



Engineering and Applied Science

July 31, 1998

L. Bruce Triplett
Westinghouse Savannah River Company
Building 730-2B, Rm. 1086
Aiken, SC 29808

Dear Mr. Triplett:

Attached is the cone penetrometer data from the 40 test locations conducted as part of the F-Area Expansion Investigation at the Savannah River Site, performed under WSRC subcontract AA82276N, task 10. The tests conducted under this task are summarized in table 1.1.

The information provided for each cone penetration test includes: corrected tip stress, sleeve stress, friction ratio, pore pressure, soil classification based on friction ratio and estimated blow counts. Information provided for the seismic tests include: the recorded compression and shear wave forms, the summary distance versus time of peak graphs for the shear waveforms, and the summary wavespeeds versus depth graphs for the compression and shear waveforms. The computer disks provides the ECP files which contain the plotted data in ASCII format and the seismic velocity files (*.vel).

This data presented on the attached sheets was obtained and interpreted by qualified ARA personnel in accordance with the requirements of SRS Subcontract No. AA82276N and contained in Specification K-SP-G-00005, Rev. 0. Any special data considerations that should be brought to your attention are summarized in table 1.2. All information contained on the data sheets and computer disks shall be considered as final and correct.

Please feel free to call us if you have any questions regarding the enclosed information.

Sincerely,

David A. Timian, P.E.
Principal Engineer

DAT:bef
d:\4569\Task reports\4569_10_ltr_rpt2.doc

Table 1.1 Summary of Cone Penetrometer at the F Area, Task 10.

Test Id.	Filename	Type of Test	Date of Test	Maximum Depth (ft)	Northing (ft)	Easting (ft)	Elevation (ft)	GWT Depth (ft)
CPT-53	404M801.DAT 404M802.DAT	P/S-CPT	3/4/98	149.9	79180.00	54845.00	289.9	66
CPT-103	423F801.DAT 423F802.DAT	P/S-CPT	2/23/98	156.0	79915.18	55260.95	271.7	80
CPT-104	420F802.DAT	P/S-CPT	2/20/98	131.4	79915.04	55385.03	274.2	80
CPT-113	519F801.DAT 519F802.DAT	P/S-CPT	2/19/98	145.7	79781.00	54825.10	276.7	80
CPT-114	519F804.DAT 519F805.DAT	P/S-CPT	2/19/98	145.5	79781.01	54975.05	273.6	80
CPT-115	520F801.DAT	P/S-CPT	2/20/98	144.0	79780.85	55125.05	272.0	80
CPT-116	520F803.DAT	P/S-CPT	2/20/98	132.6	79781.17	55261.01	270.1	80
CPT-126	524F805.DAT 524F806.DAT	P/S-CPT	2/24/98	153.0	79650.07	54825.03	278.9	80
CPT-127	524F802.DAT 524F803.DAT	P/S-CPT	2/24/98	164.7	79650.01	54975.00	279.3	80
CPT-128	523F804.DAT 523F805.DAT	P/S-CPT	2/23/98	147.4	79650.01	55124.95	279.3	80
CPT-129	523F801.DAT 523F802.DAT	P/S-CPT	2/23/98	148.2	79650.00	55261.00	277.2	80
CPT-143	525F804.DAT 525F805.DAT	P/S-CPT	2/25/98	156.1	79442.50	55195.00	286.1	80
CPT-147	424F801.DAT 424F802.DAT	P/S-CPT	2/24/98	157.5	79372.00	55261.00	284.8	61
CPT-148	427F801.DAT 427F802.DAT	P/S-CPT	2/27/98	157.5	79372.07	55385.00	284.1	80
CPT-149	404M804.DAT 405M803.DAT	P/S-CPT	3/4/98	143.3	79372.04	55517.96	274.8	80
CPT-151	424F804b.DAT 424F805b.DAT	P/S-CPT	2/24/98	156.1	79305.00	55195.00	290.1	80
CPT-155	518F801.DAT 518F802.DAT	P/S-CPT	2/18/98	162.0	79245.00	55261.00	289.1	80
CPT-156	518F804.DAT 518F805.DAT	P/S-CPT	2/18/98	161.0	79244.97	55384.98	289.2	80
CPT-157	405M804.DAT 405M805.DAT	P/S-CPT	3/5/98	152.4	79244.98	55517.98	283.1	80
CPT-159	417F801.DAT 417F802.DAT	P/S-CPT	2/17/98	164.8	79171.10	55195.00	293.7	80
CPT-163	525F801.DAT 525F802.DAT	P/S-CPT	2/25/98	165.0	79095.10	55261.00	293.9	80
CPT-167	411M801b.DAT	P/S-CPT	3/11/98	116.0	79029.91	55330.05	196.7	80
CPT-171	419M804.DAT 419M805.DAT	P/S-CPT	3/19/98	132.6	78900.00	55385.00	298.5	80
CPT-172	325M801.DAT 325M802.DAT	P/S-CPT	3/25/98	162.5	78900.00	55518.00	295.4	80

Table 1.1 Summary of Cone Penetrometer at the F Area, Task 10.

Test Id.	Filename	Type of Test	Date of Test	Maximum Depth (ft)	Northing (ft)	Easting (ft)	Elevation (ft)	GWT Depth (ft)
CPT-173	327M804.DAT 327M805.DAT	P/S-CPT	3/27/98	150.3	78900.00	55650.00	297.6	80
CPT-174	410M804b.DAT 410M805b.DAT	P/S-CPT	3/10/98	171.5	78770.00	55330.00	301.5	80
CPT-175	320M801.DAT 320M802.DAT	P/S-CPT	3/20/98	167.0	78770.00	55451.00	303.1	80
CPT-176	326M805.DAT 326M806.DAT	P/S-CPT	3/26/98	146.8	78770.00	55583.00	297.6	80
CPT-177	327M801.DAT 327M802.DAT	P/S-CPT	3/27/98	132.6	78770.00	55715.00	301.7	80
CPT-178	419M801.DAT 419M802.DAT	P/S-CPT	3/19/98	168.5	78640.00	55385.00	305.6	80
CPT-179	324M804.DAT 324M805.DAT	P/S-CPT	3/24/98	124.4	78640.00	55518.00	301.4	80
CPT-180	326M802.DAT 326M803.DAT	P/S-CPT	3/26/98	120.1	78640.00	55650.00	302.3	80
CPT-181	410M801.DAT 410M802.DAT	P/S-CPT	3/10/98	138.7	78510.00	55330.00	304.9	80
CPT-182	323M801.DAT 323M802.DAT	P/S-CPT	3/23/98	140.1	78510.00	55451.00	304.8	80
CPT-183	325M804.DAT 325M805.DAT	P/S-CPT	3/25/98	115.0	78510.00	55583.00	301.7	80
CPT-185	418M807.DAT 418M808.DAT	P/S-CPT	3/18/98	136.8	78380.00	55385.00	223.7	80
CPT-186	324M801.DAT 324M802.DAT	P/S-CPT	3/24/98	155.0	78380.00	55518.00	304.5	80
CPT-188	409M801.DAT 409M802.DAT	P/S-CPT	3/9/98	142.0	78250.00	55330.00	310.4	66
CPT-189	323M804.DAT 323M805.DAT	P/S-CPT	3/23/98	134.2	78250.00	55451.00	309.2	80
CPT-196	314A801.DAT 314A802.DAT	P/S-CPT	4/14/98	122.1	79330.00	55135.00	290.1	66

Table 1.2 Special Analysis Considerations

Task 10 –
Addendum to Cover Letter
Special Analysis Considerations

Test Id.	Date	Special Analysis Considerations
CPT-53	3/4/98	The compression wave trace of this particular test displays shear wave noise. The compression wave "time of arrival" was chosen for analysis rather than the "time of peak".
CPT-103	2/23/98	Shear wave traces not reported due to broken source hammer. Due to the evolution of the compression wave form, the time of peak selection was changed between 18.3-24.4 ft (distance). Compression wave speeds recorded above 5000 ft/s are not shown on the "Compression Wave Speed" plot due to the scale.
CPT-104	2/20/98	One of the two opposing shear wave traces was omitted from the analysis. The source hammer was partially broken on one side causing unreliable data gathered on one of the traces. Shear wave speeds recorded above 2000 ft/s are not shown on the "Shear Wave Speed" plot due to the scale.
CPT-113	2/19/98	Compression wave time histories contain background noise that could not be filtered. Note that the background noise has no effect on the resultant wavespeed.
CPT-114	2/19/98	Due to the evolution of the shear wave form, the time of peak selection was changed between 110.3-113.2 ft (distance). Compression wave time histories contain background noise that could not be filtered. Note that the background noise has no effect on the resultant wavespeed.
CPT-115	2/20/98	Compression wave time histories contain background noise that could not be filtered. Note that the background noise has no effect on the resultant wavespeed.
CPT-116	2/20/98	Due to the evolution of the shear wave form, the time of peak selection was changed between 65.4-68.4 ft (distance). Due to the evolution of the compression wave form, the time of peak selection was changed between 18.3-24.1 ft (distance).
CPT-126	2/24/98	Compression wave speeds recorded above 5000 ft/s are not shown on the "Compression Wave Speed" plot due to the scale.
CPT-127	2/24/98	Compression wave time histories contain background noise that could not be filtered. Note that the background noise has no effect on the resultant wavespeed.
CPT-128	2/23/98	Due to the evolution of the compression wave form, the time of peak selection was changed between 18.3-21.2 ft (distance).
CPT-129	2/23/98	Due to the evolution of the compression wave form, the time of peak selection was changed between 15.5-19.3 ft (distance).
CPT-143	2/25/98	Compression wave speeds recorded above 5000 ft/s are not shown on the "Compression Wave Speed" plot due to the scale.
CPT-147	2/24/98	Shear wave traces not reported due to broken source hammer. Due to the evolution of the compression wave form, the time of peak selection was changed between 21.2-24.0 ft (distance).

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Task 10 –
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Test Id.	Date	Special Analysis Considerations
CPT-148	2/27/98	Due to the evolution of the shear wave form, the time of peak selection was changed between 35.6-38.6 ft (distance). Due to the evolution of the compression wave form, the time of peak selection was changed between 18.3-21.1 ft (distance). Only one shear trace was saved at 41.5 ft (distance).
CPT-149	3/4/98 3/5/98 3/30/98	Due to the evolution of the shear wave form, the time of peak selection was changed between 77.4-80.4 ft (distance). Compression wave speeds recorded above 5000 ft/s are not shown on the "Compression Wave Speed" plot due to the scale. The shear traces and profile were recorded on two separate dates, combining the files at 77.4/80.4. The compression test was re-pushed on a later date.
CPT-151	2/24/98	Shear wave traces not reported due to broken source hammer. Due to the evolution of the compression wave form, the time of peak selection was changed between 18.3-21.2, 27.0-29.9 ft (distance).
CPT-155	2/18/98	Missing 2-3 sets of shear wave seismic traces due to full computer memory. (131-137 ft, distance) Only one shear trace was saved at 113.4 ft (distance).
CPT-156	2/18/98	Due to the evolution of the compression wave form, the time of peak selection was changed between 21.2-24.1 ft (distance).
CPT-157	3/5/98	Due to the evolution of the shear wave form, the time of peak selection was changed between 26.6-29.6, 68.6-71.7, 128.4-131.4 ft (distance). Only one shear trace was saved at 80.4, 146.4 ft (distance). A portion of the compression wave at 10.3 ft (distance) exhibits the recorded signal exceeding its maximum. The analysis is not effected.
CPT-159	2/17/98	Due to the evolution of the shear wave form, the time of peak selection was changed between 68.4-74.4 ft (distance). Due to the evolution of the compression wave form, the time of peak selection was changed between 24.1-27.0 ft (distance). One of the two shear wave traces was omitted at the following distances : 14.9 - 23.7, 56.5, 74.4, 158.3, 164.1 ft. Symptoms of a partially broken source hammer were evident on the traces that were omitted.
CPT-163	2/25/98	Due to the evolution of the compression wave form, the time of peak selection was changed between 15.5-18.3 ft (distance). Compression wave speeds recorded above 5000 ft/s are not shown on the "Compression Wave Speed" plot due to the scale.
CPT-167	3/11/98	
CPT-171	3/19/98	Shear wave speeds recorded above 2000 ft/s are not shown on the "Shear Wave Speed" plot due to the scale.

Table 1.2 Special Analysis Considerations

Task 10-
Addendum to Cover Letter
Special Analysis Considerations

Test Id.	Date	Special Analysis Considerations
CPT-172	3/25/98	Shear wave speeds recorded above 2000 ft/s are not shown on the "Shear Wave Speed" plot due to the scale. Only one shear trace was saved at 110.4, 140.4 ft (distance).
CPT-173	3/27/98	Compression wave speeds recorded above 5000 ft/s are not shown on the "Compression Wave Speed" plot due to the scale. Due to the evolution of the compression wave form, the time of peak selection was changed between 33.1-39.1 ft (distance).
CPT-174	3/10/98	Due to the evolution of the wave form, the shear wave time of peak selection was changed between 83.5-86.4, 140.4-143.4 ft (distance). Shear wave speeds recorded above 2000 ft/s are not shown on the "Shear Wave Speed" plot due to the scale. Due to the evolution of the compression wave form, the time of peak selection was changed between 15.9-18.7 ft (distance).
CPT-175	3/20/98	Due to the evolution of the shear wave form, the time of peak selection was changed between 143.3-146.4, 149.4-152.4 ft (distance). Due to the evolution of the wave form, the compression wave time of peak selection was changed between 18.7-21.6 ft (distance).
CPT-176	3/26/98	Shear wave speeds recorded above 2000 ft/s are not shown on the "Shear Wave Speed" plot due to the scale. Compression wave speeds recorded above 5000 ft/s are not shown on the "Compression Wave Speed" plot due to the scale.
CPT-177	3/27/98	Due to the evolution of the compression wave form, the time of peak selection was changed between 18.8-21.5 ft (distance).
CPT-178	3/19/98	Compression wave speeds recorded above 5000 ft/s are not shown on the "Compression Wave Speed" plot due to the scale.
CPT-179	3/24/98	Shear wave speeds recorded above 2000 ft/s are not shown on the "Shear Wave Speed" plot due to the scale. Due to the evolution of the shear wave form, the time of peak selection was changed between 110.4-113.4 ft (distance).
CPT-180	3/26/98	Due to the evolution of the shear wave form, the time of peak selection was changed between 74.5-80.5 ft (distance). Due to the evolution of the compression wave form, the time of peak selection was changed between 16.0-18.8 ft (distance).
CPT-181	3/10/98	The compression wave trace of this particular test displays shear wave noise. The compression wave "time of arrival" was chosen for analysis rather than the "time of peak".
CPT-182	3/23/98	Due to the evolution of the shear wave form, the time of peak selection was changed between 80.4-83.4, 107.4-110.4 ft (distance). Only one shear trace was saved at 128.4 ft. (distance). Compression wave speeds recorded above 5000 ft/s are not shown on the "Compression Wave Speed" plot due to the scale.

Table 1.2 Special Analysis Considerations

Task 10 –
Addendum to Cover Letter
Special Analysis Considerations

Test Id.	Date	Special Analysis Considerations
CPT-183	3/25/98	Due to the evolution of the shear wave form, the time of peak selection was changed between 104.7-107.4 ft (distance). Due to the evolution of the compression wave form, the time of peak selection was changed between 18.8-21.5 ft (distance).
CPT-185	3/18/98	Only one shear trace was saved at 23.8, 122.5, 131.4 ft (distance). Compression wave speeds recorded above 5000 ft/s are not shown on the "Compression Wave Speed" plot due to the scale.
CPT-186	3/24/98	Due to the evolution of the shear wave form, the time of peak selection was changed between 116.4-119.4, 128.4-131.4 ft (distance). Shear wave speeds recorded above 2000 ft/s are not shown on the "Shear Wave Speed" plot due to the scale. Only one shear trace was saved at 140.4 ft. (distance).
CPT-188	3/9/98 3/26/98	The compression test was re-pushed on a later date.
CPT-189	3/23/98	Due to the evolution of the shear wave form, the time of peak selection was changed between 50.4-53.5, 65.5-68.5 ft (distance). Due to the evolution of the compression wave form, the time of peak selection was changed between 16.0-18.7 ft (distance).
CPT-196	4/14/98	Shear wave speeds recorded above 2000 ft/s are not shown on the "Shear Wave Speed" plot due to the scale.

7 of 522

CPT-53

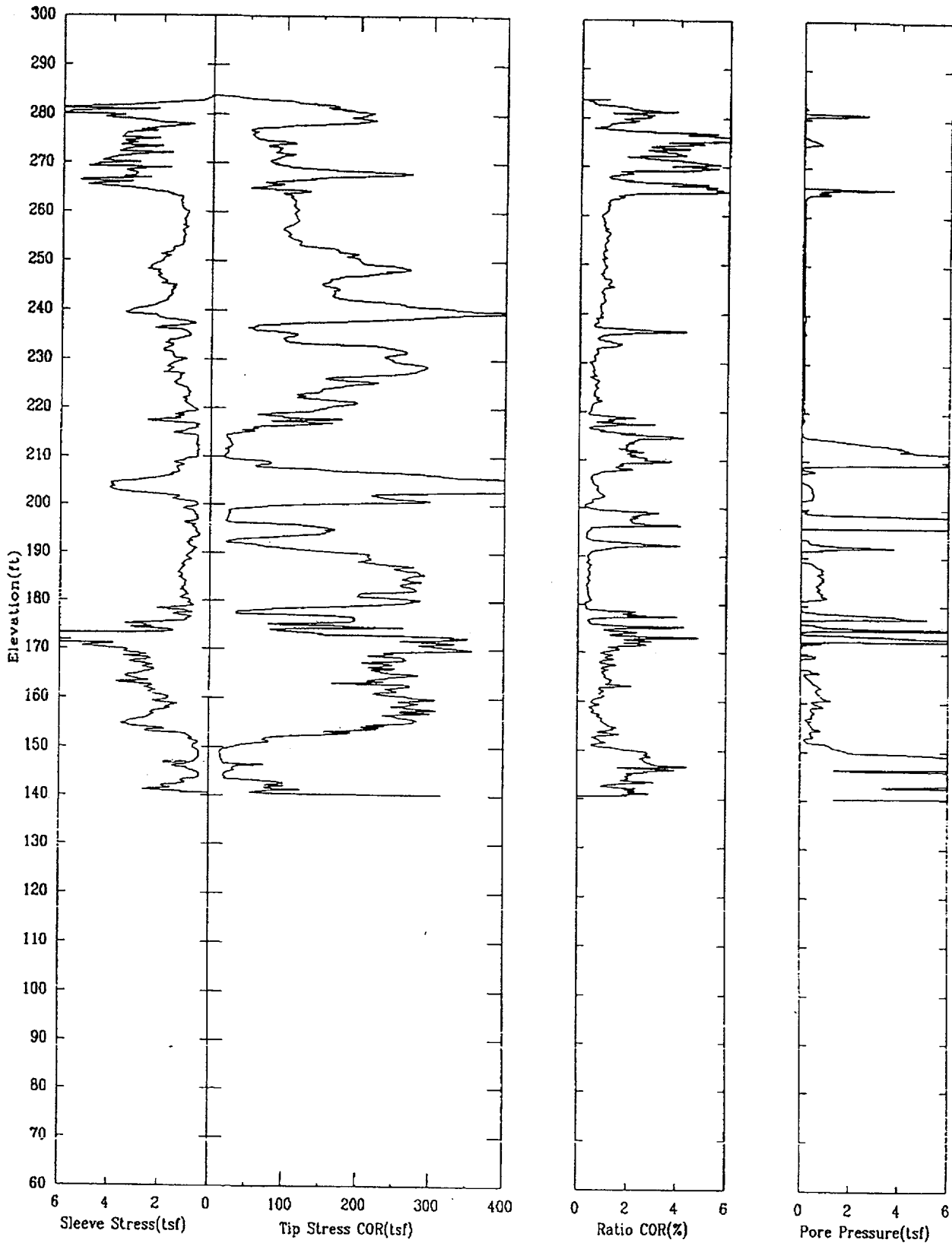
APPLIED RESEARCH ASSOCIATES, INC.

03/04/98

North 79180.0

East 54845.0

Elevation 289.9



CPT-53

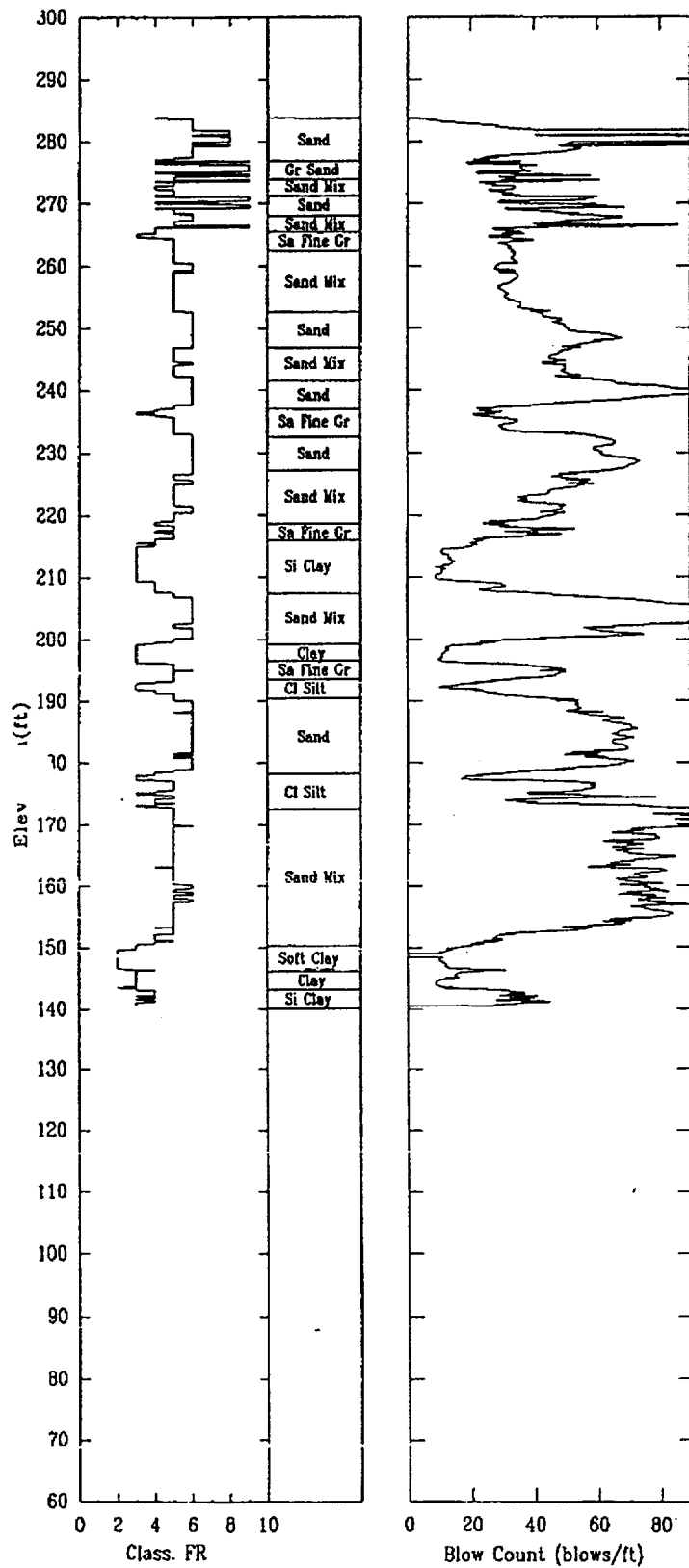
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03/04/98

North 79180.0

East 54845.0

Elevation 289.9

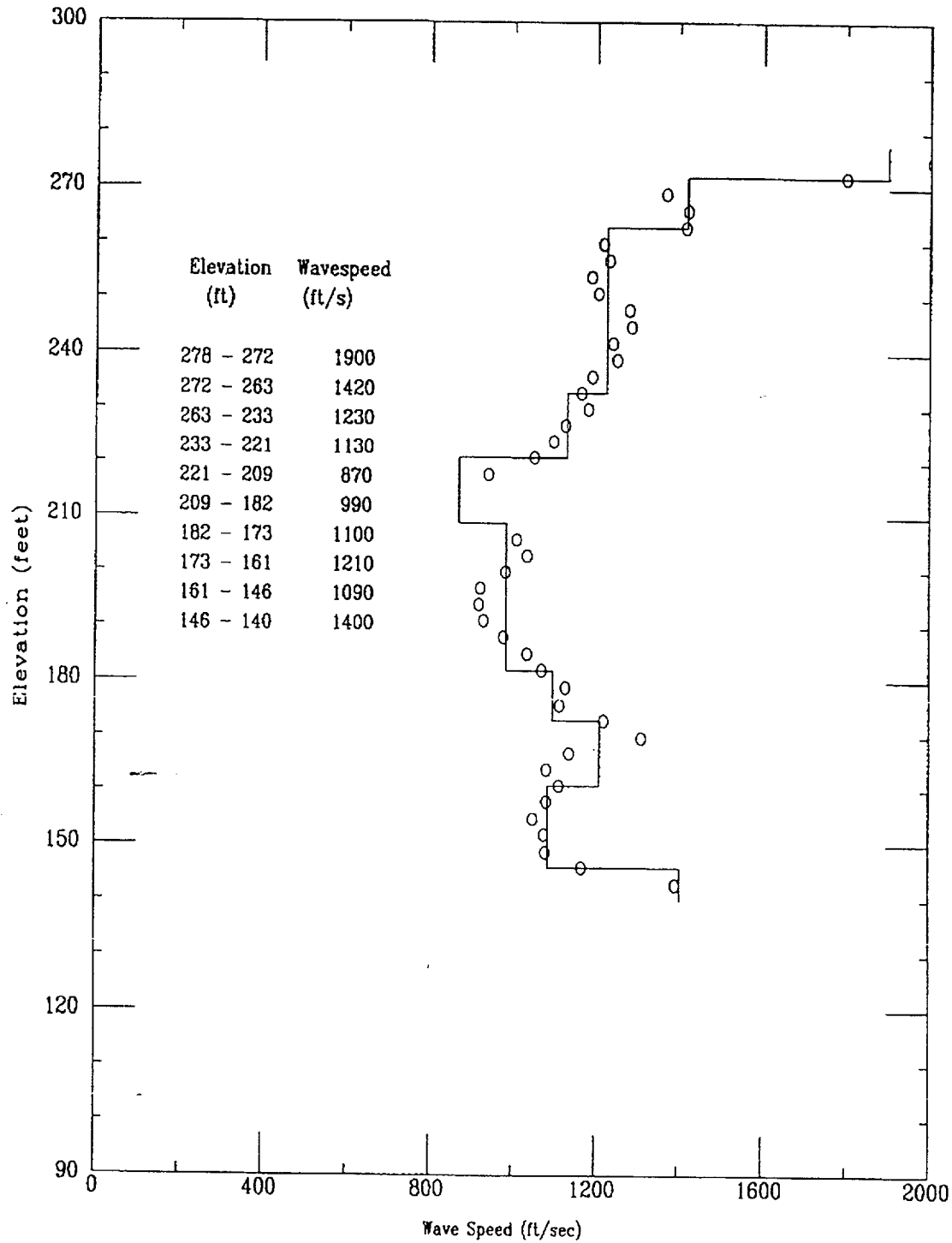


CPT-53

APPLIED RESEARCH ASSOCIATES, INC.

03/04/98

Shear Wave Speeds



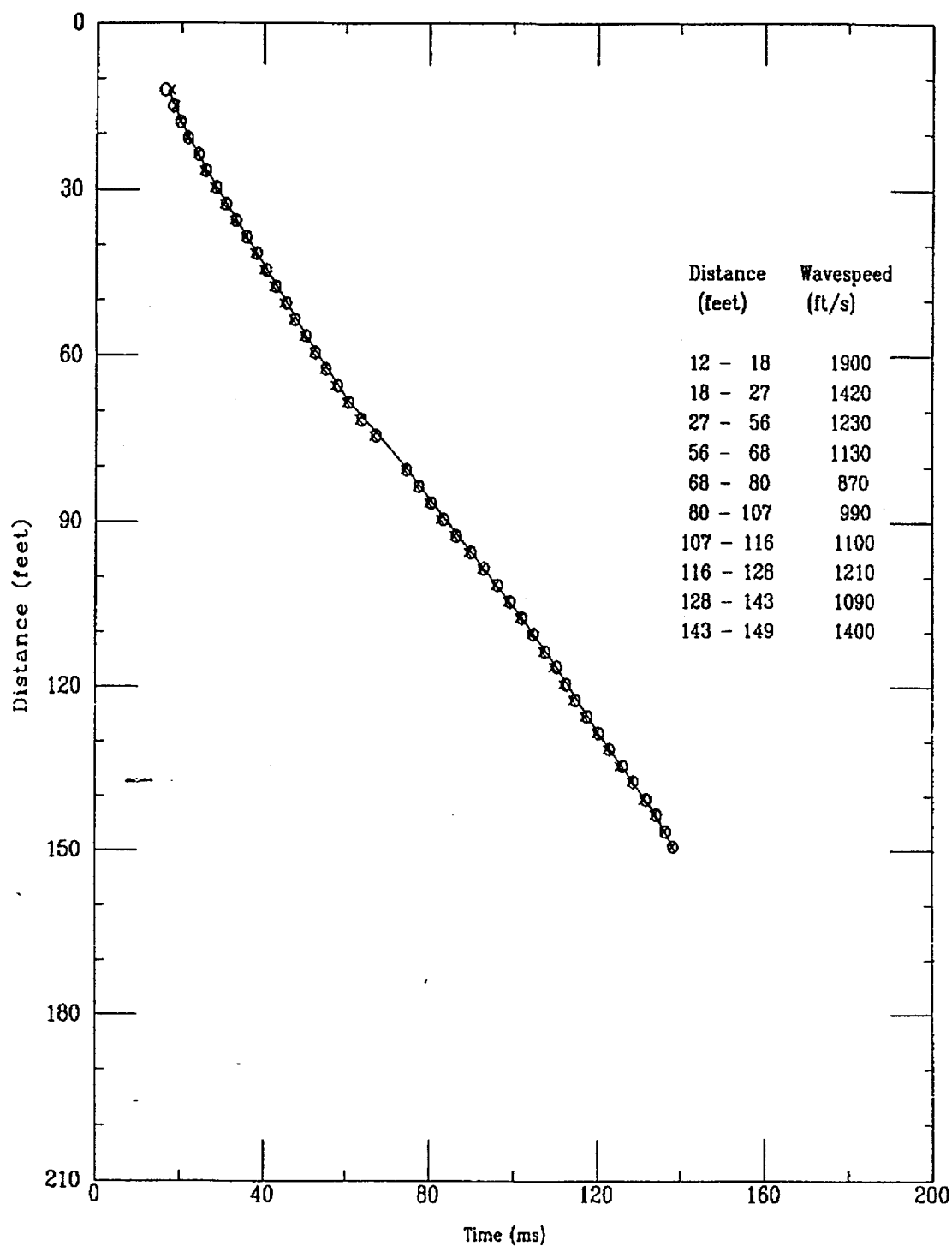
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CPT-53

APPLIED RESEARCH ASSOCIATES, INC.

03/04/98

Shear Wave Time of Peak

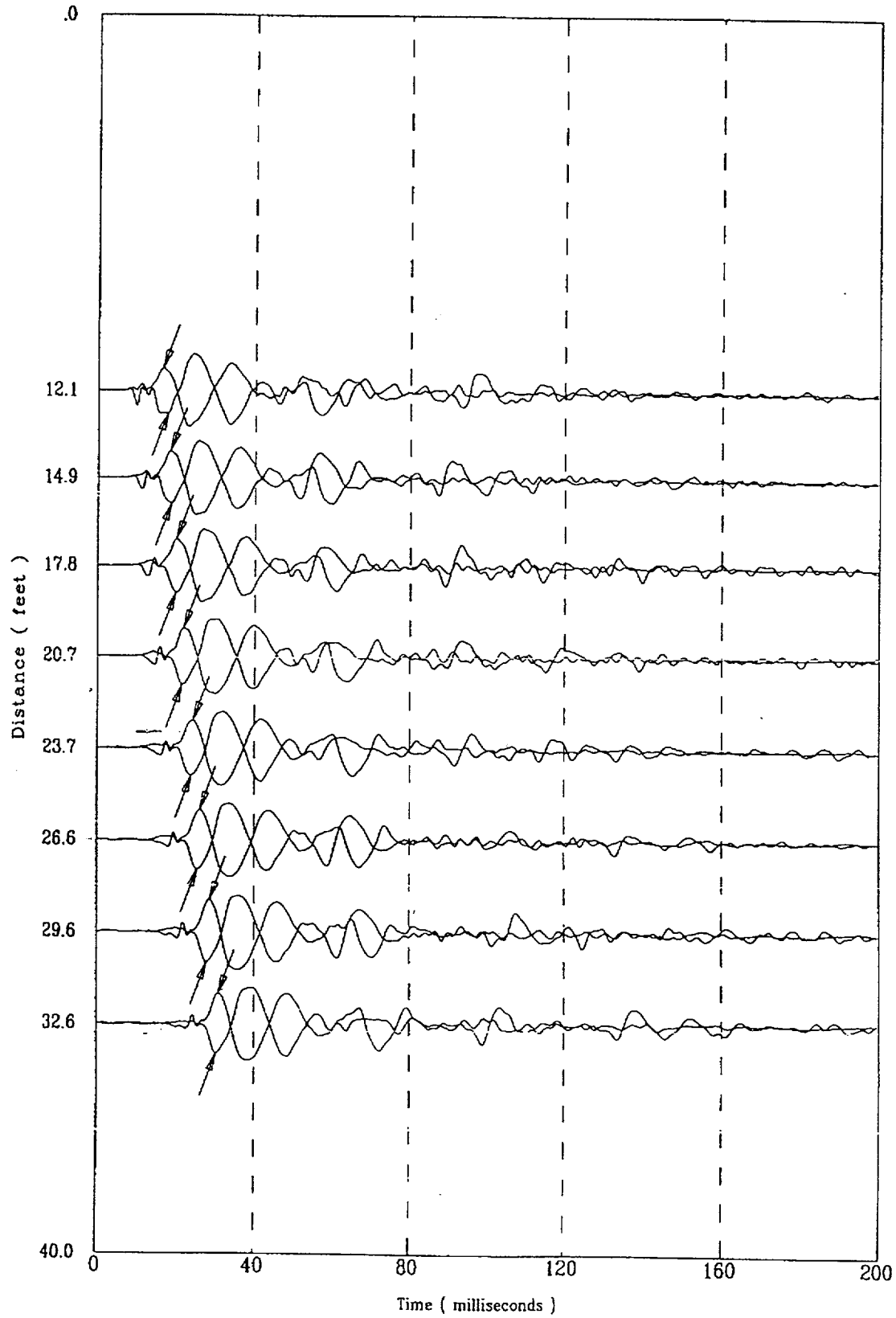


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11 of 522

Applied Research Associates, Inc.
CPT-53

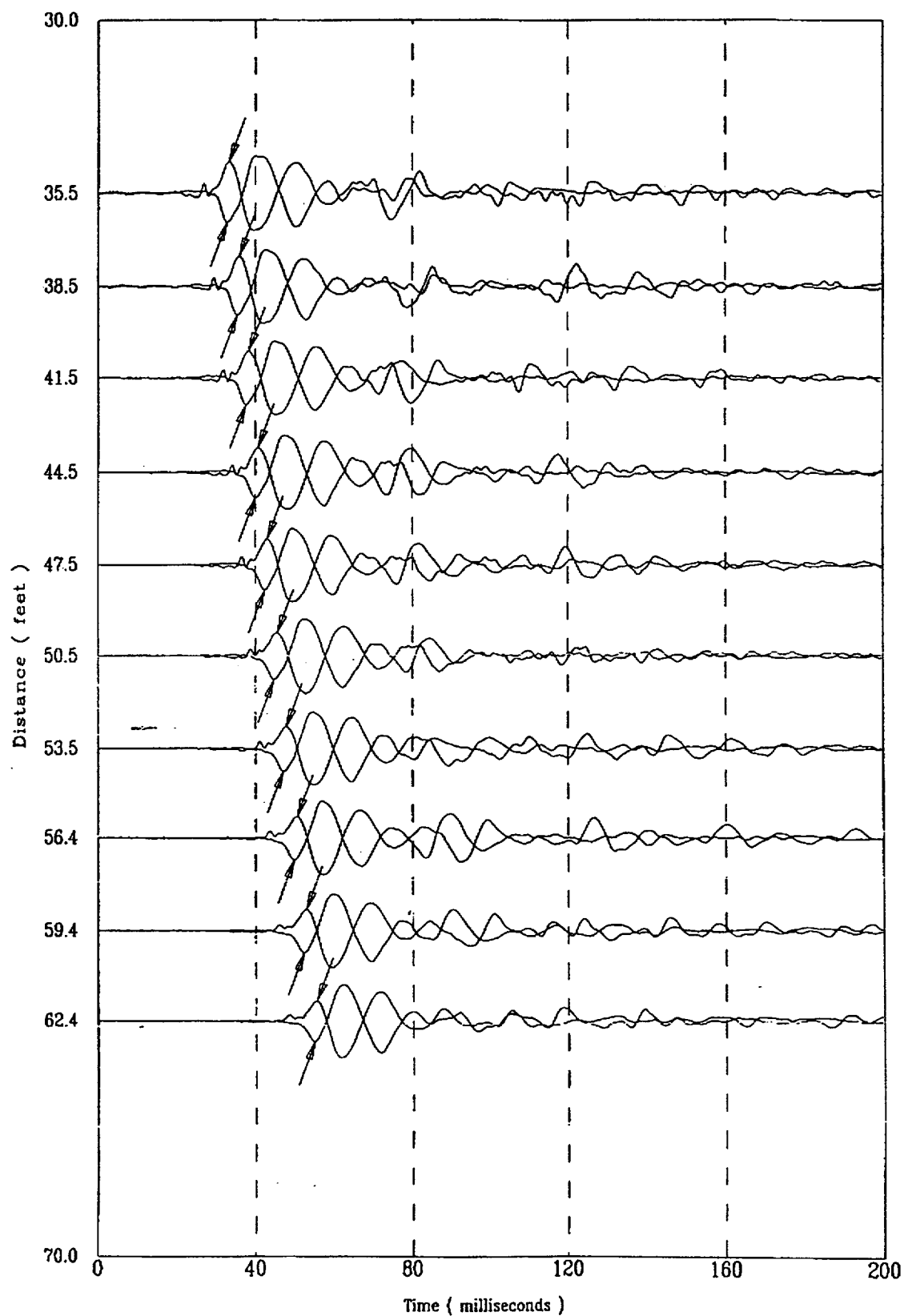
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Applied Research Associates, Inc.
CPT-53

