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DEPARTMENT OF MINES
SOUTH AUSTRALIA

GEOLOGICAL SURVEY
NON-METALLIC MINERALS SECTION

TESTING OF BORES FROM THE EUCLA BASIN AND OFFICER BASIN FOR SEDIMENTARY PHOSPHATE

by

P. J. Russ
Geologist

Rept. Bk. 60/99
G.S. 3146
D.M. 1516/64

60/99

18th May 1965

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TESTING OF BORES FROM THE EUCLA AND OFFICER BASINS FOR SEDIMENTARY PHOSPHATE

ABSTRACT

Phosphate testing of bores from the Eucla and Officer Basins showed that phosphate is distributed throughout the sediments in only small amounts; usually less than 1% P_2O_5. The highest values of P_2O_5 recorded were 1.65% from Nullarbor No. 8 Bore and 1.6% from Eyre No. 1 Well. No significant concentrations of phosphate were detected in any particular bed.

INTRODUCTION

Following the need to locate deposits of phosphate in Australia, bores from the Eucla and Officer Basins were checked for possible phosphate content.

The objectives of the testing were twofold, namely, to test for the presence of phosphate and if possible to determine whether there is any particular stratigraphic horizon in which the phosphate may be concentrated.

BORES TESTED

The bores tested are listed below. Their positions are shown on the locality map.

Eucla Basin

Albala Karoo	Muddaugana
Cook No. 1	Nullarbor No. 6
Eyre No. 1	Nullarbor No. 7
Gambanga No. 1	Nullarbor No. 8
Guinewarra	Roberts Well

Officer Basin

Emu No. 1 Well

METHOD OF TESTING

Samples were tested with ammonium molybdate solution acidified with nitric acid; a yellow precipitate indicating the presence of phosphate.

The following terms were used to describe the various grades of reaction:-

No Reaction	No yellow colouration
Very Weak	A faint yellow transparent colouration
Weak	A distinct but weakly developed transparent yellow.
Fair	A definite somewhat cloudy yellow.
Moderate	A cloudy yellow thicker and brighter than for fair.
Strong	A thick opaque bright yellow.

On the basis of these reactions, samples were drawn from those, which gave positive results for chemical analysis to determine the P_2O_5 content. At the same time a number of samples which gave no reaction were also analysed to serve as a control.

RESULTS

No significant concentrations of phosphate were detected. The results show that phosphate is distributed throughout the sediments but only in small amounts.

The average P_2O_5% for samples chemically analysed was 0.18%. This value would be higher than the average for all the strata tested as for the main part, only those samples showing reaction were selected for chemical analysis.

Most samples recorded percentages of P_2O_5 less than one percent. The highest values were 1.6% from Eyre No. 1 Well, at a depth of 1470'-1500', 1.65% (1170'-1200'), and 1.35% (1240'-1260') both from Nullarbor No. 8 Bore. In each case the sediments are of Cretaceous age.

No phosphorite grains were detected.

In the Eucla Basin there is no particular concentration within any one formation. Each formation contains sediments

which give positive results with ammonium molybdate and also materials which give no reaction.

In the Officer Basin, the surface is covered by drift and alluvial materials. Outcrops are few and scattered. Only one stratigraphic well has been sunk. It penetrates siltstones, sandstones, shales and limestones to a depth of 1370'. The formations have not been named. They are considered to be of Proterozoic Age. For the most part the sediments give a positive reaction with ammonium molybdate but there is no concentration in any particular beds.

OBSERVATIONS ON THE METHOD OF TESTING

Some difficulties were encountered with the test. Powdered limestones which effervesced strongly often produced a thick white precipitate which may have masked any phosphatic reactions.

In other instances the nitric acid of the reagent was reduced and brown fumes of nitrogen dioxide were evolved. In some cases this was accompanied by the formation of a green precipitate. Green precipitates were also formed without the evolution of nitrogen dioxide. On adding concentrated nitric acid the green turned to a yellow. However, this colour may not indicate a phosphate as yellow molybdic acid may be precipitated with an excess of nitric acid. But other phosphatic minerals (e.g. Boolcoomatta apatite samples) were shown to give green precipitates which later turned yellow, both with and without the addition of excess nitric acid.

Furthermore the range of colours produced in no way corresponds to a definite percentage, or range of percentages, of P_2O_5. The range is shown in the table.

Category	Range of P_2O_5	Average	No. of Samples
No Reaction	.05 to .15%	.075%	16
Very weak	.05 to .30%	.15%	52
Weak	.05 to 1.65%	.26%	20
Fair	.05 to .40%	.15%	13
Moderate	.05 to 1.6%	.66%	4
Strong	.15% only one sample		1

In its present form ammonium molybdate reagent provides a good empirical test for phosphate; but it is not satisfactory for quantitative work.

