
	West Pilbara Goldfield.		Pilbara Goldfield.		Ashburton Goldfield.		Peak Hill Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1949	....	....	....	....	....	....	1,175·65	8,275
1949	133·98	1,844	....	....	....	....	113·00	929
1950	821·40	6,160	....	....	....	....	93·90	2,304
1951	898·21	10,471	....	....	39·66	494	22·00	660
1952	910·19	6,933	91·71	638	1·75	31	229·04	7,080
Total	**2,763·78**	**25,408**	**91·71**	**638**	**41·41**	**525**	**1,633·59**	**19,248**

Table VI.—*Minerals other than Gold*—continued.

Period.	Cupreous Ore (Fertiliser)—*continued.*							
	East Murchison Goldfield.		Yalgoo Goldfield.		Mt. Margaret Goldfield.		Yilgarn Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1949	....	....	....	....	....	....	....	....
1949	....	....	7·00	48	....	....	....	....
1950	....	....	....	....	9·21	64	38·37	133
1951	268·93	3,079	40·00	240	12·55	125	....	....
1952	340·05	5,496	....	....	6·85	95	....	....
Total	**608·98**	**8,575**	**47·00**	**288**	**28·61**	**284**	**38·37**	**133**

Period.	Cupreous Ore (Fertiliser)—*continued.*				Calcite.		Diamonds.	
	Phillips River Goldfield.		Total.		Mt. Margaret Goldfield.		Pilbara Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	carats.	£
Prior to 1949	....	....	1,175·65	8,275	....	....	....	24
1949	....	....	253·98	2,821	....	....	....	....
1950	6·97	206	969·85	8,867	5·00	25	....	....
1951	55·70	1,035	1,337·05	16,104	....	....	....	....
1952	64·00	1,322	1,643·59	21,595	....	....	....	....
Total	**126·67**	**2,563**	**5,380·12**	**57,662**	**5·00**	**25**	....	**24**

Period.	Diatomaceous Earth.		Dolomite.		Emeralds.		Emery.	
	Outside Proclaimed Goldfield.		Murchison Goldfield.		Murchison Goldfield.		Outside Proclaimed Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	carats (cut and rough).	£	tons.	£
Prior to 1949	90·00	860	526·05	2,608	18,373·00	1,609	13·00	130
1949	540·00	950	49·50	248	....	....	....	....
1950	....	....	319·85	1,268	....	....	....	....
1951	198·00	2,700	124·25	599	....	....	....	....
1952	....	....	555·25	2,423	....	....	....	....
Total	**828·00**	**4,510**	**1,574·90**	**7,146**	**18,373·00**	**1,609**	**13·00**	**130**

Period.	Felspar.		Fergusonite.		Fuller's Earth.		Gadolinite.	
	Coolgardie Goldfield.		Pilbara Goldfield.		Outside Proclaimed Goldfield.		Pilbara Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1949	*38,063·30	96,250	....	....	†30·00	86	1·00	112
1949	1,049·00	3,934	....	....	....	....	....	....
1950	1,421·00	5,329	....	....	....	....	....	....
1951	1,806·50	7,389	....	....	....	....	....	....
1952	2,503·50	10,452	·17	165	25·00	125	....	....
Total	**44,843·30**	**123,354**	**·17**	**165**	**55·00**	**211**	**1·00**	**112**

* Includes 528·00 tons valued at £1,050 from Outside Proclaimed Goldfields. † From Broad Arrow Goldfield.
† Includes 450 tons valued at £247 from East Coolgardie and 100 tons valued at £300 from West Pilbara Goldfield.

Period.	Glass Sand.		Glauconite.		Graphite.		Gypsum.	
	Outside Proclaimed Goldfield.		Outside Proclaimed Goldfield.		Outside Proclaimed Goldfield.		Dundas Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1949	1,897·35	2,274	3,865·50	60,621	18·10	97	1,989·00	1,232
1949	986·15	1,014	203·50	5,286	....	....	10·00	6
1950	5,132·25	3,566	323·50	8,735	....	....	....	....
1951	6,172·59	4,417	506·00	15,033	....	....	7·00	19
1952	7,669·12	5,629	230·00	7,305	....	....	21·00	53
Total	**21,857·46**	**16,900**	**5,128·50**	**96,980**	**18·10**	**97**	**2,027·00**	**1,310**

Table VI.—*Minerals other than Gold*—continued.

Period.	Gypsum—*continued.*						Ilmenite Sand.	
	Yilgarn Goldfield.		Outside Proclaimed Goldfield.		Total.		Outside Proclaimed Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1949	40,209·50	54,867	146,595·15	177,571	188,793·65	233,670	....	....
1949	15,962·00	11,181	9,935·30	7,423	25,907·30	18,610	71·95	255
1950	20,466·00	14,372	10,389·40	7,570	30,835·40	21,942	84·00	521
1951	63,816·00	36,571	14,100·00	10,136	77,923·00	46,726	....	....
1952	34,054·00	21,692	16,256·56	11,512	50,331·56	33,257	....	....
Total	**174,487·50**	**138,683**	**197,276·41**	**214,212**	**373,790·91**	**354,205**	**155·95**	**776**

Period.	Iron Ore (for Pig Iron)						Iron Ore (Exported).	
	Yilgarn Goldfield.		Outside Proclaimed Goldfield.		Total.		West Kimberley Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1949	84·35	128	*65,202·20	63,085	65,286·55	63,213	....	....
1949	....	....	12,524·13	66,296	12,524·13	66,296	....	....
1950	3,069·98	19,922	11,825·25	62,760	14,895·23	82,682	....	....
1951	13,629·08	139,215	5,493·19	41,921	19,122·27	181,136	10,384·00	10,297
1952	12,994·90	179,405	4,708·55	47,439	17,703·45	226,844	204,945·00	203,238
Total	**29,778·31**	**338,670**	**99,753·32**	**281,501**	**129,531·63**	**620,171**	**215,329·00**	**213,535**

* Includes 450 tons valued at £247 from East Coolgardie and 100 tons valued ot £300 from West Pilbara Goldfield.