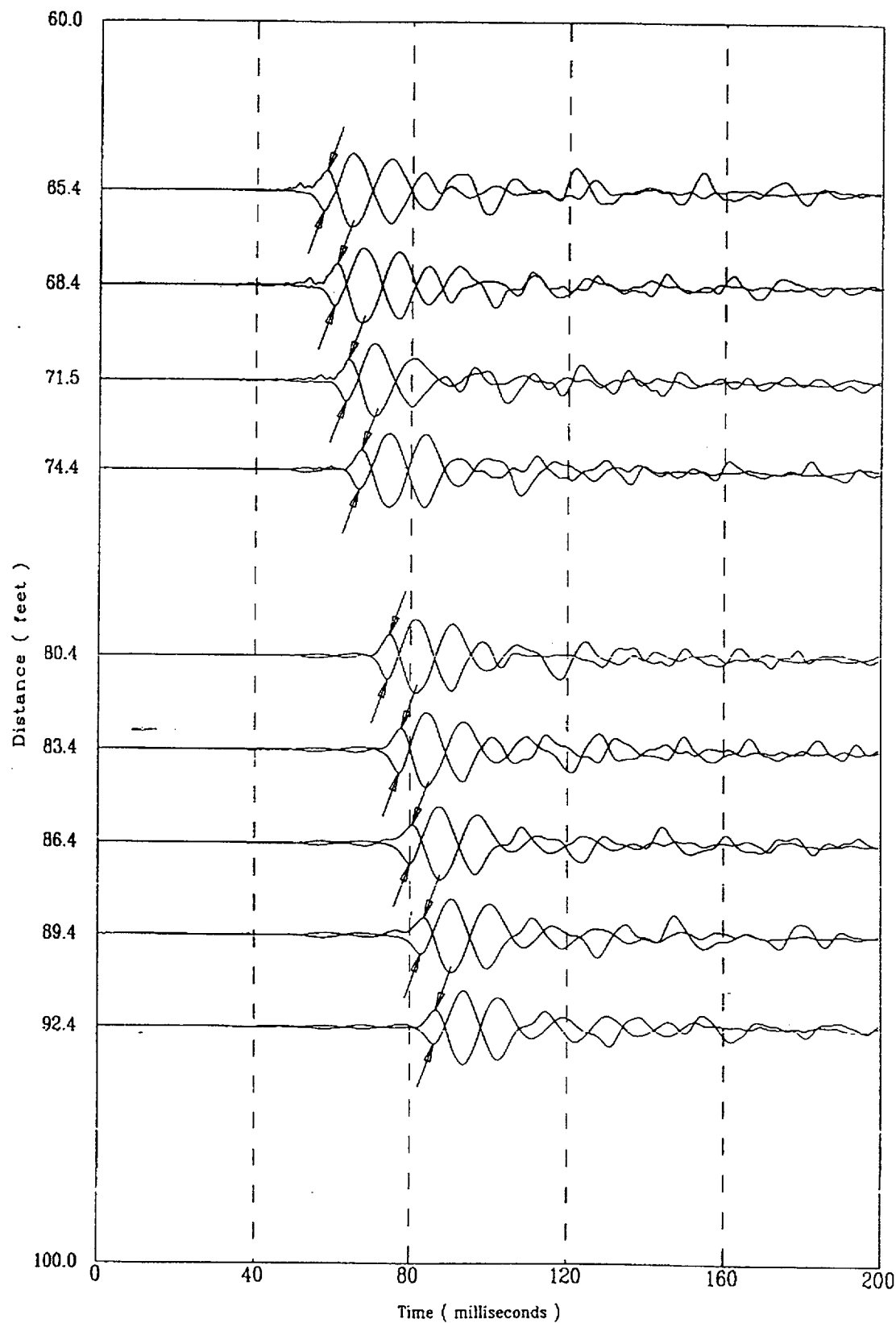
S Wave
03/04/98



File 404m801S

Applied Research Associates, Inc.
CPT-53

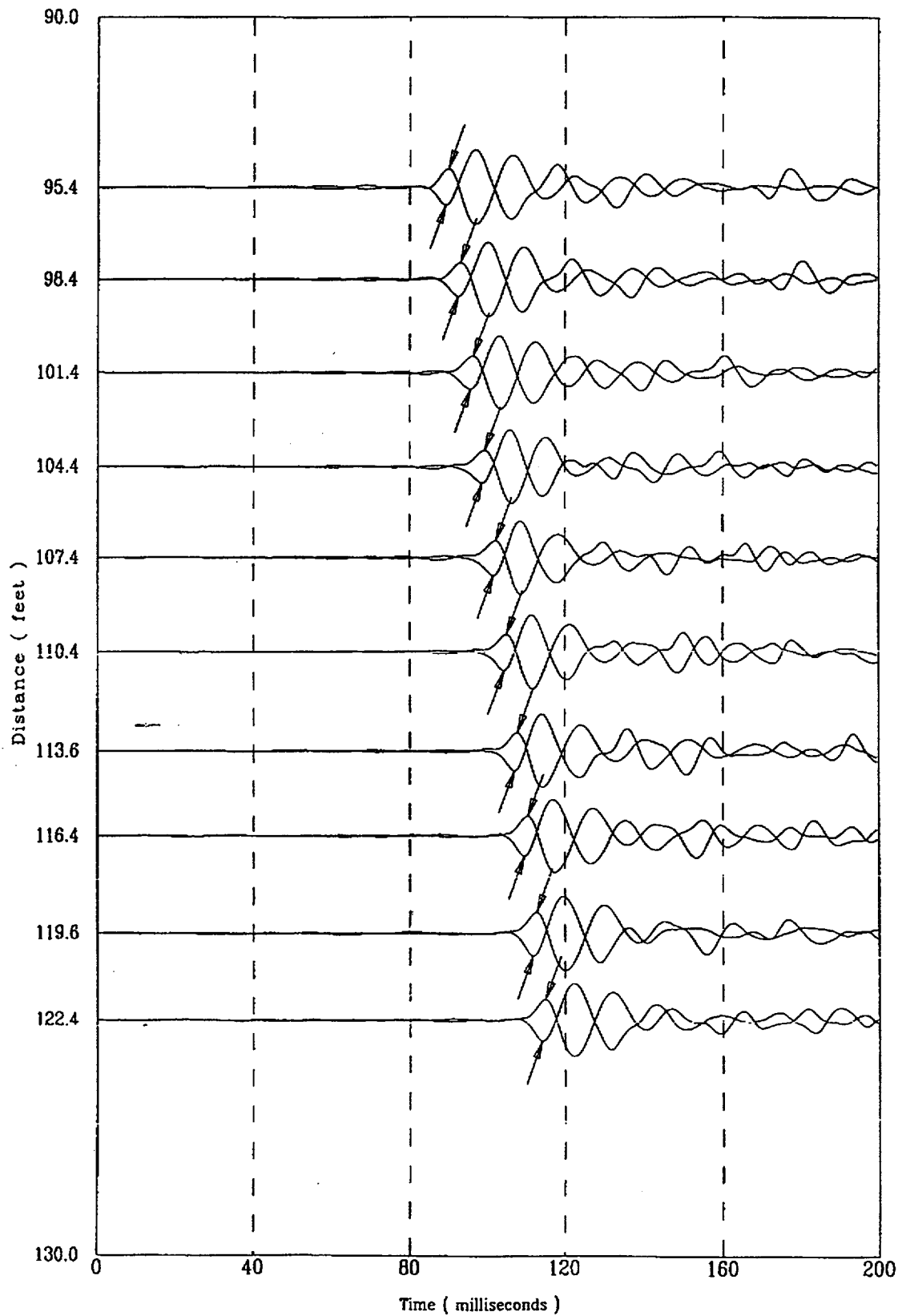
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Applied Research Associates, Inc.
CPT-53

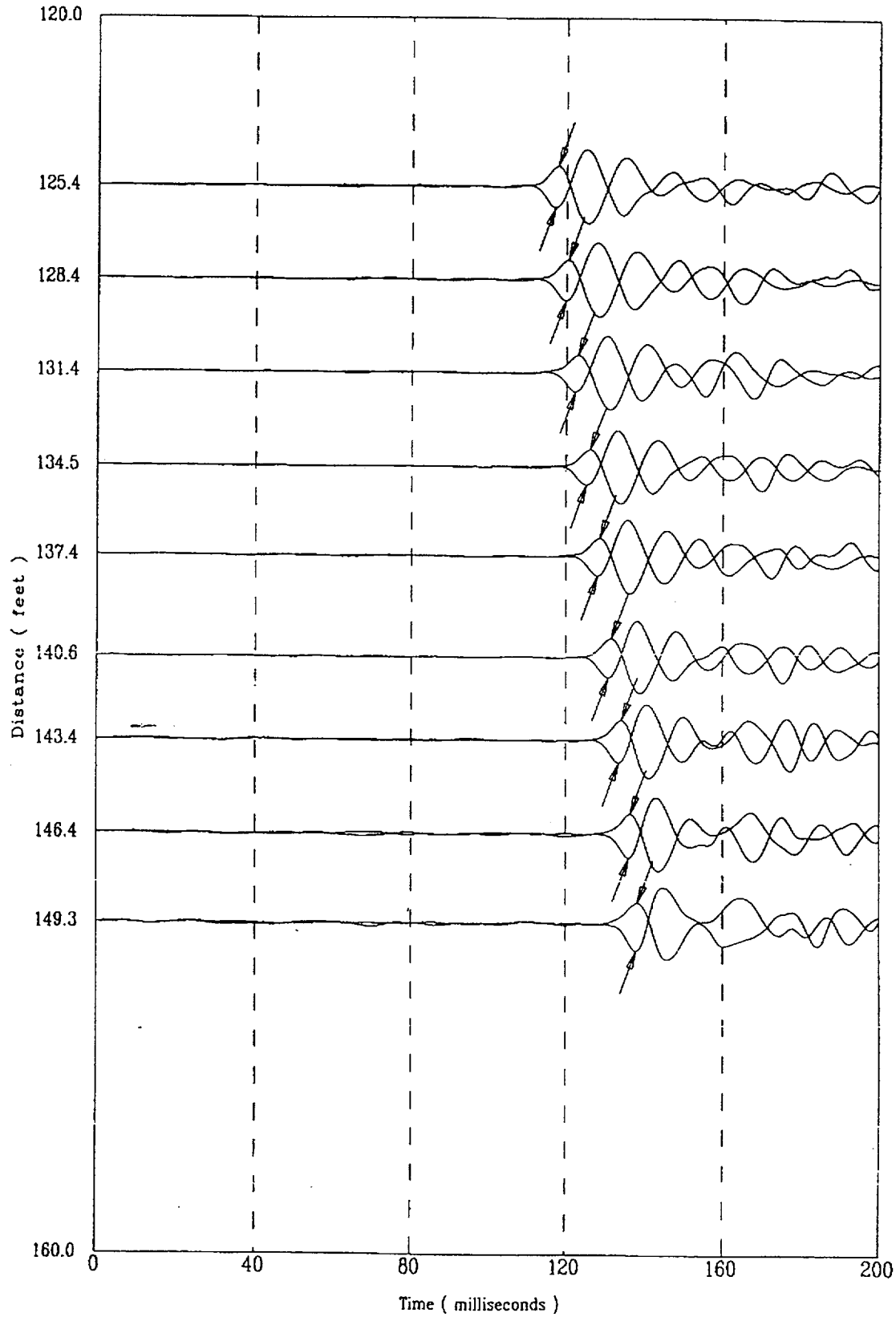
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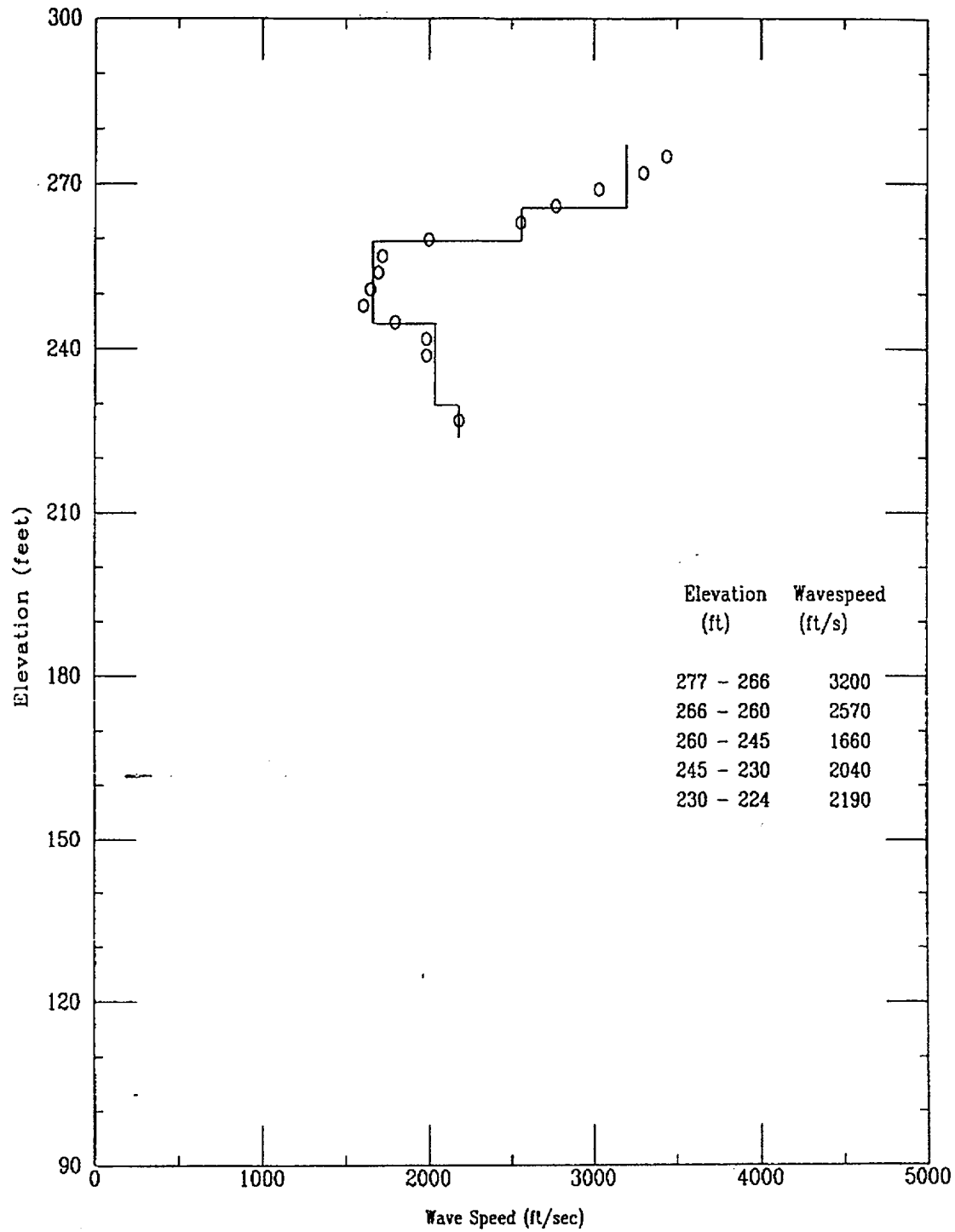
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Applied Research Associates, Inc.
CPT-53

S Wave
03/04/98



Compression Wave Speeds

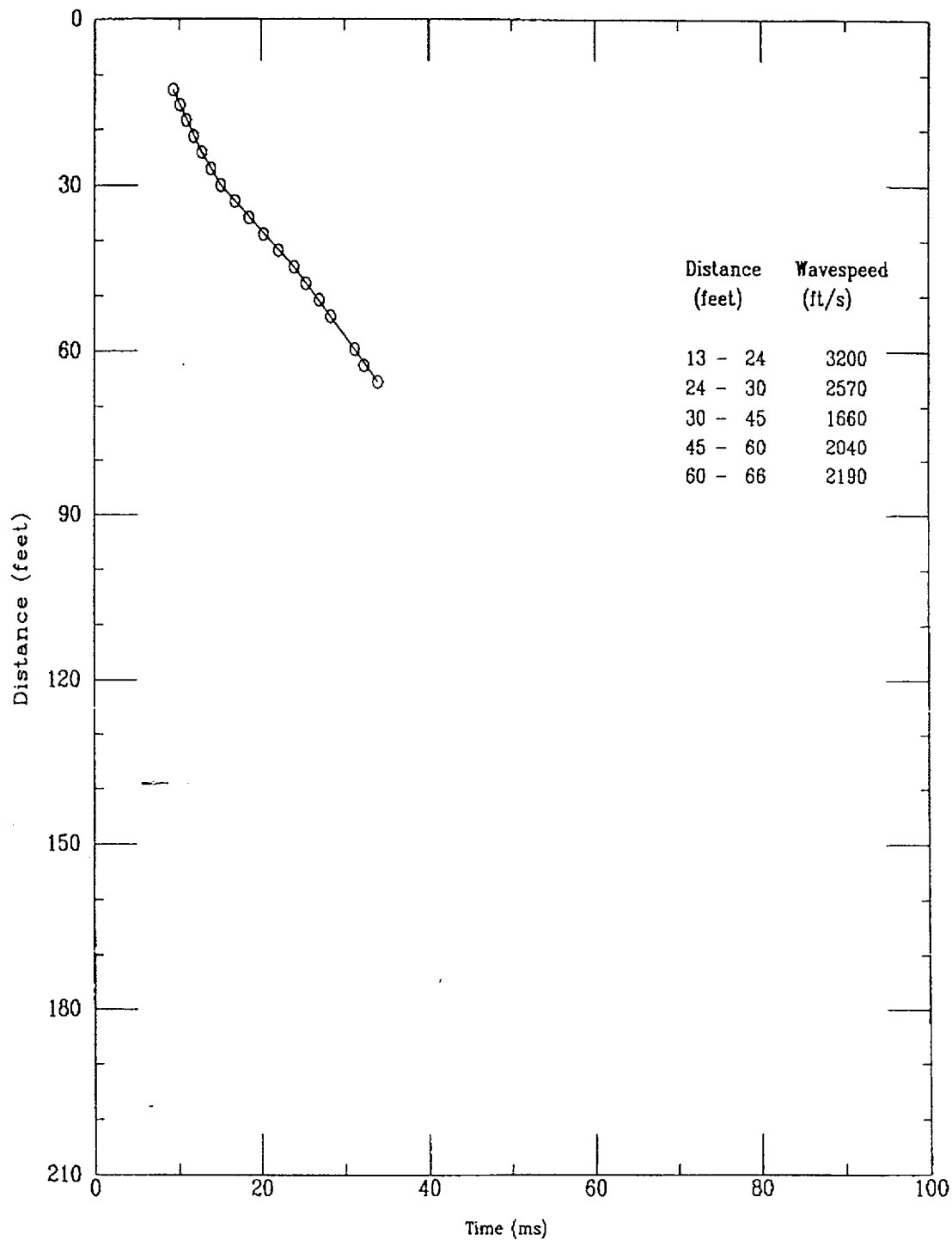


CPT-53

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03/04/98

Compression Wave Time of Peak



File 404m801S

CPT-103

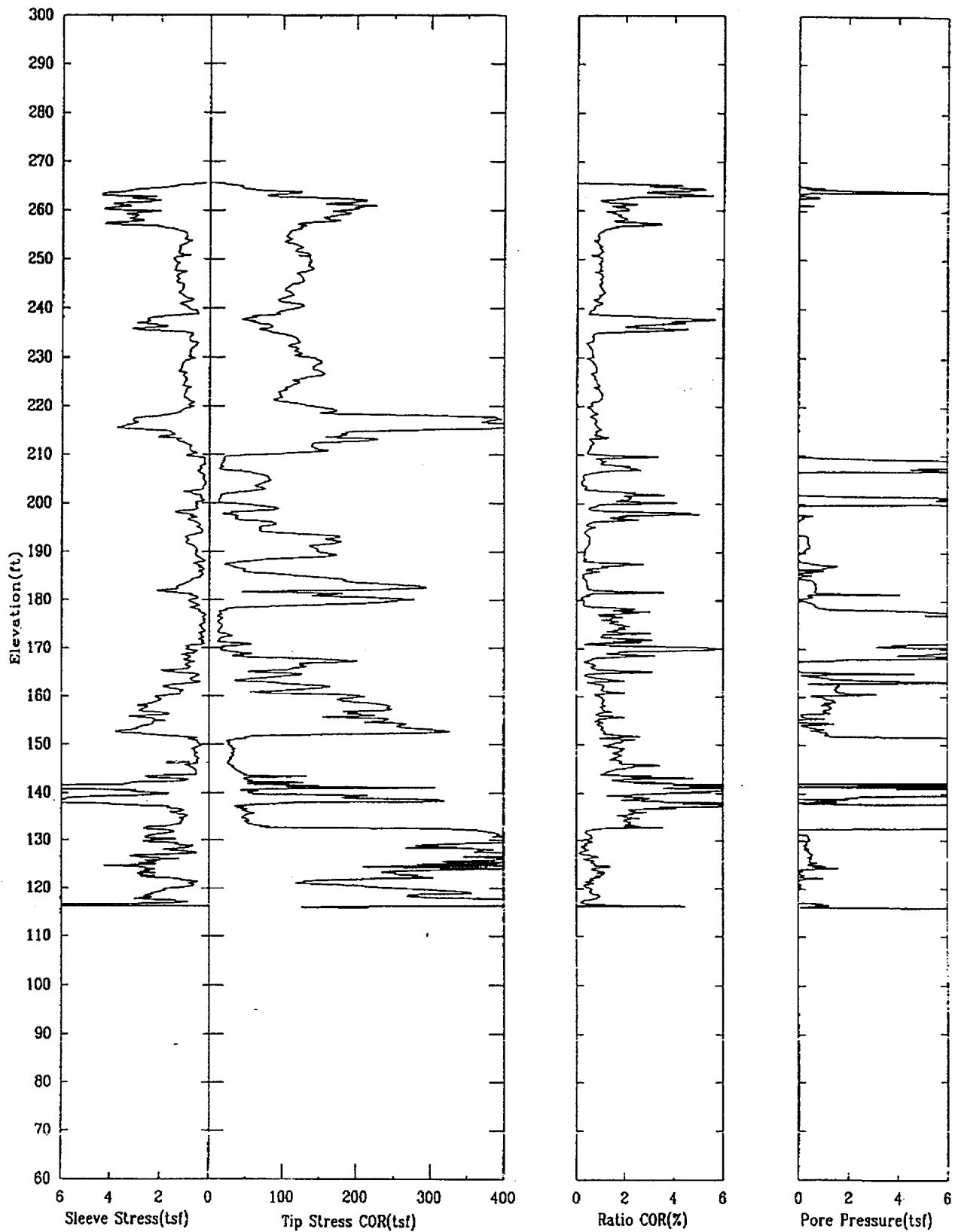
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02/23/98

North 79915.18

East 55260.95

Elevation 271.7



CPT-103

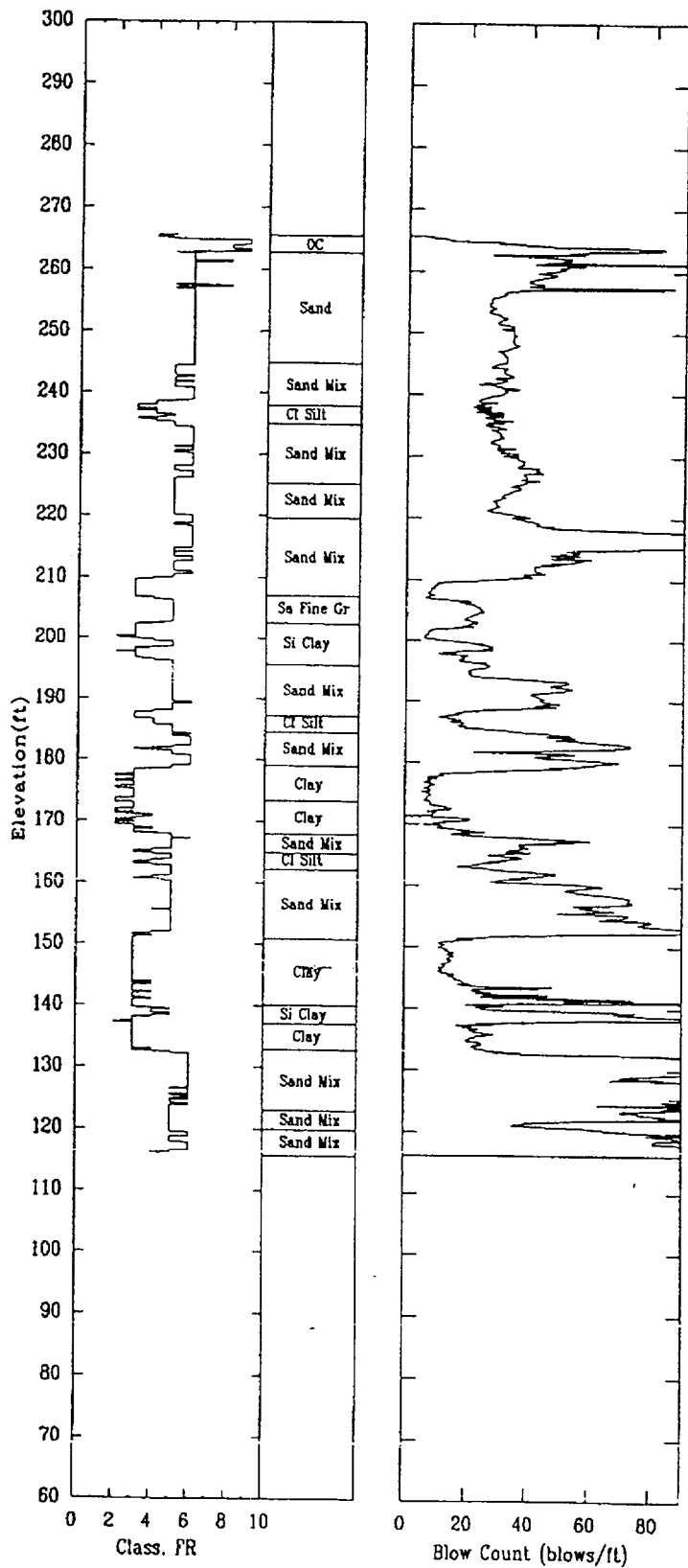
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02/23/98

North 79915.18

East 55260.95

Elevation 271.7

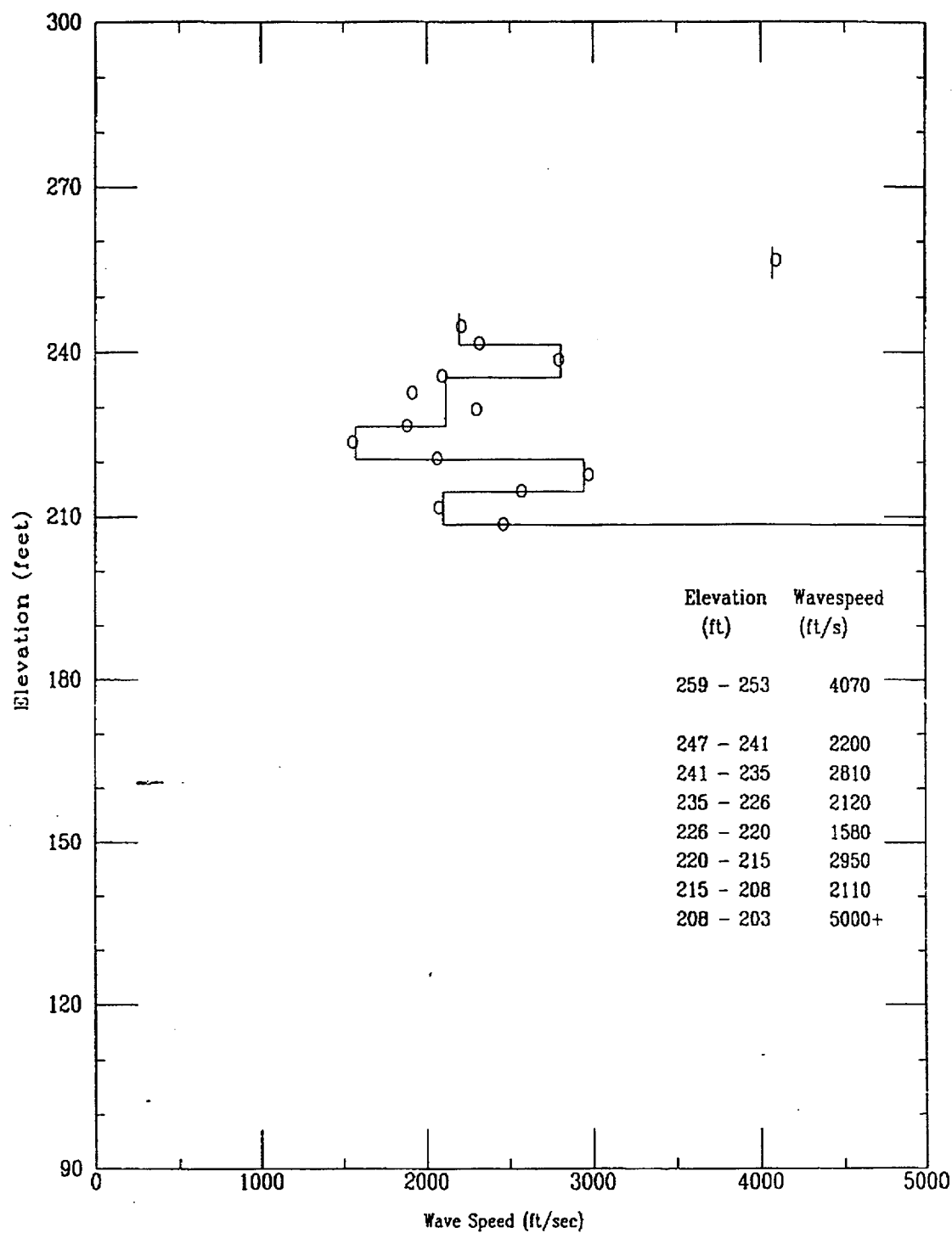


cpt-103

APPLIED RESEARCH ASSOCIATES, INC.

02/23/98

Compression Wave Speeds

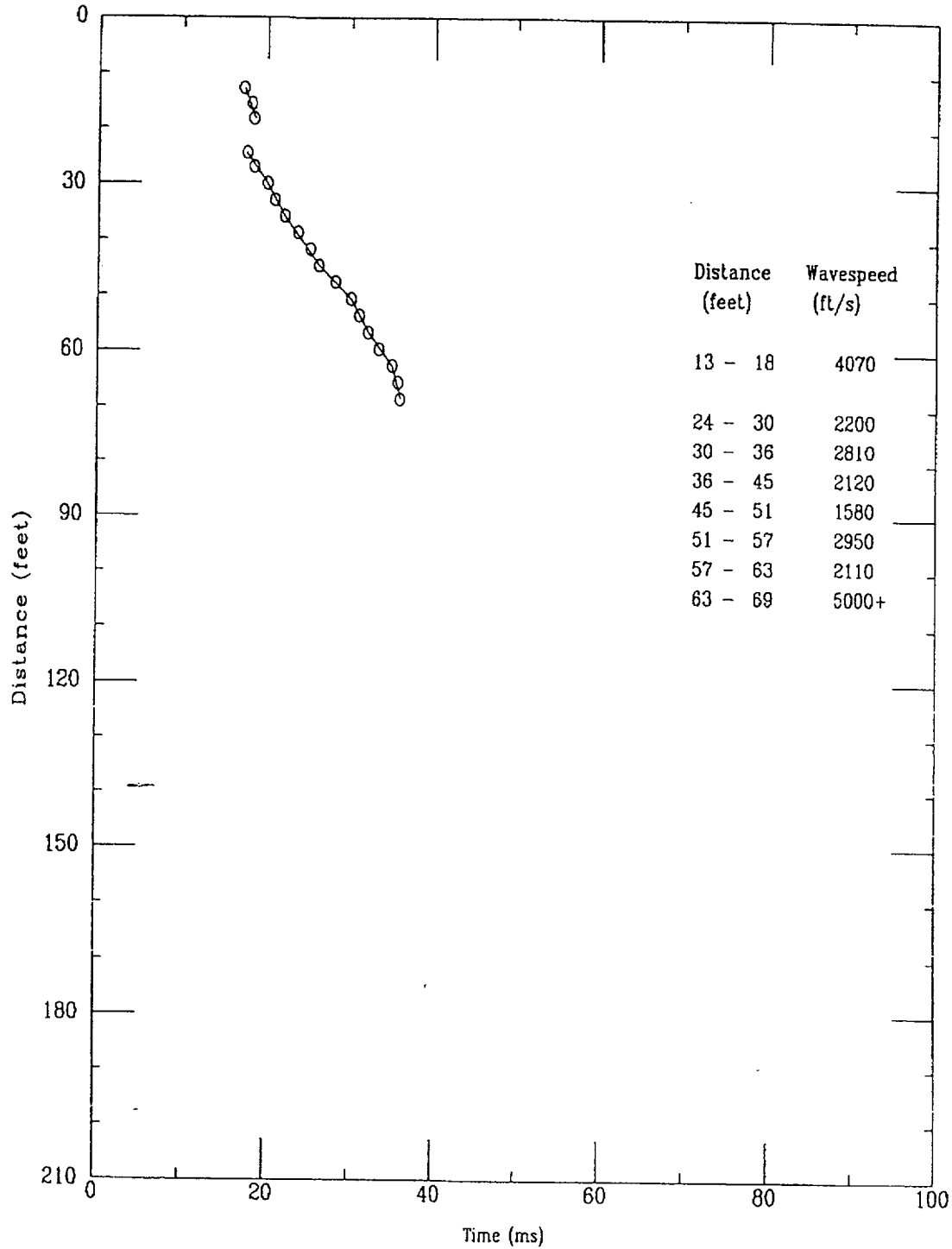


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cpt-103

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Compression Wave Time of Peak