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PJR:AGK
18/5/65

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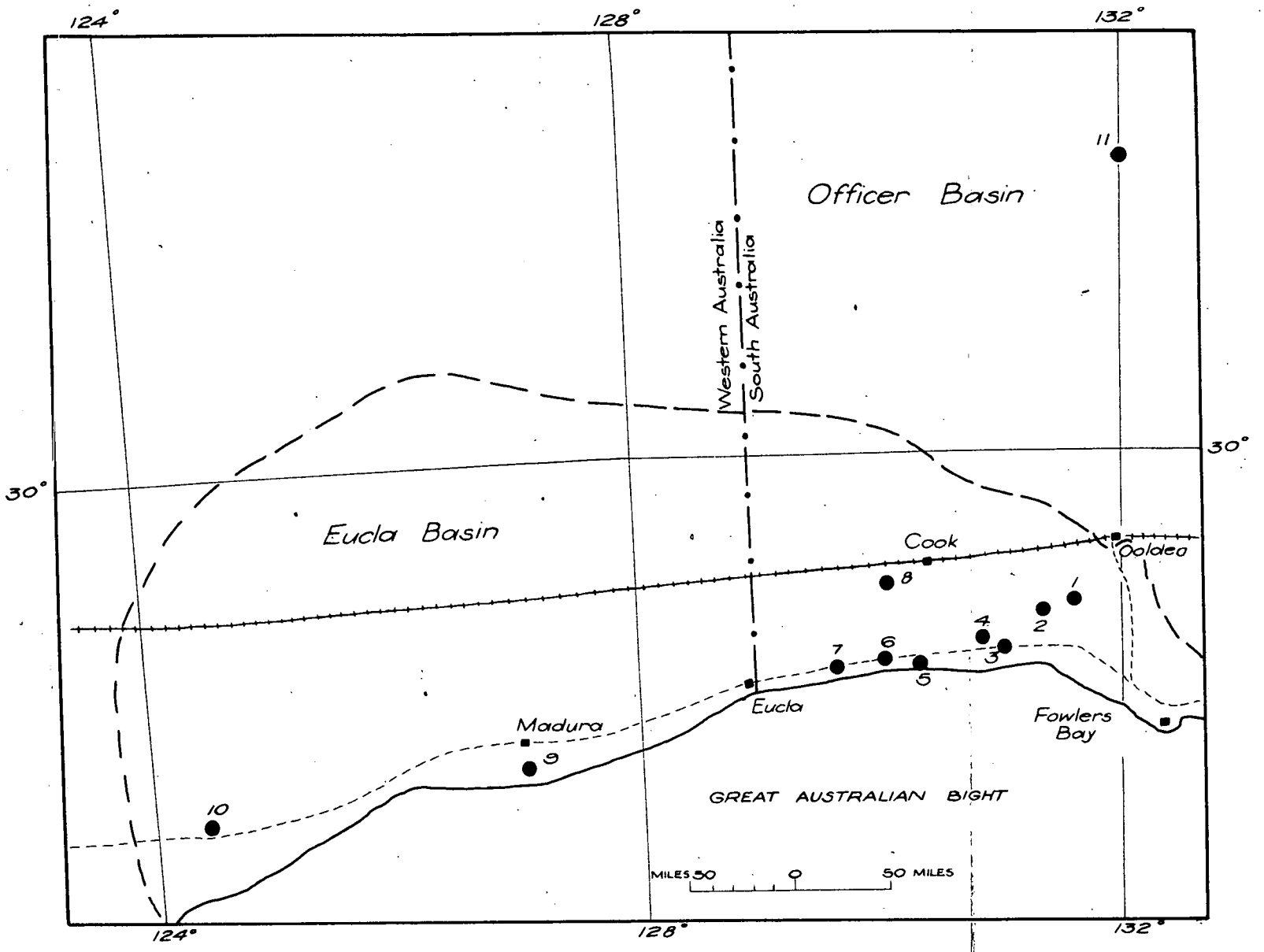


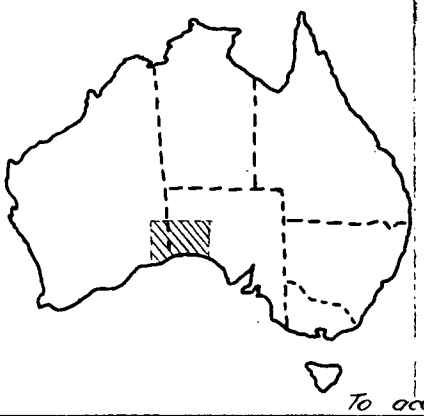
Eucla Basin

1. Nullarbor Nº 7.
2. Nullarbor Nº 6.
3. Roberts Well.
4. Muddaugana.
5. Nullarbor Nº 8.
6. Guinewarra.
7. Albala Karoo.
8. Cook.
9. Gambanga Nº 1.
10. Eyre Nº 1.

Officer Basin.

11. Emu Nº 1. Well.

Road. ------
Railway. +-+-+-+-
Wellsite. ●
Town. ■



To accompany report by P.J. Russ

DEPARTMENT OF MINES — SOUTH AUSTRALIA

LOCATION OF BORES TESTED FOR PHOSPHATE

		Drn.	SCALE: 1 inch = 75 miles (approx.)
		Tcd. T.P.S.	65-424
		Ckd.	994·1/2
Director of Mines		Exd.	DATE: 13-5-65

