BA995

SOIL INVESTIGATION

CROSSING OF C.N.R. & C.P.R.

AT BLACKHORSE ON HWY #9

ONTARIO DEPARTMENT OF HIGHWAYS

WARNOCK HERSEY SOIL INVESTIGATIONS LTD.
600 Sherbourne Street, Toronto 5, Ontario.
WAlnut 4 - 9692

TB 59/196

February 9, 1960.

Ontario Department of Highways,
Material & Research Section,
Downsview Avenue,
Toronto, Ontario.

Attn: Mr. A. Rutka

Soil Investigation re Proposed Crossing of C.N.R. and C.P.R. Highway #9 at Blackhorse, Twp. of Tecumseth W.P. 305-59. Toronto District #6.

Dear Sirs:

During the period from January 5th to February 1st we have drilled eleven (11) test holes at the above site.

The holes were drilled by the wash boring method and cased with 2 1/2 inch pipe. At selected intervals samples were taken with the Standard Split Spoon for later laboratory examination and also the resistance of penetration of this sampler was recorded. This resistance, (measured as the number of blows of a 140 lb. hammer falling a distance of 30 inches) is an empirical method of assigning the bearing values of the soil for any particular depth.

The test holes did not prove bedrock because it was not economical or necessary. In most cases we have gone down to a strata of very hard compact sand or gravel and have proven a sufficient depth of this material to take the imposed footing loads or to give sufficient pile resistance.

SOIL CONDITIONS:

Granular subsoil was found in all test holes drilled with the exception of test hole #11, which showed a thin strata of granular top soil (about 2 feet) and then 8 to 10 feet of undecomposed peat.

Continued -

TB 59/196

SOIL CONDITIONS (Continued)

The granular material varied from a well graded mixture of sand and stone to a silty uniform fine sand. The strata are shown on the attached boring logs, and nowhere is clay indicated.

CONCLUSIONS and RECOMMENDATIONS:

1. A tabulation of allowable bearing value for each of the test holes at various depths is tabulated as follows:-

Continued -

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ALLOWABLE BEARING CAPACITY - TONS/SQ.FT.

H - O - L - E - S

Depth in Feet	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11
2½	0.1	1.9	0.6	0.1	0.1	0.1	0.1	0.5	0.2	0.3	0
5	0.6	2.0	1.1	1.4	2.6	3.1	0.1	0.3	0.3	0.7	0
7½	2.0	5.3	1.7	4.3	2.5	1.2	1.8	0.8	3.1	2.3	0
10	2.0	5.3	2.1	5.2	1.8	1.2	2.5	0.9	4.6	0.8	0
12½	2.0	5.0	1.9	5.2	2.7	1.3	3.5	0.6	3.5	0.7	0
15	3.3	5.0	3.5	2.7	6.9	6.2	1.8	0.9	1.9	1.4	1.7
20	7.x	1.2	2.2	2.6	2.7	3.7	3.4	4.5	4.1	2.5	1.5
25	7.x	1.4	2.2	2.6	2.7	3.8	3.9	3.9	1.9	2.1	1.8
30	7.x	1.1	5.3	2.7	3.5	4.0	4.1	4.0	4.1	2.4	2.6
35	7.x	3.3	2.8	3.2	3.0	4.6	4.0	4.0	4.5	2.4	3.4
40	-	6.0	6.0	4.1	2.9	5.2	5.9	7.x	3.5	-	3.8
45	-	7.x	6.0	6.1	3.7	-	7.x	7.x	7.x	-	3.4
50	-	7.x	7.x	7.x	5.3	-	-	7.x	7.x	-	6.7
55	-	7.x	7.x	7.x	7.x	-	-	7.x	-	-	6.8
60	-	7.x	7.x	7.x	7.x	-	-	7.x	-	-	3.6
65	-	7.x	-	7.x	7.x	-	-	7.x	-	-	7.x
70	-	-	-	-	-	-	-	-	-	-	7.x
80	-	-	-	-	-	-	-	-	-	-	7.x
90	-	-	-	-	-	-	-	-	-	-	7.x
100	-	-	-	-	-	-	-	-	-	-	7.x
110	-	-	-	-	-	-	-	-	-	-	7.x

x - 7 tons or greater.

(a) Assume footing 10 feet or wider.
(b) Water Table above footing level during some seasons of year.
(c) Total settlement not to exceed one inch and differential settlement 3/4 inch.

TB 59/196

CONCLUSIONG and RECOMMENDATIONS:

2. It is noted that the water table varies considerably over the site. This is influenced, of course, by the small stream near test hole #11 and at the other holes possibly by ditching along the road and railway. In any case, safe design would require that one consider the water table to be within the seat of settlement of the footing. The water level undoubtedly varies considerably with season.

3. If excavation is to be carried out below water table, well points should be used to lower the water table around the perimeter of the excavation. It is generally not possible to excavate in cohesionless materials below water table without general sluffing-in of the sides and causing a quick condition of the sand on the bottom.

4. There would appear to be two possible solutions to this foundation problem -

(a) Carry the piers down to a depth to give sufficient bearing capacity, e.g. in the vicinity of test hole #1 this depth would be about 15 feet. In other holes it would be up to 30 to 35 foot depth depending on the values shown on the above tabulations.

(b) Use relatively short poured-in-place concrete piles, - a type of pile, where a mandrel is driven to sufficient dynamic resistance then the mandrel is removed and the steel casing is filled with concrete. This type of pile is preferable to an H type steel pile as the relative displacement is much greater, which would consolidate the loose sand and gravel in the strata above 35 foot depth.

5. All organic material (undecomposed peat) should be completely removed in the area of test hole #11.

Yours truly,

WARNOCK HERSEY SOIL INVESTIGATIONS LTD.

P. B. Lawrence

P. B. Lawrence, P. Eng.,
Asst. Manager.

PBL/DBR

Warnock Hersey Soil Investigations Ltd

Office Report Of Soil Exploration

Casing BX Diameter 2 1/2 Elevn. 924.79
Casing Hammer Wt. 350 Drop 24"
Sample Hammer Wt. 140 Drop 30"

Client Ontario Dept. of Highways.
Highway #9 at Blackhorse.

Order Number TB 59/196
Borehole Number 1
Date January 25,1960

SAMPLE CONDITION & TYPE

Disturbed
Good
Lost

CS - Chunk
DO - Drive Open
DF - Drive Footvalve
TO - Thinwalled Open
WS - Washed Sample
RC - Rock Core

ABBREVIATIONS

V - Insitu Vane Shear Test
M - Mechanical Analysis
U - Unconfined Compression
Qc - Triaxial Consolidated Quick
Q - Triaxial Quick
S - Triaxial Slow

- Unit Weight
K - Permeability
C - Consolidation
CA - Casing
WL - Water Level in Casing
WT - Water Table in Soil

SOIL PROFILE

Elevn. Depth	Description	Strata Plot	Elevation Scale
924.8	Top Soil		0
	Brownish grey medium sand and stones.		8"
914.8			10
	Brownish grey fine sand.		15
904.8	Brownish grey fine sand with pebbles.		
			25
894.8	Grey medium sand with stones.	W.T.	32
888.8	End of Hole		36

SHEAR STRENGTH
tons/sq. ft. or Cu/2

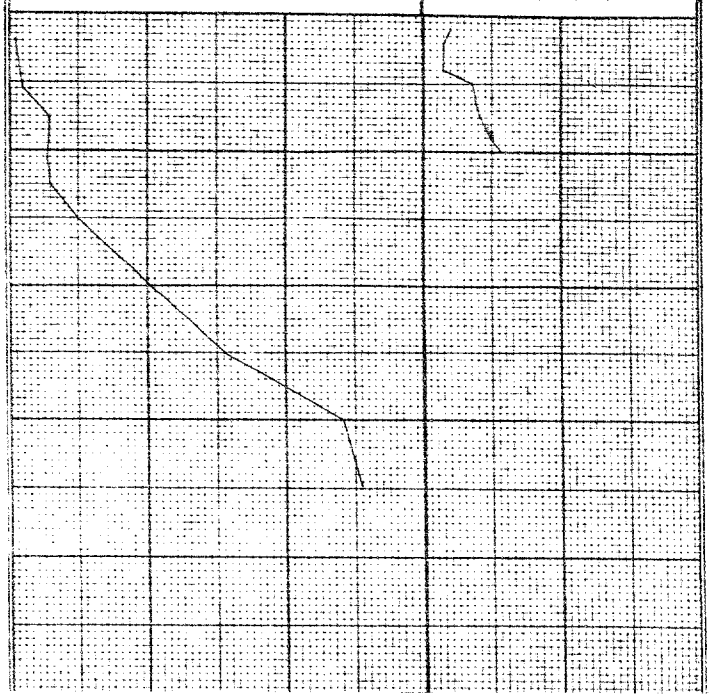
PENETRATION TESTS
standard energy 4200 in. lb.
blows/foot of penetration

100 200 300

~~WATER CONTENT~~
CASING BLOWS
w%

⊡ p.l. △ l.l.