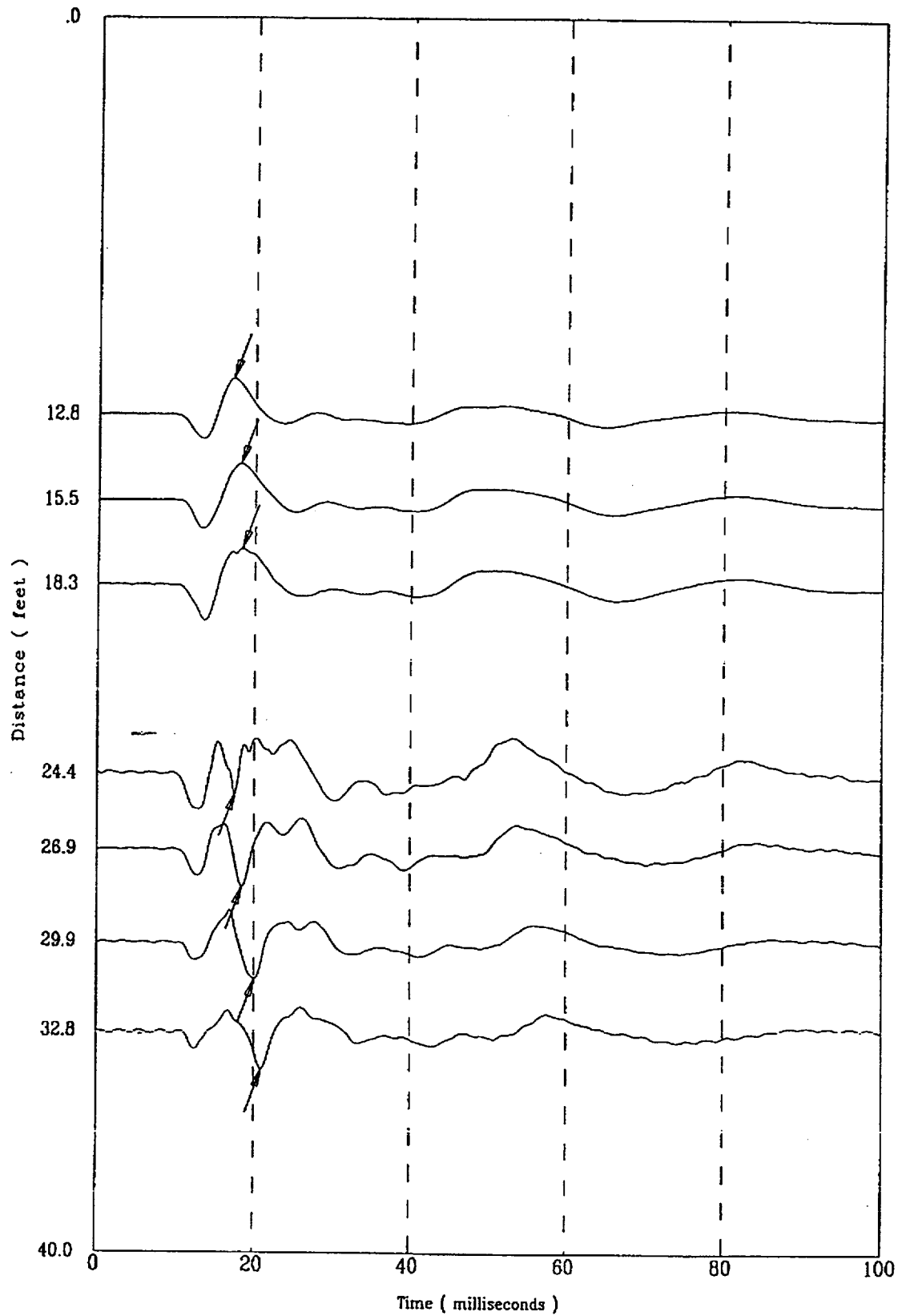
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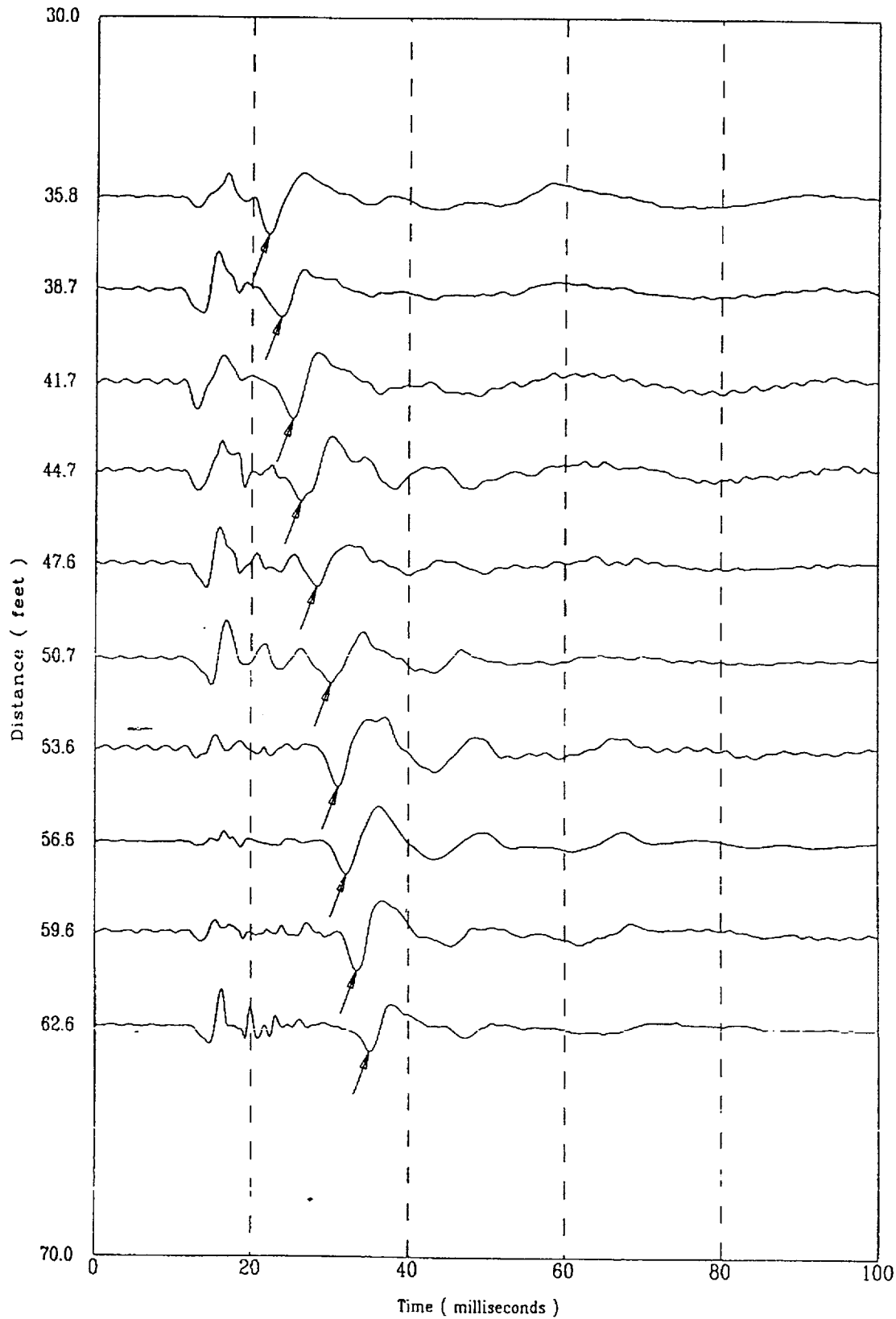
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CPT-103

P Wave
02/23/98



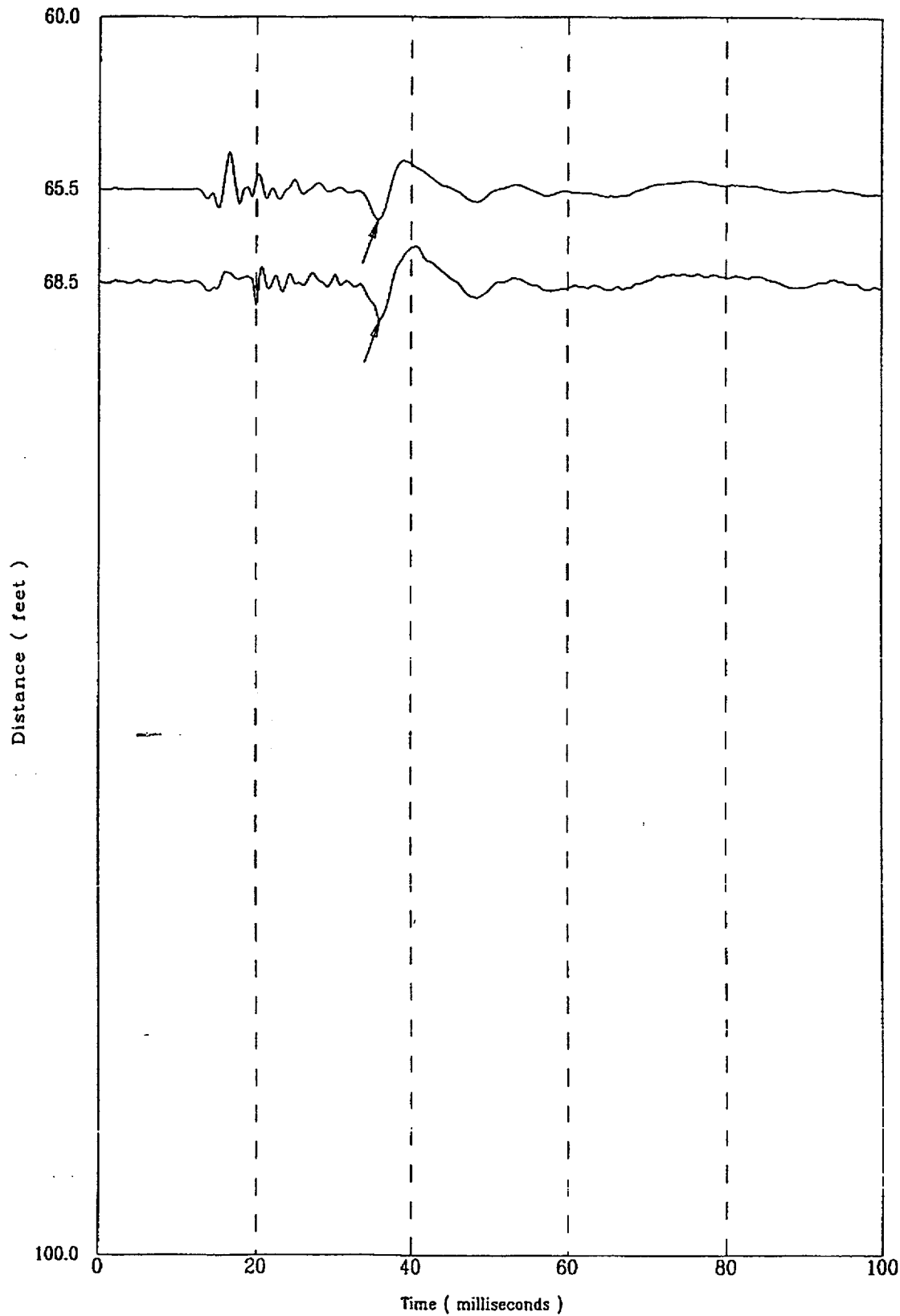
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CPT-103

P Wave
02/23/98



Applied Research Associates, Inc.
CPT-103

P Wave
02/23/98



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CPT-104

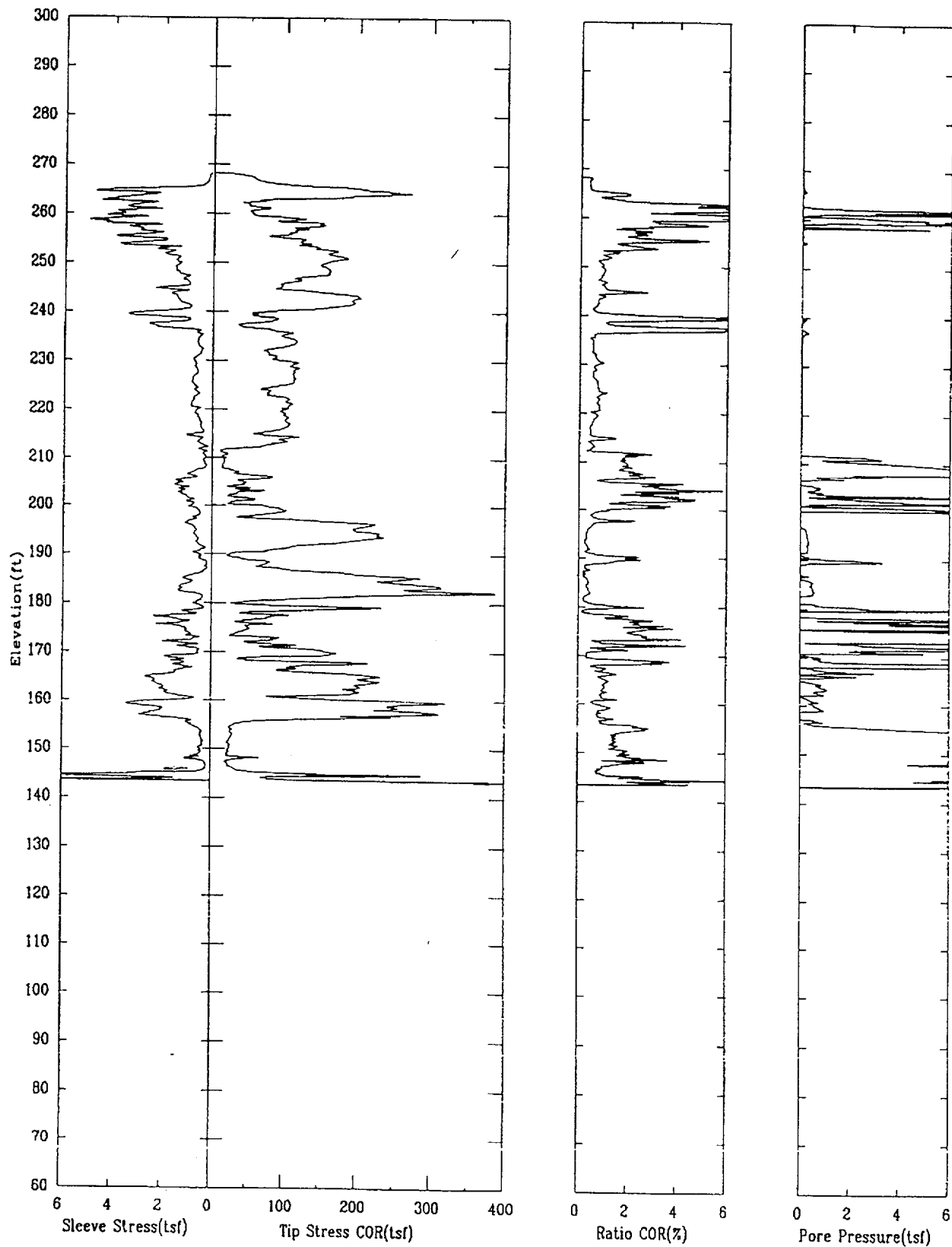
APPLIED RESEARCH ASSOCIATES, INC.

02/20/98

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East 55385.03

Elevation 274.2



CPT-104

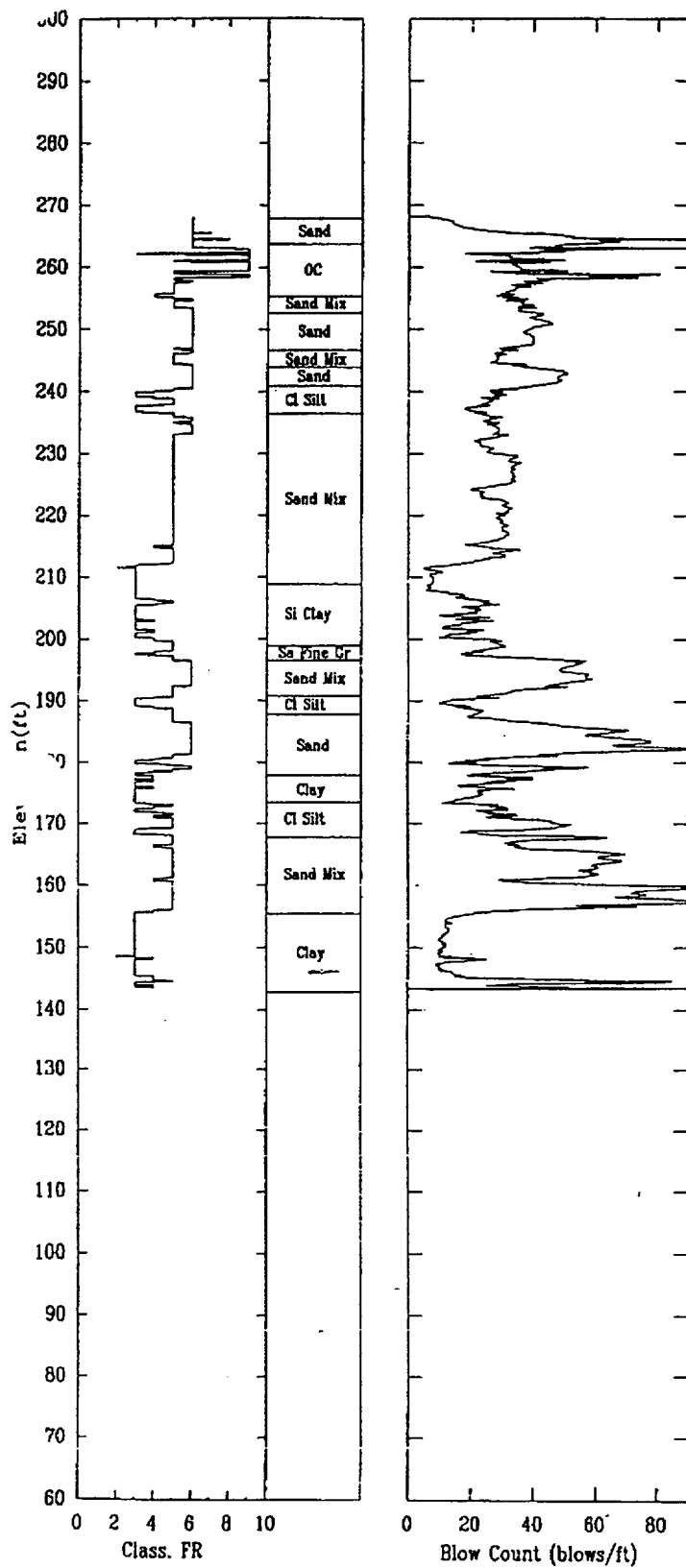
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02/20/98

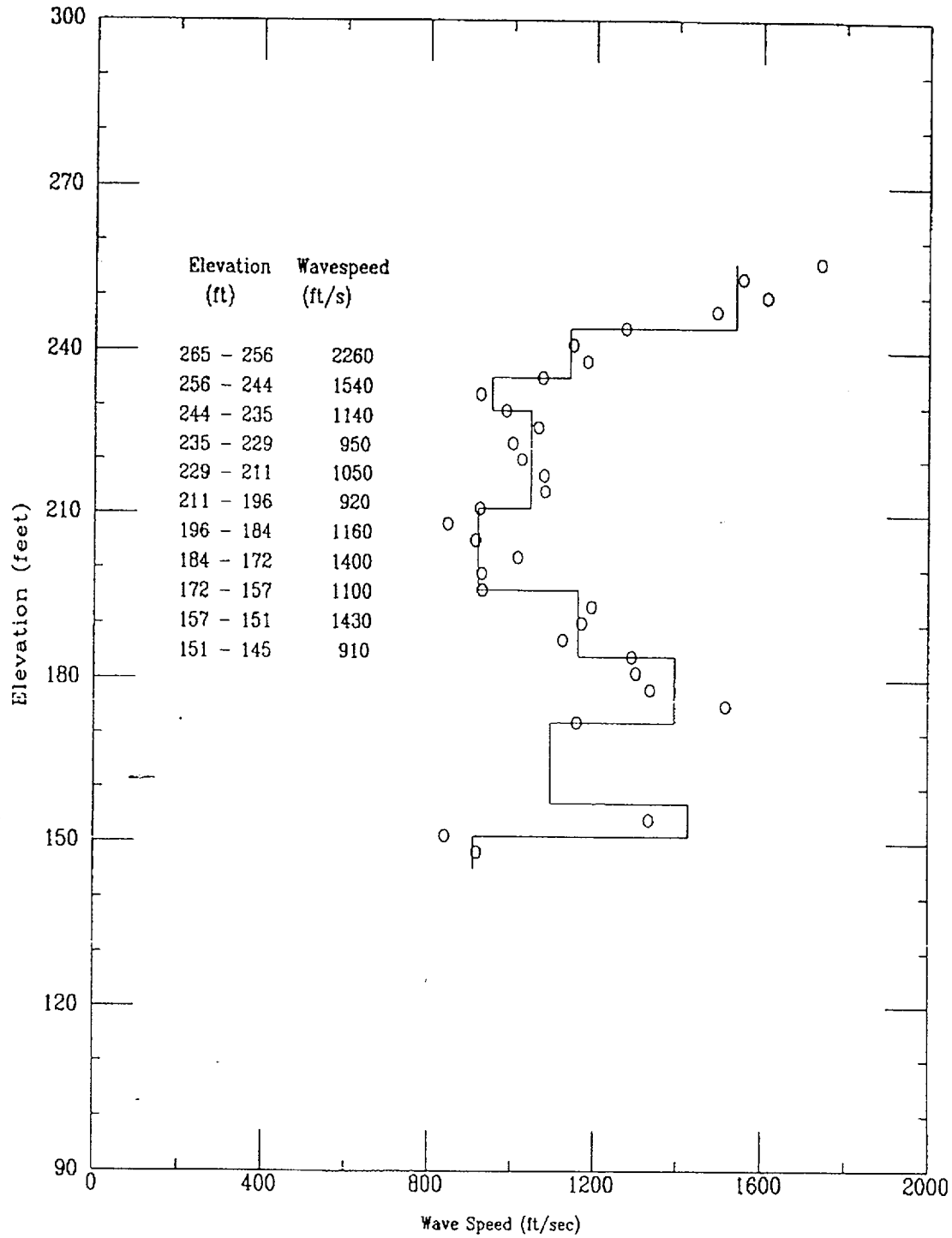
North 79915.04

East 55385.03

Elevation 274.2



Shear Wave Speeds

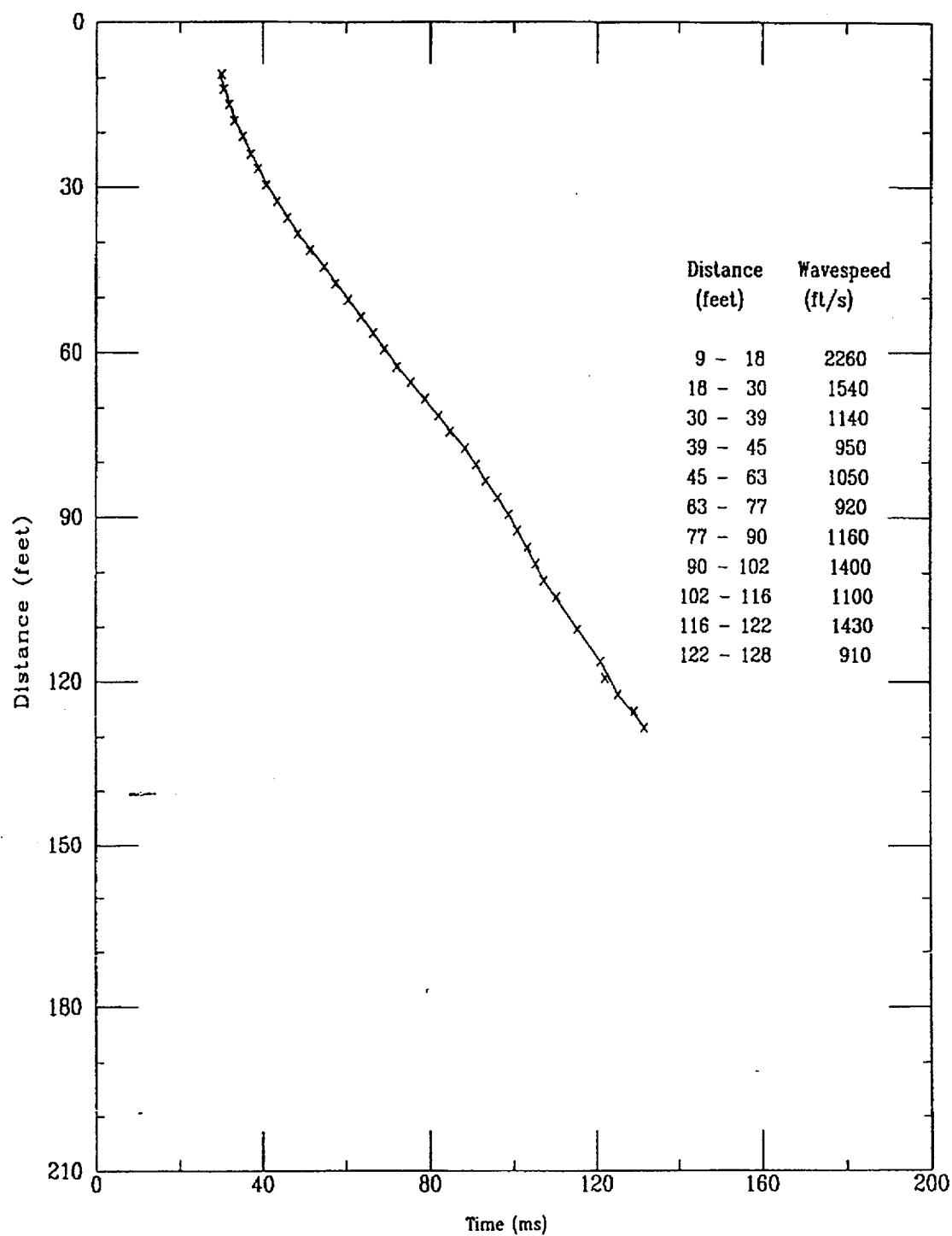


CPT-104

APPLIED RESEARCH ASSOCIATES, INC.

02/20/98

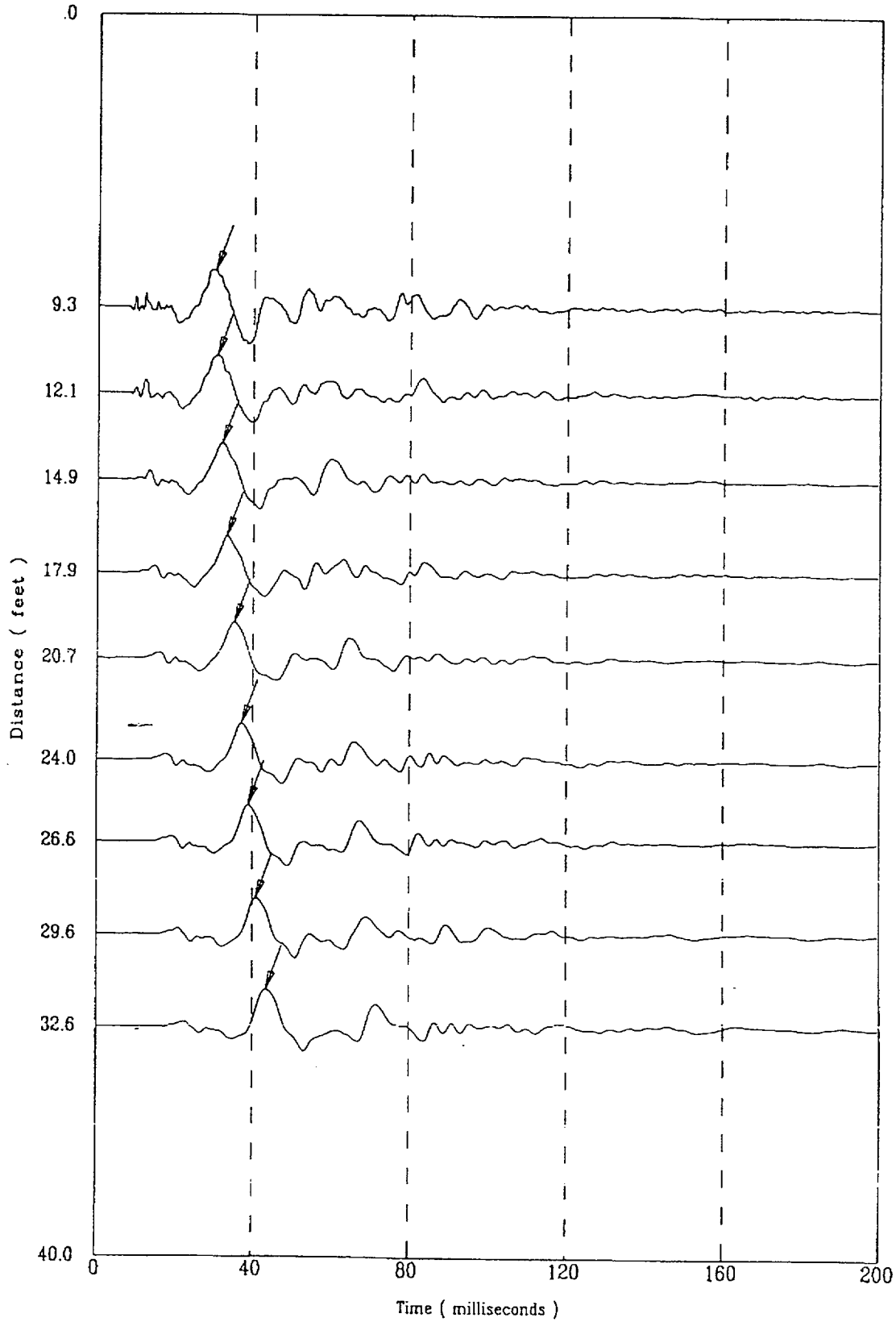
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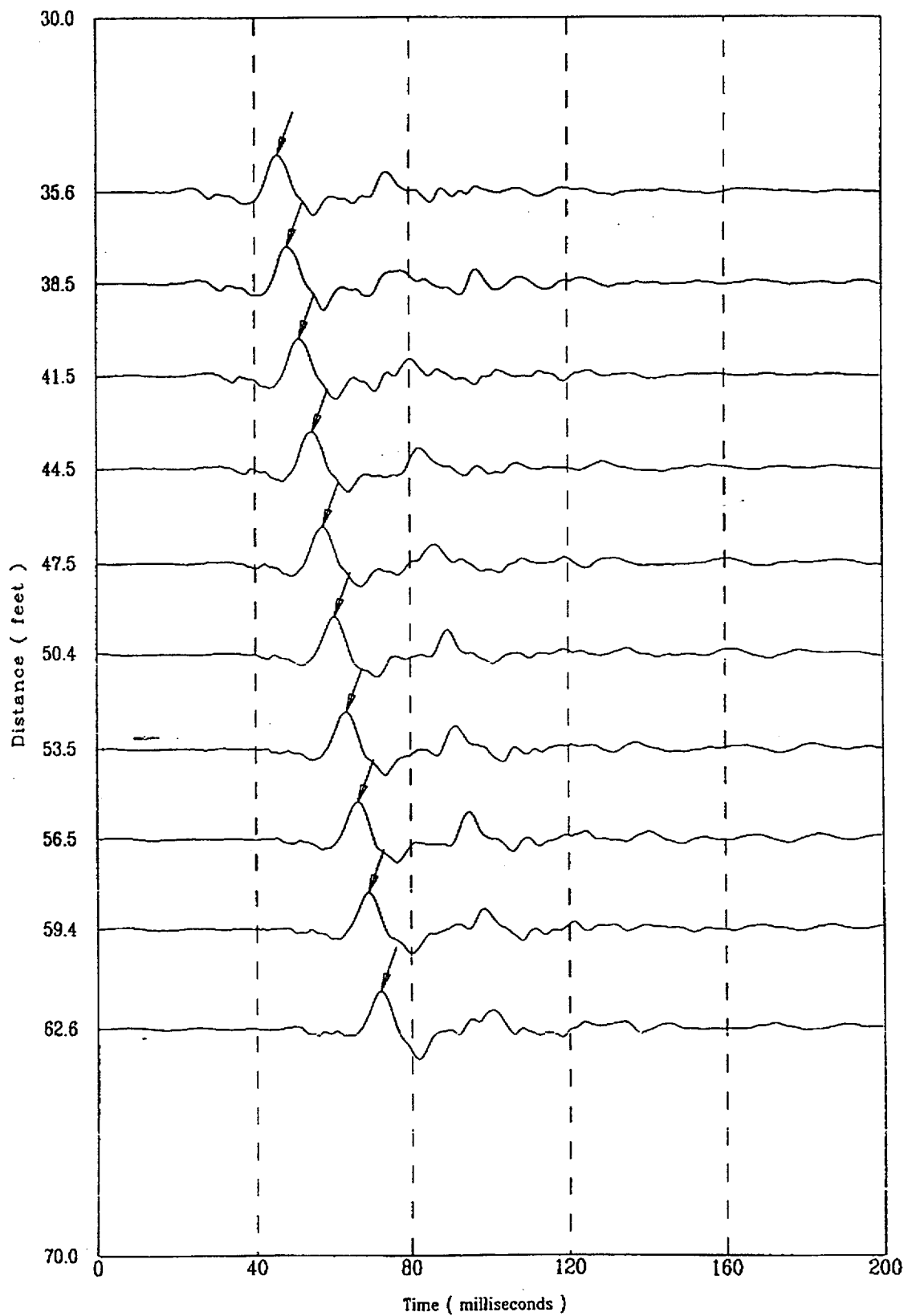


