LAND ACCESS UNIT
DEPARTMENT OF MINERALS & ENERGY

REPORT EV 113

COMPLETION REPORT ON LUNETTE GYPSUM RESOURCE, LAKE GRACE SOUTH

by

M.J. Freeman

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SUMMARY

Following completion of assaying of samples collected from the area of gypsum lunettes on the southeastern shore of Lake Grace South, the maximum quantity of gypsum available for extraction is calculated to be in the order of 70 tonnes (70 kt). This mass is exclusive of the uppermost 10 cm of topsoil which woud be needed for rehabilitation purposes. However, this mass is critically dependent on how close the mining equipment can go approaching the underlying soft muds without sinking. If a layer of 20 cm of gypsum has to be left overlying the muds, then the available quantity is reduced to a maximum of the order of 35 kt.

INTRODUCTION

Report EV111 described observations and measurements made and samples collected during, and calculations completed following a visit to an area of gypsum on the southeast shore of Lake Grace South on 11-12/9/95. This report now concludes the reporting with sample analyses and with confirmation of the quantity of gypsum likely to be present at the site. The reader is referred to the earlier report for details of the background information.

ANALYTICAL RESULTS

The results are shown in Table 1 and the analytical report is in Appendix 1. Analyses of sampling conducted in April 1994 (109 813-109 819) are also included.

Table 1. Analytical results, Lake Grace South gypsum samples

c	SECTION OR SAMPLE	GYPSUM $CaSO_4.2H_2O$ %	HALITE NaCl %
109 813	DMB 23A	94.8	0.3
109 814	DMB 23B	92.4	0.6
109 815	DMB 23C	81.9	1.5
109 816	DMB 24A	93.6	0.3
109 817	DMB 24B	85.3	0.7
109 818	DMB 25A	77.6	2.0
109 819	DMB 25B	86.5	1.3
109 849	DMB 28	88.5	0.1
109 850	DMB 28	83.5	0.6
109 851	DMB 28A	90.8	0.2
109 852	DMB 28A	91.0	0.6
109 853	DMB 28A	86.7	0.6
109 854	DMB 28A	91.6	1.3
109 855	DMB 28A	91.4	0.2
109 856	DMB 28A	90.5	0.2
109 857	DMB 24	94.1	0.1
109 858	DMB 24	87.2	0.1
109 859	DMB 24	51.0	0.9
109 860	DMB 24	91.4	0.4
109 861	DMB 24	86.3	0.7
109 862	DMB 24	80.9	1.3
109 863	DMB 24	91.2	0.1
109 864	DMB 24	88.5	0.5
109 865	DMB 23	<1.0	1.5
109 866	DMB 23	9.5	2.3
109 867	DMB 23	24.3	1.5
109 868	DMB 23	1.3	2.8
109 869	DMB 23	38.2	1.8
109 870	DMB 23	<1.0	1.7
109 871	DMB 23	92.3	1.2
109 872	DMB 23	91.4	1.0
109 873	DMB 23	68.1	3.0
109 875	DMB 23	93.1	0.1
109 876	DMB 23	88.8	0.9
109 877	DMB 31	85.9	1.0
109 878	DMB 31	86.6	2.4
109 879	DMB 32	92.4	0.9
109 880	DMB 32	89.3	2.3
109 881	DMB 32	93.2	0.1

Two of the deeper samples were collected with minimal drainage of the groundwater being allowed in the field. It was intended that these should be dried and analysed to give the halite (NaCl or common salt) concentration of the *in situ* gypsum. However, liquid leaked from the sample bags prior to analysis. Therefore it is assumed that the halite concentration is lower than *in sit*u, but it is not considered to be significantly lower. These samples were 109 862 and 873.

Discussion

The average values of these assays (with standard deviation in brackets) is 89.3% (3.6%) gypsum with 0.7% (0.6%) halite, which is acceptable for farm gypsum, although two samples as individuals have over 2% halite. The sampling does not demonstrate that the deeper gypsum is consistently enriched in halite, thereby not constraining the farm gypsum to only come from the near-surface material. Samples of gypsum from the higher ridges have an average of 89.6% gypsum and 0.4% halite (8 samples) and is slightly depleted in halite than the average, whereas samples from the lower gypsum have averages of 90.4% and 0.6% respectively (12 samples).

