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GRAND RIVER BRIDGE # 2

COUNTY ROAD # 21

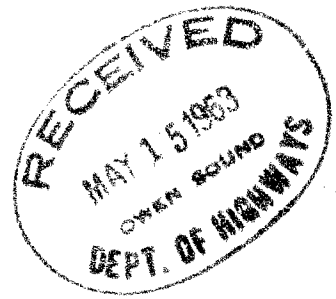
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63-5-222 M

REPORT



on

FOUNDATION INVESTIGATION

for

GRAND RIVER BRIDGE N° 2

COUNTY ROAD N° 21

TOWNSHIP OF EAST LUTHER

COUNTY OF DUFFERIN

ONTARIO

Report N° T.522/63

May, 1963.

REPORT

on

FOUNDATION INVESTIGATION

for

GRAND RIVER BRIDGE N° 2COUNTY ROAD N° 21TOWNSHIP OF EAST LUTHERCOUNTY OF DUFFERINONTARIOINTRODUCTION

The County Engineer of Dufferin, Mr. D.J. Corbett, is planning the realignment of County Road N° 21 and the construction of a new bridge across the Grand River in the Township of East Luther, and requested Universal GEOTECHNIQUE Limited to carry out an investigation of the proposed site, and accordingly this Report contains the results of the subsurface exploration together with information relative to foundation design.

AVAILABLE INFORMATION

The Consulting Engineers for the project, McCormick & Rankin Limited of Port Credit, Ontario, indicated on their drawing N° P2 the proposed location of exploratory boreholes in relation to the new bridge and the existing deteriorated bridge which at present carries the County Road over the Grand River at a point a short distance south of the new crossing. Drawing N° 2 accompanying this Report has been reproduced from the Consulting Engineers' plans and shows the actual positions at which subsurface exploration was carried out on the site.

The existing bridge, which will subsequently be removed, is a single span structure measuring approximately 100' between the abutments and comprises a concrete deck supported on 2 steel trusses forming a through bridge design as shown in the accompanying photograph.

The proposed new bridge is a deck girder structure having 3 spans of approximately 55'.

THE SITE

The site of the new bridge is situated nearly 6 miles north of Highway 9 on County Road N° 21 and is on lot 31, concession 7 in the Township of East Luther. The site of the new bridge is only 100 to 200 feet north of the existing deteriorated structure that at present carries the County Road over the Grand River and is less than half a mile north of the recently constructed bridge carrying the County Road over the Grand River on lots 30 - 31, concession 6, in the Township of East Luther and which was the subject of a foundation investigation covered in Report N° T.506/62 issued by Geotechnique in June, 1962.

SUBSURFACE EXPLORATION

The originally contemplated programme of subsurface exploration comprised 4 exploratory boreholes, one borehole being located on the line of each abutment and the two river piers. However, detailed examination of the site in April showed that the depth of water in the river due to Spring run-off would at that time necessitate the use of floating craft for carrying out drillholes in the river whereas economy could be achieved if the exploration by diamond core drilling in the river was delayed until the water level fell sufficiently to obviate the necessity for floating craft. The site examination did however reveal that rock outcrops existed on the western bank of the river at the bridge site and on both banks a short distance downstream, and that in addition the riverbed at the bridge site was entirely devoid of overburden and consisted of bedrock.

In view of the foregoing conditions and the detailed study of rock cores previously obtained from what was anticipated to be the same formation at a site less than half a mile downstream, it was decided to carry out borehole BH.4 on the eastern bank to determine the depth of overburden and obtain core samples of the bedrock for correlation purposes and thereafter carry out a subsurface exploration by geophysical means as the site conditions appeared particularly suitable for this method of exploration. Accordingly the exploration was carried out by the electrical resistivity method and the subsequent results proved entirely satisfactory as anticipated.

The location of the borehole BH.4 and the positions of the resistivity soundings were staked and the ground surface and bedrock elevations obtained by the Staff of Geotechnique, all such elevations being related to the benchmark shown on the Consulting Engineers drawing and given as elevation 117.51. At the time the geophysical survey was carried out the river level was at 102.74.

Rock core drilling was carried out in borehole BH.4 and visual examination and classification of all the rock cores was carried out in the laboratory. The descriptions of the strata obtained from the foregoing examination together with the results of core recovery are given on the borehole log included with this Report.

The results of the geophysical survey using electrical resistivity methods are shown on drawings Nos. 3 to 6 inclusive.

Subsurface conditions given in this Report are those indicated by material encountered in the borehole as determined by rock core drilling, together with examination of rock outcrops and interpretation of the results from the geophysical survey. The accuracy of interpolation and to a greater degree extrapolation to obtain the rock profile should be associated directly with the geological conditions and inversely with the spacing of positions at which exploration was carried out.

GEOLOGICAL FEATURES

The site of the proposed bridge is situated within a region known as the Dundalk Till Plain. This region forms the water shed from which issues the head water of the Grand River and at the site of the bridge the river flows in a shallow glacial spillway with bedrock outcropping in the riverbed and along the river banks. On either side of the river the bedrock is covered by a thin mantle of glacial material comprising essentially sand with boulders with organic river alluvium in lowlying areas just above the water line.

From the information obtained from the subsurface exploration it may be concluded that the strata down to the explored depths can be classified as follows:

OVERBURDEN

Only a very limited thickness of overburden exists at the site of the proposed bridge on the lines of the abutments. Its greatest thickness is approximately 2 feet on the line of the north abutment, whilst overburden is entirely absent at the location of the 2 river piers and only a thin veneer covers the bedrock on the line of the south abutment.

## BEDROCK

The bedrock obtained by diamond core drilling in borehole BH.4 and observed outcropping in the riverbed and near the south abutment is representative of the Guelph Formation. The rock encountered at the site is a generally cream coloured dolomite in even beds of about 3" thick. The rock is described as sound with only minor small solution cavities in parts.

## DISCUSSION

The results of the subsurface exploration disclosed that beneath a very thin mantle of overburden on the river banks and outcropping in the bed of the river there exists bedrock consisting of the dolomite of the Guelph Formation. This bedrock in the vicinity of the site can be classified as sound with only minor solution cavities and will thus provide an excellent foundation for the proposed new bridge.

From visual observation at the site no particularly noticeable erosion of the bedrock to any depth has occurred in recent times and consequently no appreciable deepening of the riverbed due to this factor need be anticipated in the foreseeable future.

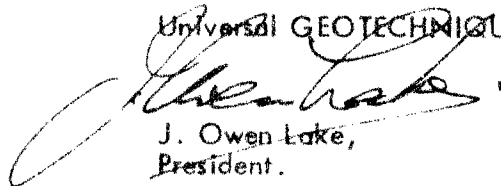
Normal spread footings may therefore be adopted as foundations for the abutments and the river piers, the underside of such footings at a minimum depth of 2' below the adjacent rock surface.