File 420F8025

Applied Research Associates, Inc.
CPT-104

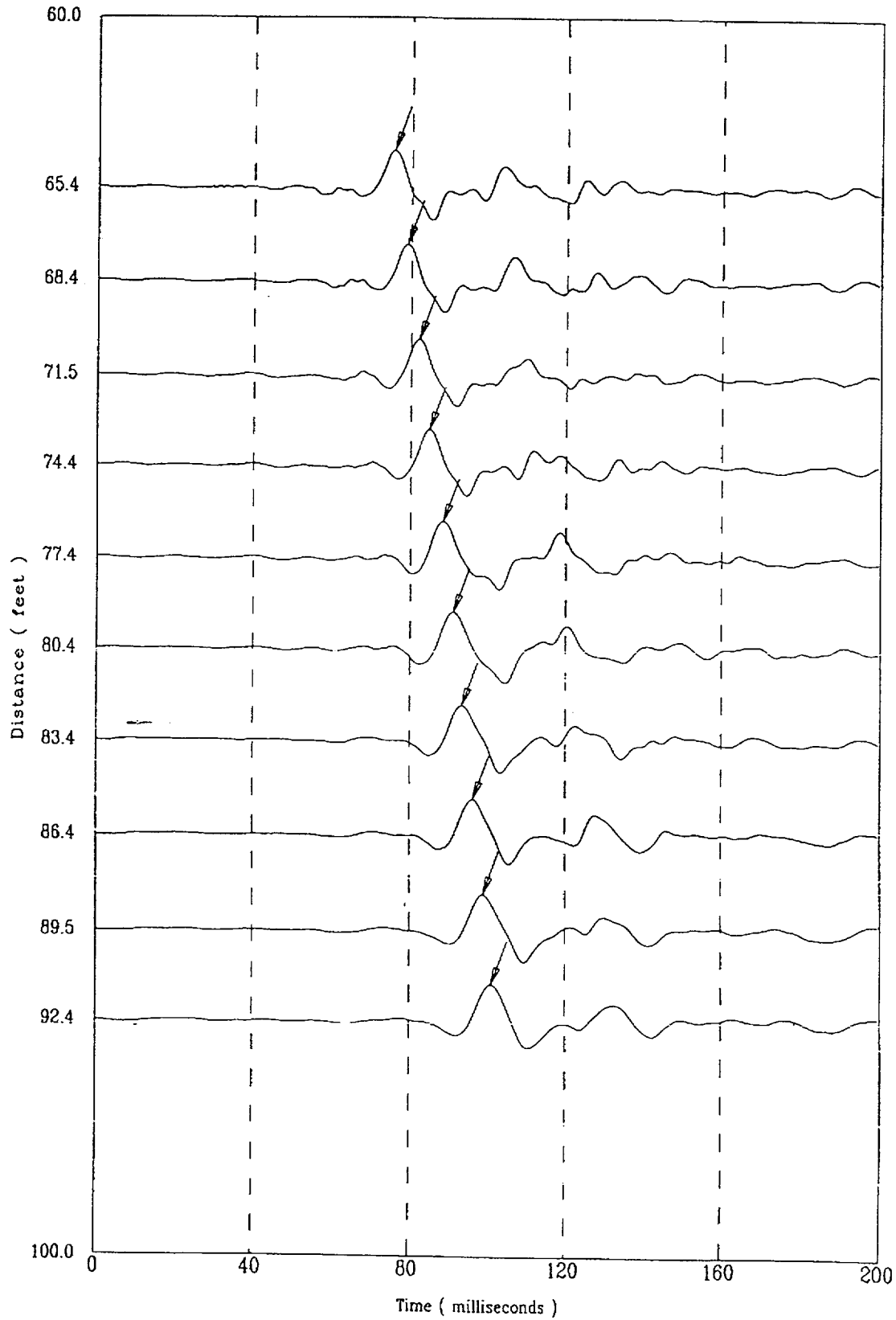
S Wave
02/20/98

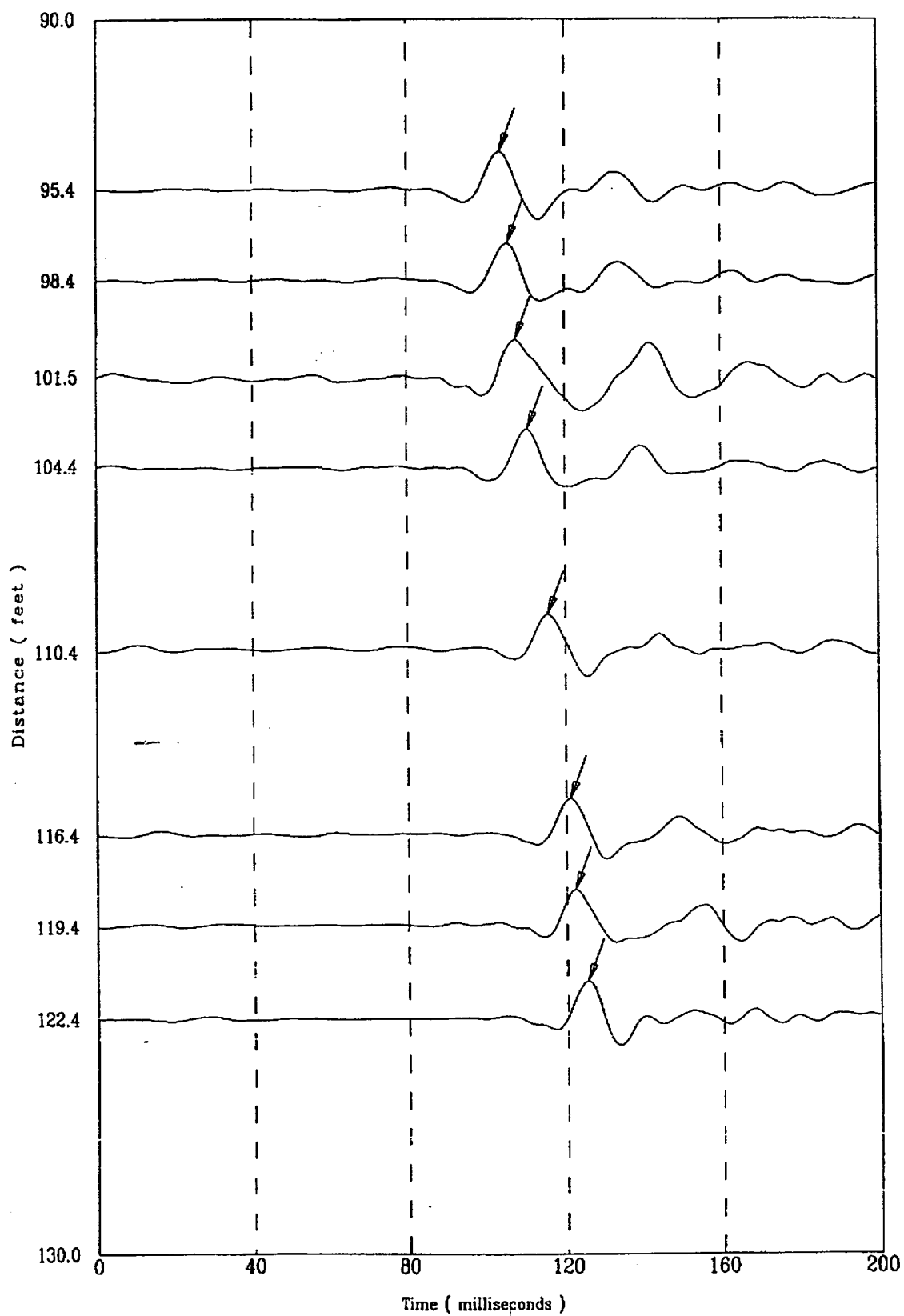




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CPT-104

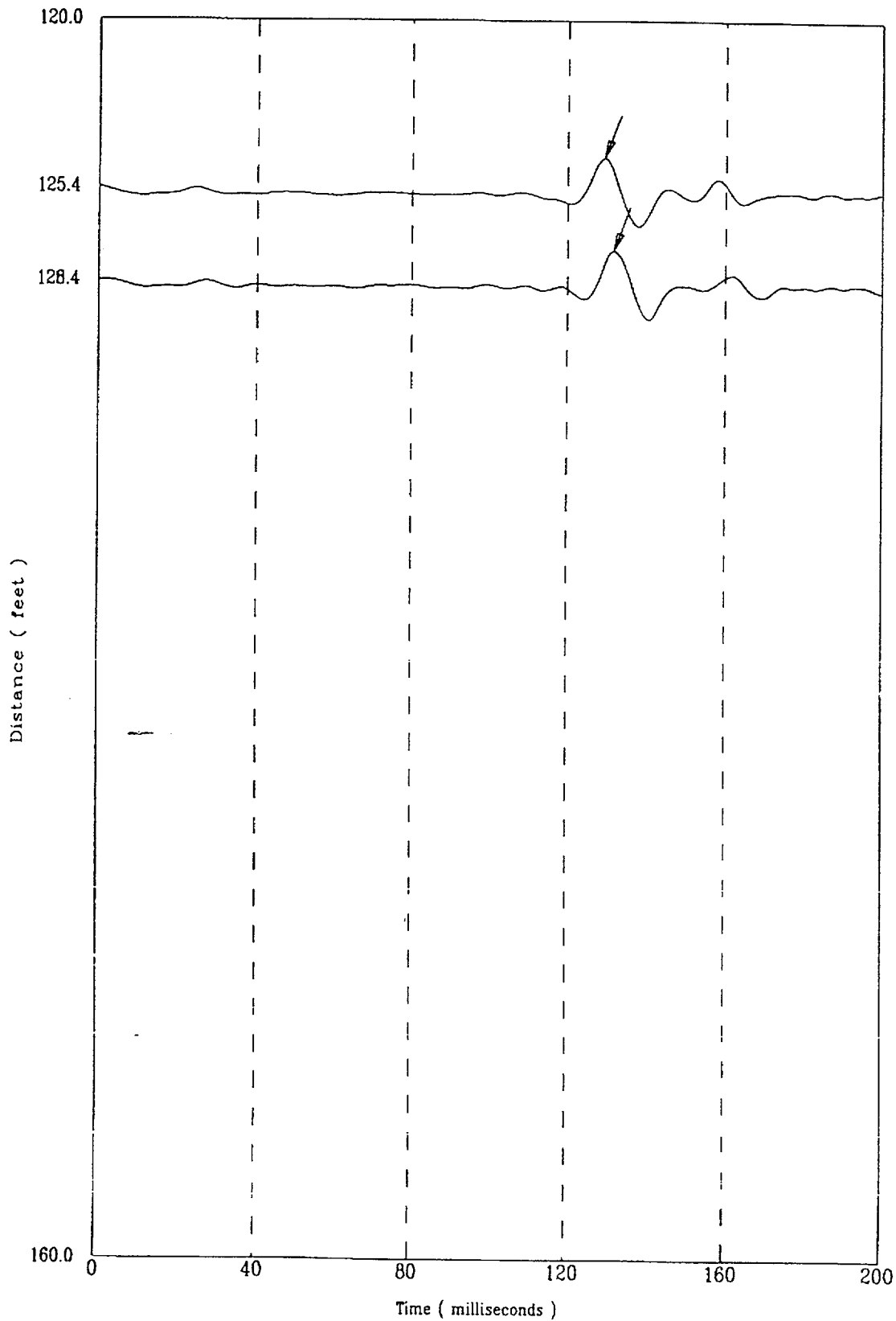
S Wave
02/20/98





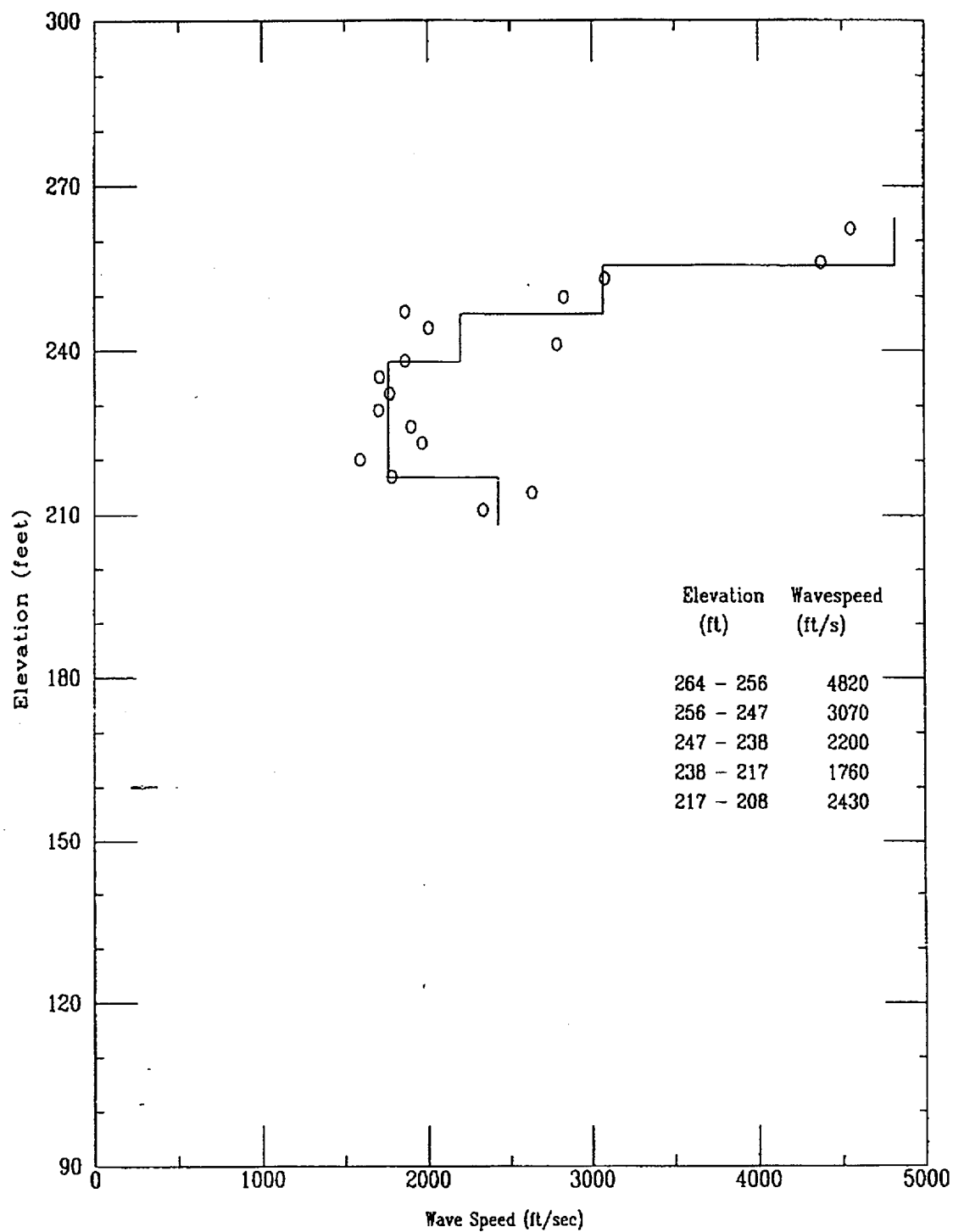
Applied Research Associates, Inc.
CPT-104

S Wave
02/20/98



File 420F802S

Compression Wave Speeds

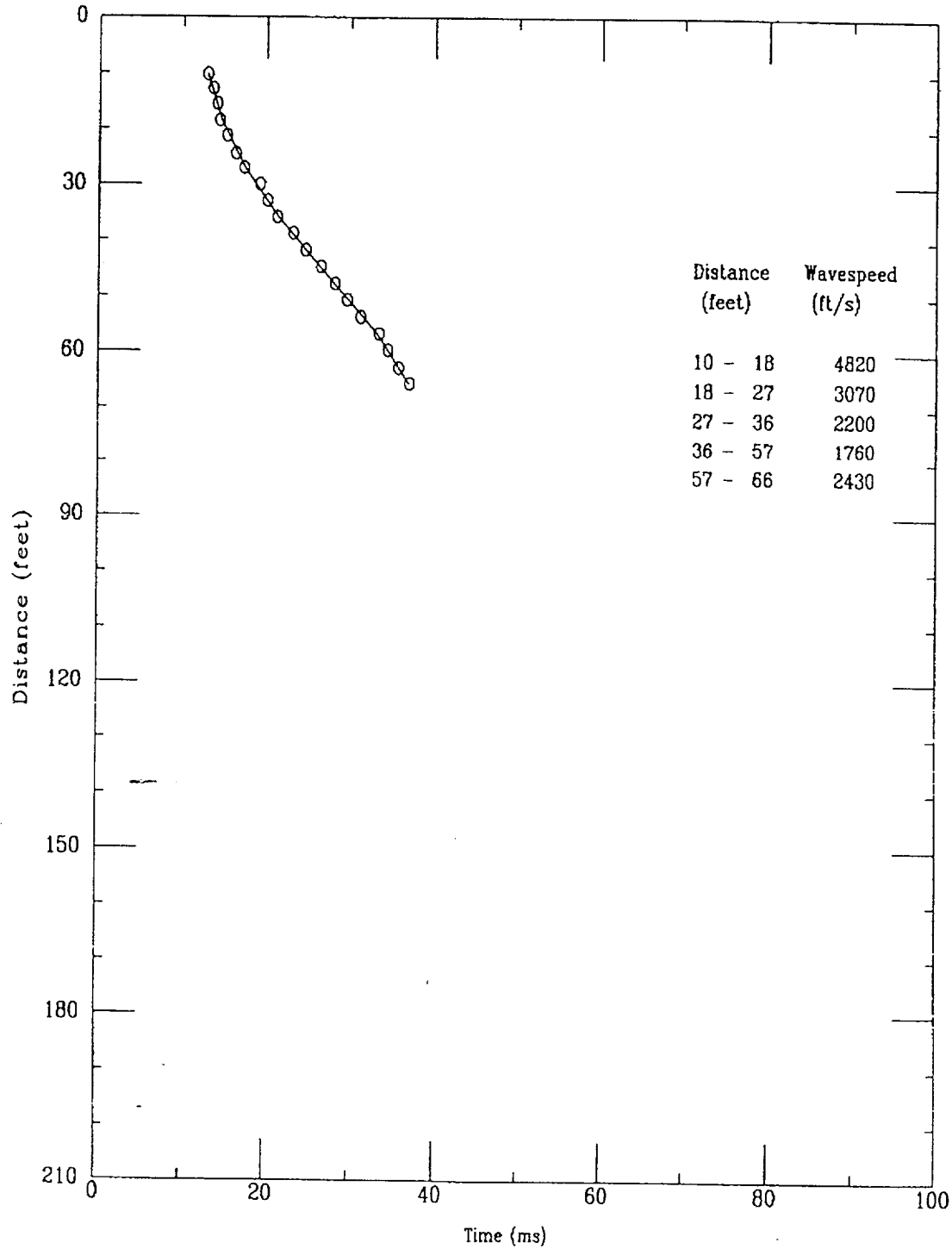


CPT-104

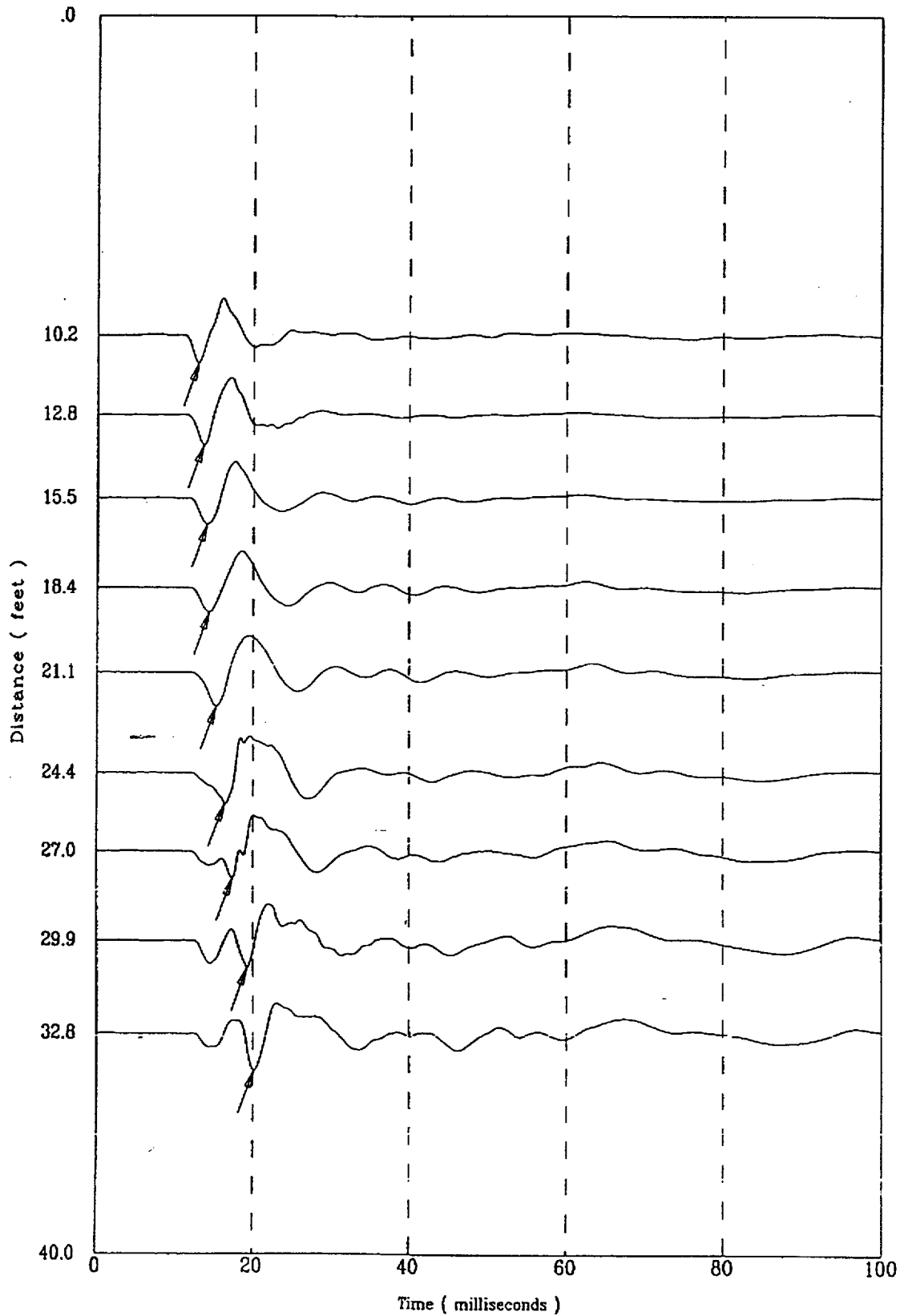
APPLIED RESEARCH ASSOCIATES, INC.

02/20/98

Compression Wave Time of Peak

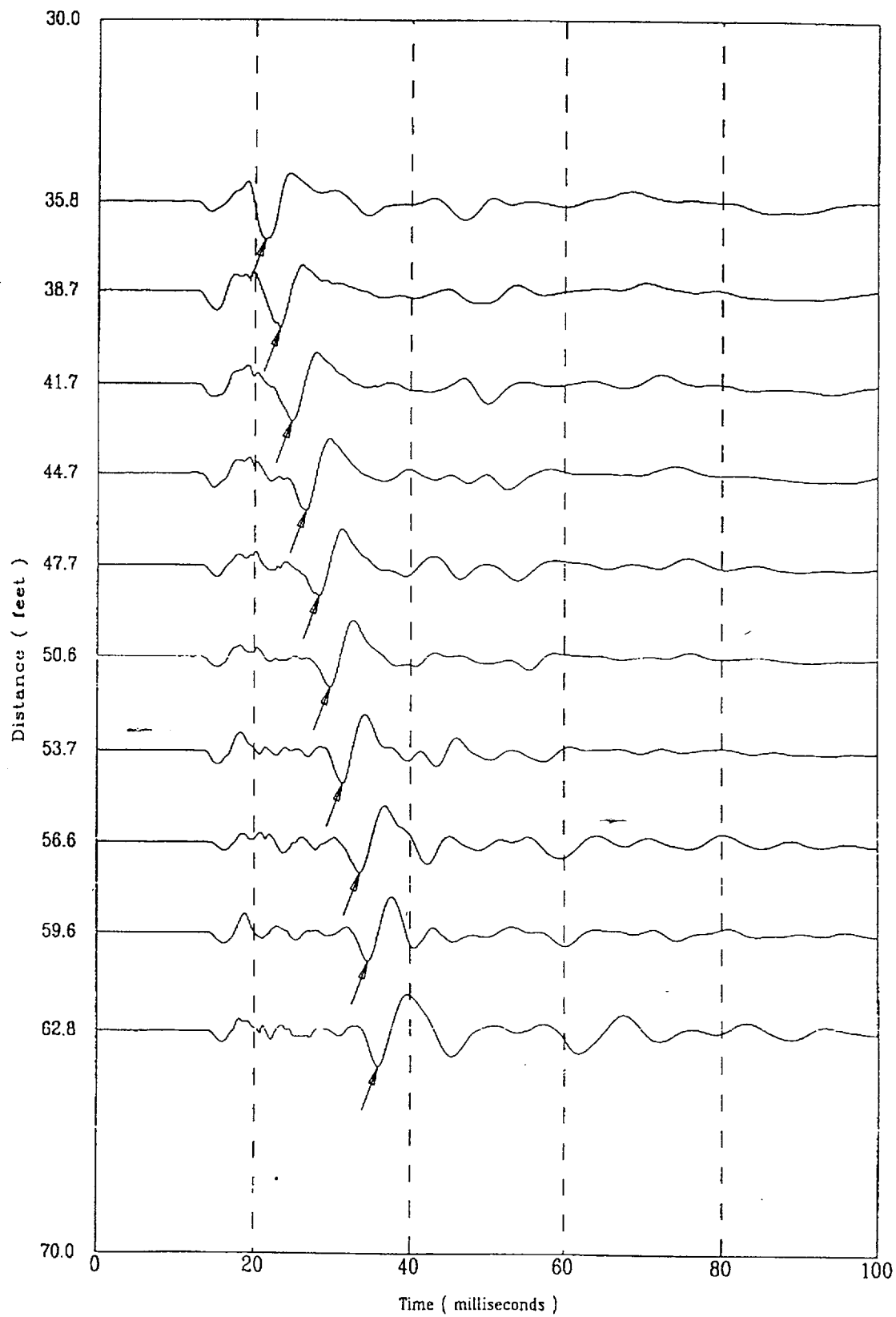


File 420f8025



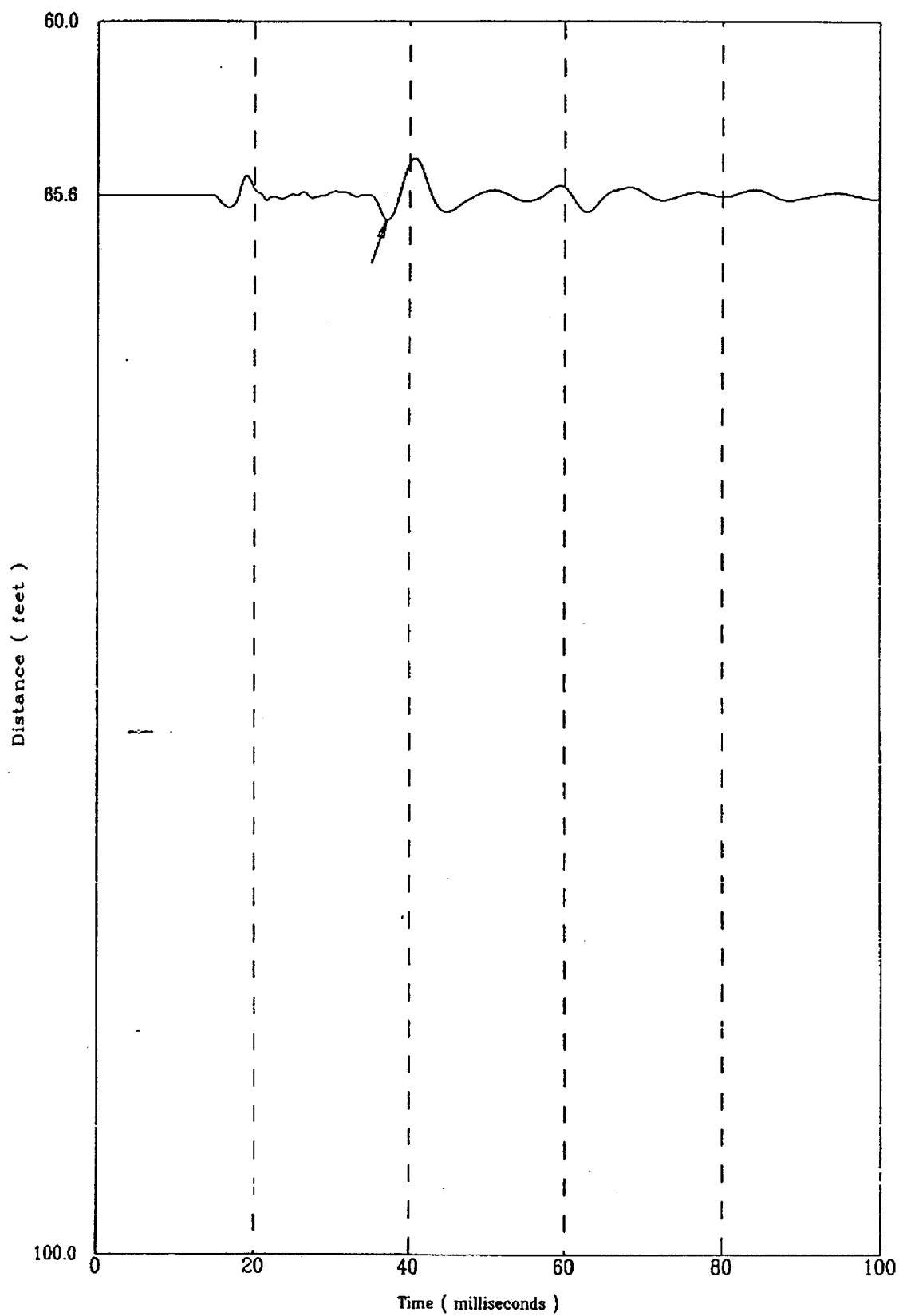
Applied Research Associates, Inc.
CPT-104

P Wave
02/20/98



Applied Research Associates, Inc.
CPT-104

P Wave
02/20/98



File 420f802S

CPT-113

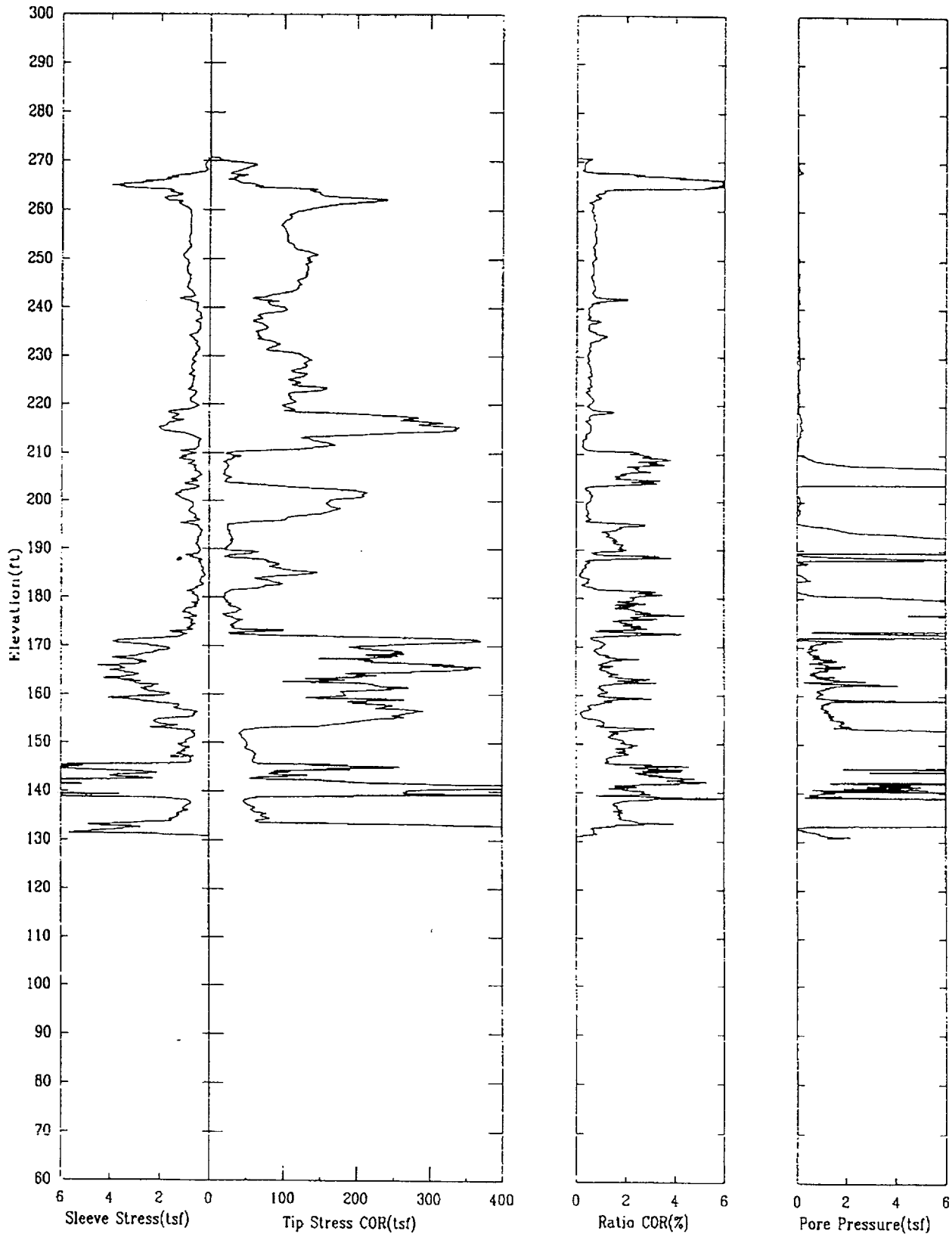
APPLIED RESEARCH ASSOCIATES, INC.

02/19/98

North 79781.00

East 54825.10

Elevation 276.7



CPT-113

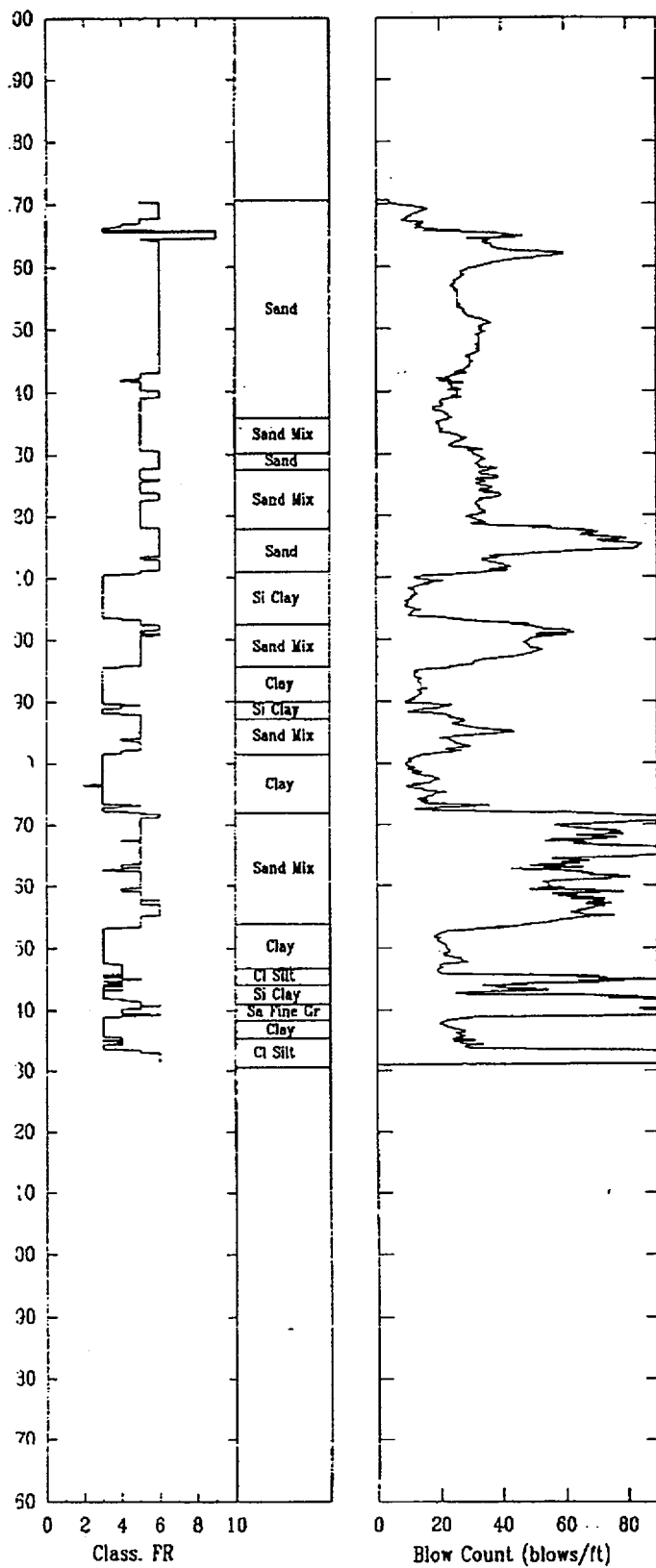
APPLIED RESEARCH ASSOCIATES, INC.

02/19/98

North 79781.00

East 54825.10

Elevation 276.7

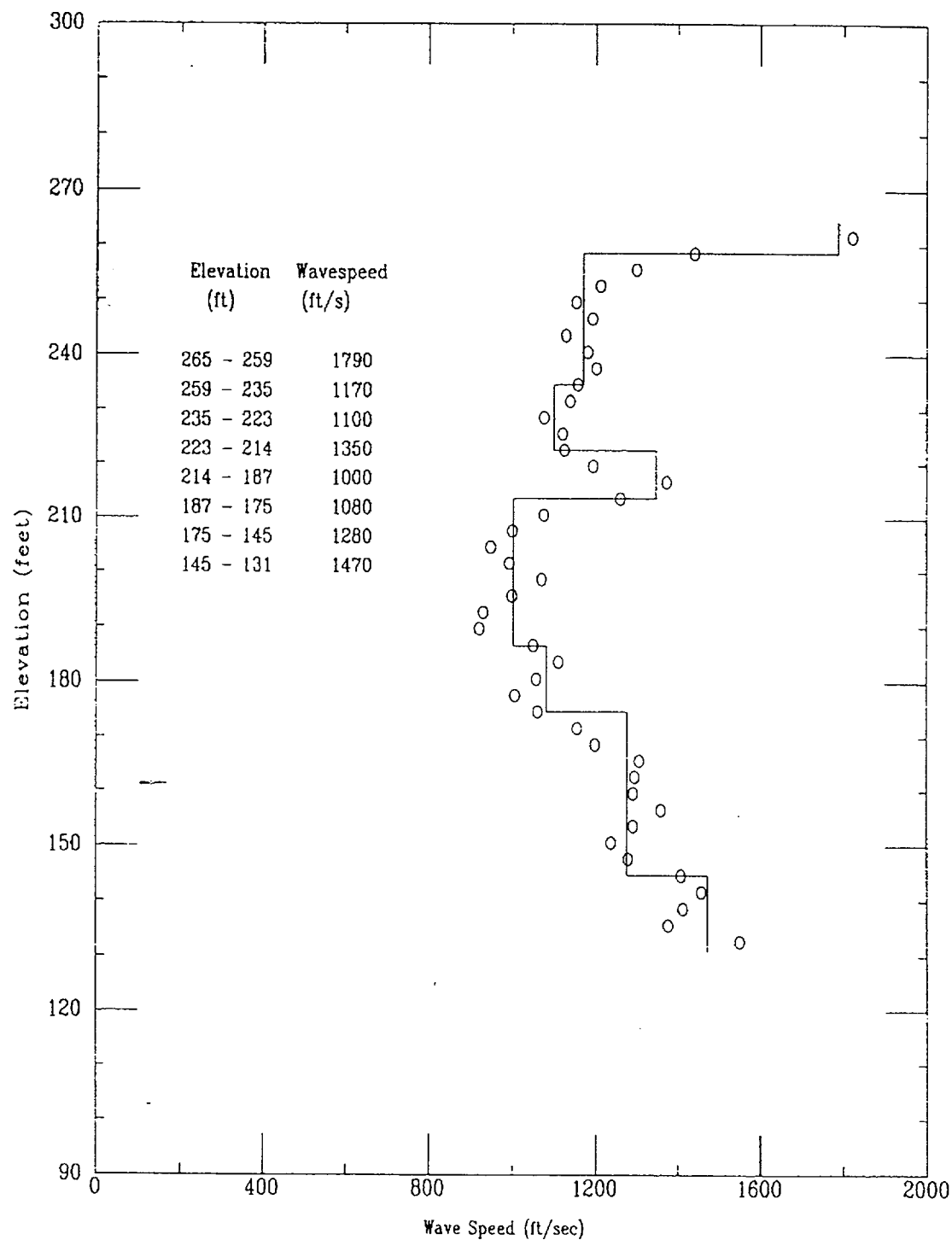


CPT-113

APPLIED RESEARCH ASSOCIATES, INC.

