

G.I.-30 SEPT. 1976

GEOCRES No. 30M11-199DIST. CR REGION _____6 W.P. No. 320-94-00

CONT. No. _____

W. O. No. _____

STR. SITE No. _____

HWY. No. 401LOCATION EB Express lanes - HMLNo of PAGES -OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS: _____

CENTRAL REGION, GEOTECHNICAL ENGINEERING

G.W.P. 320-94-00 REGION Central
HWY. 401 STR. SITE N/A

High Mast Lighting
Highway 401 Eastbound Express Lanes, Allen Road to Avenue Road

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GEOCRE 30M11-199

DATE: 1997-12-09

FOUNDATION INVESTIGATION REPORT
For
High Mast Lighting
Hwy. 401 Eastbound Express Lanes, Allen Road to Avenue Road
G.W.P. 320-94-00, Central Region

INTRODUCTION

This report represents soil information for the thirty two high mast light poles proposed at the above mentioned site. Soils information was obtained from previous subsurface investigations in the area. This report was produced at the request of Central Region Highway Engineering Office.

SITE CONDITIONS

The site extends from the express/collector transfer at Allen Road easterly to the collector/express transfer just east of Avenue Road in the City of North York

From available geological information and previous work in the area, it is known that the area is covered by a deep deposit of glacial drift consisting of several till sheets separated by interglacial or interstage sands, silts and clays.

SUBSURFACE CONDITIONS

The appended Record of Boreholes sheets have been selected from previous projects to represent the soil conditions for this project. In general, the soil consists of compact to very dense brown or grey silty till, very dense brown silty sand, hard grey silty clay and loose to dense brown silty till fill.

The closest boreholes (listed below) should be referred to for soil conditions and groundwater levels at the HML locations. The elevations indicated on the log sheets may differ from present day elevations.

<i>W.P. No.</i>	<i>Geocres #</i>	<i>BH No.</i>	<i>Elev.(m)</i>
233-61-03	30M11-78	102	187.2
233-61-03	30M11-78	110	187.5
146-58	30M11-80	1	183.3
146-58	30M11-80	16	183.1
146-58	30M11-80	7	182.2
85-59-02	30M11-76	1	180.5
264-61-1/-2	N/A	28	166.6

The Record of Borehole Sheets are appended together with drawings showing the borehole locations in plan.

DISCUSSION AND RECOMMENDATIONS

It is proposed to install thirty two high mast lighting poles (P9 through P37) on Highway 401 between Allen Road and Avenue Road and one additional pole at the west approach to the structure at Yonge Street.

The High Mast Lighting poles will be founded on single reinforced caissons. The foundations for HML should be designed in accordance with the methods described by B.B. Broms in the following two papers:

Broms, B.B.; Lateral Resistance of Piles in Cohesive Soils,
Journal of the Soil Mechanics and Foundations Division,
ASCE, Vol. 90, No. SM2, Paper 3825, March 1964.

Broms, B.B.; Lateral Resistance of Piles in Cohesionless Soils,
Journal of the Soil Mechanics and Foundations Division,
ASCE, Vol. 90, No. SM3, Paper 3909, May 1964.

There are two options for the design of the HML foundations:

OPTION 1

Assume that the soil condition at any HML pole location is similar to the soil condition in the borehole logs closest to the proposed HML location. The details of boreholes to be used for design are as follows:

<i>W.P. No.</i>	<i>BH No.</i>	<i>Elevation (m)</i>	<i>Pole</i>
233-61-03	102	187.2	P9, P10, P11, P11A
233-61-03	110	187.5	P12, P13, P14, P15, P15A, 16, P16A
146-58	1	183.3	P17, P18, P19
146-58	16	183.1	P20, P21
146-58	7	182.2	P22, P23
85-59-02	1	180.5	P24 to P35
264-61-1/-2	28	166.6	P36, P37

Use the following soil parameters to design the HML foundations:

(1) *Silty Till Fill - Loose to Dense*

ϕ = Angle of Internal Friction = 30°

γ = Unit Weight = 19.6 kN/m^3

Water Level = As shown on the log sheet closest to the HML location.

(2) *Silty Till - Brown or Grey*

ϕ = Angle of Internal Friction = 35°

γ = Unit Weight = 22.0 kN/m^3

Water Level = As shown on the log sheet closest to the HML location.

(3) *Hard Grey Silty Clay*

Q_u = Unconfined Compressive Strength = 350 kPa

γ = Unit Weight = 20.5 kN/m^3

Water Level = As shown on the log sheet closest to the HML location.

(4) *Sandy Silt, Silty Sand, Sand and Silt*

ϕ = Angle of Internal Friction = 32°

γ = Unit Weight = 21.0 kN/m^3

Water Level = As shown on the log sheet closest to the HML location.

(5) *Silt and Sandy Fill, and all other fill areas where borehole elevations differ from present ground elevations.*

For any fill overlying the native soil, the following parameters should be used, taking into consideration that only half the fill height would provide lateral support.

ϕ = Angle of Internal Friction = 28°

γ = Unit Weight = 19.0 kN/m^3

HML Pole Foundations on or near Slopes

For HML pole foundations on or near slopes, use the attached Figure 1 in the Appendix to determine the percentage of calculated lateral resistance.

Frost Penetration Depth:

It should be assumed that soil in the zone of frost penetration does not provide any lateral resistance. The depth of frost penetration at this site is 1.4m.

OPTION 2

If the project schedule does not permit for a detailed design of the foundation using soil parameters, then the caisson foundations for P9 to P14 incl., P 15, P16 to P27 incl., P29 to P35 could be designed to be 8m deep, at the discretion of the designer.

Detailed design will be required for the caisson foundations for the remaining HML poles viz: P15A, P28, P36 and P37.

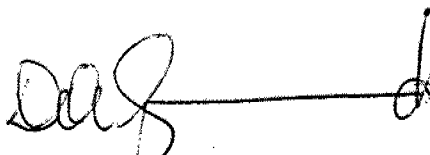
Construction Considerations

It is recommended that a non-standard special provision for the construction of HML foundations, be incorporated in the contract. A copy of the latest NSSP is appended to this report.

MISCELLANEOUS

This report was prepared by D. Grimmond, Geotechnical Trainee Engineer, assisted by B. Bennett, Foundation Engineer and reviewed by K. Ganesh Geotechnical Engineer.




D. Grimmond,
Geotechnical Trainee Engineer


K. Ganesh,
Geotechnical Engineer

APPENDIX

Non Standard Special Provision

Item Description: Concrete Footing for High Mast Light Poles

Construction

The Contractor is advised that variable types of subsurface material may be encountered at the high mast pole locations; for additional information regarding soil conditions, the Contractor is referred to the Foundation Investigation Report.

For bidding purposes, it may be assumed that:

- Ground water is at or near the surface
- If cohesionless material is encountered, it would be susceptible to disturbance under conditions of unbalanced hydrostatic head.
- If glacial deposits are encountered, there is a probability that occasional cobbles and boulders may be encountered within the deposit.

The Contractor is responsible for constructing the high mast pole foundations without disturbing the material at the sides or bases of the foundations.

