

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

To: Mr. C. S. Moase,
Manager,
Special Services Section,
Admin. Bldg.

FROM: Foundation Section,
Materials & Testing Div.,
Room 107, Lab. Bldg.

DATE: August 13, 1964

OUR FILE REF.

IN REPLY TO

SUBJECT:

FOUNDATION INVESTIGATION REPORT

For
Proposed New Buildings on D.H.O.
Patrol Yard at Sheppard Avenue and
Hwy. 400, Lots 16 & 18, Con. 5, Twp.
of N. York, County of ~~York~~, Dist. 6.
W.J. 64-F 71 -- M.T. W.P. (Nil)

It is proposed to erect two new buildings at the above-mentioned location. A foundation investigation was requested by the Special Services Section in a memo dated July 22, 1964.

In order to determine the subsoil conditions at the site and decide on the type and elevation of footings, an investigation consisting of seven sampled boreholes and two dynamic cone penetration tests was carried out. The locations of these boreholes are shown on Drawing No. 64-F-71A which is attached to this report. The elevations are taken from the contours given on the original drawing.

The subsoil conditions at the site are generally uniform and favourable. Below a thin layer of topsoil or road fill material, is a layer of clayey silt to silty clay with traces of sand and occasional fine gravel. The consistency of this material is generally hard in the upper portion, becoming stiff to firm with depth. This layer was investigated down to elevation 458.5.

cont'd. /2 ...

August 13, 1964

No water level was encountered in any of the boreholes except in borehole No. 2, where perched water was noted at a depth of 2 ft. below the ground surface.

Part of the site where buildings are proposed, is already loaded and is being used as a storage area. The area shown on the drawing for the proposed sand dump, is already loaded with sand to an approximate height of 12 ft.

It is recommended that the proposed buildings be supported on continuous strip footings, placed as high as frost conditions will allow, with a safe bearing pressure of one T.S.F.

If any loose, organic material is encountered at the footing formation level, it should be sub-excavated prior to placing the footing.

The recommendations regarding gravel and asphalt courses, were obtained from the Regional Materials Engineer, Mr. T. J. Kovich. They are as follows:

The proposed paved area is approx. 200 ft. square and is located 160 ft. south of the garage building. At present, the area is used for storage and its south portion is partly occupied by a large winter sand pile. The granular on the south portion of the stockpile is mixed with a large amount of road salt from previous piles, and is in a wet to saturated condition. This area is also slightly lower than the north portion.

It is recommended that after levelling and cleaning up, 15 inches of granular be placed on the north portion, and 21 inches on the south portion. Before adding granular on the south portion, approx. 2 inches of badly salted wet surface gravel should be removed.

cont'd. /3 ...

August 13, 1964

The total depth of granular should consist of 6 inches G.B.C. 'A', and the remainder sand cushion.

The asphalt pavement should be 1½ inches HL-3 surface course over 2 inches HL-6 binder course.

The field work was undertaken on July 27 and 28, 1964, under the supervision of Mr. B. M. Ghadiali, Project Foundation Engineer, who also interpreted the findings and prepared this report.

We believe the information contained in this report will suffice for your design work. However, should further information be required, please do not hesitate to contact our Office.

BMG/MdeF
Attach.

cc: Messrs. C. S. Moase (4)
E. J. Orr
H. D. McMillan
C. Fraser
T. J. Kovich
A. Watt

Foundations Office
Gen. Files

A. G. Stermac
A. G. Stermac,
PRINCIPAL FOUNDATION ENGINEER

APPENDIX I.

FOUNDATION SECTION

ORIGINATED BY B.M.G.

COMPILED BY _____ B.M.G.

CHECKED BY _____ M.D.

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 2

FOUNDATION SECTION

JOB 64-F-71

LOCATION D.H.O. Patrol Yard on Hwy. 400

ORIGINATED BY B.M.G.

