#56-F-9

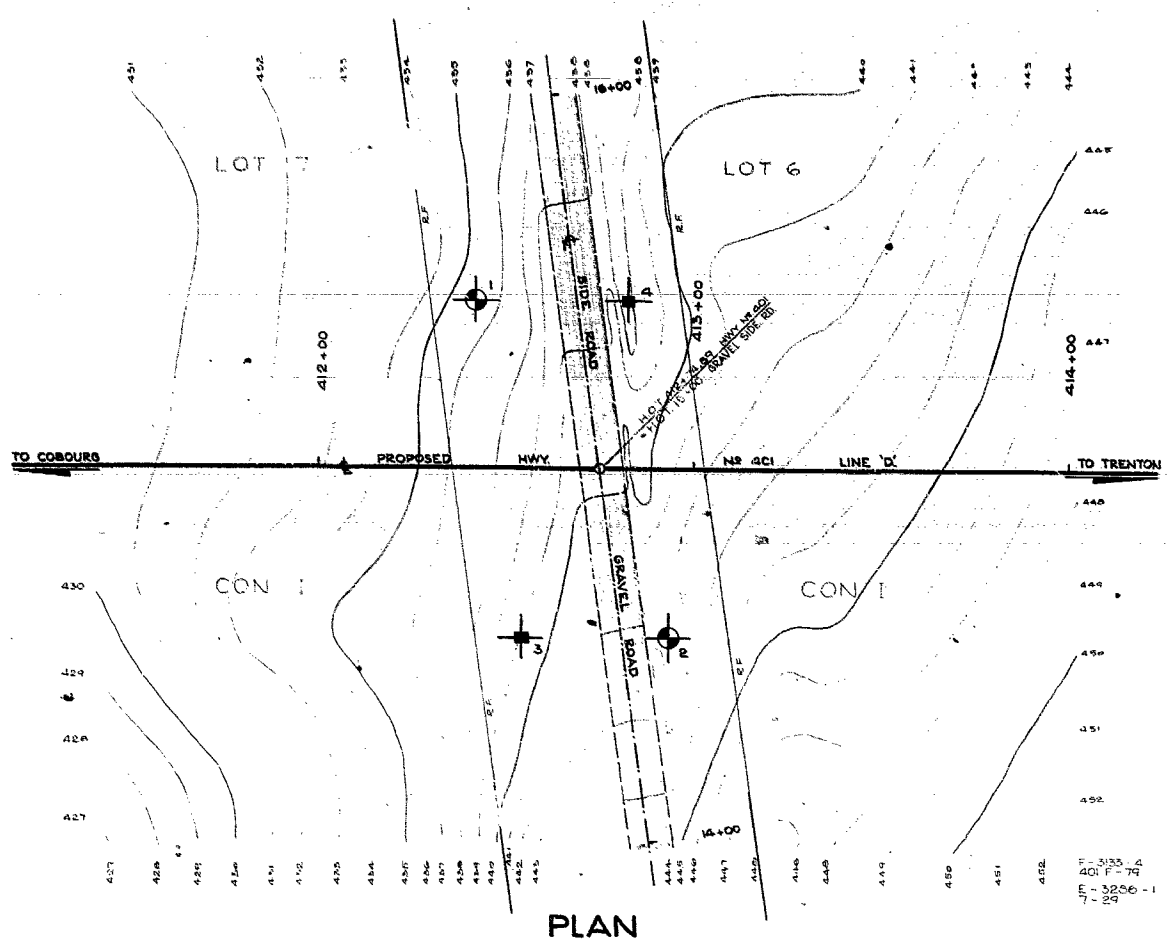
W.P. #184-57

HWY #401 AT

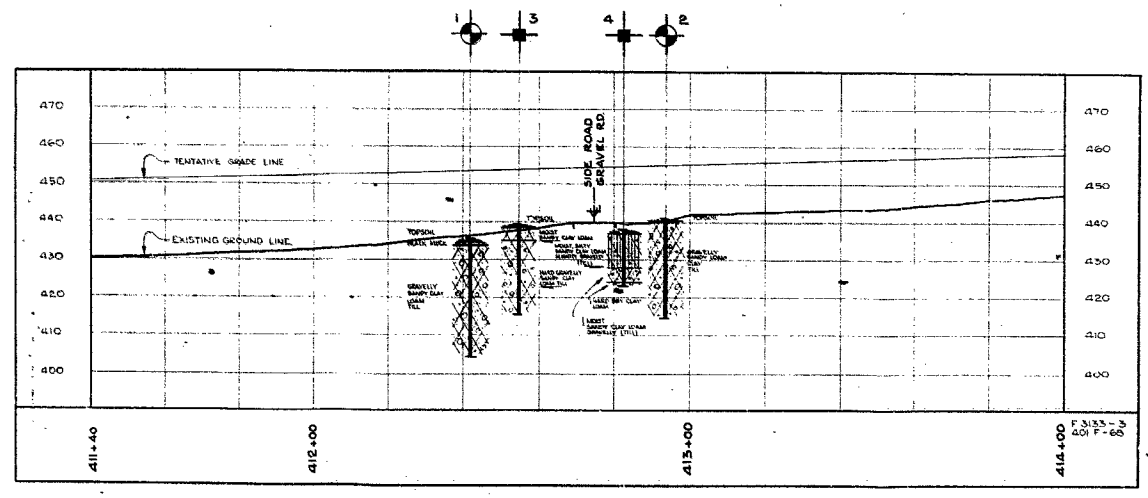
ROAD ALLOWANCE

BETWEEN LOTS #6

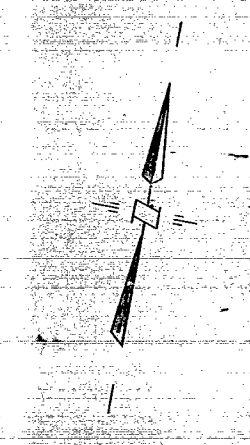
& #7



PLAN



PROFILE



LEGEND

- AUGER HOLE
- BORE HOLE
- PENETRATION HOLE
- BORE & PENETRATION HOLE

HOLE No	ELEVATION	STATION	DISTANCE FROM ℄
1	435.7'	412+42'	45' LT
2	441.38'	412+93'	45' RT
3	439.81'	412+54'	45' RT
4	436.58'	412+62'	45' LT

— NOTE —

THE BOUNDARIES BETWEEN SOIL STRATA HAVE BEEN ESTABLISHED ONLY AT BORE HOLE LOCATIONS. BETWEEN BORE HOLES THE BOUNDARIES ARE ASSUMED FROM GEOLOGICAL EVIDENCE AND MAY BE SUBJECT TO CONSIDERABLE ERROR.

DEPARTMENT OF HIGHWAYS – ONTARIO
MATERIALS & RESEARCH SECTION – DOWNSVIEW

GRAVEL ROAD PROPOSED CROSSING 3 MILES W. OF COLBORNE

SHOWING POSITION & ELEVATION OF HOLES

HWY. No 401	W.P. 184-57	DIV. No 7
CO. NORTHUMBERLAND		
TWP. HALDIMAND	LOTS 6 & 7	CON. I

SCALE 1 IN = 20 FT	SUBMITTED BY	DATE 18 APRIL 58
DRAWN BY R.E.F.	APPROVED BY	DRAWING No F-58-9A

ONTARIO

DEPARTMENT OF HIGHWAYS

Memo to V. Korlu — Date June 25, 1958

Foundations Engineer — Subject

From Materials and Research

Re: W.P. 184-57 Highway 401 Road Allowance Lots 6 & 7
Haldimand Township Foundation Report F58-9

A. Rutka reviewed the Foundation Report for the above ~~approach~~ project on June 24, 1958 and advised that since the grade has been raised 4 feet, the consultants could also raise the base of footings 4 feet to elevations 430 to 431. It would, however, be necessary to maintain careful supervision during the construction of the footings, particularly the one to be placed at bore hole No. 4, and conceivably it could be necessary to excavate any local pockets of softer material and back fill with ordinary concrete.

Mr. Trihorn of the consultants undertaking design was so advised June 25, 1958.

N. D. Smith

NDS:is
c.c. to J. Gruspier
N.D.S.
Files

cc: Foundation Section

Mr. A. Toye, April 29, 1958.

Bridge Engineer.

Materials & Research Section.