Bore	Depth		Formation	Lithology	Ammonium Nitro-Molybdate Reaction	Content P_2O_5%
Albala Karoo	0- 326'	Upper Eocene	No samples			
	326'		Wilson Bluff Limestone	White chalky limestone	No reaction	
	326- 391		"	"	"	
	391		"	"	"	.05
	391- 532		"	"	"	
	532-		"	"	"	.05
	532- 596		"	"	"	
	596		"	"	"	
	596- 610		"	"	"	
	610- 640	Eocene	Pidinga Group	Dark, sandy, clay	"	
	640			"	"	.10
	650			Greenish sandy clay	"	
	660 app.	Cretaceous	Cretaceous shales (unnamed)	Greenish grey argillaceous material	"	
	670 app.			"	"	
	680 app.			"	Very weak	
	App. 680- 916			"	"	
	916- 925			Green sandy clay	No reaction	
	933			Greenish clay	Weak	.10
	938- 940			"	No reaction	.15
	940- 966			Sandy clay	"	
	966- 978			White sandy clay	Moderate	.05
	978- 995			"	No reaction	
	1044			"	"	
	1050			Brown sandy clay	Very weak	
	1073			Grey sandy clay	Very weak	
Cook No. 1	0- 25		Wilson Bluff Limestone	Limestone	No reaction	
	25- 150			White sandy limestone	"	
	150- 175		No samples			
	175- 200			"		
	200- 220			Cream sandy limestone	Very weak	.10
	220- 230		No samples			
	230- 275			Cream sandy limestone	Very weak	
	275			"	"	.15
	275- 295			"	"	
	295- 300		No samples		"	
	300- 335			"	Ver weak	

Bore	Depth	Formation	Lithology	Ammonium Nitro-Molybdate Reaction	Content P_2O_5%
Cook	335		Cream sandy limestone.	Very weak	.05
No. 1	335- 340		"	No reaction	
(ctd.)	340- 350	Eocene	Dark carbonaceous clay	"	
	345		"	Very weak	.10
	350- 450	No samples	Brown mudstone	No reaction	
	450- 460		Brown sandy clay	"	
	460- 530		"	"	
	530- 580		Grey sandy clay	"	
	580- 640	Cretaceous ?	Grey siltstone	"	
	640- 666		Grey siltstone with some calcareous material.	"	
Cook					
No. 1C	660- 670		Grey limestone and clay	"	
	670- 690		Grey clay	"	
	690- 710		Grey limestone	"	
	710- 720		Quartz sand	"	.05
	720- 750		Greyish brown calcareous clay with quartz grains.	"	
	750- 760		Calcareous sandy clay.	Very weak	.10
	760- 770		Calcareous quartz sand	No reaction	
	770- 780		Calcareous sand and siltstone	"	
	780- 790		Calcareous siltstone	"	
	790- 800		Calcareous sandy clay	"	
	800- 865		"	"	
	865- 915		Calcareous grey sand	"	
Emu	0- 10		Brown sand	Very weak	.15
No. 1	10- 20	Unnamed	"	No reaction	
	20- 30		Red-brown sand	"	
	30- 40	Age Upper Proterozoic?	Quartz sand with clay particles	Very weak	.20
	40- 50		Red brown sandstone	"	.15
	50- 60		Shale and sandstone	"	
	60- 70		Brown sandstone		
	70- 80		Red-brown weathered shale	No reaction	
	80- 90		Red-brown sandstone	Very weak	.15
	90- 100		"	"	
	100- 110		"	"	.15
	110- 120		Red clay	"	
	120- 130		" " and sand	"	.25

Bore	Depth	Formation	Lithology	Ammonium Nitro-Molybdate Reaction	Content P_2O_5 %
Emu No. 1 (ctd.)	130- 140		Red sandstone	Very weak	
	140- 150		"	No reaction	
	150- 160		Red brown clay	Very weak	.15
	160- 170		"	No reaction	
	170- 180		Red sandstone	Very weak	.20
	180- 190		"	No reaction	
	190- 200		Red-grey shale	"	
	200- 209		Limestone	"	
	209- 214		Red-grey clay	Very weak	
	214- 219		"	"	
	219- 220		"	"	.15
	220- 230		Red-brown shale	"	
	230- 240		"	No reaction	
	240- 260		Limestone	Very weak	
	260- 270		Brown shale	No reaction	
	270- 280		Brown calcareous sediment	Very weak	
	280- 290		"	"	.20
	290- 300		Brown sandstone	"	
	300- 310		Brown shale	"	
	310- 320		Brown sandstone	No reaction	
	320- 330		Brown and grey calcareous sediment	Weak	
	330- 340		Brown and grey shale	Very weak	
	340- 350		Blue limestone and red shale	"	
	350- 360		Blue limestone	"	.15
	360- 390		"	"	
	390- 400		"	"	.15
	400- 440		"	"	
	440- 450		"	Weak	.15
	450- 470		"	"	
	470- 480		"	"	
	480- 490		"	"	
	490- 511		"	Very weak	
	511- 520		"	"	.10
	520- 530		"	"	
	530- 540		"	"	.10
	540- 550		"	"	
	550- 560		" with some weathered shale.	"	
	560- 570		Brown shale	Very weak	.20
	570- 590		"	"	

Bore	Depth	Formation	Lithology	Ammonium Nitro-Molybdate Reaction	P_2O_5% Content
Emu No. 1 (ctd.)	590- 610	No samples	Red clay	No reaction	
	610- 620				
	620- 630		Brown shale with white calcareous material	Very weak	.15
	630- 670		Brown shale with white limestone	No reaction	
	670- 680		" "	Very weak	.20
	680- 720		Brown and grey weathered shale.	"	
	720- 730		"	"	
	730- 780		"	"	
	780- 790		"	"	.20
	790- 812		"	"	
	812- 815		Brown clay	"	
	815- 820		Blue limestone	"	.20
	820- 830		Brown argillaceous sediment	"	.20
	830- 837		"	"	
	837- 840		Blue grey calcareous sediment contaminated with cement and mica	Weak	
	840- 850		Brown clay	No reaction	
	850- 860		"	Very weak	
	860- 910		Blue limestone	"	
	910- 916		"	"	.25
	916- 950		"	"	
	950- 960		"	"	.17
	960- 970			No reaction	
	970- 980			"	
	980-1010		Grey brown calcareous sediment	Very weak	
	1010-1050		"	No reaction	
	1050-1070		"	"	
	1070-1080		"	Very weak	.15
	1080-1090		"	"	
	1090-1100		"	"	
	1100-1105		"	No reaction	
	1110-1115		Brown clay	"	
	1115-1120		Brown siliceous material	"	
	1120-1130		"	Very weak	.15
	1130-1140		"	"	
	1140-1145		Brown siliceous material and clay	No reaction	
	1145-1190		"	"	
	1190-1200		"	Very weak	.15
	1200-1216		Brown clay	No reaction	

