

62-F-297 M
ARVA - MEDWAY
BRIDGE
CONC. VI/VII
LOT 18
MIDDLESEX CTY.

ARVA-MEDWAY BRIDGE
TOWNSHIP OF LONDON

- BRIDGE SURVEY DATA -

1- SPECIAL FEATURES: Waterfalls, Dams, Exceptional Floods, Ice, Driftwood, Sliding Banks, etc.
ROLLING AGRICULTURAL LAND

2- (A) Upstream & Downstream Bridges Give location, length, height above N.T.W.L., Net Cross-Sectional Area at High Water & Estimated Age: UP-STREAM BRIDGE IS AT HIGHWAY N-4 AND IS BEING REPLACED BY D.B.O. IN NEAR FUTURE. DOWN-STREAM BRIDGE IS A 1900 TRUSS, 97' CLEAR SPAN, 14' MAX. WATER DEPTH.

(B) Reasons Why These Bridges Are, or Are Not Fair Indication of Size of Proposed Bridge: THEY ARE

3- Reasons for Changes in Height or Length from that of Old Bridge: THE ACTUAL WATERWAY OPENING HAS BEEN KEPT THE SAME

4- Is Ditch, Stream, or River Gradient liable to be Lowered? NO

5- Navigation Clearances Required, if any: N.A.

6- Railway Clearance Required, if any: N.A.

7- If Structure is Over or Under a Railway, has approval been obtained?

(A) From Railway Co:

(B) From Board of Transport Commissioners:

8- Has Approval been obtained under Navigable Waters Protection Act? N.A.

9- Is a Temporary Detour Required? YES