Period.	Jarosite.		Kaolin.					
	Phillips River Goldfield.		Murchison Goldfield.		Outside Proclaimed Goldfield.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1949	9·54	37	....	....	4,160·48	4,227	4,160·48	4,227
1949	....	....	....	....	80·00	160	80·00	160
1950	....	....	....	....	....	....	....	....
1951	....	....	....	....	12·00	19	12·00	19
1952	....	....	41·75	207	226·00	1,096	267·75	1,303
Total	**9·54**	**37**	**41·75**	**207**	**4,478·48**	**5,502**	**4,520·23**	**5,709**

Period.	Kyanite.		Lead Ore and Concentrates.					
	Outside Proclaimed Goldfield.		Northamtpon Mineral Field.		Outside Proclaimed Goldfield.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1949	4,215·69	21,781	419,340·61	1,375,180	12·19	13	419,352·80	1,375,193
1949	....	....	1,834·87	100,899	....	....	1,834·87	100,899
1950	....	....	1,035·05	66,389	....	....	1,035·05	66,389
1951	....	....	1,521·62	148,068	....	....	1,521·62	148,068
1952	....	....	5,699·39	783,186	....	....	5,699·39	783,186
Total	**4,215·69**	**21,781**	**429,431·54**	**2,473,722**	**12·19**	**13**	**429,443·73**	**2,473,735**

Period.	Magnesite.							
	East Coolgardie Goldfield.		Coolgardie Goldfield.		Outside Proclaimed Goldfield.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1949	1,008·25	1,240	758·40	2,033	495·07	1,485	2,261·72	4,758
1949	26·71	74	21·00	57	1,986·05	4,583	2,033·76	4,714
1950	....	....	40·00	175	1,788·70	3,650	1,828·70	3,825
1951	418·00	1,099	344·25	870	....	....	762·25	1,969
1952	....	....	1,054·67	2,843	....	....	1,054·67	2,843
Total	**1,452·96**	**2,413**	**2,218·32**	**5,978**	**4,269·82**	**9,718**	**1,452·96**	**2,413**

Table VI.—*Minerals other than Gold*—continued.

Period.	Manganese.		Mica.		Ochre.			
	Peak Hill Goldfield.		Outside Proclaimed Goldfield.		West Pilbara Goldfield.		Murchison Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1949	*1,721·59	10,878	†31.676·25	2,641	3,727·65	46,555	1,834·62	17,513
1949	9,420·31	56,289	§1,253·75	1,343	15·60	225	7·55	38
1950	11,961·64	65,459	....	....	....	....	186·00	1,860
1951	5,256·52	33,789	....	....	15·60	234	672·10	7,057
1952	5,044·80	35,634	....	....	....	....	296·55	3,252
Total	**33,404·86**	**202,049**	**32,930·00**	**3,984**	**3,758·85**	**47,014**	**2,996·82**	**30,320**

* Includes 20 tons valued at £180 from Mt. Margaret Goldfield and 24·85 tons valued at £112 from Outside Proclaimed Goldfield. † Includes 7,868 lb. Crude Mica. § Includes 31·25 lb. Mica valued at £5 from West Kimberley Goldfield.

Period.	Ochre—*continued.*						Petalite.	
	Yalgoo Goldfield.		East Coolgardie Goldfield.		Total.		Coolgardie Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1949	....	....	35·35	126	*5,646·12	64,400	....	....
1949	11·00	66	10·00	37	44·15	366	5·19	52
1950	....	....	....	....	186·00	1,860	....	....
1951	....	....	....	....	687·70	7,891	....	....
1952	....	....	....	....	296·55	3,252	....	....
Total	**11·00**	**66**	**45·35**	**163**	**6,860·52**	**77,769**	**5·19**	**52**

* Includes 36 tons valued at £108 from Outside Proclaimed Goldfield, 2·10 tons valued at £15 from Pilbara Goldfield and 40·40 tons valued at £83 from North-East Coolgardie Goldfield.

Period.	Phosphatic Guano.		Pyrites.		Sillimanite.		Silver Lead Ore and Concentrates.	
	Outside Proclaimed Goldfield.		Dundas Goldfield.		Outside Proclaimed Goldfield.		Kimberley Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1949	10,799·73	59,174	*261,833·56	694,648	2·00	13	4·07	196
1949	....	....	31,299·00	125,857	....	....	2·46	161
1950	....	....	35,213·00	163,514	....	....	....	....
1951	....	....	46,615·00	296,988	....	....	....	....
1952	....	....	53,577·00	422,029	....	....	2·73	291
Total	**10,799·73**	**59,174**	**428,537·56**	**1,703,036**	**2·00**	**13**	**9·26**	**648**

* Includes 74,047·56 tons valued at £45,496 from Mt. Margaret Goldfield.

Period.	Silver Lead Ore and Concentrates.							
	Pilbara Goldfield.		West Pilbara Goldfield.		Ashburton Goldfield.		Peak Hill Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	tons.	tons.	£	tons.	£	tons.	£
Prior to 1949	211·82	4,284	108·64	1,591	3,100·54	44,874	....	..
1949	235·15	11,103	15·32	453	719·92	35,926	5·50	285
1950	445·22	21,859	2·24	75	345·62	21,743	....	....
1951	301·72	25,692	18·14	2,289	648·16	61,559	....	....
1952	420·30	36,827	30·79	3,176	979·20	96,977	....	....
Total	**1,614·21**	**99,765**	**175·13**	**7,584**	**5,793·44**	**261,079**	**5·50**	**285**

Period.	Silver Lead Ore and Concentrates—*continued.*		Silver Lead Zinc Ore and Concentrates.					
	Total.		West Kimberley Goldfield.		Northampton Mineral Field.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1949	3,425·07	50,945	713·46	13,598	....	....	713·46	13,598
1949	978·35	47,928	33·38	1,456	75·53	2,607	108·91	4,063
1950	793·08	43,677	7·83	205	29·83	1,376	37·66	1,581
1951	968·02	89,540	49·03	2,568	....	....	49·03	2,568
1952	1,433·02	137,271	316·57	14,743	....	....	316·57	14,743
Total	**7,597·54**	**369,361**	**1,120·27**	**32,570**	**105·36**	**3,983**	**1,225·63**	**36,553**

Table VI.—*Minerals other than Gold*—continued.

Period.	Soapstone.						Talc.	
	Greenbushes Mineral Field.		Outside Proclaimed Goldfield.		Total.		East Coolgardie Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1949	517·00	1,778	10·00	25	527·00	1,803	784·96	3,271
1949	....	....	....	....	....	....	....	....
1950	....	....	....	....	....	....	56·00	210
1951	....	....	38·40	125	38·40	125	54·70	232
1952	....	....	....	....	....	....	68·25	273
Total	**517·00**	**1,778**	**48·40**	**150**	**565·40**	**1,928**	**963·91**	**3,986**

Period.	Talc—*continued.*				Tantalite.			
	Outside Proclaimed Goldfield.		Total.		Pilbara Goldfield. Field.		Greenbushes Mineral Field.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1949	....	....	784·96	3,271	265·07	130,672	15·29	10,052
1949	181·00	2,375	181·00	2,375	....	....	....	....
1950	200·00	2,490	256·00	2,700	....	....	....	....
1951	597·47	7,431	651·17	7,663	....	....	....	....
1952	1,155·36	14,410	1,223·61	14,683	....	....	....	....
Total	**2,132·83**	**26,706**	**3,096·74**	**30,692**	**265·07**	**130,672**	**15·29**	**10,052**

Period.	Tantalite—*continued.*		Tantalo Columbite Ore and Concentrates.					
	Total.		Pilbara Goldfield.		Coolgardie Goldfield.		Greenbushes Mineral Field.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1949	*283·17	143,233	·53	166	....	....	....	....
1949	....	....	....	....	....	....	1·16	286
1950	....	....	2·29	749	....	....	4·41	2,109
1951	....	....	....	....	....	....	2·06	2,350
1952	....	....	1·37	1,555	2·02	2,399	3·63	6,056
Total	**283·17**	**143,233**	**4·19**	**2,470**	**2·02**	**2,399**	**11·26**	**10,801**

* Includes 2·81 tons valued at £2,509 from Coolgardie Goldfield.