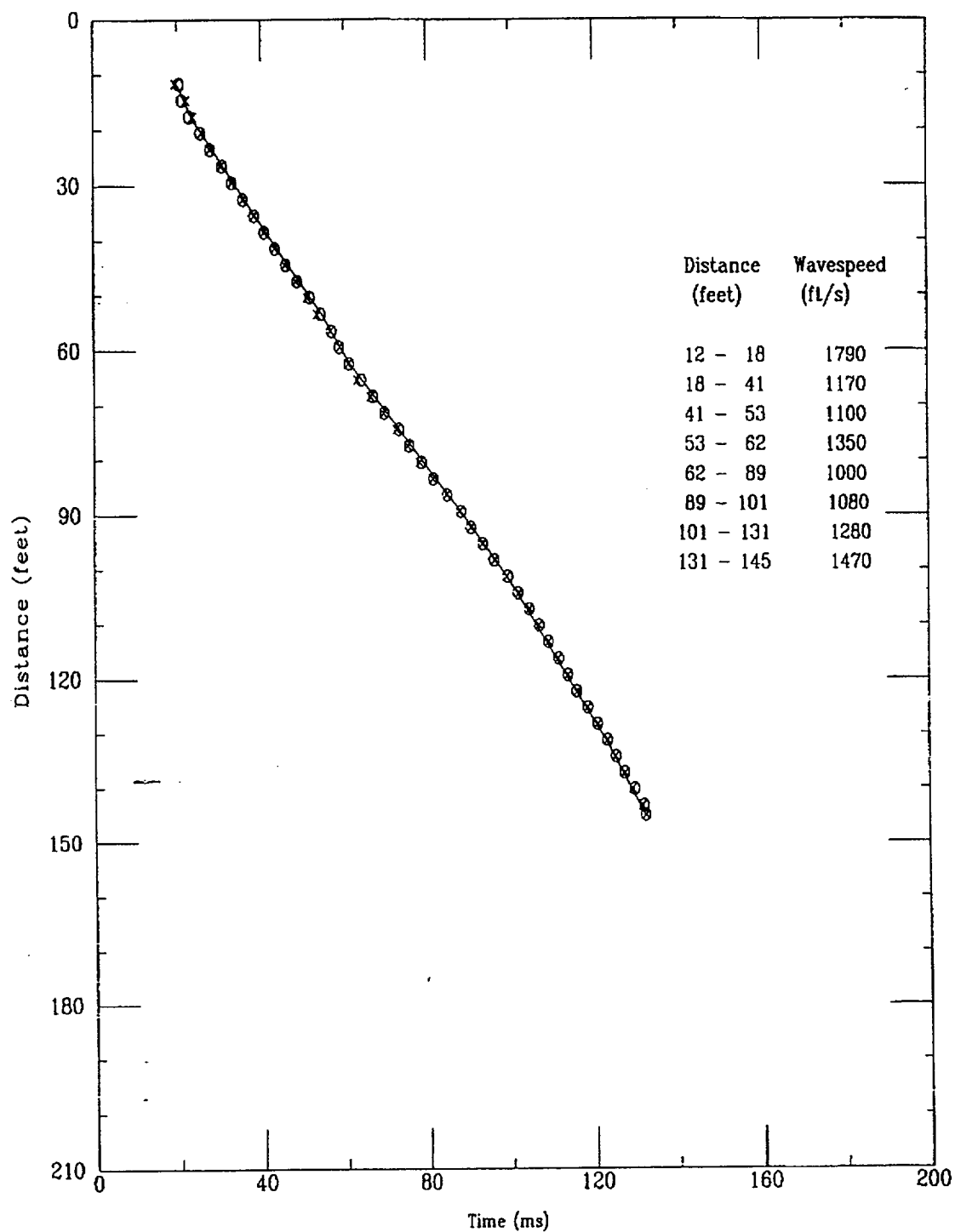
02/19/98

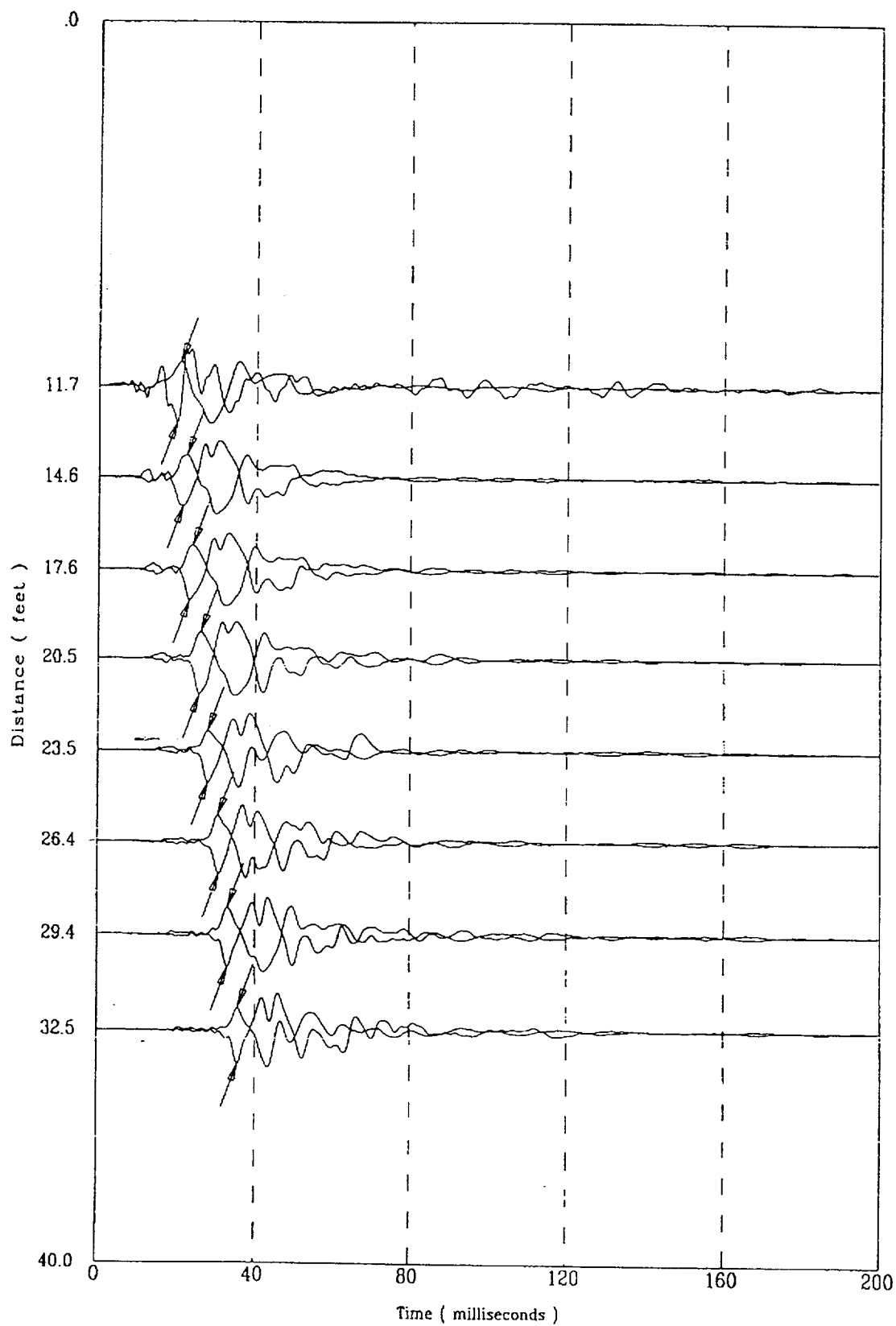
Shear Wave Speeds



File 519f801S

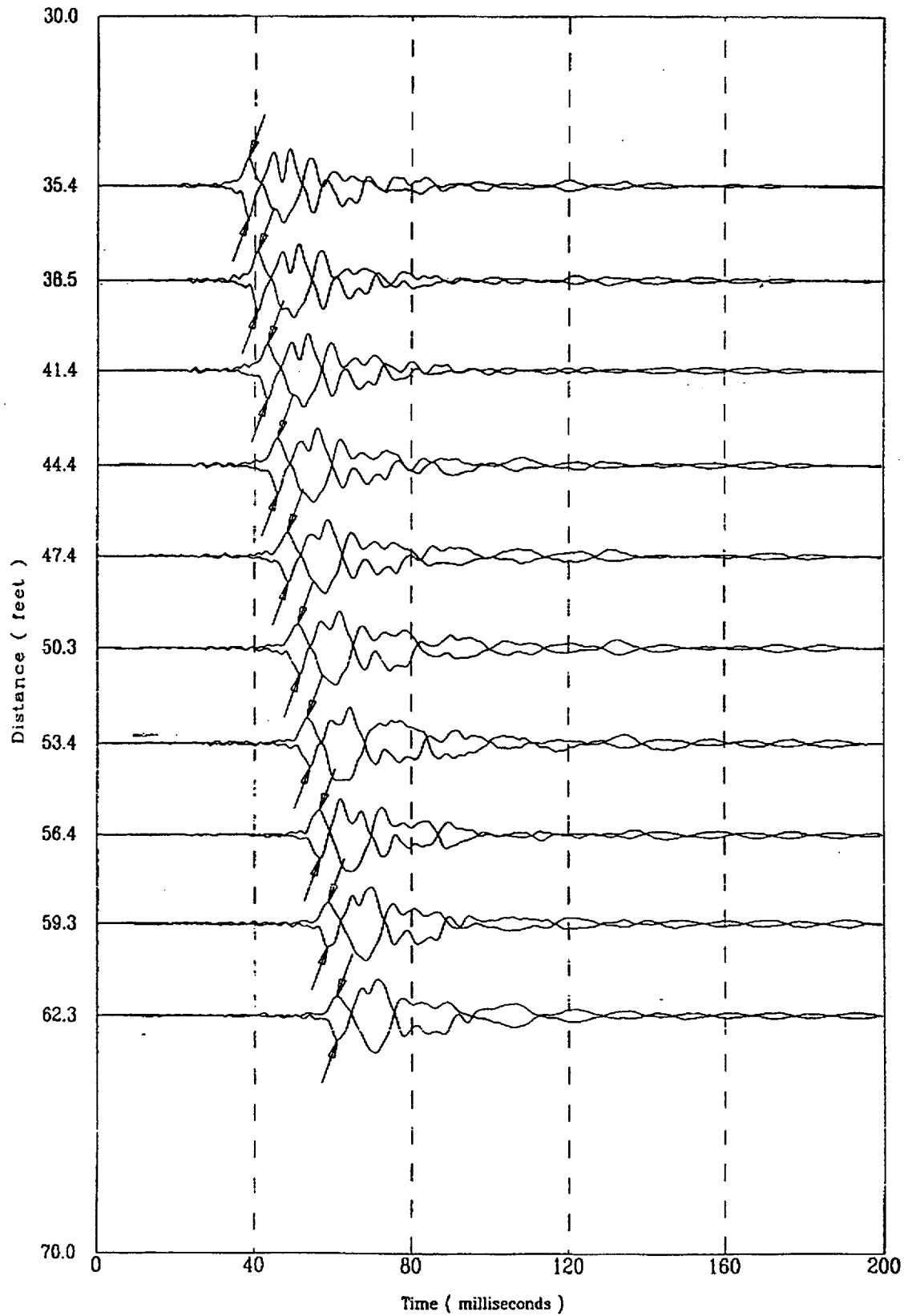
Shear Wave Time of Peak





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CPT-113

S Wave
02/19/98

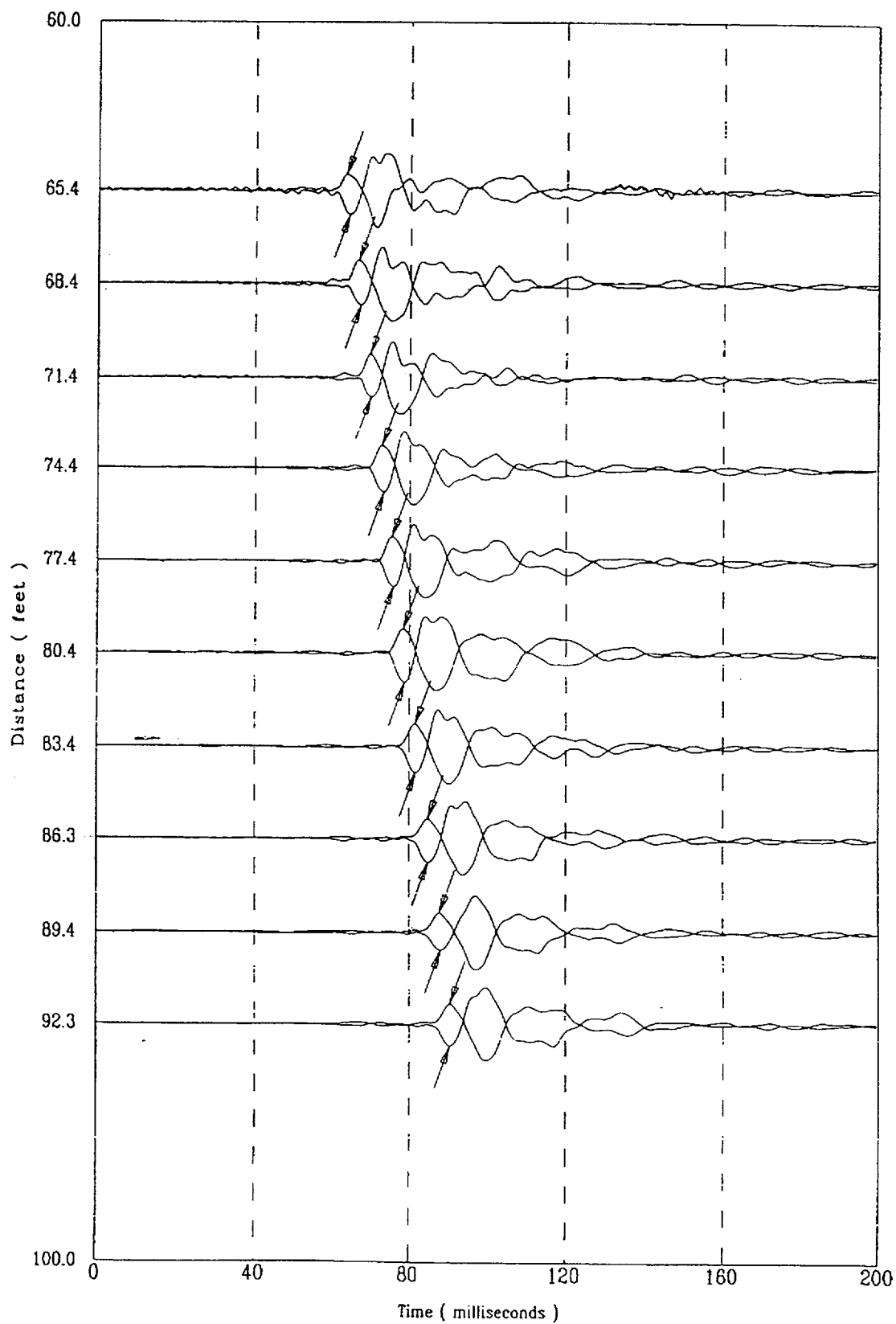


5197801S

45 of 522

Applied Research Associates, Inc.
CPT-113

S Wave
02/19/98

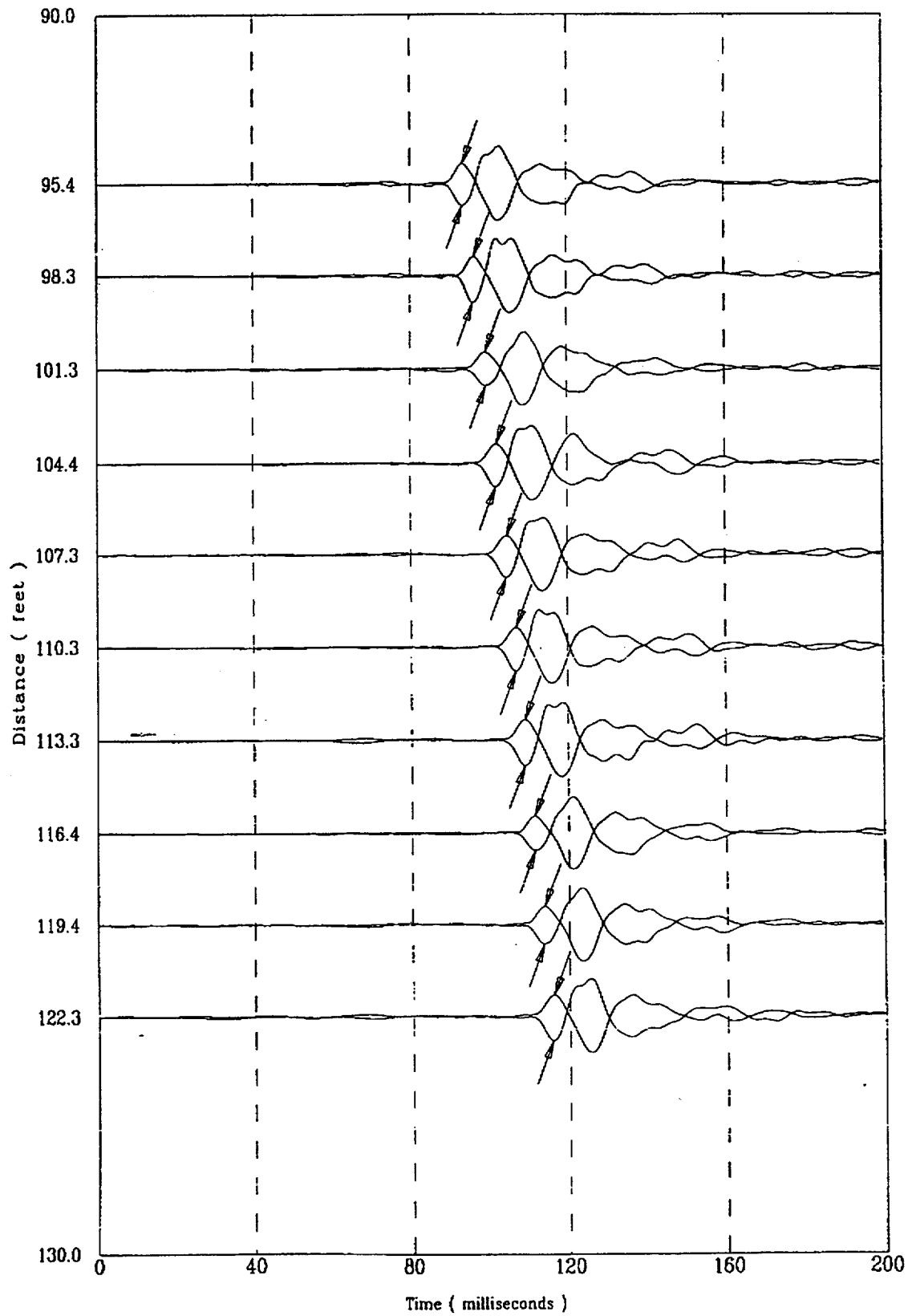


5191801S

46 of 522

Applied Research Associates, Inc.
CPT-113

S Wave
02/19/98

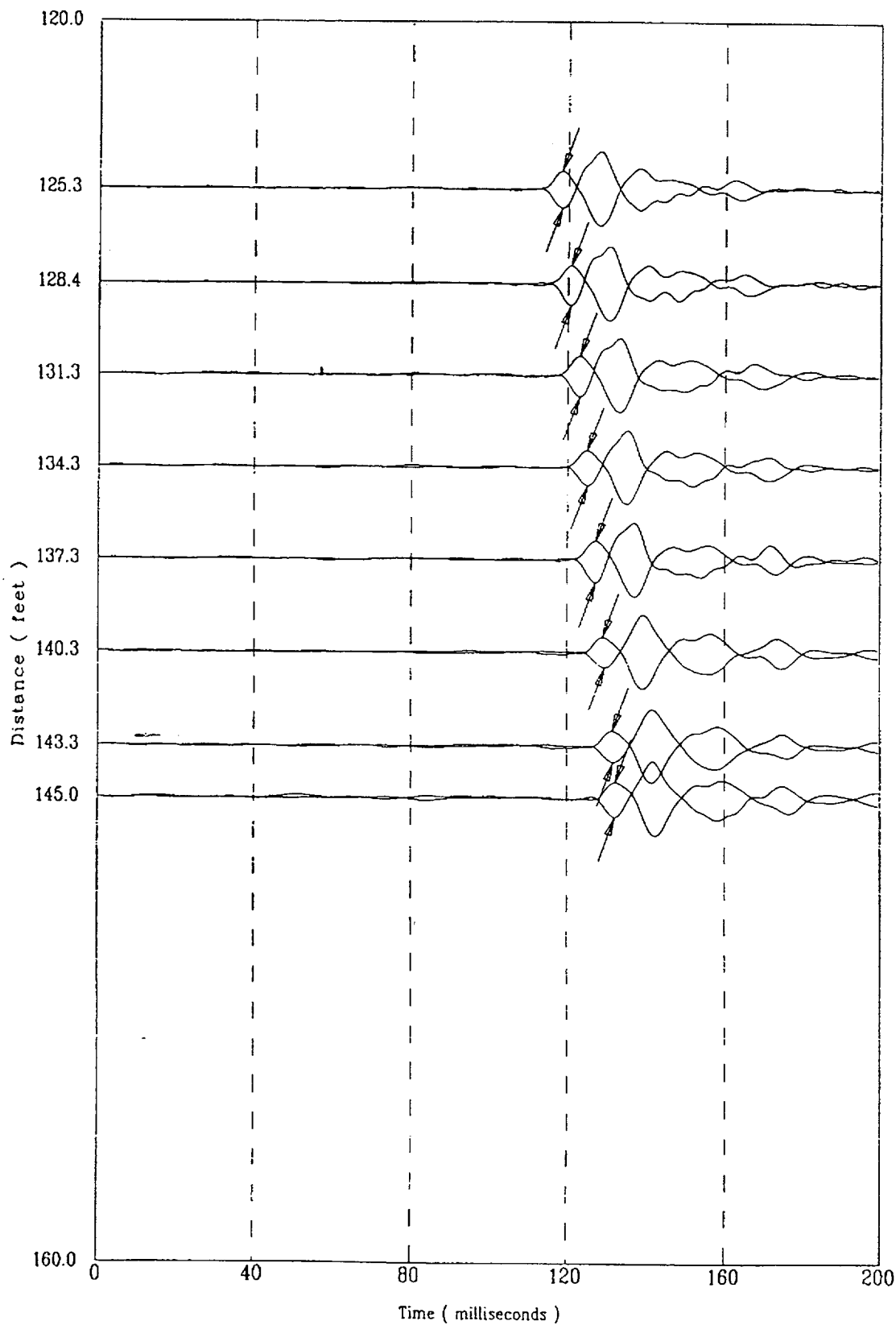


519/801S

47 of 522

Applied Research Associates, Inc.
CPT-113

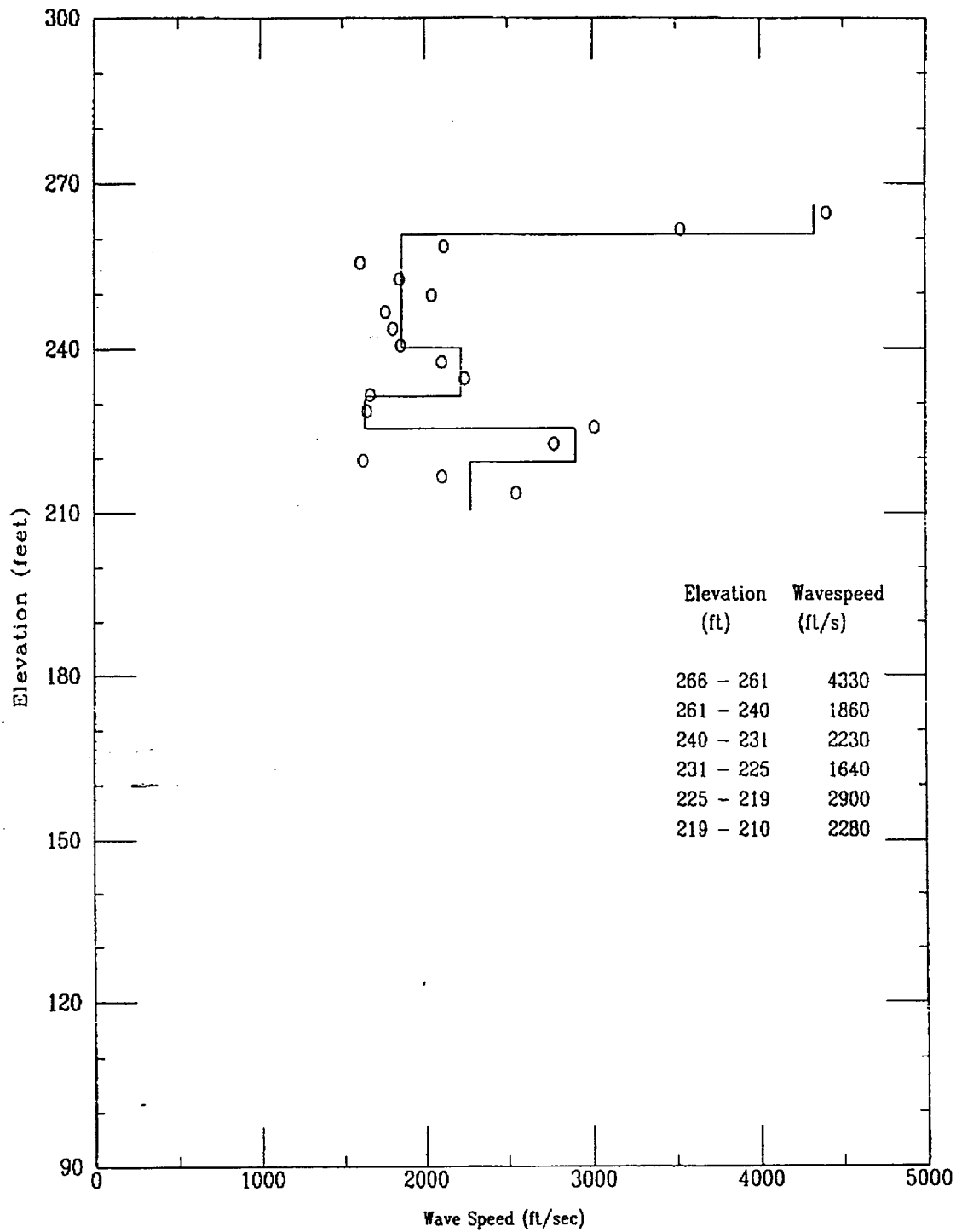
S Wave
02/19/98



519/001S

4/8 of 522

Compression Wave Speeds



-
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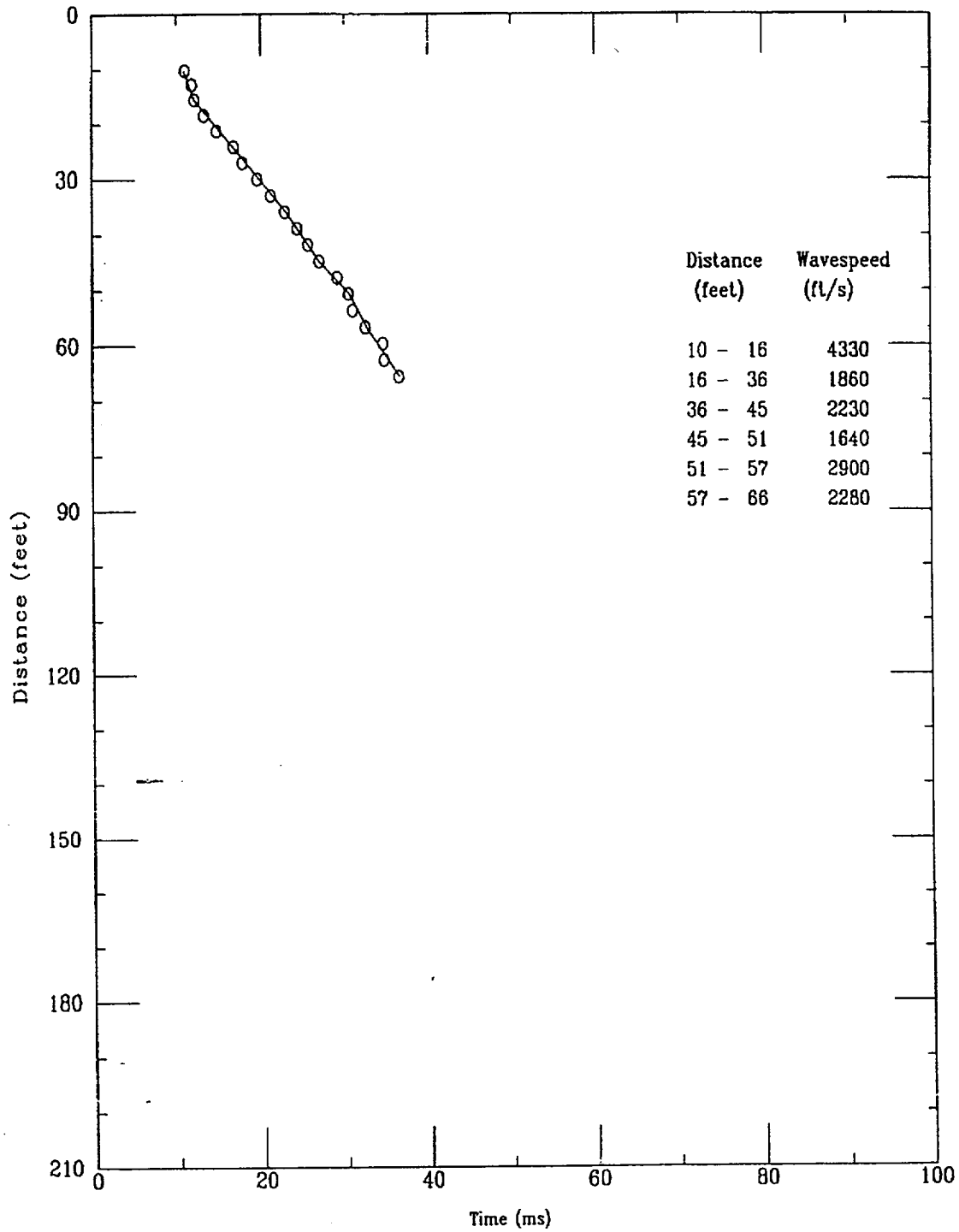
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CPT-113

APPLIED RESEARCH ASSOCIATES, INC.

02/19/98

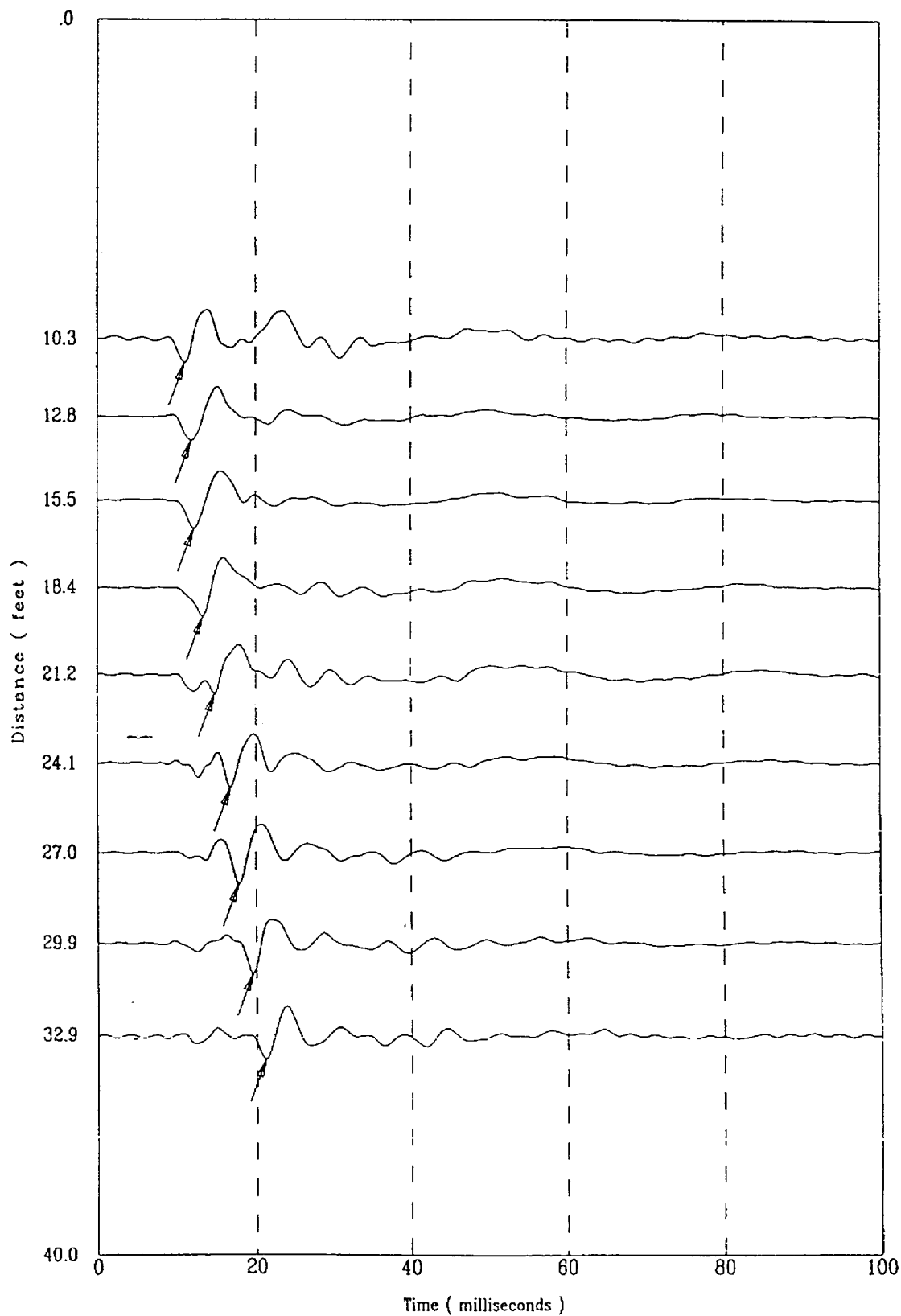
Compression Wave Time of Peak



File 519/801S

Applied Research Associates
CPT-113

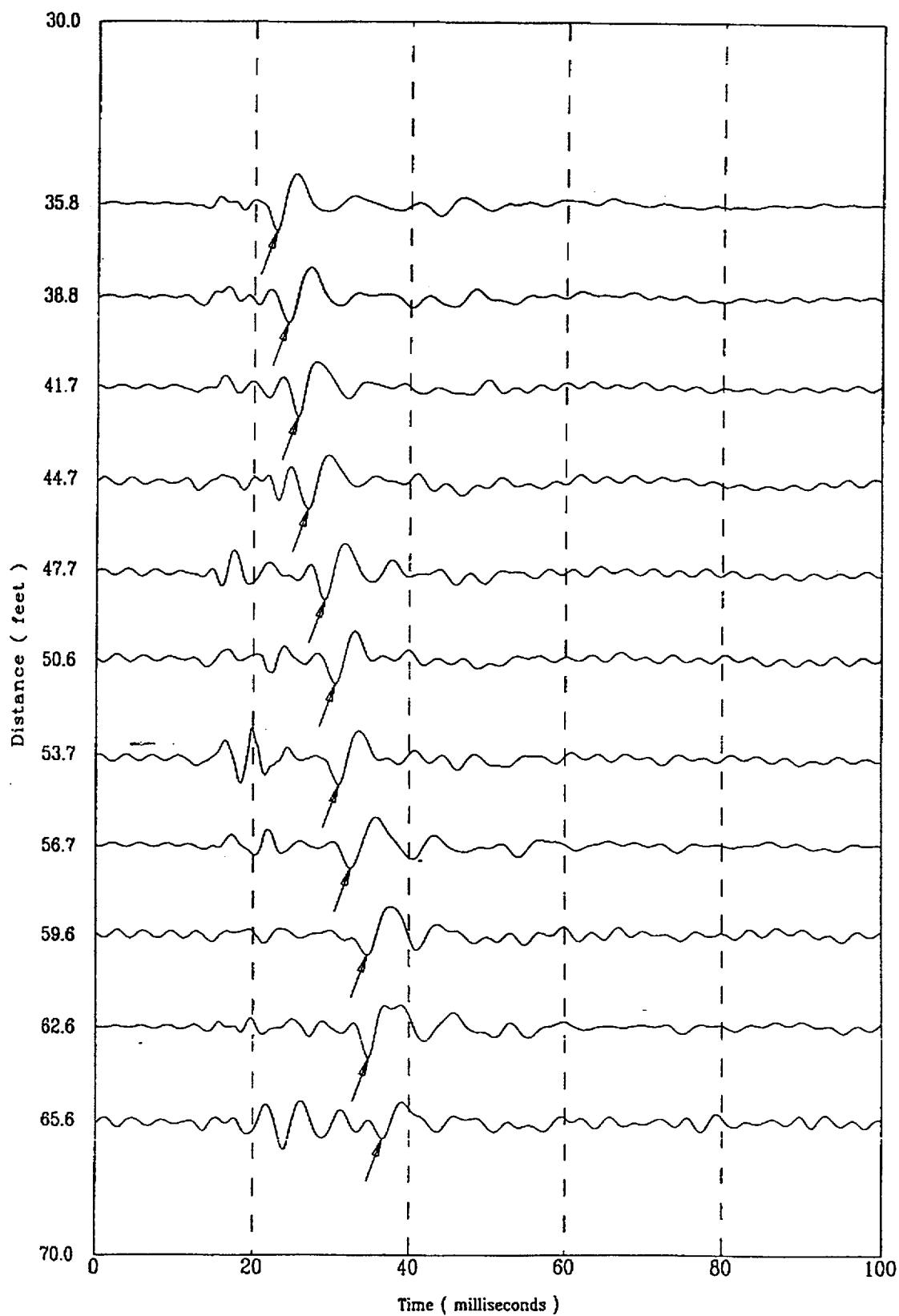
P Wave
02/19/98



51978015

Applied Research Associates
CPT-113

P Wave
02/19/98



CPT-114

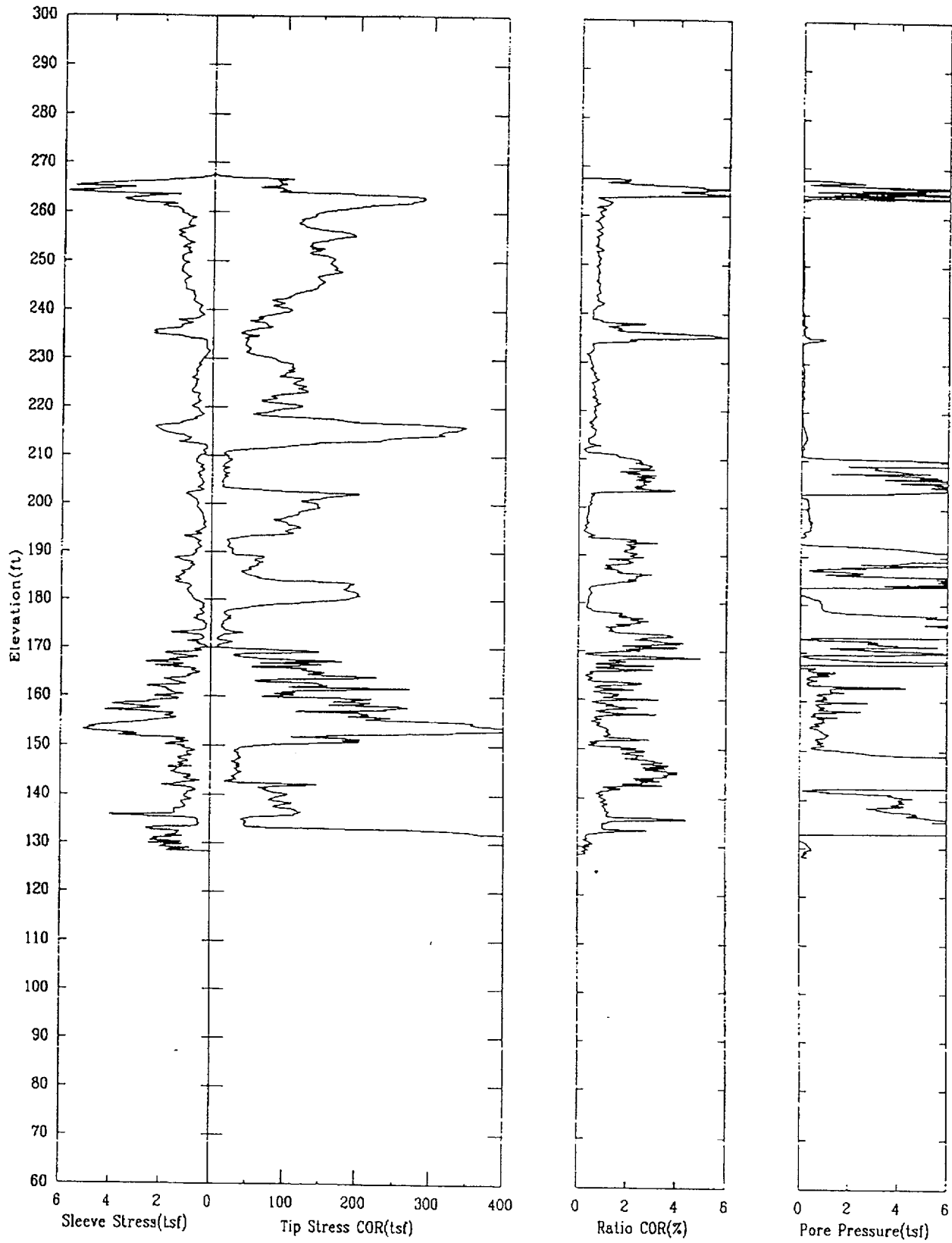
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02/19/98