Who will build it?

CONTRACTOR

Who will maintain it?

CONTRACTOR

10- Information and Evidence of Extreme Flooding was obtained from TWR ROAD SUPERINTENDENT, and Reflects Highest Water Elevation in the Area of this construction to be EL. 184.00 and the lowest Water Elevation to be EL. 178.70

11- Road Design Information:

Estimated A.D.T.

Design Speed

Stopping Sight Distance:

- BRIDGE STRUCTURE DATA -

1- Net Span Length and Type of Bridge: 2 SPAN, SIMPLE, PRECAST-PRESTRESSED GIRDER BRIDGE.

2- Roadway Width on Bridge: 28' CURB TO CURB.

3- Number and Width of Sidewalks: NONE

4- Skew Angle: 0°

5- Total Length & Type of Piling: TUBE PILES APPROX. 1000'

6- Approx. Volume of Concrete: 280 cu yds

7- Approx. Weight of Stir Steel: 15 tons

8- Approx. Weight of Reinforcement: 15 tons

9- Approx. Volume of Approach Fill 100 ft. Side of Structure: 68.5 cu yds

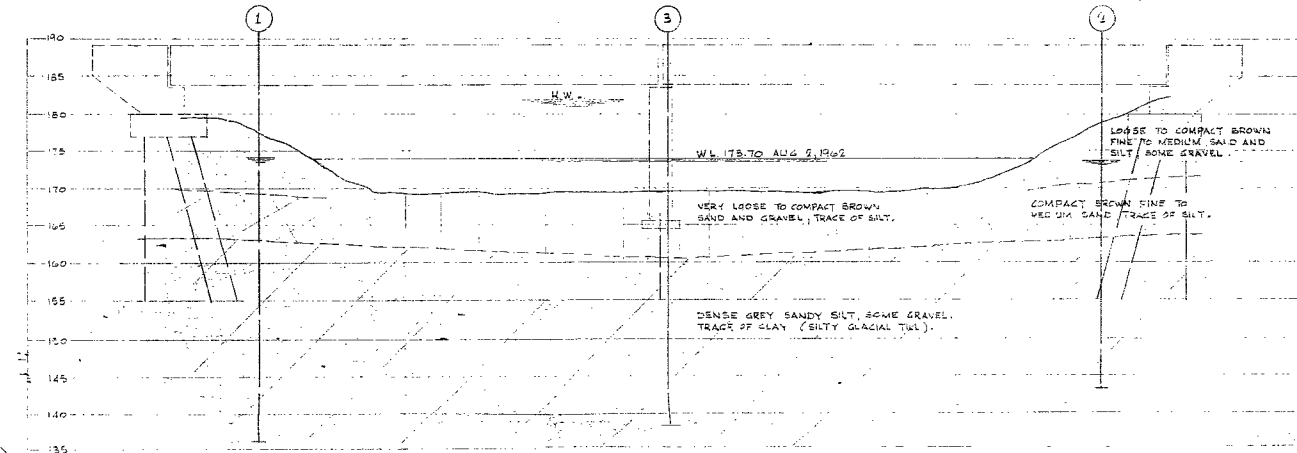
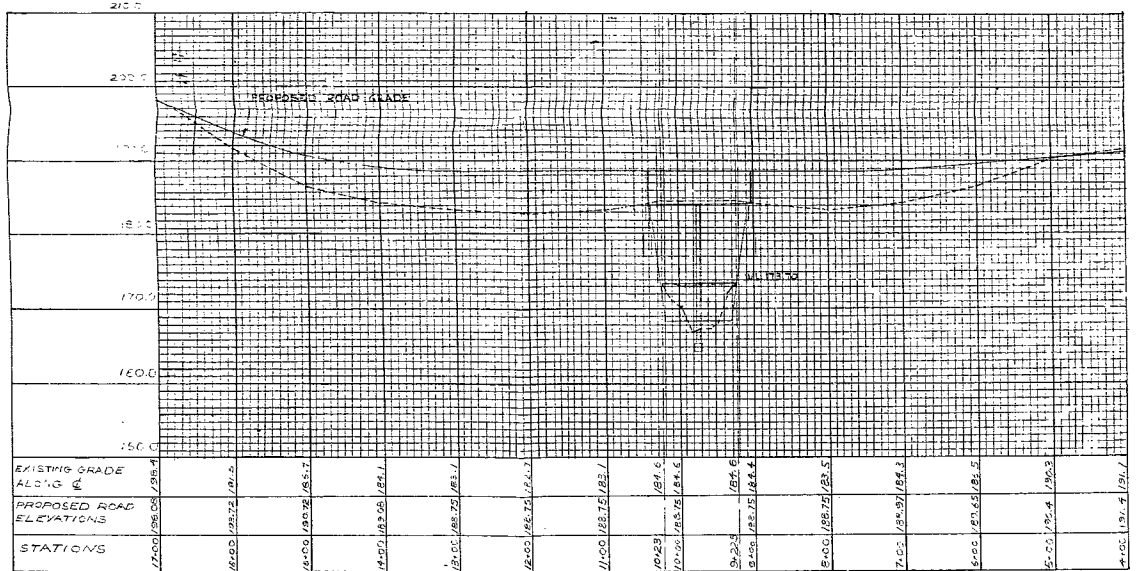
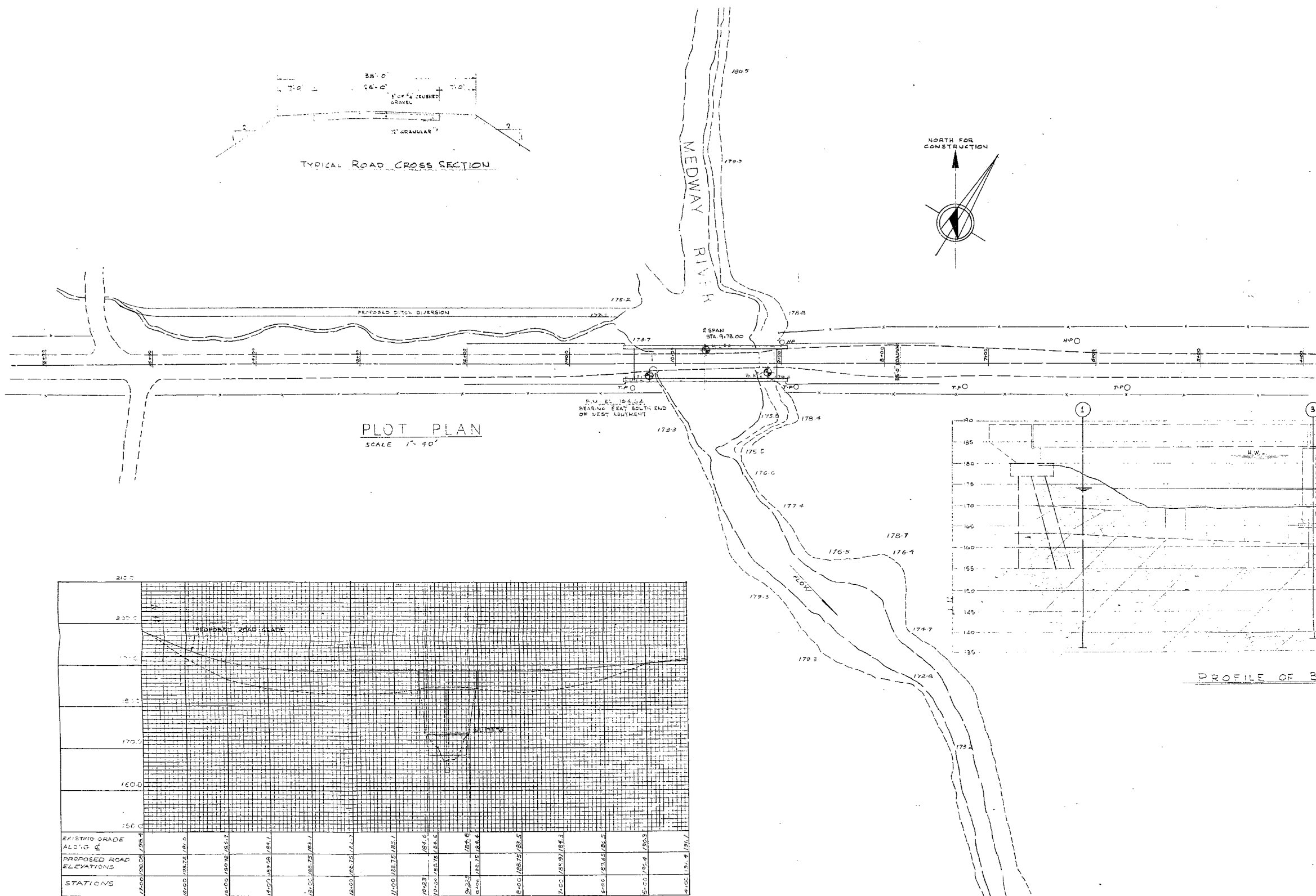
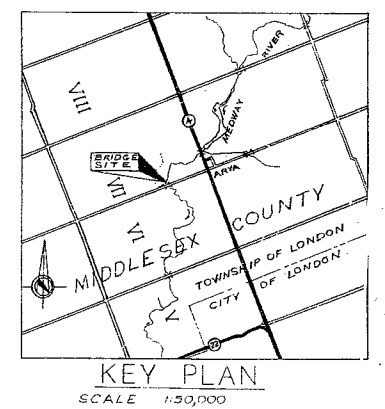
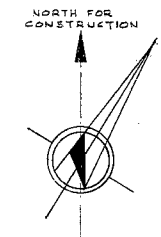
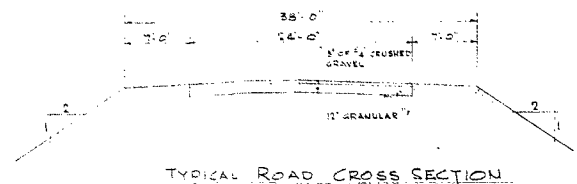
10- Drainage Area: 68.5 sq. mi.