Period.	Tantalo Columbite Ore and Concentrates—*continued.*		Tin.					
	Total.		Greenbushes Mineral Field.		Kimberley Goldfield.		West Kimberley Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1949	·53	166	11,379·77	1,007,638	·60	143	....	....
1949	1·16	286	3·14	1,099	....	....	....	....
1950	6·70	2,858	30·34	17,019	....	....	....	....
1951	2·06	2,350	22·44	17,854	·17	117	·15	115
1952	7·02	10,010	35·88	23,962	·06	42	·15	120
Total	**17·47**	**15,670**	**11,471·57**	**1,067,572**	**·83**	**302**	**·30**	**235**

Period.	Tin—*continued.*						Tungsten (Scheelite).	
	Pilbara Goldfield.		West Pilbara Goldfield.		Total.		East Murchison Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Conc.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1949	6,002·81	573,342	....	....	*17,389·04	1,581,647	....	....
1949	31·52	11,980	....	....	34·66	13,079	....	....
1950	21·07	8,477	....	....	51·41	25,496	....	....
1951	38·31	21,389	·03	18	61·10	39,493	....	....
1952	59·85	43,305	1·86	1,287	97·80	68,716	·06	52
Total	**6,153·56**	**658,493**	**1·89**	**1,305**	**17,634·01**	**1,728,431**	**·06**	**52**

* Includes 4·72 tons valued at £360, ·15 tons valued at £15, ·60 tons valued at £46 and ·39 tons valued at £103 from Murchison, Coolgardie, Yilgarn and East Murchison Goldfields respectively.

Table VI.—*Minerals other than Gold*—continued.

Period.	Tungsten (Scheelite)—*continued.*						Tungsten (Wolfram).	
	Mt. Margaret Goldfield.		Coolgardie Goldfield.		Total.		Pilbara Goldfield.	
	Conc.	Value.	Conc.	Value.	Conc.	Value.	Ore and Conc.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1949	....	....	20·75	5,019	*138·17	46,439	....	....
1949	....	....	·58	219	·58	219	....	....
1950	....	....	....	....	....	....	....	....
1951	·04	51	·10	164	·14	215	3·69	7,392
1952	1·29	2,255	·93	1,384	2·28	3,691	20·92	37,686
Total	**1·33**	**2,306**	**22·36**	**6,786**	**141·17**	**50,564**	**24·61**	**45,078**

* Includes ·16 tons valued at £59 from Murchison Goldfield, 2·99 tons valued at £1,050 from Yalgoo Goldfield, 1·01 tons valued at £175 from Broad Arrow Goldfield, 6·45 tons valued at £1,030 from North Coolgardie Goldfield, 106·74 tons valued at £39,087 from Yilgarn Goldfield and ·08 tons valued at £19 from Dundas Goldfield.

Period.	Tungsten (Wolfram)—*continued.*						Vermiculite.	
	Murchison Goldfield.		Yalgoo Goldfield.		Total.		East Coolgardie Goldfield.	
	Ore and Conc.	Value.	Ore and Conc.	Value.	Ore and Conc.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1949	238·64	1,148	·72	115	*268·12	1,682	102·90	717
1949	....	....	....	....	....	....	23·22	155
1950	....	....	....	....	....	....	....	....
1951	1·24	2,193	....	....	4·93	9,585	....	....
1952	5·94	7,538	·57	795	27·43	46,019	....	....
Total	**245·82**	**10,879**	**1·29**	**910**	**300·48**	**57,286**	**126·12**	**872**

* Includes 28·48 tons valued at £331 from West Kimberley Goldfield and ·28 tons valued at £88 from Broad Arrow Goldfield.

	Vermiculite—*continued.*				Zinc Ore (Fertiliser).	
	Outside Proclaimed Goldfield.		Total.		Pilbara Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£
Prior to 1949	1,281·55	7,755	*1,404·45	8,532	....	....
1949	138·75	832	161·97	987	....	....
1950	120·00	720	120·00	720	....	....
1951	54·50	491	54·50	491	10·70	50
1952	62·00	744	62·00	744	....	....
Total	**1,656·80**	**10,542**	**1,802·92**	**11,474**	**10·70**	**50**

* Includes 20 tons valued at £60 from Yilgarn Goldfield.

TABLE VII.

Quantity and Value of Minerals, other than Gold, reported during year 1952.

