65-F(R)-80

HWY. # 17 &

522

D.H.O. PATROL

YARD

cc: GEN. FILES

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 18, 1965

Our File Ref.

In reply to

Subject:

FOUNDATION INVESTIGATION REPORT
For
Proposed D.H.O. Patrol Yard, Hwy's. #17 & #522, District of Algoma, Twp. of Vankoughnet, N.W. 1/4, Sect. 31, District #18 (Sault Ste. Marie)
W.J. 65-F(R)-80 -- W.P. (Nil)

Attached, we are forwarding to you, our detailed foundation investigation report on the subsoil conditions existing at the above structure site.

We believe that you will find the factual data and recommendations contained therein, adequate for your design work. Should additional information be required, please feel free to contact our Office.

A. G. Stermac,
PRINCIPAL FOUNDATION ENGINEER

AGS/MdeF
Attach.
cc: Messrs. C. S. Moase (4)
E. J. Orr
D. W. Farren
J. A. Knowles
E. R. Saint
A. Watt

Foundations Office
Gen. Files

FOUNDATION INVESTIGATION REPORT

For

Proposed D.H.O. Patrol Yard, Hwy's. #17 & #522, District of Algoma, Twp. of Vankoughnet, N.W. 1/4, Sect. 31, District #18 (Sault Ste. Marie)

W.J. 65-F(R)-80 -- W.P. (Nil)

It is proposed to erect a D.H.O. Patrol Garage at the South-West corner of the intersection of Hwy's. #17 and #522. A request for a foundation investigation was received from Mr. F. J. Mauro, Regional Inspector of Special Services, dated May 21, 1965.

In order to determine the properties of the soil and decide on the type of foundations, an investigation was carried out by this Section. The field investigation was confined to three sampled boreholes and five dynamic cone penetration tests.

The elevations, as well as the locations of the boreholes, are shown on Dwg. No. 65-F(R)-80A, attached to this report.

The stratigraphy of the soil throughout the site, was found to be quite uniform. The subsoil consists of compact to dense silt with only traces of clay. The safe bearing pressure for spread footings, 2 feet wide, at a depth of 7 feet below ground level, is estimated to be 2 tons/sq.ft.

At the time of the investigation, the ground water level was encountered approx. 2'-0" to 2'-6" below existing ground elevations.

The sand pile, at any location, may be built without danger of base failure.

cont'd. /2 ...

Attention is drawn to the existence of wells located approximately 300 and 700 feet East and North, respectively. Because of the granular and, therefore, permeable character of the subsoil, the probability of salt contamination is very real.

The recommendations given by Mr. E. R. Saint, Regional Materials Engineer, for grading and paving, are as follows:

The soils where the driveway and paved areas are to be located generally consist of a loamy topsoil over a medium to coarse sand. This material overlies a fine to very fine sandy loam and silt which is saturated.

Due to the high water table, the loamy material overlying the medium to coarse sand should be removed prior to the placing of any granular base material. This will preclude the possibility of serious heaving within the loamy layer. Also the finished grade should be raised to at least three feet above the normal ground level. Again, because of the high water table, a granular material should be used exclusively to within 6 inches of grade. The top 6 inches should be G.B.C. Class "A".

The hot mix paving should consist of a 2 inch binder course and a 1½ inch top course of HL4. Materials suitable for sand cushion and G.B.C. "A" are located in the general vicinity of the proposed work.

cont'd. /3 ...

The field work, performed during July 13 and 14, 1965, together with the preparation of this report, was undertaken by Mr. W. W. Kulmatickas, Project Foundation Engineer. The investigation was carried out under the general supervision of Mr. K. G. Selby, Senior Foundation Engineer, who reviewed this report.

August 1965

APPENDIX I.

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 :-

CONSISTENCY	'N' BLOWS / FT.	c LB. / SQ. FT.	DENSENESS	'N' BLOWS / FT.
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
	IN TERMS OF EFFECTIVE STRESS $\tau_f = c' + \sigma' \tan \phi'$
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
	IN TERMS OF TOTAL STRESS $\tau_f = c_u + \sigma \tan \phi$
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 (YOUNGS MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
η	COEFFICIENT OF VISCOSITY