Field Investigation Made: AUG. 1962

By:

Survey Engineer

TOTAL ESTIMATED COST \$65,000.00



NOTE: RESULTS INDICATED ARE TO BE USED AS A GUIDE ONLY. THE ACCURACY OF WHICH IS NOT GUARANTEED BY THE OWNER.

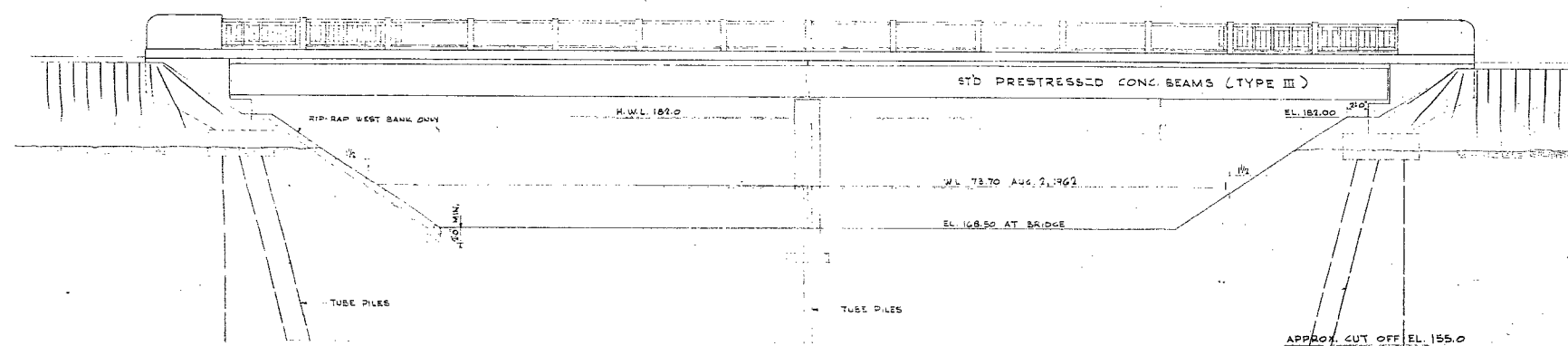
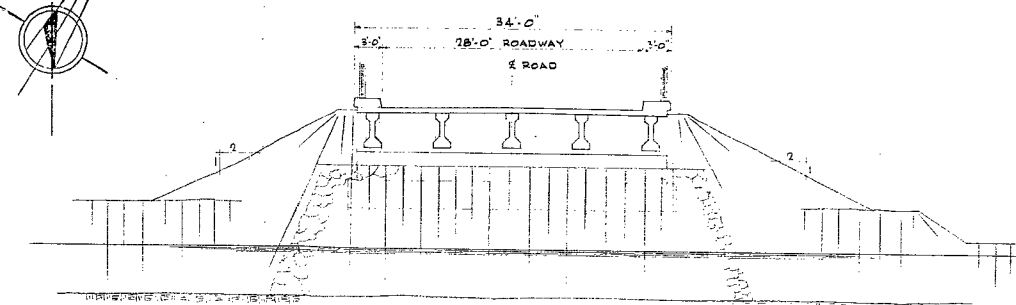
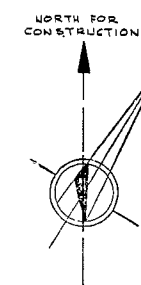
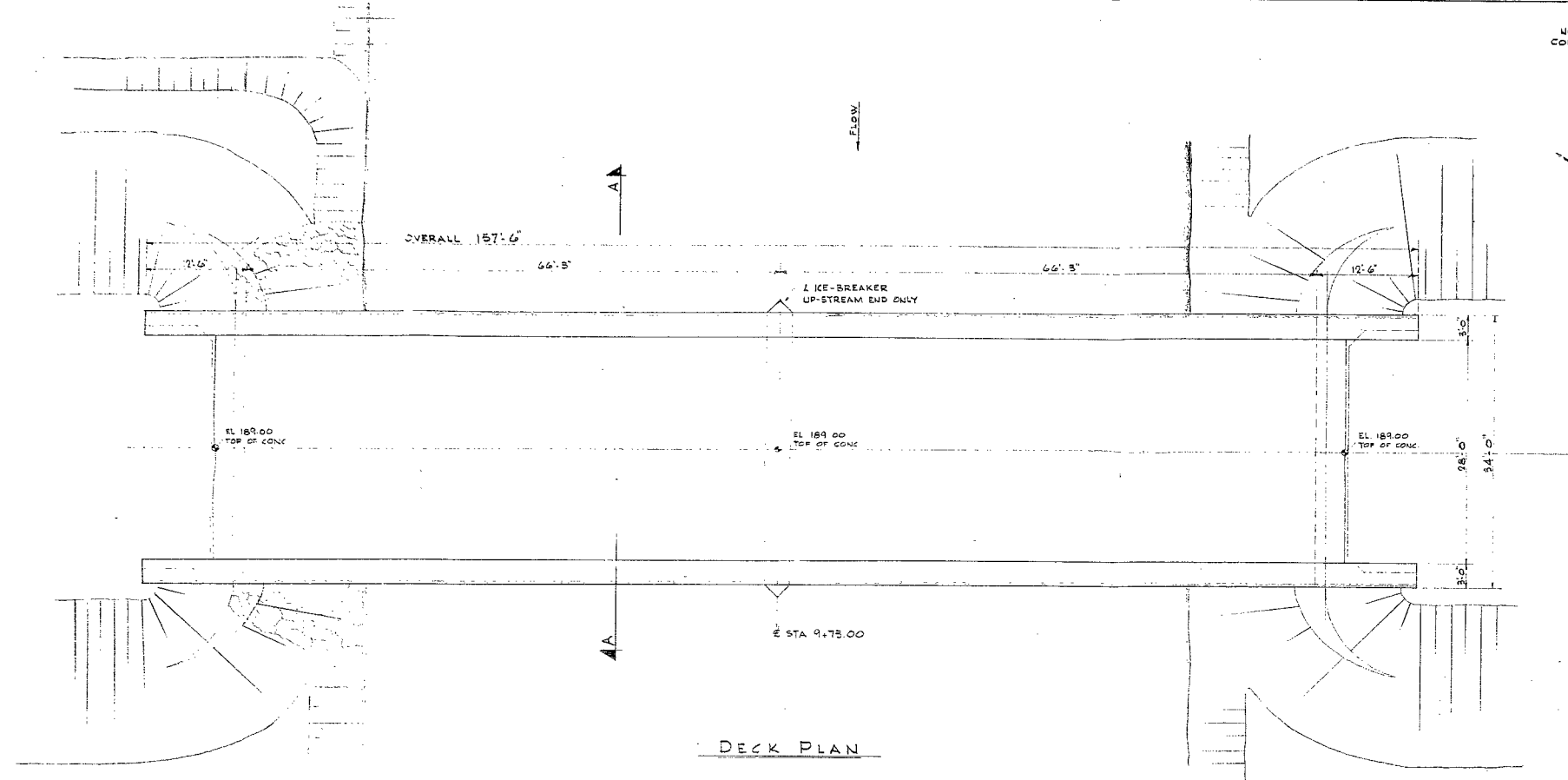
FOR FULL DETAILS SEE B.O. REPORT NO. 1010 BY H. B. GORDON & ASSOCIATES DATED SEPT. 1964

STRUCTURE SHEET 20-149
62-F-297 M

TOWNSHIP OF LONDON
R. C. DUNN & ASSOCIATES, LTD.
CONSULTING ENGINEERS
150 COMMISSEURS RD. LONDON ONTARIO
GE 3-4770

APPROVED FOR BRIDGE
LOCATED ON ROAD BETWEEN CONVI
G. C. 10. VII AT 101.18

DATE: OCT. 26, 1962
DRAWN BY: A.M.
CHECKED BY: C.W.S.
P-1



TOWNSHIP OF LONDON		DATE	
R. C. DUNN & ASSOCIATES, LTD.		JUN 26 / 93	
CONSULTING ENGINEERS		JOB NO.	
230 COMMISSEMOIRES RD.		60-115	
LONDON		ONTARIO	
ARVA-MEDWAY BRIDGE			
SCALE	DECK PLAN AND ELEVATIONS	DATE	
1/8" = 1'-0"		JUN 26 / 93	
DRAWN C. LOCKHART		JOB NO. 60-115	
CHECKED		DWG. NO. P.2	

MEMORANDUM

To: Mr. A. Stermac
Principal Foundation Engineer,
Materials & Research Section,
Room 226, Lab. Bldg.,

FROM: G.C.E. Burkhardt,

DATE: November 9, 1962

OUR FILE REF. BA1530

IN REPLY TO

SUBJECT: Township of London,
Arva-Medway Bridge,
Con. VI/VII, Lot 18,
County of Middlesex,
Structure Site #20-149,

62-15-297 14

Attached please find one copy of the Foundation Report by H.Q. Golder & Associates Ltd., and one copy of the Preliminary Plans for your comments.

We intend to approve the plans before November 20, 1962 and would appreciate it very much if we could have your comments within the next two weeks.

GCEB/dm

G.C.E. Burkhardt
G.C.E. Burkhardt,
for K.L. Kleinsteinber,
Municipal Bridge Liaison Engineer.

*By phone Nov. 13, 1962. - G.C.E. Burkhardt
Basically no comments. He would suggest
that battered piles be used for the pier.*

Nov 13, 1962,

A. Stermac

H. Q. GOLDER & ASSOCIATES LTD.

CONSULTING CIVIL ENGINEERS

H. Q. GOLDER
V. MILLIGAN
L. G. SODERMAN

2444 BLOOR STREET WEST
TORONTO 9, ONTARIO
767-9201
763-4103

REPORT
TO
R. C. DUNN & ASSOCIATES LIMITED
ON
SITE INVESTIGATION
PROPOSED ARVA MEDWAY BRIDGE
LONDON TOWNSHIP ONTARIO

ABSTRACT

The results of a site investigation for the proposed Arva-Medway Bridge on the Medway River near Arva, Ontario are reported. The site was found to be underlain by a succession of silts, sands and gravels followed by dense silty glacial till. Two alternatives for foundation design are presented. In one, the central pier and abutments of the proposed two span bridge would be founded on spread footings in the till. This would require sheeted excavations or predrainage by wellpoints for excavation in the granular materials overlying the till. Therefore, it may be economical to consider founding the structure on displacement piles driven into the till.

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Figures 2 - Results of Laboratory Tests to 5	

INTRODUCTION

H. Q. Golder & Associates Ltd., have been retained to carry out a site investigation at the proposed Arva-Medway Bridge on the Medway River near Arva in London Township, Ontario. The purpose of the investigation was to determine soil conditions at the site and to recommend a foundation design for the proposed structure. This report incorporates the results of the investigation, including detailed borehole logs, a boring plan and inferred stratigraphy, laboratory testing, and a discussion of the soils encountered and the indicated design for foundation.

PROCEDURE

A total of three borings were carried out at the site in the period August 21 to August 24, 1962. The borings were taken to depths of 35 to 42 feet using a standard skid-mounted machine drillrig. Standard drive samples were taken at 5 foot vertical intervals in each boring.