50 100



SAMPLES

Condition	Type	Number	Pen. Resistance	Elevn. Recvry.
	SS	1	5	
	SS	2	10	
	SS	3	30	
	SS	4	28	
	SS	5	30	
	SS	6	50	
	SS	7	109	
	SS	8	157	
	SS	9	240/10"	
	SS	10	253	

Warnock Hersey Soil Investigations Ltd

Office Report Of Soil Exploration

Casing BX Diameter 2 1/2" Elevn. 916.6
Casing Hammer Wt. 350 Drop 24"
Sample Hammer Wt. 140 Drop 30"

Client Ontario Dept. of Highways.
Highway #9 at Blackhorse.

Order Number TB 59/196
Borehole Number 2
Date January 28, 1960

SAMPLE CONDITION & TYPE

Disturbed
Good
Lost

CS - Chunk
DO - Drive Open
DF - Drive Footvalve
TO - Thinwalled Open
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RC - Rock Core

ABBREVIATIONS

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WT - Water Table in Soil

SOIL PROFILE

Elevn. Depth	Description	Strata Plot	Elevation Scale
916.6	Top Soil		0
	Greyish brown medium sand and stones.		6
906.6	Greyish brown fine sand with some stones.		14
896.6	Greyish brown medium to coarse sand with pebbles.		21
	Very fine grey sand.		25
886.6	Grey coarse sand with stones.		
876.6			
866.6		W.T.	50
850.6	End of Hole		66

SHEAR STRENGTH
tons/sq. ft. or Qu/2

PENETRATION TESTS
standard energy 4200 in. lb.
blows/foot of penetration
100 200 300

WATER CONTENT
CASING BLOWS
w%
⊡ p.l. △ l.l.
50 100

SAMPLES

Condition	Type	Number	Pen. Resistance	Elevn. Recvry.
	SS	1	29	
	SS	2	30	
	SS	3	75	
	SS	4	75	
	SS	5	67	
	SS	6	65	
	SS	7	20	
	SS	8	23	
	SS	9	18	
	SS	10	50	
	SS	11	89	
	SS	12	93	
	SS	13	105	
	SS	14	125	
	SS	15	144	
	SS	16	157	

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Office Report Of Soil Exploration

Casing BX Diameter 2 1/2" Elevn. 917.02
Casing Hammer Wt. 350 Drop 24"
Sample Hammer Wt. 140 Drop 30"

Client Ontario Dept. of Highways.
Highway 49 at Blackhorse.

Order Number TV 59/196
Borehole Number 3
Date January 26, 1960

SAMPLE CONDITION & TYPE

Disturbed
Good
Lost

CS - Chunk
DO - Drive Open
DF - Drive Footvalve
TO - Thinwalled Open
WS - Washed Sample
RC - Rock Core

ABBREVIATIONS

V - Insitu Vane Shear Test
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Qc - Triaxial Consolidated Quick
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S - Triaxial Slow

- Unit Weight
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CA - Casing
WL - Water Level in Casing
WT - Water Table in Soil

SOIL PROFILE

Elevn. Depth	Description	Strata Plot	Elevation Scale
917.02	Top Soil.		0
			6"
	Medium brown sand.		
			8
907.02	Grey medium sand.		10
	Grey coarse sand with stones.		
897.02			20
	Very fine brown sand.		
887.02			30
	Fine brown sand with pebbles.		35
877.02	Grey coarse sand with stones.		
		WT	40
867.02			
857.02			
856.02	End of Hole.		61

SHEAR STRENGTH
tons/sq. ft. or Qu/2

PENETRATION TESTS
standard energy 4200 in. lb.
blows/foot of penetration

100 200 300

~~WATER CONTENT~~
CASING BLOWS
w%

⊡ p.l. △ l.l.

50 100

SAMPLES

Condition	Type	Number	Pen. Resistance	Elevn. Recvry.
	SS	1	11	
	SS	2	18	
	SS	3	26	
	SS	4	33	
	SS	5	29	
	SS	6	52	
	SS	7	32	
	SS	8	31	
	SS	9	74	
	SS	10	36	
	SS	11	85	
	SS	12	83	
	SS	13	90	
	SS	14	90	
	SS	15	108	

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Office Report Of Soil Exploration

Casing BX Diameter 2 1/2" Elevn. 915.47
Casing Hammer Wt. 350 Drop 24"
Sample Hammer Wt. 140 Drop 30"

Client Ontario Dept. of Highways.
Highway 79 at Blackhorse.

Order Number TB 59/196
Borehole Number 4
Date Jan. 16. 1960.

SAMPLE CONDITION & TYPE

Disturbed
Good
Lost

CS - Chunk
DO - Drive Open
DF - Drive Footvalve
TO - Thinwalled Open
WS - Washed Sample
RC - Rock Core

ABBREVIATIONS

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M - Mechanical Analysis
U - Unconfined Compression
Qc - Triaxial Consolidated Quick
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S - Triaxial Slow

- Unit Weight
K - Permeability
C - Consolidation
CA - Casing
WL - Water Level in Casing
WT - Water Table in Soil

SOIL PROFILE

Elevn. Depth	Description
915.47	Top Soil
	Brown fine sand.
	Brownish grey fine sand.
905.47	
	Grey fine sand with pebbles.
895.47	
885.47	Grey medium sand with pebbles.
875.47	
865.47	
850.47	
849.47	
	End of Hole.

Strata Plot

Elevation Scale: 0, 6", 5, 8, 13, 20, 41, 55, 66

SHEAR STRENGTH
tons/sq. ft. or Qu/2

PENETRATION TESTS
standard energy 4200 in. lb.
blows/foot of penetration
100 200 300

~~WATER CONTENT~~
CASING BLOWS
w%
p.l. l.l.
50 100

SAMPLES

Condition	Type	Number	Pen. Resistance	Elevn. Recvry.
	SS	1	5	
	SS	2	22	
	SS	3	60	
	SS	4	73	
	SS	5	75	
	SS	6	39	
	SS	7	35	
	SS	8	38	
	SS	9	40	
	SS	10	49	
	SS	11	57	
	SS	12	79	
	SS	13	100	
	SS	14	98	
	SS	15	115	
	SS	16	123	

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Office Report Of Soil Exploration

Casing BX Diameter 2 1/2" Elevn. 915.17
Casing Hammer Wt. 350 Drop 24"
Sample Hammer Wt. 140 Drop 30"

Client Ontario Dept. of Highways, Highway 79 at Blackburn.
Order Number TB 59/196
Borehole Number 5
Date January 21, 1960

SAMPLE CONDITION & TYPE

Disturbed
Good
Lost

CS - Chunk
DO - Drive Open
DF - Drive Footvalve
TO - Thinwalled Open
WS - Washed Sample
RC - Rock Core

ABBREVIATIONS

V - Insitu Vane Shear Test
M - Mechanical Analysis
U - Unconfined Compression
Qc - Triaxial Consolidated Quick
Q - Triaxial Quick
S - Triaxial Slow

- Unit Weight
K - Permeability
C - Consolidation
CA - Casing
WL - Water Level in Casing
WT - Water Table in Soil

SOIL PROFILE

Elevn. Depth	Description
915.17	Top Soil
	Brown fine silty sand.
905.17	Light brow fine sand.
895.17	Light brown fine sand with stones.
885.17	Brownish grey coarse sand with pebbles.
875.17	
865.17	Brownish grey medium sand with stones.
855.17	
849.17	End of Hole.