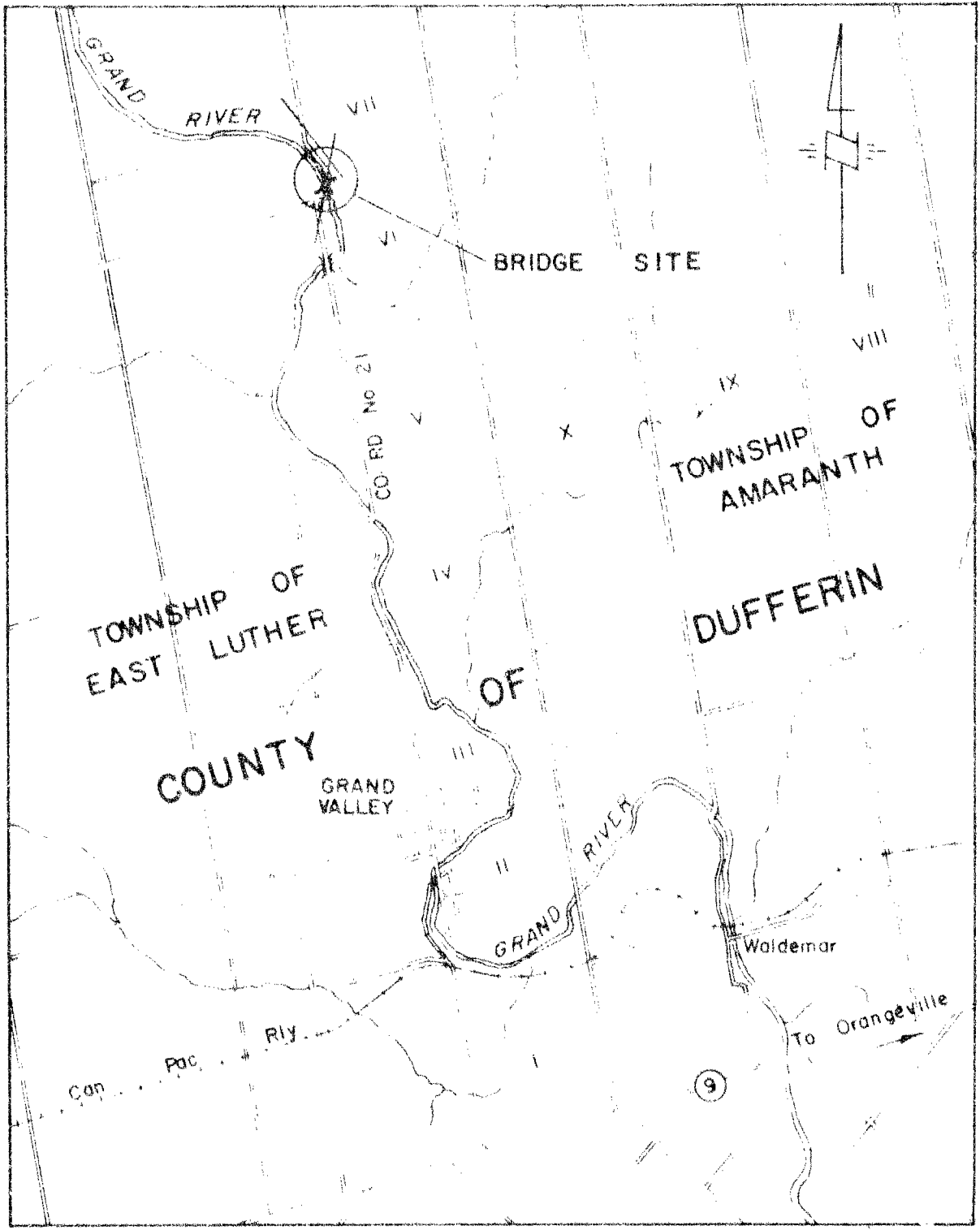
## CONCLUSIONS

The results of the subsurface exploration and subsequent study indicate the following conclusions with respect to foundation design:

1. Bedrock is exposed in the river and is covered by only a thin veneer of overburden on the line of the proposed abutments to the new bridge. This bedrock consists of dolomite of the Guelph Formation and it exists in a sound condition.
2. Normal spread footings can be adopted for the foundations to the river piers and the abutments and with the underside of such footings located at a minimum depth of 2' below the adjacent rock surface, the allowable bearing capacity can be taken as 15 tons/sq. ft.

Universal GEOTECHNIQUE Limited,

  
J. Owen Lake,  
President.

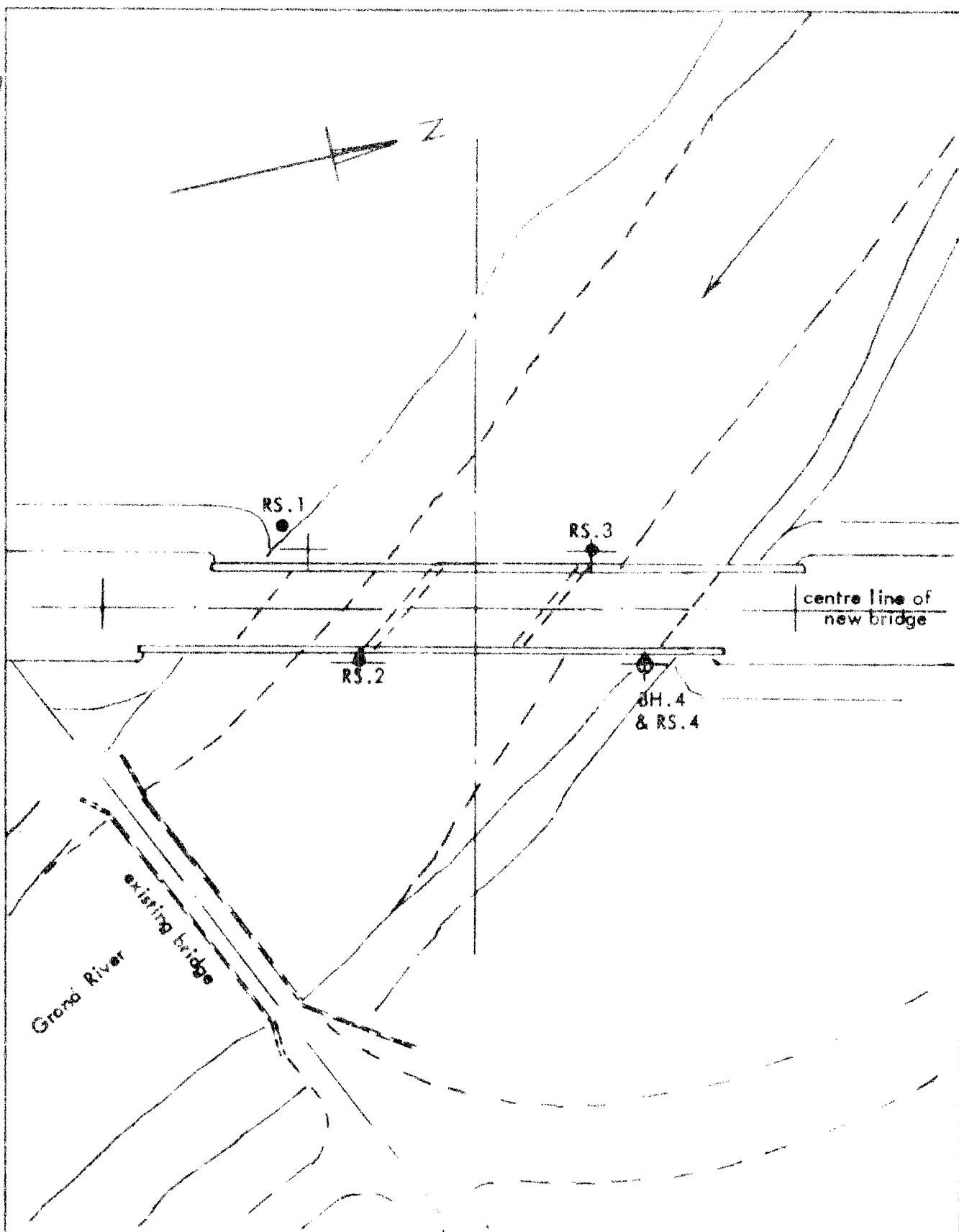


SCALE — 1/25 Inches = 1 Mile

PROJECT	Grand River Bridge NO. 2
TITLE	Site Plan
DRG NO.	1
ORDER NO.	T.522/63



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Scale: 1" = 50'