The elevations employed in this report are referenced to bench mark on the top of the southwest concrete abutment near the seat of the existing bridge. The elevation of this bench mark was given as 184.64; the datum to which this bench mark is referred is not known, but it is assumed to be local.

SITE DESCRIPTION AND GEOLOGY

The Medway River in this area meanders through a broad shallow valley which is considered to be on the abandoned channel

of a glacial meltwater stream. Typically these spillways are associated with glacial moraines, in this case the Lucan moraine, and their floors are covered with stratified silts sands and gravels underlain by glacial till.

SOIL CONDITIONS

As shown on Figure 1 the banks of the river are underlain by a succession of about 8 feet of loose to compact sand and silt followed by 6 to 7 feet of compact fine to medium sand. The existing river bed itself is underlain by about 9 feet of very loose to compact sand and gravel. The sand and gravel and the fine to medium sand are followed at about Elevation 160 by a dense silty glacial till. Typical grading curves for these various strata are shown on Figures 2 to 5 inclusive.

Groundwater levels were approximately equal to river level in all boreholes during the investigation.

DISCUSSION

It is understood that the tentative design for the proposed bridge calls for a two-span, simply supported structure, the deck to be carried on prestressed reinforced concrete beams. Two alternative possibilities are indicated for the design of the foundations of the abutments and central pier; the choice between alternatives depends mainly on their relative cost.

On the one hand, it would be possible to found spread

footings directly on the till at about Elevation 160. This would necessitate either sheeted excavations or predrainage by wellpoints in the overlying sands and gravels. The alternative to this would be to found the pier and abutments on short displacement piles driven into the till.

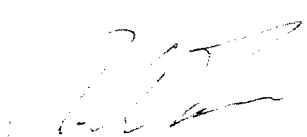
For spread footings founded in the till an allowable bearing capacity of 2 tons per square foot may be employed. This figure is based on the assumption that the till acts as a granular material with a standard penetration resistance of 40 blows per foot. In fact, some samples of the till exhibited slight plasticity with a plasticity index of about 5, but the above assumption is conservative and should limit possible settlement of the individual piers to less than one inch. A minimum soil cover of five feet should be maintained around the footings as scour protection.

Alternatively, it may be more economical, in view of the sheeting or dewatering required for constructing spread footings, to found the pier and abutments on tube piles driven to practical refusal in the till stratum. Assuming a 12 inch diameter pipe pile, a 40 ton allowable pile load may be taken for design.

The abutments should be backfilled with clean, free-draining granular material with the fill placed and compacted in lifts not exceeding 6 inches. If this is done, then water pressure against the abutment can be eliminated from consideration in design

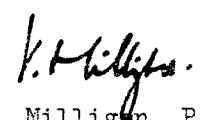
and lateral earth pressures on the abutment may be computed for the active case using an earth pressure coefficient, K_a , of 0.3.

AAG/jb
6240



A. A. Gass, P. Eng.

September, 1962



V. Milligan, P. Eng.

GOLDER & ASSOCIATES

LIST OF STANDARD ABBREVIATIONS

The standard abbreviations commonly employed on each "Record of Borehole", on the figures, and in the text of the report are as follows:

SAMPLE TYPES

A.S. - Auger Sample	R.C. - Rock Core
C.S. - Chunk Sample	S.T. - Slotted Tube
D.O. - Drive Open	T.O. - Thin-walled, Open
D.S. - Denison Type Sample	T.P. - Thin-walled, Piston
F.S. - Foil Sample	W.S. - Wash Sample

PENETRATION RESISTANCES

Dynamic Penetration Resistance - The energy required to drive a 2 inch diameter, 60 degree cone attached to the end of the drilling rods into the ground: expressed in blows per foot, where each blow represents 4,200 inch-pounds of energy.

Standard Penetration Resistance, N - The number of blows by a 140 pound hammer dropped 30 inches required to drive a 2 inch drive open sampler one foot into the ground.

Sampler advanced by static weight	- weight, hammer - Wh
Sampler advanced by pressure	- pressure, hydraulic - Ph
Sampler advanced by pressure	- pressure, manual - Pm

SOIL DESCRIPTION

The standard terminology for the descriptions of the relative density of cohesionless soils and the consistency of cohesive soils is as follows:

<u>Relative Density</u>	<u>N, Blows/ft.</u>	<u>Consistency</u>	<u>c, lb/sq. ft.</u>
Very Loose	0 to 4	Very Soft	Less than 250
Loose	4 to 10	Soft	250 to 500
Compact	10 to 30	Firm	500 to 1,000
Dense	30 to 50	Stiff	1,000 to 2,000
Very Dense	over 50	Very Stiff	2,000 to 4,000
		Hard	over 4,000

SOIL TESTS

C - Consolidation Test	Q - Undrained Triaxial
H - Hydrometer Analysis	Qc - Consolidated Undrained Triaxial
M - Sieve Analysis	S - Drained Triaxial
MH - Combined Analysis, Sieve and Hydrometer	U - Unconfined Compression
	V - Field Vane Test

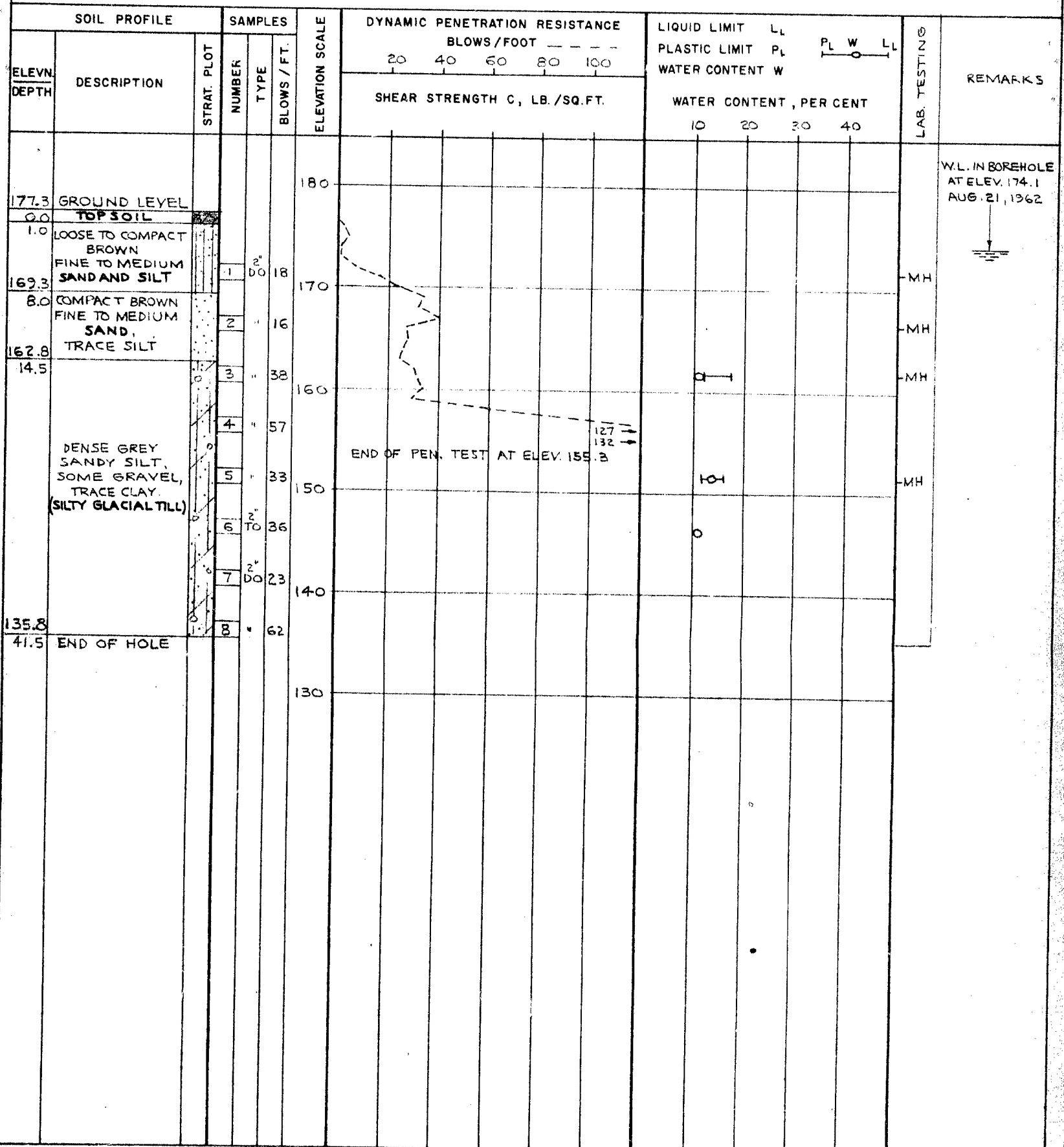
Note: Undrained triaxial tests in which pore pressures are measured are shown as Q' or Q'c.

