

# 64-RF-90

Hwy. # 17

PROPOSED

PATROL YARD

23-67-67  
Gen. Files  
~~23-67-501~~

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: November 9, 1964.

OUR FILE REF.

IN REPLY TO

SUBJECT:

FOUNDATION INVESTIGATION REPORT

For  
Proposed D.H.O. Patrol Yard,  
Township of Springer, Hwy. #17  
District 13, North Bay

co. NIPISSING

W.J. 64-RF-90 - W.P. (Nil)

It is proposed to construct a patrol yard on Hwy. #17, approximately 1.2 miles east of Sturgeon Falls. A foundation investigation was requested by the Special Services Section in a memo dated September 17, 1964.

In order to determine the subsoil conditions at the site, a foundation investigation consisting of 5 sampled boreholes and 1 dynamic cone penetration test was carried out by this Section. The locations and elevations of these boreholes are shown on Drawing # 64-RF-90A which is attached to this report.

The area east and south of Sturgeon Falls is very flat and low lying and was once inundated by old Lake Nipissing. The site is covered by 0.5 feet to 1 foot of topsoil, followed by a deposit of compact silt with fine sand. the 'N' values ranging from 14 to 25. The upper 7 to 8 feet of the material is yellowish brown and below this oxidized zone, the soil is grey in colour.

cont'd /2...

November 9, 1964

Ground water levels were measured at the time of the foundation investigation and it was found that the water level was about 1 foot below the existing ground level.

It is recommended that the garage building be supported on continuous strip footings, placed as high as frost conditions will permit. A safe bearing load of 1 ton per square foot may be used for design purposes.

As regard to the height of the sand and salt piles, no stability problems are anticipated.

Because of the fine grained nature of the subsoil and the presence of the high water table, precautions should be taken to prevent "boiling" of the foundation material during excavation of the footings. It is suggested a 2 ft. thick well graded gravel should be placed immediately after the excavation bottom is reached prior to the construction of the footings.

This section was informed by Mr. R. H. Moran, Regional Inspector of Special Services in a memo dated November 3, 1964, that the nearest wells were approximately 1700 feet from both the east and west sides of the proposed site. In view of the permeable nature of the subsoil, precautions should be taken to prevent contamination of the nearby wells.

The following recommendations regarding paving of roadways and parking areas were given by Mr. E. R. Saint, Regional Materials Engineer for the Northern Region.

cont'd. /3...

Mr. C. S. Moase, Mgr.,  
Special Services Section.

November 10, 1964.

- (1) Before any granular base or fill material is placed, all topsoil should be removed within 4 feet of finished grade. The average topsoil thickness within the limits of the yard is 10 inches.
- (2) Over the very fine sand and silt soils found within the site, provide for 24 inches of granular base. This will consist of 6 inches of G.B.C. Class "A" and 18 inches of sand cushion.
- (3) Due to low lying character of the land, adequate drainage should be provided.
- (4) The paving of parking areas and driveways should consist of 2 inches of HL4 binder course and 1½ inches of HL4 top course.

The foundation investigation, carried out in October 1964 was undertaken by Mr. T. Chan, Project Foundation Engineer, who also prepared this report. The investigation was carried out under the general supervision of Mr. M. Devata, Senior Foundation Engineer, who also reviewed this report.

TC/pb

Attach.

cc: Messrs. C. S. Moase (4)  
E. J. Orr  
H. D. McMillan  
G. Martens  
E. R. Saint  
A. Watt

Foundations Office  
Gen. Files

*A. G. Stermac*  
A. G. Stermac  
PRINCIPAL FOUNDATION ENGINEER

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 :-

<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./	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

Q <sub>u</sub>	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V.	FIELD VANE
Q <sub>cu</sub>	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Q <sub>d</sub>	DRAINED TRIAXIAL	S	SENSITIVITY

