

W. A. G.

RED RIVER FLOODWAY

Outlet Control Works

EXPLORATIONS AND GEOLOGICAL INVESTIGATIONS

H.G. AGRES & COMPANY LIMITED
Consulting Engineers,
Niagara Falls, Canada

January 11, 1963

63-17

January 11, 1963

Job No. 940.19.04

RED RIVER FLOODWAY
Outlet Control Works

EXPLORATIONS AND GEOLOGICAL INVESTIGATIONS

The enclosed data concerning explorations and tests on materials from the outlet works are provided to assist prospective tenderers in assessing conditions of the site. In providing the exploratory drilling and testing data the Minister neither offers, nor implies, any warranty as to the fact other than that such drilling and testing have actually been carried out.

The approximate locations of the drill holes are shown on drawing No. 940-C-1003.

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H. G. ACRES & COMPANY LIMITED — CONSULTING ENGINEERS
 NIAGARA FALLS, CANADA

DRILLING REPORT

CLIENT: Manitoba Dept. of Agriculture and Conservation JOB No. 940
 PROJECT: Red River Floodway HOLE No. 01
 SITE: Outlet Control Works SHEET No. 1 OF 3

CONTRACTOR: Midwest Diamond Drilling STARTED 2.30 P.M. November 20, 1961
 Limited FINISHED 1.00 A.M. November 23, 1961
 METHOD OF DRILLING: SOIL 4" Flite auger - 42' CASING DIAM. NX - 46'
 ROCK Diamond Drilling - 54' CORE DIAM. NX 46 - 54'

LOCATION:* LATITUDE ELEVATIONS: DATUM G.S.C.
 DEPARTURE DRILL PLATFORM ---
 BEARING GROUND SURFACE 753.8
 INITIAL DIP 90° ROCK SURFACE 707.8
 OTHER DIPS BOTTOM OF HOLE 699.8
 WATER TABLE 724+

* See Acres' drawing No. 940-C-1003

DEPTH	SOIL TYPE	DESCRIPTION: COLOUR, CONSISTENCY, STRUCTURE, WATER CONTENT, PLASTICITY, COMPACTNESS, WATER LOSS OR GAIN, ETC.	SAMPLE					PENETRATION TEST
			NO.	TYPE *	SIZE	DEPTH	RET'D	
ft					in.	ft	in.	
0.0	Humus	Black topsoil in cultivated field, very dry and crumbly						
2.0	Silty clay	Greyish brown silty clay mottled with small light and dark silt pockets, weathered, (fissured), very stiff, only slightly moist in top portion. slight increase in moisture and decrease in weathering with depth. unable to turn the vane in this material	1	B0	2	5.0	16	pushed 10,000 lb
			2	B0	2	10.0	15	pushed 10,000 lb
14.5	Sandy silt (Till)		3	B0	2	15.0	nil	unable to push 12,000 lb

SAMPLING METHOD

- * A - SPLIT TUBE
- B - THIN WALL TUBE
- C - PISTON SAMPLER
- D - CORE BARREL

- E - AUGER
- F - WASH

SHIPPING CONTAINER

- N - INSERT
- O - TUBE
- P - WATER CONTENT TIN
- Q - GLASS JAR

- R - CLOTH BAG
- S - PLOFILM BAG
- Z - DISCARDED

INSPECTOR H.W. Ryder

LOGGED BY H.W. Ryder

APPROVED *[Signature]*

DATE

November 1962

DRILLING REPORT

CLIENT Manitoba Dept. of Agriculture and Conservation JOB No. 940

PROJECT Red River Floodway HOLE No. 01

SITE Outlet Control Works SHEET No. 2 OF 3

DEPTH	SOIL TYPE	DESCRIPTION: COLOUR, CONSISTENCY, STRUCTURE, WATER CONTENT, PLASTICITY, COMPACTNESS, WATER LOSS OR GAIN, ETC	S A M P L E					PENETRATION TEST
			NO	TYPE	SIZE in.	DEPTH ft	RET'D in.	
ft 14.5								Flow/6"
			4	AS	2	20		
						20.5		36
						21.0	12	100
			5	AS	2	25.0		
						25.5		75
						26.0		100
	Sandy silt (Till)	Light brown (yellowish) sandy silt containing many limestone and some granite boulders, very dry and dense with several somewhat more moist and softer seams at 31' and 35' noted, could be lack of cobbles encountered. Struck a water seam at 36'. In 36 hours water rose to 28.7'.				26.5	18	115
			6	AS	2	30		
						30.5		Disturbed
						31.0		
						31.5	10	70/10"
			7	AS	2	35		
						35.5		10
						35.5	6	200
			8		2	40	0	100/0"
		Impossible to auger beyond 42'						
46.0		Setup BBS-2 put down NX Casting to 42' drilled till to 46' (see next page)						

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 NIAGARA FALLS, CANADA

DRILLING REPORT

CLIENT Manitoba Dept. of Agriculture and Conservation JOB No. 940
 PROJECT Red River Floodway HOLE No. 02
 SITE Outlet Control Works SHEET No. 1 OF 3

CONTRACTOR: Midwest Diamond Drilling Limited STARTED 2.00 P.M. November 21, 1961
 FINISHED 5.00 P.M. December 1, 1961
 METHOD OF DRILLING: SOIL 4" Flite auger - 31.5' CASING DIAM. NX - 44.5
 ROCK Diamond Drilling - 62.0' CORE DIAM. NX - 44.5 - 62.0

LOCATION: * LATITUDE ELEVATIONS: DATUM G.S.C.
 DEPARTURE DRILL PLATFORM
 BEARING GROUND SURFACE 755.3
 INITIAL DIP 90° ROCK SURFACE 710.8
 OTHER DIPS BOTTOM OF HOLE 693.3
 WATER TABLE 724±

* See Acres' drawing No. 940-C-1003

DEPTH	SOIL TYPE	DESCRIPTION: COLOUR, CONSISTENCY, STRUCTURE, WATER CONTENT, PLASTICITY, COMPACTNESS, WATER LOSS OR GAIN, ETC.	SAMPLE					PENETRATION TEST
			NO.	TYPE *	SIZE	DEPTH	RET'D	
ft					in.	ft	in.	
0.0	Humus	Black topsoil, cultivated land, very dry and crumbly						
1.0	Silty clay	Mottled dark brown changing to light grey-brown. Weathered (fissured) and dry with weathering decreasing with depth. Containing dark and light silt pockets and some gravel particles and cobbles (mostly limestone) up to 6".	1	BO	2	5.0	pushed	
						6.5	18 10,000 lb	
					Vane Test	7.0		
			2	BO	2	10.0	pushed	
						11.5	10,000 lb	
					Vane Test	12.0		
			3	BO	2	15.0	pushed	
						16.5	16 10,000 lb	
					Vane Test	17.5		
21.0	Sandy silt (Till)		4	BO	2	20	pushed	
						21.5	15 10,000 lb	

SAMPLING METHOD

- * A — SPLIT TUBE
- B — THIN WALL TUBE
- C — PISTON SAMPLER
- D — CORE BARREL

- E — AUGER
- F — WASH

SHIPPING CONTAINER

- N — INSERT
- O — TUBE
- P — WATER CONTENT TIN
- Q — GLASS JAR

- R — CLOTH BAG
- S — PLIOFILM BAG
- Z — DISCARDED

INSPECTOR H.W. Ryder
 LOGGED BY H.W. Ryder

APPROVED 

DATE November 1962

H. G. ACRES & COMPANY LIMITED — CONSULTING ENGINEERS
 NIAGARA FALLS, CANADA

DRILLING REPORT

CLIENT Manitoba Dept. of Agriculture and Conservation JOB No. 940

PROJECT Red River Floodway HOLE No. 02

SITE Outlet Control Works SHEET No. 2 OF 3

DEPTH ft	SOIL TYPE	DESCRIPTION: COLOUR, CONSISTENCY, STRUCTURE, WATER CONTENT, PLASTICITY, COMPACTNESS, WATER LOSS OR GAIN, ETC.	S A M P L E					PENETRATION TEST Blow/ft
			NO.	TYPE	SIZE in.	DEPTH ft	RET'D in.	
21.0	Sandy silt (Till)	Light brown (yellowish) sandy silt with some clay and limestone pebbles. Very dry mainly with some areas more moist, very crumbly and dense, not cohesive unless quite moist	5	BO	2	25.0 26.5	16	
			6	S	2	30 30.5 30.8	10	22 78
		Unable to auger beyond 31.5'						
42.0		Setup BBS-2 ran NX casing to 42.0 with drill water return. Many large cobbles mostly limestone but some granites.						
	Gravel	Very pervious open granular material, all drill water lost. When 7 gpm was poured into casing water level could not be raised above elevation 724.						
44.5	Rock							

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 NIAGARA FALLS, CANADA

DRILLING REPORT

CLIENT Manitoba Dept. of Agriculture and Conservation JOB No. 940
 PROJECT Red River Floodway HOLE No. 03
 SITE Outlet Control Works SHEET No. 1 OF 3

CONTRACTOR: Midwest Diamond Drilling Limited STARTED 1.00 P.M. November 22, 1961
 FINISHED 5.00 P.M. December 10, 1961
 METHOD OF DRILLING: SOIL 4" Ø Flite auger - 23.0' CASING DIAM. NX - 41.0'
 ROCK Diamond Drilling CORE DIAM. NX - 410 - 93.5