North 79781.01

East 54975.05

Elevation 273.6



CPT-114

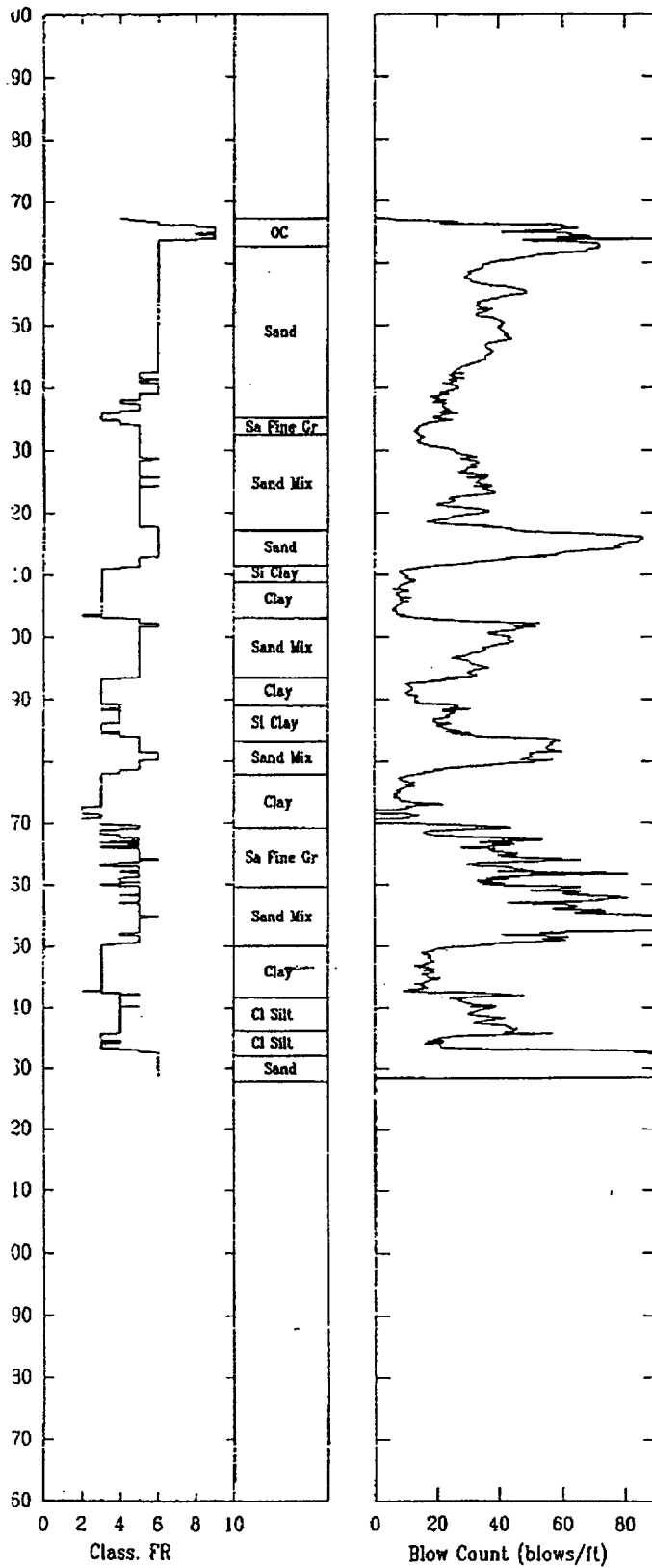
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02/19/98

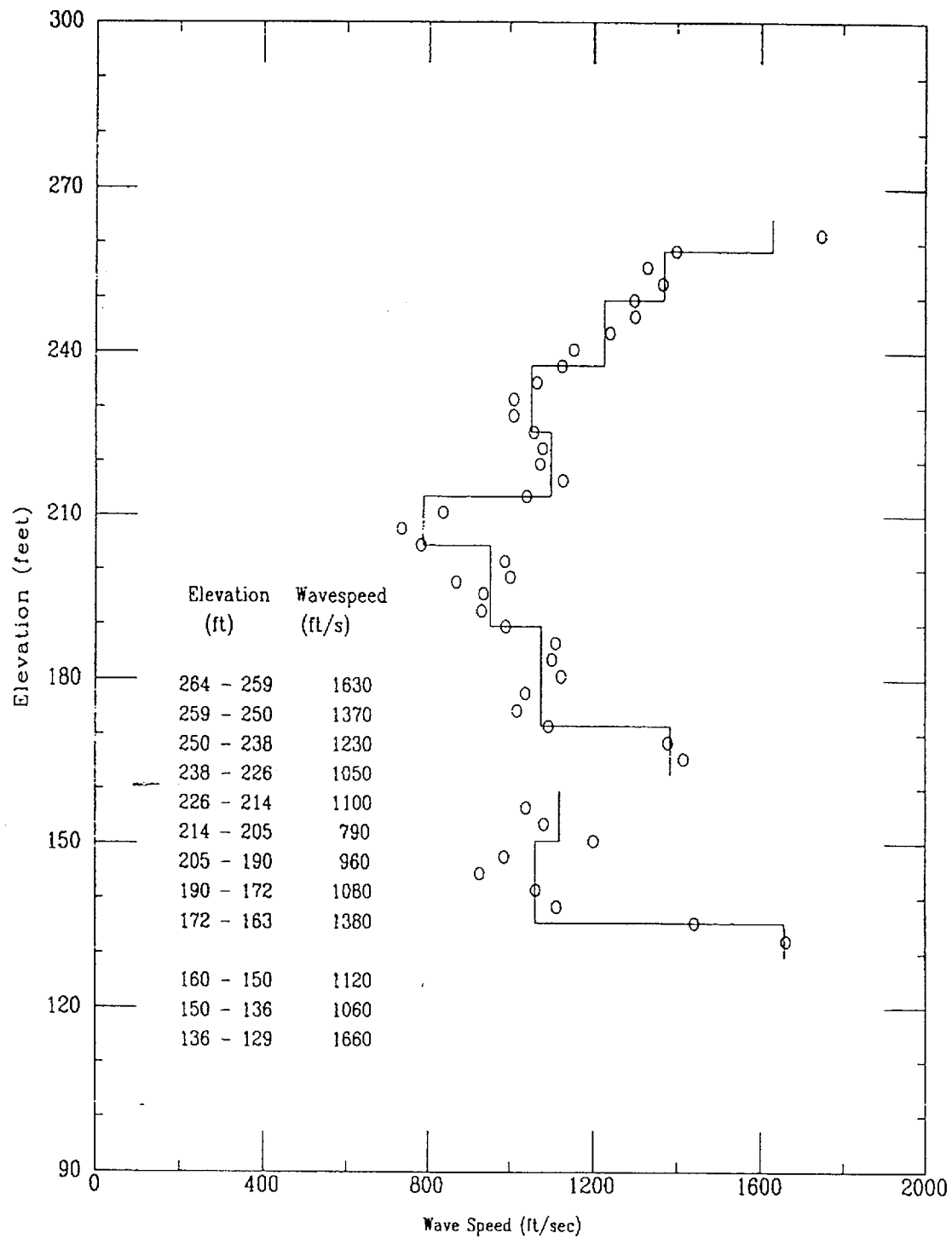
North 79781.01

East 54975.05

Elevation 273.6



Shear Wave Speeds

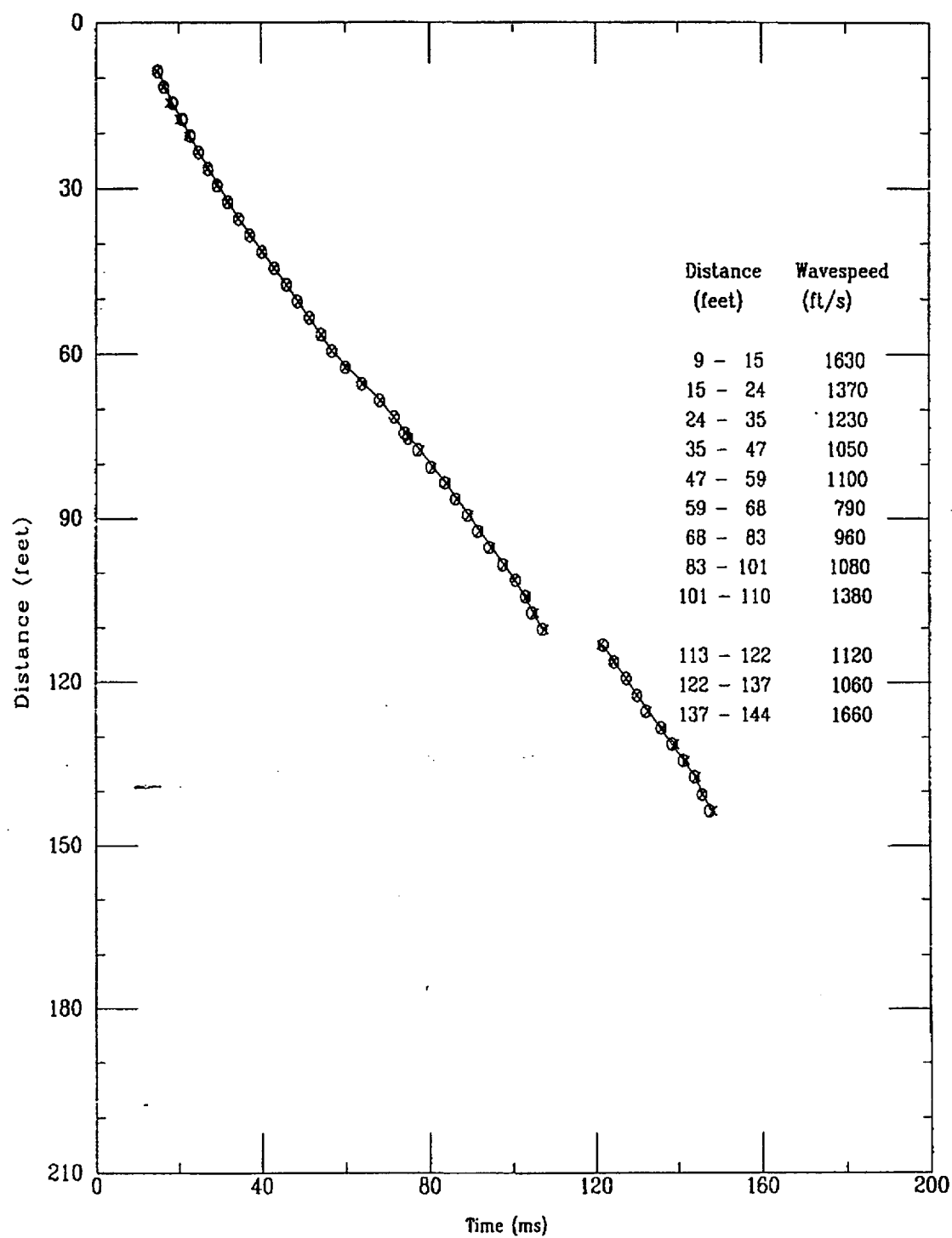


CPT-114

APPLIED RESEARCH ASSOCIATES, INC.

02/19/98

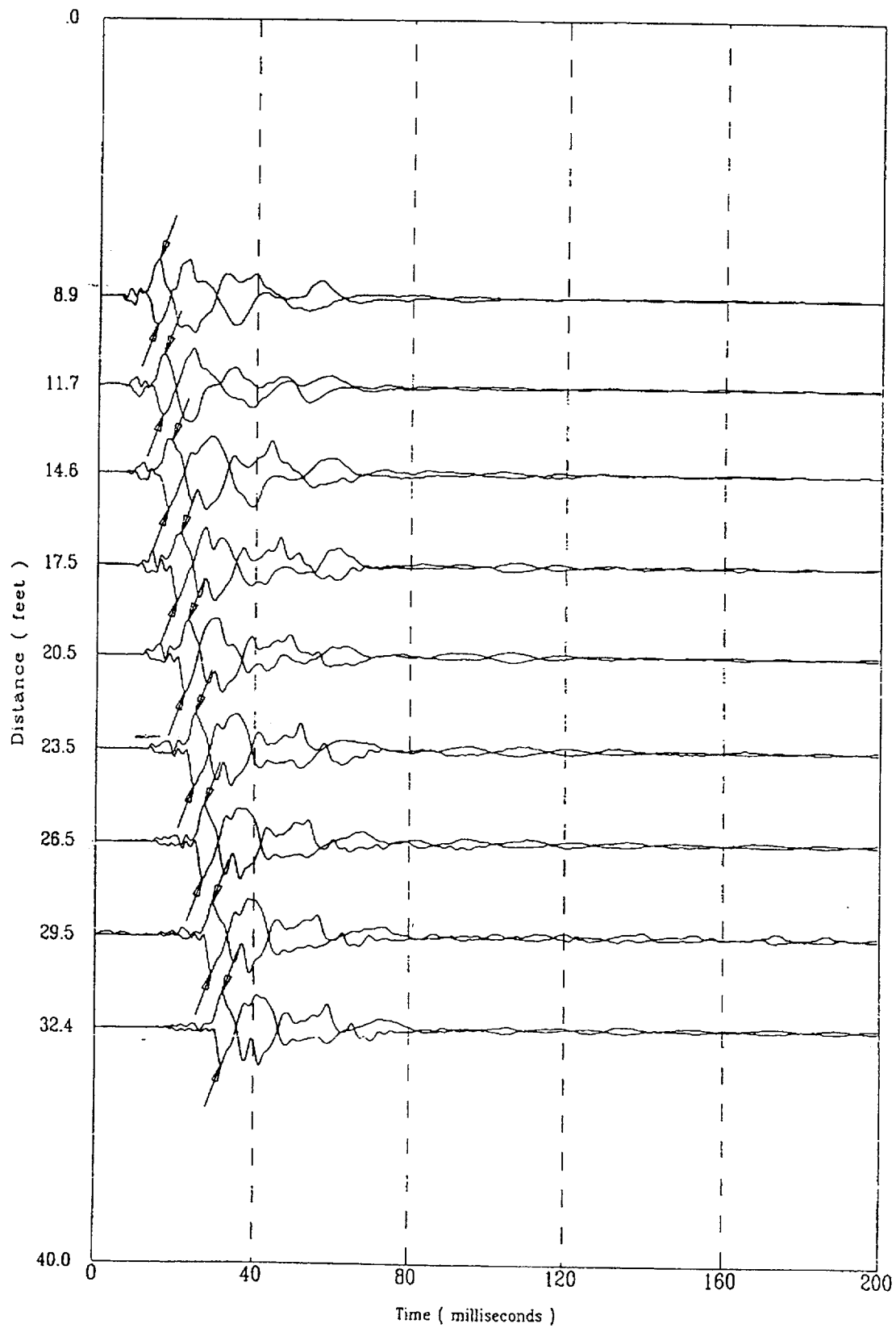
Shear Wave Time of Peak



File 519/804S

Applied Research Associates, Inc.
CPT-114

S Wave
02/19/98

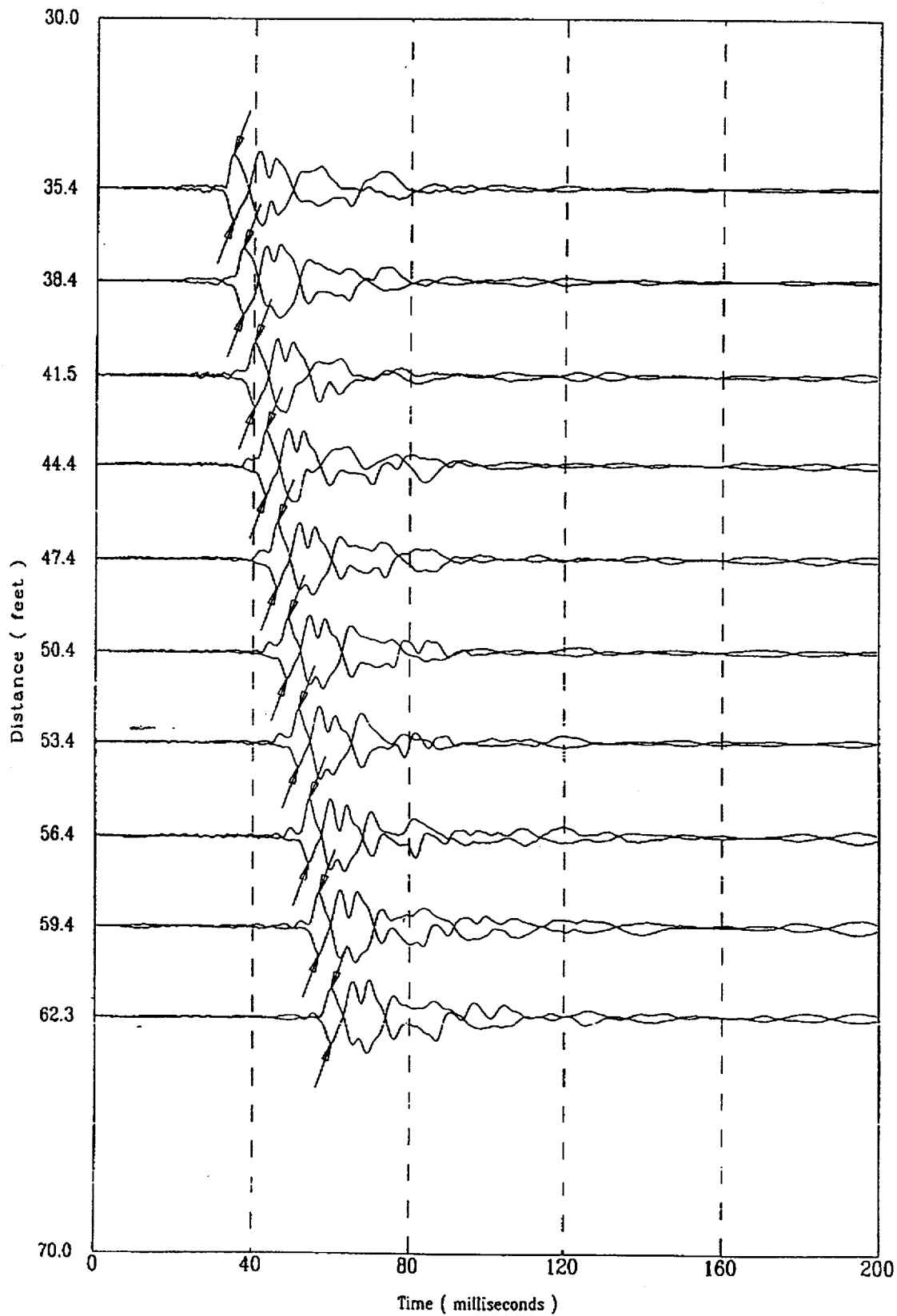


519f804S

58 of 522

Applied Research Associates, Inc.
CPT-114

S Wave
02/19/98

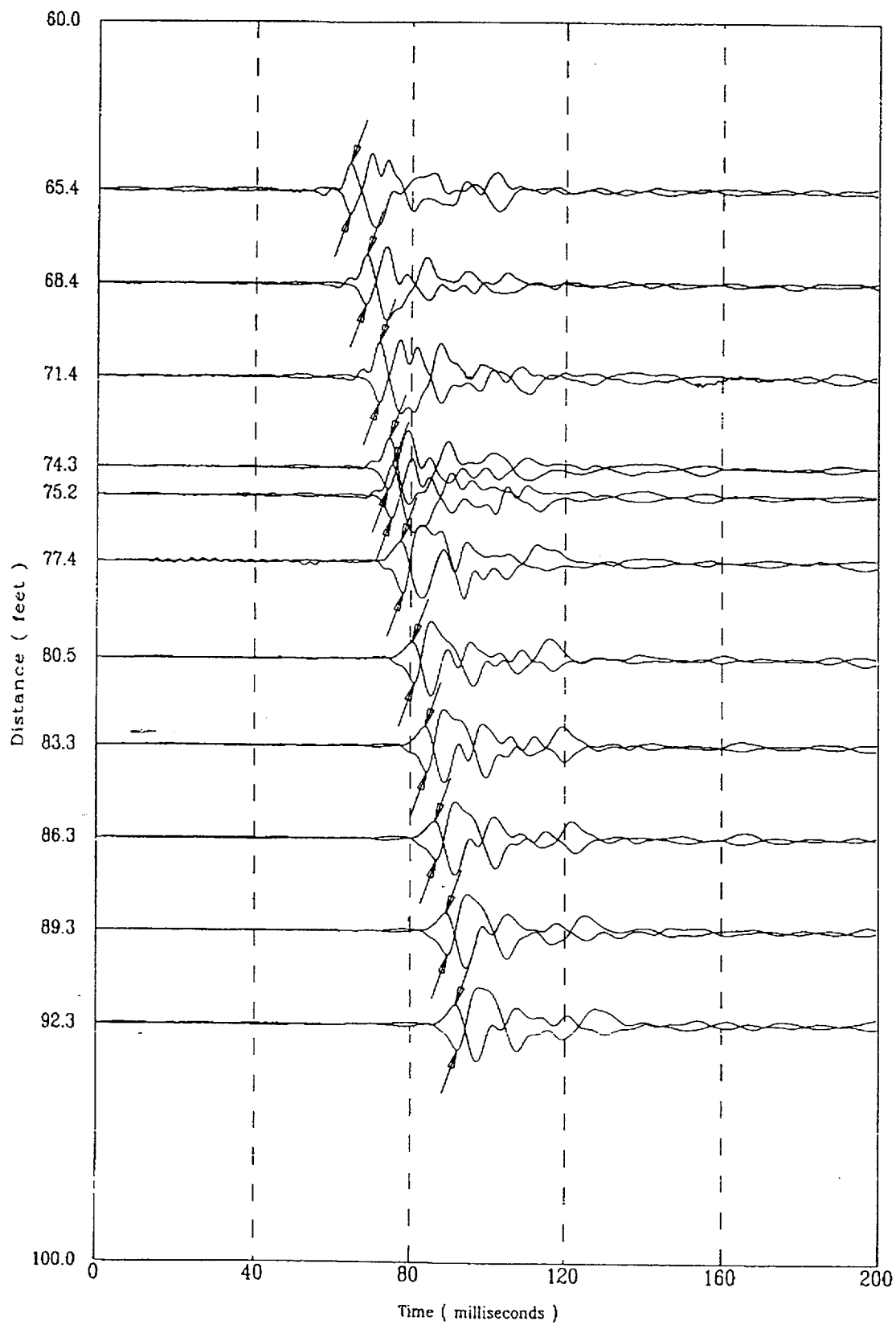


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59 of 522

Applied Research Associates, Inc.
CPT-114

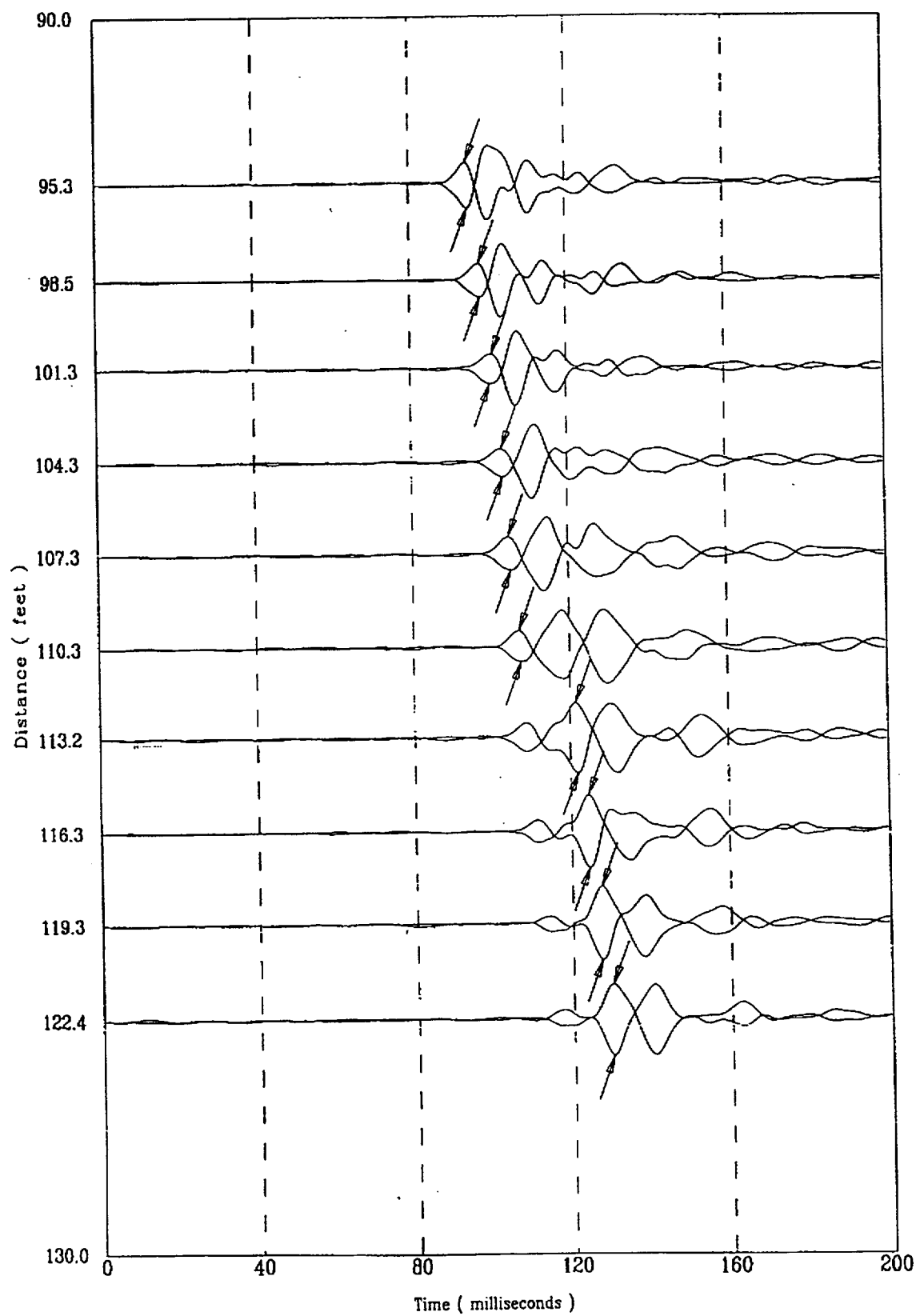
S Wave
02/19/98



519/804S

Applied Research Associates, Inc.
CPT-114

S Wave
02/19/98

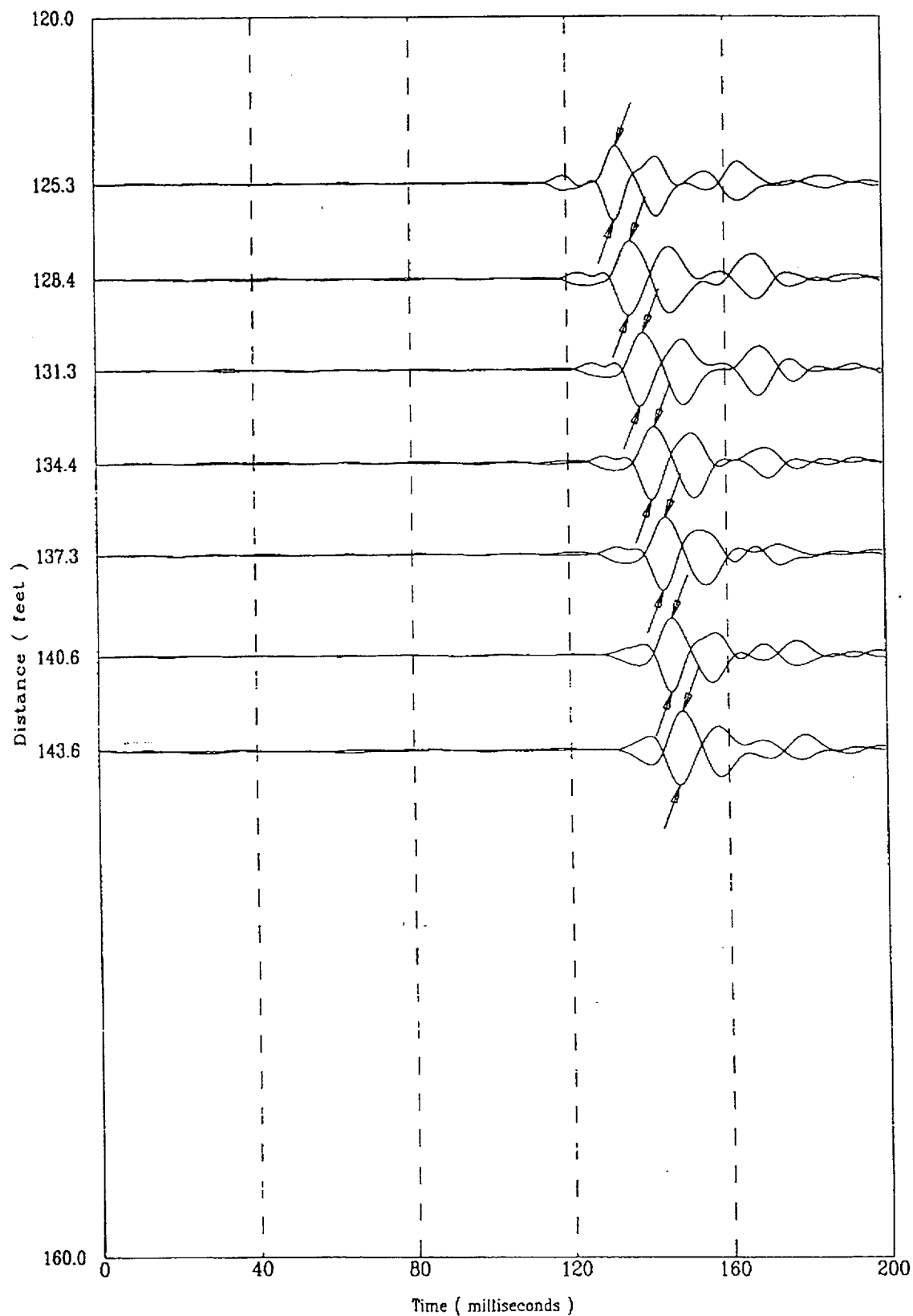


1197804S

61 of 522

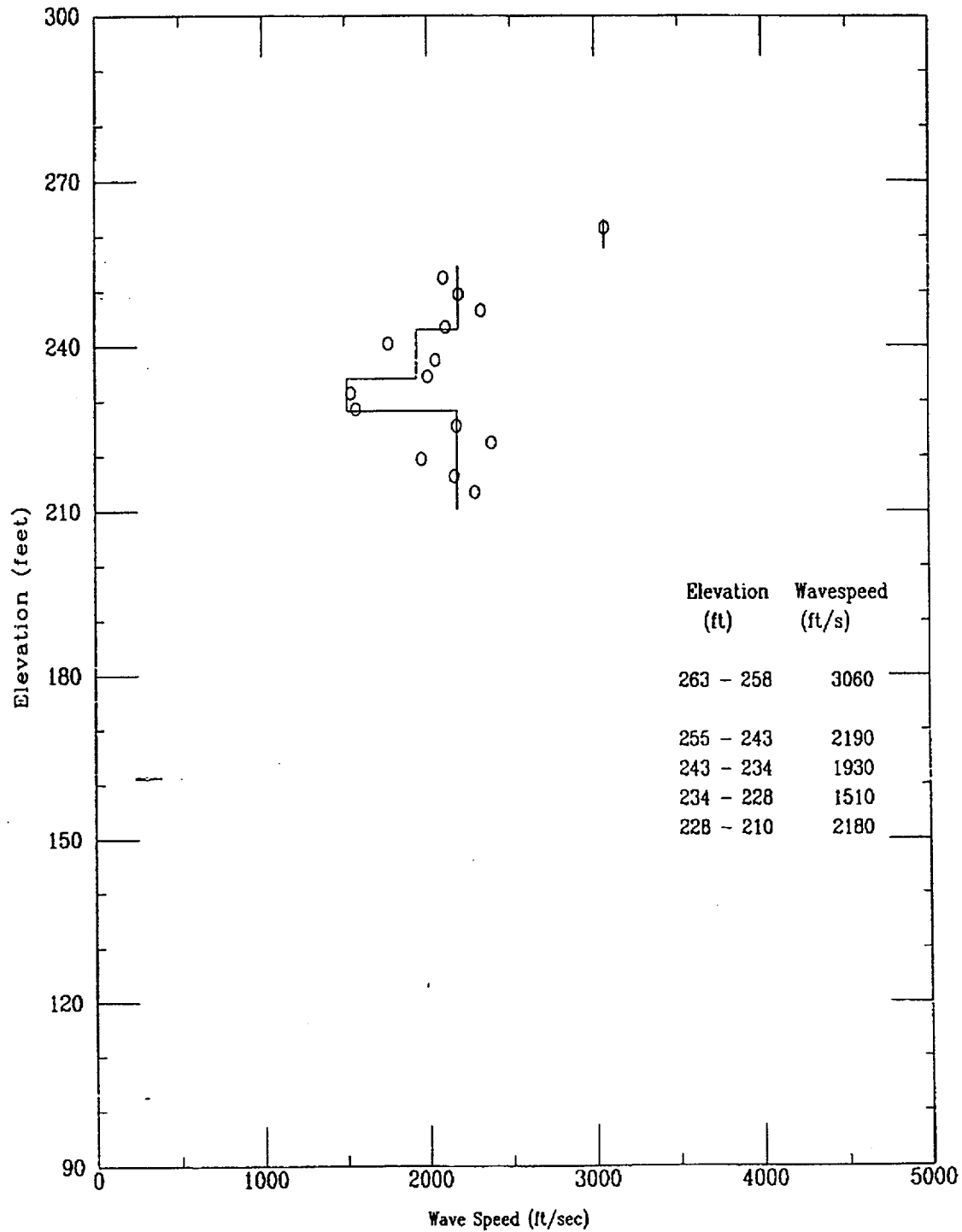
Applied Research Associates, Inc.
CPT-114

S Wave
02/19/98



5197804S

Compression Wave Speeds

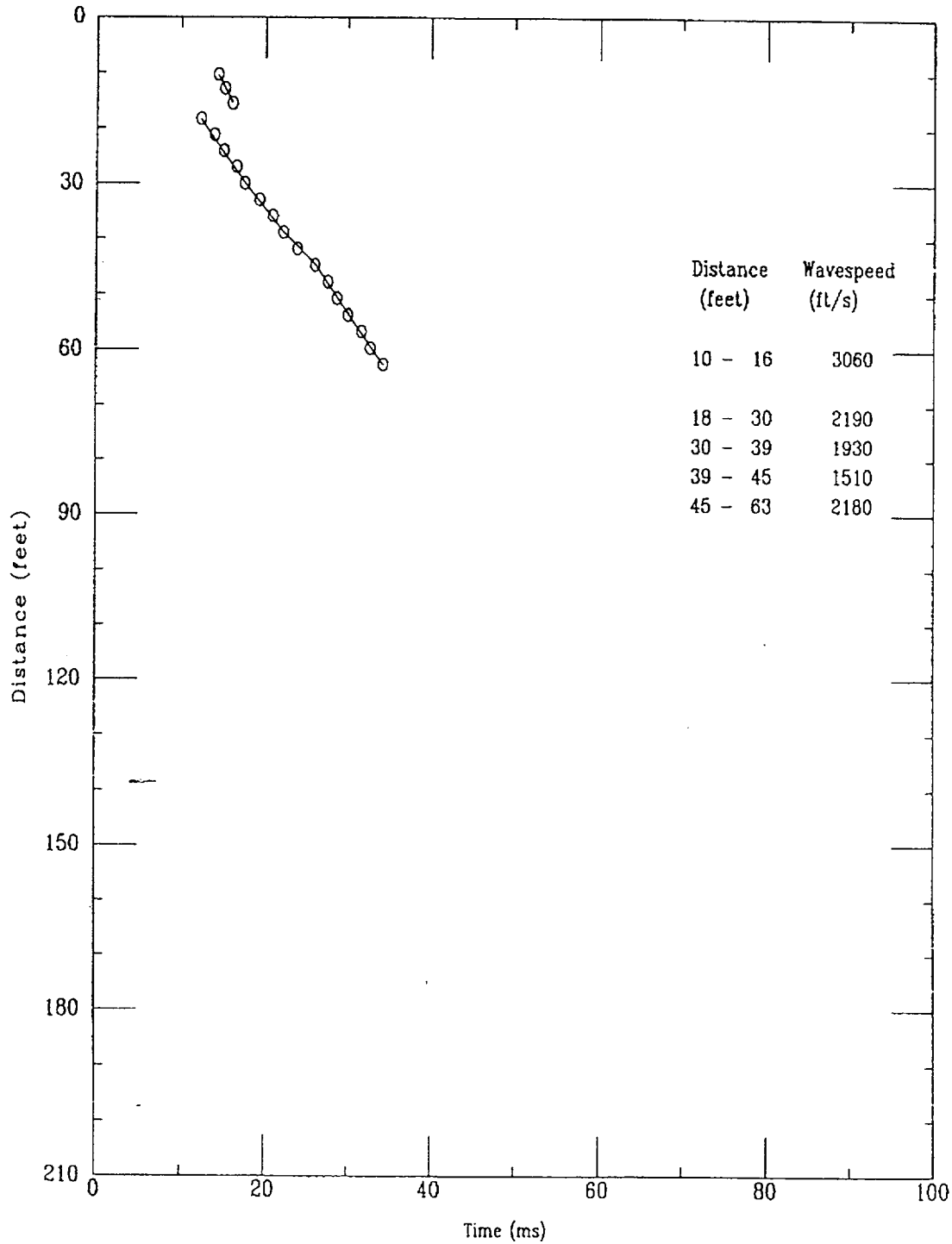


CPT-114

APPLIED RESEARCH ASSOCIATES, INC.

