Section

Rept. Bk. No. 55/126
G.S. No. 2494
D.M. 1230/62

DEPARTMENT OF MINES

SOUTH AUSTRALIA

GEOLOGICAL SURVEY

SOILS GEOLOGY SECTION

REPORT ON SITE INVESTIGATION

PROPOSED BULK GRAIN STORAGE INSTALLATION

LONG PLAINS RAILWAY YARD, HUNDRED DUBLIN

DUBLIN 1-MILE SHEET (ZONE6, NO. 815), NE AND SE QUADRANTS

by

R. I. Chugg
Geologist

5th December, 1962

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INTRODUCTION

It is proposed to construct a wheat storage silo toward the northern end of the Long Plains Railway yard which is about 40 miles north from Adelaide. Two percussion test bores were drilled at the request of Mr. J.A. Corbett, Senior Engineer, S.A. Co-operative Bulk Handling Ltd., for the purpose of testing the foundation conditions.

In Bore No. 1 sealed tube samples were taken at five foot intervals down to a depth of 50 ft. At all other depths down to the bottom of the bore at 90 ft., open tube samples were taken and extruded into plastic envelopes. Open tube samples only were taken from Bore No. 2 which was finished at 25 ft.

The number of blows per foot of penetration were recorded during both open and sealed tube sampling in the two bores. Pocket penetrometer readings were measured in the cohesive sample material.

The location of the bores and the general geology of the area are shown on plans accompanying this report. Records of the number of blows per foot of penetration and pocket penetrometer readings are included in the descriptive geological logs of the samples in an appendix. This information is also shown on a cross section drawn through the bores. Also in the

appendix are descriptive logs of a 583 ft. bore, 2½ miles south-west from the site. The positions of seismic shot hole bores are shown on the plan.

TOPOGRAPHY

The area is part of the plains of the St. Vincent Basin. The site is situated on the Ridley Plains, a low-lying area with small surface irregularities and vague surface drainage. The presence of gravel beds at shallow depth in parts of the low-lying areas suggests the presence of former river courses. The boundaries of the low-lying areas appear to be, in part, small erosional terraces. Slightly higher ground occurs to the north where a system of fixed aeolian dune ridges is present.

GEOLOGY

A sheet kunkar has apparently developed on the old dune and riverine topographies fixing the forms of an old land surface.

An erosional cycle has removed the kunkar sheet from some of the low-lying areas, including the silo site position. This erosion did not remove the kunkar sheet from the higher, fixed dune areas.

The original sand of the dune ridges has been blown from the ridge crests and redistributed as thin sand sheets in the interdunal areas and on portions of the Ridley Plains. Some post kunkar thin alluvial material is also present on parts of the low-lying areas.

The sequence of deeper sediments is given by a 583 feet deep water bore about two and a half miles south-west from the site (Hd. Dublin, Sect. 97) which penetrated terrestrial clays with sands and gravels down to marine limestone at 134 ft. Interbedded limestone and fossiliferous marls were found to continue to 311 feet. Sands and clays then continue to 376 feet where ancient Palaeozoic to Proterozoic sediments were penetrated.

A log of this bore is given in the appendix. Other bores in the district but outside of the area of the accompanying plan have shown that extensive lignitic materials are frequently present at depth.

Samples from the two foundation bores at the site show that a limey silty sandy clay soil overlies red-brown and light, slightly greenish grey clays. The clays are generally sandy and silty and some thin sand horizons are present.

The occurrence of near surface gravels and Quaternary erosional features suggest the possibility that an overlying cover of material has been removed from the red-brown and grey clays.

FOUNDATION CONDITIONS

The test drilling at the site has shown that generally friable limey silty and sandy clay occurs down to about five or six feet. The underlying cohesive clays are all stiff to very stiff and are damp to the touch. Pocket penetrometer readings in these clays are consistently off scale suggesting fairly high compressive strengths and the possibility of preconsolidation.

There is a higher sand and silt content from 16 to 25 feet and the material is semi cohesive and crumbly to friable. This material, however, is very compact and required from 10 to 30 blows per foot of penetration.