## ABBREVIATIONS USED IN THIS REPORT

### SOIL PROPERTIES

$\gamma$	UNIT WEIGHT OF SOIL (BULK DENSITY)
$\gamma_s$	UNIT WEIGHT OF SOLID PARTICLES
$\gamma_w$	UNIT WEIGHT OF WATER
$\gamma_d$	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
$\gamma'$	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
$\tau_f$	SHEAR STRENGTH
$c'$	EFFECTIVE COHESION
$\phi'$	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
$c_u$	APPARENT COHESION
$\phi_u$	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
$\mu$	COEFFICIENT OF FRICTION
$S_t$	SENSITIVITY

### GENERAL

$\pi$	$\approx 3.1416$
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
$\sigma$	NORMAL STRESS
$\sigma'$	NORMAL EFFECTIVE STRESS ( $\bar{\sigma}$ IS ALSO USED)
$\tau$	SHEAR STRESS
$\epsilon$	LINEAR STRAIN
$\gamma$	SHEAR STRAIN
$\nu$	POISSON'S RATIO ( $\mu$ IS ALSO USED)
E	MODULUS OF LINEAR DEFORMATION (YOUNG'S MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
$\eta$	COEFFICIENT OF VISCOSITY

### EARTH PRESSURE

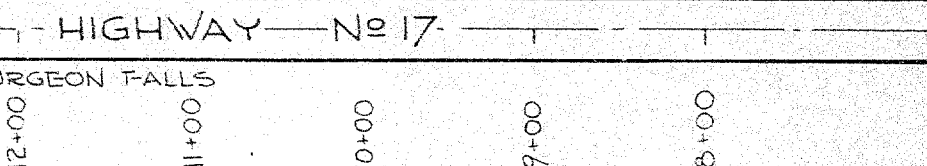
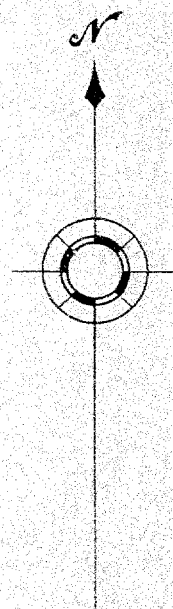
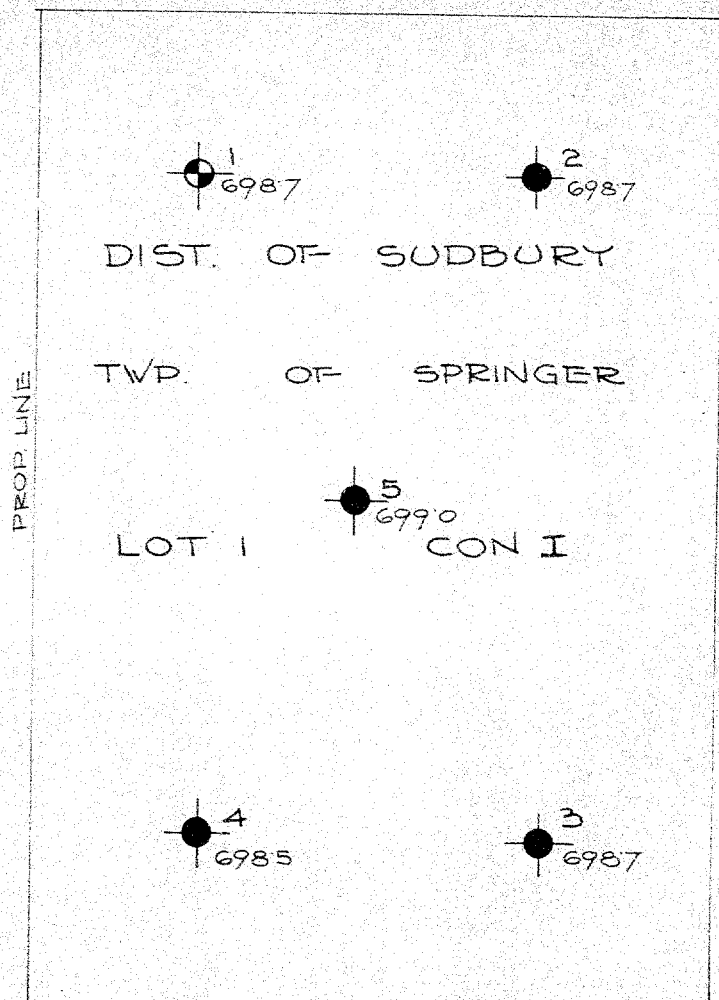
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
$\delta$	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
$K_0$	COEFFICIENT OF EARTH PRESSURE AT REST