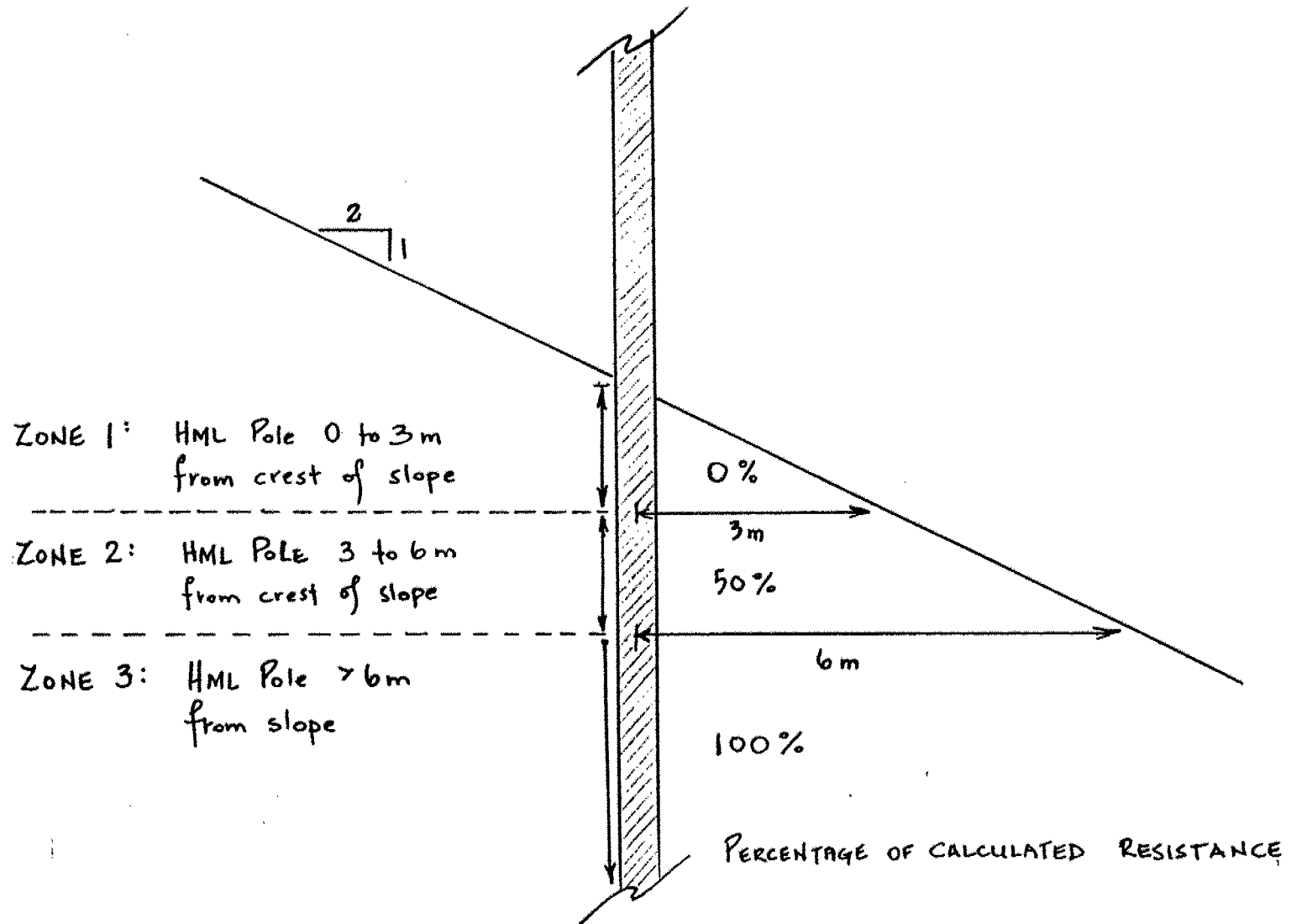
A professional engineer, experienced in caisson installation shall be retained by the Contractor to certify that the subsurface conditions encountered during construction of the caissons reflect those identified in the Foundation Investigation Report. Any discrepancies shall be reported to the Contract Administrator.

The base of the caissons shall be cleaned of loose and soft materials and inspected prior to pouring concrete. Caisson inspection shall be carried out and approved by a professional engineer as outlined above. Complete documentation of the inspection and installation of each caisson shall be maintained and submitted to the Contract Administrator.

Basis of Payment

Payment at the contract price for the above tender item shall be full compensation for all labour, equipment and materials required to do the work.

HML POLE FOUNDATIONS ON OR NEAR SLOPES



n.t.s.

Figure 1

OFFICE REPORT ON SOIL EXPLORATION

SAMPLE CONDITION

SAMPLE TYPES

ABBREVIATIONS

DISTURBED
FAIR
GOOD
LOST

A.S. - AUGER SAMPLE
S.T. - SLOTTED TUBE
W.S. - WASHED SAMPLE
D.O. - DRIVE-OPEN
D.F. - DRIVE-FOOT VALVE
C.S. - CHUNK SAMPLE

F.S. - FOIL SAMPLE
S.O. - SLEEVE-OPEN
S.F. - SLEEVE-FOOT VALVE
T.O. - THIN WALLED OPEN
R.C. - ROCK CORE

V - IN-SITU VANE TEST
 M - MECHANICAL ANALYSIS
 U - UNCONFINED COMPRESSION
 QC - TRIAXIAL CONSOLIDATED QUICK
 Q - TRIAXIAL QUICK
 S - TRIAXIAL SLOW

W. WET UNIT WEIGHT
K. PERMEABILITY
C. CONSOLIDATION
WL. WATER LEVEL IN CASING
WT. WATER TABLE IN SOIL

SOIL PROFILE					SAMPLES						
ELEVATION SCALE	WATER CONDITIONS	DESCRIPTION	STRAT. PLOT	ELEVATION SCALE	WATER CONTENT W% _____ O NAT. □ LW Δ Pw		OTHER TESTS	CONDITION	TYPE	NUMBER	PENETRATION RESISTANCE BLOWS/FT
					DYNAMIC PENETRATION TEST BLOWS PER FOOT _____						
610.4	W.L. 585.1 SEPT. 7, 1942	GROUND LEVEL		610	0.5 TOP SOIL						
602.6		COMPACT TO VERY DENSE BROWN SILTY TILL		600							
598.0				590							
596.2				580							
594.4		BROWN SILTY FINE SAND WITH S.WAT.		580							
592.6		VERY DENSE BROWN SAND		570							
588.0		VERY DENSE GREY SANDY SILT		560							
576.3				550							
544.3			END OF HOLE		540						
614.3		BOREHOLE DRY SEPT. 7, 1942	GROUND LEVEL		610	0.5 TOP SOIL					
606.0	COMPACT TO VERY DENSE BROWN SILTY TILL			600							
602.0				590							
598.0				580							
596.0	VERY DENSE BROWN SANDY SILT WITH LAYERS OF SILTY SAND			570							
575.0				560							
533.3			END OF HOLE		550						

GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT L 7413 BORING # 102 AND 110 DATUM SEA LEVEL CASING 3" DIA.
 BORING DATE SEPT 1, 1962 REPORT DATE SEPT 5, 1962 COMPILED BY A.E. CHECKED BY F.T.H.
 SAMPLER HAMMER WT 140 LBS. DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN. LBS. ENERGY)