Number of Lease, Claim, Or Area.	Goldfield or Mineral Field.	Registered Name of Producer.	Quantity.	Metallic Content.	Value.
		ANTIMONY (*f*) (*g*) (*r*).			
G.M.L's. 231L, etc ...	Pilbara	Blue Spec G.M.'s N.L.	264·58	129·69	(*b*) 43,397·00
		ASBESTOS (Chrystotile).			
Temporary Residence 130 5H	Pilbara	Hancock, L. G.	192·72	....	3,083·52
M.C.'s 48, 68	West Pilbara....	Hancock, L. G.	459·63	....	34,170·90
			652·35	....	(*b*) 37,254·42
		ASBESTOS (Crocidolite).			
M.C.'s 54, etc.	West Pilbara....	Australian Blue Asbestos, Ltd.	2,940·09	....	*b* 557,861·32
		BARYTES.			
M.C. 2N	Murchison	Rumble and Horley	9·00	....	(*a*) 49·50
		BENTONITE.			
M.C.'s 282H, 397H (Marchagee)	O.P.G.	Fennell, W. G.	150·00	....	630·00
M.L.'s 437H, etc., (Marchagee)	O.P.G.	Noonan, E. J.	382·00	....	1,136·00
M.C. 456H (Marchagee)	O.P.G.	Read, D. J. & T. I.	54·00	....	270·00
			586·00	....	(*a*) 2,036·00
		BERYL (*f*) (*g*).		BeO Units.	
		Watkins, D.	8·11	106·05	1,437·40
		Parker, J.	·91	8·76	115·00
		Coffin & Ball	4·87	64·37	965·60
		Mitchell, J.	1·49	19·58	293·60
		Eaton & Ball	6·67	74·19	973·75
Crown Lands	Pilbara	Hall, W.	1·51	18·39	241·00
		Pitt, R. E.	8·99	97·27	1,276·85
		Doherty & Stream	·55	7·49	112·25
		Houghton, L.	·83	9·59	97·00
		Stein, L. C.	3·10	39·36	485·00
		Smith & Coffin	1·34	16·37	189·55
M.C. 234	Pilbara	Otway, R. H.	1·75	17·88	212·91
M.C.'s 107, etc.	Pilbara	Tantalite Ltd.	26·66	325·30	4,586·75
P.A. 2413	Pilbara	Stein & McAlpine	2·91	36·72	517·80
M.C. 12	Coolgardie	Giles, A. S.	14·03	184·64	2,737·40
M.C. 444H (Yinnietharra)....	O.P.G.	Brazzle, P. J.	1·24	15·34	216·25
Crown Lands (Yinnietharra)	O.P.G.	Giles, Bros.	·33	4·53	67·95
			85·29	1,045·83	(*b*)14·562·06
		CHROMITE.		Av. Assay. % Cr_2O_3	
M.C. 46P, etc.	Peak Hill	Broken Hill Pty., Ltd.	773·000	46·00	(*b*) 11,100·00
		CLAY (Fireclay).			
M.C.'s 304H (Clackline)	O.P.G.	Clackline Refractories Ltd.	7,836·00	....	7,836·00
Private Property (Glen Forrest)	O.P.G.	Darling Range Firebrick Co.	1,772·00	....	1,683·75
			9,608·00	....	(*c*) 9,519·75
		CLAY (Pottery Clay).			
M.C. 109H (Goomalling)	O.P.G.	H. L. Brisbane & Wunderlich, Ltd.....	780·00	....	(*c*) 3,000·00
		CLAY (Cement).			
Private Property (Maidavale)	O.P.G.	Swan Portland Cement Ltd.....	5,363·60	....	1,991·77
	O.P.G.	D. Rhodes Pty., Ltd.	9,946·50	....	3,672·80
			15,310·10	....	(*c*) 5,664·57

Table VII.—*Minerals other than Gold*—continued.

Quantity and Value of Minerals, other than Gold reported during year 1952.

Number of Lease, Claim, or Area.	Goldfield or Mineral Field.	Registered Name of Producer.	Quantity.	Metallic Content.	Value.
		COAL			
M.L. 250, etc.	Collie	Amalgamated Collieries of W.A. Ltd. :—			
		Coperative Mine	62,350·80	....	182,137·45
		Proprietary Mine	57,736·05	....	169,330·90
		Cardiff Mine	63,859·37	....	187,985·55
		Stockton Mine	66,221·09	....	196,783·55
		Stockton Open Cut	171,735·74	....	499,199·45
		Black Diamond Open Cut	96,172·27	....	275,830·80
		Ewington Open Cut	81,917·49	....	252,181·40
M.L.'s 314, etc.	Collie	Griffin Coal Mining Co. Pty :—			
		Griffin Mine	48,435·81	....	161,815·32
		Wyvern Mine	64,119·02	....	210,048·03
		Phoenix Mine	17,429·60	....	59,618·03
		Centaur Mine	32,492·56	....	106,312·76
	Collie	Western Collieries Ltd. :—			
Temporary Residence 1235H		Collie Burn Open Cut	61,519·00	....	138,116·00
M.L. 418		Western Collieries No. 1	5,215·00	....	12,622·00
M.L. 437		Western Collieries No. 2	2,057·00	....	5,315·00
			830,461·20		*e*2,457,296·24
		COPPER ORE & CONCENTRATES (*f*) (*g*).		Copper Tons.	Silver Fine Ozs.	
Mc's 34L, 35L	Pilbara	Stubbs & Baker	15·51	6·20	50·72	1,093·75
P.A. 745	Phillips River	Warnes, W. T.	....	(*h*)·46	....	94·15
			15·51	6·66	50·72	(*b*) 1,187·90
		(Silver—Quantity and Value transferred to Silver Item.)				
		CUPREOUS ORE AND CONCENTRATES (for Fertiliser).		Av. Assay. Cu %.	
P.A. 230	Pilbara	Lee, T.	47·82	7·06	337·74
P.A. 234	Pilbara	Lee, T.	43·89	6·83	299·77
M.L. 259	West Pilbara	Lee, T.	205·68	13·56	3,355·66
Freehold Property	West Pilbara	Walters, I.	704·51	6·85	3,577·64
M.L. 148	Ashburton	Brindal & Party	1·75	12·15	30·63
M.C. 35P	Peak Hill	Edwards, M.	15·65	7·40	130·68
M.C. 43P	Peak Hill	Parkinson, T. L.	67·00	36·46	5,257·15
P.A. 835P	Peak Hill	Rumble, P. R.	16·77	13·10	200·80
M.L. 66P	Peak Hill	Walsh, E.	129·62	10·04	1,491·35
P.A. 1426	East Murchison	Alac, M.	128·50	16·40	2,690·00
P.A. 1429	East Murchison	Coe, C.	34·95	10·76	424·55
P.A. 1432	East Murchison	Flannigan, P.	8·00	6·00	48·00
P.A. 1440	East Murchison	Jones & Campbell	27·35	7·91	216·37
P.A. 1446	East Murchison	Moriarty & Crombie	20·15	10·92	280·50
M.C. 5	East Murchison	Poletti, A.	121·10	13·42	1,836·30
M.L. 24F	Mt. Margaret	Philiphoff, M.	6·85	12·14	95·64
P.A. 76·8	Phillips River	O'Dea, J.	(*i*) 20·25	9·44	442·02
L.T.T. 1079H	Phillips River	Wehr Bros.	43·75	8·70	880·32
			1,643·59	10·70	*ab* 21,595·12
		CORUNDUM.			
M.C. 9	East Murchison	Moriarty, T. K.	54·00	....	(*a*) 380·00
		DOLOMITE.			
M.L.'s 11M, etc.	Murchison	Atkinson & Giles	555·25	....	(*a*) 2,423·50
		FELSPAR.			
M.L.'s 80, etc.	Coolgardie	Aust. Glass Manufacturers, Ltd.	2,503·50	....	(*a*) 10452·12
		FERGONSONITE.			
Crown Lands	Pilbara	Hansen, H.	·17	....	(*b*) 164·90

Table VII.—*Minerals other than Gold*—continued.

Quantity and Value of Minerals, other than Gold, reported during the year 1952.