Re: Foundation Report -
Hwy. 401 at the Road Allowance
between Lots 6 & 7, Haldimand Township.
W.P. 184-57 W.J. F 58-9

Two copies of the above mentioned Foundation Report are being forwarded herewith for your use and information.

In view of the dense till in this area, spread footing foundations will be satisfactory. The subsoil has a conservative bearing value of 3 tons per square foot with a safety factor of 3.

F. C. Brownridge,
MATERIALS & RESEARCH ENGR.

Per:

A. Rutka

(A. Rutka,
Principal Soils Engr.)

AR:daf
Encl.

cc: Mr. A. Toye
D. G. Ramsay
H. Trajankus
E. G. Huff
A. Watt
Dr. E. Farrow

Foundation Section ✓

File

FOUNDATION REPORT

ON

NEW BRIDGE AT NEW HIGHWAY 401 LINE "D"

OVERPASSING THE EXISTING GRAVEL ROAD

BETWEEN LOTS 6 & 7 (CON. 1),

IN TOWNSHIP OF HALLDIMAND.

Plan No: F-3133-4

Station No: 412/74.89

Distribution:

Mr. A. Foye
Bridge Engineer (2)

Mr. H. Tregakes
Construction Engineer (1)

Mr. D. G. Ramsay
Design Engineer (1)

Mr. H. D. Duff
Dist. Engr. Port Hope (1)

Mr. A. Watt
Water Resources Commission (1)

Dr. P. Karrow
Department of Mines (1)

Foundation Section (1)

File (1)

E. P. 184-57
P.J. F-58-9

INTRODUCTION.

A subsoil investigation was carried out to determine the bearing values of layers for supporting the foundations of the proposed bridge.

The site is located at about three miles west of Colborne where the new highway 401 line "D" crossed the gravel road between lots 6 and 7 (con.I), Township of Haldimand, (station 412/74.89, profile No. F-3133-3). The job started on March 21st, 1958 and was completed on March 28th, 1958.

DESCRIPTION OF SITE AND FIELD WORK:

The crossing is located in an area which is within the shorelines of lat Iroquois Lake. The area is characterised by drumlins cut by ravines. The terrain is till with topsoil providing grazing field for the farms.

The investigations were carried out by means of a skid mounted coredrill machine. Due to the very hard nature of the soil the casings were drilled down by using BX casing shoe. Besides the two boreholes drilled as such, two additional holes were made by means of flight auger. At the same time by driving 2 inch diameter cones down to refusal dynamic cone penetration profile of the site was established.

The boreholes were explored some 30 ft. below the ground surface and due to the nature of the subsoil encountered were stopped at this depth.

The location of the boreholes is shown on the drawing No. F-58-9A and their elevations on log sheets under Appendix I.

FIELD AND LABORATORY FINDINGS.

The explorations carried out at the site revealed the subsoil stratigraphy as made up of one layer of gravelly sandy loam till down to the end of the explorations.

The samples extracted from the boreholes were tested in our laboratory. The classification showed the soil to be made up of about 35% cohesive material, 45% fine aggregate and 20% coarse aggregate. No plastic or liquid limits could be determined. The natural moisture content in the layer was measured to be about 7% and the density about 145 - 150 p.c.f.

The standard penetration tests performed in the field during sampling registered about 60 to 80 blows per foot penetration.

The layer was moist with infiltration water due to the thaw season. The moisture decreased by depth.

SUPPORT OF ABUTMENTS:

The nature of the soil handicaps the determination of bearing values by shear formulas. Its geological structure, mostly confirmed by its textural classification, its density and its non-plastic state, indicate its being preconsolidated till layer. The field standard penetration test results confirm its very hard state.

The new highway 401 is overpassing the existing gravel road at this crossing. The surface elevation of the gravel road after the cut will be lowered to 433.5 ft. Assuming the structure will be supported on 7 ft. wide continuous footings and a depth factor of one is needed then, the footings will be placed at elevation about 427 ft. At this

elevation it is believed the layer can provide a conservative bearing value of 3 T.s.f. with a safety factor of 3.

CONCLUSIONS AND RECOMMENDATIONS.