Samples from section DMB 31 have acceptable gypsum contents, but the halite concentration is elevated, and therefore the previous inference of restricting the resource material to the areas south of this section is substantiated. The deeper (20-40 cm) sample from the eastern end of Section DMB 32 has elevated halite, and this downgrades the potential resources marginally. In Section DMB 23, the middle sample site is underlain be low grade, saline gypsum and downgrades the gypsum potential slightly. At the eastern end, the section of three sample pits clearly shows there is no potential for farm-quality gypsum east of the higher ridge on which the illegal mining has occurred. There is a consistent gradation of gypsum concentration downward and to the east. It is of interest to note that the surficial material which has an efflorescent surface is developed when the gypsum content is as low as about 25%. In Section DMB 24, the gypsum is all of acceptable quality except the deepest sample at the eastern end which has only 51% gypsum. The potential resources are downdraded marginally because of this sample. Further south, sample analyses on Sections DMB 28 and 28A are all of acceptable quality.

Therefore it is concluded that of the four alternative scenarios presented for resources in Report EV 111, the last is probably the best indication of the quantity of gypsum which may be available from the area, which is that approximately 70 kt is the maximum which could possibly be extracted. This quantity would be effected by the ability to extract the gypsum from near the lower, saturated horizon, because of problems of the mining machinery sinking into the gypsum and underlying clay and becoming bogged. This factor could have a major effect on the mineable quantity, and evaluation of the implications will have to await until trials can be conducted. It is highly likely that the amount of gypsum which would have to be left would be much greater in winter or spring because of the greater amount of water present. Calculations as shown in Table 2 indicate a maximum resource of about 35kt may be present if 20 cm of gypsum has to be left behind after removal of the saleable quantity, and commensurately larger or smaller amounts would be expected as this thickness of remaining gypsum varies.

Table 2. Maximum likely amount of gypsum available retaining only 10 cm of topsoil

	Gypsum retaining 10 cm topsoil only					Gypsum retaining 10 cm top-soil and leaving basal 20 cm		
SECTION	Width (m)	Height (m)	Length (m)	Volume (m^3)	Mass (@S.G. 1.8)	Height (m)	Volume (m^3)	Mass (@S.G. 1.8)
HIGHER LUNETTE								
DMB29 east	15.0	0.9	150.0	1 012.5	1 518.8	0.7	787.5	1 181.3
DMB29 west	25.0	1.8	400.0	9 000.0	13 500.0	1.6	8 000.0	12 000.0
DMB28	10.0	0.9	500.0	2 250.0	3 375.0	0.7	1 750.0	2 625.0
DMB24	10.0	1.4	300.0	2 100.0	3 150.0	1.2	1 800.0	2 700.0
DMB23	20.0	1.4	500.0	7 000.0	10 500.0	1.2	6 000.0	9 000.0
Total					32 043.8			27 506.3
"SHEET" GYPSUM								
DMB28A	25.0	0.5	350.0	4 375.0	6 562.5	0.3	1 312.5	1 968.8
DMB 24	60.0	0.3	500.0	9 000.0	13 500.0	0.1	1 500.0	2 250.0
DMB 23	85.0	0.4	400.0	13 600.0	20 400.0	0.2	3 400.0	5 100.0
DMB 32	40.0	0.2	100.0	800.0	1 200.0	0.0	0.0	0.0
Total					41 662.5			9 318.8
Grand total					73 706.3			36 825.0

Footnote: Even though these values are quoted to the nearest tonne, the precision of the measurements means that the results of the calculations should not be taken to any more than two significant figures.

OTHER GYPSUM

Three additional samples are reported upon in Appendix 1. 109 882 was collected from the floor of a large playa lake located 24 km southeast of Pingrup. The playa is located immediately northwest of the intersection of Cowcher and Dunnart roads and at approximate grid reference 856 000 mE 269 200 mN on the Lake Joy 1:50 000 map sheet. This sample contained 75.1% $CaSO_4.2H_2O$, but is severely salt-contaminated, with 5.6% NaCl. The sample was collected to ascertain if there was gypsum present which had potential for farm applications. It is concluded that without washing out the salt, it is unacceptable.

The remaining two samples were collected to document the analyses of gypsum currently being supplied for farm supplies. 109 883 was collected from Lake Cobham. Gypsum mining for agricultural use is currently proceeding from Mining Lease M70/273. This sample was collected by taking numerous small subsamples from all over and within the run-of-mine stockpile which had been generated for sale. It contains 90.3$% $CaSO_4.2H_2O$ and 1.2% NaCl.