Number of Lease, Claim, Or Area.	Goldfield or Mineral Field.	Registered Name of Producer.	Quantity.	Metallic Content.	Value.
		FULLERS EARTH.			
M.C. 452H (Marchagee)	O.P.G.	Read, D. J. & T. I.	25·00	....	(*a*) ....125·00
		GLASS SAND.			
M.C.'s 417H, etc., (Lake Gnangara)	O.P.G.	Aust. Glass Manufacturers Co., Pty., Ltd.	6,893·52	....	(*c*) 4,480·78
M.C. 365H (Lake Gnangara)	O.P.G.	Leach, R. J.	564·00	....	(*c*) 845·60
M.C.'s 161H, etc., (Lake Gnangara)	O.P.G.	Leach, W. M.	211·50	....	(*c*) 303·00
			7,669·12	....	(*c*) 5,629·38
		GLAUCONITE.	Greensand Treated.	Glauconite recovered Tons.	
Private Property (Gin Gin)	O.P.G.	Brook, G. E.	1,380·00	230·00	*b d* 7,305·00
		GYPSUM.			
M.L.'s 38, etc.	Yilgarn	Aust. Plaster Industries Pty., Ltd.	15,777·00	....	7,888·50
M.C.'s 30, etc.	Yilgarn	Ajax Plaster Co., Ltd.	6,013·00	....	4,941·54
M.C.'s 9, etc.	Yilgarn	Perth Modelling Works, Ltd.	12,264·00	....	8,861·91
M.C. 12	Dundas	McDonald & Whitfield	21·00	....	52·75
M.C.'s 280H, etc., (Lake Brown)	O.P.G.	H. B. Brady & Co. & Saunders (Jnr.)	7,795·00	....	5,846·25
M.C.'s 126H, etc., (Baandee)	O.P.G.	Perth Modelling Works, Ltd.	5,018·00	....	3,246·90
M.C. 465H, etc., (Baandee)	O.P.G.	Perth Modelling Works, Ltd.	604·00	....	392·60
M.C.'s 31H, etc., (Baandee)	O.P.G.	Millars Timber & Trading Co., Ltd.	97·00	....	121·25
M.C.'s 31H, etc., (Baandee)	O.P.G.	Mt. Hawthorn Modelling Works	40·00	....	62·00
M.C.'s 402H, etc., (Hines Hill)	O.P.G.	Kay, C. J.	1,243·80	....	761·29
M.C.'s 293H, etc., (Woolundra)	O.P.G.	Ripper, P.	1,458·76	....	1,081·75
			50,331·56	....	*a c* 33,256·74

Plaster of Paris reported as manufactured during the year being 32,136·00 tons (including 8,055 tons exported Inter-State) from 49,481·50 tons of Gypsum by five factories.

		IRON ORE (for Pig Iron).	Ore Treated.	Pig Iron recovered Tons.	
Temporary Residence 1258H	Yilgarn	The Charcoal Iron & Steel Industry	12,994·90	8,433·08	179·404·52
Crown Lands (Wundowie)....	O.P.G.	The Charcoal Iron & Steel Industry	4,708·55	2,208·55	47,439·30
			17,703·45	10,641·63	*c d* 226,843·82

Average Assay Ore used—Koolyanobbing 60·94% Fe, Wundowie 43·56% Fe.

		IRON ORE (*g*).	Ore Exported	Average Assayed Iron Content.	
M.L.'s 10 etc.	West Kimberley	Aust. Iron & Steel, Ltd.	204,945·00	62·53%	203,238·00
		KAOLIN.			
Crown Lands	Murchison	Zadow, J. C.	41·75	....	207·00
M.C. 247H (Mt. Kokeby)	O.P.G.	Linton, J. B.	214·00	....	1,073·75
Private Property (Nynaania)	O.P.G.	Le Vaux, C.W.	12·00	....	22·00
			267·75	....	(*a*) 1,302·75

Table VII.—*Minerals other than Gold*—continued.

Quantity and Value of Minerals, other than Gold, reported during year 1952.