Water was not struck in the foundation testing. No authenticated water table data was available close to the site.

CONCLUSIONS AND RECOMMENDATIONS

The upper five to six feet of silty sandy clay with lime may be subject to significant settlement and is not considered to be as satisfactory a foundation material as the underlying very stiff cohesive clays which continue to a depth of about sixteen feet. The thickness of this very stiff clay may be sufficient to spread the loadings over the more friable silty and

sandy clays which extend down to about 25 feet. Below 25 feet the material is again cohesive and stiff and has a penetration rate of over 20 blows per foot.

Soils mechanics tests may assist in determining a suitable depth for the footings which would be consistent with the structural requirements.

R. I. Chugg

R. I. CHUGG
GEOLOGIST
SOILS GEOLOGY SECTION

RIC:AGK
5/12/62

APPENDIX 1

PERCUSSION TEST BORE NO. 1

Bore Serial No.: 572 **Docket:** B.M. 1230/62
Location: Long Plains Railway Siding
Hundred: Dublin **Section:** **R.L. at Collar:**
Purpose: Testing Foundation Conditions
Hirer: South Australian Cooperative Bulk Handling Ltd.
Plant: No. 15 **Driller:** A. Sturak
Nominal Bore Diameter: 6 in. **Core Diameter:** 4 in.
Total Depth: 90 ft.
Date Commenced: 13.8.62 **Date Completed:** 15.8.62
Logged by: R.I. Chugg

Depth From	Depth To	Pocket Penetrometer Readings	Description	Penetration Depth From	Penetration Depth To	Penetration Blows per/ft
0'0"	0'3"	-	Medium dark brown loam with scattered subrounded light brown limey nodules. Friable. Damp.	0'0"	1'0"	20
0'3"	1'0"	-	Brown limey fine sandy clay - silt with numerous subrounded light brown hard limey nodules. Easily friable. Damp.			
1'0"	2'8"	-	Brown limey clay - silt with abundant light brown very limey patches and scattered hard limey nodules. Granular structure with a dull to moderate sheen on unit faces. Friable. Damp.	1'0" 2'0"	2'0" 3'0"	9 14
2'8"	3'0"	-	Medium dark reddish brown silty fine sandy clay with light reddish brown limey patches and brown hard rounded kunkar nodules with black coatings. Granular structure. Friable to crumbly. Damp.			
3'10"	5'0"	-	Brown silty fine sandy clay mottled with abundant light brown limey patches. Numerous sand to grit sized hard limey grains are scattered throughout. Scattered small black soft grains are also present. A granular structure with a moderate sheen on unit faces is present in the more clayey portions. Friable to crumbly. Stiff where more clayey. Damp.	3'0" 4'0"	4'0" 5'0"	14 14
5'0"	6'3"		Sealed tube sample.	5'0"	6'3"	17

Percussion Test Bore No. 1 (contd.) D.M. 1230/62

Depth From	Depth To	Pocket Penetrometer Readings	Description	Penetration Depth From	Penetration Depth To	Penetration Blows per ft
6'3"	9'9"	4.5+ 4.5+ 4.5+	Red-brown and reddish brown slightly sandy clay with a little slightly greenish grey mottling. Scattered small black soft grains are present. Prismatic structure with a vague granular sub-structure. Moderate to bright sheen on unit faces. Very stiff. Damp. From 8'0" to 8'9" dark brown surface skins and dendritic staining along rootlets are present.	6'3" 7'3" 8'3"	7'3" 8'3" 9'3"	13 18 18
9'9"	11'3"	4.5+	Light and dark red brown sandy to very sandy clay with some light greenish grey mottling. A little scattered rounded quartz grit. Dark reddish brown staining around root-lets. Massive where very sandy. Granular and somewhat prismatic where more clayey. Moderate to bright sheens on unit faces. Very stiff. Damp.	9'9" 10'3"	10'3" 11'3"	18 20
11'3"	12'6"		Sealed tube sample.	11'3"	12'6"	16
12'6"	13'6"		As for 9'9" - 11'3"	12'6"	13'6"	18
13'6"	16'6"	4.5+	Reddish brown and light green-ish grey fine sandy clay with dark red-brown and purplish staining around rootlets. Irregular prismatic structure and granular substructure, in part with a moderate sheen and surface skins on unit faces. Massive where more sandy. Very stiff. Damp. More sandy from 14'6"-15'6" where generally massive. Numerous root passages with sand filling from 15'6"-16'6".	13'6" 14'6" 15'6" 16'6"	14'6" 15'6" 16'6" 17'6"	18 18 18 18
16'6"	17'6"	-	Reddish brown to red-brown silty fine sandy clay with greenish grey mottling. Root passages are present and associated with the mottling and purplish brown staining. An irregular prismatic and granular structure are present in the more clayey portions. Crumbly but very compact. Stiff where more clayey. Damp.	16'6"	17'6"	19