Bore	Depth	Formation	Lithology	Ammonium Nitro-Molybdate	P_2O_5 %
Emu No. 1 (ctd.)	1216-1220		Quartz gravel	Very weak	.10
	1220-1240		Brown siliceous material	"	
	1240-1320		Brown siltstone	No reaction	
	1320-1356		Brown sandy clays	"	
	1361-1366		Sand	Very weak	
Eyre No. 1	0- 20	Pleistocene Sandy Limestone (Unnamed)	White bryozoal limestone	Very weak	.05
	20- 40	"	"	Very weak	.05
	40- 50	Wilson Bluff Limestone	"	No reaction	
	50- 100	"	"	Very weak	.05
	100- 110	"	"	"	.05
	110- 150	"	"	"	.05
	150- 230	"	"	"	
	230- 270	"	"	Weak	.05
	280- 300	"	"	Very weak	
	300- 350	"	"	Weak	
	350- 360	"	"	No reaction	
	360- 420	"	"	Weak	
	420- 460	"	"	Weak	.05
	460- 550	"	"	Weak	
	550- 570	No samples			
	570- 600	Wilson Bluff Limestone	White bryozoal limestone	Weak	
	600- 610	No samples			
	610- 670	Wilson Bluff Limestone	"	Very weak	
	670- 680	"	"	No reaction	
	680- 690	"	"	Very weak	
	690- 710	"	"	No reaction	
	710- 720	"	"	Very weak	
	720- 730	"	"	No reaction	
	730- 760	"	"	Very weak	
	760- 790	No samples			
	790- 860	Wilson Bluff Limestone	"	Very weak	
	860- 870				
	870- 900	Wilson Bluff Limestone	"	Fair	.10
	900- 910	No samples			
	920- 990	Wilson Bluff Limestone	"	Weak	
	990-1035	No samples			
	1035-1120	Wilson Bluff	Marly glauconitic bryozoal limestone	Weak	
	1120-1150	Hampton Conglomerate	Sandy limestone	Weak	.05

Bore	Depth	Formation	Lithology	Ammonium Nitro-Molybdate Reaction	Content P_2O_5%
Eyre No. 1 (ctd.)	1150-1230		Sandy limestone	Weak	
	1230-1240		Greensand	No reaction	
	1240-1260		" with coarse quartz	Very weak	
	1260-1280		" "	No reaction	
	1280-1310		Greensand	Very weak	
	1310-1330		" with black phosphatic grains	Fair	.30
	1330-1340		Grey mudstone with quartz sand	Weak	average
	1340-1370		Grey mudstone with quartz sand	Weak	
	1370-1400		" "	"	.20
	1400-1405		Grey mudstone with pyrite grains	Moderate	
	1405-1430		" "	"	.95
	1430-1440		"	Fair	
	1440-1450		Siltstone	No reaction	
	1450-1470		Siltstone	Moderate	
	1470-1500		"	Moderate	1.6
	1500-1530		"	"	
	1530-1540		"	Very weak	
	1540-1580		"	Moderate	
	1580-1585		Sandstone with quartz grains stained green.	Very weak	
	1585-1610		Greensand	Fair	
	1610-1620		"	Weak	
	1620-1630		"	Fair	
	1630-1640		"	Weak	
	1640-1650		"	Fair	
	1650-1660		"	Weak	
	1660-1680		"	Fair	.40
	1680-1690		"	Fair	
	1690-1700		"	Weak	
	1700-1710		"	Fair	
	1710-1714		"	Very weak	
	1700-1719		"	not tested	
	1710-1719		Gneissic granite		
Gambanga No. 1	0- 10		Cherty limestone	No reaction	
	10- 60		Limestone	No reaction	
	60- 390	No sample			
	390- 400		White bryozoal limestone	Fair	.05
	400- 440		"	Fair	

Bore	Depth		Formation	Lithology	Ammonium Nitro-Molybdate Reaction	Content P_2O_5%
Gambanga No. 1	430- 440			White bryozoal limestone	Weak	.05
	440- 450			"	"	.05
	450- 530			"	"	
	530- 540			"	Very weak	
	540- 550			"	"	
	550- 560			"	"	.05
	560- 600			"	Weak	
	600- 605			"	"	.20
	605- 620			"	"	
	620- 630			"	Very weak	
	630- 640			"	Fair	.25
	640- 650			"	Very weak	
	650- 660			Glauconitic marl	Fair	.15
	660- 670			"	Very weak	
	670- 680			Glauconitic marl and brown sandstone	Fair	.15
	680- 695			Sandstone	Very weak	
	695- 713		No samples			
	713- 718			"	Fair	.05
	718- 900			"	No reaction	
	900- 910			"	"	.05
	910- 920			"	"	
	920-1280		Not tested			
Guinewarra	0- 13			Red clay	No reaction	
	13- 40		Nullarbor Limestone	Limestone	"	
	40- 48		"	"	"	.05
	48- 95		"	"	"	
	95- 108		"	"	"	
	108- 115		"	Bryozoal Limestone	Fair	
	115- 140			"	No Reaction	
	140- 150	Upper Eocene	Wilson Bluff Limestone	"	No Reaction	.05
	150- 170		"	"	No Reaction	
	170- 180		"	Chalky white limestone	Weak	.05
	180- 200		"	"	No reaction	
	200- 212		"	"	Very weak	.12
	212- 250		"	"	"	
	250- 260		"	"	"	
	260- 290		"	"	"	
	290- 300		"	"	Fair	.05