EARTH PRESSURE

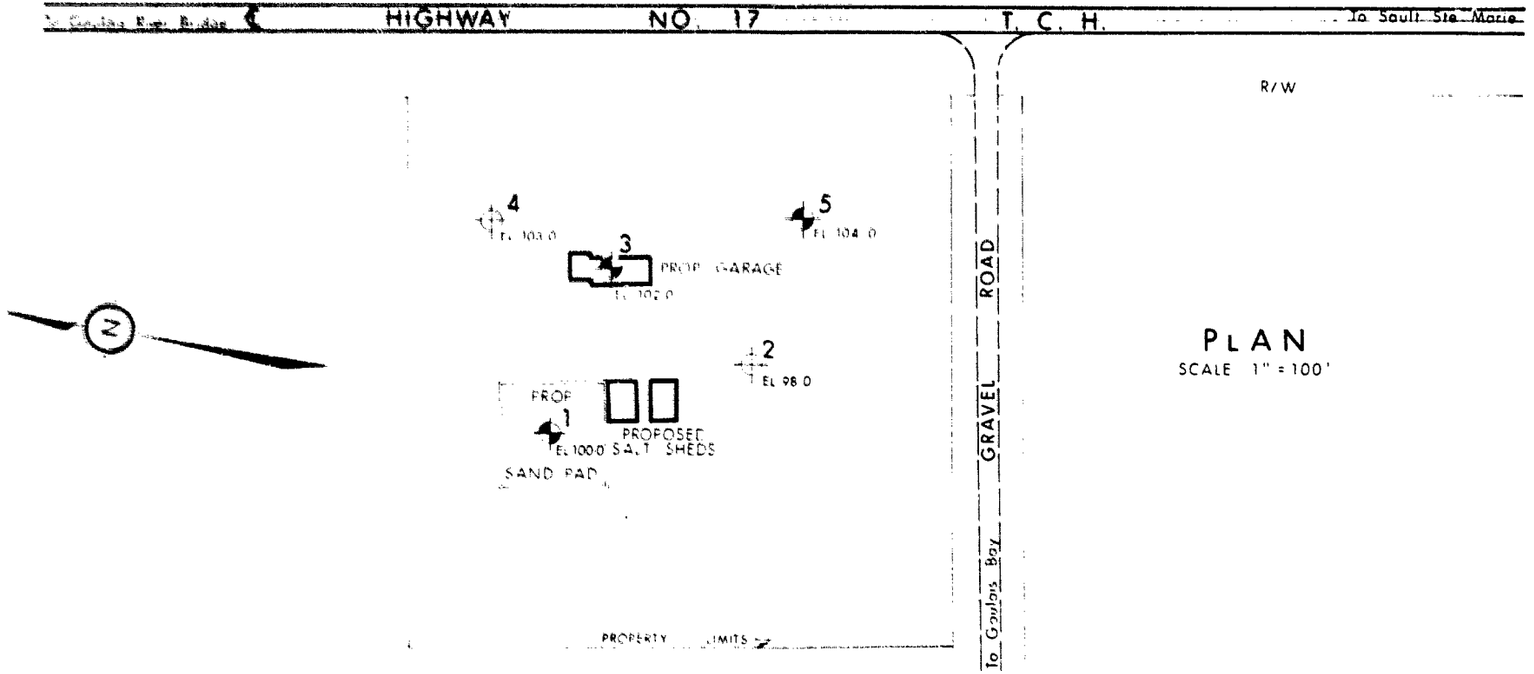
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_o	COEFFICIENT OF EARTH PRESSURE AT REST