SAMPLE CONDITION

☐ DISTURBED
☐ FAIR
☐ GOOD
☐ LOST

A.S. AUGER SAMPLE
 S.T. SLOTTED TUBE
 W.S. WASHED SAMPLE
 D.O. DRIVE-OPEN
 D.F. DRIVE-FOOT VALVE
 C.S. CHUCK SAMPLE

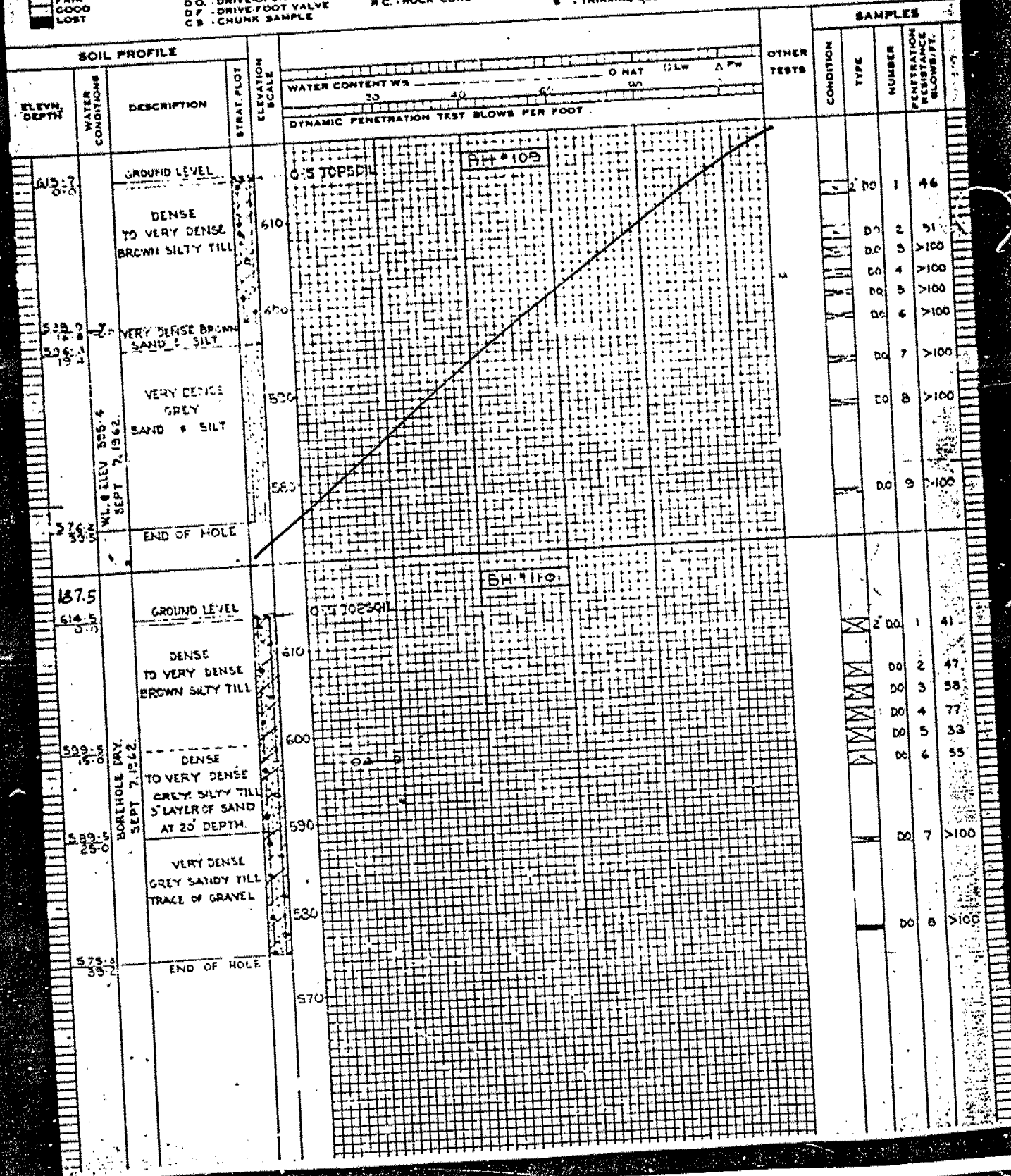
SAMPLE TYPES

F.S. FOIL SAMPLE
 S.O. SLEEVE-OPEN
 S.F. SLEEVE-FOOT VALVE
 T.O. THIN WALLED OPEN
 R.C. ROCK CORE

V. IN-SITU VANE TEST
 M. MECHANICAL ANALYSIS
 U. UNCONFINED COMPRESSION
 Q.C. TRIAXIAL CONSOLIDATED QUICK
 Q. TRIAXIAL QUICK
 S. TRIAXIAL SLOW

ABBREVIATIONS

W. WET UNIT WEIGHT
 K. PERMEABILITY
 C. CONSOLIDATION
 WL. WATER LEVEL IN CASING
 WT. WATER TABLE IN SOIL



GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT S7358 BORING # 101-1-2 DATUM AROMATIC CASING
 BORING DATE APRIL 19 1961 REPORT DATE APRIL 28 1961 COMPILED BY A.E.L. CHECKED BY D.B.O.
 SAMPLER HAMMER WT. 140 LBS. DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN - LBS. ENERGY)

SAMPLE CONDITION

☒ DISTURBED
☐ FAIR
☐ GOOD
☐ LOST

SAMPLE TYPES

A.S. - AUGER SAMPLE
 S.T. - SLOTTED TUBE
 W.S. - WASHED SAMPLE
 D.O. - DRIVE-OPEN
 D.F. - DRIVE-FOOT VALVE
 C.S. - CHUNK SAMPLE

F.S. - FOIL SAMPLE
 S.O. - SLEEVE-OPEN
 S.F. - SLEEVE-FOOT VALVE
 T.O. - THIN WALLED OPEN
 R.C. - ROCK CORE

V - IN-SITU VANE TEST
 M - MECHANICAL ANALYSIS
 U - UNCONFINED COMPRESSION
 OC - TRIAXIAL CONSOLIDATED QUICK
 O - TRIAXIAL QUICK
 S - TRIAXIAL SLOW