From the above discussion it will follow that:

1. The subsoil at the site is one layer of gravelly sandy loam clay till in a very hard state.

2. The existing gravel road will underpass the new highway 401 at elevation 433.5 ft.

3. It will be convenient to support the bridge on spread footing type foundations. It is presumed these footings will be placed at elevation 427 ft. At this elevation the layer can provide a bearing value of 3 T.s.f. with sufficient safety factor to support the foundations.

4. The approach fills to the new structure do not present any stability problem.

V. Korlu

Foundation Engineer.

APPENDIX I.

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & RESEARCH BRANCH - FOUNDATIONS SECTION - DOWNSVIEW

OFFICE REPORT ON SOIL EXPLORATION

DRILL RIG CORE DRILL #2 OPERATION BORE & PENET'N JOB F-58-9 W.P. 184-57 BORING 1 STA. 412+42 (45' LT.)

CASING BX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT APRIL 1958

SAMPLER HAMMER WT. 250 LBS. DROP 18 INCHES COMPILED BY H.S. CHECKED BY A.L. DATE BORING 22 MARCH 1958

ABBREVIATIONS

V - INSITU VANE SHEAR TEST; M - MECHANICAL ANALYSIS; U - UNCONFINED COMPRESSION; Q_c - TRIAXIAL CONSOLIDATED QUICK; Q - TRIAXIAL QUICK; S - TRIAXIAL SLOW; W.L. - WATER LEVEL IN CASING; W.T. - WATER TABLE IN SOIL; K - PERMIABILITY; C - CONSOLIDATION; CA. - CASING; γ - UNIT WEIGHT

SAMPLE TYPES

C.S. - CHUNK; D.O. - DRIVE OPEN; D.F. - DRIVE FOOT VALVE; T.O. - THIN WALLED OPEN; S.S. - SLEEVE SAMPLE; P.S. - PISTON SAMPLE; W.S. - WASHED SAMPLE; R.C. - ROCK CORE

SAMPLE CONDITION

- DISTURBED
- FAIR
- GOOD
- LOST

SOIL PROFILE

ELEVATION DEPTH	WATER CONDITIONS	DESCRIPTION	STRAT PLOT
435.7'		GROUND LEVEL	
434.0' / 1.7'	W.T. @ ELEV 435.0' MARCH 27/58	TOPSOIL BLACK MUCK	
5.5		GRAVELLY SANDY CLAY LOAM TILL	
19.5			
25.8			
30.8			
404.2' / 31.5'		END of BOREHOLE	
35.8			

ELEVATION SCALE: 435, 430, 425, 420, 415, 410, 408, 400

SHEAR STRENGTH IN LBS. PER SQ. FT. (1000, 2000, 3000, 4000)

WATER CONTENT W% — 0 - NAT. □ - P.W. Δ - L.W. (10, 20, 30, 40)

PENETRATION TEST RESISTANCE BLOWS PER FOOT AT STANDARD ENERGY (4200 IN. LBS. PER BLOW)

D. CONE PEN. X-------X-------X STAND. PEN. (50, 100, 150, 200)

FROST

REFUSAL AT ELEV. 423.2'

BX CASING SHOE

END OF CASING AT ELEV. 405.7

CASING BLOWS (ACTUAL): 4, 2, 4, 10, 15, 8, 9, 9, 8, 6

NOTE UNCONFINED COMPRESSION TEST RESULTS ARE INACCURATE DUE TO PRESENCE OF GRAVEL & PEBBLES.

SAMPLES

OTHER TESTS	CONDITION	TYPE	NO.	PENETRATION RESISTANCE	ELEV. RECOV. %
					435.7'
					430.7'
γ = 147.0 p.c.f.		T.O.	1	19	75
					425.7'
γ = 140.5 p.c.f.		S.S.	2	37	100
					420.7'
γ = 152 p.c.f.		D.O.	3	81	100
					415.7'
γ = 153.8 p.c.f.		D.O.	4	83	89
					410.7'
		D.O.	5	86	
					408.7'
		D.O.	6	54	67

TL - 129 (REV 56)

H.D.R.