No. of Lease Claim or Area.	Goldfield or Mineral Field.	Registered Name of Producer.	Ore and Conc.	Lead.		Silver.		Zinc.	
			tons.	tons.	Value £A.	fine oz.	Value £A	tons.	Value. £A.
LEAD ORE AND CONCENTRATES (*f*) (*g*).									
Imp. Grant on Loc. 833	Northampton	Anglo-Australian Mining Pty. Ltd.	4,592·11	3,573·93	654,855·25 (*b*)	....	....	....	....
M.L. 257	do.	Cotic, A. J.	17·11	10·49	1,331·48	15·71	....	1·01	
M.Ls. 227, 37 PP	do.	Gabalong Asbestos Co. Pty., Ltd.	28·38	21·24	2,652·86	15·05	....	....	....
M.Ls. 205, etc.	do.	Galena Lead Mines, N.L.	1·85	·95	78·78	·73	....	....	....
M.L. 222	do.	" Geraldine North "	54·37	38·93	5,521·53	28·32	....	....	....
M.L. 253	do.	" Great Western "	1·98	1·46	165·07	1·19	....	....	....
Vic. Loc. 832	do.	Isseka Mining Pty., Ltd.	30·13	15·53	1,950·54	33·18	....	....	....
M.L. 250	do.	" Kirtons " Mine	20·17	14·61	1,251·81	7·45	....	....	....
M.L. 234	do.	Mary Springs Syndicate	50·75	37·95	4,942·90	27·17	....	...	....
M.L. 39 PP	do.	Mulligan's Mine	23·25	16·97	2,592·00	12·78	....	....	....
M.Ls. 31 PP, etc.	do.	Northampton M. and &. Pty., Ltd.	167·72	122·66	16,150·95	100·43	....	....	....
M.L. 256	do.	O'Shea, Cavanagh & Shepherd	13·58	9·93	1,036·03	6·79	....	....	....
P.A. 73 PP....	do.	" Rhyhope " Mine	20·65	14·55	2,073·24	10·32	....	....	....
Vic. Loc. 334	do.	" Wheal Fortune "	17·49	12·50	1,363·20	9·05	....	...	....
Vic. Loc. 436	do.	"Paringa Wheel of Fortune	659·85	497·46	87,220·33	148·55	....	....	....
			5,699·39	4,389·16	783185·97	416·72	*nil*	1·01	*nil*
Silver—Quantity transferred to Silver Item.									
SILVER/LEAD ORE AND CONCENTRATES (*f*) (*g*).									
M.Cs' 5 and 6	Ashburton	Aerial Mines Pty., Ltd.	49·19	31·29 (*b*)	3,905·08	185·80	42·56	....	....
M.L. 116, etc.	do.	Ashburton Mng. & Min. Pty., Ltd.	29·77	22·74	3,593·61	88·96	13·19	....	....
M.L. 140	do.	" Beadon " Mine	31·97	21·49	3,350·96	262·53	78·43	....	....
M.L. 136	do.	" Big Chief " Mine	8·38	2·66	266·45	·02	....	....	....
M.L. 118	do.	" Bilrose " Mine	60·92	43·94	7,577·46	553·68	174·25	...	....
P.A. 282	do.	Coombes & Furvey	3·92	2·19	336·64	21·49	5·15	....	....
M.L. 143	do.	" Dingo " Mine	60·24	40·40	5,646·28	464·19	129·71	....	....
P.A. 285	do.	Donnelly Bros.	4·45	2·48	344·89	18·69	3·71	....	....
Crown Land....	do.	Downie, J. D.	2·14	1·31	207·83	11·45	2·72	....	....
M.L. 122	do.	Gift Mine	371·21	289·73	37,025·89	2671·34	832·78	....	....
M.C. 2	do.	Ibbotson, G. R.	103·95	49·80	8,067·15	1400·78	448·15	....	....
P.A. 276	do.	James, A.	13·87	8·81	1,286·48	89·66	27·39	....	....
P.A. 270	do.	Jenkin, A. J.	2·07	1·57	242·97	16·33	5·20	...	....
M.L. 135	do.	" June Audrey " Mine	188·26	135·31	20,948·60	1346·31	366·34	....	....
M.L. 120	do.	" Kooline Queen "	8·19	5·63	822·52	58·97	13·26	....	....
M.L. 123	do.	" Phar Lap "	1·30	·87	143·20	6·98	1·48	....	....
M.L. 138	do.	" Rainbow "	3·06	2·28	187·14	22·05	7·13	....	....
M.L. 144	do.	Rooney & Healy	17·26	10·44	1,498·14	40·82	5·40	....	....
P.A. 281	do.	Sheminant, J. R.	·93	·60	79·36	34·34	12·18	....	....
M.L. 124	do.	" Silver King " Mine	11·69	9·20	941·28	56·83	16·32	....	....
M.L. 121	do.	" South Kooline "	4·02	2·86	340·81	18·83	4·23	....	....
P.A. 286	do.	Zagar, F.	2·41	1·31	164·37	53·84	18·38	....	....
M.C. 227	Pilbara	Challenger, C. W.	24·05	14·06	2,208·66	103·97	22·45	...	....
P.A. 2366	do.	Engstrom, O.	10·68	6·48	960·17	30·43	7·18	....	....
M.C. 249	do.	Engstrom & Rogers	4·88	2·68	274·93	23·67	5·92	....	....
M.C. 189	do.	Moore, R. O.	360·27	229·83	32,305·27	2024·98	593·81	....	....
M.C. 193	do.	O'Callaghan, J.	6·69	2·72	147·88	27·44	2·52	....	....
P.A. 2375	do.	Rogers, E. E.	13·73	6·87	929·66	32·25	5·49	....	....
M.C. 73	West Pilbara	Leevers & Horn	30·79	21·41	3,175·95	277·37	88·69	....	....
Crown Lands	Kimberley	Sundry Persons....	2·73	1·73	290·99	15·08	3·64	....	....
			1,433·02	972·69	137270·62	9959·08	2937·66	*nil*	*nil*
Silver—Quantity and Value transferred to Silver Item.									
SILVER/LEAD/ZINC ORE AND CONCENTRATES (*f*) (*g*).									
M.C. 29 ...	West Kimber-	Devonian Pty., Ltd.	316·57	133·06	14,743·02 (*b*)	2285·91	606·19	46·01	364·71
Silver—Quantity and Value transferred to Silver Item.									

Table VII.—*Minerals other than Gold*—continued.

Quantity and Value of Minerals, other than Gold, reported during year 1952.

Number of Lease, Claim, or Area.	Goldfield or Mineral Field.	Registered Name of Producer.	Quantity.	Metallic Content.	Value.
		MAGNESITE.			
M.L. 87, etc.	Coolgardie	Seahill & Gibbons	1,024·67	....	2,752·50
P.A. 6600	Coolgardie	Seahill, A. J.....	30·00	....	90·00
			1,054·67	....	(*a*) 2,842·50
		MANGANESE (*g*).			
				Av. Assay. % Mn.	
M.C.'s 28P, etc.	Peak Hill	Broken Hill Pty., Co., Ltd.	904·00	48·68	5,532·00
M.C.'s 24P, etc.	Peak Hill	Westralian Ores Pty., Ltd.	4,140·80	44·60	30,101·77
			5,044·80	45·30	(*b*)35,633·77
		OCHRE (Red).			
M.C.'s 26 and 29	Murchison	Murchison Minerals (1951)	220·00	....	2,640·00
M.C. 27	Murchison	Cassidy, J. E.	76·55	....	612·00
			296·55	....	(*a*) 3,252·00
		PYRITES ORE AND CONCENTRATES.			
				Sulphur recovered Tons.	
G.M.L.'s 1460, etc.	Dundas	Norseman G.M., N.L.	11,327·00	3,815·33	55·601·00
			(*j*) 42,250·00	18,950·33	366,428·00
			53,577·00	22,765·66	(*a*)422,029·00
		SILVER.			
			Fine Ozs.		
	By-product from	Gold Mining	186,440·98	....	76,568·67
	,, ,,	Lead Mining	416·72	....	..
	,, ,,	Silver/Lead Mining	9,959·08	....	2,937·66
	,, ,,	Silver/Lead/Zinc Mining	2,285·91	....	606·19
	,, ,,	Copper Mining	50·72	....	12·25
			199,153·41	....	80·124,77
		TALC.			
			Tons.		
M.C. 14E	East Coolgardie	Bean, H.	68·25	....	(*a*) 273·00
Loc. M 839 (Three Springs)	O.P.G.	Universal Milling Co.	886·00	....	(*c*) 13,065·75
Loc. 820 (Bolgart)	O.P.G.	Industrial Earth & Minerals Pty., Ltd.	(*k*) 269·36	....	1,344·25
			1,223·61	....	*a c* 14,683·00
		TANTALO/COLUMBITE ORE AND CONCENTRATES (*f*) (*g*).			
			Concentrates Lbs.	Combined $TaNb_2O_5$ Lbs.	
M.C.'s 58, etc.	Greenbushes	Amalgamated Tin Ltd.	(*m*)8,126·00	5,392·00	6,056·00
M.C.'s 221, etc.	Pilbara	McLeod, D.	3,071·00	2,211·00	1,555·00
M.C. 9	Coolgardie	Giles, A. S.	4,523·00	3,321·00	2,398·80
			15,720·00	10,924·00	(*b*) 10,009·80
		TIN (*f*) (*g*).			
			Tons.	Tons.	
M.C.'s 58, etc.	Greenbushes	Amalgamated Tin Ltd.	(*m*) 31·23	19·99	20,956·00
D.C. 111	Greenbushes	South Greenbushes Tin Dredging Syndicate	(*n*) 3·29	2·03	2,122·93
Crown Lands	Greenbushes	Sundry Persons	1·36	·83	882·63
D.C. 25, etc.	Pilbara	Johnston, J. A.	43·93	30·09	31,639·71
D.C. 49, etc.	Pilbara	Thompson, & Stutz	2·38	1·69	1,838·53
Crown Lands	Pilbara	Sundry Persons	11·97	8·22	8,732·98
D.C. 14, etc.	Pilbara	Moolyella Tin Dev., N.L.	1·57	1·12	1,094·17
Crown Lands	West Pilbara	Sundry Persons	1·86	1·29	1,287·00
Crown Lands	Kimberley	Johnstone, W.	·06	·04	42·56
Crown Lands	West Kimberley	Stuart, J. A.	·15	·11	119·75
			97·80	65·41	(*b*) 68,716·26