Bore	Depth		Formation	Lithology	Ammonium Nitro-Molybdate Reaction	Content P_2O_5%
Guinewarra (contd.)	300- 310	Upper Eocene	Wilson Bluff Limestone	Chalky white limestone	No reaction	
	310- 320		"	"	Weak	
	320- 330		"	"	Fair	.05
	330- 370		"	"	"	
	370- 400		"	"	"	.05
	400- 460		"	"	Weak	
	460- 470		"	"	"	.05
	470- 480		"	"	"	
	480- 500		"	"	Fair	.10
	500- 530		"	"	"	
	530- 555		"	"	No reaction	
	555- 565		"	Greenish grey sandy limestone	Weak	.20
	565- 575		"	"	"	
	575- 598	Eocene	(Pidinga)	Quartz sand	No reaction	
	598- 599			Yellow brown sandy clay	"	.15
	599- 640			Grey argillaceous sediment	"	
	640- 650			"	Fair	
	650- 680			Greenish-grey argillaceous sediment	Very weak	.30
	680- 780	Cretaceous		Grey argillaceous material	No reaction	
	780- 810			"	Very weak	
	810- 840			"	"	.20
	840- 860			"	"	.25
	860- 975			"	"	
	975- 980			"	"	.15
	980-1020			Grey argillaceous material	No reaction	
	1020-1025			Greyish-white chalky limestone	"	
	1025-1042			Grey argillaceous material	"	
	1042-1062			Quartz sand	"	
	1062-1062.5			Sandy limestone	"	
	1062.5-1066			Quartz sand	"	
	1066-1078			White clay	"	
	1078-1079			Red and green weathered shale	"	
	1079-1120			Greenish clay	"	
	1120-1140			Black siltstone	"	
	1140-1144			Reddish quartz sand	Very weak	
	1144-1210			Dark siltstone	No reaction	

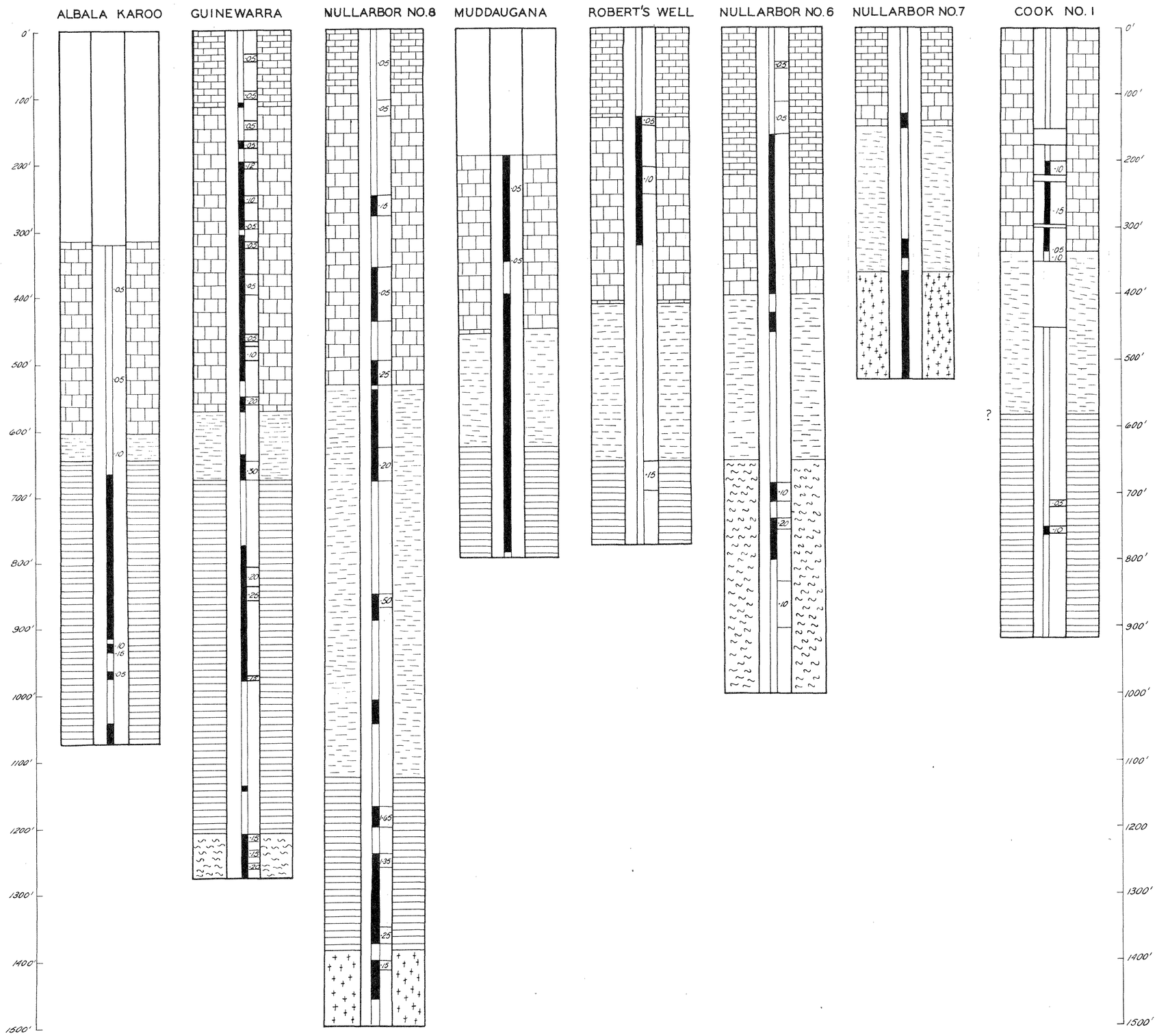
Bore	Depth		Formation	Lithology	Ammonium Nitro-Molybdate Reaction	Content P_2O_5 %
Guinewarra (ctd.)	1210-1219	Pre-cambrian		Dark siltstone	Very weak	.15
	1219-1234			Red and green weathered shales	"	
	1234-1243			"	"	.15
	1243-1259			"	"	.20
	1259-1260			"	"	.20
	1260-1277			"	"	.20
Muddaugana	0- 190	Upper Eocene	No samples			
	190- 235		Wilson Bluff Limestone	Limestone.	Very weak	
	240'		"	White limestone	"	.05
	240- 244		No samples			
	244- 244.5		Wilson Bluff Limestone	Red clay and limestone	No reaction	
	247'		"	White limestone	Very weak	
	270		"	"	Weak	
	330		"	"	"	
	340		"	"	"	
	350		"	"	"	.05
	400		"	"	No reaction	
	420		"	"	Very weak	
	463		"		Weak	
	464	Eocene	Carbonaceous clays and sands	Brown sandy limestone	No reaction	
	467		(Pidinga)	Brown sandy clay	"	
	473		"	"	Very weak	
	484		"	Black sandy clay	"	
	627			Grey argillaceous	"	
	787		Cretaceous	Grey sand	"	
	794			"	No reaction	

