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Commonwealth of Massachusetts
Department of Public Works
W. F. Callahan, Commissioner

U. S. Department of the Interior
Geological Survey
W. E. Wrather, Director

Cooperative Geologic Project

Geologic Interpretation of Seismic Data

Projected Northern Circumferential Highway, Route 128

Cut, Stations 87-94

in Waltham, Mass.

by

James E. Maynard, geologist, U. S. Geological Survey,

and

Rev. Daniel Linehan, S. J., seismologist, Weston College

3 pages of text
2 plates

Seismic Series #_____

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General Statement

The Department of Public Works plans for the projected Northern Circumferential Highway, Route 128, in Waltham, Mass. call for an extensive cut between stations 87 and 94. Although bedrock crops out at numerous places on both sides of the base-line in the central segment of the projected cut, a series of traverses was run for the purpose of obtaining data on the depths to bedrock and the position and form of the bedrock surfaces along the northern and southern segments of the cut. The work was performed in June and July, 1949 as a part of a cooperative program of the Massachusetts Department of Public Works and the United States Geological Survey.

Surface Geology

At this location the base-line of the proposed roadsite passes through a notch in the top of a prominent till-bedrock hill. Bedrock is obviously close to the surface in the central part of the notch but would be expected to be at increasingly greater average depths down the slopes on either side of the notch, though in places small pinnacles or ridges might be found. The bedrock

exposures to the east of the base-line along or in close proximity to the right of way are dominantly medium-grained crystalline melanite; to the west of the base-line they are somewhat massive mica schist. The till is moderately loose and should yield relatively low seismic velocities. It is covered by a layer of fine wind-blown material a few inches to several feet in thickness. Boulders are not exceptionally numerous in the till, but large blocks of rock are present in places.

Seismic Traverses

A plan of the seismic traverses is attached, sheet 1. Ten seismic traverses were made at this site, 4 along the base-line and 6 transverse to it. All of the transverse traverses except J-K were 110 feet long; J-K was 165 feet long. The base-line traverses except N-O were 220 feet long; N-O was 110 feet long. The traverses were located as follows:

B-C:	B,	station						93+65
	C,	"						91+45
C_1-D:	C_1,	"						91+50
	D_1,	"						89+30
H-I:	H,	"						90+40
	I,	"						88+20
J-K:	J,	105	feet	to the	right	(East)	of station	92+70
	K,	60	"	" "	left	(West)	" "	92+70
L-M:	L,	55	"	" "	right	(East)	" "	92+10
	M,	55	"	" "	left	(West)	" "	92+10
N-O:	N,	station						92+85
	O,	"						91+75
P-Q:	P,	45	feet	to the	right	(East)	" "	90+50
	Q,	65	"	" "	left	(West)	" "	90+50
R-S:	R,	65	"	" "	right	(East)	" "	89+84
	S,	55	"	" "	left	(West)	" "	89+84
T-U:	T,	65	"	" "	right	(East)	" "	89+40
	U,	30	"	" "	left	(West)	" "	88+80
V-W:	V,	36	"	" "	right	(East)	" "	88+75
	W,	37	"	" "	left	(West)	" "	87-93

Depths to Bedrock

The depths to bedrock at the shot points as calculated from the seismic data are as follows:

B,	8 feet	N,	5 feet
C,	5 "	O,	5 "
C_1,	5 "	P,	6 "
D,	5 "	Q,	6 "
E,	5 "	R,	6 "
I,	14 "	S,	6 "
J,	8 "	T,	5 "
K,	6 "	U,	6 "
L,	5 "	V,	8 "
M,	10 "	W,	10 "

The depth values for shot points I, N, and J are reliable. M and V are dotted, the actual depths may be much less. The other depths at the shot points are reasonably close, but should be used with caution as the bedrock surface was at too shallow depths to yield sufficient points on the travel-time plot for accurate till velocities; for this reason the depths may be shallower than indicated.

Geologic Interpretation of Seismic Data

The geologic sections as interpreted from the seismic data and the geology of the site are shown on sheets 1 and 2. The positions of the bedrock surfaces on the geologic sections are shown by smooth curves. It is probable, however, that the surfaces are more irregular than the curves indicate for, in general, the detectors were spaced too widely to pick up minor points and ridges. Only 3 actual till velocities could be calculated from the time-travel data; these were 1600 feet per second (B to C), 2600 feet per second (E to I), and 1800 feet per second (J to K). All other till velocities were estimated from these values and the nature of the till near the surface of the ground.