LOCATION: * LATITUDE ELEVATIONS: DATUM G.S.C.
 DEPARTURE DRILL PLATFORM
 BEARING GROUND SURFACE 753.2
 INITIAL DIP ROCK SURFACE 712.2
 OTHER DIPS BOTTOM OF HOLE 659.7
 WATER TABLE 724[±]

* See Acres' dwg. No. 940-C-1003

DEPTH	SOIL TYPE	DESCRIPTION: COLOUR, CONSISTENCY, STRUCTURE, WATER CONTENT, PLASTICITY, COMPACTNESS, WATER LOSS OR GAIN, ETC.	S A M P L E					PENETRATION TEST
			NO.	TYPE *	SIZE	DEPTH	RET'D	
ft					In.	ft.	In.	Blows/6"
0.0	Humus	Black dry and crumbly cultivated land						
2.0	Silty clay	Mottled dark brown, very dry and weathered (fissured) to depth of 7' containing gravel particles and cobbles, and light and dark silt pockets. Below 7' mottled medium brown with increasing water content	1	BO	2	5.0		pushed
			2	ES		6.5	16	
			3	BO	2	9.0		
						10.0		pushed
						11.5	16	
					Vane Test	13.0		
			4	BO	2	15.0		pushed
					Vane Test	16.5		
					Vane Test	18.0		
19.0	Sandy silt (till)	Light brown (yellowish) dry sandy silt with many gravel particles and cobbles.	5	BO	2	20	0	unable to push 12,000lb
			6	AS	2	20		
						20.5		45
		Unable to auger beyond 23.0'				21.0		35
						21.5		30

SAMPLING METHOD: A - SPLIT TUBE, B - THIN WALL TUBE, C - PISTON SAMPLER, D - CORE BARREL, E - AUGER, F - WASH
 SHIPPING CONTAINER: N - INSERT, O - TUBE, P - WATER CONTENT TIN, Q - GLASS JAR, R - CLOTH BAG, S - PLOFILM BAG, Z - DISCARDED

INSPECTOR H.W. Ryder APPROVED [Signature]
 LOGGED BY H.W. Ryder DATE November 1962

H. G. ACRES & COMPANY LIMITED — CONSULTING ENGINEERS
 NIAGARA FALLS, CANADA

DRILLING REPORT

CLIENT Manitoba Dept. of Agriculture and Conservation JOB No. 940
 PROJECT Red River Floodway HOLE No. 04
 SITE Outlet Control Works SHEET No. 1 OF 2

CONTRACTOR: Midwest Diamond Drilling Limited STARTED 4:00 P.M. November 22, 19 61
 FINISHED 10:00 A.M. November 23, 19 61

METHOD OF DRILLING: SOIL 4" Ø Flite auger CASING DIAM.
 ROCK CORE DIAM.

LOCATION: * LATITUDE ELEVATIONS: DATUM G.S.C.
 DEPARTURE DRILL PLATFORM -
 BEARING GROUND SURFACE 756.0
 INITIAL DIP ROCK SURFACE -
 OTHER DIPS BOTTOM OF HOLE 729.0
 WATER TABLE -

* See Acres' dwg. No. 940-C-1003

DEPTH	SOIL TYPE	DESCRIPTION: COLOUR, CONSISTENCY, STRUCTURE, WATER CONTENT, PLASTICITY, COMPACTNESS, WATER LOSS OR GAIN, ETC.	SAMPLE					PENETRATION TEST
			NO.	TYPE *	SIZE	DEPTH	RET'D	
ft					in.	ft	in.	
0.0	Humus	Black dry and crumbly						
2.0	Silty clay	Mottled dark brown, dry and weathered (fissured) containing gravel-sized particles and cobbles and light and dark silt pockets. Weathering decreasing and water content increasing with depth	1	BO	2	5.0 6.5	18	pushed 10,000 lb
				Vane Test		7.5		
			2	BS	2	10.0 11.5	6	pushed 10,000 lb
				Vane Test		13.0		
			3	BO	2	15.0 15.5 16.0 16.5	18	pushed
				Vane Test		17.0		
20.0			4 162	BO	2	20.0 20.5 21.0		pushed

SAMPLING METHOD
 * A — SPLIT TUBE
 B — THIN WALL TUBE
 C — PISTON SAMPLER
 D — CORE BARREL
 E — AUGER
 F — WASH

SHIPPING CONTAINER
 N — INSERT
 O — TUBE
 P — WATER CONTENT TIN
 Q — GLASS JAR
 R — CLOTH BAG
 S — PHTOFILM BAG
 Z — DISCARDED

INSPECTOR H.W. Ryder
 LOGGED BY H.W. Ryder

APPROVED [Signature]
 DATE November 1962

H. G. ACRES & COMPANY LIMITED — CONSULTING ENGINEERS
 NIAGARA FALLS, CANADA

DRILLING REPORT

CLIENT Manitoba Dept. of Agriculture and Conservation JOB No. 940
 PROJECT Red River Floodway HOLE No. 05
 SITE Outlet Control Works SHEET No. 1 OF 3

CONTRACTOR: Midwest Diamond Drilling Limited STARTED 11.00 A.M. November 23, 1961
 FINISHED 5.00 P.M. December 6, 1961
 METHOD OF DRILLING: SOIL 4" Flite auger 27.0 CASING DIAM. NX 46.5
 ROCK Diamond Drilling 27.0-72.5 CORE DIAM. NX - 46.5 - 72.5

LOCATION: * LATITUDE ELEVATIONS: DATUM G.S.C.
 DEPARTURE DRILL PLATFORM --
 BEARING GROUND SURFACE 751.5
 INITIAL DIP ROCK SURFACE 705.0
 OTHER DIPS BOTTOM OF HOLE 679.0
 WATER TABLE 724.0

* See Acres' drawing No. 940-C-1003

DEPTH	SOIL TYPE	DESCRIPTION: COLOUR, CONSISTENCY, STRUCTURE, WATER CONTENT, PLASTICITY, COMPACTNESS, WATER LOSS OR GAIN, ETC.	S A M P L E					PENETRATION TEST
			NO.	TYPE *	SIZE	DEPTH	RET'D	
ft					in.	ft	in.	
0.0	Humus	Black topsoil, cultivated land						
2.5	Silty clay	Dark brown dry and stiff lightly weathered, containing light and dark silt pockets	1	BO	2	5.0	18	pushed
5.0	Silty clay	Mottled light brown, moist and stiff, light and dark silt pockets rust stained throughout showing effects of weathering (fissured)	2	ER		6.0		
						10.0		
			3	EP		7.0		
			4	EP		9.0		
			5	BS	2	10.0	0	
						11.5		
			6	ER		11.0		
						15.0		
			7	EP		12.0		
			8	EP		14.0		
16.0	(Till)		9	BO	2	15.0	18	pushed
						16.5		

SAMPLING METHOD

* A' — SPLIT TUBE
 B — THIN WALL TUBE
 C — PISTON SAMPLER
 D — CORE BARREL

E — AUGER
 F — WASH

SHIPPING CONTAINER

N — INSERT
 O — TUBE
 P — WATER CONTENT TIN
 Q — GLASS JAR

R — CLOTH BAG
 S — PLOFILM BAG
 Z — DISCARDED

INSPECTOR H.W. Ryder

LOGGED BY H.W. Ryder

APPROVED *[Signature]*

DATE November 1962

H. G. ACRES & COMPANY LIMITED - CONSULTING ENGINEERS
 NIAGARA FALLS, CANADA

DRILLING REPORT

CLIENT Manitoba Dept. of Agriculture and Conservation JOB No. 940

PROJECT Red River Floodway HOLE No. 05

SITE Outlet Control Works SHEET No. 2 OF 3

DEPTH ft	SOIL TYPE	DESCRIPTION: COLOUR, CONSISTENCY, STRUCTURE, WATER CONTENT, PLASTICITY, COMPACTNESS, WATER LOSS OR GAIN, ETC.	S A M P L E					PENETRATION TEST Blows/6"
			NO.	TYPE	SIZE in.	DEPTH ft	RET'D in.	
16.0	Sandy silt (till)	Light brown (yellow) dry to slightly moist medium dense with many gravel particles and cobbles mostly limestone	10	ER		16.0		
			11	EP		17.0		
			12	EP		19.0		
			13	AS	2	20.0		10
						20.5		11
						21.0		14
						21.5		
			14	ER		20.0		
						20.5		
			15	EP		22.0		
			16	EP		24.0		
		Auger refusal at 27.0'	17	AS	2	25.0		17
		Continued with BBS-2				25.5		15
		and NX casing				26.0		80
						26.5		
27.0	Boulder							
28.2	Sandysilt	Till as described above. Lost drill water at 33', between 33' and 43' recovered 2' of gravel and one 8" piece of core in core barrel						
45	Boulder							
46.5	Rock	See next page						

H. G. ACRES & COMPANY LIMITED — CONSULTING ENGINEERS
 NIAGARA FALLS, CANADA

DRILLING REPORT

CLIENT Manitoba Dept. of Agriculture and Conservation JOB No. 940
 PROJECT Red River Floodway HOLE No. 05
 SITE Outlet Control Works SHEET No. 3 OF 3