ABBREVIATIONS

W - WET UNIT WEIGHT, P.C.F.
 X - PERMEABILITY
 C - CONSOLIDATION
 WL - WATER LEVEL IN CASING
 WT - WATER TABLE IN SOIL

SOIL PROFILE

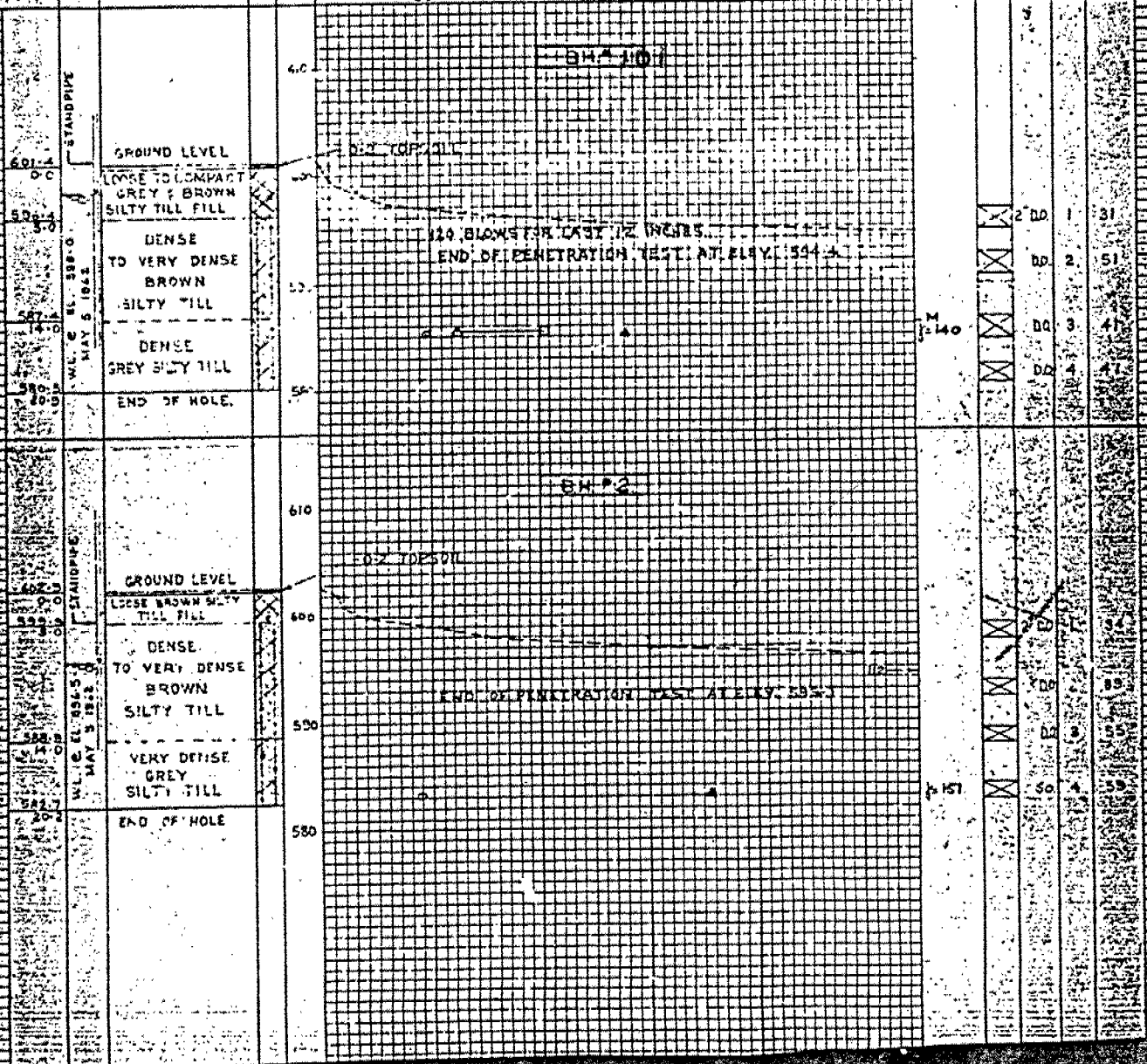
COMPRESSION STRENGTH TONS PER SQ. FT.
 A UNCONFINED

WATER CONTENT WS 0 NAT. OLW ΔPW
 DYNAMIC PENETRATION TEST BLOWS PER FOOT

OTHER TESTS

SAMPLES

CONDITION TYPE NUMBER
 PENETRATION RESISTANCE BLOWS/FT.



GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT 5712 BORING # 1 DATUM PROJ. 1 CASING DBO
 BORING DATE APR 30 1964 REPORT DATE MAY 1 1964 COMPILED BY AL CHECKED BY DBO
 SAMPLER HAMMER WT. 140 LBS. DROP 22 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN. LBS. ENERGY)

SAMPLE CONDITION

☒ DISTURBED
☐ FAIR
☐ GOOD
☐ LOST

SAMPLE TYPES

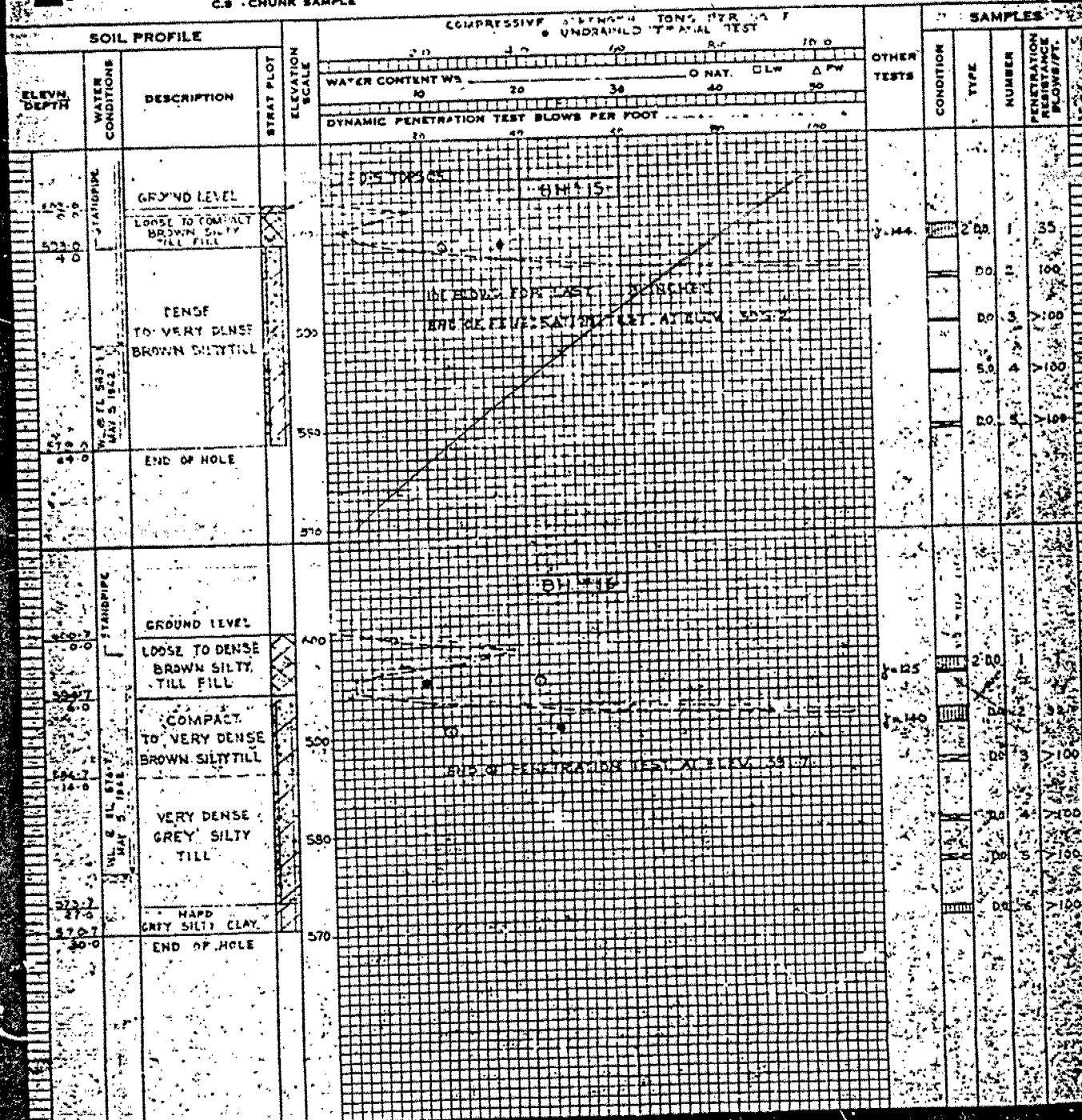
A.S. - AUGER SAMPLE
 S.T. - SLOTTED TUBE
 W.S. - WASHED SAMPLE
 D.O. - DRIVE-OPEN
 D.P. - DRIVE-FOOT VALVE
 C.S. - CHUNK SAMPLE

F.S. - FOIL SAMPLE
 S.O. - SLEEVE-OPEN
 S.F. - SLEEVE-FOOT VALVE
 T.O. - THIN WALLED OPEN
 R.C. - ROCK CORE

V - IN-SITU VANE TEST
 M - MECHANICAL ANALYSIS
 U - UNCONFINED COMPRESSION
 QC - TRIAXIAL CONSOLIDATED QUICK
 Q - TRIAXIAL QUICK
 S - TRIAXIAL SLOW