Bore	Depth			Formation	Lithology	Ammonium Nitro-Molybdate Reaction	Content P_2O_5 %
Nullarbor No. 6	0-	6'			Brown clay	No reaction	
	6-	15	Lower Miocene	Nullarbor Limestone	Crystalline limestone	"	
	15-	30		"	White sandy limestone	"	
	30-	40		"	"	"	
	40-	50		"	"	"	
	50-	60		"	"	"	.05
	60-	110		"	"	"	
	110-	160		"	"	"	.05
	160-	180		"	"	Very weak	.05
	180-	220		"	"	Very weak	
	220-	400		Wilson Bluff Limestone?	"	"	
	400-	430	Eocene		Dark carbonaceous clay	No reaction	
	430-	450			Carbonaceous clay and quartz sand	Weak	
	450-	455			Quartz gravel	"	
	455-	470			"	No reaction	
	470-	503			"	"	
	503-	540			White sandy clay	"	
	540-	548			Quartz gravel and clay	"	
	555-	560			Dark carbonaceous clay	"	
	560-	580			Conglomerate	"	
	587-	591			Sandy clay	"	
	591-	653			"	"	
	653-	687	PreCambrian		Red and green shales	"	
	687-	710			"	Weak	.10
	710-	738			Red clay and argillaceous sediment	No reaction	
	738-	750			Green-grey sandstone	Very weak	.20
	750-	770			"	"	
	770-	798			Green and red shales	"	
	798-	808			Fine quartz gravel	No reaction	
	808-	830			Sand with clay	"	
	830-	847			"	"	.10
	950-	1000			Red sandy clay	"	
Nullarbor No. 7	0-	7	Lower Miocene		Travertine limestone	No reaction	
	7-	20		Nullarbor Limestone	Chalky white limestone	"	
	20-	42		"	Reddish limestone	"	
	42-	60		"	Chalky white limestone	"	
	60-	100		"	Reddish limestone	"	
	100-	130		Wilson Bluff Limestone	White marl	"	
	130-	150		"	"	Very weak	

Bore	Depth		Formation	Lithology	Ammonium Nitro-Molybdate Reaction	Content P_2O_5 %
Nullarbor No. 7 (ctd.)	150- 190	Eocene	(Pidinga Group)	Yellow limonitic quartz sand	No reaction	
	190- 205			"	"	
	205- 219			"	"	
	219- 220			Clay with sand grains	"	
	220- 233			Grey mudstone	"	
	233- 247			Gritty clay	"	
	247- 320			White clay with quartz pebbles	"	
	320- 328			Glauconitic sandy clay	Very weak	
	328- 348			"	"	
	348- 360			"	No reaction	
	360- 366			Sandy clay	"	
	366- 367	Archaean	Granite & Gneiss	Gneissic calcareous material	Weak	
	365- 370		Archaean	"	"	
	374- 380			"	"	
	380- 383			"	"	
	383- 390			"	"	
	390- 396			"	"	
	396- 403			"	"	
	403- 410			"	"	
	410- 447			"	"	
	447- 465			"	"	
	465- 495			"	"	
	495- 505			"	"	
	505- 530			"	"	
Nullarbor No. 8	0- 38	Lower Miocene		Red clay	No reaction	
	38- 45		Nullarbor Limestone	Hard Limestone	"	
	45- 52		"	"	"	.05
	52- 100		"	"	"	
	100- 108	Upper Eocene	Wilson Bluff	Chalky, white, limestone	"	
	108- 133		"	"	"	.05
	133- 250		"	"	"	
	250- 280		"	"	Strong	.15
	280- 360		"	"	No reaction	
	360- 440		"	"	Moderate-fair	.05
	440- 500		"	"	No reaction	
	500- 538		"	" and quartz sand at bottom	Fair - Moderate	.25
	538- 543			Grey argillaceous	No reaction	