Percussion Test Bore No. 1 (contd.) D.M. 1230/62

Depth From	Depth To	Pocket Penetrometer Readings	Description	Penetration Depth From	Penetration Depth To	Blows per/ft.
17'6"	18'9"	-	Sealed tube Sample	17'6"	18'9"	28
18'9"	21'9"	-	Reddish brown and light greenish grey mottled very sandy and very silty clay with small yellowish and purplish patches associated with rootlets. Irregular prismatic to polyhedral structures with dull to moderate sheens on unit faces. Some horizontal partings are present. Very compact. Friable. Damp.	18'9"	19'9"	19
				19'9"	20'9"	18
				20'9"	21'9"	18
21'9"	22'9"	-	Light greenish grey and reddish brown mottled very sandy and very silty clay with a few small purplish patches. Generally massive. Very compact. Friable.	21'9"	22'9"	22
22'9"	23'9"	-	Light greenish grey very clayey very silty very fine sand with reddish brown mottling and purplish stains associated with fine plant (root) material. The material is finely stratified with thin sand layers. Horizontal partings are present. Very compact. Friable.	22'9"	23'9"	24
23'9"	25'0"	-	Sealed Tube Sample	23'9"	25'0"	30
25'0"	30'0"	4.5+	Red-brown and light slightly greenish grey mottled clay with yellowish brown and purplish stains. Granular structure with a moderate to bright sheen on unit faces. Some near vertical to near horizontal slickensides. Very stiff. Slightly damp.	25'0"	26'0"	24
				26'0"	27'0"	26
				27'0"	28'0"	26
				28'0"	29'0"	25
				29'0"	30'0"	25
30'0"	31'3"		Sealed Tube Sample			
31'3"	32'3"	4.5+	As for 25'0"-30'3"			
32'3"	36'3"	4.5+	Light, slightly greenish grey clay with reddish and yellowish brown mottling. Some purplish mottling along rootlets. Irregular granular to platy structure. Dull to moderate sheens on unit faces. The sample has broken along planes at angles varying from 30° to 60° from vertical. Very stiff. Slightly damp.	31'3"	32'3"	28
				32'3"	33'3"	28
				33'3"	34'3"	28
				34'3"	35'3"	28
				35'3"	36'3"	24