ABBREVIATIONS

W - WET UNIT WEIGHT PC
 K - PERMEABILITY
 C - CONSOLIDATION
 WL - WATER LEVEL IN CASING
 WT - WATER TABLE IN SOIL



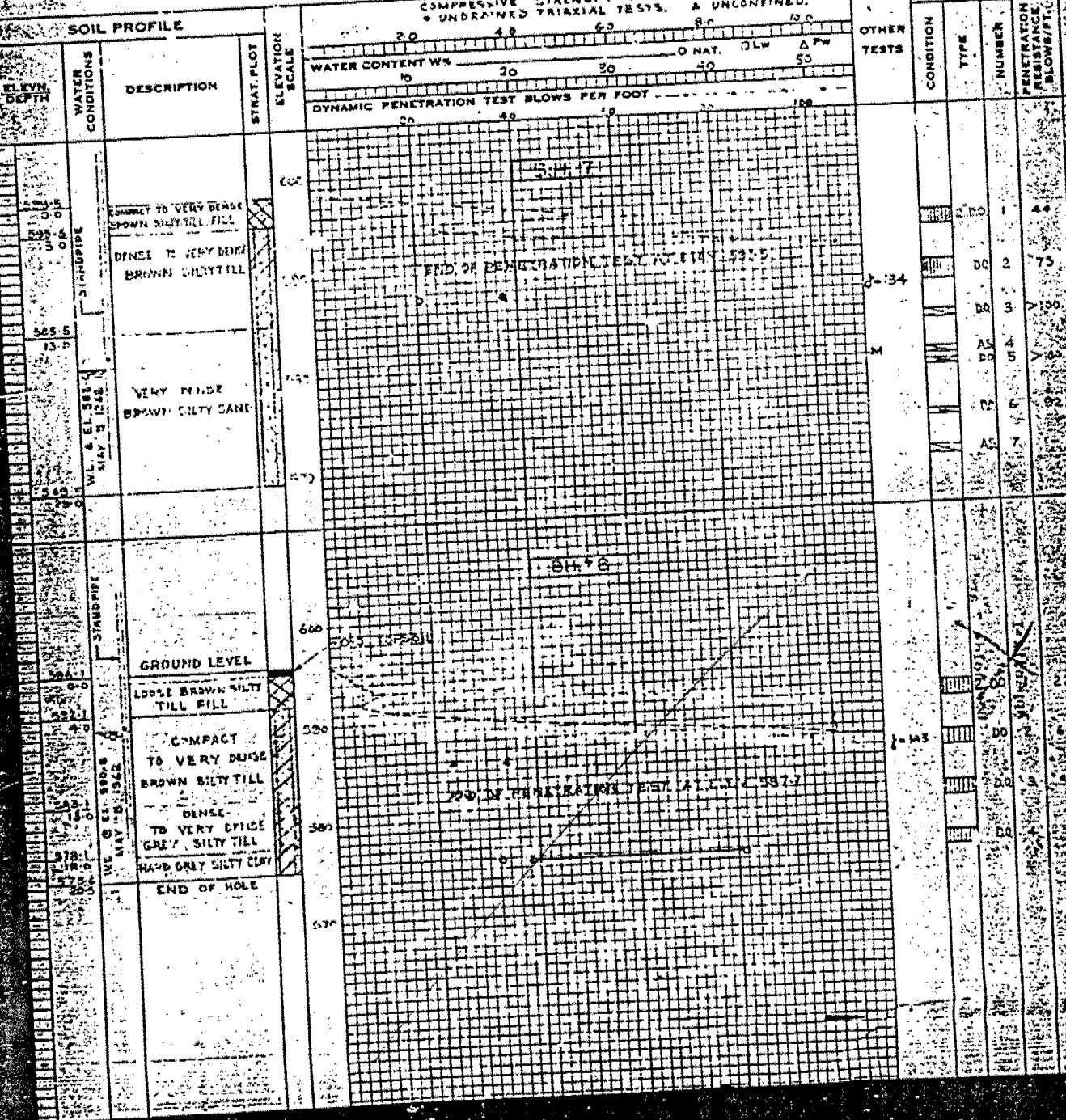
GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT 57358 BORING 7 1 A DATUM GEODETIC Casing 0 5 0
 BORING DATE MAY 1 1962 REPORT DATE APRIL 30 1962 COMPILED BY R.L. CHECKED BY D.B.O.
 SAMPLER HAMMER 7 1 A 2 LBS DROP 30 INCHES PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN - LBS. ENERGY

SAMPLE CONDITION
 DISTURBED
 FAIR
 GOOD
 LOST

SAMPLE TYPES
 S.S. - AUGER SAMPLE
 S.T. - SLOTTED TUBE
 W.S. - WASHED SAMPLE
 D.D. - DRIVE-OPEN
 D.V. - DRIVE-FOOT VALVE
 C.S. - CHUNK SAMPLE
 F.S. - FOIL SAMPLE
 S.O. - SLEEVE-OPEN
 S.F. - SLEEVE-FOOT VALVE
 T.O. - THIN WALLED OPEN
 R.C. - ROCK CORE
 V. - IN-SITU VANE TEST
 M. - MECHANICAL ANALYSIS
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 Q.C. - TRIAXIAL CONSOLIDATED QUICK
 Q. - TRIAXIAL QUICK
 S. - TRIAXIAL SLOW
 W. - WET UNIT WEIGHT
 K. - PERMEABILITY
 C. - CONSOLIDATION
 WL. - WATER LEVEL IN CASING
 WT. - WATER TABLE IN SOIL



OUR REFERENCE NO 2-H-2

GEOTECHNICAL DATA SHEET FOR BOREHOLE 1...

CLIENT: ONTARIO DEPARTMENT OF HIGHWAYS
 PROJECT: AVENUE ROAD - HWY 401 - RETAINING WALL
 LOCATION: SEE ENCL. 2.
 DATE: NOVEMBER 19, 1962.
 DATUM ELEVATION: 592.2

ENCLOSURE NO. 3

ELEVATION ft	DEPTH ft	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE Blows per foot		CONSISTENCY	REMARKS
				NO.	TYPE	TEST	SHALLOW	DEEP		
592.2	0	TOPSOIL								
587	5	DAMP HARD SANDY CLAYEY SILT TILL		1	SS	40				HAMMER BOUNCING
586	10	<i>brown streaky</i>		2	SS	75				
580	15	GREY DAMP VERY DENSE SILT <i>slightly cemented</i>		3	SS	450				
575	20	GREY HARD CLAYEY SILT TILL		4	SS	150				
570	25			5	SS	110				
565	30									DETAILS OF EXTRAPOLATED PENETRATION RESISTANCES:
										5' : BLOWS:
										1 15/6" 25/6"
										2 20/6" 30/6" 15/2"
										3 75/2"
										4 38/6" 65/5"
										5 36/6" 50/6" 20/2"

VERTICAL SCALE: 1 IN. TO 5 FT.

DOMINION SOIL INVESTIGATION LIMITED

MADE: MB

CHKD: *Reese*

GEOTECHNICAL DATA SHEET FOR BOREHOLE 28.