Strata Plot

Elevation Scale: 0, 6", 5, 20, 25, 40, 43, 66

SHEAR STRENGTH tons/sq. ft. or Qu/2

PENETRATION TESTS standard energy 4200 in. lb. blows/foot of penetration

100 200 300

WATER CONTENT CASING BLOWS w%

⊡ p.l. △ l.l.

50 100

SAMPLES

Condition	Type	Number	Pen. Resistance	Elevn. Recvry.
	SS	1	5	
	SS	2	40	
	SS	3	35	
	SS	4	23	
	SS	5	38	
	SS	6	87	
	SS	7	38	
	SS	8	38	
	SS	9	52	
	SS	10	45	
	SS	11	41	
	SS	12	56	
	SS	13	74	
	SS	14	114	
	SS	15	100	
	SS	16	111	

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Office Report Of Soil Exploration

Casing BX Diameter 2 1/2" Elevn. 914.64
Casing Hammer Wt. 350 Drop 24"
Sample Hammer Wt. 140 Drop 30"

Client Ontario Dept. Highways.
Highway #9 at Blackhorse

Order Number TB 59/196
Borehole Number 3
Date January 14, 1960

SAMPLE CONDITION & TYPE

Disturbed
Good
Lost

CS - Chunk
DO - Drive Open
DF - Drive Footvalve
TO - Thinwalled Open
WS - Washed Sample
RC - Rock Core

ABBREVIATIONS

V - Insitu Vane Shear Test
M - Mechanical Analysis
U - Unconfined Compression
Qc - Triaxial Consolidated Quick
Q - Triaxial Quick
S - Triaxial Slow

- Unit Weight
K - Permeability
C - Consolidation
CA - Casing
WL - Water Level in Casing
WT - Water Table in Soil

SOIL PROFILE

Elevn. Depth	Description	Strata Plot	Elevation Scale
914.64	Top Soil		0
	Very fine brown sand.		6"
	Brown medium sand with pebbles.		5
904.64			6
	Brown coarse sand with pebbles.		16
894.64			20
	Brown coarse sand with stones.		
884.64			32
	Medium to coarse sand with stones.		
873.64	End of Hole		41

SHEAR STRENGTH
tons/sq. ft. or Qu/2

PENETRATION TESTS
standard energy 4200 in. lb.
blows/foot of penetration

100 200 300

~~WATER CONTENT~~
CASING BLOWS
w%

p.l. l.l.

50 100

SAMPLES

Condition	Type	Number	Pen. Resistance	Elevn. Recvry.
	SS	1	5	
	SS	2	47	
	SS	3	19	
	SS	4	20	
	SS	5	29	
	SS	6	80	
	SS	7	53	
	SS	8	57	
	SS	9	59	
	SS	10	65	
	SS	11	76	

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Office Report Of Soil Exploration

Casing BX Diameter 2 1/2" Elevn. 914.16
Casing Hammer Wt. 350 Drop 24"
Sample Hammer Wt. 140 Drop 30"

Client Ontario Dept. of Highways.
Highway #9 at Blackhorse

Order Number TB 59/196
Borehole Number 7
Date January 15, 1960

SAMPLE CONDITION & TYPE

Disturbed
Good
Lost

CS - Chunk
DO - Drive Open
DF - Drive Footvalve
TO - Thinwalled Open
WS - Washed Sample
RC - Rock Core

ABBREVIATIONS

V - Insitu Vane Shear Test
M - Mechanical Analysis
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Qc - Triaxial Consolidated Quick
Q - Triaxial Quick
S - Triaxial Slow

- Unit Weight
K - Permeability
C - Consolidation
CA - Casing
WL - Water Level in Casing
WT - Water Table in Soil

SOIL PROFILE				SHEAR STRENGTH	WATER CONTENT	SAMPLES				
Elevn. Depth	Description	Strata Plot	Elevation Scale	tons/sq. ft. or Qu/2	CASING BLOWS w%	Condition	Type	Number	Pen. Resistance	Elevn. Recvry.
914.16	Top Soil.		0	PENETRATION TESTS standard energy 4200 in. lb. blows/foot of penetration	⊡ p.l. △ l.l.					
			6"							
	Reddish brown silty sand.		5				SS	1	5	
							SS	2	5	
	Greyish brown medium sand.						SS	3	18	
904.16							SS	4	37	
			12'6"				SS	5	52	
	Ditto - with pebbles.		15				SS	6	19	
		WT	16'6"							
894.16	Grey coarse sand with pebbles.						SS	7	51	
			25				SS	8	48	
884.16	Dark grey coarse sand with pebbles.						SS	9	58	
			37				SS	10	54	
874.16	Greyish brown medium sand.						SS	11	84	
868.16			46				SS	12	93	
	End of Hole.									

Scale: 100 200 300 — 50 100

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Office Report Of Soil Exploration

Casing BX Diameter 2 1/2" Elevn. 913.19
Casing Hammer Wt. 350 Drop 24"
Sample Hammer Wt. 140 Drop 30"

Client Ontario Dept. of Highways.
Highway 79 at Plackmorse

Order Number TB 59/136
Borehole Number 8
Date January 20, 1960

SAMPLE CONDITION & TYPE

Disturbed
Good
Lost

CS - Chunk
DO - Drive Open
DF - Drive Footvalve
TO - Thinwalled Open
WS - Washed Sample
RC - Rock Core

ABBREVIATIONS

V - Insitu Vane Shear Test
M - Mechanical Analysis
U - Unconfined Compression
Qc - Triaxial Consolidated Quick
Q - Triaxial Quick
S - Triaxial Slow

- Unit Weight
K - Permeability
C - Consolidation
CA - Casing
WL - Water Level in Casing
WT - Water Table in Soil

SOIL PROFILE

SHEAR STRENGTH tons/sq. ft. or Qu/2

PENETRATION TESTS standard energy 4200 in. lb. blows/foot of penetration

WATER CONTENT CASING BLOWS w%

⊡ p.l. △ l.l.

SAMPLES

Elevn. Depth	Description	Elevation Scale	Condition	Type	Number	Pen. Resistance	Elevn. Recvry.
913.19	Top Soil.	0.. 8"		SS	1	9	
	Greyish brown fine sand.			SS	2	7	
				SS	3	12	
903.19				SS	4	10	
				SS	5	6	
		15		SS	6	11	
	Greyish brown medium sand.						
893.19		20		SS	7	56	
	Fine grey sand.	22					
		WT 23					
	Brown medium sand.			SS	8	46	
883.19				SS	9	58	
		35		SS	10	57	
	Greyish brown medium to coarse sand.						
873.19				SS	11	105	
				SS	12	108	
863.19		50		SS	13	116	
	Coarse brown sand with gravel.						
				SS	14	108	
853.19				SS	15	100	
847.19		66		SS	16	120	
	End of Hole.						

Warnock Hersey Soil Investigations Ltd

Office Report Of Soil Exploration

Casing BX Diameter 2 1/2" Elevn. 910.58
Casing Hammer Wt. 350 Drop 24"
Sample Hammer Wt. 140 Drop 30"

Client Ontario Dept. of Highways.
Highway 79 at Blackhorse.