DEPTH	ROCK TYPE	DESCRIPTION: COLOUR, TEXTURE, FOLIATION, JOINTING, FRACTURING, FAULTING, ALTERATION, WATER LOSS OR GAIN, CAVING, LOST CORE, CEMENTING, ETC.	SC CORE
46.5	Dolomitic limestone or limestone	Pale grey with moderate brown to limonite yellow nodules, fine grained, unsound. hardness: 3.0 - 3.5 nodules 3.5 - 4.0 pale grey component few chalky inclusions core breaks average 2 - 3 inches 46.5 - 61.5 strongly leached with few 2 - 3% solution cavities and a few interconnecting solution channels 1/4" in diameter	
		46.5 - 49	40
		49 - 53	100
		53 - 63	70
		63 - 72.5	75
72.5		End of hole	

DRILLING REPORT

CLIENT Manitoba Dept. of Agriculture and Conservation JOB No. 940
 PROJECT Red River Floodway HOLE No. 06
 SITE Outlet Control Works SHEET No. 1 OF 3

CONTRACTOR: Midwest Diamond Drilling Limited STARTED 1.00 P.M. November 23 19 61
 FINISHED 5.00 P.M. December 14 19 61
 METHOD OF DRILLING: SOIL 4" Flite auger 0 30.0' CASING DIAM. NX - 48.0
 ROCK Diamond Drilling 0 - 73.5 CORE DIAM. NX - 48.0 - 73.5

LOCATION: *
 LATITUDE ELEVATIONS: DATUM G.S.C.
 DEPARTURE DRILL PLATFORM ---
 BEARING GROUND SURFACE 754.0
 INITIAL DIP 90° ROCK SURFACE 706.0
 OTHER DIPS BOTTOM OF HOLE 680.5
 WATER TABLE ---

* See Acres' drawing

DEPTH ft	SOIL TYPE	DESCRIPTION: COLOUR, CONSISTENCY, STRUCTURE, WATER CONTENT, PLASTICITY, COMPACTNESS, WATER LOSS OR GAIN, ETC.	S A M P L E					PENETRATION TEST Blow/6"
			NO.	TYPE *	SIZE in.	DEPTH ft	RET'D in.	
0.0	Humus							
1.0	Silty clay	Very dark brown dry and stiff, extremely weathered						
3.0	Silty clay	Mottled medium greyish-brown, stiff dry to moist, weathered.	1	BO	2	5.0		pushed
		Containing light and dark silt pockets and gravel particles	2	BO	2	10.0	16	pushed
				Vane Test		8.0		
			3	ES		12.0-14.0		
			4	BZ	2	15.0		pushed
16.5	Silt	Pale yellow, dry, silt layer				16.5		hit
				Vane Test		17.5		
17.5	Silty clay	Mottled light brown, stiff, moist, less weathered, containing light and dark silt pockets and gravel particles.	5	BO	2	20.0		pushed
						21.5		
				Vane Test		23.0		
24.5								

SAMPLING METHOD

- * A - SPLIT TUBE
- B - THIN WALL TUBE
- C - PISTON SAMPLER
- D - CORE BARREL

- E - AUGER
- F - WASH

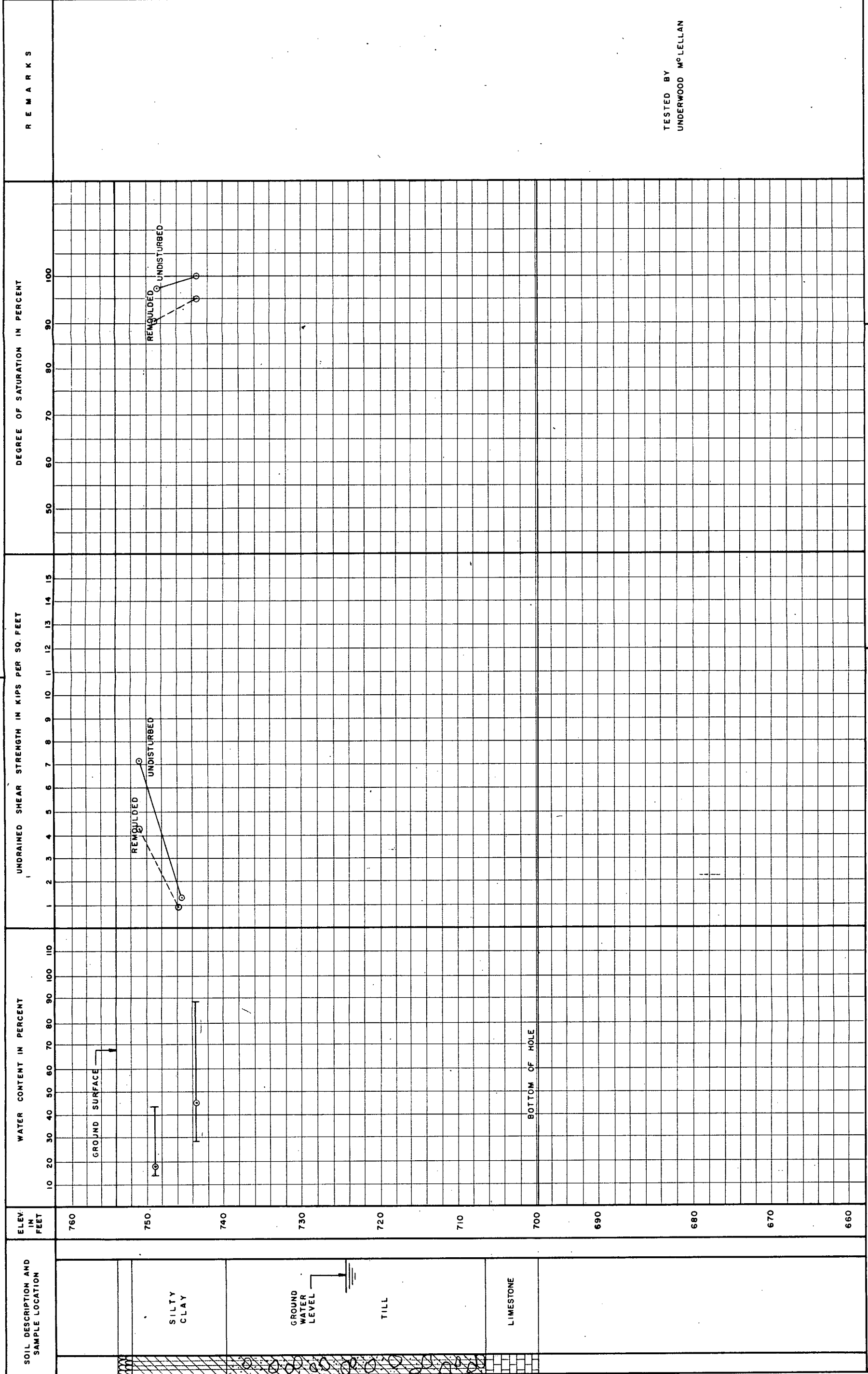
SHIPPING CONTAINER

- N - INSERT
- O - TUBE
- P - WATER CONTENT TIN
- Q - GLASS JAR

- R - CLOTH BAG
- S - PLIOFILM BAG
- Z - DISCARDED

INSPECTOR H.W. Ryder
 LOGGED BY H.W. Ryder

APPROVED [Signature]
 DATE November 1962



TESTED BY
UNDERWOOD McLELLAN

OUTLET CONTROL WORKS

SUMMARY OF DRILLING & TEST RESULTS
HOLE OI

DATE MARCH 7 1962
SK-940-A-39

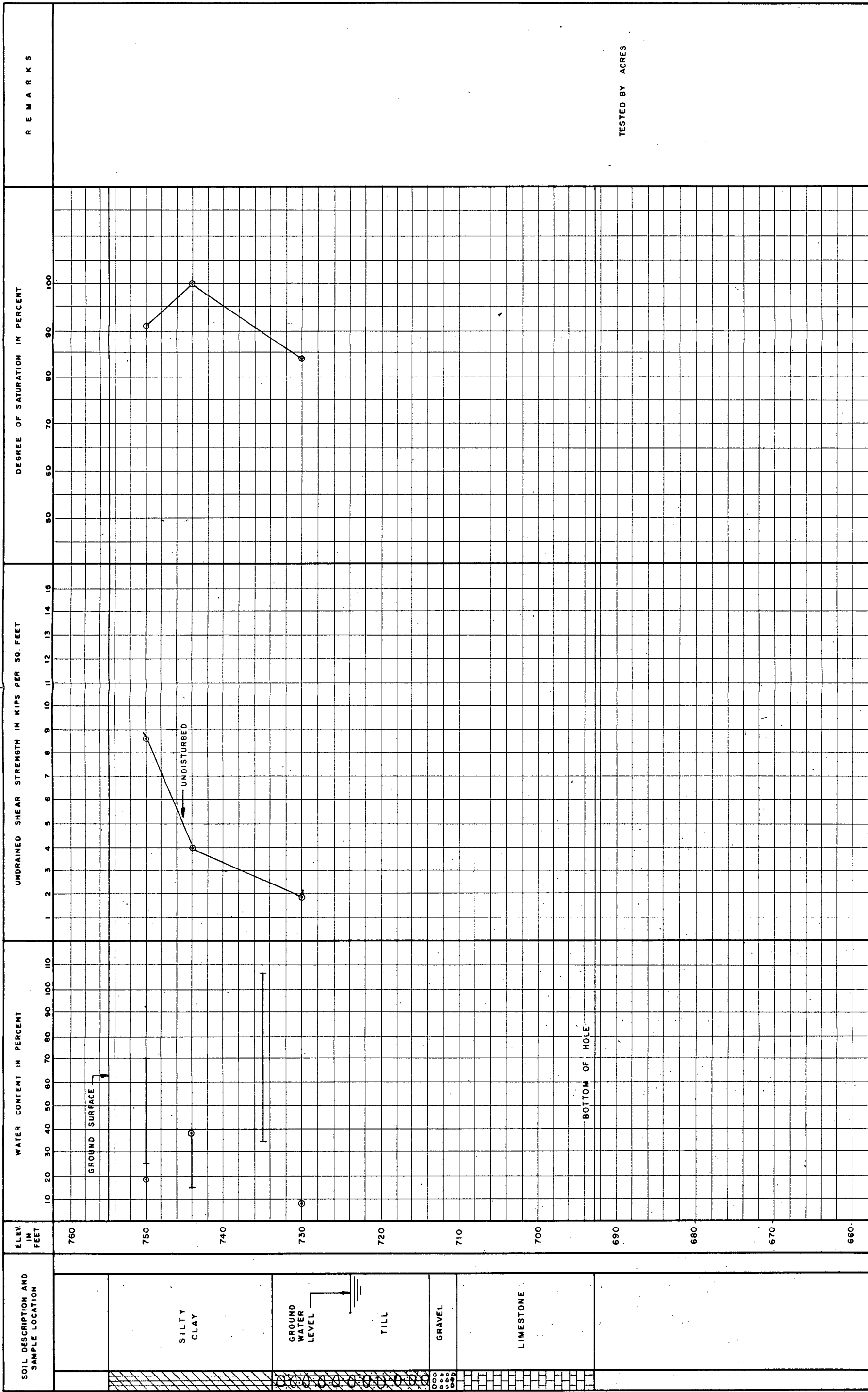
H.G. ACRES & COMPANY LIMITED CONSULTING ENGINEERS