109 884 was collected from M70/234, which is an active gypsum producer located 7 km west of Lake King townsite. A slot was dug to a depth of about 2 m below the water

table, and had apparently exposed gypsum for its full depth. Th slot material consisted of seed gypsum but with scattered crystals up to 3 cm across. The analysis of a sample composited from various from parts of the stockpile gave 81.4% $CaSO_4.2H_2O$ and 0.5% NaCl. Water in the slot tasted highly saline (?seawater-like), and therefor it is inferred that the majority of the NaCl was washed out by rainfall.

CONCLUSION

There is a geological resource of up to about 90 kt of seed gypsum in the area of gypsum lunettes on the southeast shore of Lake Grace South, with a grade indicated to average approximately 90% $CaSO_4.2H_2O$ and with less than 1% NaCl. If a topsoil thickness of 10 cm is excluded, the mass is approximately 70 kt. Further, if a basal layer of gypsum must be left behind because of the underlying soft muds, the mass available is indicated to decrease to about 35 kt. Small patches of gypsum from the lower parts of the deposit have NaCl concentrations, when dried, of just over 2%, and therefore it is recommended that if the basal gypsum is mined that it be blended from at least two sites and to ensure the NaCl is below this value.

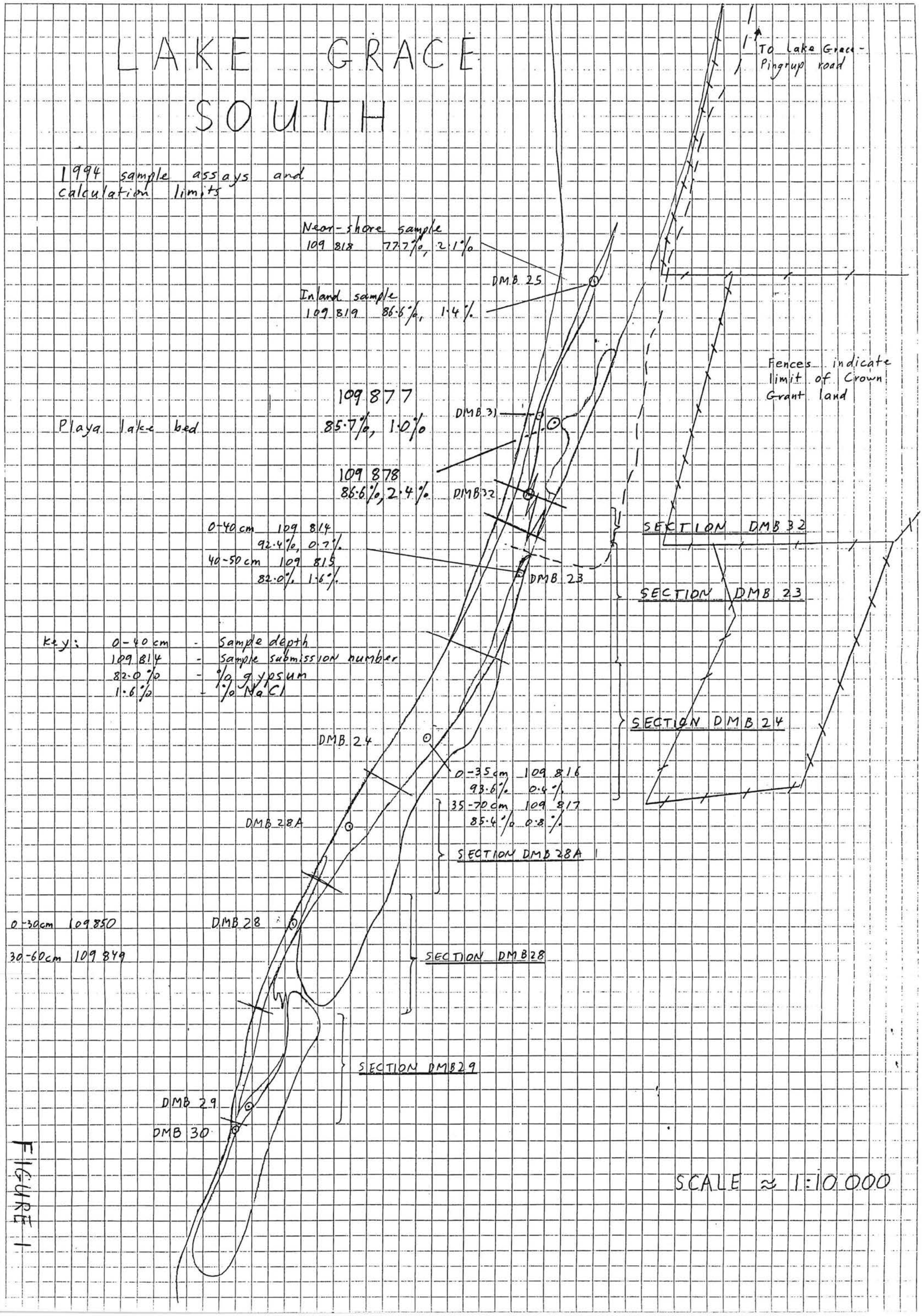
Perth
1/11/95

APPENDIX 1

ANALYTICAL REPORT

LAKE GRACE SOUTH

1994 sample assays and calculation limits



SCALE ≈ 1:10 000

FIGURE 1

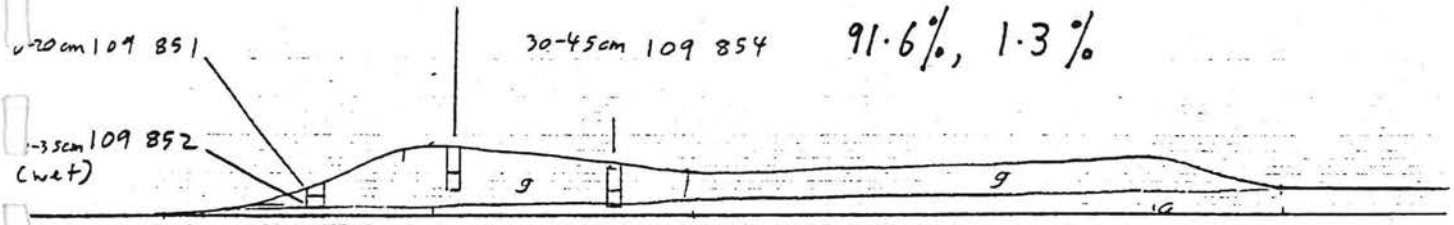
DMB 28A

0-30 cm 109855 91.4%, 0.2%

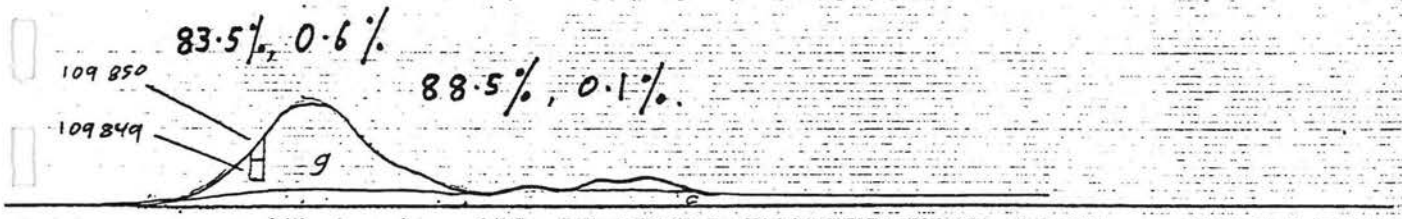
30-55 cm 109856 (Base wet) 90.5%, 0.2%

0-30cm 109853 86.7%, 0.6%

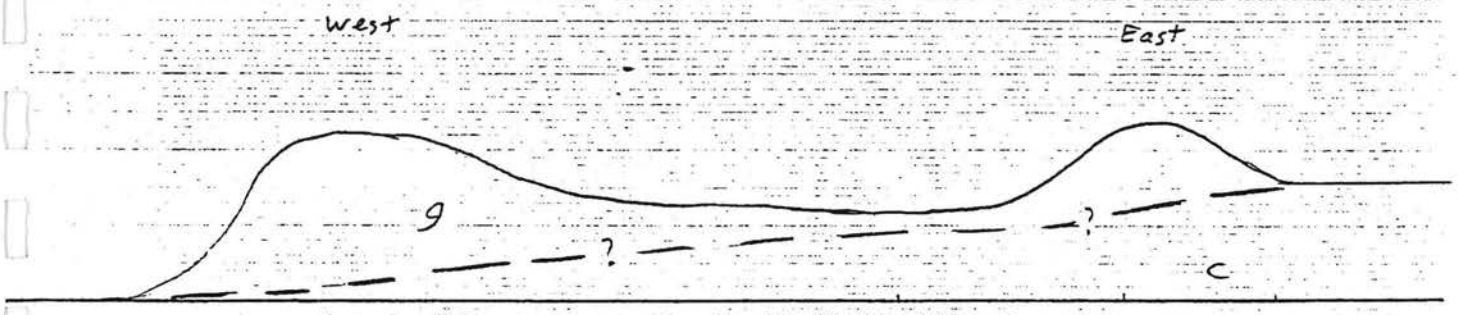