Order Number TB 59/196
Borehole Number 9
Date January 8, 1960

SAMPLE CONDITION & TYPE

Disturbed
Good
Lost

CS - Chunk
DO - Drive Open
DF - Drive Footvalve
TO - Thinwalled Open
WS - Washed Sample
RC - Rock Core

ABBREVIATIONS

V - Insitu Vane Shear Test
M - Mechanical Analysis
U - Unconfined Compression
Qc - Triaxial Consolidated Quick
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S - Triaxial Slow

- Unit Weight
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CA - Casing
WL - Water Level in Casing
WT - Water Table in Soil

SOIL PROFILE

SHEAR STRENGTH
tons/sq. ft. or Qu/2

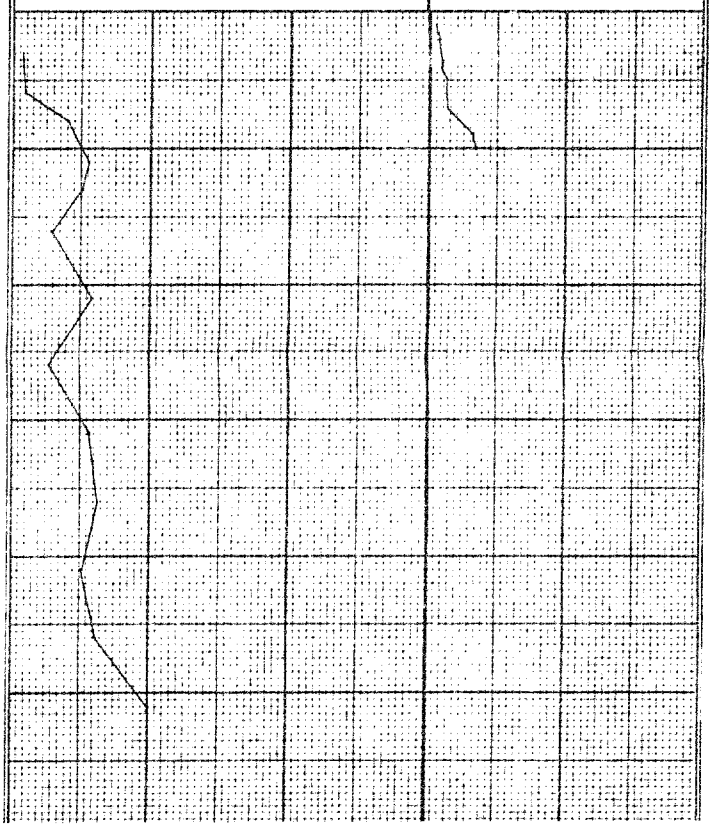
PENETRATION TESTS
standard energy 4200 in. lb.
blows/foot of penetration

WATER CONTENT
CASING BLOWS
w%

p.l. l.l.

SAMPLES

Elevn. Depth	Description	Strata Plot	Elevation Scale
910.58	Top Soil		0 6"
	Brownish grey fine sand.		
900.58		WT	15 16
890.58	Coarse grey sand with stones.		26
880.58	Brown medium sand.		
870.58			
859.58	End of Hole		51



Condition	Type	Number	Pen. Resistance	Elevn. Recvry.
	SS	1	7	
	SS	2	8	
	SS	3	41	
	SS	4	56	
	SS	5	51	
	SS	6	28	
	SS	7	58	
	SS	8	28	
	SS	9	57	
	SS	10	63	
	SS	11	51	
	SS	12	112	
	SS	13	100	

Warnock Hersey Soil Investigations Ltd

Office Report Of Soil Exploration

Casing BX Diameter 2 1/2" Elevn. 910.99
Casing Hammer Wt. 350 Drop 24"
Sample Hammer Wt. 140 Drop 30"

Client Ontario Dept. Highways.
Highway #9 at Blackhorse

Order Number TB 59/196
Borehole Number 10
Date January 3, 1960.

SAMPLE CONDITION & TYPE

Disturbed
Good
Lost

CS - Chunk
DO - Drive Open
DF - Drive Footvalve
TO - Thinwalled Open
WS - Washed Sample
RC - Rock Core

ABBREVIATIONS

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S - Triaxial Slow

- Unit Weight
K - Permeability
C - Consolidation
CA - Casing
WL - Water Level in Casing
WT - Water Table in Soil

SOIL PROFILE				SHEAR STRENGTH tons/sq. ft. or Cu/2	WATER CONTENT CASING BLOWS w%	SAMPLES				
Elevn. Depth	Description	Strata Plot	Elevation Scale	PENETRATION TESTS standard energy 4200 in. lb. blows/foot of penetration (100 200 300)	⊡ p.l. △ l.l. (50 100)	Condition	Type	Number	Pen. Resistance	Elevn. Recvry.
910.99	Top Soil		0				SS	1	8	
			6"				SS	2	11	
	Fine brown sand.						SS	3	33	
			8				SS	4	12	
900.99	Greyish brown medium sand.	WT	13				SS	5	11	
			15				SS	6	23	
	Greyish brown fine sand.									
890.99			22				SS	7	36	
	Grey fine sand with pebbles.						SS	8	31	
880.99			30				SS	9	35	
	Brown fine to medium sand.									
874.99			36				SS	10	35	
	End of Hole.									

Warnock Hersey Soil Investigations Ltd

Office Report Of Soil Exploration

Casing BX Diameter 2 1/2" Elevn. 898.51
Casing Hammer Wt. 350 Drop 24"
Sample Hammer Wt. 140 Drop 30"

Client Ontario Dept. Highways.
Highway #9 at Bleckhorse

Order Number TB 59/196
Borehole Number 11
Date January 5, 1960

SAMPLE CONDITION & TYPE

Disturbed
Good
Lost

CS - Chunk
DO - Drive Open
DF - Drive Footvalve
TO - Thinwalled Open
WS - Washed Sample
RC - Rock Core

ABBREVIATIONS

V - Insitu Vane Shear Test
M - Mechanical Analysis
U - Unconfined Compression
Qc - Triaxial Consolidated Quick
Q - Triaxial Quick
S - Triaxial Slow

- Unit Weight
K - Permeability
C - Consolidation
CA - Casing
WL - Water Level in Casing
WT - Water Table in Soil

SOIL PROFILE

Elevn. Depth	Description	Strata Plot	Elevation Scale
898.51	Top Soil		0
	Brown fine sand.	WT	1'6"
	Black organic matter (peat)		4'6"
888.51			
	Grey medium sand with pebbles.		12'6" 15
878.51			
	Grey medium sand.		
868.51			32
	Grey medium sand.		
			38
858.51	Grey fine sand.		
			47
848.51	Grey fine sand.		49
	Grey medium sand.		
838.51			
			66
828.51	Grey fine sand.		
818.51			
808.51			
798.51	Continued -		100

SHEAR STRENGTH
tons/sq. ft. or Qu/2

PENETRATION TESTS
standard energy 4200 in. lb.
blows/foot of penetration
100 200 300

WATER CONTENT
CASING BLOWS
w%
p.l. l.l.
50 100

SAMPLES

Condition	Type	Number	Pen. Resistance	Elevn. Recvry.
	SS	1	1	
	SS	2	3	
	SS	3	5	
	SS	4	6	
	SS	5	29	
	SS	6	25	
	SS	7	23	
	SS	8	28	
	SS	9	39	
	SS	10	50	
	SS	11	57	
	SS	12	50	
	SS	13	83	
	SS	14	87	
	SS	15	53	
	SS	16	90	
	SS	17	110	

Warnock Hersey Soil Investigations Ltd

Office Report Of Soil Exploration

Casing BX Diameter 2 1/2" Elevn. 898.51
Casing Hammer Wt. 350 Drop 24"
Sample Hammer Wt. 140 Drop 30"

Client Ontario Dept. of Highways.
Highway #9 at Blackhorse

Order Number TB 59/196
Borehole Number 11 Cont.
Date January 6, 1960.