PROVINCE OF MANITOBA
DEPARTMENT OF AGRICULTURE AND CONSERVATION
WATER CONTROL AND CONSERVATION BRANCH

RED RIVER FLOODWAY

H.G. ACRES & COMPANY LIMITED

- 3 SOIL SAMPLE
- NATURAL WATER CONTENT
- △ FIELD VANE TEST
- NATURAL STRENGTH
- REMOULDED STRENGTH
- UNDRAINED COMPRESSION TEST
- △ FAILURE STRAIN



TESTED BY ACRES

OUTLET CONTROL WORKS

SUMMARY OF DRILLING & TEST RESULTS
HOLE 02

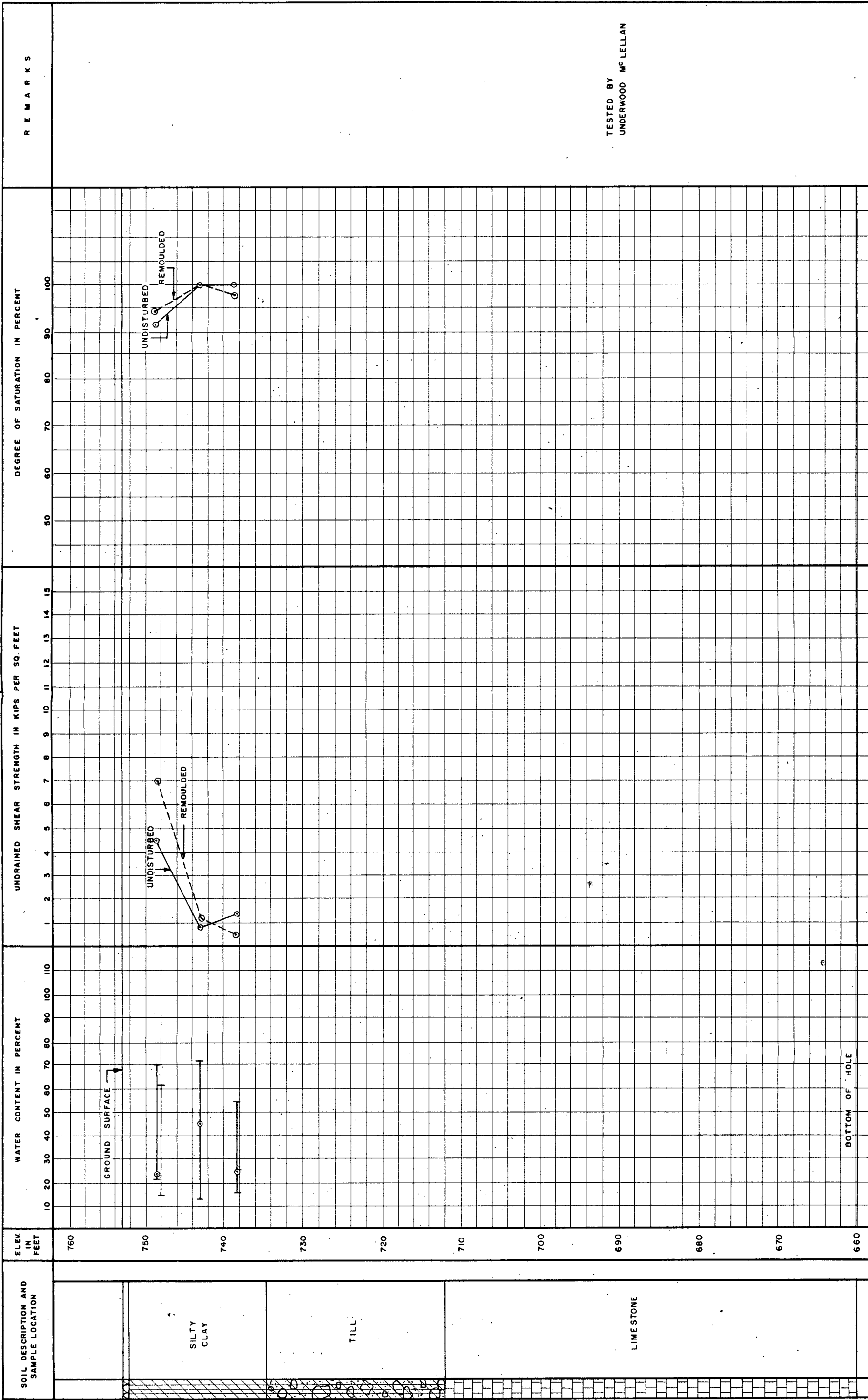
DATE MARCH 7, 1962
SK-940-A-40

H.G. ACRES & COMPANY LIMITED

H.G. ACRES & COMPANY LIMITED CONSULTING ENGINEERS

PROVINCE OF MANITOBA
DEPARTMENT OF AGRICULTURE AND CONSERVATION
WATER CONTROL AND CONSERVATION BRANCH

RED RIVER FLOODWAY



TESTED BY
UNDERWOOD McLELLAN

H.G. ACRES & COMPANY LIMITED CONSULTING ENGINEERS
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 DEPARTMENT OF AGRICULTURE AND CONSERVATION
 WATER CONTROL AND CONSERVATION BRANCH
 RED RIVER FLOODWAY

OUTLET CONTROL WORKS
 SUMMARY OF DRILLING & TEST RESULTS
 HOLE 03
 DATE MARCH 7, 1962
 SK-940-A-41
 H.G. ACRES & COMPANY LIMITED

3 SOIL SAMPLE
 ○ NATURAL WATER CONTENT
 △ FIELD VANE TEST
 — LIQUID LIMIT
 - - - - - PLASTIC LIMIT
 ○ UNDRAINED COMPRESSION TEST
 △ NATURAL STRENGTH
 - - - - - REMOULDED STRENGTH
 ○ FAILURE STRAIN