W.P. -

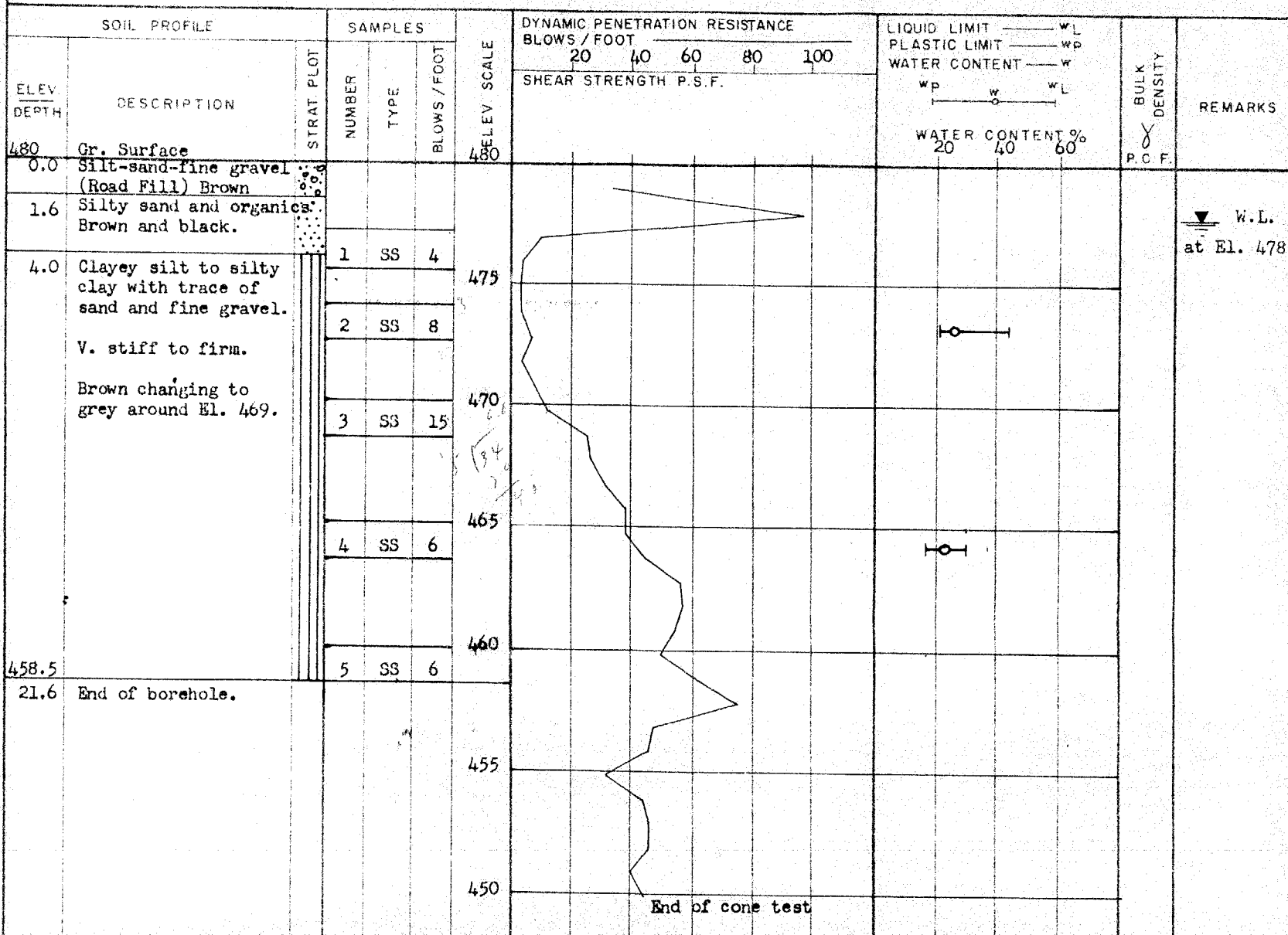
BORING DATE July 27, 1964.