Table VII.—*Minerals other than Gold*—continued.

Quantity and Value of Minerals, other than Gold, reported during the year 1952.

Number of Lease, Claim, or Area.	Goldfield or Mineral Field.	Registered Name of Producer.	Quantity.	Metallic Content.	Value.
		TUNGSTEN (Scheelite) (*f*) (*g*).			
			Lbs.	WO_3 Content Lbs.	
M.C. 4	East Murchison	Jones & Party	141·00	52·69	51·80
P.A. 2548T	Mt. Margaret....	Hutchinson & Chase	2,275·00	1,676·14	1,906·80
G.M.L. 2516T	Mt. Margaret....	Tarabini & Party	636·00	329·55	348·00
P.P.L. 463	Coolgardie	McRae & Party	2,087·00	1,296·97	1,384·05
			5,139·00	3,355·35	(*b*) 3,690·65
		TUNGSTEN (Wolfram) (*f*) (*g*).			
			Lbs.	WO_3 Content Lbs.	
M.C.'s 30L, etc.	Pilbara	Macdonald, E.	4,213·00	2,753·70	3,459·90
M.C.'s 26L, etc.	Pilbara	Northen Dev. & Mining Co., Pty., Ltd.	41,299·00	26,998·56	33,026·05
M.C.'s 26L, etc.	Pilbara	McLeod, D. W.	1,371·00	911·70	1,200·00
M.C. 46	Murchison	Watkins & Sons	125·00	76·00	89·00
M.C.'s 37, etc.	Murchison	Western Minerals Syndicate....	12,052·00	6,886·00	7,448·60
P.A. 2470	Yalgoo	Carter, King, Triat & Parry	912·00	546·35	648·95
P.A. 2485	Yalgoo	Hards & Bowman	380·00	126·00	146·00
			60,352·00	38,298·31	(*b*)46,081·50
		VERMICULITE.			
			Tons.		
M.C. 187H (Young River)....	O.P.G.	Perth Modelling Works Pty., Ltd.	62·00	....	(*c*) 744·00

Annual Disposals.

Local exfoliation 69·50 tons producing 56·00 tons of " Gold Flake. " Crushed and sized Ore exported from State was 5·00 tons.

References :—O.P.G. denotes Outside Proclaimed Goldfields. (*a*) Value F.O.R. (*b*) Value F.O.B. (*c*) Value at Works. (*d*) Value of Mineral recovered. (*e*) Value at Pit Head. (*f*) Only results from shipments finalised during period under review. (*g*) Metallic content calculated on Assay basis. (*h*) From 1·31 tons copper precipitates. (*i*) Includes 1·50 tons concentrates. (*j*) Concentrates. (*k*) Includes 261·25 tons valued at £A1,306·25, late reported for period 1946 to 1951 inclusive. (*m*) Separated from 35·04 tons (78,500 lbs) of Tin/Tant./Col. Conc. (*n*) Includes 1·74 tons separated from 1·87 tons Tin/Tant./Col. Conc. (Value of T/C Conc. not yet available. (*r*) By-product from Gold Mining.

TABLE SHOWING AVERAGE NUMBER OF MEN EMPLOYED ABOVE AND UNDER GROUND IN THE LARGER GOLDMINING COMPANIES OPERATING IN WESTERN AUSTRALIA DURING THE YEARS FROM 1943 to 1952 INCLUSIVE.