SAMPLE CONDITION & TYPE

Disturbed
Good
Lost

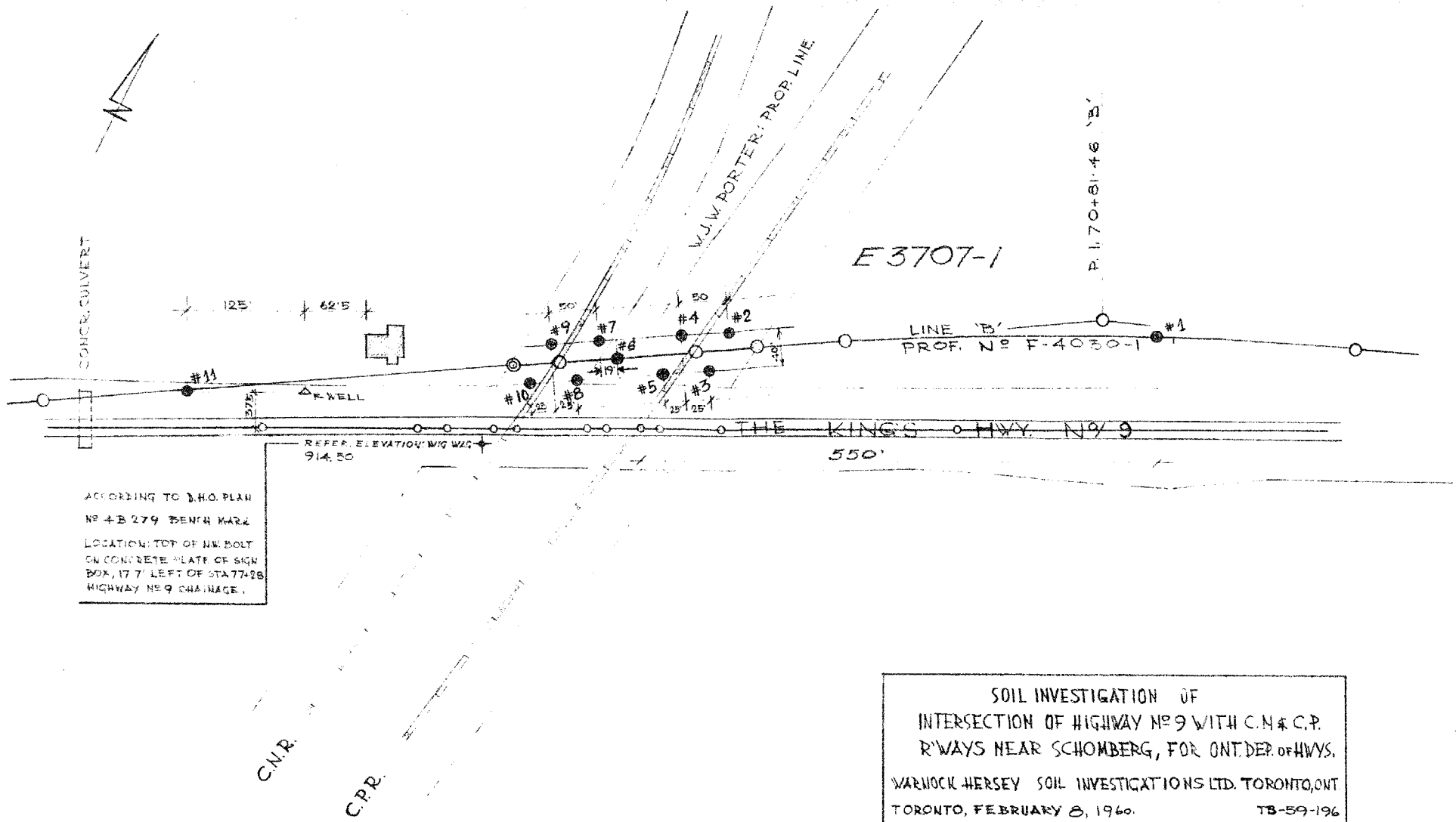
CS - Chunk
DO - Drive Open
DF - Drive Footvalve
TO - Thinwalled Open
WS - Washed Sample
RC - Rock Core

ABBREVIATIONS

V - Insitu Vane Shear Test
M - Mechanical Analysis
U - Unconfined Compression
Qc - Triaxial Consolidated Quick
Q - Triaxial Quick
S - Triaxial Slow

- Unit Weight
K - Permeability
C - Consolidation
CA - Casing
WL - Water Level in Casing
WT - Water Table in Soil

SOIL PROFILE				SHEAR STRENGTH tons/sq. ft. or Cu/2 / PENETRATION TESTS standard energy 4200 in. lb. blows/foot of penetration	WATER CONTENT CASING BLOWS w% ▣ p.l. △ l.l.	SAMPLES				
Elevn. Depth	Description	Strata Plot	Elevation Scale	100 200 300	50 100	Condition	Type	Number	Pen. Resistance	Elevn. Recvry.
798.51	Continued -		100 102							
	Grey fine to medium sand with stones.									
788.51 787.51			111				SS	18	150	
	End of Hole									



ACCORDING TO D.H.O. PLAN
No 4B 279 BENCH MARK
LOCATION: TOP OF N.W. BOLT ON CONCRETE PLATE OF SIGN BOX, 17.7' LEFT OF STA 77+28 HIGHWAY No 9 CHAINAGE.

SOIL INVESTIGATION OF
INTERSECTION OF HIGHWAY No 9 WITH C.N & C.P.
R'WAYS NEAR SCHOMBERG, FOR ONT. DEP. OF HWYS.

WARNOCK HERSEY SOIL INVESTIGATIONS LTD. TORONTO, ONT

TORONTO, FEBRUARY 8, 1960. TB-59-196

DRAWN BY: V.D. APPROVED BY:

Mr. A. M. Toye,
Bridge Engineer.

Materials & Research Section.

February 10, 1960.

FOUNDATION INVESTIGATION - by
Construction Borings, Limited.

Attention: Mr. S. McCombie.

Re: Proposed Crossing of C.N.R. & C.P.R.,
Hwy. #9 at Blackhorse, Twp. of Tecumseth,
W.P. 305-59 - Toronto District #6.

This memo accompanies the detailed foundation investigation report submitted by Construction Borings, Ltd., for the above noted structure.

The borings carried out show that the soil underlying this site consists of fine to coarse sand, generally in a medium dense state. The material as described in the Consultant's report, contains virtually no silt or clay sizes, and can therefore be considered free-draining. The water table is reported to be well below a practical spread footing depth.

We have reviewed the factual data presented in this report and submit the following recommendations to be used in design:-

(1) Spread footings founded at a shallow depth below existing ground surface can be used at this site. A minimum footing width of 6 feet should be specified and an allowable footing pressure of 3 T/sq.ft. can be used for footings founded at the following depths:-

Location	Recommended Elevation of Underside of Footing	Allowable Gross Bearing Pressure
Borings 2, 3, 4 & 5.	908.0'	3 Tons/sq.ft.
Borings 9 & 10.	902.0'	3 Tons/sq.ft.
Borings 6, 7 & 8.	905.0'	3 Tons/sq.ft.

The minimum depth of cover above underside footing elevation should be 8 feet to utilize above tabulated bearing pressures.

cont'd. /2 ...

Recommendations: (cont'd.) ...

(2) The water table elevations given in the Consultants' report are well below the above recommended footing elevations. It is possible that during a very wet season, a higher water table will be established. If water is encountered during footing excavations, dewatering will be necessary. Either well points, or shallow wells within the excavation, can be used - the choice being dependent upon water table elevation relative to underside of footing elevation. A sustained water table elevation higher than that reported by the Consultants, is highly improbable.

The tabulated values of depth vs. bearing capacity given in the Consultants' report, is a gross underestimate of footing capacities - particularly - a depth of 100 feet! The recommended values of bearing pressures and depths given in this covering memo, should be used, rather than the values quoted by the Consultants.