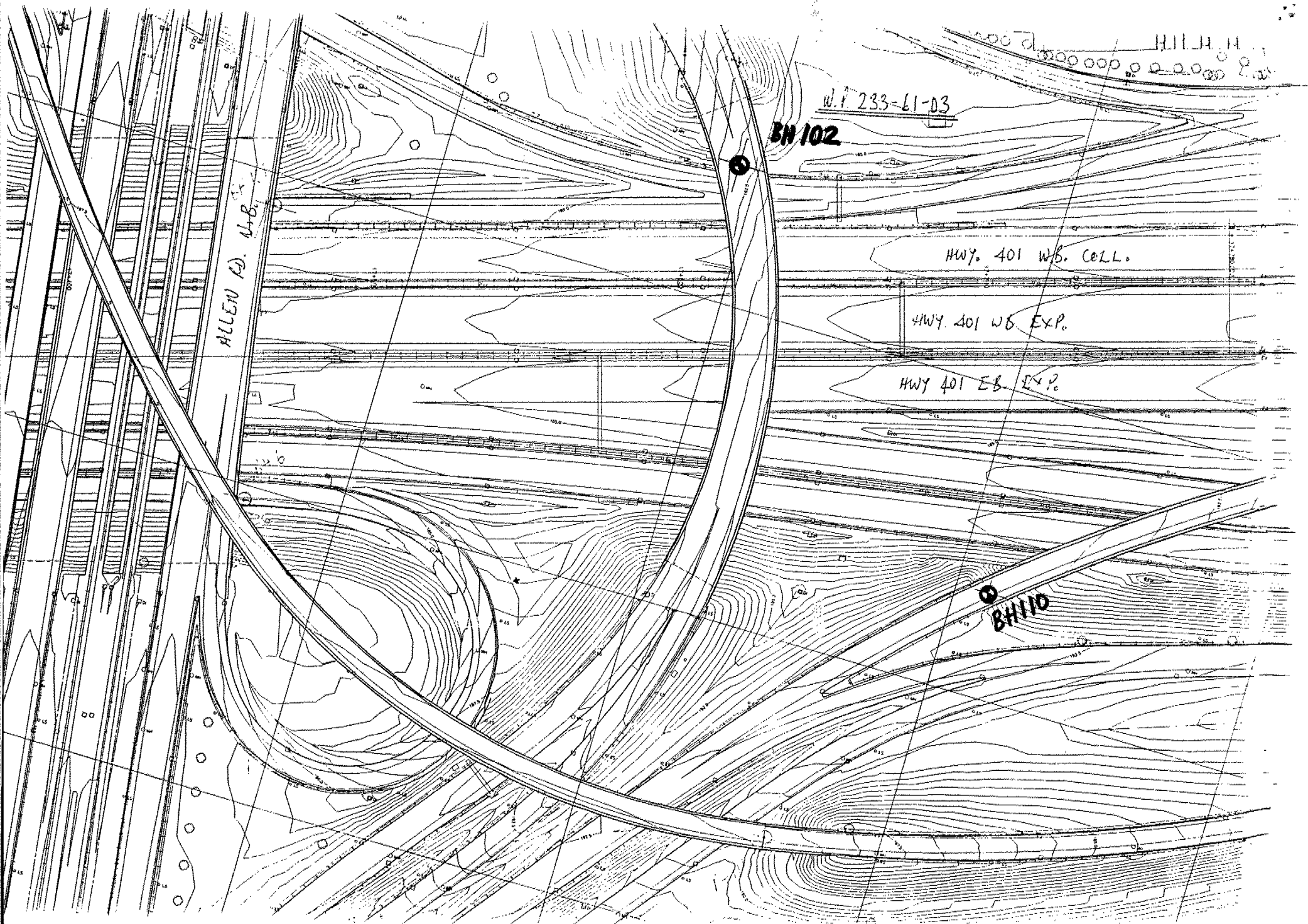
OUR REFERENCE NO 2-8-18

CLIENT: ONTARIO DEPARTMENT OF HIGHWAYS
 PROJECT: HWY. # 401 COLLECTOR ROADS
 LOCATION: HOGGS HOLLOW, TORONTO
 DATUM ELEVATION: 546.7

METHOD OF BORING: WASHBORING
 DIAMETER OF BOREHOLE: 2 1/8"
 DATE: SEPT. 25-26, 1962.

ENCLOSURE NO 30

ELEVATION ft	DEPTH ft	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE		CONSISTENCY		REMARKS
				NUMBER	TYPE	1-2-3 Adj. to 100	blows per foot	SHEAR STRENGTH lbs sq ft	water content % PL W LI		
546.7	0	TOPSOIL									
545.0	5	BROWN FINE SAND WITH LAYERS OF SILT		1	SS	7	0				
				2	SS	11	0				
540.0	10			3	SS	31	0				
535.0	15			4	SS	47	0				
				5	SS	46	0				
530.0	20	BROWN HARD SLIGHTLY CEMENTED <i>gravel pocket</i> SANDY SILT TILL		6	SS	91	0				
525.0	25			7	SS	84	0				
520.0	30			8	SS	95	0				



W.P. 233-61-03

BH 102

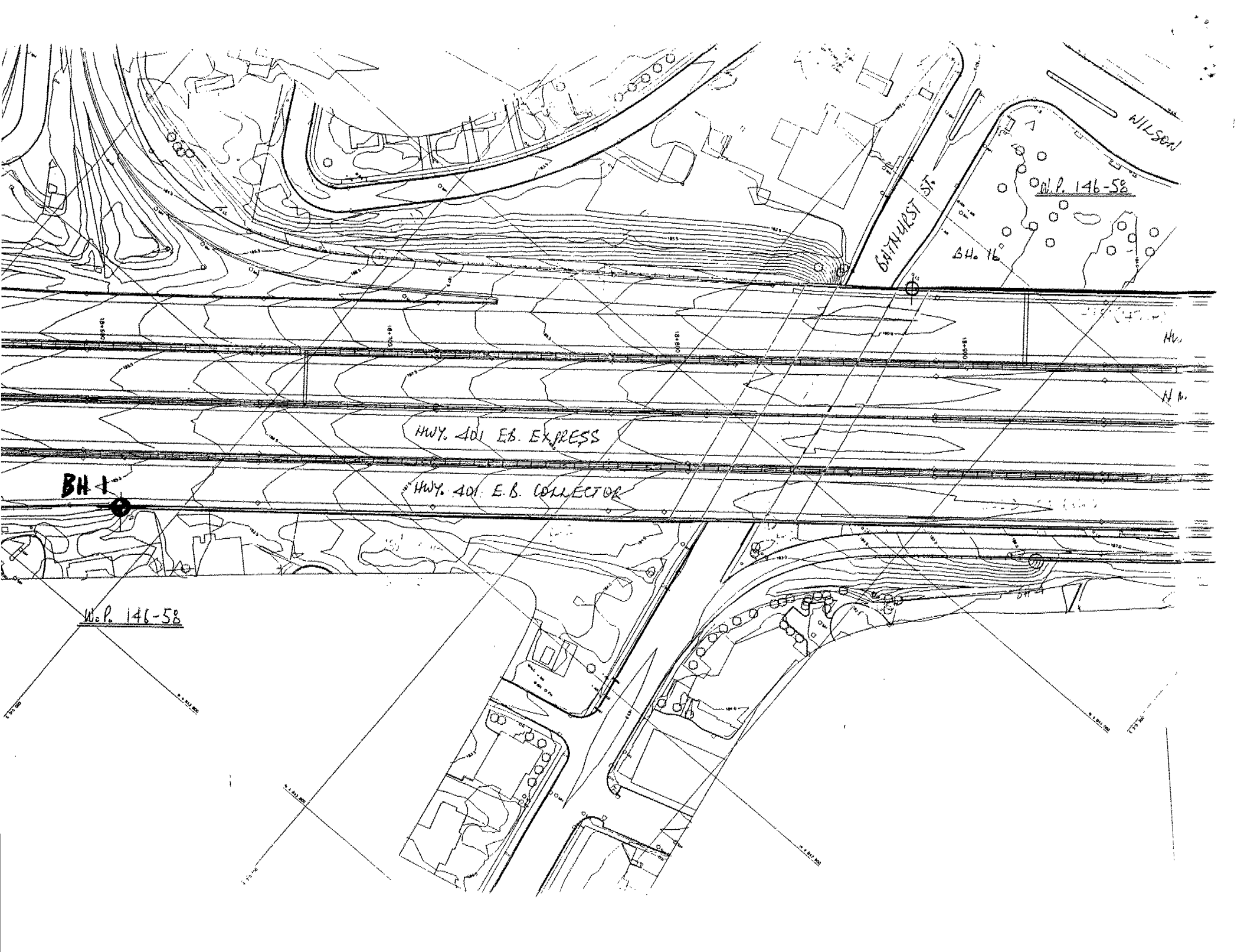
ALLEN RD. W.B.