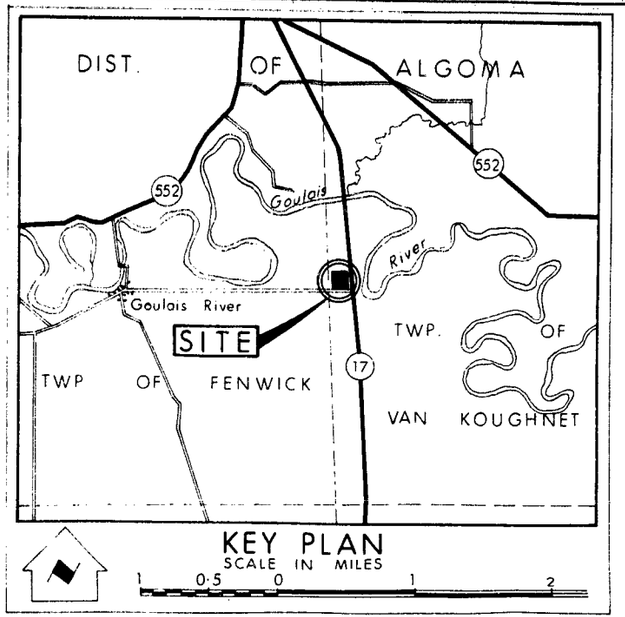
FOUNDATIONS

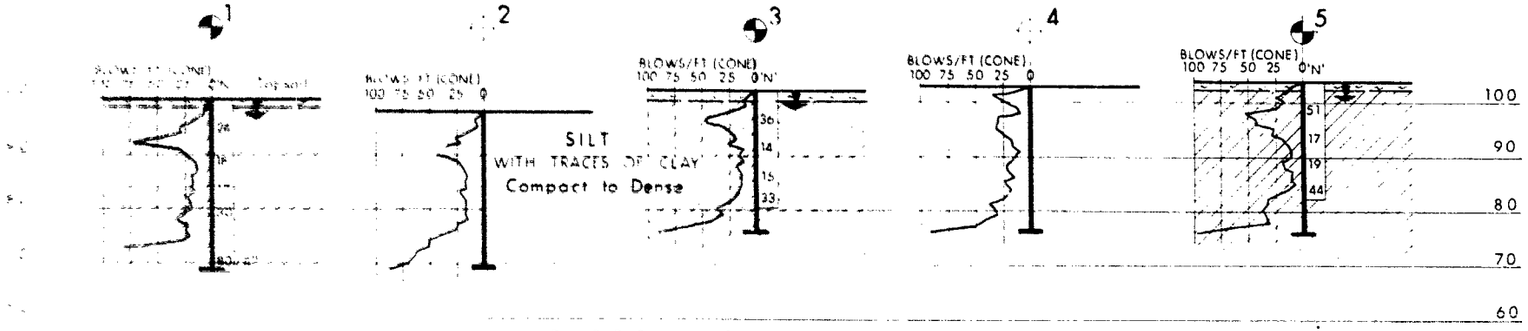
B	BREADTH OF FOUNDATION
L	LENGTH OF FOUNDATION
D	DEPTH OF FOUNDATION BENEATH GROUND
N	DIMENSIONLESS COEFFICIENT USED WITH A SUFFIX APPLYING TO SPECIFIC GRAVITY, DEPTH AND COHESION ETC. IN THE FORMULA FOR BEARING CAPACITY
k_s	MODULUS OF SUBGRADE REACTION

SLOPES

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







SUBSOIL STRATIGRAPHY
SCALE 1" = 20'

LEGEND

- Cone Penetration Hole
- Bore & Cone Penetration Hole
- Water Level (13 July 1965)

DEPARTMENT OF HIGHWAYS
ONTARIO
MATERIALS and TESTING DIVISION

GOULAIS RIVER PATROL YARD

DIST. ALGOMA TWP. VAN KOUGHNET SECT. 31 N.W. ¼

DATE 31 AUG. 1965

APPROVED A. Stinmac

DRAWING NO. 65-F(R)-80A

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

To: Mr. A. Rutka
Materials & Testing Engineer
Downsview

Att: Mr. K.Y. Lo

From: Materials & Testing
Northern Region

Date: July 7, 1965

Our File Ref.

In reply to

Subject: Re: Soils Investigation on Goulais Patrol Yard,
Township of Vankoughnet

A soils investigation was carried out on the above noted Patrol Yard in June 1965, using both hand and power equipment.

The soils of the area consist chiefly of medium to coarse sands and gravels over a very fine sandy loam and silt. The water table in most cases is quite close to the ground surface ranging from 18 inches to 40 inches in depth.

The soils where the driveway and paved areas are to be located generally consist of a loamy topsoil over a medium to coarse sand. This material overlies a fine to very fine sandy loam and silt which is saturated.

Due to the high water table, the loamy material overlying the medium to coarse sand should be removed prior to the placing of any granular base material. This will preclude the possibility of serious heaving within the loamy layer. Also the finished grade should be raised to at least three feet above the normal ground level. Again because of the high water table a granular material should be used exclusively to within 6 inches of grade. The top 6 inches should be G.B.C. Class "A".

The hot mix paving should consist of a 2 inch binder course and a 1½ inch top course of HL4. Materials suitable for sand cushion and G.B.C. "A" are located in the general vicinity of the proposed work.

for D.J. Armatage

for: D.B. Saint
Regional Materials Engineer

DJA/ef
c.c. File (2)

Township: Vankoughnet Date: June 23, 1965

Test Hole #1

0" - 3"	dk. sa. lo. tpsl.	
3" - 17"	br. med. sa. sl. lo.	
17" - 24"	br. med.-coarse sa.	
24" - 54"	gry. fi. sa. (sat.)	(free water at 40")
54" - 60"	gry. v. fi. sa. & si.	

Test Hole #2

0" - 4"	dk. sa. lo. tpsl.	
4" - 12"	br. fi. sa. lo.	
12" - 54"	br. med.-coarse sa.	(free water at 22")
54" - 60"	gry. v. fi. sa. & si.	