BOTTOM OF HOLE

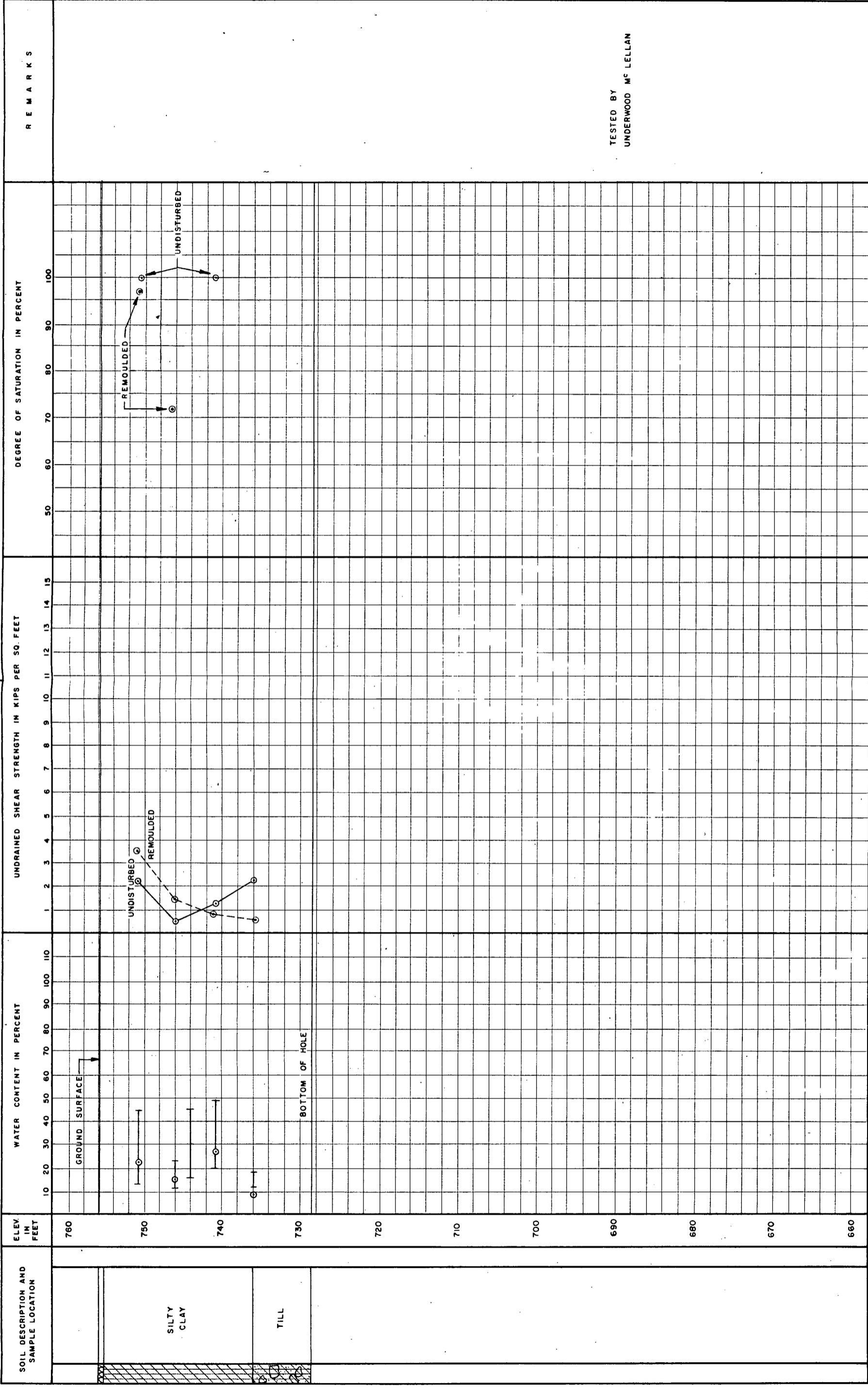
GROUND SURFACE

SILTY CLAY

TILL

LIMESTONE

REMARKS



TESTED BY
UNDERWOOD M^c LELLAN

OUTLET CONTROL WORKS

SUMMARY OF DRILLING & TEST RESULTS
HOLE 04

DATE MARCH 7, 1962

SK-940-A-42

H.G. ACRES & COMPANY LIMITED

H.G. ACRES & COMPANY LIMITED CONSULTING ENGINEERS

PROVINCE OF MANITOBA
DEPARTMENT OF AGRICULTURE AND CONSERVATION
WATER CONTROL AND CONSERVATION BRANCH

RED RIVER FLOODWAY

SOIL SAMPLE

NATURAL WATER CONTENT

LIQUID LIMIT

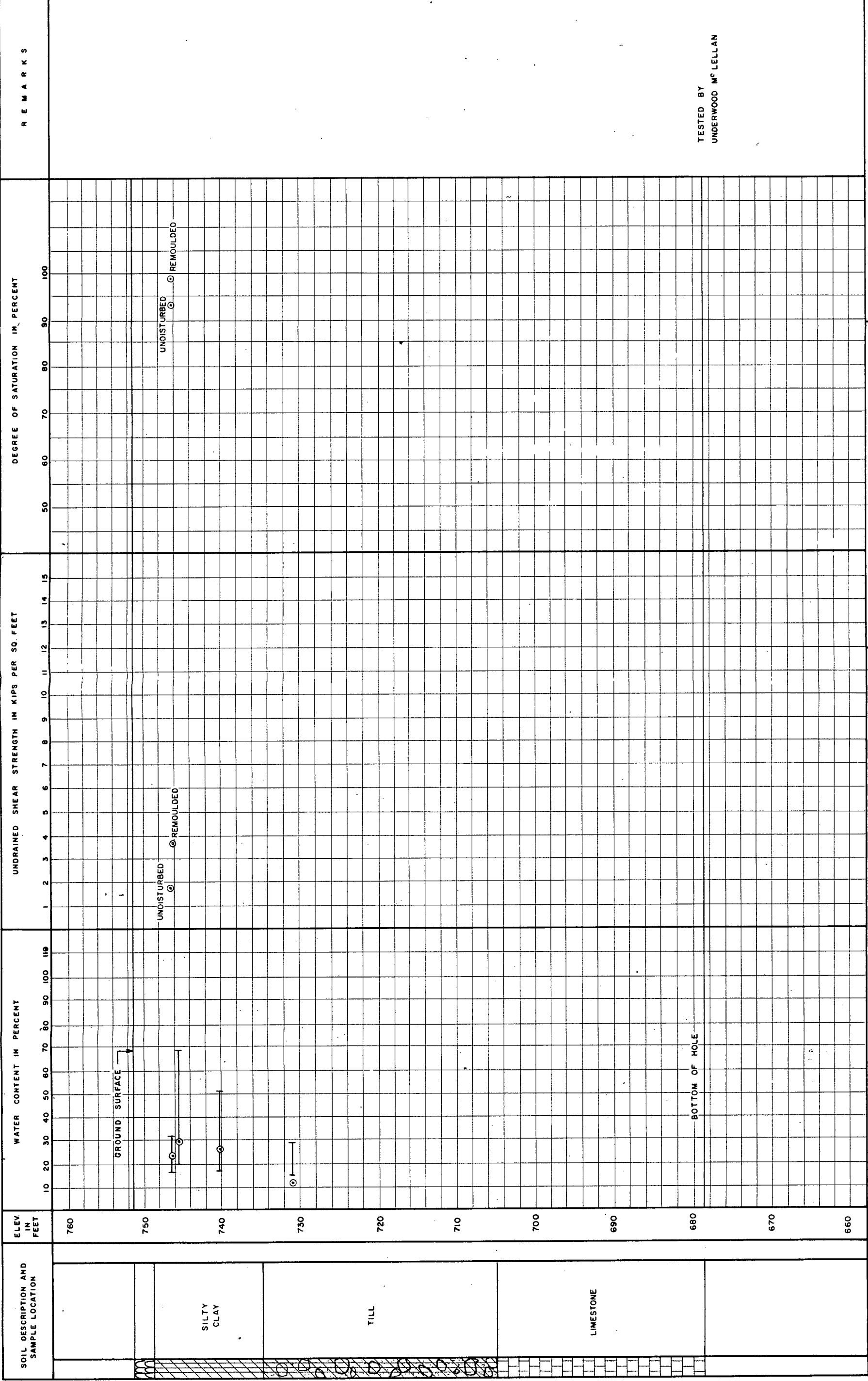
PLASTIC LIMIT

UNDRAINED COMPRESSION TEST

NATURAL STRENGTH

REMOULDED STRENGTH

FAILURE STRAIN



SOIL DESCRIPTION AND SAMPLE LOCATION	ELEV. IN FEET
LIMESTONE	660 - 700
TILL	700 - 730
SILTY CLAY	730 - 750
GROUND SURFACE	750
BOTTOM OF HOLE	680