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & RESEARCH BRANCH - FOUNDATIONS SECTION - DOWNSVIEW

OFFICE REPORT ON SOIL EXPLORATION

DRILL RIG CORE DRILL "A" OPERATION BORE & PENET'N JOB F-58-9 W.P. 184-57 BORING 2 STA. 412+93 (55' RT)

CASING BX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT APRIL 1958

SAMPLER HAMMER WT. 250 LBS. DROP 18 INCHES COMPILED BY H.S. CHECKED BY A.L. DATE BORING 25 MARCH 1958

ABBREVIATIONS

V - INSITU VANE SHEAR TEST; M - MECHANICAL ANALYSIS; U - UNCONFINED COMPRESSION; Q_C - TRIAXIAL CONSOLIDATED QUICK; Q - TRIAXIAL QUICK; S - TRIAXIAL SLOW; WL - WATER LEVEL IN CASING; WT - WATER TABLE IN SOIL; K - PERMIABILITY; C - CONSOLIDATION; CA - CASING; γ - UNIT WEIGHT

SAMPLE TYPES

C.S. - CHUNK; D.O. - DRIVE OPEN; D.F. - DRIVE FOOT VALVE; T.O. - THIN WALLED OPEN; S.S. - SLEEVE SAMPLE; P.S. - PISTON SAMPLE; W.S. - WASHED SAMPLE; R.C. - ROCK CORE

SAMPLE CONDITION

- DISTURBED
- FAIR
- GOOD
- LOST

ELEVATION DEPTH	WATER CONDITIONS	DESCRIPTION	STRAT PLOT	ELEVATION SCALE
441.38' 0		GROUND LEVEL		
440.88' 0.5	W.T.	TOPSOIL		440
6.5	W.T. @ ELEV. 441.13' MARCH 27, 1958	GRAVELLY SANDY LOAM CLAY TILL		435
11.5				430
16.5				425
21.5				420
414.88' 26.5		END of BOREHOLE		415

SHEAR STRENGTH IN LBS PER SQ. FT. * (1000, 2000, 3000, 4000)

WATER CONTENT W % (10, 20, 30, 40) O - NAT. □ - P.W. Δ - L.W.

PENETRATION TEST RESISTANCE BLOWS PER FOOT AT STANDARD ENERGY (4200 IN. LBS. PER BLOW)

D. CONE PEN. X------X------X STAND. PEN. ●——●——● (50, 100, 150, 200)

REFUSAL AT ELEV 428.98'

NOTE: UNCONFINED COMPRESSION TEST RESULTS ARE INACCURATE DUE TO PRESENCE OF GRAVEL & PEBBLES.

CASING BLOWS (ACTUAL)	OTHER TESTS	CONDITION	TYPE	NO.	PENETRATION RESISTANCE	ELEV. RECOV. %
						441.38'
3 / 58						436.38'
		X	D.O.	1	63	78
						433.38'
	γ 134.8 pcf		S.S.	2	28	100
						427.38'
BX CASING SHOE		X	S.S.	3	>100	50
						421.38'
		X	S.S.	4	95	31
						416.38'
		X	S.S.	5	86	77

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & RESEARCH BRANCH - FOUNDATIONS SECTION - DOWNSVIEW

OFFICE REPORT ON SOIL EXPLORATION

DRILL RIG FLIGHT AUGER OPERATION BORE & PENET'N JOB F-58-9 W.P. 184-57 BORING 3 STA. 412+34 (45' RT.)

CASING BX (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT APRIL 1958

SAMPLER HAMMER WT. 250 LBS. DROP 18 INCHES COMPILED BY W.S. CHECKED BY A.L. DATE BORING 27 MARCH 1958

ABBREVIATIONS

V - INSITU VANE SHEAR TEST
M - MECHANICAL ANALYSIS
U - UNCONFINED COMPRESSION
Q_c - TRIAXIAL CONSOLIDATED QUICK
Q - TRIAXIAL QUICK
S - TRIAXIAL SLOW
WL - WATER LEVEL IN CASING
WT - WATER TABLE IN SOIL
K - PERMIABILITY
C - CONSOLIDATION
CA - CASING
γ - UNIT WEIGHT

SAMPLE TYPES

C.S. - CHUNK
D.O. - DRIVE OPEN
D.F. - DRIVE FOOT VALVE
T.O. - THIN WALLED OPEN
S.S. - SLEEVE SAMPLE
P.S. - PISTON SAMPLE
W.S. - WASHED SAMPLE
R.C. - ROCK CORE