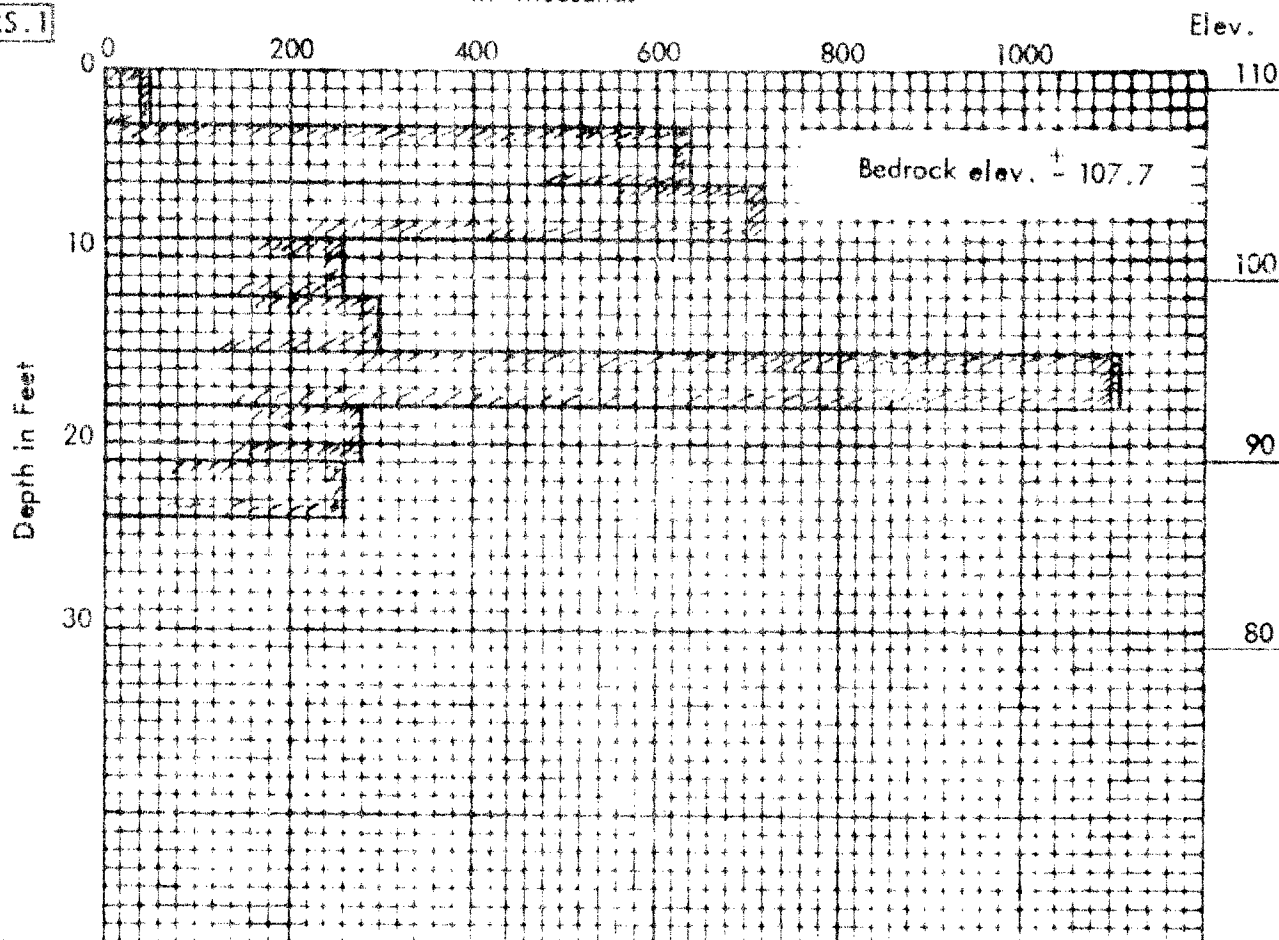
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 TITLE Borehole & Geophysical Tests Location Plan  
 DRG. NO. 2 ORDER NO. T.522/63



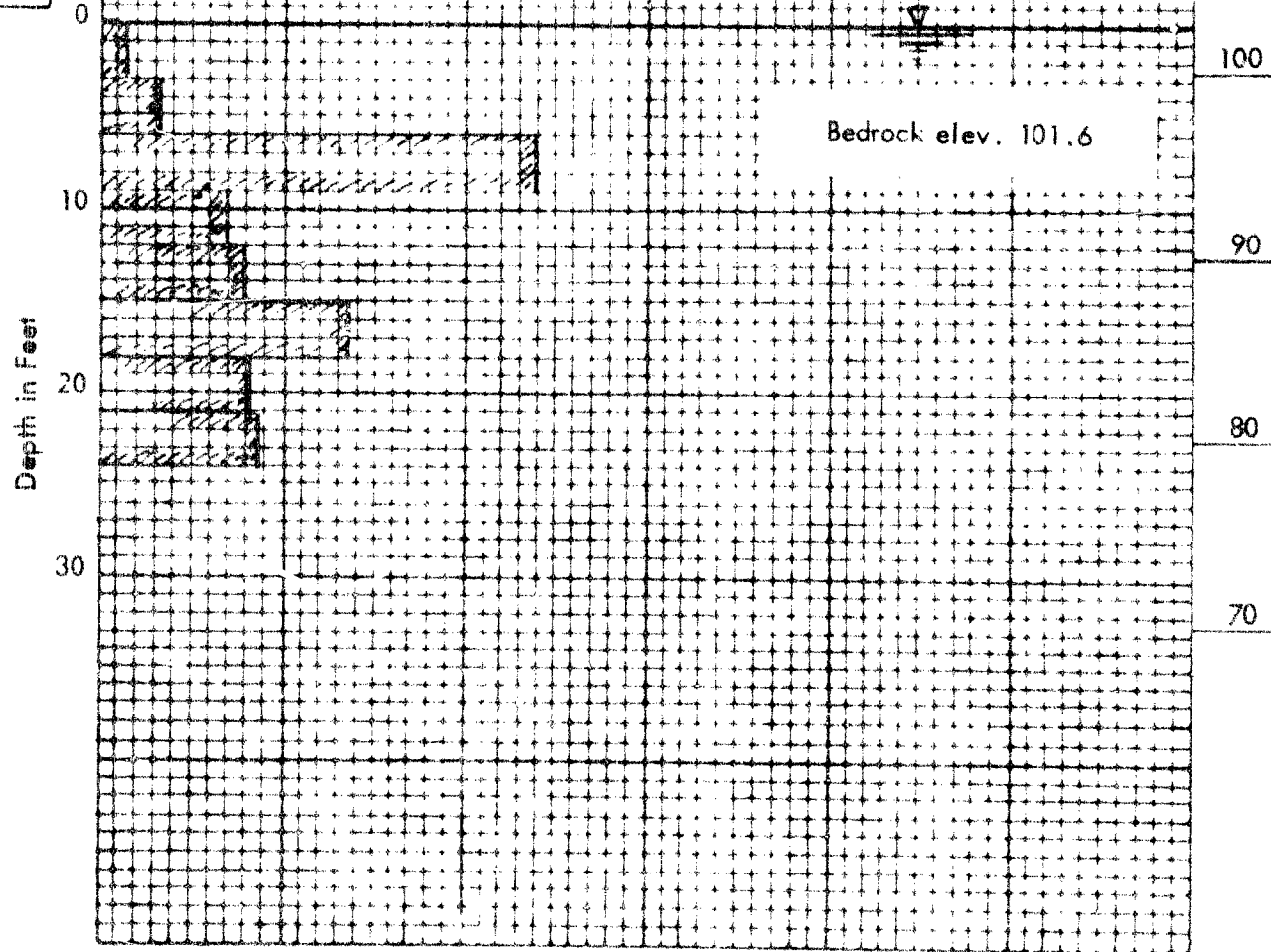
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RESISTIVITY Ohm - cms.  
in thousands