If you have any queries with respect to the contents of the attached report, or our foregoing comments, please do not hesitate to call the Foundations Office.

L. G. Soderman

LGS/NdeF
Attach.

L. G. Soderman,
PRINCIPAL SOILS & FOUNDATIONS ENGINEER

cc: Messrs. A. M. Toye (2)
H. A. Tregaskes
D. G. Ramsay
I. Campbell
C. Fraser
P. F. Weber
A. Watt

Foundations Office
Gen. Files.

Re: Proposed Crossing of C.N.R. & C.P.R.,
Hwy. No. 9 at Blackhorse, Twp. of
Tecumseth,
W.P. 305-59 -- Toronto District No. 6.

CHECKING OF PRELIMINARY PLANS.

Preliminary plans in agreement with suggestions contained in the covering letter of the Soil Investigation Report (Construction Borings, Ltd.).

It is not visible whether allowable bearing capacity has been taken as 3 T/sq.ft. as suggested in the covering letter, but since foundation elevations are in agreement, it is assumed that bearing capacities are, as well.

The foundation problem in this particular case, is a very simple one.

A Stermac

AS/MdeF

A. Stermac,
FOUNDATION OFFICE ENGINEER

April 11, 1960.

Mr. A. M. Toye,
Bridge Engineer.

Materials & Research Section.

February 10, 1960.

FOUNDATION INVESTIGATION - by
Construction Borings, Limited

Attention: Mr. S. McCombie.

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Hwy. #9 at Blackhorse, Twp. of Tecumseth,
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cont'd. /2 ...

Recommendations: (cont'd.) ...

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L. G. Soderman

LGS/MdeP
Attach.

L. G. Soderman,
PRINCIPAL SOILS & FOUNDATIONS ENGINEER

cc: Messrs. A. M. Toye (2)
S. A. Tregaskes
B. G. Ramsay
I. Campbell
C. Fraser
F. P. Weber
A. Watt

Foundations Office/
Gen. Files.

Kl

Lonsd Downs

WARNOCK HERSEY SOIL INVESTIGATIONS LTD.

600 Sherbourne Street, Toronto 5, Ontario.
WAlnut 4 - 9692

TB 59/196

January 21, 1960

Ontario Department of Highways,
Materials & Research Section,
Parliament Buildings,
Toronto 2.

Attn: Mr. A. Rutka.

Dear Sir:

We wish to report progress on the work being done by our Company at Highway #9, Canadian National, and Canadian Pacific Railway level crossings at Blackhorse.

Test Hole #11: Completed.
Below 12 foot depth granular material varying from fine sand to coarse sand to gravel, generally increasing in compactness to 83 blows at 50 foot depth. Between 50 - 110 foot depth - material medium sand of blows 87, 53, 90, 110 and finally 150 blows plus at 110 feet.

Test Hole #10: Completed.
All granular material increasing in compactness to 31 foot depth - blows at this depth 35.

Test Hole #9: Completed.
All granular material increasing in compactness to 31 feet. Blows at this depth - 40.

Test Hole #8: Not completed.
Hole just started at 5 foot depth.

Test Hole #7: Completed.
All granular material increasing in compactness to 30 feet - 50 blows; continuing harder material to 93 blows at 46 foot depth.

Test Hole #6: Completed.
All granular material increasing hardness to 30 foot depth - 60 blows; then to 76 blows at 41 foot depth.

Continued -

TB 59/196

Test Hole #4: Not completed.

Granular material to 15 feet - 75 blows. Continuing drilling.

The material underlying this area is all granular and increases in compactness with depth and will sustain the loading of the order of 3 tons per square foot at 30 foot depth. This, we believe, adequate to meet your requirements.

We propose to put two other holes (viz. #5 and #1) down to approximately 100 feet or a continuous stratum of 20 feet of 75 blow material. The rest of the holes will be to 40 - 50 feet.

This work should be completed in about 10 days when a full detailed report will be issued.

Yours truly,

WARNOCK HERSEY SOIL INVESTIGATIONS LTD.

P. B. Lawrence per DBR

P. B. Lawrence, P. Eng.,
Asst. Manager.

PBL/DBR

60-F-220

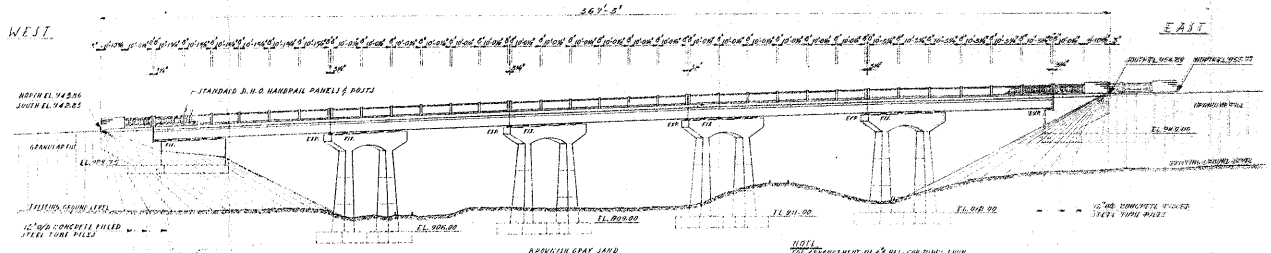
W.P. # 305-59

Hwy. # 9

CROSSING

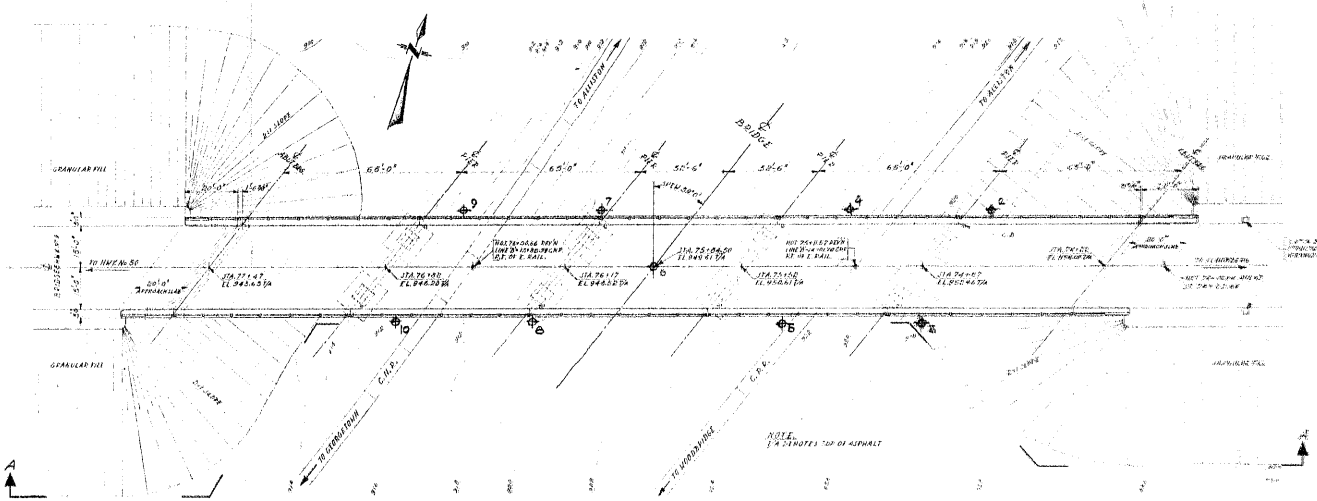
C.N.R. & C.P.R.