OUTLET CONTROL WORKS

SUMMARY OF DRILLING & TEST RESULTS
HOLE .05

TESTED BY
UNDERWOOD McLELLAN

DATE MARCH 7 1962
SK-940-A-43

H.G. ACRES & COMPANY LIMITED

H.G. ACRES & COMPANY LIMITED CONSULTING ENGINEERS

PROVINCE OF MANITOBA
DEPARTMENT OF AGRICULTURE AND CONSERVATION
WATER CONTROL AND CONSERVATION BRANCH

RED RIVER FLOODWAY

UNDRAINED COMPRESSION TEST

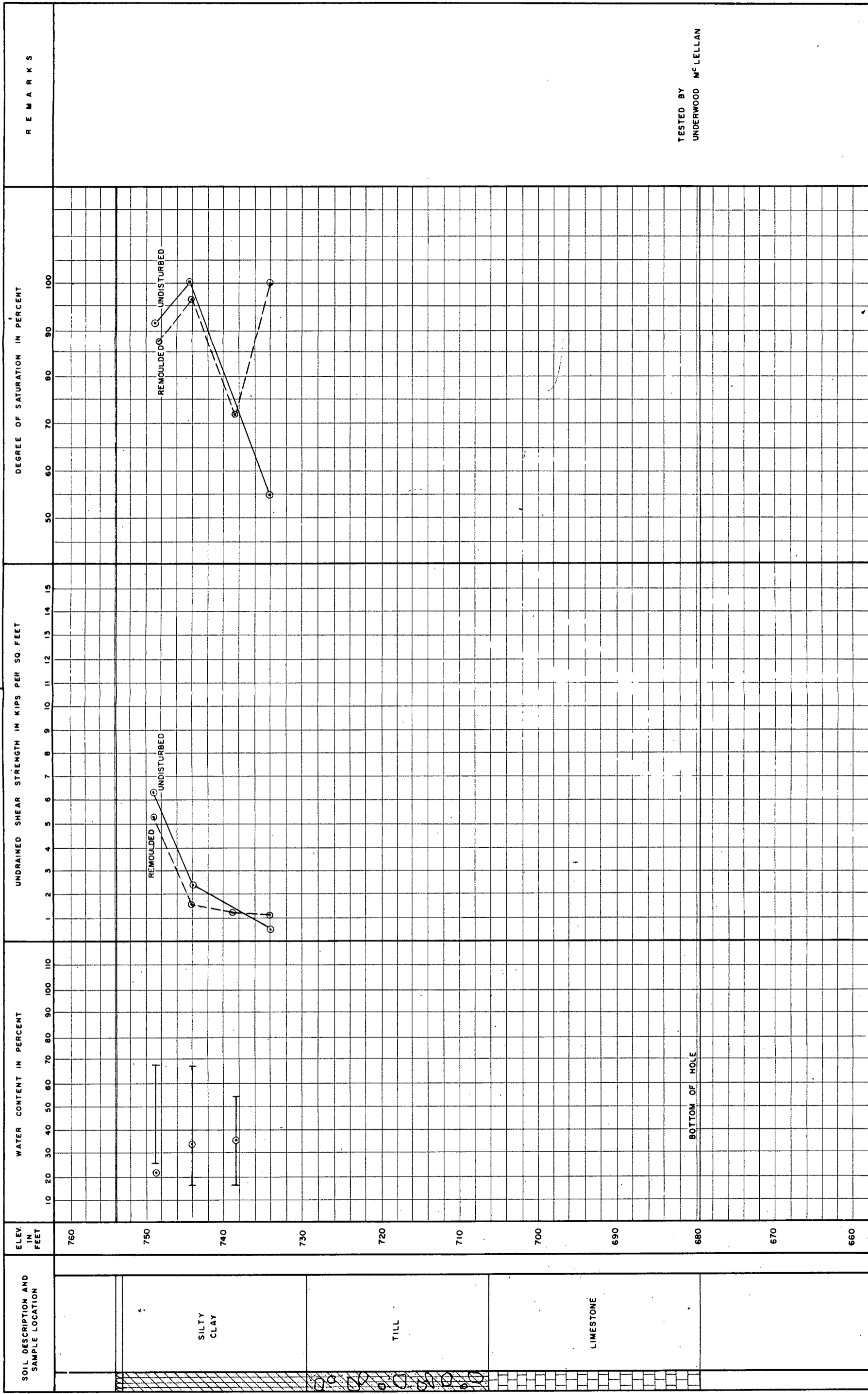
○ UNDISTURBED △ FIELD VANE TEST

○ NATURAL WATER CONTENT — NATURAL STRENGTH

— LIQUID LIMIT - - - - - REMOULDED STRENGTH

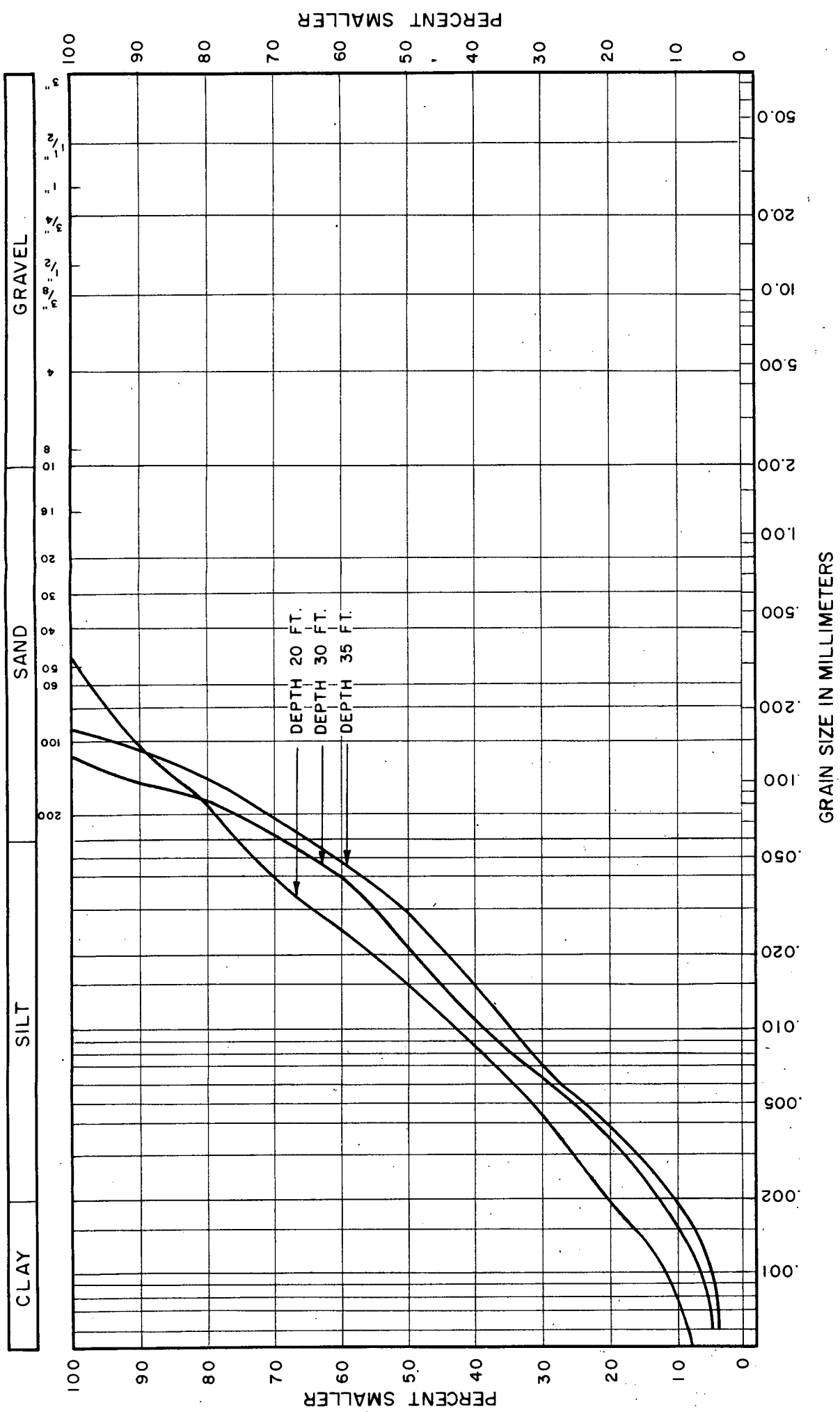
— PLASTIC LIMIT

FAILURE STRAIN



TESTED BY
UNDERWOOD McLELLAN

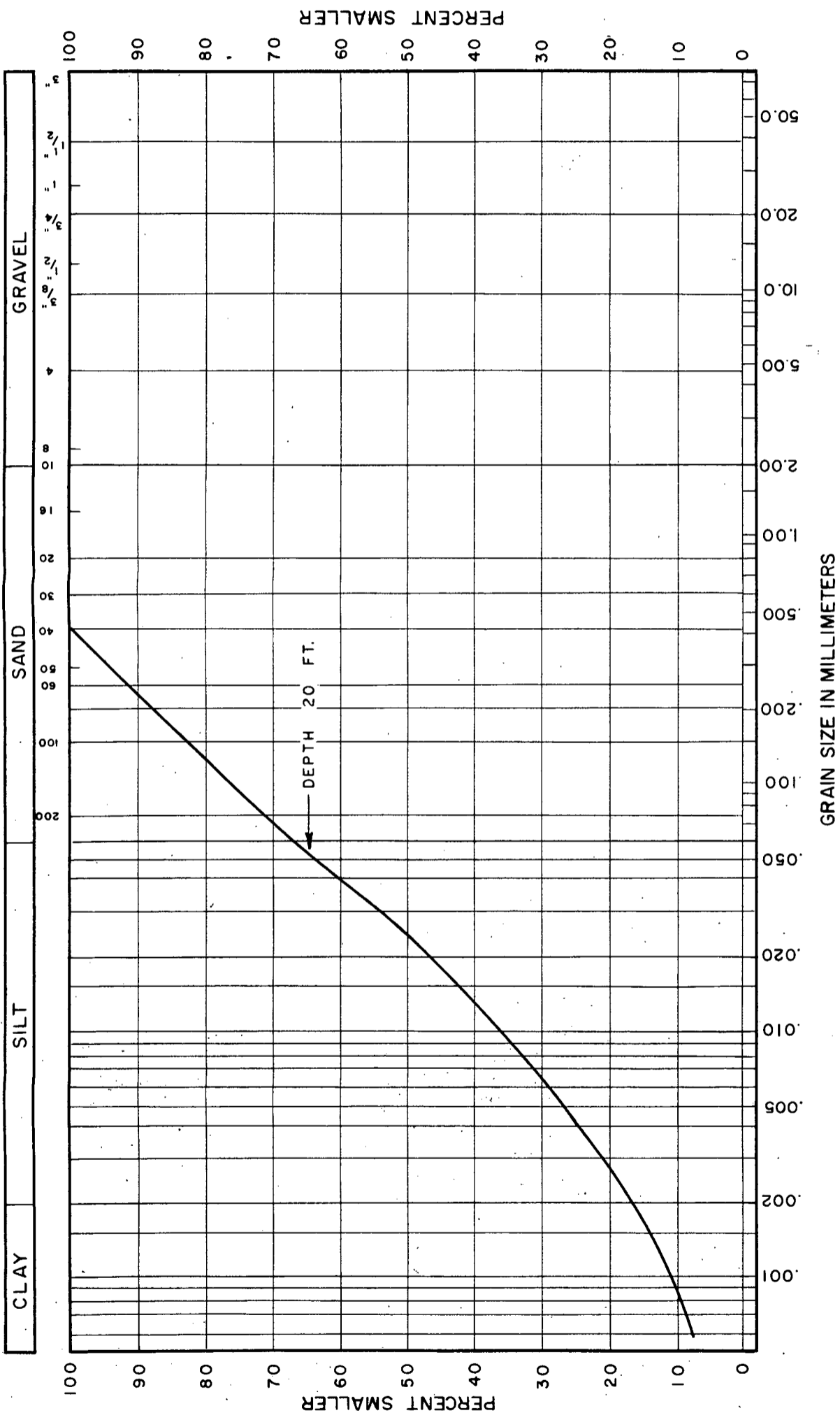
H.G. ACRES & COMPANY LIMITED CONSULTING ENGINEERS PROVINCE OF MANITOBA DEPARTMENT OF AGRICULTURE AND CONSERVATION WATER CONTROL AND CONSERVATION BRANCH	OUTLET CONTROL WORKS SUMMARY OF DRILLING & TEST RESULTS HOLE 06
	DATE MARCH 7, 1962 H.G. ACRES & COMPANY LIMITED
SOIL SAMPLE ○ NATURAL WATER CONTENT — LIQUID LIMIT — PLASTIC LIMIT	UNDRAINED COMPRESSION TEST △ FIELD VANE TEST — NATURAL STRENGTH - - - - REMOULDED STRENGTH
3	RED RIVER FLOODWAY