RS. 1



RS. 2



PROJECT Grand River Bridge N° 2

TITLE Electrical Resistivity Soundings RS. 1 & 2

DWG. NO. 3 ORDER NO. T.522/63



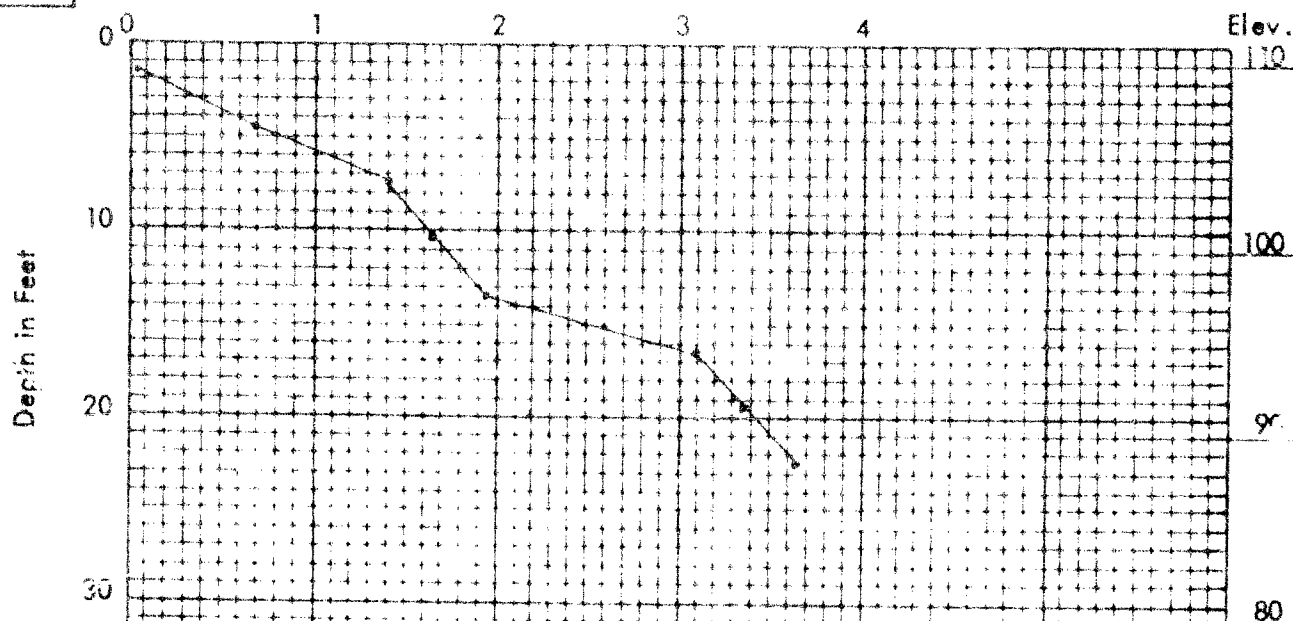
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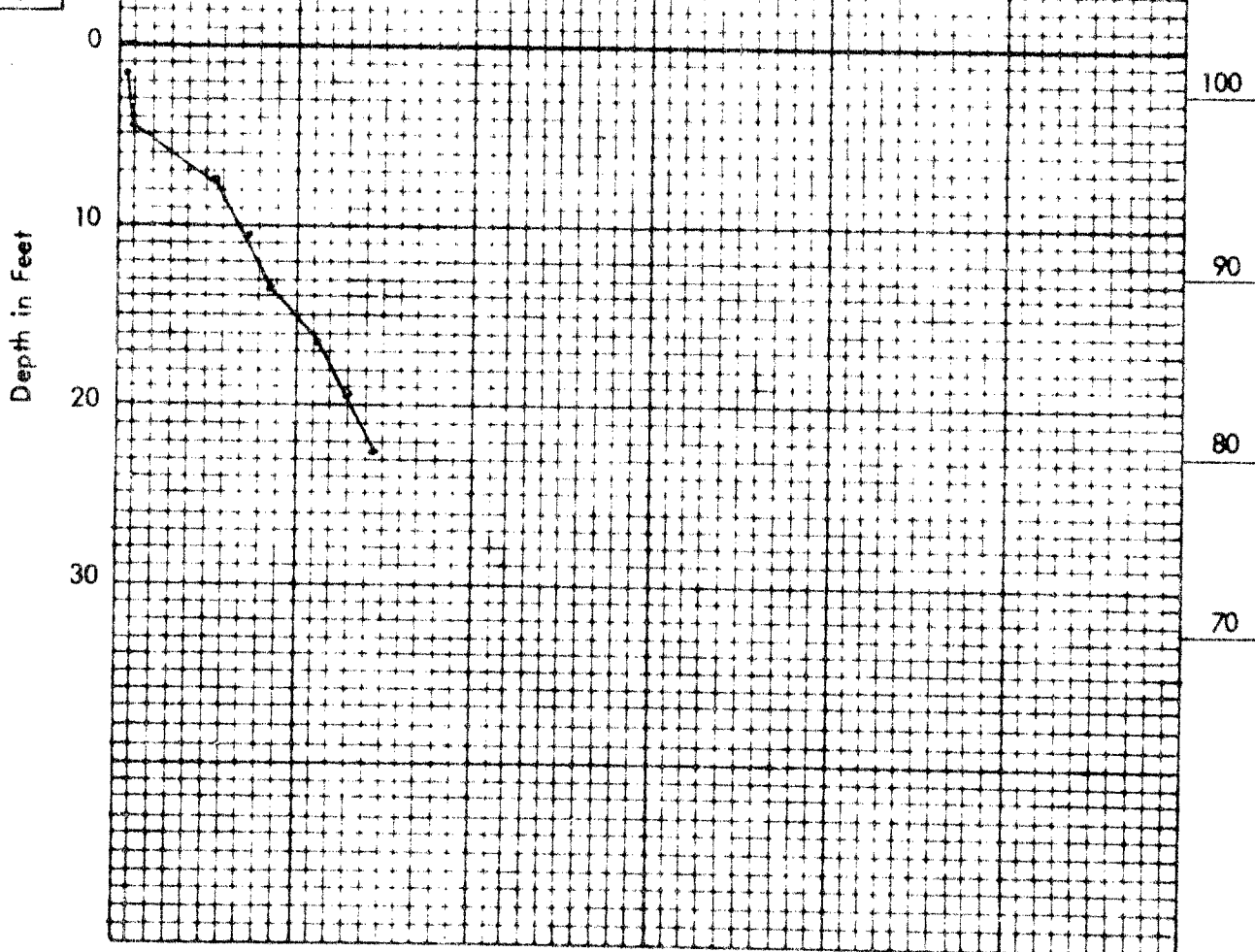
FORM 6-3-60  
UNIVERSAL GEOTECHNIQUE