SOIL PROPERTIES

γ - Total Unit Weight	K - Coefficient of Permeability
γ_d - Dry Unit Weight	c - Undrained Shear Strength
γ_b - Submerged Unit Weight	($\frac{1}{2}$ Compressive Strength)
L _L - Liquid Limit	St - Sensitivity
P _L - Plastic Limit	Q' - Effective Angle of Shearing Resistance
W - Natural Water Content	c' - Effective Cohesion Intercept
G - Specific Gravity	Cc - Compression Index
e - Void Ratio	Cv - Coefficient of Consolidation

RECORD OF BOREHOLE 1

LOCATION SEE FIGURE 1 BORING DATE AUG. 21, 1962 DATUM LOCAL
 BOREHOLE TYPE WASH BORING BOREHOLE DIAMETER 8X CASING
 SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT 140 LB. DROP 30 INCHES



VERTICAL SCALE
1 INCH TO 10' - 0"

GOLDER & ASSOCIATES

DRAWN M.W.
CHECKED *AK*

RECORD OF BOREHOLE 2

LOCATION SEE FIGURE 1

BORING DATE AUG. 22, 1962

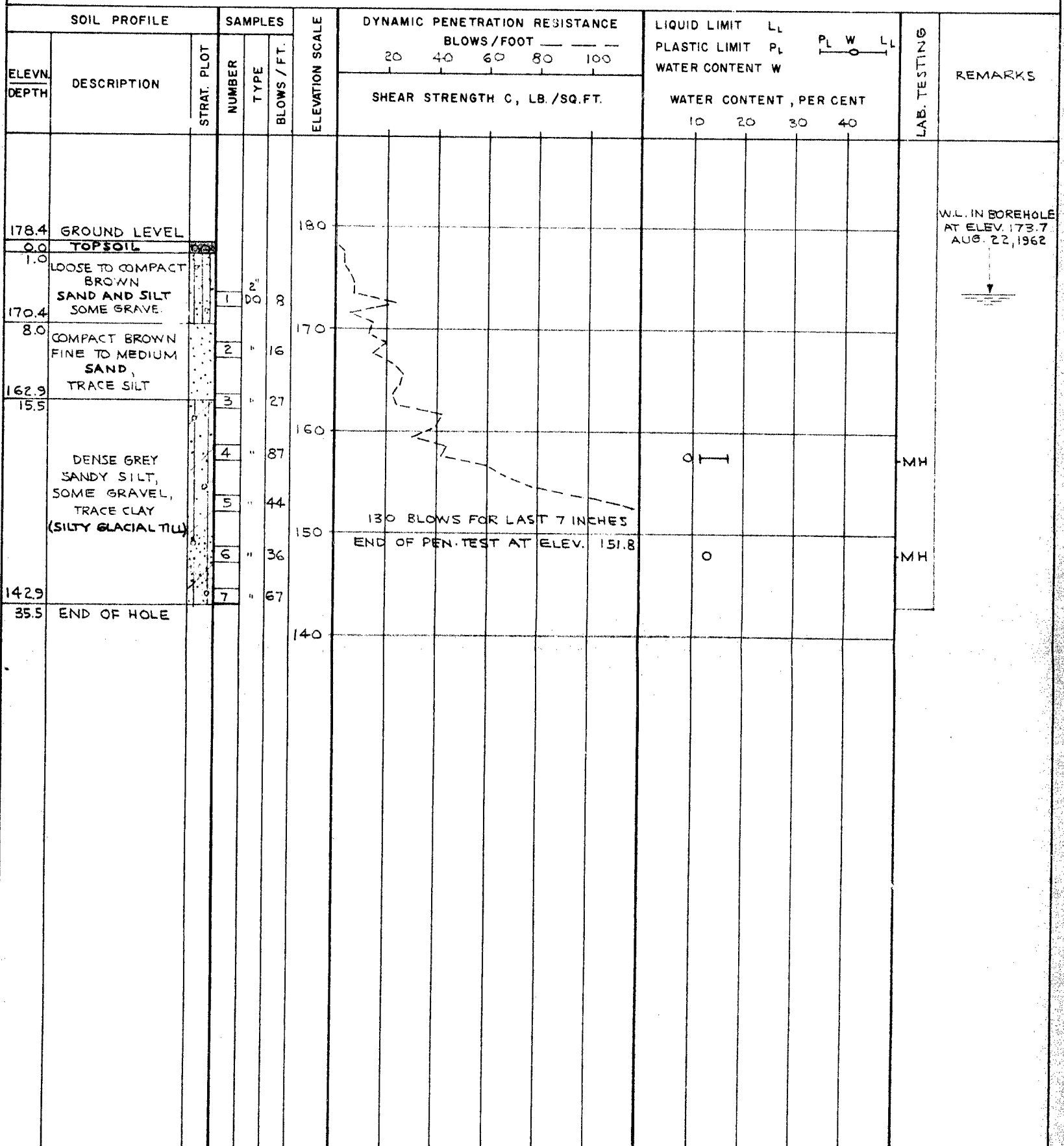
DATUM LOCAL

BOREHOLE TYPE WASH BORING

BOREHOLE DIAMETER 8X CASING

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES

PEN. TEST HAMMER WEIGHT 140 LB. DROP 30 INCHES

VERTICAL SCALE
1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.
CHECKED *MC*