COMPANY.	1943.			1944.			1945.			1946.			1947.			1948.			1949.			1950.			1951.			1952.		
	Above.	Under.	Total.	Above.	Under.	Total.	Above.	Under.	Total.	Above.	Under.	Total.	Above.	Under.	Total.	Above.	Under.	Total.	Above.	Under.	Total.	Above.	Under.	Total.	Above.	Under.	Total.	Above.	Under.	Total.
Anglo-Westralian Mng. Pty.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	47	4	51
Boulder Perseverance, Ltd.	117	96	213	116	101	217	127	115	242	178	148	326	195	159	354	185	148	333	171	135	306	173	138	311	115	119	274	151	115	266
Broken Hill Pty. Co., Ltd.	5	....	5	4	....	4	11	2	13	33	82	115	38	95	133	38	84	122	36	73	109	34	68	102	13	12	25	6	....	6
Blue Spec Gold Mines, Ltd.	5	4	9	28	7	35	32	12	44	38	17	55	36	24	60	17	12	29	1	....	1	20	6	26	33	21	54	36	21	57
Big Bell Mines, Ltd.	29	11	40	14	1	15	29	16	45	171	143	314	186	198	384	188	193	381	197	210	407	219	246	465	230	240	470	203	205	408
Burbidge Gold Mines, N.L.	3	....	3	....	....	....	....	....	....	18	....	18	15	4	19	14	4	18	18	4	22	16	4	20	2	....	2	1	....	1
Consolidated Gold Area, N.L.	13	16	29	1	....	1	1	....	1	2	....	2	2	....	2	2	....	2	1	....	1	1	....	1	3	1	4	1	....	1
Comet Gold Mines, Ltd.	54	28	82	47	30	77	42	33	75	43	32	75	17	7	24	7	10	17	9	13	22	11	12	23	13	11	24	10	8	18
Consolidated Gold Mines of Coolgardie, Ltd.	37	44	81	20	23	43	8	1	9	2	....	2	1	....	1	1	....	1	1	....	1	1	....	1	1	....	1	1	....	1
Central Norseman Gold Corporation, N.L.	82	117	199	72	115	187	77	135	212	103	201	304	111	251	362	117	268	385	133	246	379	163	236	399	148	226	374	151	212	363
Coolgardie Gold Mines, Ltd.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	2	3	1	....	1
Dundas Gold Mines, N.L.	....	....	....	....	....	....	1	1	2	4	13	17	9	22	31	7	17	24	11	15	26	3	9	12	....	....	....	....	....	....
Emu Gold Mines, Ltd.	33	32	65	29	28	57	34	38	72	38	40	78	36	35	71	9	6	15	....	....	....	....	....	....	....	....	....	....	....	....
Edna May Amalgamated, N.L.	30	35	65	35	36	71	33	34	67	29	42	71	28	33	61	11	9	20	....	....	....	....	....	....	....	....	....	....	....	....
Evanston Gold, N.L.	5	7	12	....	....	....	....	....	....	28	32	60	37	26	63	2	....	2	2	....	2	....	....	....	....	....	....	....	....	....
First Hit Gold Mine	17	15	32	21	14	35	20	15	35	7	7	14	4	5	9	2	1	3	1	1	2	1	1	2	....	....	....	....	....	....
Firelight Syndicate	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	2	....	....	....
Golden Horseshoe (New), Ltd.	39	....	39	38	....	38	39	....	39	45	....	45	46	....	46	45	....	45	43	....	43	41	....	41	39	....	39	38	....	38
Gold Mines of Kalgoorlie, Ltd.	95	96	191	90	98	188	103	114	217	144	171	315	169	158	327	166	173	339	175	179	354	187	180	367	181	191	372	185	182	367
Great Boulder Pty., Ltd.	249	329	578	226	305	531	237	344	581	310	469	779	325	496	821	316	418	734	312	392	704	327	404	731	311	354	665	344	339	683
Great Western Consolidated	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	125	72	197	148	60	208
Hill 50 Gold Mine, N.L.	32	42	74	32	41	73	41	45	86	55	48	103	49	55	104	55	67	122	68	78	146	74	66	140	62	41	103	59	48	107
Kalgoorlie Enterprise, Ltd.	....	55	55	....	53	53	....	74	74	....	99	99	....	118	118	1	105	106	7	103	110	7	95	102	8	85	93	8	93	101
Kalgurli Ore Treatment Co., Ltd.	65	....	65	67	....	67	68	....	68	73	....	73	69	....	69	69	....	69	74	....	74	74	....	74	77	....	77	81	....	81
Lake View and Star, Ltd.	218	186	404	225	214	439	246	242	488	337	422	759	366	468	834	414	465	879	454	441	895	471	476	947	492	517	1,009	486	529	1,015
Moonlight Wiluna Gold Mines, Ltd.	18	61	79	16	44	60	4	5	9	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Marvel Loch Gold Mines, Syndicate	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	1	....	....	....
Moonlight Wiluna Gold Mines, Ltd. (Timoni)	10	10	20	4	2	6	2	....	2	13	11	24	18	20	38	13	20	33	18	18	36	33	32	65	42	42	84	42	41	83
Mountain View Gold, N.L.	....	....	....	....	....	....	....	....	....	....	....	....	7	9	16	11	8	19	10	14	24	11	11	22	13	7	20	5	3	8
Mt. Charlotte (Kalgoorlie) Gold Mines, N.L.	....	....	....	....	....	....	....	....	....	....	....	....	2	1	3	18	18	36	24	28	52	10	8	18	2	....	2	2	3	5
North Kalgurli (1912), Ltd.	37	91	128	42	107	149	52	131	183	62	173	235	66	213	279	76	265	341	79	304	383	90	316	406	133	348	481	112	293	405
New Milano, N.L.	6	8	14	1	....	1	2	....	2	2	1	3	2	2	4	2	1	3	1	....	1	1	....	1	....	....	....	....	....	....
*Norseman Gold Mines, N.L.	101	104	205	87	72	159	98	56	154	105	79	184	12	19	31	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
New Coolgardie Gold Mines, N.L. (Barbara Leases)	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	12	9	21	78	64	142	73	125	198	73	120	193	65	109	174
New Coolgardie Gold Mines, N.L. (Callion Leases)	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	6	21	27	6	29	35
Ora Banda Amalgamated, Ltd.	22	26	48	7	5	12	4	....	4	11	20	31	23	44	67	5	4	9	3	1	4	2	....	2	1	....	1	1	....	1
Paringa Mining and Exploration Co., Ltd.	59	88	147	78	82	160	69	103	172	76	113	189	83	117	200	87	134	221	79	134	213	92	138	230	47	46	93	10	6	16
Phoenix Gold Mines, Ltd.	35	36	71	40	38	78	48	33	81	50	30	80	50	30	80	33	22	55	....	....	....	....	....	....	....	....	....	....	....	....
Porphyry (1939) Gold Mines, Ltd.	....	....	....	....	....	....	....	....	....	....	....	....	2	1	3	18	18	36	24	28	52	10	8	18	6	1	7	1	....	1
Radio Gold Mines	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	5	3	8	4	4	8
South Kalgurli Consolidated	67	77	144	43	74	117	51	80	131	80	91	171	103	105	208	107	111	218	110	105	215	120	107	227	124	110	234	67	102	169
Sons of Gwalia, Ltd.	101	125	226	101	115	216	104	106	210	122	160	282	108	128	236	98	109	207	92	143	235	104	151	255	121	129	250	121	118	239
Sunshine Reward Amalgamated Leases	5	6	11	5	5	10	4	3	7	5	7	12	8	9	17	9	10	19	9	14	23	10	9	19	10	7	17	9	7	16
Triton Gold Mine	4	10	14	8	15	23	11	23	34	41	66	107	83	178	261	64	95	159	7	....	7	....	....	....	....	....	....	....	....	....
Wiluna Gold Mines, Ltd.	255	282	537	237	244	481	214	196	410	168	96	264	117	5	122	69	....	69	49	....	49	29	....	29	20	....	20	13	....	13
Yellowdine Gold Development, Ltd.	30	28	58	13	9	22	2	....	2	4	....	4	2	....	2	2	....	2	2	....	2	1	....	1	....	....	....	....	....	....
All other Operators	599	495	1,094	511	437	948	599	388	987	1,002	674	1,676	1,174	993	2,167	1,127	972	2,099	965	825	1,790	985	837	1,822	879	661	1,540	850	598	1,448
State Average (incl. Diggers)	2,488	2,591	5,079	2,266	2,348	4,614	2,424	2,394	4,818	3,416	3,545	6,961	3,612	4,037	7,649	3,416	3,762	7,178	3,260	3,540	6,800	3,404	3,676	7,080	3,378	3,388	6,766	3,265	3,129	6,394
*Also additional men engaged exclusively on Pyrites Production	6	27	33	7	33	40	5	49	54	4	53	57	78	56	134	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....

* Converted solely to Pyrites production after 1947.

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