COMPILED BY B.M.G.

DATUM G.S.C.

BOREHOLE TYPE Penn. Auger

CHECKED BY M.D.



DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 3

FOUNDATION SECTION

JOB 64-F-71

LOCATION D.H.O. Patrol Yard on Hwy. 400

ORIGINATED BY B.M.C.

Chemical structures of 1,2-dichloroethane and 1,1-dichloroethane.

BOBING DATE July 28, 1964.

COMPILED BY B.M.C.

DATUM G.S.C.

BOREHOLE TYPE Penn. Auger

CHECKED BY M.D.

SOIL PROFILE		SAMPLES		ELEV SCALE FEET	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	Liquid Limit ——— WL	BULK DENSITY P.C.F.	REMARKS
ELEV DEPTH	DESCRIPTION	NUMBER	TYPE		BLOWS / FOOT	20 40 60 80 100		
479	Gr. Surface							
0.3	Top Soil							
	Clayey silt with trace of sand and fine gravel. Hard to stiff. Brown changing to grey around El. 468.	1	SS	31	475			
		2	SS	23	470			
		3	SS	19	465			
462.5		4	SS	11	460			
16.6	End of borehole.							

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 4

FOUNDATION SECTION

JOB 64-F-71

LOCATION D.H.O. Patrol Yard on Hwy. 400

ORIGINATED BY B.M.G.

W.P. -

BORING DATE July 28, 1964.

COMPILED BY B.H.G.

DATUM G.S.C.

BOREHOLE TYPE Penn. Auger.

CHECKED BY M.D.

SOIL PROFILE		SAMPLES			ELEV SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT ——— WL		BULK DENSITY	REMARKS
ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT		PLASTIC LIMIT ——— WP			
479	Gr. Surface				480	SHEAR STRENGTH P.S.F.		WATER CONTENT ——— W			
	Topsoil							WP ——— W ——— WL			
0.6	Clayey silt with trace of sand and fine gravel.							WATER CONTENT %			
	Stiff to v. stiff.	1	SS	14	475						
	Brown changing to grey at El. 468.	2	SS	22	470						
467.5		3	SS	14							
11.6	End of borehole.				465						

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 5

FOUNDATION SECTION

JOB 64-F-71

LOCATION D.H.O. Patrol Yard on Hwy. 400

ORIGINATED BY B.M.G.

W.C.

BORING DATE July 28, 1964.

COMPILED BY B.M.G.

DATUM G.S.C.

BOREHOLE TYPE Penn. Auger

CHECKED BY M.D.

SOIL PROFILE		SAMPLES			ELEV SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT ——— W _L		BULK DENSITY	REMARKS
ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT		PLASTIC LIMIT ——— W _P			
479	Gr. Surface Topsoil				480			WATER CONTENT ——— W			
0.3	Clayey silt with trace of fine gravel. Hard to stiff. Brown changing to grey at El. 468.	1	SS	31	475			W _P ——— W _L			
		2	SS	26	470						
467.5		3	SS	14							
11.6	End of borehole.				465						

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 6

FOUNDATION SECTION

JOB 64-K-71

LOCATION D.H.O. Patrol Yard on Hwy. 400

ORIGINATED BY B.M.G.

5. P

BORING DATE July 28, 1964.

COMPILED BY B.M.G.

DATA ON G.S.C.

BOREHOLE TYPE Penn. Auger

CHECKED BY _____ M.D.

SOIL PROFILE		STRAT. PLOT	SAMPLES			ELEV SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	LIQUID LIMIT ——— WL			BULK DENSITY	REMARKS
ELEV DEPTH	DESCRIPTION		NUMBER	TYPE	BLOWS / FOOT			PLASTIC LIMIT ——— WP	WATER CONTENT ——— W	WATER CONTENT %		
480	Gr. Surface					480						
0.6	Clayey silt with trace of sand and fine gravel. Hard to v. stiff. Brown changing to grey at El. 468.5		1	SS	30	475						
			2	SS	33							
468.5			3	SS	16	470						
11.6	End of borehole.					465						

FOUNDATION SECTION

ORIGINATED BY B.M.G.