RECORD OF BOREHOLE 3

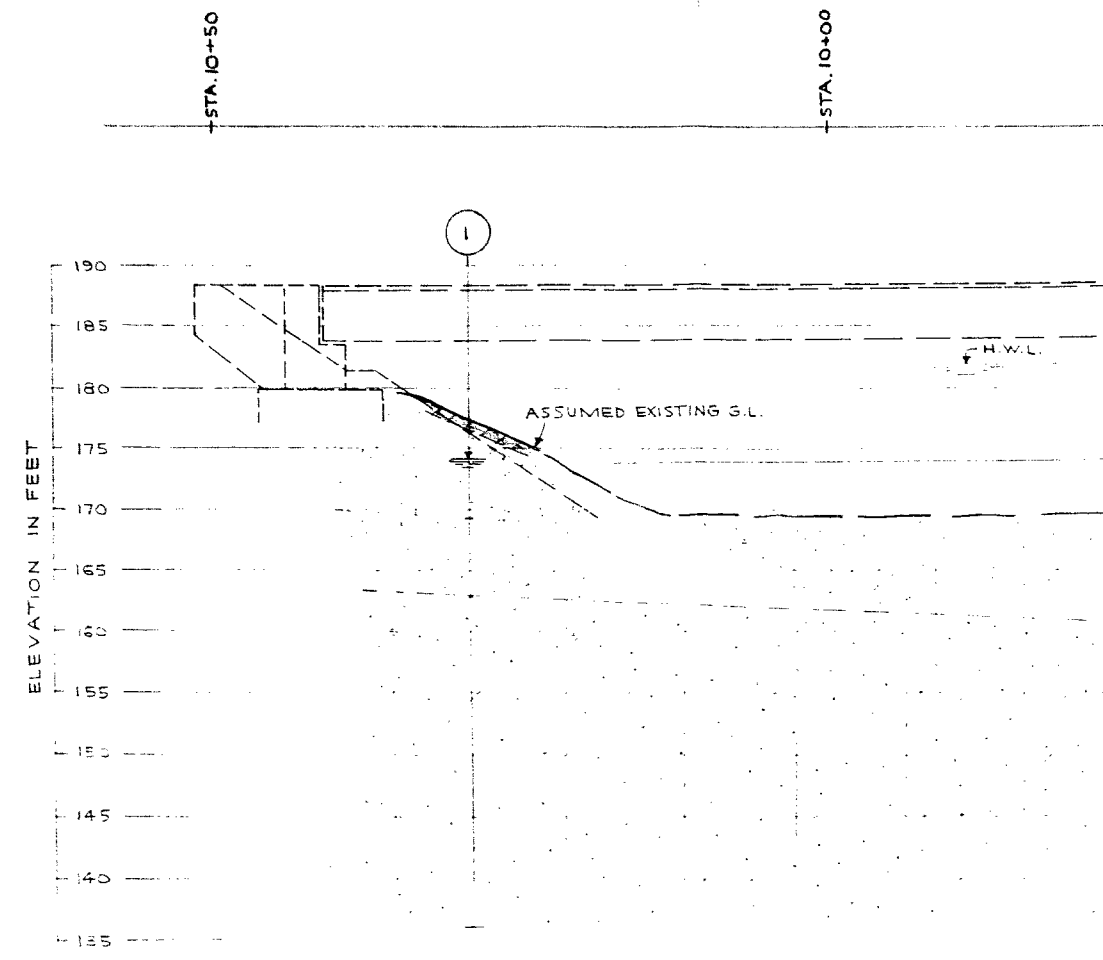
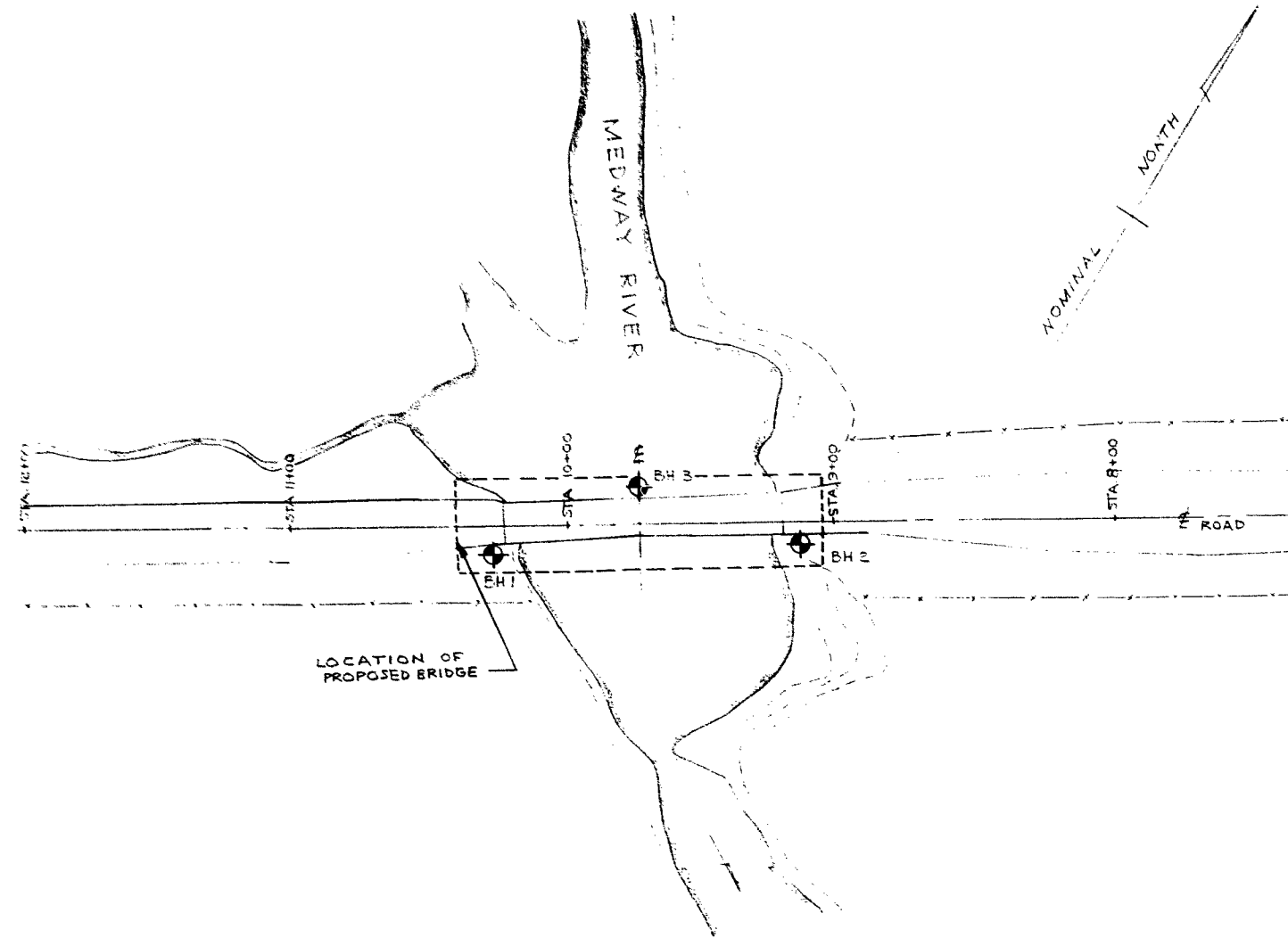
LOCATION SEE FIGURE 1 BORING DATE AUG. 23-24, 1962 DATUM LOCAL
 BOREHOLE TYPE WASH BORING BOREHOLE DIAMETER 8X CASING
 SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT 140 LB. DROP 30 INCHES

SOIL PROFILE			SAMPLES		ELEVATION SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT L _L PLASTIC LIMIT P _L WATER CONTENT W				LAB. TESTING	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE		BLOWS / FOOT					WATER CONTENT, PER CENT					
						20	40	60	80	100	10	20	30	40		
						SHEAR STRENGTH C, LB. / SQ. FT.										
174.1	RIVER LEVEL															
0.0	WATER															
169.6	RIVER BOTTOM															
4.5	VERY LOOSE TO COMPACT BROWN SAND AND GRAVEL TRACE SILT.		1	2"	2	170										
			2	"	40											
160.6	DENSE GREY SANDY SILT, SOME GRAVEL TRACE CLAY (SILTY GLACIAL TILL)		3	"	40	160									MH	
13.5			4	"	39										MH	
			5	"	34	150										
			6	"	74											
			7	"	71	140										
138.1	END OF HOLE															
36.0																
						130										