CUMULATIVE RESISTANCE Ohm - cms.  
in millions

RS.1



RS.2



PROJECT Grand River Bridge N° 2

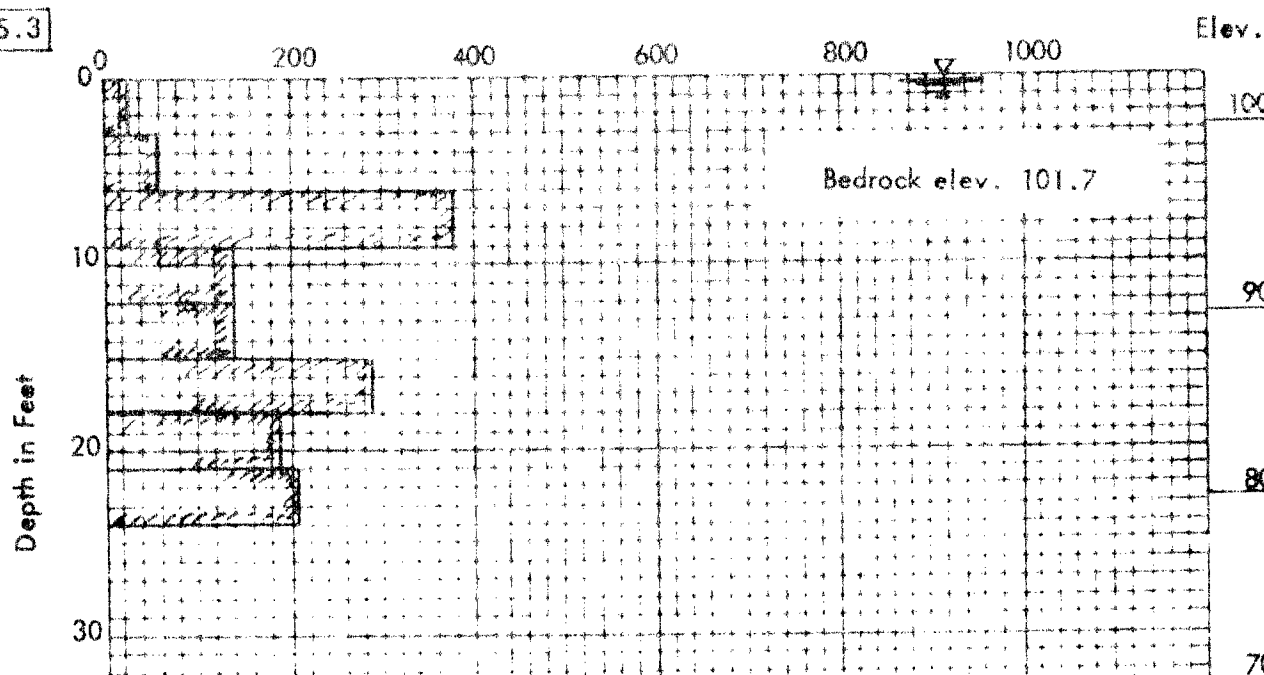
TITLE Cumulative Resistivity RS.1 & 2

DRG. NO. 4 ORDER NO. T.522/63

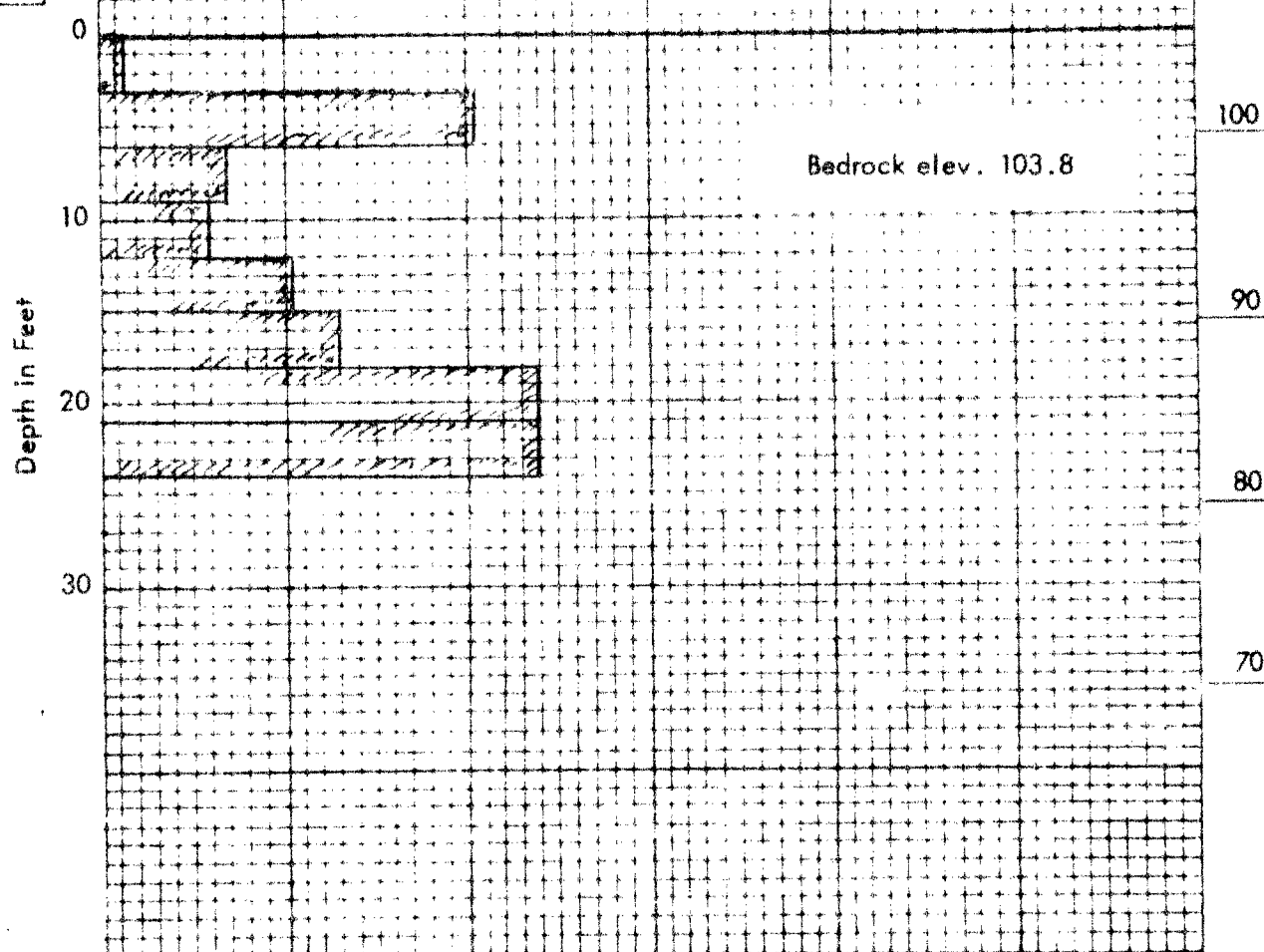


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RS.3



RS.4