Test Hole #3

0" - 4"	bk. org. tpsl.	
4" - 9"	gry. med. sa.	
9" - 48"	br. med.-coarse sa.	(free water 19")
48" - 72"	(gry. v. fi. sa. & si. Sample 65MQ16-E_3)	Sample 65MQ15 ASC Wet Density 125.0 Dry Density 109.4 Opt Moisture 14.4

Test Hole #4

0" - 11"	gry. fi.-med. sa. sl. lo.	
11" - 24"	br. med. sa.	(free water 23")
24" - 48"	gry. med.-coarse sa.	
48" - 60"	gry. v. fi. sa. & si.	

Test Hole #5

0" - 4"	tpsl.	
4" - 8"	gry. br. fi.-med. sa. sl. lo.	
8" - 30"	br. med. sa.	(free water 23")
30" - 48"	gry. med.- coarse sa.	(falling in steadily)
48" - 60"	gry. v. fi. sa. & si.	

Test Hole #6

0" - 3"	bk. org. tpsl.	
3" - 11"	gry. fi. sa. lo.	
11" - 24"	br. med. sa. sl. lo.	(free water at 21")
24" - 54"	gry. med. coarse sa.	
54" - 60"	gry. v. fi. sa. & si.	

continued.....2

Township: Vankoughnet Date: June 23, 1965

Test Hole #7

0" - 4"	br. sa. lo. tpsl.
4" - 18"	gry. fi. sa. & org. mix
18" - 30"	br. med.-coarse sa.
30" - 48"	gry. med. sa.
48" - 60"	gry. v. fi. sa. & si.

Test Hole #8

0" - 2"	bk. org. tpsl.	
2" - 24"	br.-gry. fi. sa. sl. lo. org. trs.	
24" - 34"	br. fi. sa. sl. lo.	
34" - 42"	gry. fi. sa.	
42" - 60"	gry. med.-coarse sa.	(moist to wet)

Test Hole #9

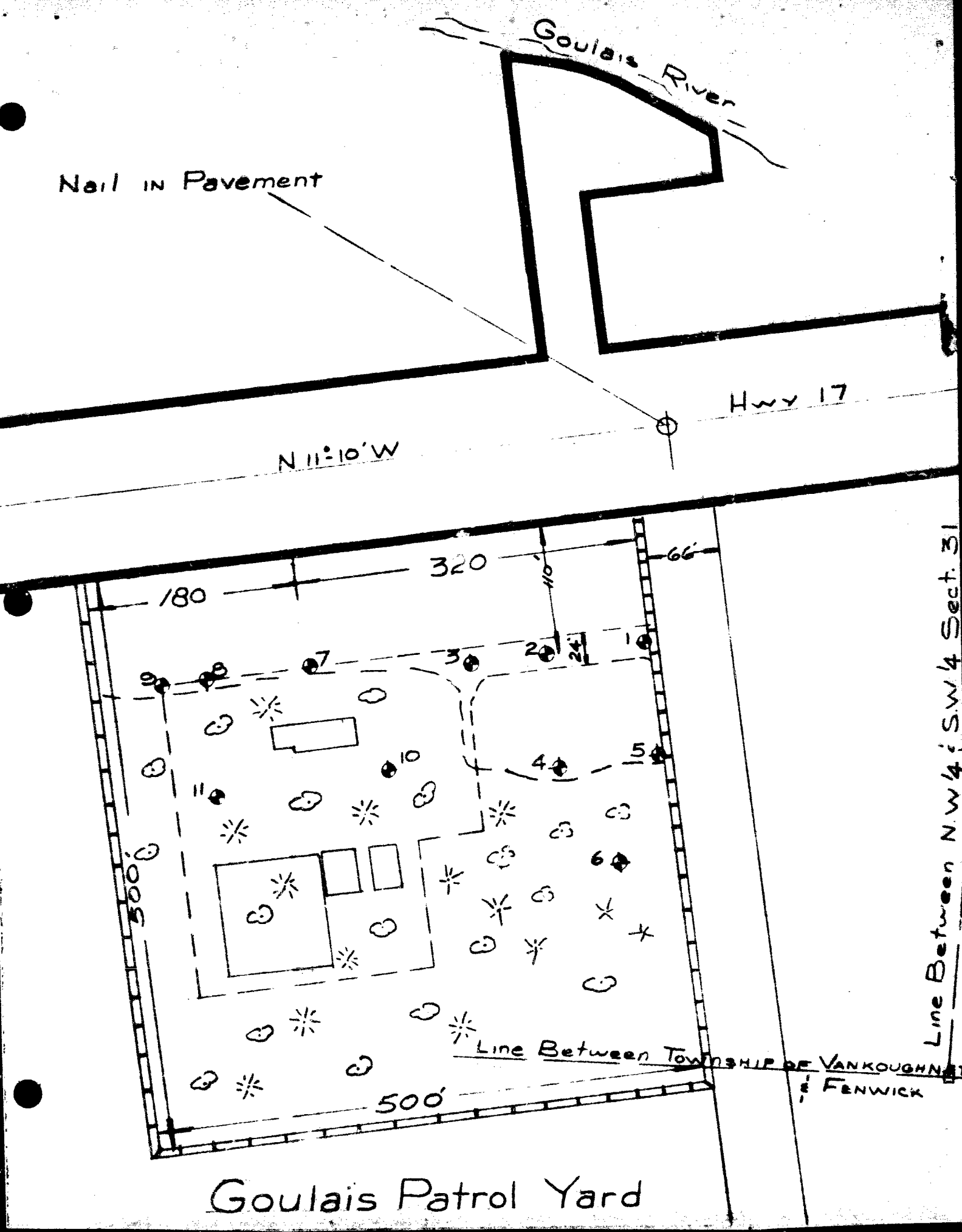
0" - 2"	bk. org. tpsl.	
2" - 24"	br. gry. fi.-med. sa.	
24" - 36"	br. med. sa.	(free water at 32")
36" - 60"	gry. med.-coarse sa.	