30-45cm 109854 91.6%, 1.3%



DMB 28



DMB 29



83.5%, 0.6% : % gypsum, % halite

c: clay

g: gypsum

SCALE Vert 1:100

Horiz 1:500

FIGURE 2

DMB 23

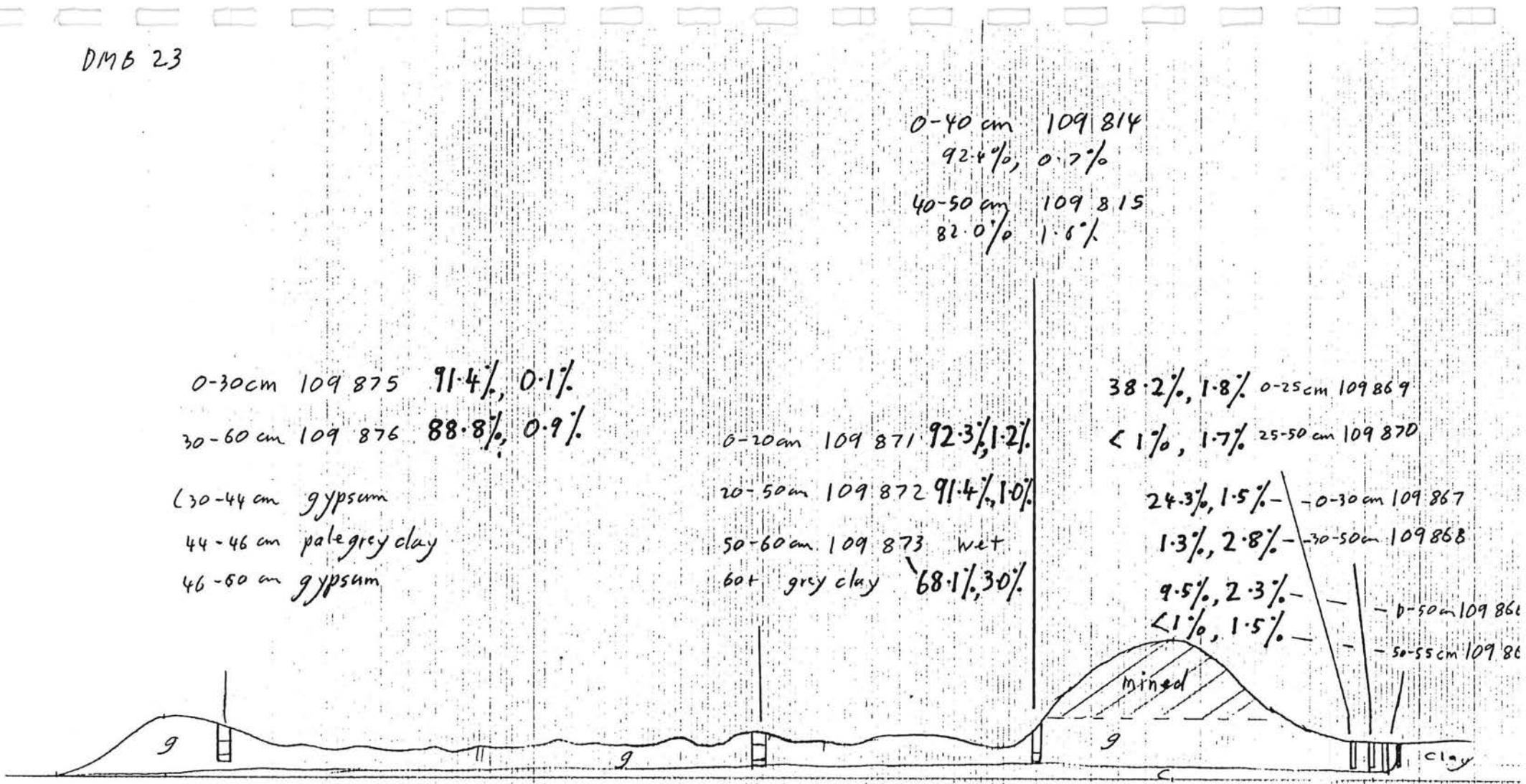


FIGURE 3

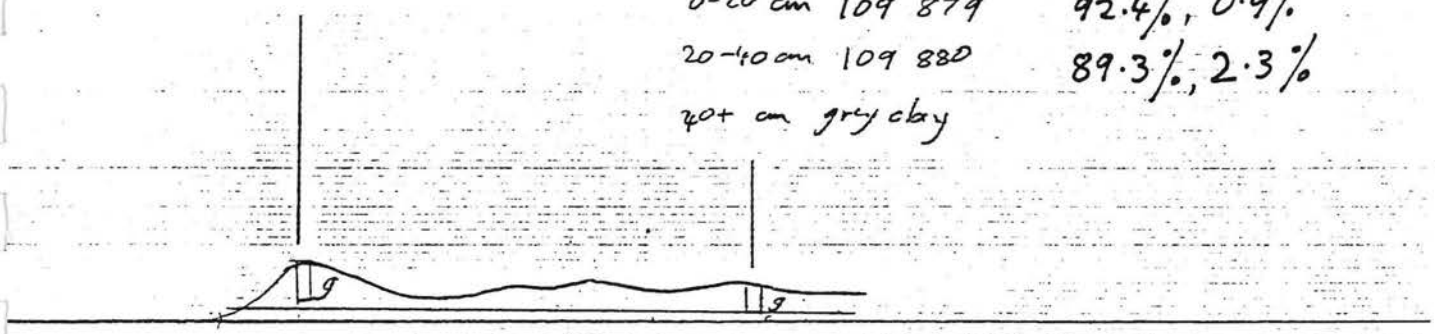
c: clay

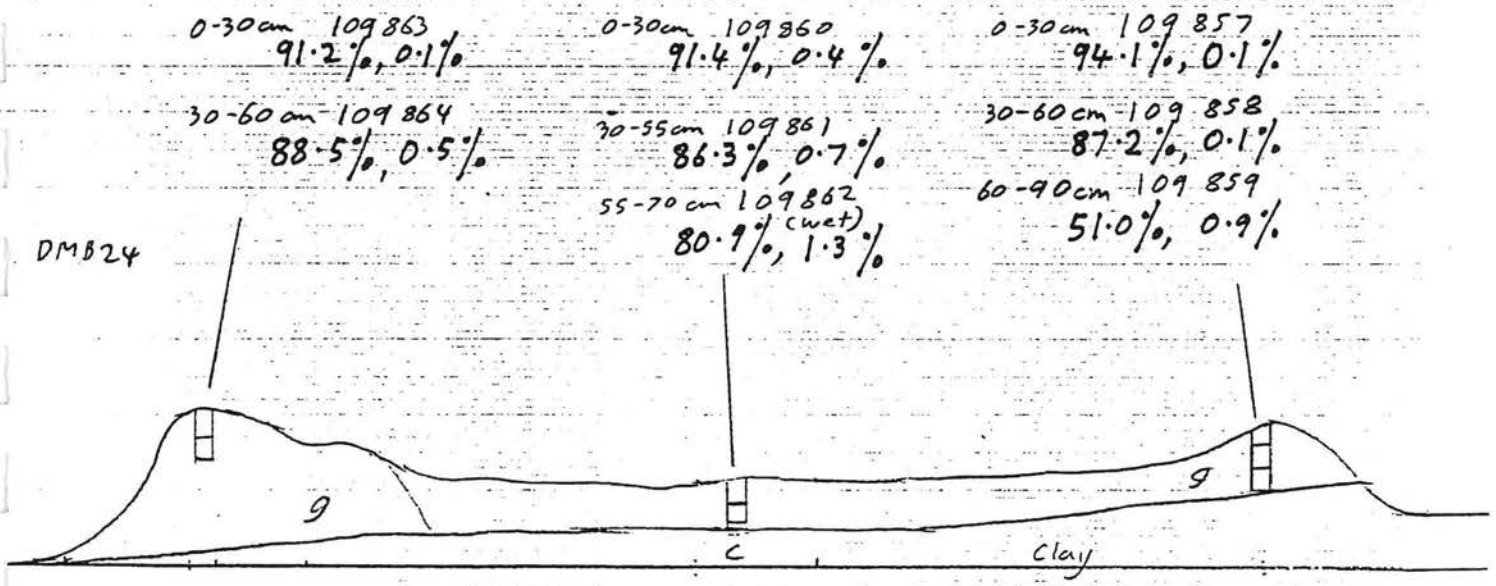
g: gypsum

91·4%, 0·1%: % gypsum, % halite

DMB 32

0-40 cm 109 881 93·2%, 0·1%





c: clay 91·2%, 0·1%: %gypsum, %halite Scale Vert 1: 100

g: gypsum Horiz 1: 500

FIGURE 4

19/7210/430
Lab. No. 95A542001-35

CHEMISTRY CENTRE

DIRECTOR GENERAL
Department of Agriculture
Baron-Hay Court
SOUTH PERTH WA 6151

ATTENTION: N Schoknecht

Report on 35 samples of seed gypsum
received on 18-OCT-1995

27-OCT-1995

LAB NO	SAMPLE	Gypsum	Salt
95A		%db$	%db$
542001	109849	88.5	0.1
542002	109850	83.5	0.6
542003	109851	90.8	0.2
542004	109852	91.0	0.6
542005	109853	86.7	0.6
542006	109854	91.6	1.3