### 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
$\beta$	ANGLE OF SLOPE TO HORIZONTAL



# LEGEND

- BORE & CONE PENETRATION HOLE
- BORE HOLE

ORIGINATED T.C.	DEPARTMENT OF HIGHWAYS - ONTARIO	SCALE 1" = 100'
DRAWN D.G.H.	MATERIALS & RESEARCH SECTION	W.P. NO.
CHECKED	STURGEON FALLS	JOB NO. 64 RF 90
APPROVED	PATROL YARD	DWG. NO. 64 RF 90A
DATE 16 NOV 1964		



1964 OCT 7 PM 4:38

00478

DOWN NBAD 11 OCTOBER 7/64 4:30P

MR DEVATA

FOUNDATIONS SECTION

THE PROPERTY IN QUESTION ON HIGHWAY NO. 17, JUST EAST OF STURGEON FALLS, AND WHICH IS TO BE A PATROL YARD, IS CLEARED OF BRUSH, HAS AN ENTRANCE AVAILABLE FROM HIGHWAY 17, IS FAIRLY FLAT, AND THE D H O FORCES AT STURGEON FALLS WILL PROVIDE A SUPPLY OF WATER IN 45 GALLON DRUMS AT THE SITE.

A P CUNLIFFE, MAINTENANCE ENGINEER

PER: A GIBBONS, HWYS SERVICE SUPERVISOR

BG

64-F-90

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## MEMORANDUM

To: Mr. A.G. Stermac  
Principal Foundation Engineer  
Downsview, Ontario

From: Materials & Testing  
Northern Region

Date: October 26, 1964

Our File Ref.

In Reply To

Subject: Re: Soils Investigation - Proposed Patrol Yard East of  
Sturgeon Falls - Lot 1, Con. 1 Springer Twp.

*cu F 90*

A soils investigation was carried out at the above noted proposed patrol yard site. Since no drawings were available indicating where various building, parking areas and roadways would be located, boreholes were drilled over the entire area in the form of a grid.

The area east and south of Sturgeon Falls is very flat and low lying and was once completely inundated by old Lake Nipissing. Within the area investigated there was an average of 10 inches of topsoil over a very fine sand and silt. In many places the sand and silt was found to be saturated.

Recommendations:

- 1.) Before any granular base or fill material is placed, all topsoil should be removed within 4 feet of finished grade. The average topsoil thickness within the limits of the yard is 10 inches.
- 2.) Over the very fine sand and silt soils found within the site, provide for 24 inches of granular base. This will consist of 6 inches of G.B.C. Class "A" and 18 inches of sand cushion.
- 3.) Due to low lying character of the land, adequate drainage should be provided.
- 4.) The paving of parking areas and driveways should consist of 2 inches of HL4 binder course and 1½ inches of HL4 top course.

*F. Rendulic*

for: F. Rendulic  
E.R. Saint  
Regional Materials Engineer

FR/ef  
c.c. File (2)

October 23, 1964

Log of Boreholes

B. H. #1

0" - 10"  
10" - 54"

Blk. Tpsl.  
Br. V.F. Sa. & Si.

B. H. #2

0" - 16"  
16" - 60"

Blk. Tpsl. Wet  
Br. V.F. Sa. & Si. (Sat.)

B. H. #3

0" - 8"  
8" - 60"

Blk. Tpsl. Wet  
Br. V.F. Sa. & Si. Sat.