COMPILED BY B.N.O.

CHECKED BY M.D.

SOIL PROFILE		SAMPLES			ELEV SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT ——— W _L		BULK DENSITY	REMARKS
ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT	SHEAR STRENGTH P.S.F.	PLASTIC LIMIT ——— W _P	WATER CONTENT ——— W		
482	Gr. Surface										
0.3	Topsoil				480						
	Clayey silt with trace of sand.	1	SS	26							
	V. stiff.										
	Brown.	2	SS	28	475						
470.5		3	SS	26							
11.6	End of borehole.				470						

ABBREVIATIONS USED IN THIS REPORT

PENETRATION RESISTANCE

STANDARD PENETRATION RESISTANCE 'N' : - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A STANDARD SPLIT SPOON SAMPLER 12 INCHES INTO THE SUBSOIL, DRIVEN BY MEANS OF A 140 POUND HAMMER FALLING FREELY A DISTANCE OF 30 INCHES.

DYNAMIC PENETRATION RESISTANCE : - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A 2 INCH, 60 DEGREE CONE, FITTED TO THE END OF DRILL RODS, 12 INCHES INTO THE SUBSOIL, THE DRIVING ENERGY BEING 350 FOOT POUNDS PER BLOW.

DESCRIPTION OF SOIL

THE CONSISTENCY OF COHESIVE SOILS AND THE RELATIVE DENSITY OR DENSENESS OF COHESIONLESS SOILS ARE DESCRIBED IN THE FOLLOWING TERMS :-

<u>CONSISTENCY</u>	<u>'N' BLOWS / FT.</u>	<u>c LB. / SQ. FT.</u>	<u>DENSENESS</u>	<u>'N' BLOWS / FT.</u>
VERY SOFT	0 - 2	0 - 250	VERY LOOSE	0 - 4
SOFT	2 - 4	250 - 500	LOOSE	4 - 10
FIRM	4 - 8	500 - 1000	COMPACT	10 - 30
STIFF	8 - 15	1000 - 2000	DENSE	30 - 50
VERY STIFF	15 - 30	2000 - 4000	VERY DENSE	> 50
HARD	> 30	> 4000		

TYPE OF SAMPLE

S.S.	SPLIT SPOON	T.W.	THINWALL OPEN
W.S.	WASHED SAMPLE	T.P.	THINWALL PISTON
S.B.	SCRAPER BUCKET SAMPLE	O.S.	OESTERBERG SAMPLE
A.S.	AUGER SAMPLE	F.S.	FOIL SAMPLE
C.S.	CHUNK SAMPLE	R.C.	ROCK CORE
S.T.	SLOTTED TUBE SAMPLE		
	P.H. SAMPLE ADVANCED HYDRAULICALLY		
	P.M. SAMPLE ADVANCED MANUALLY		

SOIL TESTS

Qu	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V.	FIELD VANE
Qcu	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Qd	DRAINED TRIAXIAL	S	SENSITIVITY