542007	109855	91.4	0.2
542008	109856	90.5	0.2
542009	109857	94.1	0.1
542010	109858	87.2	0.1
542011	109859	51.0	0.9
542012	109860	91.4	0.4
542013	109861	86.3	0.7
542014	109862	80.9	1.3
542015	109863	91.2	0.1
542016	109864	88.5	0.5
542017	109865	<1.0	1.5
542018	109866	9.5	2.3
542019	109867	24.3	1.5
542020	109868	1.3	2.8
542021	109869	38.2	1.8
542022	109870	<1.0	1.7
542023	109871	92.3	1.2
542024	109872	91.4	1.0
542025	109873	68.1	3.0
542026	109875	93.1	0.1
542027	109876	88.8	0.9
542028	109877	85.9	1.0
542029	109878	86.6	2.4
542030	109879	92.4	0.9
542031	109880	89.3	2.3
542032	109881	93.2	0.1

..../2

Chemistry Centre (WA)
125 Hay Street, East Perth, Western Australia 6004 Phone (09) 222 3177, Facsimile (09) 325 7767

LAB NO	SAMPLE	Gypsum	Salt
95A		%db$	%db$
542033	109882	75.1	5.6
542034	109883	90.3	1.2
542035	109884	81.4	0.5

Gypsum = Gypsum,CaSO4.2H2O, calculated from sulphur,S