B. H. #4

0" - 10"  
10" - 84"

Blk. Tpsl.  
Br. V.F. Sa. & Si. Sat. at 66"

B. H. #5

0" - 10"  
10" - 60"

Blk. Tpsl.  
Br. V. F. Sa. & Si. Sat. at 40"

B. H. #6

0" - 10"  
10" - 60"

Blk. Tpsl.  
Br. V.F. Sa. & Si.

B. H. #7

0" - 12"  
12" - 60"

Blk. Tpsl.  
Br. V.F. Sa. & Si.

B. H. #8

0" - 8"  
8" - 60"

Blk. Tpsl.  
Br. V.F. Sa. & Si.

B. H. #9

0" - 10"  
10" - 60"

Blk. Tpsl.  
Br. V.F. Sa. & Si.

B. H. #10

0" - 12"  
12" - 60"

Blk. Tpsl.  
Br. V.F. Sa. & Si.

Patrol Yard East of Sturgeon Falls  
Springer Township

B. H. #11

0" - 18"  
18" - 60"

Blk. Tpsl.  
Br. V. F. Sa. & Si.

B. H. #12

0" - 12"  
12" - 60"

Blk. Tpsl.  
Br. V.F. Sa. & Si.

B. H. #13

0" - 8"  
8" - 60"

Blk. Tpsl.  
Br. V.F. Sa. & Si.

B. H. #14

0" - 8"  
8" - 60"

Blk. Tpsl.  
Br. V.F. Sa. & Si.

B. H. #15

0" - 8"  
8" - 60"

Blk. Tpsl.  
Br. V.F. Sa. & Si.

B. H. #16

0" - 8"  
8" - 60"

Blk. Tpsl.  
Br. V.F. Sa. & Si.

B. H. #17

0" - 12"  
12" - 60"

Blk. Tpsl.  
Br. V.F. Sa. & Si.

B. H. #18

0" - 8"  
8" - 60"

Blk. Tpsl.  
Br. V.F. Sa. & Si.

B. H. #19

0" - 14"  
14" - 60"

Blk. Tpsl.

B. H. #20

#25010 Moist

0" - 12"  
12" - 60"

Blk. Tpsl.  
Br. V.F. Sa. & Si.

Patrol Yard East of Sturgeon Falls  
Springer Township

B. H. #21

0" - 10"  
10" - 60"

Blk. Tpsl.  
Br. V. F. Sa. & Si. Wet

B. H. #22

0" - 16"  
16" - 60"

Blk. Tpsl.  
Br. V.F. Sa. & Si.

B. H. #23

0" - 12"  
12" - 60"

Blk. Tpsl.  
Br. V.F. Sa. & Si. Firm

B.H. #24

0" - 8"  
8" - 60"

Blk. Tpsl.  
Br. V.F. Sa. & Si. Firm

B. H. #25

0" - 12"  
12" - 60"

Blk. Tpsl.  
Br. V.F. Sa. & Si. Firm

B. H. #26

0" - 12"  
12" - 60"

Blk. Tpsl.  
Br. V.F. Sa. & Si. Firm Wet

B. H. #27

0" - 12"  
12" - 60"

Blk. Tpsl.  
Br. V.F. Sa. & Si. Firm

B. H. #28

0" - 18"  
18" - 60"

Blk. Tpsl.  
Br. V.F. Sa. & Si. Firm

B. H. #29

0" - 12"  
12" - 42"  
42" - 60"

Blk. Tpsl.  
Br. V.F. Sa. & Si.  
Cr. V.F. Sa.

B. H. #30

0" - 12"  
12" - 42"  
42" - 60"

Blk. Tpsl.  
Br. V.F. Sa. & Si.  
Gr. V.F. Sa. & Si.

SPRINGER TWP. PATROL YARD  
LOT 1, CON. 1 TWP. SPRINGER.  
2 Mi. E. of STURGEON FALLS

580600E  
5135400W

31L5W.