Percussion Test Bore No. 1 (contd.) D.M. 1230/62

Depth From	Depth To	Pocket Penetrometer Readings	Description	Penetration Depth From	Penetration Depth To	Penetration Blows per/ft
36'3"	37'6"		Sealed Tube Sample	36'3"	37'6"	27
37'6"	40'6"	4.5+	As for 32'3" - 36'3" with some darkred-brown patches of granular clay with bright sheens.	37'6"	38'6"	25
				38'6"	39'6"	22
				39'6"	40'6"	24
40'6"	42'6"	4.5+	Light, slightly greenish grey clay with yellowish brown and reddish brown mottling. Irregular polyhedral structure with dull to moderate sheens on unit faces. Some purplish staining associated with fine rootlets. Slickensides through samples occur at various attitudes. Very stiff. Slightly damp.	40'6"	41'6"	24
42'6"	43'9"	-	Sealed Tube Sample	42'6"	43'9"	33
43'9"	45'9"		As for 40'6"-42'6"	43'9"	44'9"	25
				44'9"	45'9"	20
45'9"	48'9"	4.5+	Light, slightly greenish grey clay with dark red-brown and reddish brown mottling and staining along well developed slickensides. Fine prismatic to polyhedral forms with a well developed horizontal parting are developed in the red-brown zones. These structures have a bright sheen. The greenish grey clay has a more platy structure with dull sheens. Stiff. Slightly damp.	45'9"	46'9"	24
				46'9"	47'9"	24
				47'9"	48'9"	24
48'9"	50'0"	-	Sealed Tube Sample	48'9"	50'0"	26
50'0"	68'0"	4.5+	Light, slightly greenish grey clay with some dark red-brown and reddish brown mottling and staining. Some prismatic and polyhedral forms are developed in the redbrown zones, but the more reddish materials and these structures are sparse below 53' and thematerial becomes more massive. Well developed partings inclined at about 45 degrees and some horizontal and vertical partings occur. Very thin sand infillings are present in vertical partings at 59'6" to 60' where the clay is sandy. Light brown mottling and sparse off-white small streaks occur between 65 and 67 ft. Very stiff. Slightly damp.	50'0"	51'0"	26
				51'0"	52'0"	26
				52'0"	53'0"	28
				53'0"	54'0"	28
				54'0"	55'0"	26
				55'0"	56'0"	29
				56'0"	57'0"	28
				57'0"	58'0"	24
				58'0"	59'0"	27
				59'0"	60'0"	26
				60'0"	61'0"	26
				61'0"	62'0"	28
				62'0"	63'0"	28
				63'0"	64'0"	22
				64'0"	65'0"	22
				65'0"	66'0"	26
				66'0"	67'0"	26
				67'0"	68'0"	28

Percussion Test Bore No. 1 (contd.) D.M. 1230/62

Depth From	Depth To	Pocket Penetrometer Readings	Description	Penetration Depth From	Penetration Depth To	Blows perft.
68'0"	88'0"	4.5+	Light, slightly greenish grey clay with red-brown patches. The greyish material is massive with subhorizontal and weak vertical partings. The red-brown material has stronger partings and some fine prismatic forms are present. This material generally has a granular structure with a moderate to bright sheen on the unit faces. Numerous slickensides traverse the sample at about 45 degrees. The material is somewhat silty and crumbly between 83 and 84 ft. Some yellowish brown mottling occurs below 84ft. Very stiff. Slightly damp.	68'0"	69'0"	28
				69'0"	70'0"	25
				70'0"	71'0"	23
				71'0"	72'0"	25
				72'0"	73'0"	25
				73'0"	74'0"	26
				74'0"	75'0"	24
				75'0"	76'0"	20
				76'0"	77'0"	22
				77'0"	78'0"	18
				78'0"	79'0"	18
				79'0"	80'0"	19
				80'0"	81'0"	22
				81'0"	82'0"	20
				82'0"	83'0"	20
				83'0"	84'0"	23
				84'0"	85'0"	21
				85'0"	86'0"	22
				86'0"	87'0"	23
				87'0"	88'0"	22
88'0"	89'0"	4.5+	Yellow-brown and light slightly greenish grey mottled slightly sandy slightly silty clay with brick red silty patches and scattered rounded quartz grit. Well developed horizontal partings. Generally massive to platy. Stiff. Damp.	88'0"	89'0"	22
89'0"	90'0"	4.5+	Yellow-brown and light slightly greenish grey mottled silty clay with strong horizontal and moderately strong vertical partings. The partings give rise to platy and fine polyhedral structural units with no marked sheen on the unit faces. Very stiff. Damp.	89'0"	90'0"	22

END OF BORE AT 90'.