Bore	Depth		Formation	Lithology	Ammonium Nitro-Molybdate Reaction	Content P_2O_5%
Nullarbor No. 8 (ctd.)	543- 630	Lower Eocene	Pidinga Group	Greenish-grey argillaceous sediment	Very weak	
	630- 680			"	"	.20
	680- 850			Dark grey argillaceous sediment	No reaction	
	850- 870			Grey mudstone	Weak	.50
	870- 890			"	"	
	890- 900			"	No reaction	
	900- 940			Sandy clay	"	
	940- 960			Grey clay	"	
	960- 970			Gravel	"	
	970- 982			Gravel and clay	"	
	982- 990			Grey argillaceous	"	
	990-1006			Fine gravel and clay	"	
	1006-1012			Conglomerate	"	
	1012-1045			"	Very weak	
	1045-1048			Chalky white clay	No reaction	
	1048-1074			Conglomerate	"	
	1074-1100			Grey pebbly clay	"	
	1100-1132			Gravel	"	
	1132-1146	Cretaceous	Cretaceous shales unnamed	Grey mudstone	"	
	1146-1170			"	"	
	1170-1200			"	Weak	1.65
	1200-1220			"	No reaction	
	1220-1226			"	Weak	
	1226-1240			"	No reaction	
	1240-1260			"	Weak	1.35
	1260-1280			"	"	
	1280-1290			"	Very weak	
	1290-1350			"	"	
	1350-1375			"	"	.25
	1375-1390			"	No reaction	
	1390-1400	Archaean		Green gneissic material	"	
	1400-1415			"	Weak	.15
	1415-1460			"	"	
	1460-1500			Red clay	No reaction	

Bore	Depth		Formation	Lithology	Ammonium Nitro-Molybdate Reaction	Content P_2O_5 %
Roberts Well	0- 4	Lower Miocene		Red clay	No reaction	
	4- 135		Nullarbor Limestone	Limestone	"	
	135- 149	Upper Eocene	Wilson Bluff Limestone	Chalky white limestone	Weak	.05
	149- 190		"	"	"	
	210- 250		"	"	Very weak	.10
	250- 325		"	"	"	
	325- 414		"	"	No reaction	
	414- 488	Eocene	Pidinga Group	Grey sandy clay	"	
	488- 650			Grey clay	"	
	650- 697	Cretaceous	Cretaceous shales (unnamed)	"	"	.15
	697- 745			Quartz sand	"	
	745- 749			Sandy clay	"	
	749- 762			Sand and gravel	"	
	768- 777			Conglomerate	"	



LEGEND

Lower Miocene	Nullarbor Limestone
Upper Eocene	Wilson Bluff Limestone
Eocene	Carbonaceous sands & clays
Cretaceous	Shales & clays
PreCambrian	Decomposed purple & grey shales
Archaean	Granite & Gneiss

PHOSPHATE TESTING

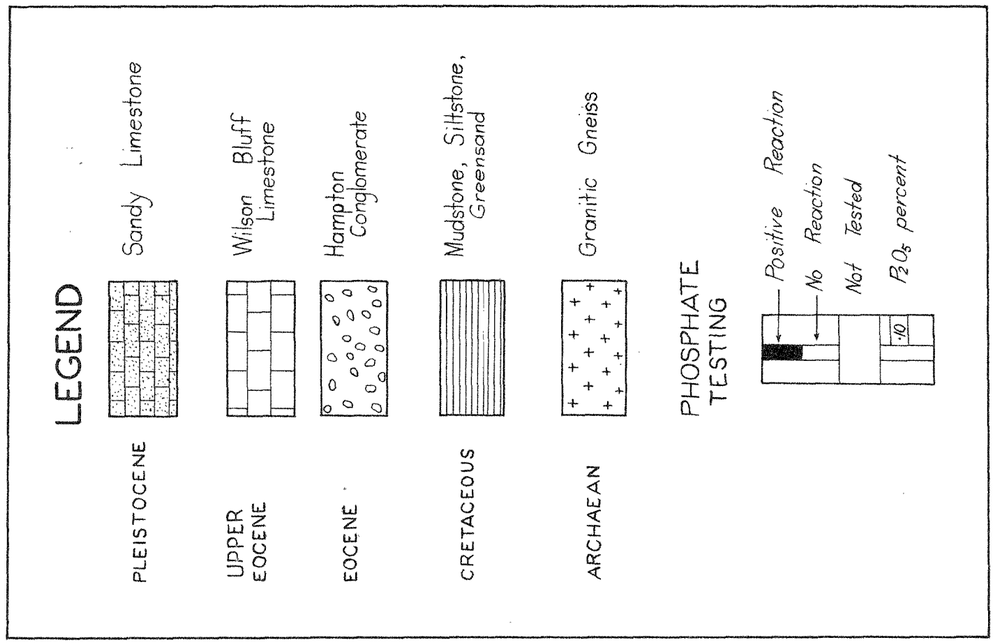
- Positive Reaction
- No Reaction
- Not Tested
- .10 P_2O_5 Percent