ABBREVIATIONS USED IN THIS REPORT

SOIL PROPERTIES

γ	UNIT WEIGHT OF SOIL (BULK DENSITY)
γ_s	UNIT WEIGHT OF SOLID PARTICLES
γ_w	UNIT WEIGHT OF WATER
γ_d	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
γ'	UNIT WEIGHT OF SUBMERGED SOIL
G	SPECIFIC GRAVITY OF SOLID PARTICLES $G = \frac{\gamma_s}{\gamma_w}$
e	VOID RATIO
n	POROSITY
w	WATER CONTENT
S_r	DEGREE OF SATURATION
w_L	LIQUID LIMIT
w_p	PLASTIC LIMIT
I_p	PLASTICITY INDEX
s	SHRINKAGE LIMIT
I_L	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$
I_c	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$
e_{max}	VOID RATIO IN LOOSEST STATE
e_{min}	VOID RATIO IN DENSEST STATE
I_D	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
	RELATIVE DENSITY D_r IS ALSO USED
h	HYDRAULIC HEAD OR POTENTIAL
q	RATE OF DISCHARGE
v	VELOCITY OF FLOW
i	HYDRAULIC GRADIENT
k	COEFFICIENT OF PERMEABILITY
j	SEEPAGE FORCE PER UNIT VOLUME
m_v	COEFFICIENT OF VOLUME CHANGE = $\frac{-\Delta e}{(1+e)\Delta\sigma}$
c_v	COEFFICIENT OF CONSOLIDATION
C_c	COMPRESSION INDEX = $\frac{\Delta e}{\Delta \log_{10} \sigma}$
T_v	TIME FACTOR = $\frac{c_v t}{d^2}$ (d, DRAINAGE PATH)
U	DEGREE OF CONSOLIDATION
τ_f	SHEAR STRENGTH
c'	EFFECTIVE COHESION INTERCEPT
ϕ'	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
μ	COEFFICIENT OF FRICTION
S_t	SENSITIVITY

GENERAL

π	= 3.1416
e	BASE OF NATURAL LOGARITHMS 2.7183
$\log_e a$ OR $\ln a$	NATURAL LOGARITHM OF a
$\log_{10} a$ OR $\log a$	LOGARITHM OF a TO BASE 10
t	TIME
g	ACCELERATION DUE TO GRAVITY
V	VOLUME
W	WEIGHT
M	MOMENT
F	FACTOR OF SAFETY

STRESS AND STRAIN

u	PORE PRESSURE
σ	NORMAL STRESS
σ'	NORMAL EFFECTIVE STRESS ($\bar{\sigma}$ IS ALSO USED)
τ	SHEAR STRESS
ϵ	LINEAR STRAIN
γ	SHEAR STRAIN
ν	POISSON'S RATIO (μ IS ALSO USED)
E	MODULUS OF LINEAR DEFORMATION (YOUNG'S MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
η	COEFFICIENT OF VISCOSITY

EARTH PRESSURE

d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_o	COEFFICIENT OF EARTH PRESSURE AT REST

FOUNDATIONS

B	BREADTH OF FOUNDATION
L	LENGTH OF FOUNDATION
D	DEPTH OF FOUNDATION BENEATH GROUND
N	DIMENSIONLESS COEFFICIENT USED WITH A SUFFIX APPLYING TO SPECIFIC GRAVITY, DEPTH AND COHESION ETC. IN THE FORMULA FOR BEARING CAPACITY
k_s	MODULUS OF SUBGRADE REACTION

SLOPES

H	VERTICAL HEIGHT OF SLOPE
D	DEPTH BELOW TOE OF SLOPE TO HARD STRATUM
β	ANGLE OF SLOPE TO HORIZONTAL

MEMORANDUM

TO: Mr. A. Stermac,
Principal Foundation Engr.

FROM: Materials & Testing Division.

Attn: Mr. B. Ghadiali.

DATE: August 10th, 1964.

OUR FILE REF.

IN REPLY TO

SUBJECT: Patrol Yard, Hwy. #400 at Sheppard Avenue,
- Toronto District -

A number of shallow borings to obtain the subsurface conditions for a proposed paved area at the Sheppard Avenue patrol yard along the west side of Hwy. #400 were carried out.

The proposed paved area is approx. 200' square and located 160' south of the garage building. At present the area is used for storage and its south portion partly occupied by a large winter sandpile.

The borings indicate from 6" - 15" of granular over 9" - 15" of firm black clay loam topsoil over a light to medium clay.