APPENDIX 2

LONG PLAINS SILO SITE INVESTIGATION

BORE 2: DESCRIPTIVE AND PENETRATION LOG

PERCUSSION TEST BORE NO. 2

Bore SerialNo.: 573/63 Docket: D.M. 1230/62
Location: Long Plains Railway Siding
Hundred: Dublin Section: R.L. at Collar:
Purpose: Testing Foundation Conditions
Hirer: South Australian Co-operative Bulk Handling Ltd.
Plant: No. 15 Driller: A. Sturak
Nominal Bore Diameter: 6 in. Core Diameter: 4 in.
Total Depth: 90 ft.
Date Commenced: 15.8.1962 Date Completed: 17.8.1962
Logged by: R.I. Chugg

Depth From	Depth To	Pocket Penetrometer Readings	Description	Penetration Depth From	Penetration Depth To	Blows p/ft.
0'0"	0'3"	-	Medium dark brown loam with scattered subrounded light brown hard limey nodules. Friable. Damp.	0'0"	1'0"	12
0'3"	2'0"		Light brown very limey fine sandy clay-silt with abundant sub-rounded light brown hard limey nodules. Readily friable. Damp.	1'0"	2'0"	10
2'0"	3'0"		Light brown very limey very sandy clay silt with patches of reddish brown silty clay becoming abundant toward the base. Readily friable. Damp.	2'0"	3'0"	10
3'0"	3'10"	4.2	Brown silty fine sandy clay mottled with abundant small light brown limey patches and numerous red-brown clay patches. Sand to grit sized hard limey grains are scattered throughout. A coarse granular structure is present in the more clayey material. Friable to crumbly. The more clayey patches are firm. Very damp.	3'0"	4'0"	12
3'10"	5'0"		Light brown very limey fine sandy clay with patches of reddish brown fine sandy silty clay and scattered small sub-angular hard limey nodules. The clay patches have a granular structure with dull sheens on the surfaces. Generally friable. The clay patches are firm. Very damp.	4'0"	5'0"	16

Percussion Test Bore No. 2 (contd.) D.M. 1230/62

Depth From	Depth To	Pocket Penetrometer Readings	Description	Penetration Depth From	Penetration Depth To	Penetration Blows p/ft.
5'0"	9'0"	4.5+	Light red-brown slightly sandy clay with scattered greenish grey mottling and a few scattered small hard angular kunkar fragments. Black scattered grains and thin patches of carbonaceous material are present. Prismatic structure with a vague granular substructure with moderate to bright sheens on the surface of the structures. Very stiff. Damp.	5'0"	6'0"	16
				6'0"	7'0"	19
				7'0"	8'0"	19
				8'0"	9'0"	23
9'0"	13'0"	4.5+	Red-brown slightly sandy clay with light grey mottling and dark brown clay skins and vertical thin brown sand seams. Granular to prismatic structures with moderate surface sheens are present. The structures become less well defined with depth. Stiff. Damp.	9'0"	10'0"	20
				10'0"	11'0"	24
				11'0"	12'0"	22
				12'0"	13'0"	20
13'0"	15'0"	4.5+	Reddish-brown, red-brown and light, slightly greenish grey mottled fine sandy silty clay, very sandy in part. A granular structure is present. Very compact but friable to crumbly in part. Damp.	13'0"	14'0"	18
				14'0"	15'0"	18
15'0"	17'0"	-	Light red-brown fine sandy silty clay, very sandy in part with light, slightly greenish grey coarse mottling. Brown sand filled ? worm tracks are present. Very compact but friable to crumbly. Damp.	15'0"	16'0"	21
17'0"	18'0"	-	Reddish brown and light slightly greenish grey mottled very sandy and very silty clay. Brown sand filled ? worm tracks. Very compact but friable. Damp.	17'0"	18'0"	18
18'0"	21'0"	-	Light reddish brown, brown and light grey slightly clayey fine sand. Some ochreous staining occurs in the upper one foot. Very compact. Friable. Damp.	18'0"	19'0"	27
				19'0"	20'0"	27
				20'0"	21'0"	27
21'0"	24'2"		Light, slightly greenish grey and reddish brown mottled clayey very silty very fine sand with yellowish and purplish staining. Compact. Friable. Damp.	21'0"	22'0"	30
				22'0"	23'0"	26
				23'0"	24'0"	27