02/19/98

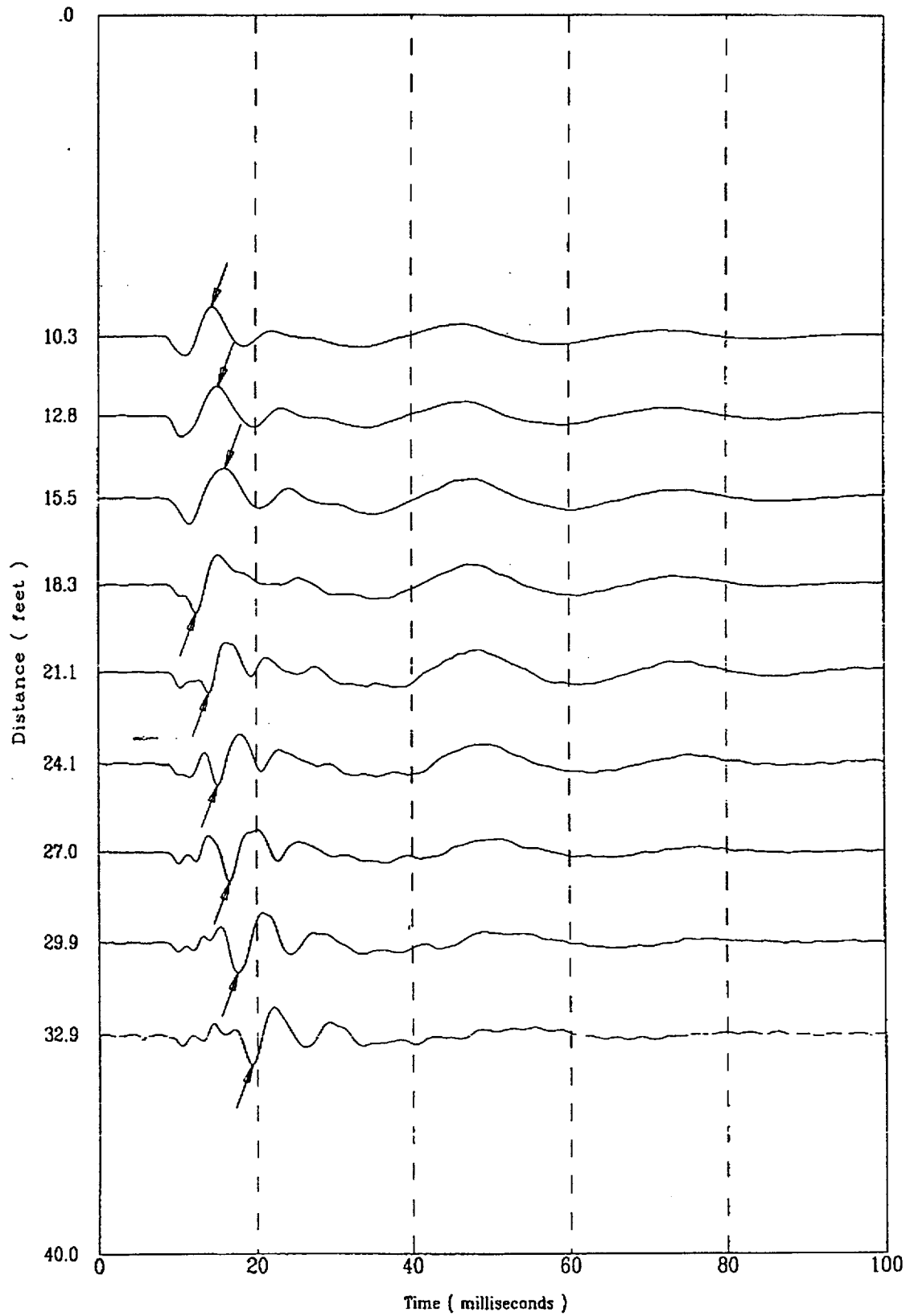
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File 519/0045

Applied Research Associates
CPT-114

P Wave
02/19/98

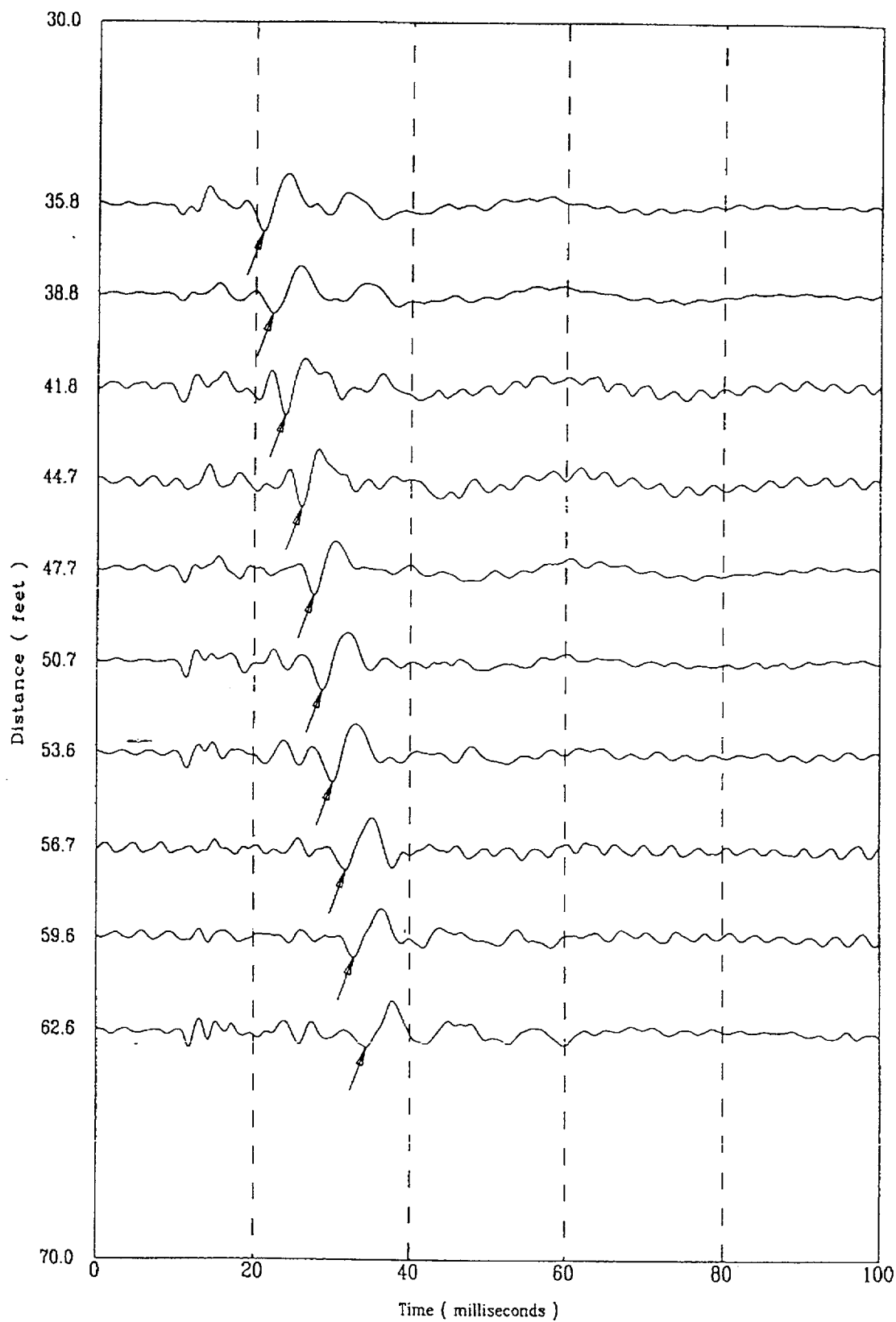


5197804S

65 of 522

Applied Research Associates
CPT-114

P Wave
02/19/98



CPT-115

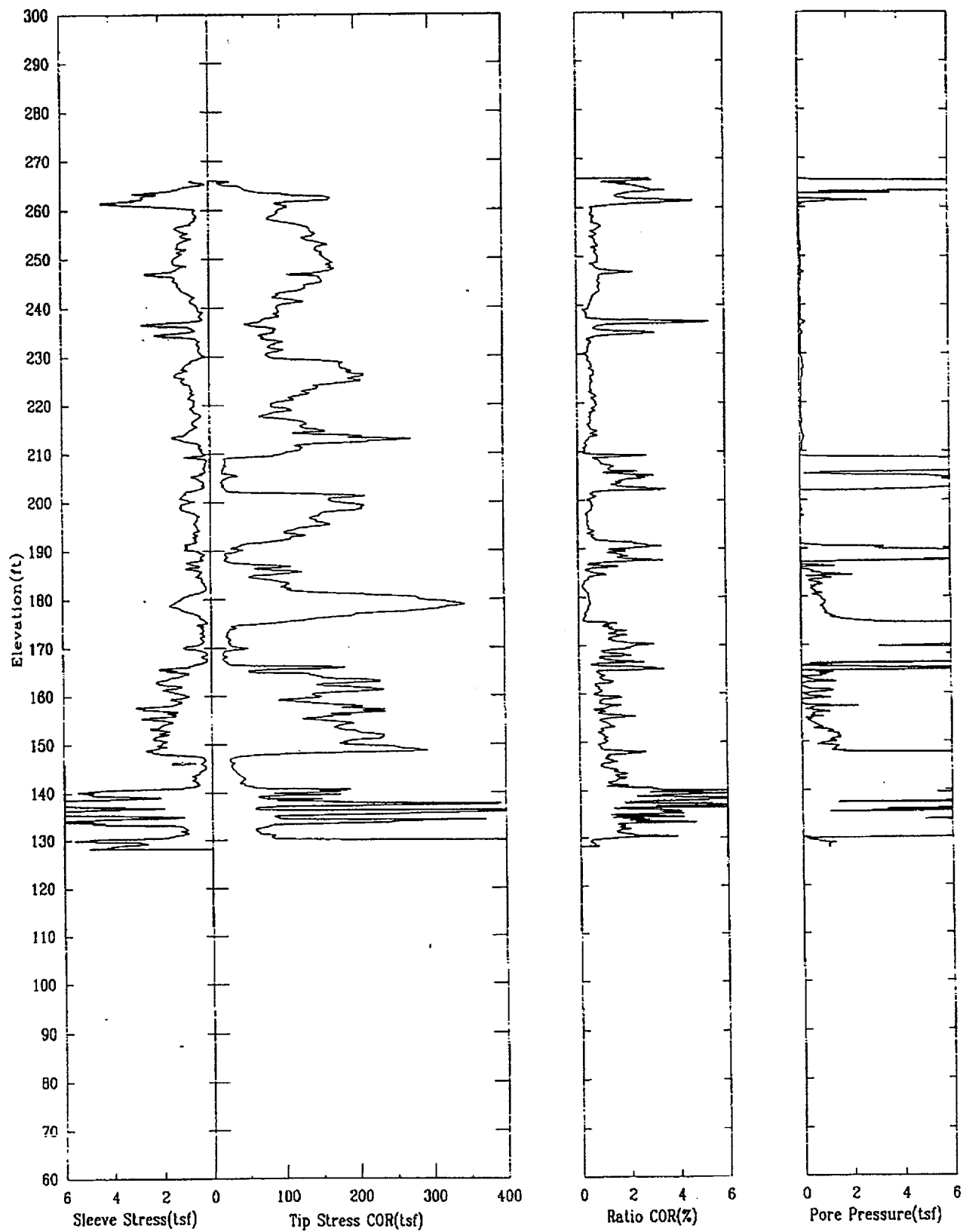
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02/20/98

North 79780.85

East 55125.05

Elevation 272.0



CPT-115

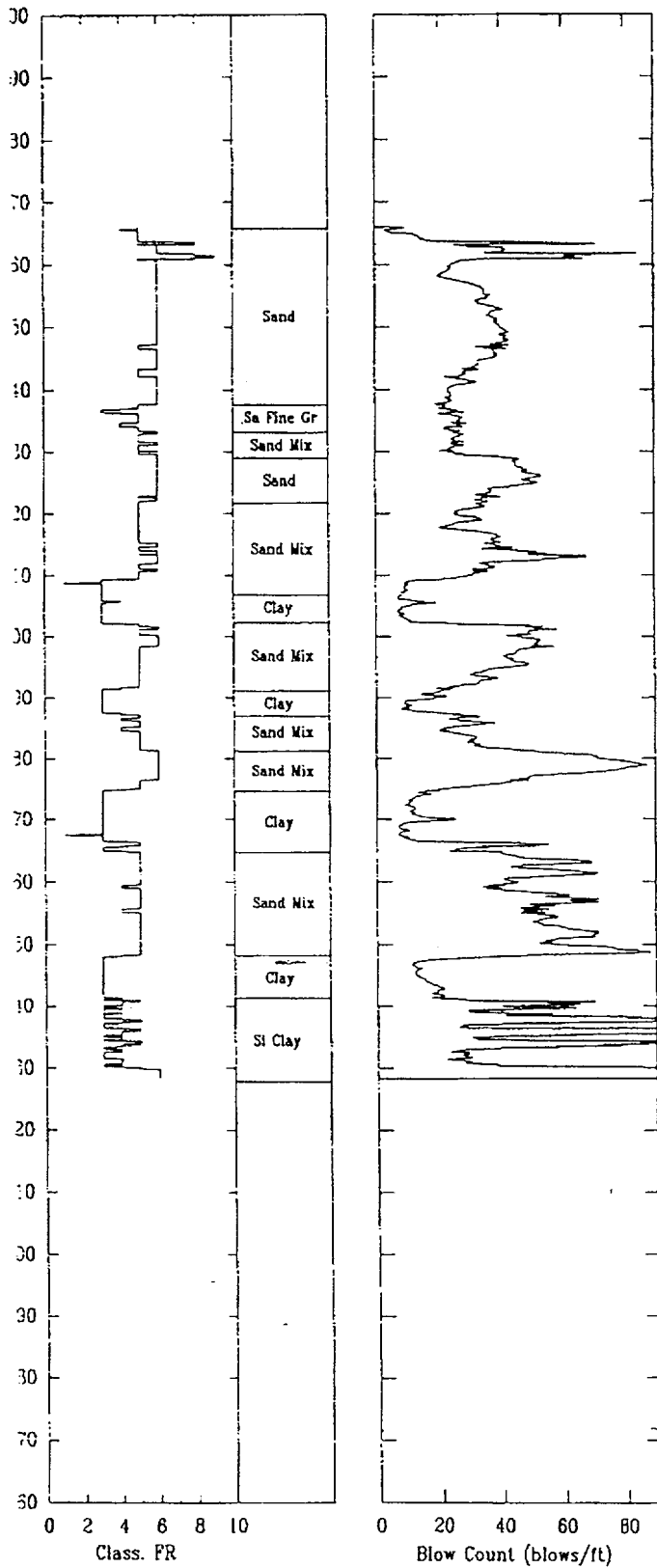
APPLIED RESEARCH ASSOCIATES, INC.

02/20/98

North 79780.85

East 55125.05

Elevation 272.0

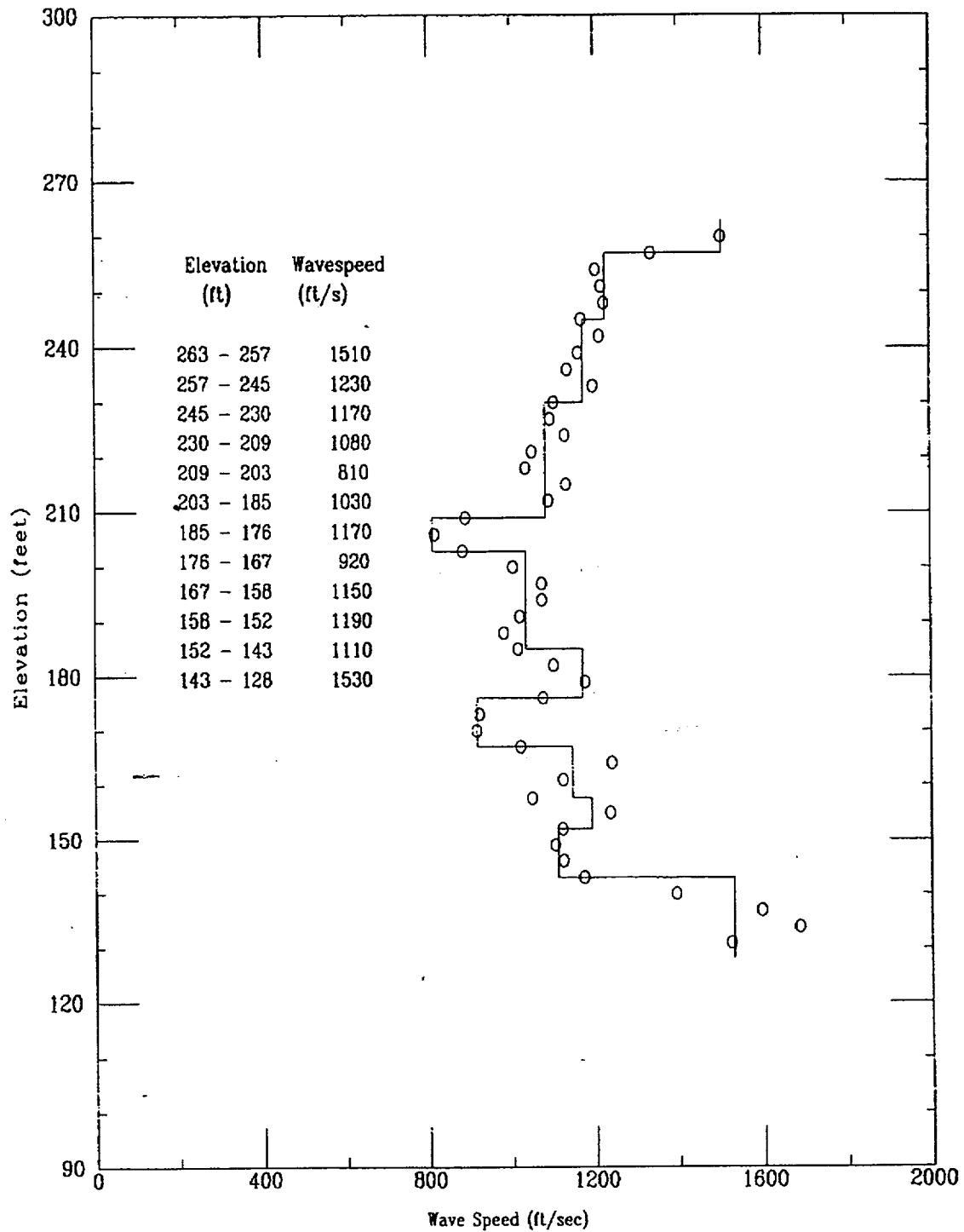


CPT-115

APPLIED RESEARCH ASSOCIATES, INC.

02/20/98

Shear Wave Speeds



File 520f801S

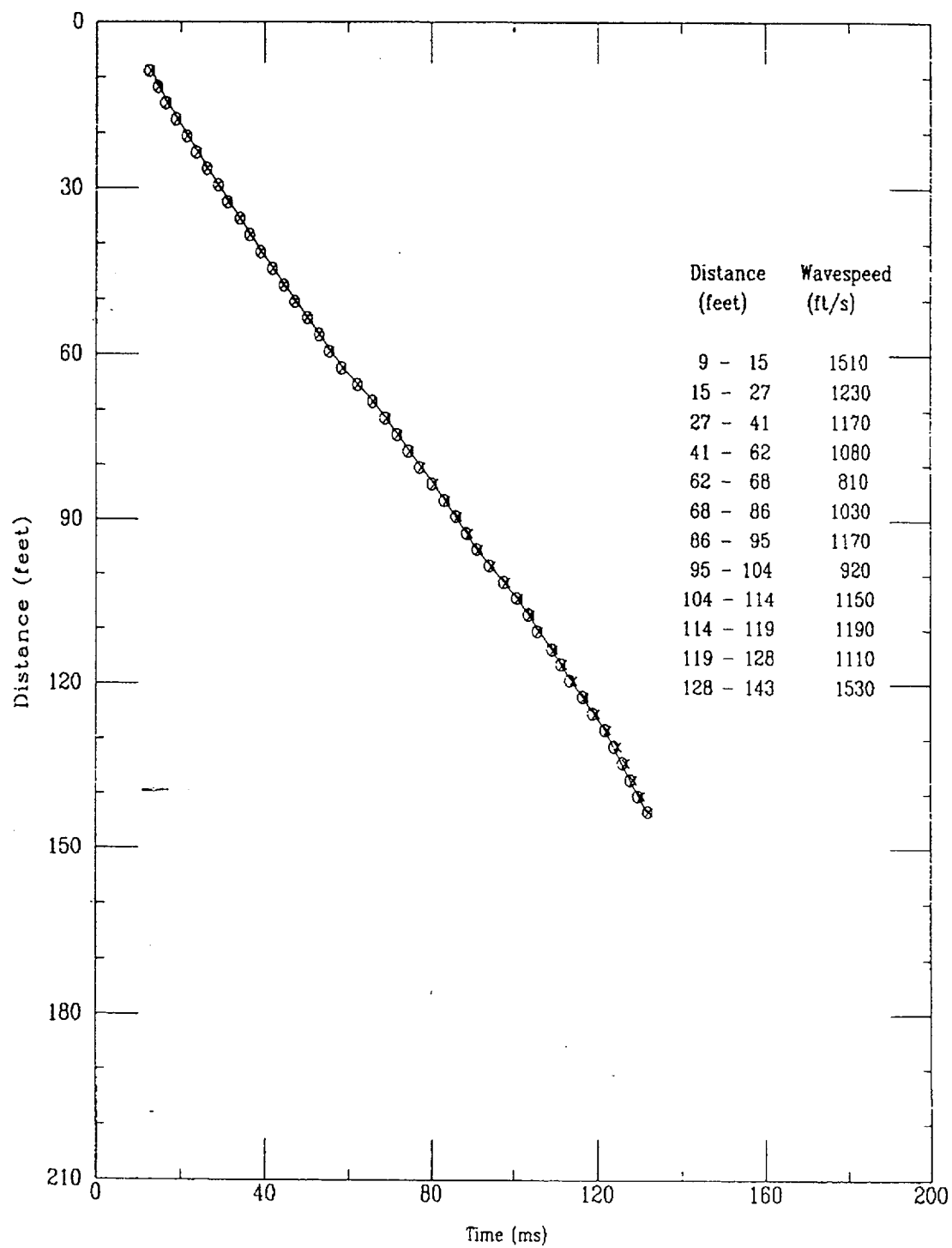
69 of 522

CPT-115

APPLIED RESEARCH ASSOCIATES, INC.