Test Hole #10

0" - 3"	blk. org. tpsl.
3" - 10"	br. f. sa. (sl. lo.)
10" - 48"	br. m. sa. (Sat.-free H^2O 10")

Test Hole #11

0" - 4"	blk. org. tpsl.
4" - 10"	br. f. sa. sl. lo.
10" - 24"	lt. bk. f. sa.
24" - 36"	br. f.-m. sa.
36" - 48"	br. m.-co. sa. Sat.



Goulais Patrol Yard

65-F-80 4

DEPARTMENT OF HIGHWAYS, ONTARIO
SERVICES BRANCH
SPECIAL SERVICES SECTION REQUISITION

REQUISITION NO. 0199

TO BE SHOWN ON ALL BILLINGS

MR. A. RUTKA MATERIALS & RESEARCH ENG.

TO: DISTRICT ENGINEER DISTRICT: _____ DATE MAY 21/65

NOTE: THIS FORM MUST BE USED FOR ALL PROJECTS FOR WHICH SPECIAL SERVICES ARE RESPONSIBLE

PLEASE INDICATE WHICH OF THE THREE FOLLOWING CATEGORIES APPLY

CATEGORY 1

AN EMERGENCY PROJECT
ALL PROJECTS OF THIS NATURE MAY BE UNDERTAKEN AT THE DISCRETION OF THE DISTRICT IN WHICH CASE THIS FORM WILL BE USED AS A CONFIRMING DOCUMENT ONLY.

CATEGORY 2

NORMAL MAINTENANCE
ALL PROJECTS OF THIS NATURE MAY BE UNDERTAKEN AT THE DISCRETION OF THE DISTRICT BUT EACH ITEM MUST NOT EXCEED AN ESTIMATED COST OF $200.00 IN WHICH CASE THIS FORM WILL BE USED AS A CONFIRMING DOCUMENT ONLY.

CATEGORY 3

MAJOR PROJECTS (NON-EMERGENCY - EXCEEDING $200.00)
ALL PROJECTS OF THIS NATURE MUST BE APPROVED BY THE REGIONAL SPECIAL SERVICES INSPECTOR BEFORE UNDERTAKEN.

ITEM NO.	CATEGORY NO.	DESCRIPTION (AN ACCURATE DESCRIPTION OF EACH ITEM IS REQUIRED)	ESTIMATED COST	ACTUAL COST
		PLEASE PROVIDE US WITH A SOILS INVESTIGATION AT SAID PROPERTY KNOWN AS N1/2 1/4 SECT. 31 TWSP OF VANKOUGNET. PROPERTY IS ON N. SIDE OF JOSEPHS MOTEL. DRILL HOLES ARE SHOWN IN RED DOTES AND ARE APPROXIMATE LOCATIONS ONLY.		
		4/80 05		

MULTIPLE PROJECTS MAY BE INCLUDED ON ONE FORM PROVIDED THEY ARE CONCENTRATED AT ONE SITE.

REQUIRED FOR PROPOSED PATROL YARD GOULAIS RIVER.

SIGNED _____ DISTRICT ENGINEER

REQUESTED BY F. J. MAURO

SIGNED F J Mauro REGIONAL SPECIAL SERVICES INSP.

SPECIAL SERVICES SECTION