PROJECT Grand River Bridge N° 2

TITLE Electrical Resistivity Soundings RS.3 & 4

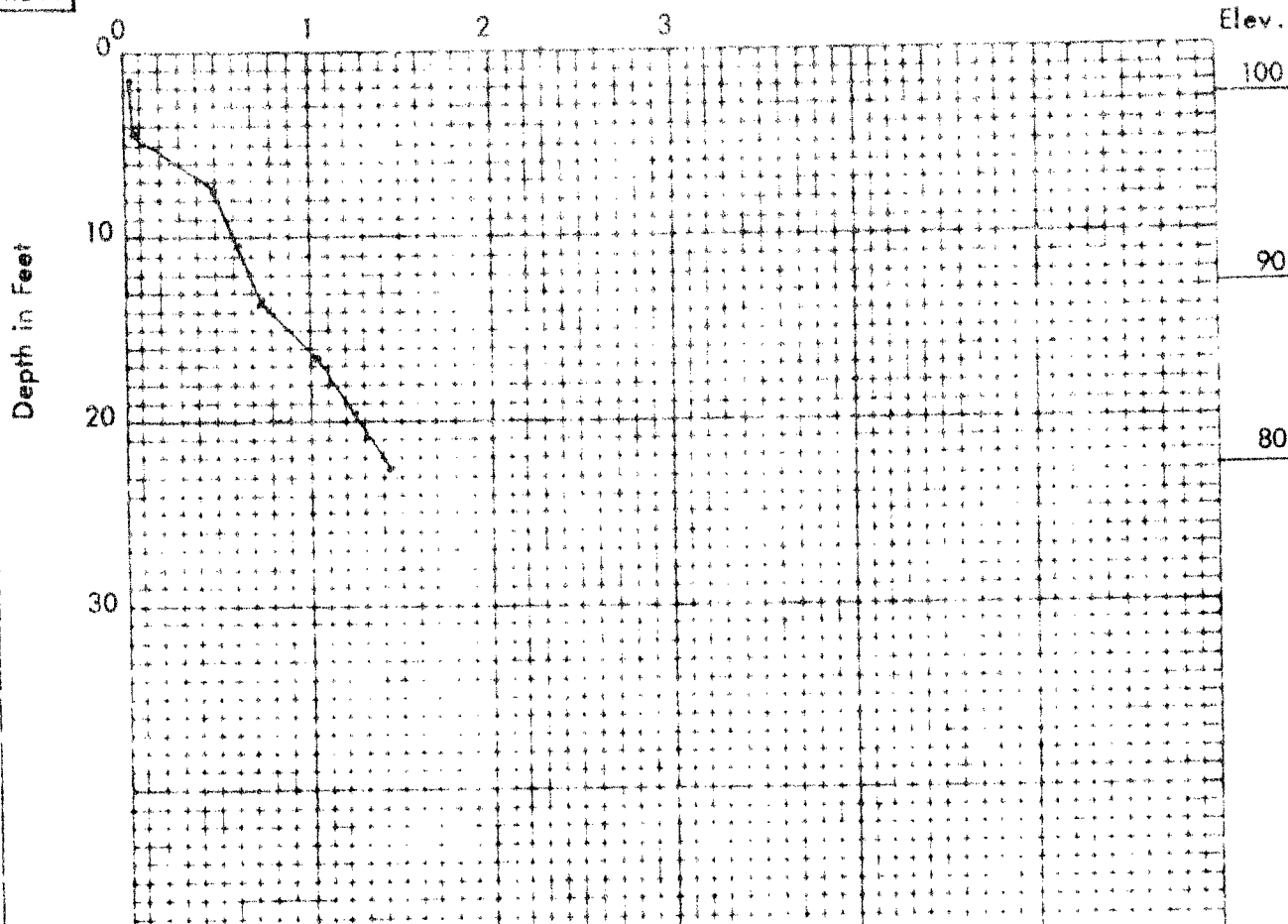
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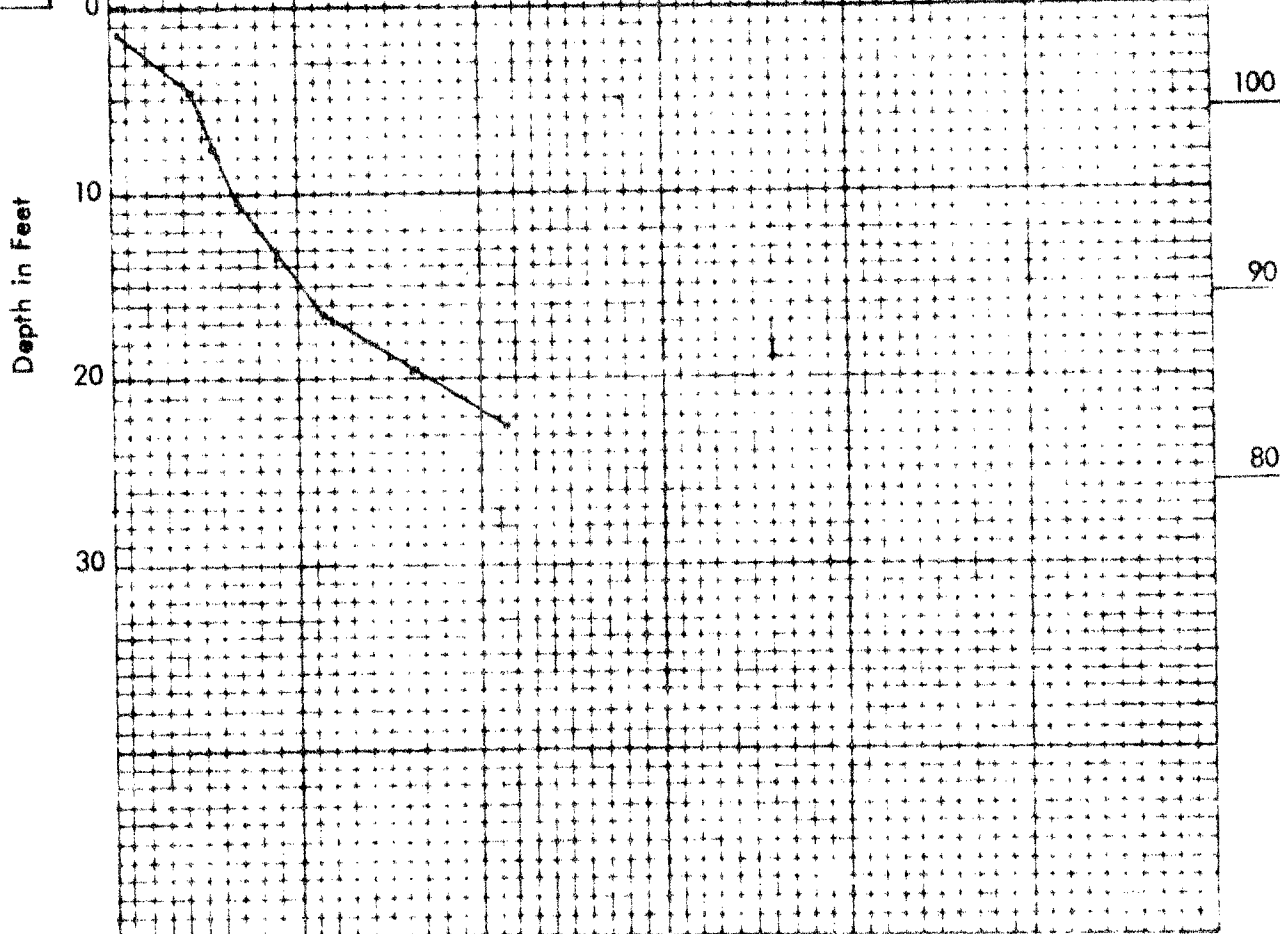
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CUMULATIVE RESISTANCE Ohm - cms.  
in millions