AT BLACKHORSE



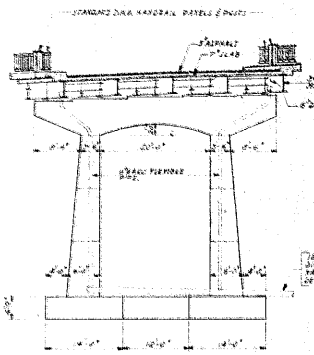
ELEVATION (A-A)

SCALE 1" = 20'-0"

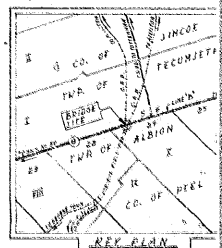


PLAN

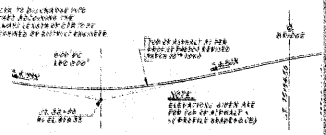
SCALE 1" = 20'-0"



TYPICAL ELEVATION OF PIER

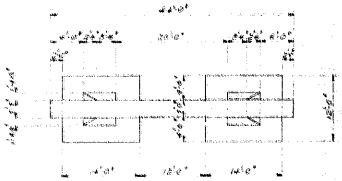


KEY PLAN

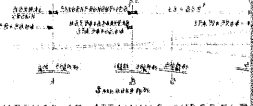


PROFILE OF HWY No. 9

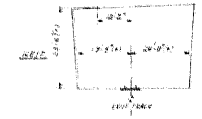
NOT TO SCALE



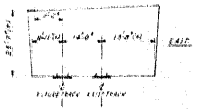
PLAN OF PIER



METHOD OF ATTAINING SUPERELE



MINIMUM CLEARANCE DIAGRAM OF C.N.R.
SECTION AT 90° TO TRACKS



MINIMUM CLEARANCE DIAGRAM OF C.P.R.
SECTION AT 90° TO TRACKS

DATA FOR 59°0' SKEW.

SIN. 0.85952
COS. 0.51015
TAN. 0.84936
SEC. 1.96476

NOTE
FOR DETAILS OF GRADING LIMITS SEE D-4659-R1A

REVISIONS					
DATE	BY	DESCRIPTION	REFERENCE PLANS		
			E-3707-1		
			D-8152-1		
			RA-279		
			F-4080-1		
			RA 995		

DEPARTMENT OF HIGHWAY
BRIDGE OFFICE - TORONT

TECUMSETH TWP. C
OVERHEAD BRIDG

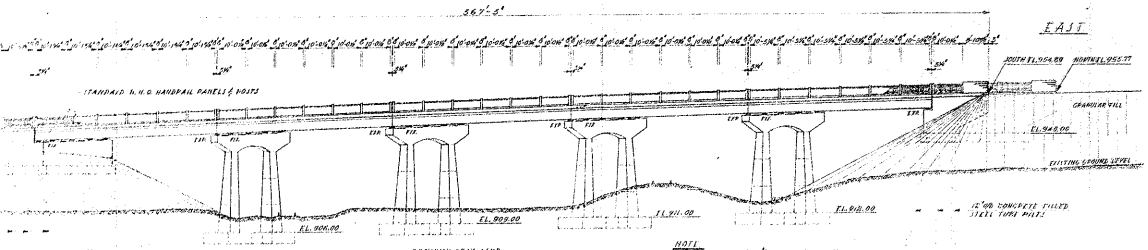
THE KING'S HIGHWAY No. 9
CO. SIMCOE
TWP. TECUMSETH LOT 4

PRELIMINARY PLA

APPROVED

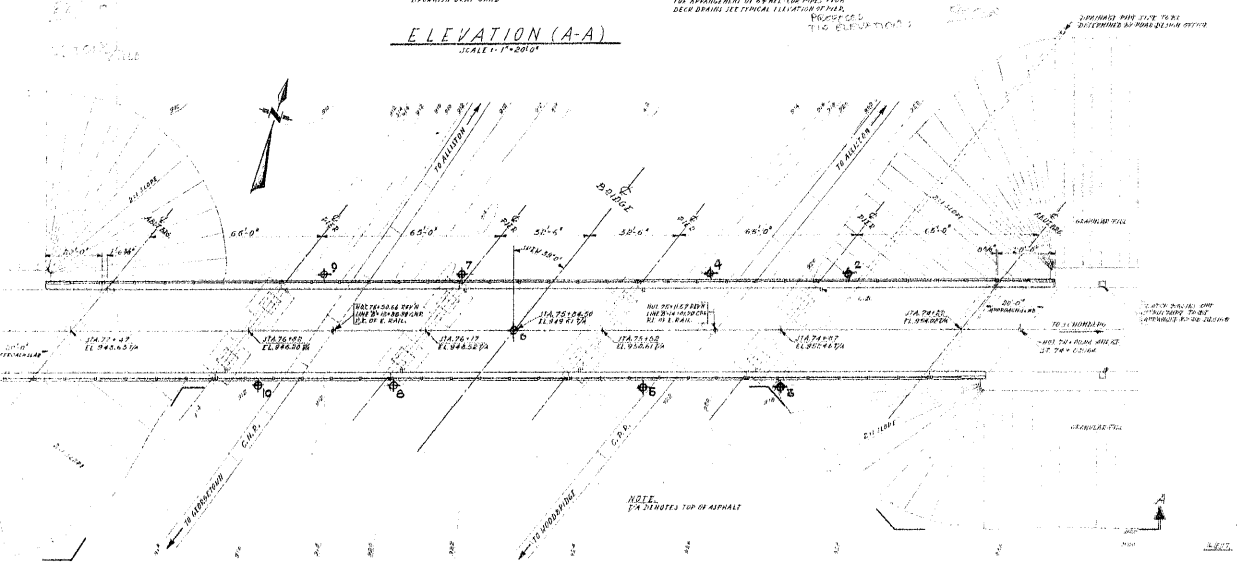
BRIDGE ENGINEER

DESIGN	K.G.B.	CHECK	L.N.F.	CONTRACT NUMBER	
DRAWING	J.D.	CHECK	J.N.F.		
TRACING		CHECK		LOCATION NUMBER	1108-516
DATE	MARCH 1960			DRAWING NUMBER	D



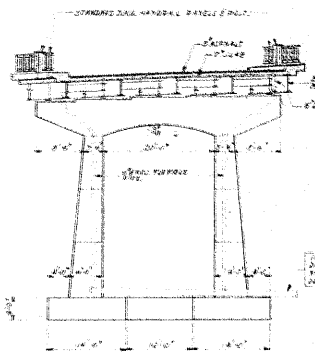
ELEVATION (A-A)

SCALE 1" = 20'-0"

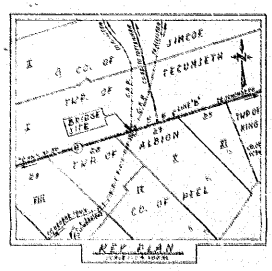


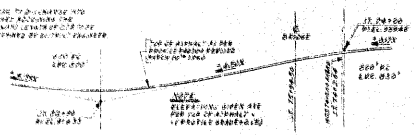
PLAN

SCALE 1" = 20'-0"



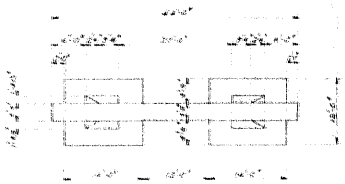
TYPICAL ELEVATION OF PIER



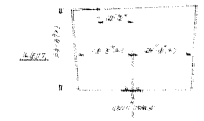


PROFILE OF HWY No 9

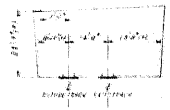
METHOD OF ATTAINING SUPERELEVATION



PLAN OF PIER



MINIMUM CLEARANCE DIAGRAM OF C.N.R.



MINIMUM CLEARANCE DIAGRAM OF C.P.R.

DATA FOR 33°0' SKEW.

NOTE

REVISIONS			
DATE	BY		DESCRIPTION

REFERENCE PLANS	
E-3767-1	
E-5142-2	
45-279	
F-4054-1	
RA 995	

WR 305-59

DEPARTMENT OF HIGHWAYS: ONTARIO

BRIDGE OFFICE: TORONTO

TECUMSETH TWP. C.N.R. & C.P.R. OVERHEAD BRIDGE.