W. 1/2 of E. 1/3 LOT 1,

CONCE

PART

E. 1/3

PARCE

MARY C

ANDREW M.

SPR

REPRODUCTION

Nº 43193

KING'S

HIGHWAY

REPOSITED PLAN Nº 2

DEFECTS IN NEGATIVE DUE TO  
CONDITION OF ORIGINAL DOCUMENT

MEMORANDUM

P. O. Box 810, North Bay, Ontario

To: Mr. A. G. Stermac,  
Principal Foundation Engineer,  
DOWNSVIEW.

FROM: R. H. Moran

DATE: November 3, 1964

OUR FILE REF.

IN REPLY TO

SUBJECT:

Distance of Water Wells on East  
and West Sides of Proposed Maintenance  
Yard, Sturgeon Falls, P.R. 64/1503  
Highway #17, Township of Springer

As requested, I have now checked the distance of the nearest well on both the east and west sides of the above location and is as follows:

To the west side, and approximately 1700 feet from proposed maintenance yard, a Mr. Martin, who operates a farm, advises that he has a drilled well, 195 feet deep, with ample supply of good, clear, fresh water available.

To the east side, and also approximately 1700 feet from proposed maintenance yard, (at the Red Rock Motel) the owner advises that he has a drilled well, depth unknown, with sufficient supply available of clear, fresh water.

The above is for your information.

RHM/nc

c.c. D. W. Baird

*R. H. Moran*  
REGIONAL INSPECTOR SPECIAL SERVICES

MEMORANDUM

Mr. C.S. Moase  
Manager  
Special Services Section  
Administration Building

FROM: Materials & Testing  
Northern Region

DATE: November 27, 1964

Our File Ref.

IN REPLY TO


SUBJECT:

Re: Foundation Investigation Report  
for  
Proposed D.H.C. Patrol Yard  
Township of Springer, Hwy. 17  
District 13 North Bay

A discrepancy was noted on page 3 of the  
above noted Foundation Report.

Point #2 of the Soils Recommendations should  
read as follows:

- (2) Over the very fine sand and silt soils  
found within the site, provide for 24 inches  
of granular base. This will consist of 6  
inches of G.B.C. Class "A" and 18 inches  
of sand cushion.

  
D. Armatage

for: E.R. Saint  
Regional Materials Engineer

DA/ef

c.c. A.G. Stermac ✓  
E.J. Orr  
H.D. McMillan  
G. Martens  
A. Watt  
File



MEMORANDUM

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

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

DATE: December 1, 1964.

OUR FILE REF.

IN REPLY TO

SUBJECT:

FOUNDATION INVESTIGATION REPORT

FOR

Proposed D.H.O. Patrol Yard  
Township of Springer, Hwy. #17  
District 13 North Bay  
W.J. 64-RF-90 W.P. (Nil)

Enclosed, please find the revised page 3 of report  
64-F-90. Item (2) has been changed.

Sincerely yours,

*A. G. Stermac*  
A. G. Stermac  
PRINCIPAL FOUNDATION ENGINEER

KS/PB  
Attach.

cc: Messrs. C. S. Moase (4)  
E. J. Orr  
H. D. McMillan  
G. Martens  
E. R. Saint  
A. Watt

Foundations Office  
Gen. Files

Mr. C. S. Moase, Mgr.,  
Special Services Section.

November 10, 1964.

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The foundation investigation, carried out in October 1964 was undertaken by Mr. T. Chan, Project Foundation Engineer, who also prepared this report. The investigation was carried out under the general supervision of Mr. M. Devata, Senior Foundation Engineer, who also reviewed this report.

TC/pb

Attach.

cc: Messrs. C. S. Moase (4)  
E. J. Orr  
H. D. McMillan  
G. Martens  
E. R. Saint  
A. Watt

Foundations Office  
Gen. Files

  
A.G. Stermac  
PRINCIPAL FOUNDATION ENGINEER