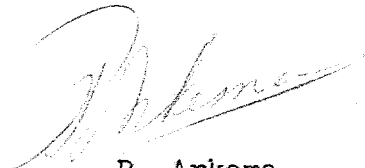
The granular on the south portion of the stockpile is mixed with a large amount of road salt from previous piles and in a wet to saturated condition. This area is also slightly lower than the north portion.

It is recommended that after leveling and cleaning up, 15" of granular be placed on the north portion, and 21" on the south portion. Before adding granular on the south portion approx. 2" of badly salted wet surface gravel should be removed.

The total depth of granular should consist of 6" G.B.C. "A" and the remainder sand cushion.

The asphalt pavement should be 1½" HL3 surface course over 2" HL6 binder course.

PA/hd
c.c. T.J. Kovich,
Files.


P. Arkema,
For: T.J. Kovich,
Regional Materials Engineer.

Aug. 7/64

HOLE #1

0-8" BR SA GRAV. (Lo) (MOIST-VET)
8-10" SA GR TOPSOIL
10-15" BR SA GR (Lo)
15-23" BLK CL Lo - LT CL TOPSOIL.
23-38" BR MED CL
38-48" GR BR HEAVY CL. (STIFF)

HOLE #2

0-1" SA GRAVEL & SODIUM CHLORIDE NOD
1-20" BR SA GRAV (WET & SL Lo)
20-25" BLK CL Lo TOPSOIL
25-29" GR BR LT CLAY
29-48" GR BR HEAVY CL (MOIST & STIFF)

HOLE #3

0-7" CR GRAVEL (S & Lo)
7-11" BR F.A. SAND (Lo)
11-22" DK BR CL Lo TOPSOIL
22-29" GR BR LT CL
29-48" GR BR S CL - LT CL (S SEAMS) } DRY

HOLE #4

0-5" CR GRAVEL (SANDY & Lo)
5-9" BR F SA - SAND
9-29" BLK CL Lo TOPSOIL
29-33" BR LT-M CL (MOIST)
33-48" BR S CL - LT CL (DRY-MOIST)

HOLE #5

0-3" CR GRAV (SA & DRY)
3-8" BR M-H CLAY
8-15" BLK CL Lo TOPSOIL (WOOD PERCES)
15-27" BLK CL Lo TOPSOIL
27-40" GR BR LT-MED CLAY
40-48" GR BR H CLAY (FIRM) DRY

N

DATE: AUG 7/69

HOLE #6.
0-4"
4-17"
17-24"
24-48"

BR SA GRAV. (LO)
BR STONEY SALO. TOPSOIL.
BR T-V.F. SALO.
BR SA CL LO-LT CL
GR BR MED-H CL (SILT SEAMS + FIRM)

HOLE #7
0-10"
10-24"
24-38"
38-48"

BR SA GRAV. (SL. LO)
BLK SA LO. TOPSOIL
DK GR. SALO-SACL. LO. TOPSOIL
LT. BR. V.F. SA SILT - SALO. (MOIST)

HOLE #8
0-12"
12-26"
26-48"

BR SA GRAV (SL. LO.)
BLK CL. LO. TOPSOIL
GR BR H CL (STIFF)

HOLE #9
0-2"
2-11"
11-26"
26-48"

BR SAGR. (LO & WET)
BLK CL LO. TOPSOIL
BR M-H CL
GR BR M CL TILL (SILT SEAMS, DRY + FIRM)

64-F-71

At location of BH 2, there will be a basement with El. 470.0

Since soil at this location seems to be poorer than elsewhere it was suggested to Peter Vantlooff of Public Works that the excavation be inspected by a representative of this section prior to concrete placing.

If unfavourable conditions are encountered footings should be widened.

By telephone Oct 8. 1965

Althman

64-F-71

Hwy. #400 E

SHEPPARD AVE.

D.H.O. PATROL

YARD