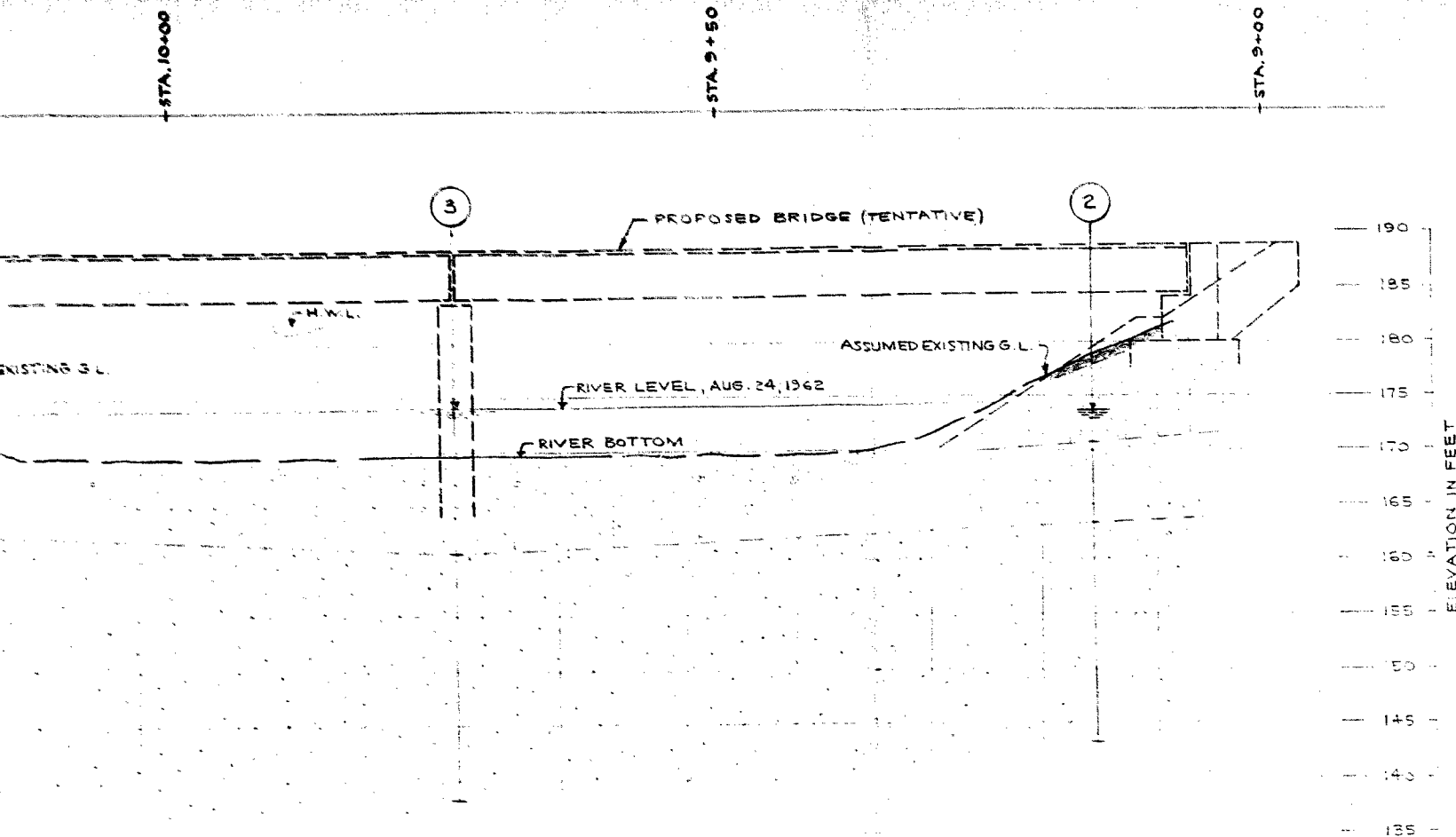
VERTICAL SCALE
 1 INCH TO 10' - 0"

GOLDER & ASSOCIATES

DRAWN M.W.
 CHECKED *[Signature]*



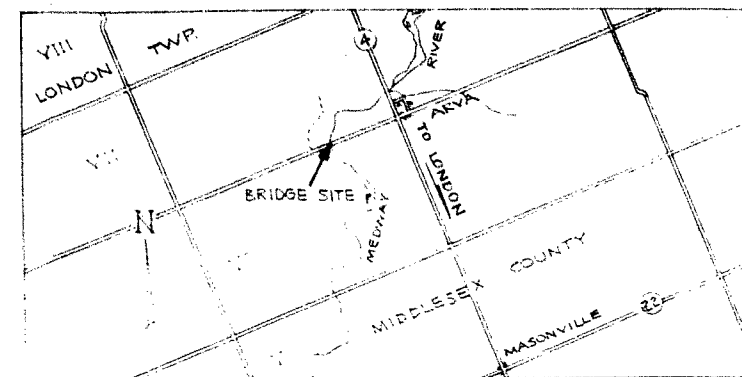
SECTION ALONG



SECTION ALONG CENTRELINE PROPOSED BRIDGE
SCALE 1" TO 10'-0"



SPECIAL NOTE: DATA CONCERNING THE VARIOUS STRATA HAVE BEEN OBTAINED AT BOREHOLE LOCATIONS ONLY. THE SOIL STRATIGRAPHY BETWEEN BOREHOLES HAS BEEN INFERRED FROM GEOLOGICAL EVIDENCE AND SO MAY VARY FROM THAT SHOWN.


REFERENCE	
DRWG. No.	DESCRIPTION
G2-115	R.C. DUNN AND ASSOCIATES, LTD. DRAWING OF ARVA-MEDWAY BRIDGE, SITE PLAN, DATED: AUG. 10, 1962
-	R.C. DUNN AND ASSOCIATES, LTD. DRAWING OF ARVA-MEDWAY BRIDGE, SKETCH OF TENTATIVE STRUCTURE, DATED: AUG. 10, 1962







KEY PLAN
SCALE 1" TO 50,000"

LEGEND

BOREHOLE WITH PENETRATION TEST  IN PLAN,  IN SECTION.

 WATER LEVEL IN BOREHOLE, AUG. 1962



STRATIGRAPHY

-  LOOSE TO COMPACT BROWN FINE TO MEDIUM SAND AND SILT, SOME GRAVEL.
-  COMPACT BROWN FINE TO MEDIUM SAND, TRACE SILT.
-  VERY LOOSE TO COMPACT BROWN SAND AND GRAVEL, TRACE SILT.
-  DENSE GREY SANDY SILT, SOME GRAVEL, TRACE CLAY (SILTY GLACIAL TILL)

R.C. DUNN & ASSOCIATES, LTD.
LONDON ONTARIO
PROPOSED ARVA-MEDWAY BRIDGE
NEAR ARVA ONTARIO
BORING PLAN AND SOIL STRATIGRAPHY