SAMPLE CONDITION

- DISTURBED
- FAIR
- GOOD
- LOST

SOIL PROFILE

ELEVATION / DEPTH	WATER CONDITIONS	DESCRIPTION	STRAT PLOT
439.81'		GROUND LEVEL	
438.81' / 1.0'		TOPSOIL	
	W.T.	MOIST SANDY CLAY (LOAM)	
435.81' / 4.0'	W.T. @ ELEV. 437.51' MARCH 28/1957.	HARD GRAVELLY SANDY CLAY LOAM TILL	
415.81' / 24.0'		END of BOREHOLE	

ELEVATION SCALE: 435, 430, 425, 420, 415

WATER CONTENT W % — O - NAT. □ - P.W. △ - L.W.

PENETRATION TEST RESISTANCE BLOWS PER FOOT AT STANDARD ENERGY (4200 IN. LBS. PER BLOW)

D. CONE PEN. X-------X-------X STAND. PEN. ●——●——●

50 100 150 200

D. CONE PEN. REFUSAL AT ELEV. 427.1'

FLIGHT AUGER REFUSAL @ ELEV. 418.8'

CASING BLOWS (ACTUAL)

SAMPLES

OTHER TESTS	CONDITION	TYPE	NO.	PENETRATION RESISTANCE	ELEV. RECOV. %

TL-129 (REV. 56)

H.D.R.

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & RESEARCH BRANCH - FOUNDATIONS SECTION - DOWNSVIEW

OFFICE REPORT ON SOIL EXPLORATION

DRILL RIG FLIGHT AUGER OPERATION BORE & PENET'N JOB F-58-9 W.P. 184-57 BORING 4 STA. 412+82 (45' LT.)

CASING B X (standard samplers to fit unless noted) DATUM GEODETIC DATE REPORT APRIL 1958

SAMPLER HAMMER WT. 250 LBS. DROP 18 INCHES COMPILED BY W.G. CHECKED BY A.C. DATE BORING 27 MARCH 1958

ABBREVIATIONS

V - INSITU VANE SHEAR TEST; M - MECHANICAL ANALYSIS; U - UNCONFINED COMPRESSION; Q_c - TRIAXIAL CONSOLIDATED QUICK; Q - TRIAXIAL QUICK; S - TRIAXIAL SLOW; WL - WATER LEVEL IN CASING; WT - WATER TABLE IN SOIL; K - PERMIABILITY; C - CONSOLIDATION; CA - CASING; γ - UNIT WEIGHT

SAMPLE TYPES

C.S. - CHUNK; D.O. - DRIVE OPEN; D.F. - DRIVE FOOT VALVE; T.O. - THIN WALLED OPEN; S.S. - SLEEVE SAMPLE; P.S. - PISTON SAMPLE; W.S. - WASHED SAMPLE; R.C. - ROCK CORE

SAMPLE CONDITION

D - DISTURBED; F - FAIR; G - GOOD; L - LOST

SOIL PROFILE

ELEVATION / DEPTH	WATER CONDITIONS	DESCRIPTION	STRAT PLOT
438.58'		GROUND LEVEL	
437.58' / 1.0'		TOPSOIL	
3.5	W.T.	MOIST, SILTY SANDY CLAY LOAM SLIGHTLY GRAVELLY (TILL)	
8.5	W.T. @ ELEV. 434.33' MARCH 27/1958.		
428.58' / 10.0'		MOIST SANDY CLAY LOAM GRAVELLY (TILL)	
12.5			
424.58' / 14.0'		HARD DRY CLAY LOAM TILL	
423.58' / 15.0'		END OF BOREHOLE	

ELEVATION SCALE: 435, 430, 425

WATER CONTENT W% — ○ - NAT. □ - P.W. △ - L.W.

PENETRATION TEST RESISTANCE BLOWS PER FOOT AT STANDARD ENERGY (4200 IN. LBS. PER BLOW)

D. CONE PEN. X------X------X STAND. PEN. ●——●——● (50, 100, 50, 200)

D. CONE PEN. REFUSAL AT ELEV. 426.78'

FLIGHT AUGER REFUSAL @ ELEV. 423.58'

CASING BLOWS (ACTUAL)

SAMPLES

OTHER TESTS	CONDITION	TYPE	NO.	PENETRATION RESISTANCE	ELEV. RECOV. %