THE KING'S HIGHWAY No. 9 — DIST. No. 6

CO. JINCOE

TWP. TECUMSETH — LOT 4 — CON. I.

PRELIMINARY PLAN

APPROVED

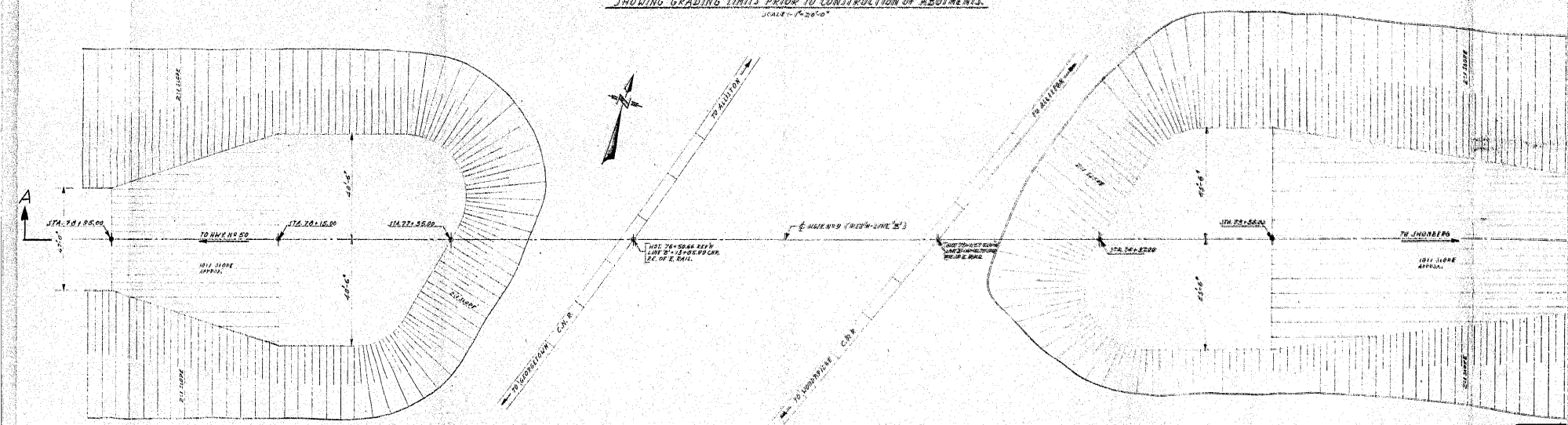
BRIDGE ENGINEER — DESIGN ENGINEER

DESIGN	K.A.B.	CHECK	L.N.F.	CONTRACT NUMBERS	
DRAWING	J.D.	CHECK	L.N.F.		
TRACING		CHECK		WARDS	
DATE	MARCH 1960			H09-516	DRAWING NUMBER D-4539-P1

SECTION A-A

SHOWING GRADING LIMITS PRIOR TO CONSTRUCTION OF ABUTMENTS.

SCALE: 1" = 20'-0"



PLAN

SHOWING APPROACH FILL PRIOR TO CONSTRUCTION OF ABUTMENTS.

SCALE: 1" = 20'-0"

REVISIONS			
DATE	BY	DESCRIPTION	

REFERENCE PLANS
SPEC. D-4069-71

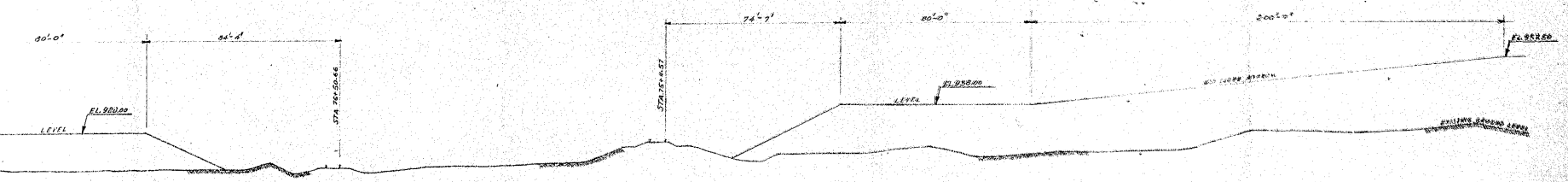
DEP

TE

THE KING'S
CO. SIMCOE
TWP. TECU

APPROVED

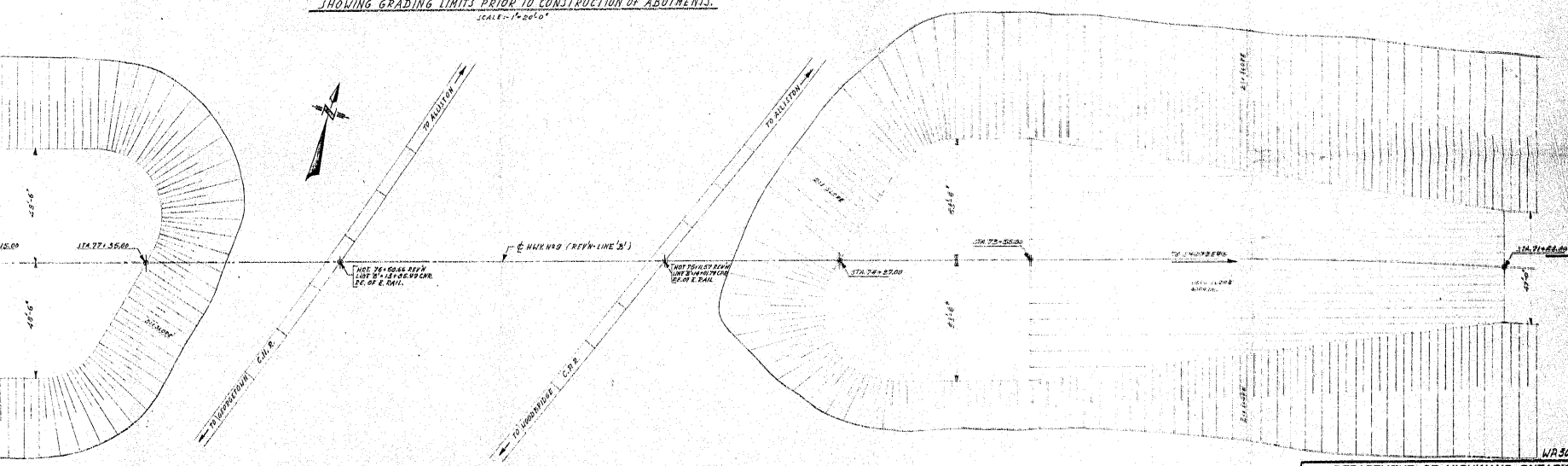
DESIGN	K.G.B.
DRAWING	J.S.
T. ADING	
DATE	MARCH



SECTION A-A

SHOWING GRADING LIMITS PRIOR TO CONSTRUCTION OF ABUTMENTS.

SCALE:- 1" = 20'-0"



PLAN

SHOWING APPROACH FILL PRIOR TO CONSTRUCTION OF ABUTMENTS.

SCALE:- 1" = 20'-0"

WR305-59

DEPARTMENT OF HIGHWAYS:.ONTARIO.
BRIDGE OFFICE:-TORONTO

TECUMSETH TWP. C.N.R. & C.P.R.
OVERHEAD BRIDGE

THE KING'S HIGHWAY No. 9. DIST. No. 6.
CO. SIMCOE
TWP. TECUMSETH LOT 4. CON. 2.

GRADING LIMITS

APPROVED

BRIDGE ENGINEER — DESIGN ENGINEER

REFERENCE PLANS: SEE D-4559-P1

DESIGN	K.G.B.	CHECK	L.H.F.
DRAWING	J.S.	CHECK	L.H.F.
PLANS		CHECK	
DATE	MARCH 1960		

CONTRACT NUMBER
HIGHWAY
DRAWING NUMBER D-4559-P1A

REVISIONS: DATE | BY | DESCRIPTION