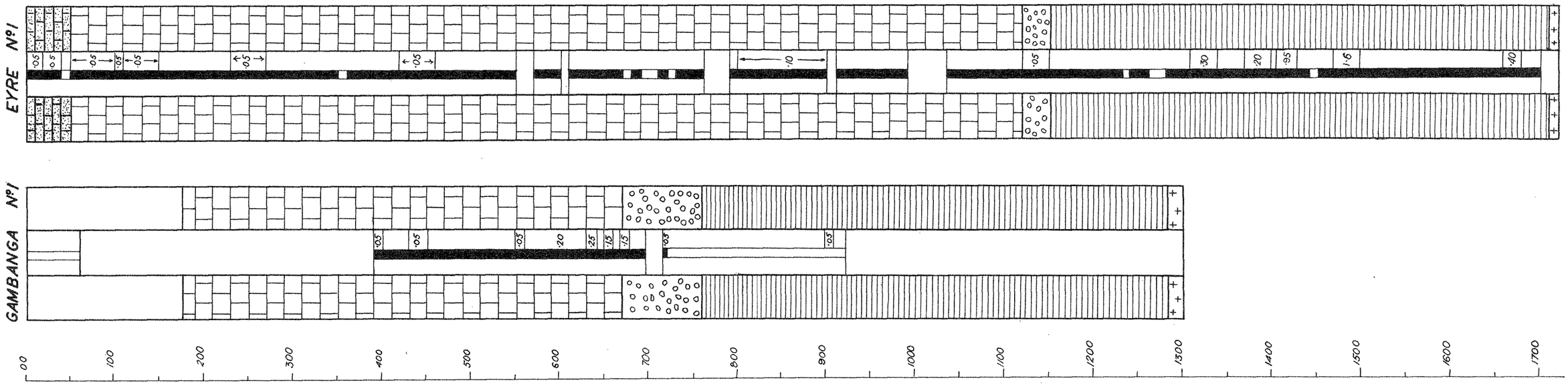
To accompany report by P. Russ.

DEPARTMENT OF MINES — SOUTH AUSTRALIA

PHOSPHATE TESTING
EUCLA BASIN

		Drn.	SCALE: Vertical 1 inch to 100 feet
		Tcd. B.L.S	65–421
		Ckd.	Abe
Director of Mines		Exd.	DATE: 11-5-65



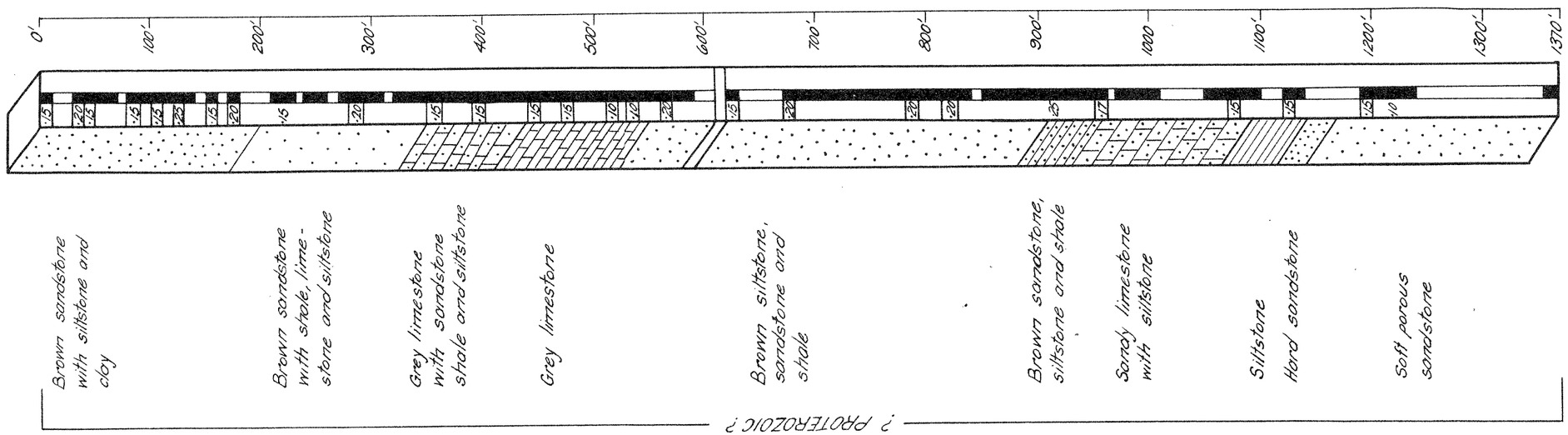


To accompany report by P Russ.

DEPARTMENT OF MINES — SOUTH AUSTRALIA

PHOSPHATE TESTING EUCLA BASIN

		Drn.	SCALE :
		Tcd. R.H.	65 – 422
		Ckd.	394·1
Director of Mines		Exd.	DATE : 13th May 1965



To accompany report by P. Russ.

DEPARTMENT OF MINES — SOUTH AUSTRALIA

EMU NO.1 WELL
PHOSPHATE TESTING
OFFICER BASIN

		Drn.	SCALE: Vertical: 1 inch to 100 feet
		Tcd. B.L.S.	65-423 Ad.
		Ckd.	
Director of Mines		Exd.	DATE: 12-5-65