RS.3



RS.4



PROJECT Grand River Bridge N° 2  
 TITLE Cumulative Resistivity RS.3 & 4  
 DRG NO 6 ORDER NO T.522/63






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## SOIL MECHANICS LABORATORY

## BOREHOLE LOG

PROJECT Grand River Bridge N° 2, County Road N° 21 ORDER NO. I,522/63CLIENT County of Dufferin, Ontario.BOREHOLE NO. BH.4 DIAMETER 2-1/2" CASING BXBOREHOLE LOCATION See Plan INCLINATION Vertical BEARING \_\_\_\_\_

DESCRIPTION OF STRATA	ELEVATION	LEGEND	SAMPLE	DEPTH	THICKNESS	N	REMARKS
Dark brown silt with organic matter and occasional boulder.	105.7			Zero			
Light grey and cream coloured dolomite, generally crystalline and in about 3" horizontal beds near the surface:				2'-0"			Drilled AXI 2'-0" to 2'-8" core recovery 63%
Sound bedrock with minor small solution cavities in parts near the surface.				7'-9"			2'-8" to 4'-8" core recovery 85%
							4'-8" to 6'-8" core recovery 92%
							6'-8" to 7'-9" core recovery 100%

SCALE: 1" = 2'

• DISTURBED SAMPLE

■ UNDISTURBED SAMPLE

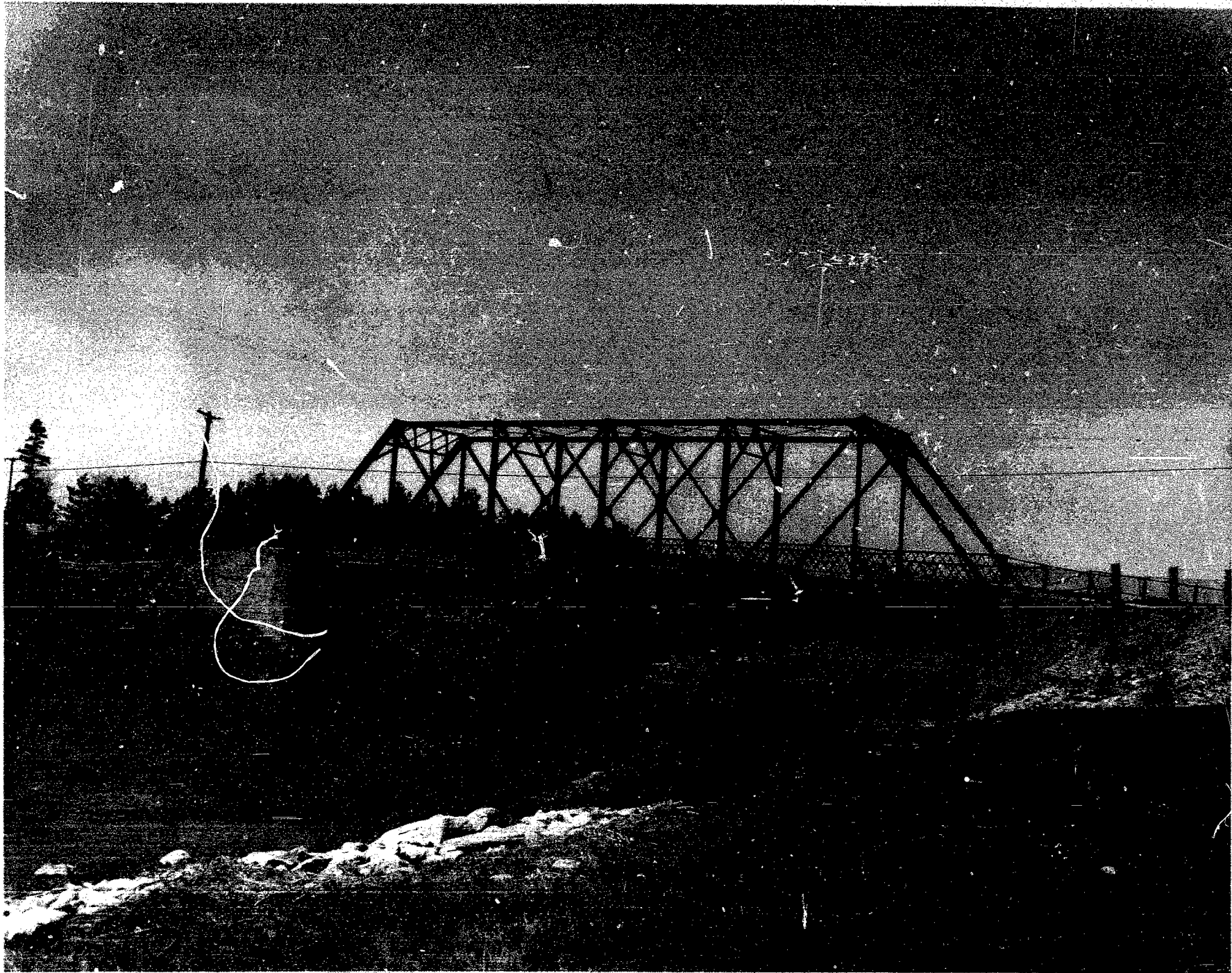


FIG. 1

View of Existing Bridge from  
the southeast (downstream)





FIG. 1

View of Existing Bridge from  
the southeast (downstream)