NOTE:
 SAMPLES TESTED IN UNDERWOOD McLELLAN LABORATORY
 ON PORTION OF SAMPLE PASSING No 40 SIEVE

H.G. ACRES & COMPANY LIMITED CONSULTING ENGINEERS
 PROVINCE OF MANITOBA
 DEPARTMENT OF AGRICULTURE AND CONSERVATION
 WATER CONTROL AND CONSERVATION BRANCH
 RED RIVER FLOODWAY
 OUTLET CONTROL WORKS
 HOLE OI
 GRAIN SIZE CURVES
 TILL

DATE MARCH 6, 1962
 SK-940-A-45
 H.G. ACRES & COMPANY LIMITED

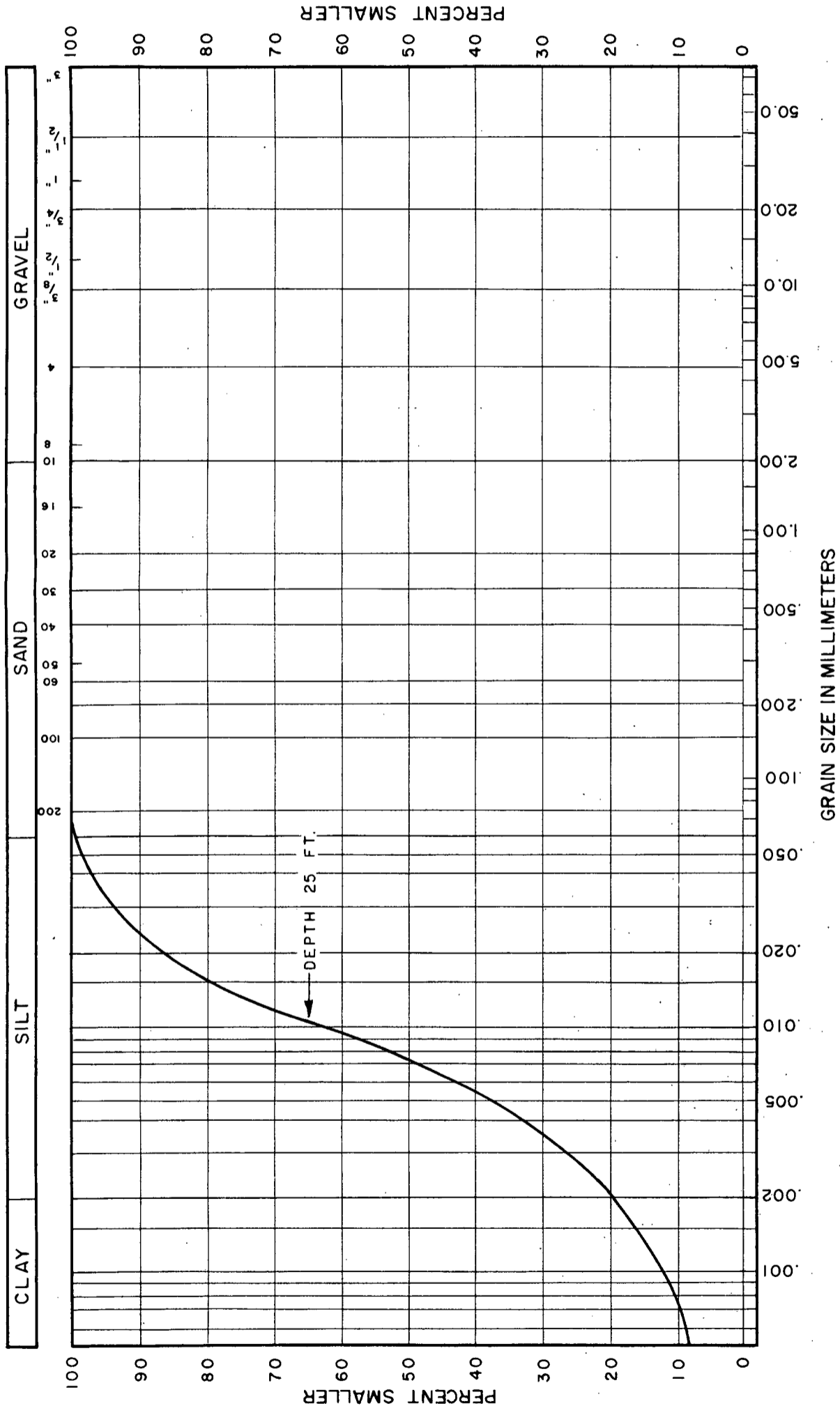


NOTE:

SAMPLES TESTED IN UNDERWOOD McLELLAN LABORATORY
ON PORTION OF SAMPLE PASSING No 40 SIEVE

H.G. ACRES & COMPANY LIMITED CONSULTING ENGINEERS
 PROVINCE OF MANITOBA
 DEPARTMENT OF AGRICULTURE AND CONSERVATION
 WATER CONTROL AND CONSERVATION BRANCH
 RED RIVER FLOODWAY
 OUTLET CONTROL WORKS
 HOLE 03
 GRAIN SIZE CURVE
 TILL

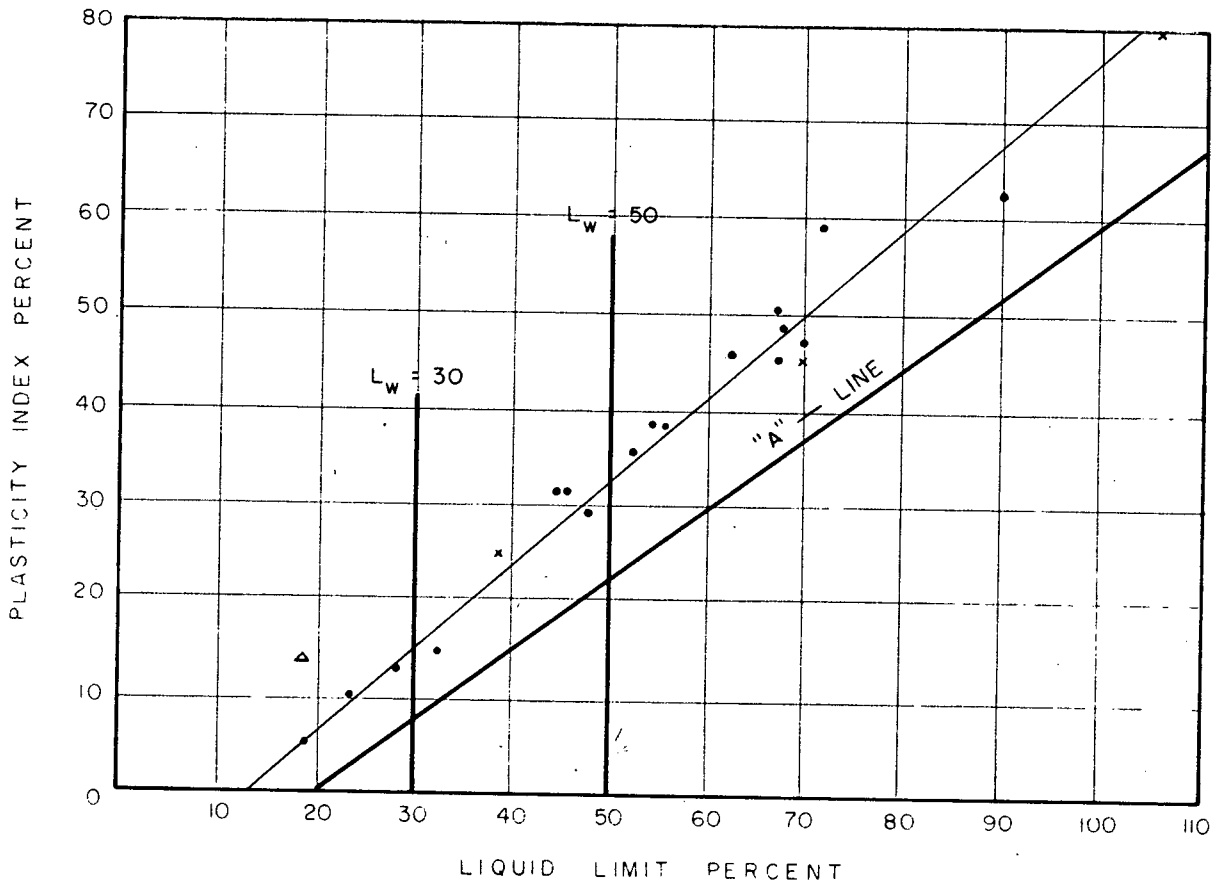
DATE MARCH 6 1962
 SK-940-A-47



NOTE:

SAMPLES TESTED IN UNDERWOOD McLELLAN LABORATORY
ON PORTION OF SAMPLE PASSING No 40 SIEVE

H.G. ACRES & COMPANY LIMITED CONSULTING ENGINEERS	
PROVINCE OF MANITOBA	
DEPARTMENT OF AGRICULTURE AND CONSERVATION	
WATER CONTROL AND CONSERVATION BRANCH	
RED RIVER FLOODWAY	
OUTLET CONTROL WORKS	
HOLE 05	
GRAIN SIZE CURVE	
TILL	
<i>[Signature]</i>	DATE MARCH 6 1962
H.G. ACRES & COMPANY LIMITED	SK-940-A-46



LEGEND

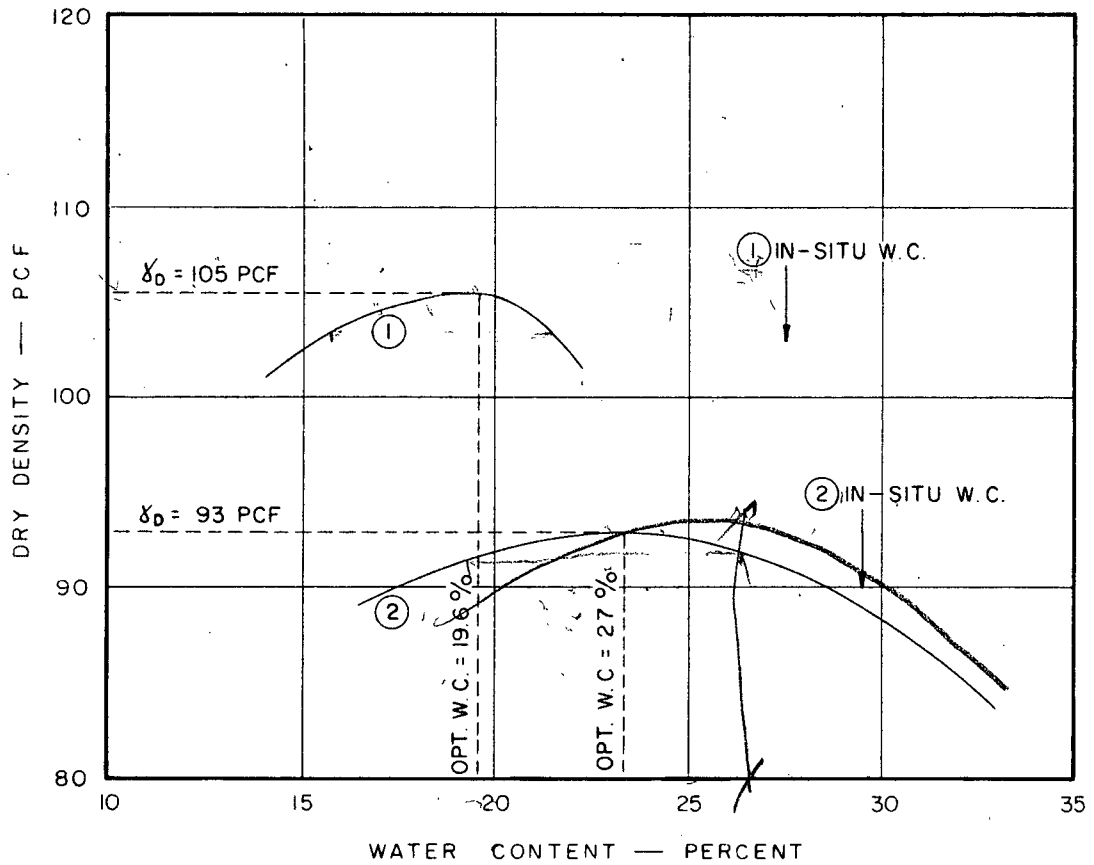
- CLAY SAMPLES : • TEST AT UNDERWOOD Mc LELLAN
 × TEST AT ACRES
- TILL SAMPLE : △ TEST AT ACRES

NOTE:

UNDERWOOD McLELLAN PLASTICITY TESTS PERFORMED ON SOIL PREVIOUSLY OVEN DRIED.

ACRES' TESTS PERFORMED ON SOIL NOT PREVIOUSLY DRIED.

H.G ACRES & COMPANY LIMITED CONSULTING ENGINEERS	
PROVINCE OF MANITOBA DEPARTMENT OF AGRICULTURE AND CONSERVATION WATER CONTROL AND CONSERVATION BRANCH	
RED RIVER FLOODWAY	
OUTLET CONTROL WORKS	
PLASTICITY CHART	
<i>H.G. Acres</i> H G ACRES & COMPANY LIMITED	DATE MARCH 6, 1962 SK-940-LS-49



SILTY CLAY

CURVE ① HOLE 05 DEPTH 11 FT.

CURVE ② HOLE 05 DEPTH 6 FT.

TESTED BY UNDERWOOD M^cLELLAN

H.G. ACRES & COMPANY LIMITED CONSULTING ENGINEERS

PROVINCE OF MANITOBA
DEPARTMENT OF AGRICULTURE AND CONSERVATION
WATER CONTROL AND CONSERVATION BRANCH

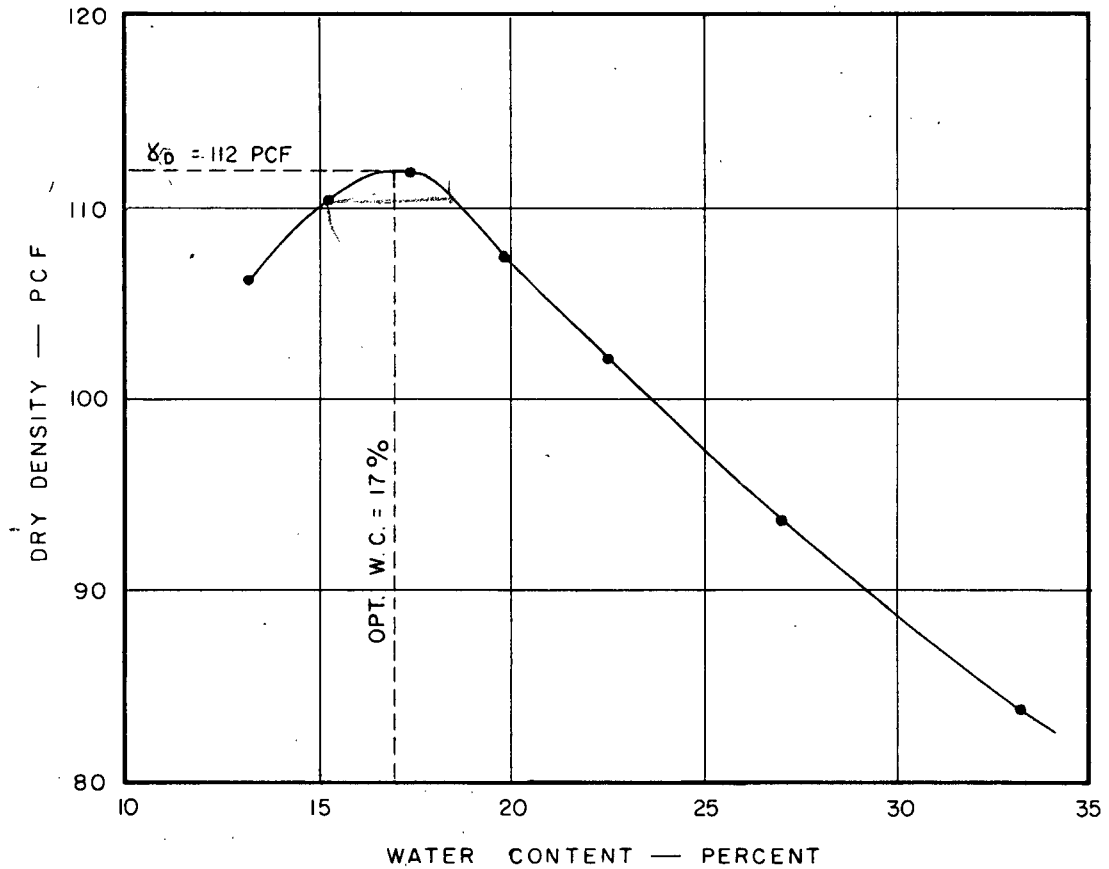
RED RIVER FLOODWAY

OUTLET CONTROL WORKS
PROCTOR COMPACTION CURVES

M. Lellan
H.G. ACRES & COMPANY LIMITED

DATE MARCH 6, 1962

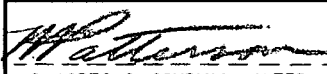
SK-940-LS-50



SILTY CLAY

MIXED SAMPLE FROM HOLE 02 AT 10 FT. DEPTH
AND HOLE 04 AT 12 FT. DEPTH

TESTED BY ACRES

H.G. ACRES & COMPANY LIMITED CONSULTING ENGINEERS	
PROVINCE OF MANITOBA DEPARTMENT OF AGRICULTURE AND CONSERVATION WATER CONTROL AND CONSERVATION BRANCH	
RED RIVER FLOODWAY	
OUTLET CONTROL WORKS PROCTOR COMPACTION CURVES	
 H.G. ACRES & COMPANY LIMITED	DATE MARCH 6, 1962
	SK 40-LS-51

SK-940-LS-51