APPENDIX 3

DESCRIPTIVE LOG OF BORE

HD. DUBLIN, SECT. 97

Depth From	Depth To	Nature of Strata
0	1'	Dark loam.
1'	15'	Yellow clay with limestone
15'	35'	Reddish sandy clay
35'	36'	Struck water- salt
36'	58'	Variegated sandy clay
58'	59'6"	Brown sand and gravel
59'6"	90'	Variegated clay
90'	105'6"	Red and white sandy clay
105'6"	120'	Yellow clay - struck salt water
120'	125'	Yellow sand
125'	128'6"	White sandy clay
128'6"	132'6"	Sandstone boulders and sand
132'6"	134'	White clay
134'	160'	Coarse brown limestone
160'	178'	Brown marl marine fossils
178'	184'	Hard dark grey limestone
184'	220'	Bluish marl with marine fossils
220'	223'	Hard dark grey limestone
223'	234'	Bluish marl. Marine fossils
234'	236'6"	Hard dark grey limestone
236'6"	241'	Bluish marl marine fossils
241'	245'	Hard dark grey limestone
245'	310'	Dark blue clayey silt marine fossils
310'	311'	Struck salt water
311'	320'	Sand stained green with chloride, marine fossils
320'	335'	Drift sand
335'	348'	Light bluish clay
348'	370'	Clay slate
370'	373'	Drift sand
373'	376'	Decomposed clay slate
376'	408'	Bluish calcareous rock slightly crystalline Struck salt water
408'	432'6"	Light blue clay
432'6"	583'2"	Hard bluish calcareous rock.

END OF BORE 583'2".

Percussion Test Bore No. 2 (contd.) D.M. 1230/62

Depth From	Depth To	Pocket Penetrometer Readings	Description	Penetration Depth From	Penetration Depth To	Penetration Blows p/ft.
24'2"	24'6"	-	Pale brown medium grained sand. Friable. Damp.			
24'6"	25'0"	4.5+	Red-brown and light, greenish grey clay with purplish staining associated with fine rootlets. Granular and prismatic structures are present with moderate and bright sheens on unit faces. Very stiff. Damp.	24'0"	25'0"	27

END OF BORE AT 25'.

APPENDIX 3

DESCRIPTIVE LOG OF BORE

MD. DUBLIN, SECT. 97

Depth From	Depth To	Nature of Strata
0	1'	Dark loam.
1'	15'	Yellow clay with limestone
15'	35'	Reddish sandy clay
35'	36'	Struck water- salt
36'	58'	Variegated sandy clay
58'	59'6"	Brown sand and gravel
59'6"	90'	Variegated clay
90'	105'6"	Red and white sandy clay
105'6"	120'	Yellow clay - struck salt water
120'	125'	Yellow sand
125'	128'6"	White sandy clay
128'6"	132'6"	Sandstone boulders and sand
132'6"	134'	White clay
134'	160'	Coarse brown limestone
160'	178'	Brown marl marine fossils
178'	184'	Hard dark grey limestone
184'	220'	Bluish marl with marine fossils
220'	223'	Hard dark grey limestone
223'	234'	Bluish marl. Marine fossils
234'	236'6"	Hard dark grey limestone
236'6"	241'	Bluish marl marine fossils
241'	245'	Hard dark grey limestone
245'	310'	Dark blue clayey silt marine fossils
310'	311'	Struck salt water
311'	320'	Sand stained green with chloride, marine fossils
320'	335'	Drift sand
335'	348'	Light bluish clay
348'	370'	Clay slate
370'	373'	Drift sand
373'	376'	Decomposed clay slate
376'	408'	Bluish calcareous rock slightly crystalline Struck salt water
408'	432'6"	Light blue clay
432'6"	583'2"	Hard bluish calcareous rock.

END OF BORE 583'2".