Salt = Sodium chloride,NaCl, calculated from sodium,Na
%db$ = per cent air-dried basis

These samples were dried at 40 C prior to preparation. This has been called "air-dried" on the report.
The results apply only to samples as received.

Cost $638.00

N.E.ROTHNIE
CHIEF
AGRICULTURAL CHEMISTRY LABORATORY

Copy to: M Freeman
Dept. of Minerals & Energy
Land Access Unit
100 Plain Street(10th Floor)
EAST PERTH WA 6004

LAKE CHINOCUP GYPSUM - SAMPLES FROM LAKE GRACE SOUTH

SAMPLE	CCWA	Assays (%)			Calculations (%)	
		CaO	Cl	Na	CaSO4 2H2O	NaCl
109813	1	30.90%	0.22%	0.16%	94.87%	0.38%
109814	2	30.10%	0.42%	0.27%	92.41%	0.69%
109815	3	26.70%	1.00%	0.59%	81.98%	1.59%
109816	4	30.50%	0.23%	0.14%	93.64%	0.37%
109817	5	27.80%	0.45%	0.31%	85.35%	0.76%
109818	6	25.30%	1.33%	0.75%	77.68%	2.08%
109819	7	28.20%	0.89%	0.49%	86.58%	1.38%
					87.50%	1.04%