HWY. 401 W.B. COLL.

HWY. 401 W.B. EXP.

HWY 401 E.B. EXP.

BH 110



HWY. 401 E.B. EXPRESS

HWY. 401 E.B. COLLECTOR

BATHURST ST.

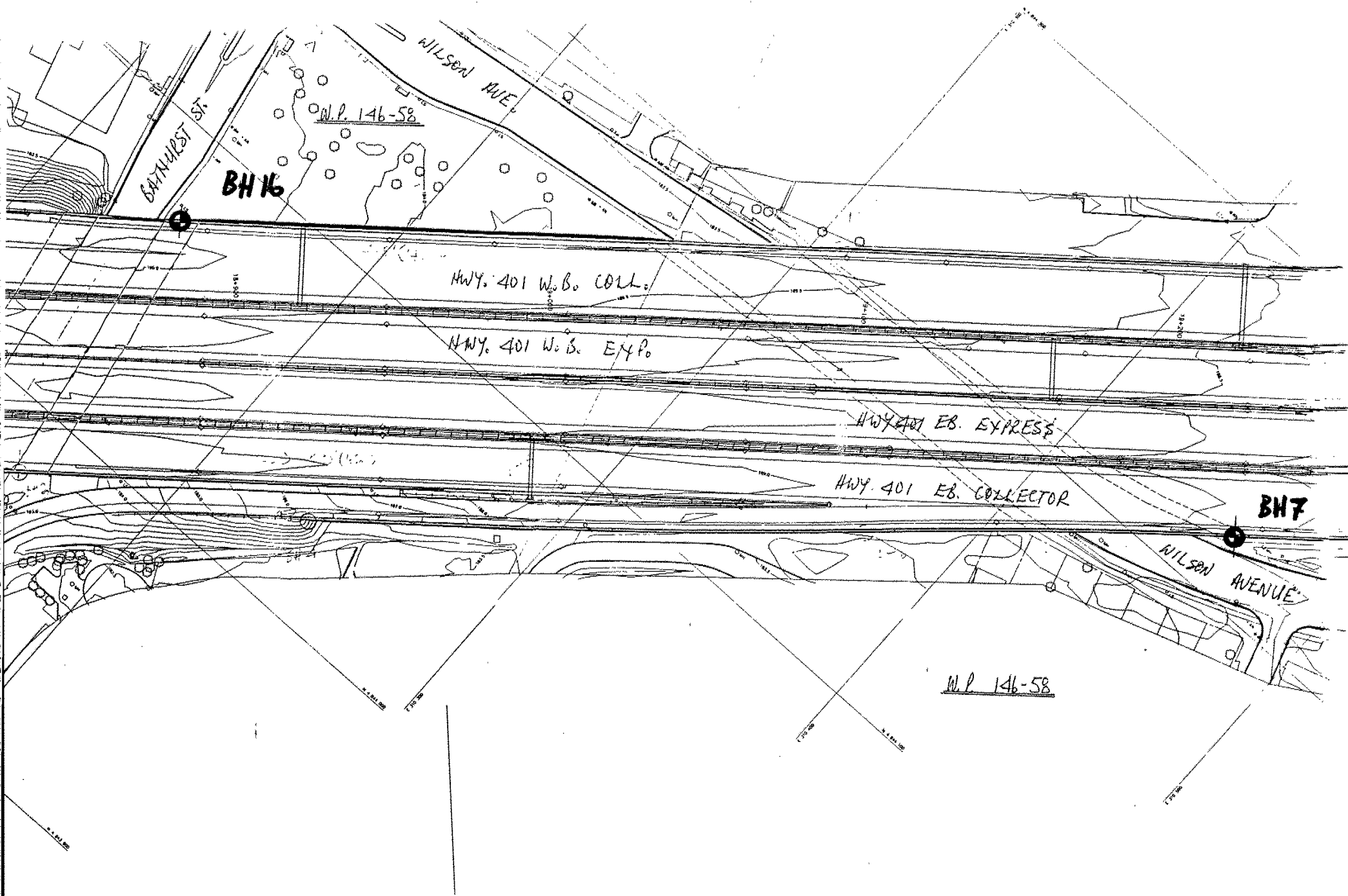
W.P. 146-58

BH. 16

WILSON

BH-1

W.P. 146-58



BATHURST ST.

BH16

W.P. 146-58

WILSON AVE.

HWY. 401 W.B. COLL.

HWY. 401 W.B. EXP.