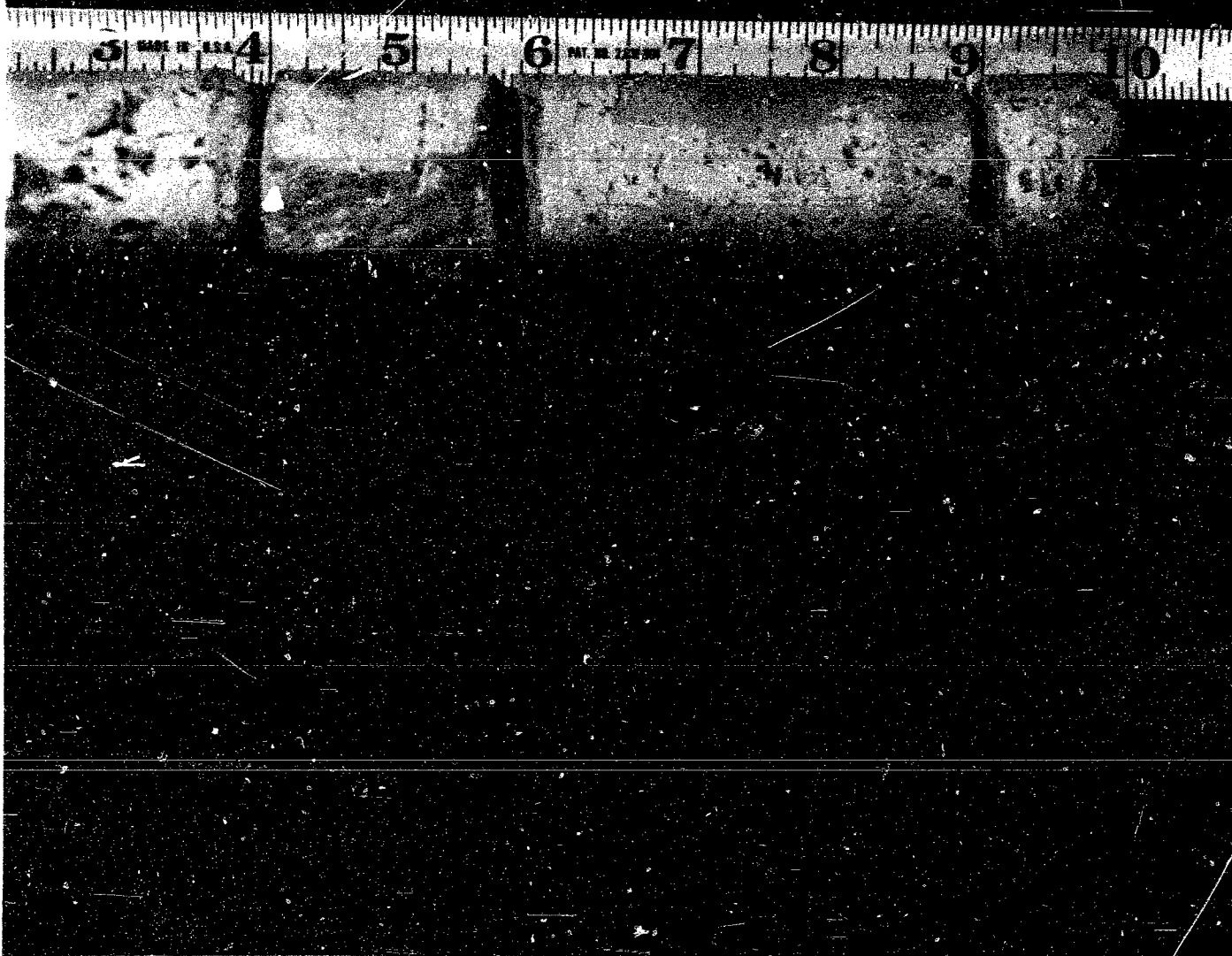


FIG. 2

Typical rock-core showing  
minor solution cavities

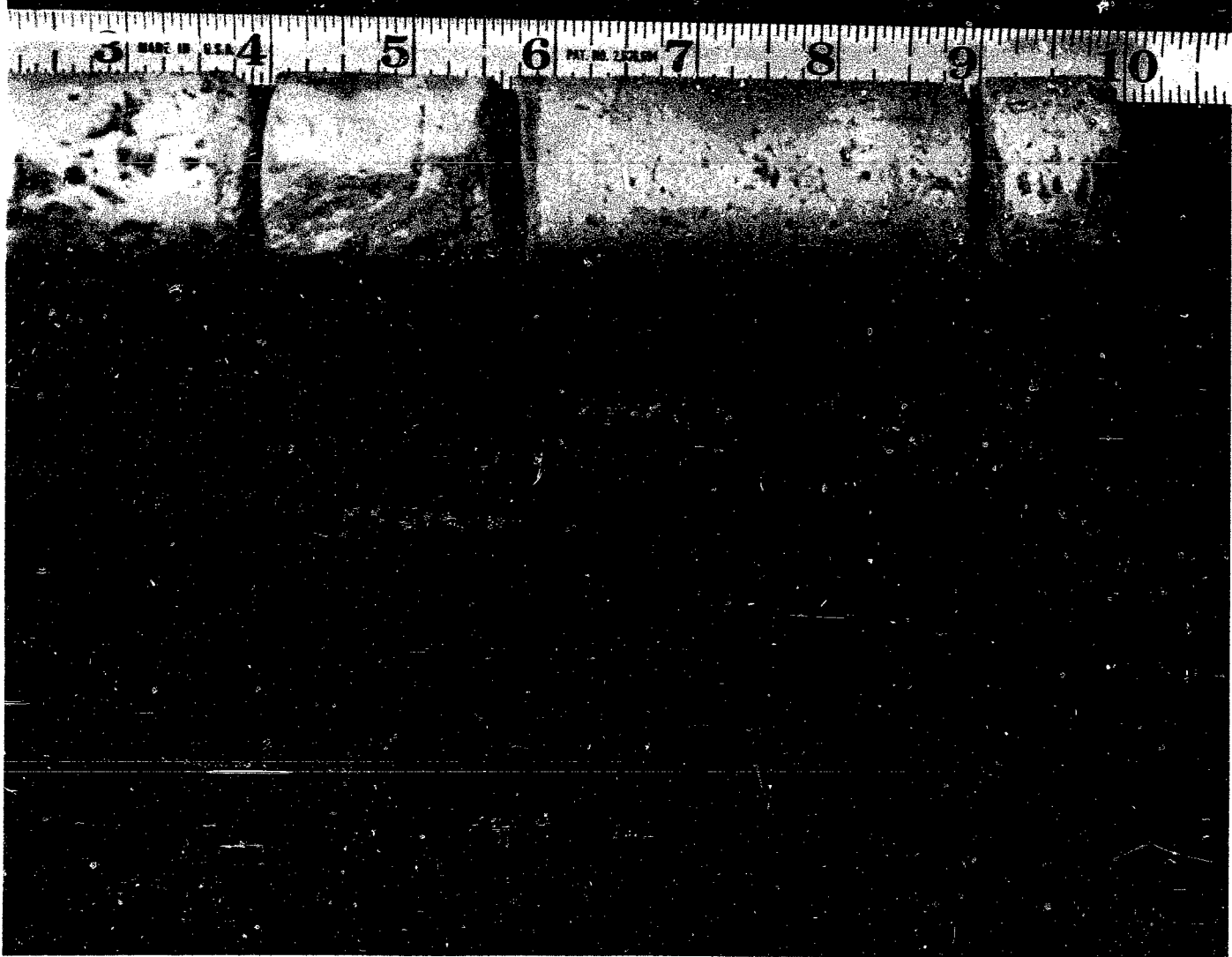


FIG. 2

Typical rock-core showing  
minor solution cavities