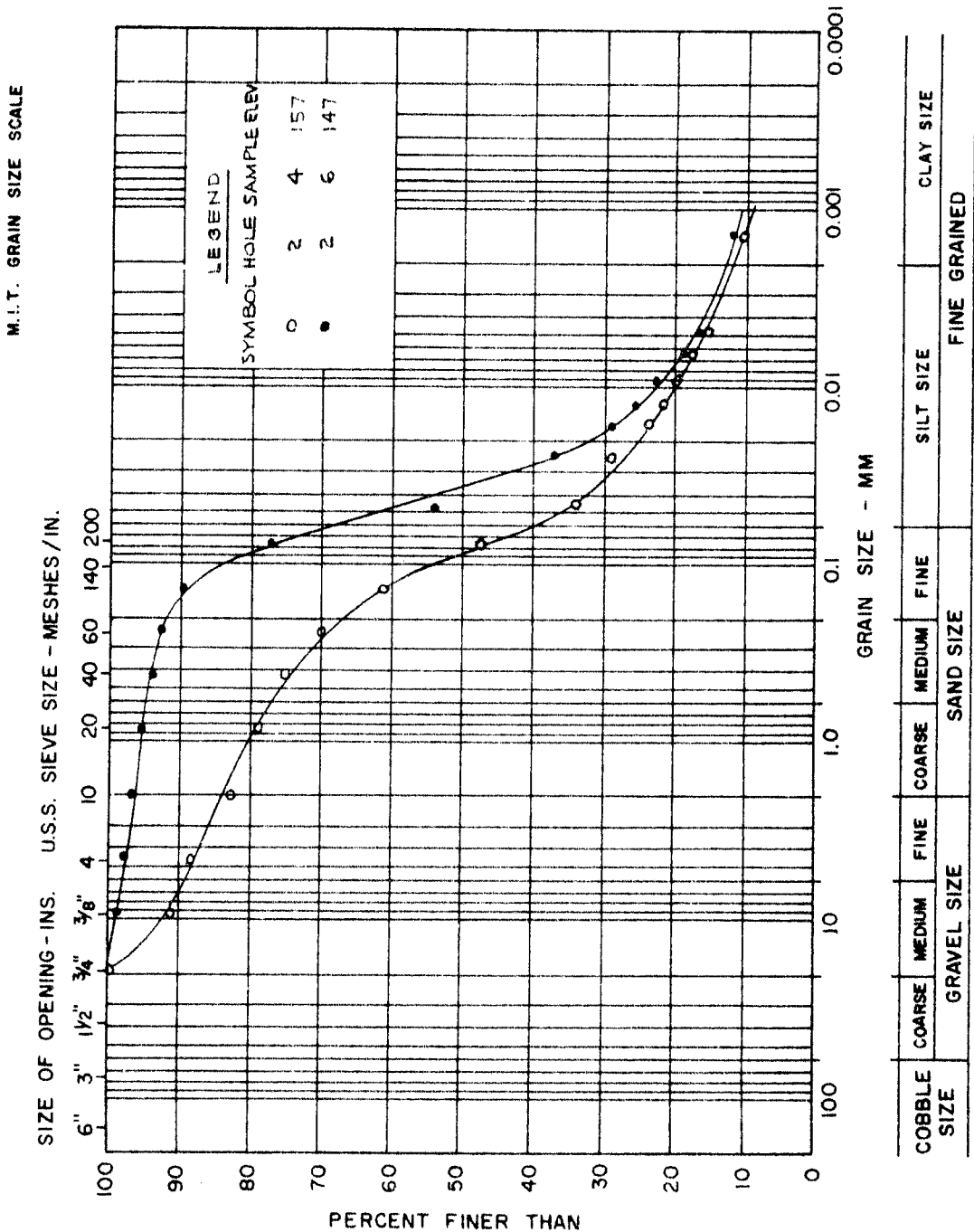
GOLDER & ASSOCIATES
CONSULTING CIVIL ENGINEERS

DATE SEPT. 5, 1962 SCALE AS SHOWN

MADE M.W.	CHKD. 	APPD. 	FIGURE 1
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GRAIN SIZE DISTRIBUTION

FIGURE 3

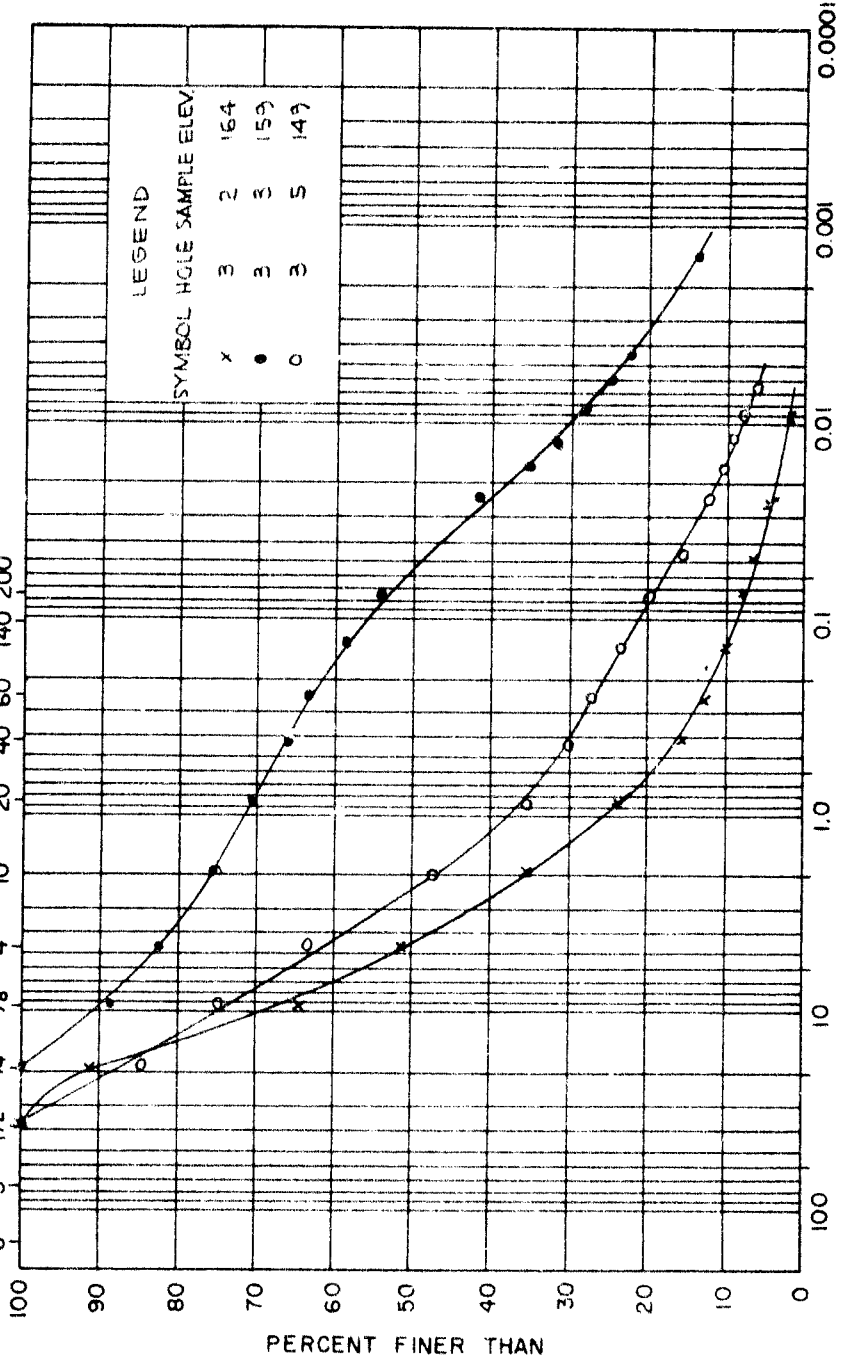


GRAIN SIZE DISTRIBUTION

FIGURE 4

M.I.T. GRAIN SIZE SCALE

SIZE OF OPENING - INS. U.S.S. SIEVE SIZE - MESHES / IN.



GRAIN SIZE - MM

COBBLE SIZE	COARSE	MEDIUM	FINE	SAND SIZE		SILT SIZE		CLAY SIZE	
	GRAVEL SIZE			COARSE	MEDIUM	FINE	FINE GRAINED	FINE GRAINED	FINE GRAINED

GOLDER & ASSOCIATES

GRAIN SIZE DISTRIBUTION

FIGURE 5