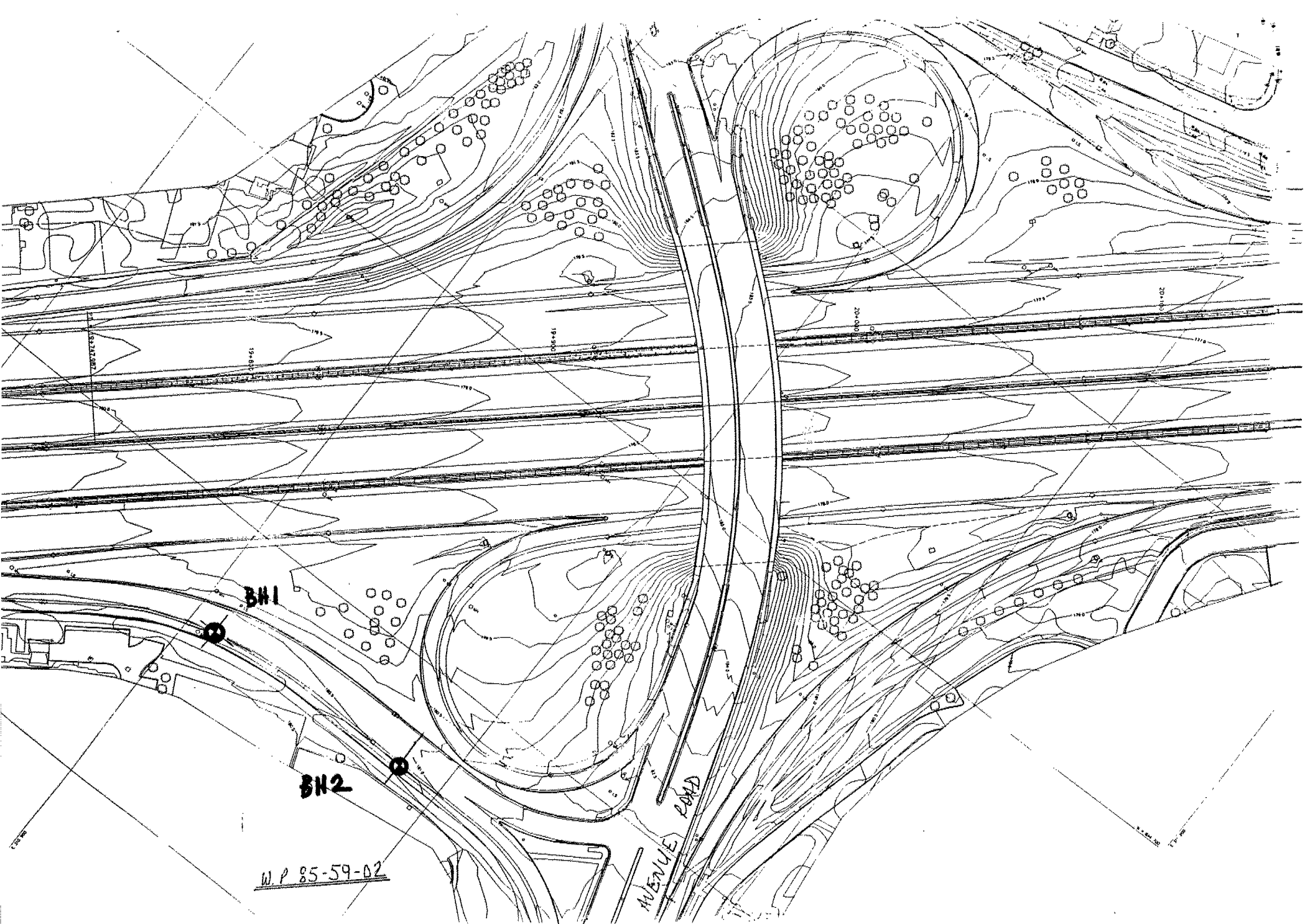
HWY. 401 EB. EXPRESS

HWY. 401 EB. COLLECTOR

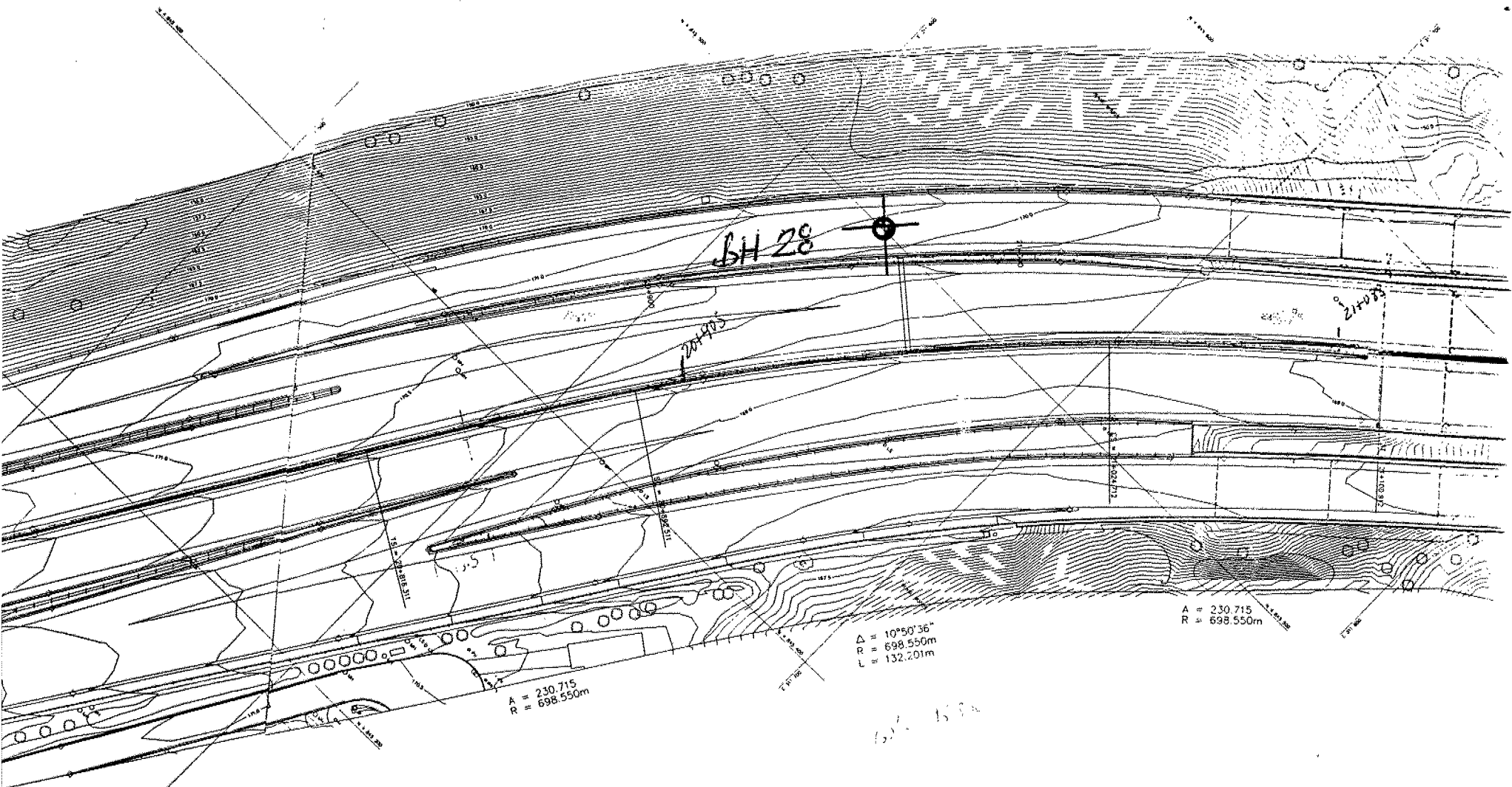
BH7

WILSON AVENUE

W.P. 146-58



W.P 85-59-02



LIST OF HIGH MAST POLES (between Allen Road & Avenue Road East Transfer)
Hwy 401 - Leslie to Dufferin (W.P. 320-94-01)

03-Nov-97

Pole No.	Station	Offset from 401 CL (m)	Length (m)	Luminaires	Remarks
				Qty	
P9	17+674	138 Rt	35	8	Mounted on Tall Wall Barrier
P10	17+690	0	35	8	
P11	17+800	54 Lt	35	8	
P11A	17+616	127.2 Lt	35	8	
P12	17+826	118 Rt	35	8	
P13	17+961	42 Rt	35	8	Mounted on Tall Wall Barrier
P14	17+974	55 Lt	35	8	
P15	18+128	29.6 Rt	35	8	
P15A	18+169	60.6 Lt	35	6	
P16	18+296	0	35	8	
P16A	18+341	51.5 Lt	35	6	Mounted on Tall Wall Barrier
P17	18+457	0	35	8	
P18	18+610	0	35	8	
P19	18+758	0	35	8	
P20	18+905	0	35	8	
P21	19+050	0	35	8	Mounted on Tall Wall Barrier
P22	19+205	0	35	8	
P23	19+360	0	35	8	
P24	19+515	0	35	8	
P25	19+669	0	35	8	
P26	19+808	0	35	8	Mounted on Tall Wall Barrier
P27	19+897	103 Rt	35	8	
P28	19+917	77 Lt	35	6	
P29	20+009	52 Rt	35	6	
P30	20+025	74 Lt	35	8	
P31	20+115	0	35	8	Mounted on Tall Wall Barrier
P32	20+267	0	35	8	
P33	20+418	0	35	8	
P34	20+577	0	35	8	
P35	20+736	0	35	8	
P36	20+905	0	35	8	Mounted on Tall Wall Barrier
P37	21+088	0	40	12	
Totals 32 Poles				252 Luminaires	
31				240	

METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

PLATE No
CONT No
WP No 320-94-01

KEY PLAN
ELECTRICAL
Survey _____ Revised _____
DELCAN

SHEET
i