02/20/98

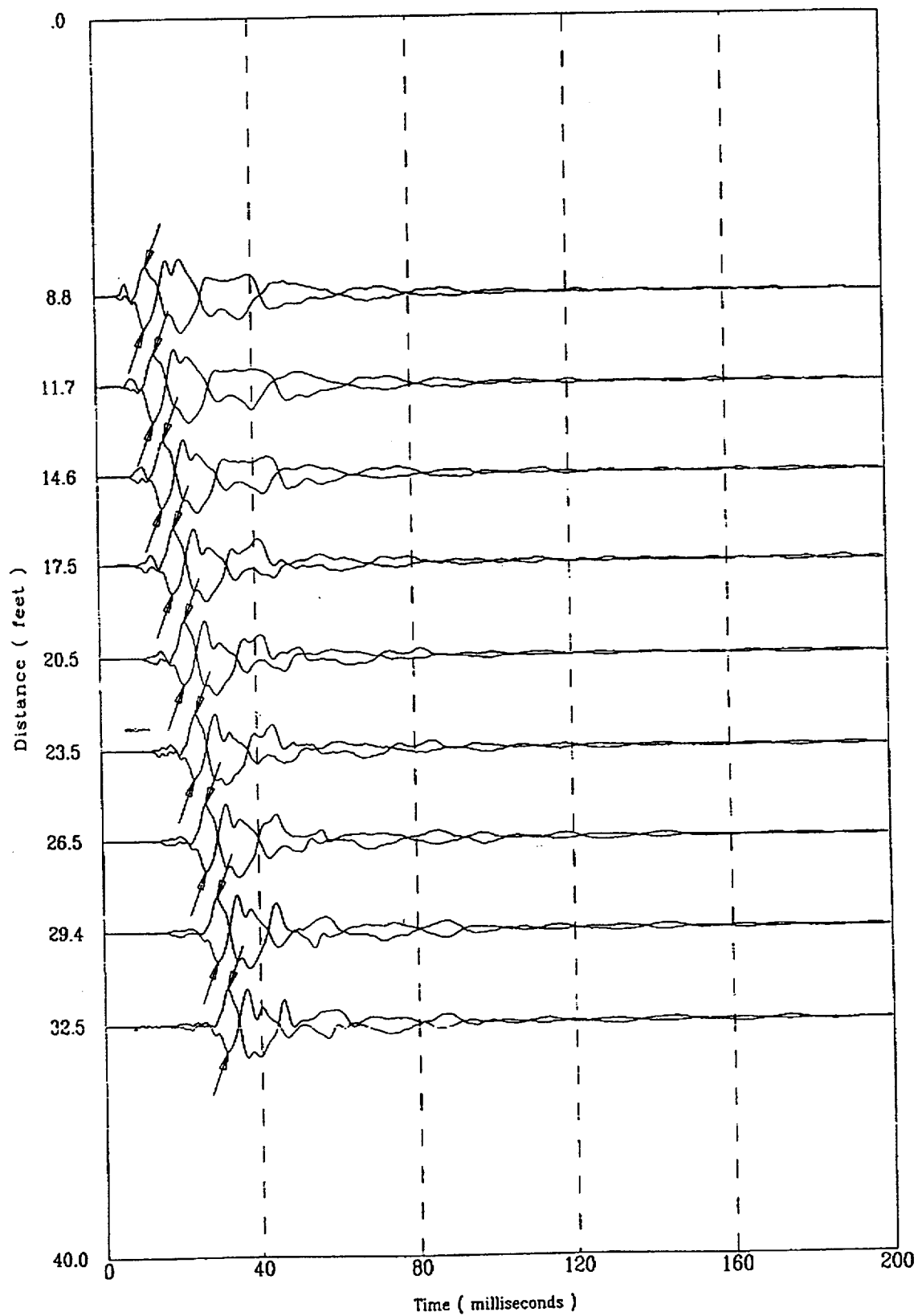
Shear Wave Time of Peak



File 520f801S

Applied Research Associates, Inc.
CPT-115

S Wave
02/20/98

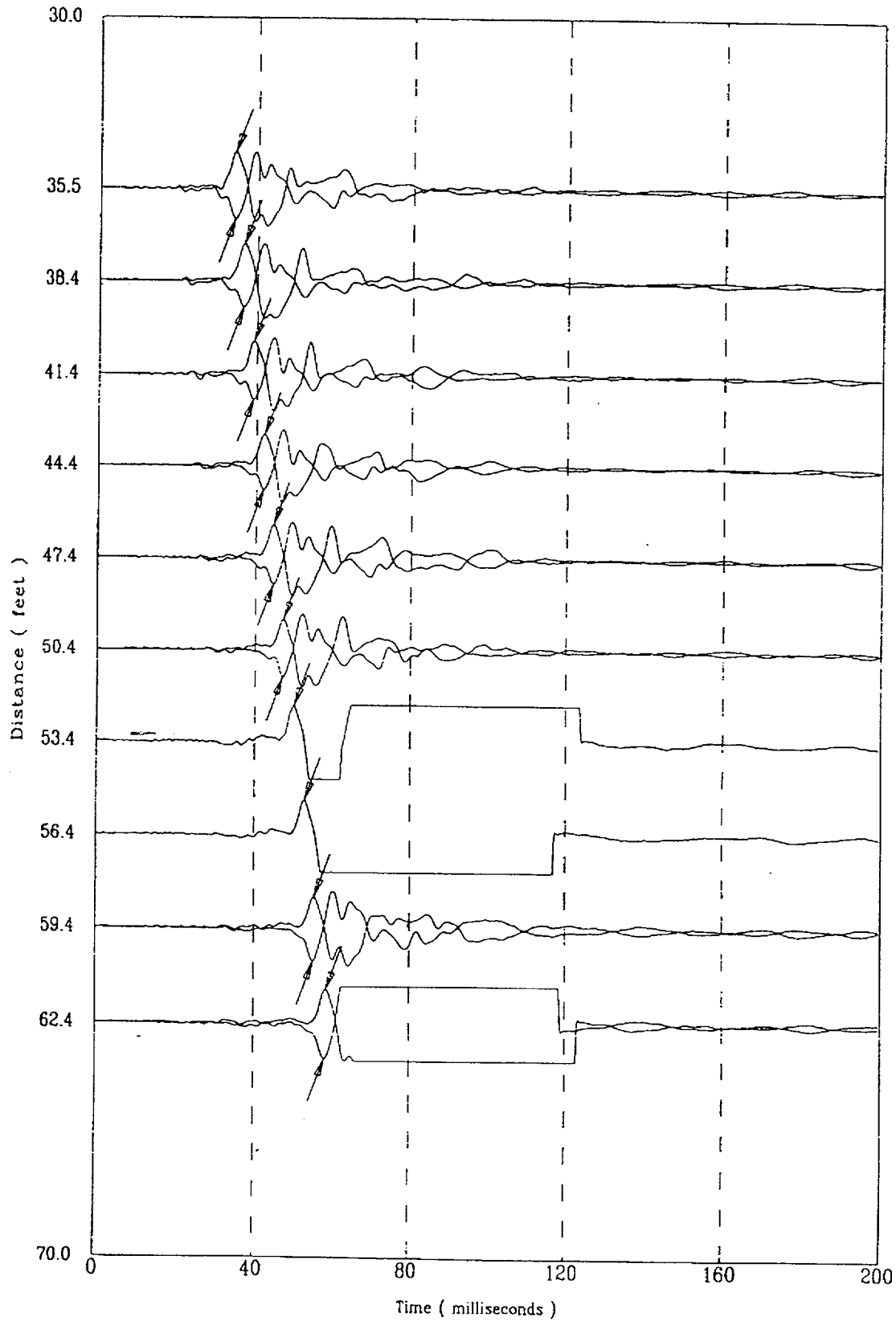


5201801S

71 of 522

Applied Research Associates, Inc.
CPT-115

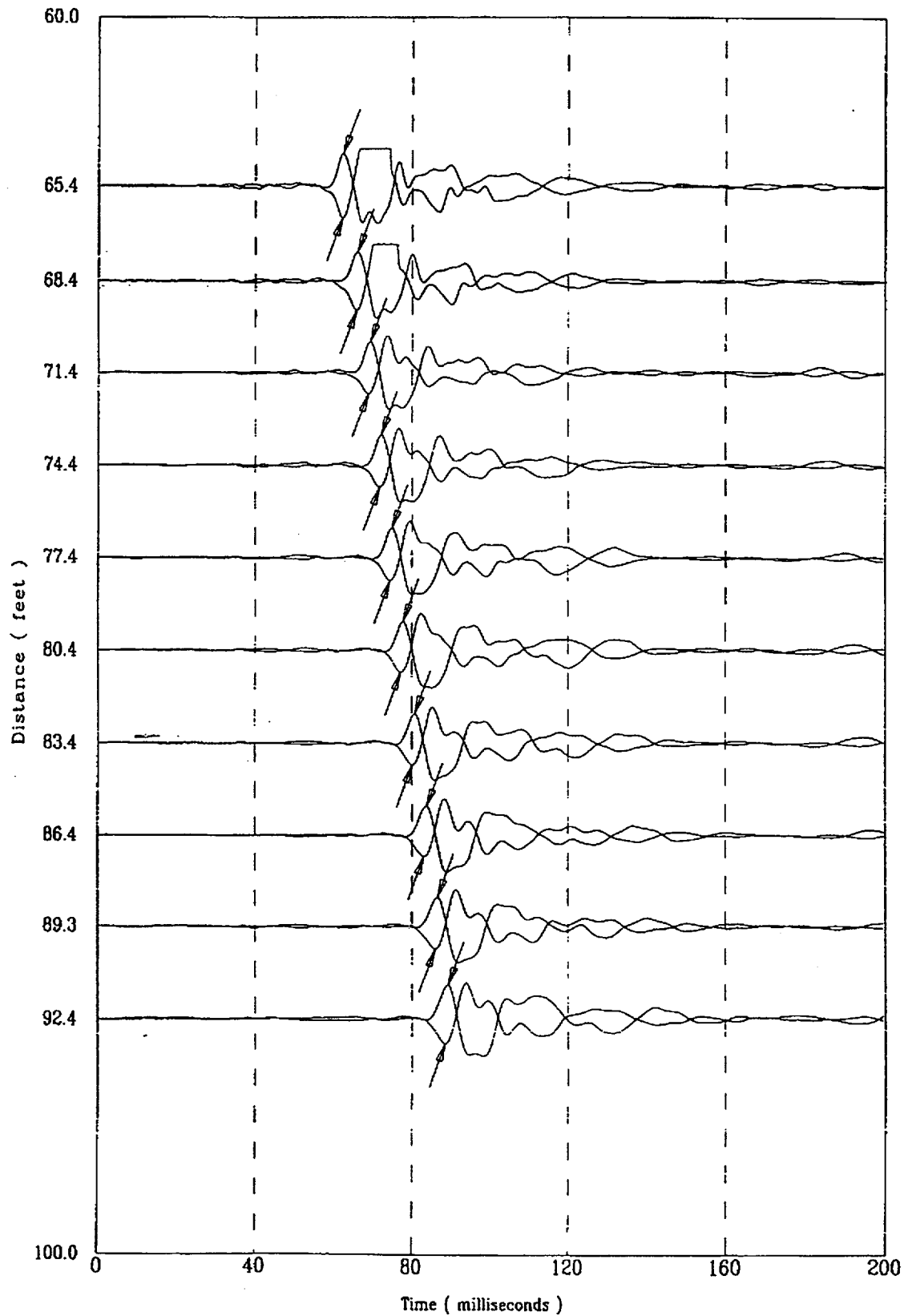
S Wave
02/20/98



5201801S

Applied Research Associates, Inc.
CPT-115

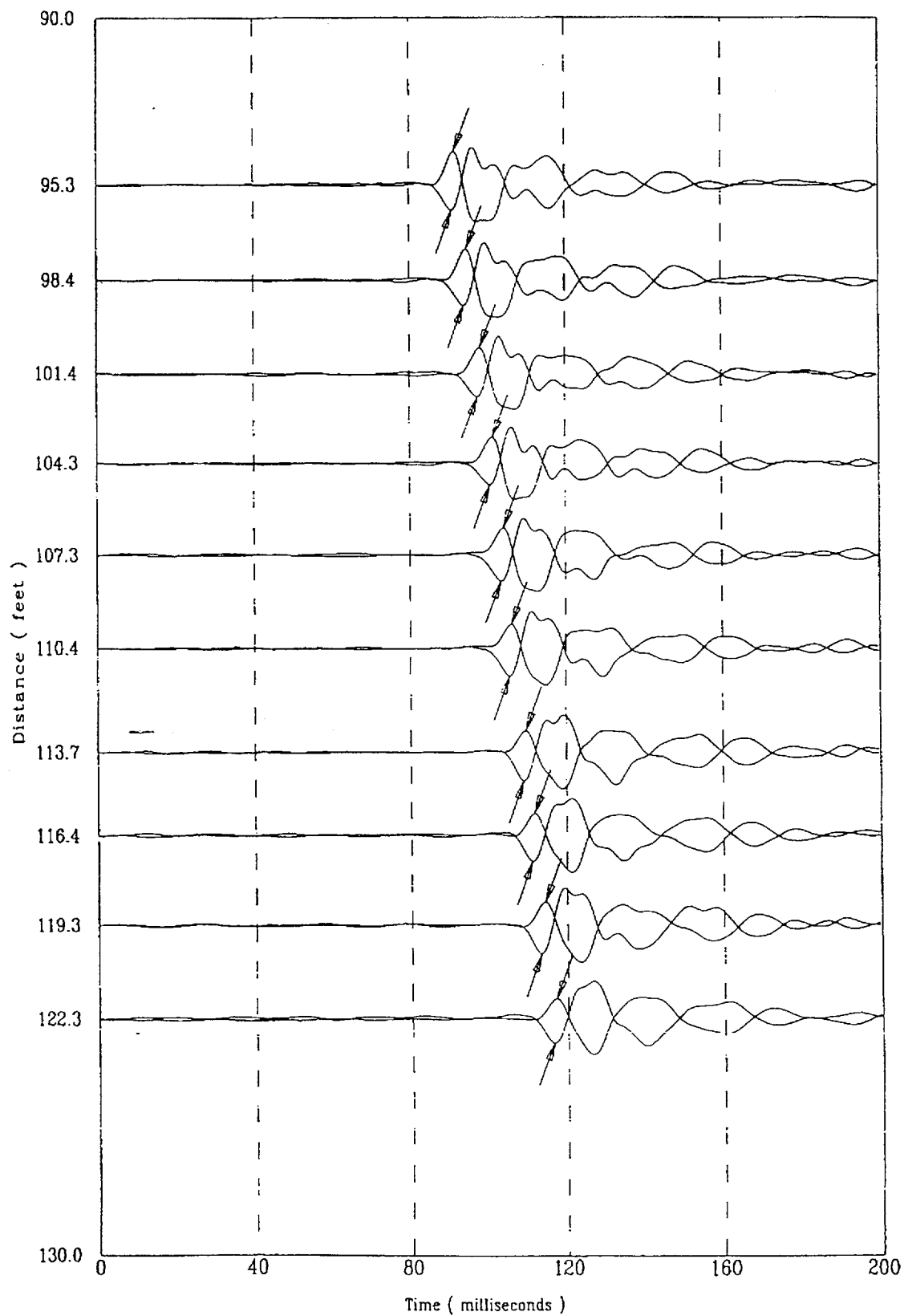
S Wave
02/20/98



201801S

Applied Research Associates, Inc.
CPT-115

S Wave
02/20/98

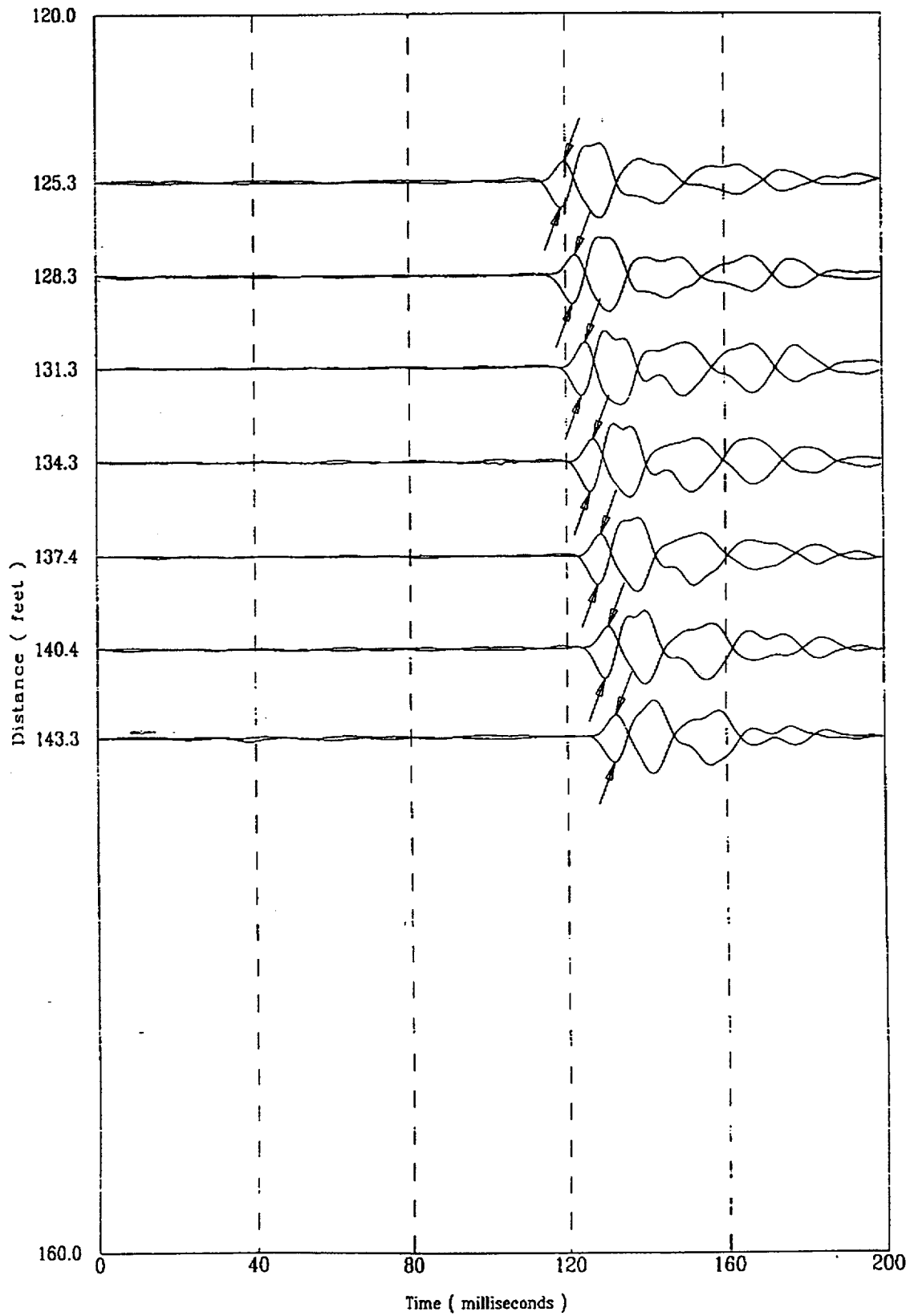


5201801S

74 of 522

Applied Research Associates, Inc.
CPT-115

S Wave
02/20/98



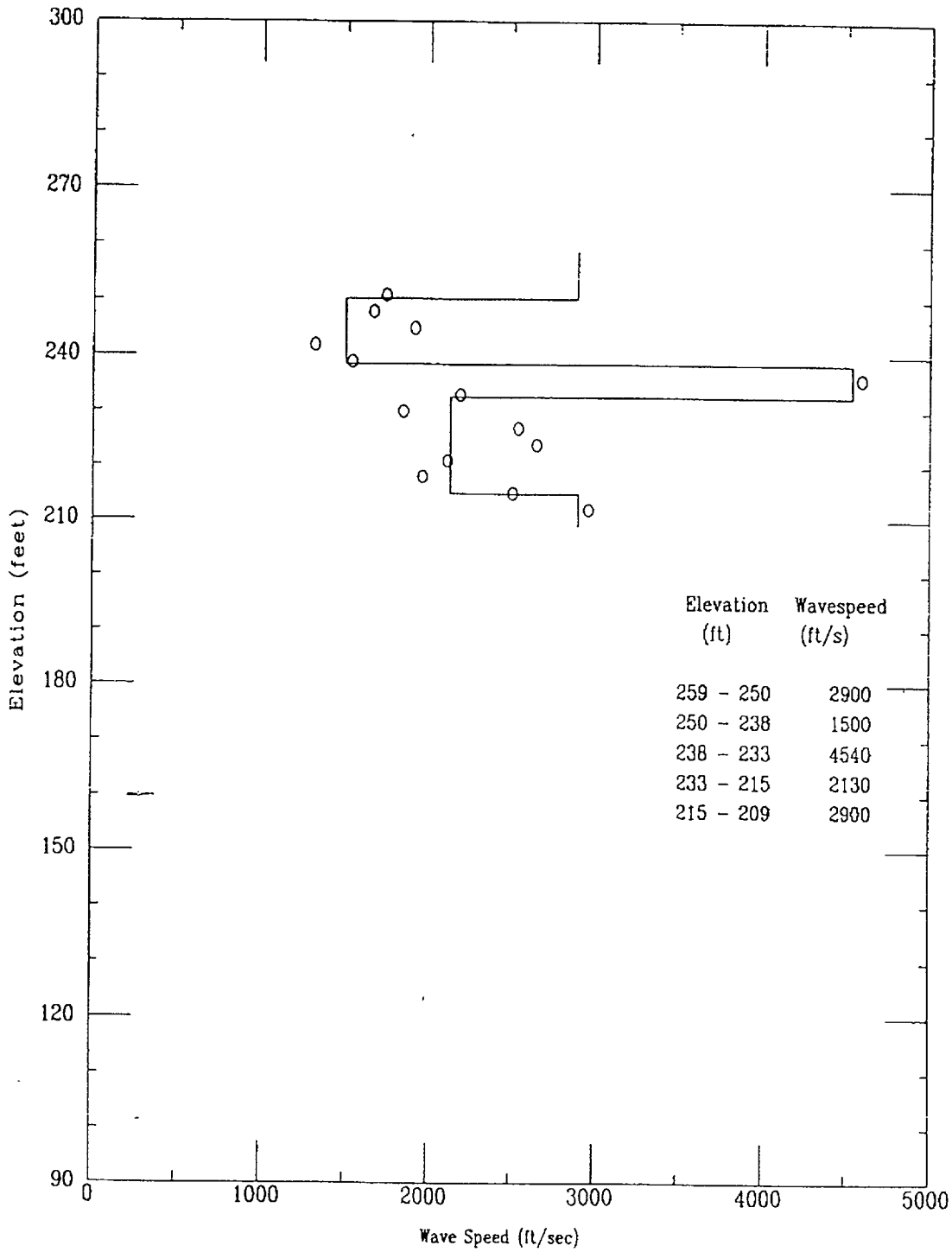
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CPT-115

APPLIED RESEARCH ASSOCIATES, INC.

02/20/98

Compression Wave Speeds

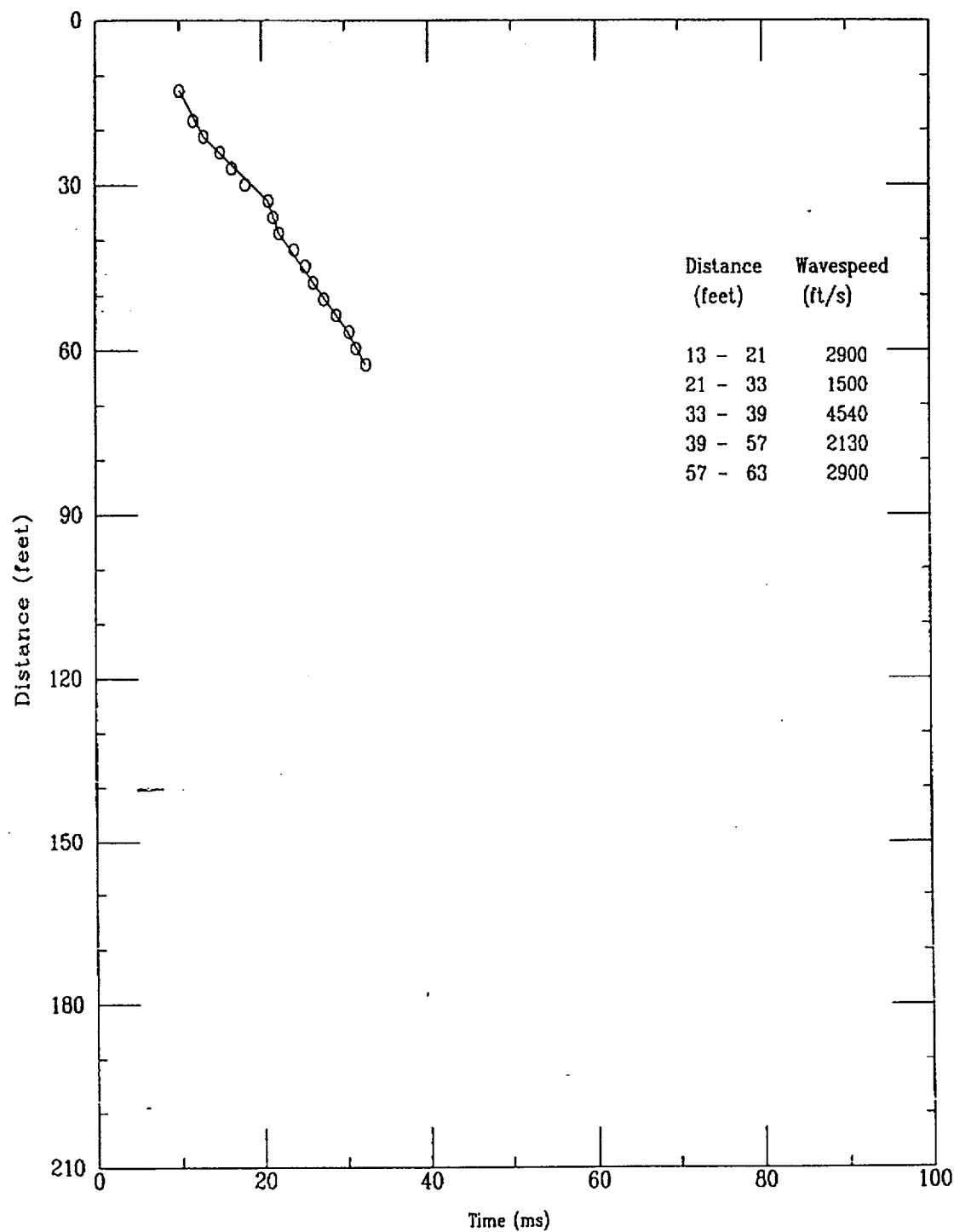


CPT-115

APPLIED RESEARCH ASSOCIATES, INC.

02/20/98

Compression Wave Time of Peak

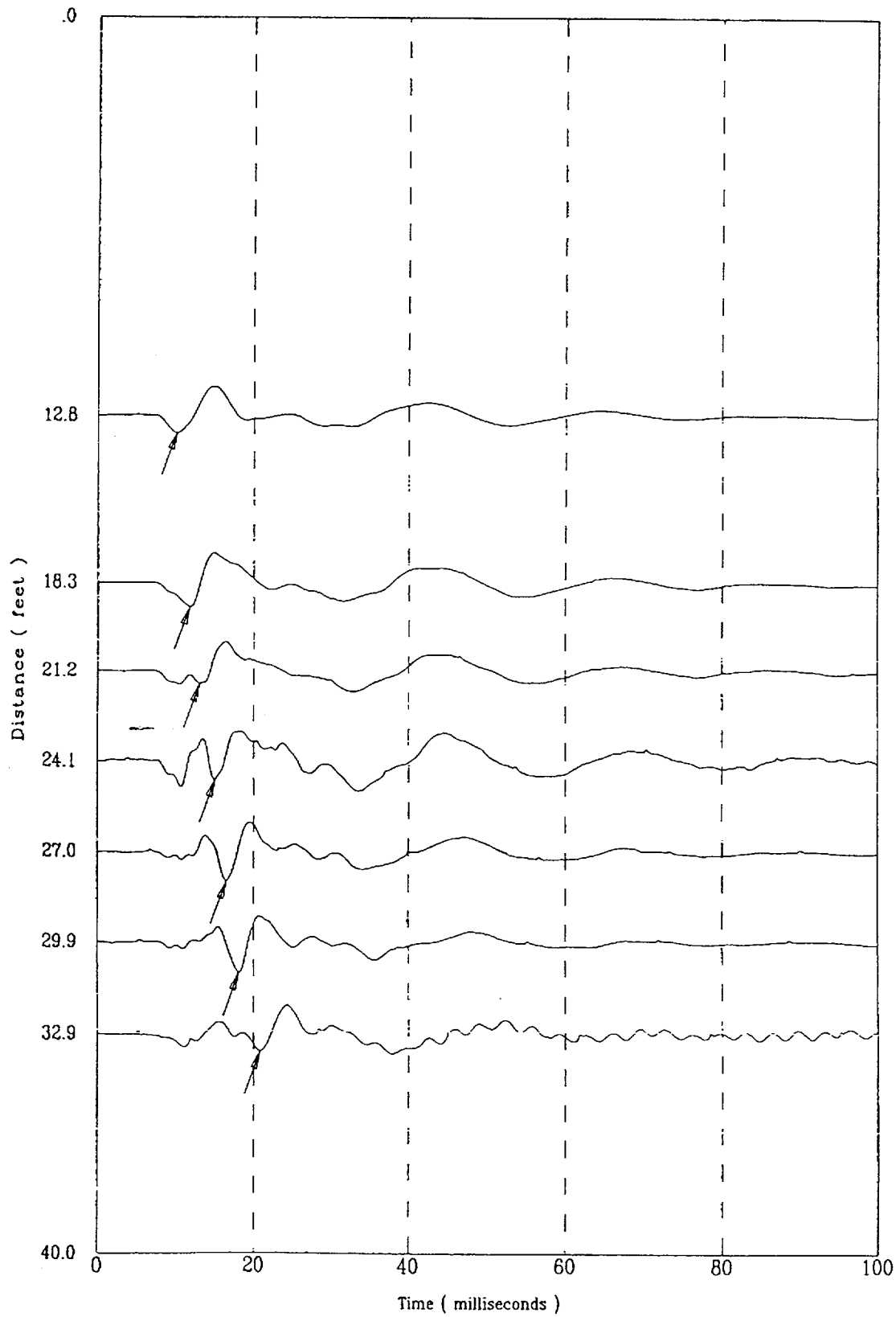


File 5201801S

77 of 522

Applied Research Associates
CPT-115

P Wave
02/20/98



5201801S

CPT-116

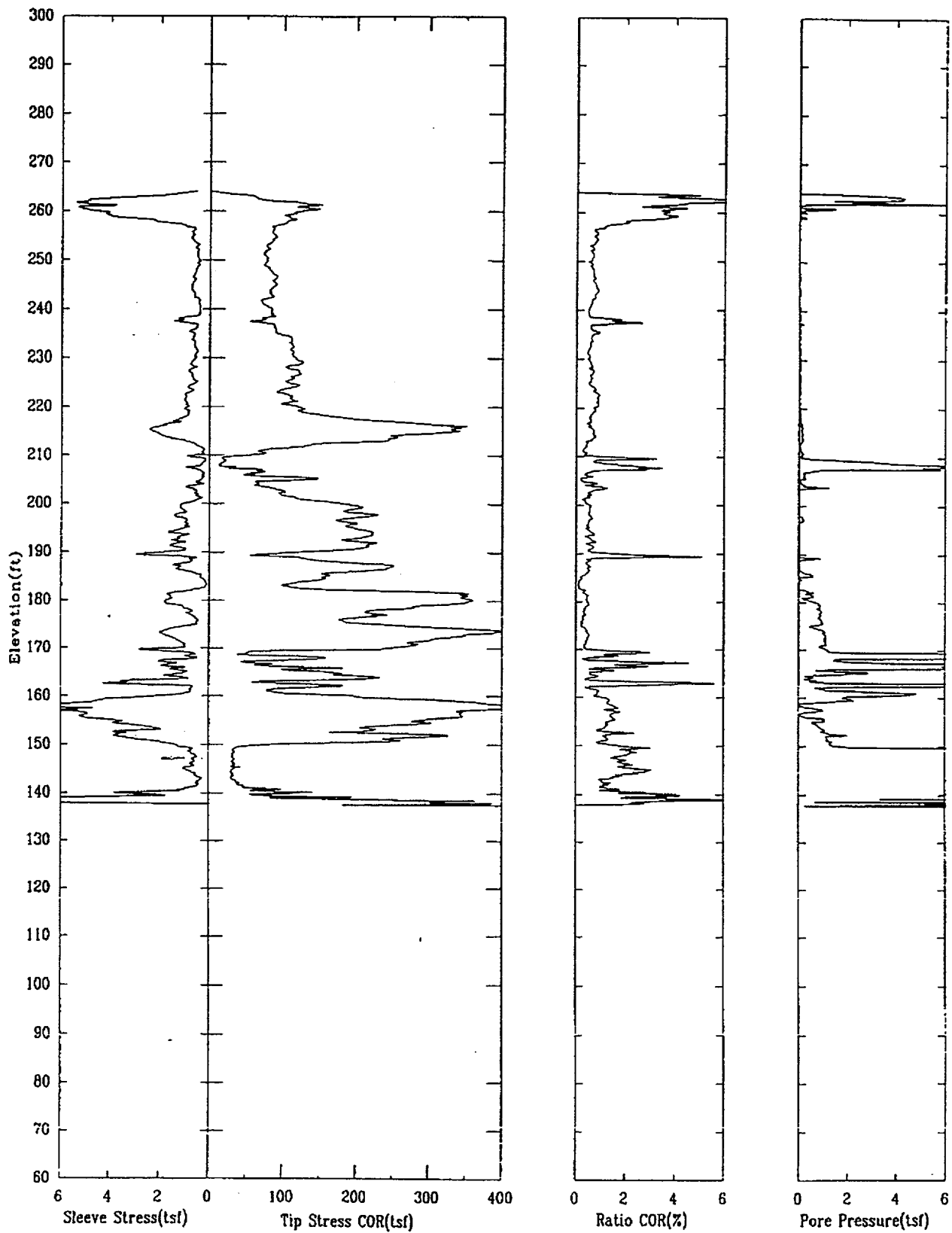
APPLIED RESEARCH ASSOCIATES, INC.

02/20/98

North 79781.17

East 55261.01

Elevation 270.1



CPT-116

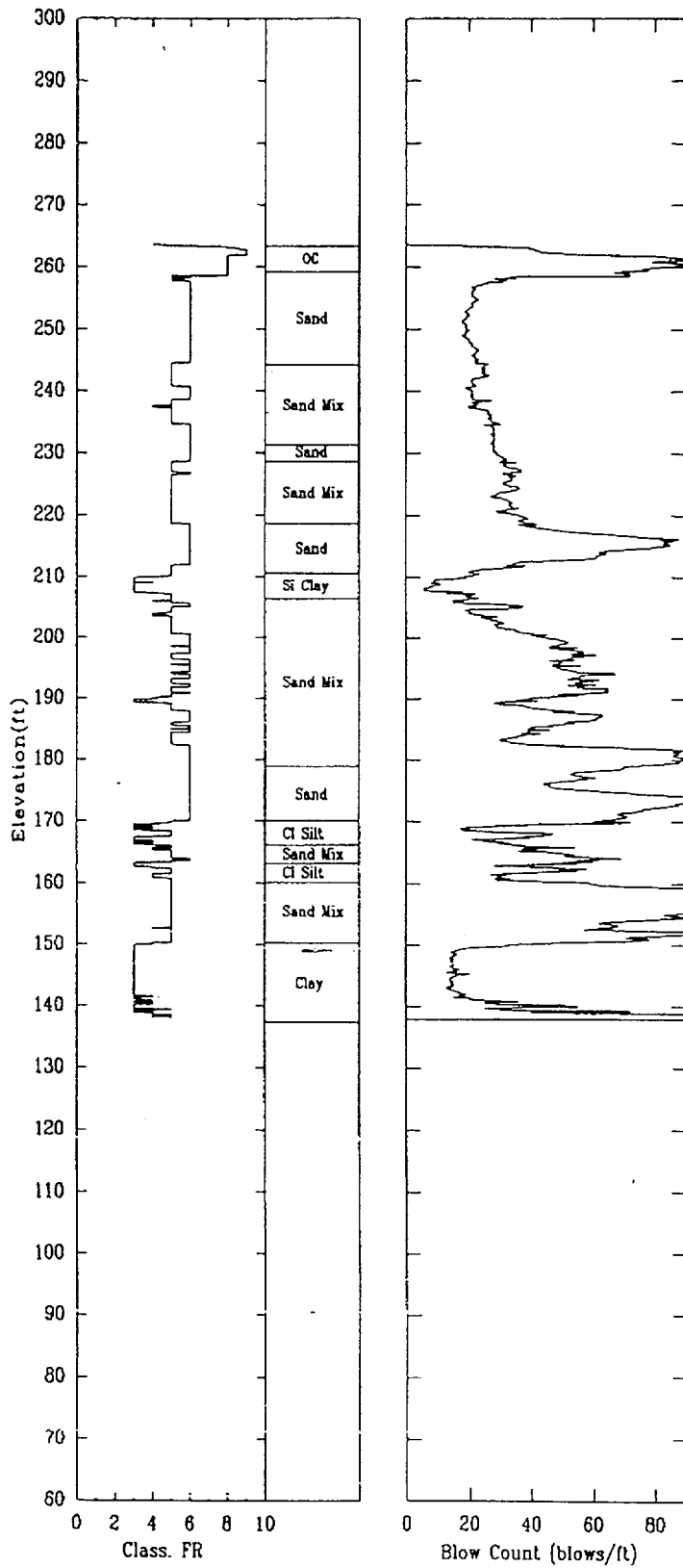
APPLIED RESEARCH ASSOCIATES, INC.

02/20/98

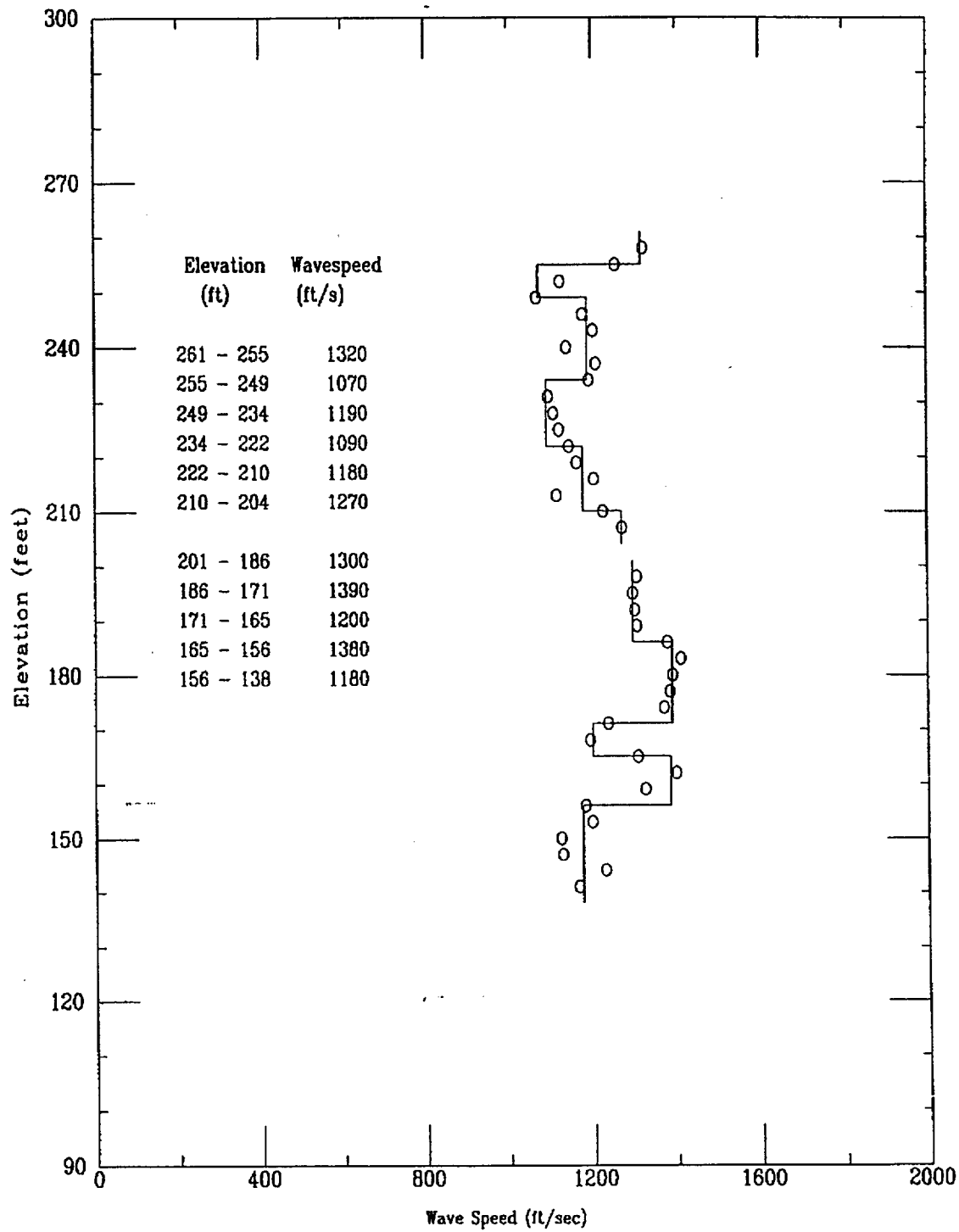
— North 79781.17

East 55261.01

Elevation 270.1



Shear Wave Speeds

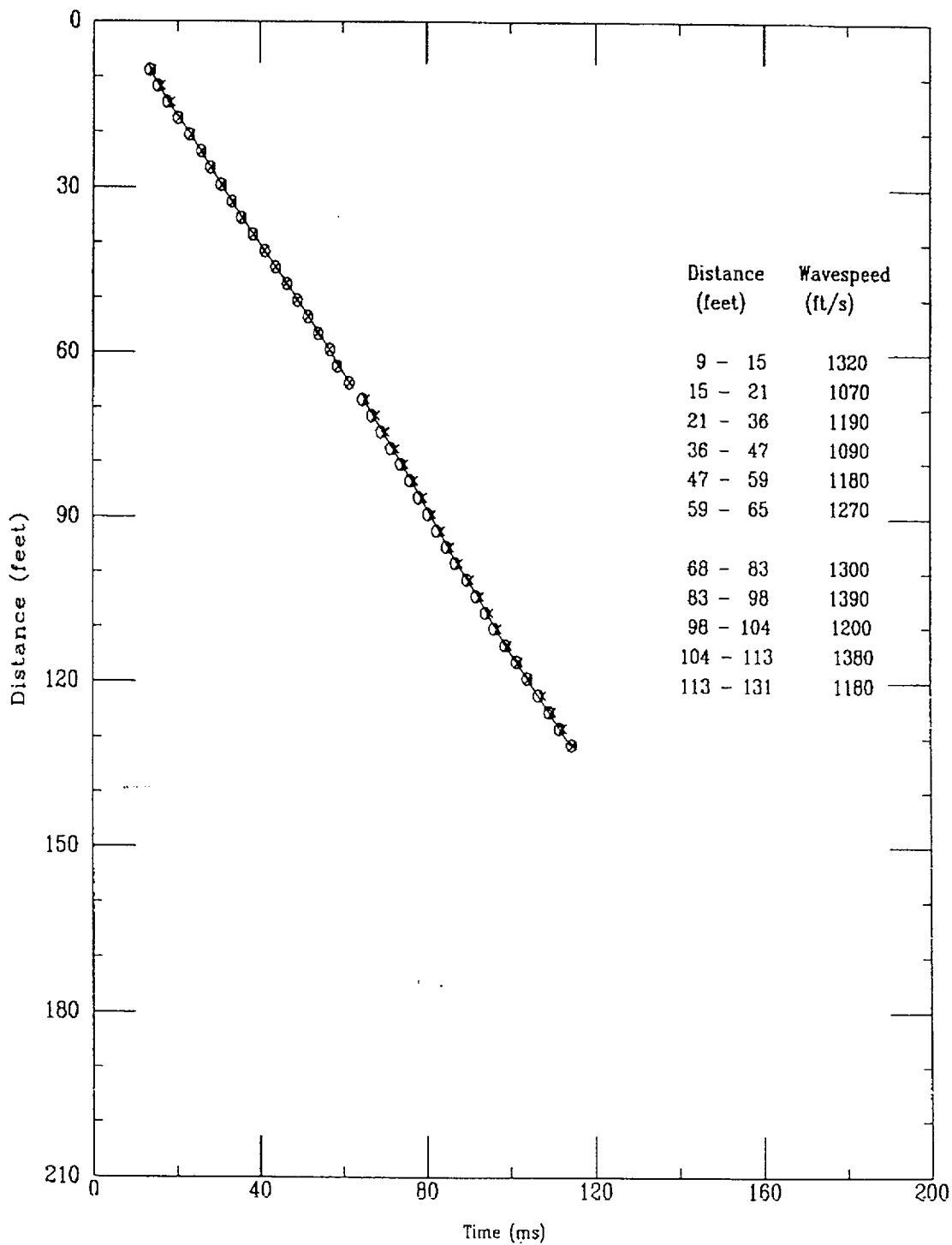


CPT-116

APPLIED RESEARCH ASSOCIATES, INC.

02/20/98

Shear Wave Time of Peak

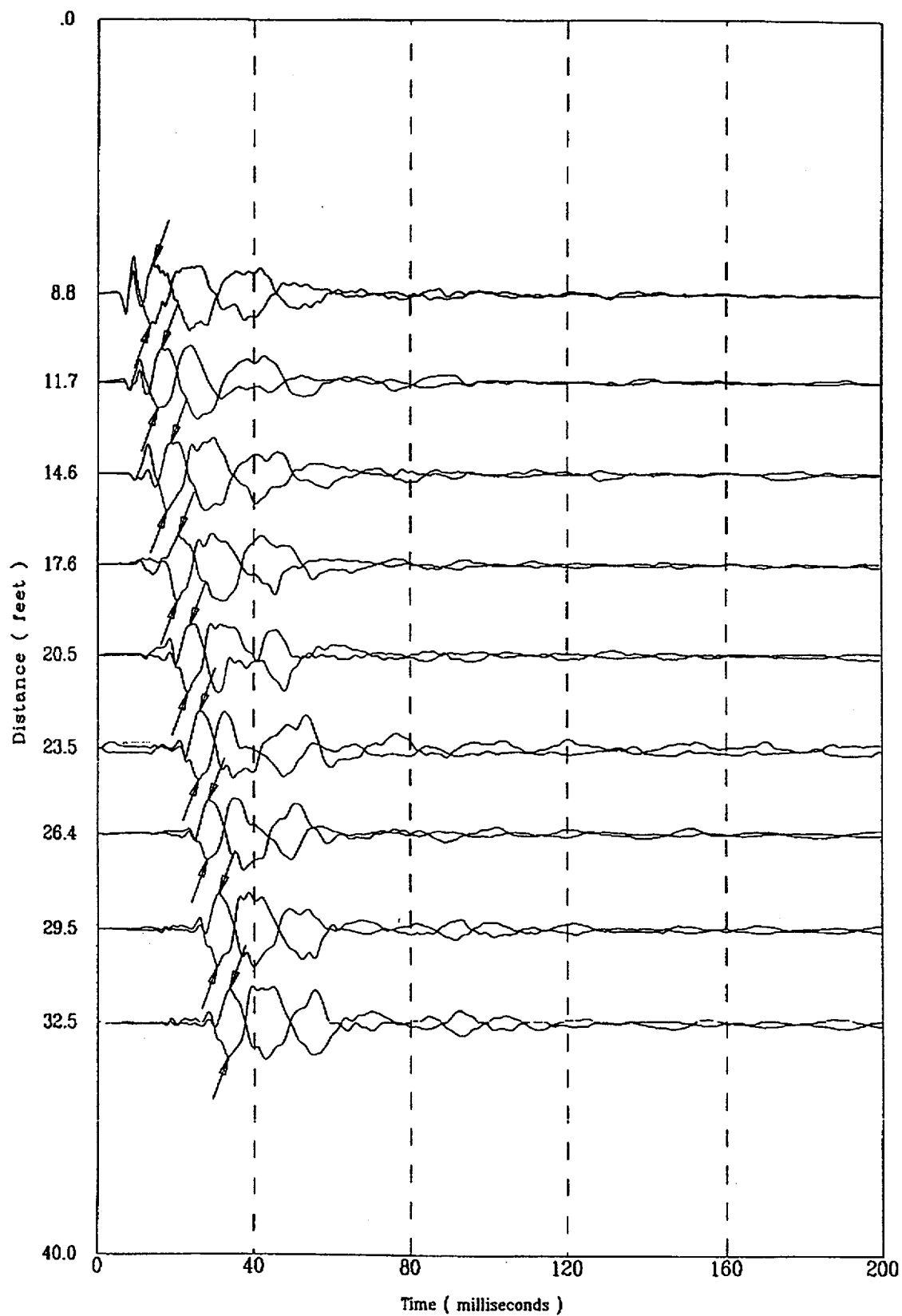


File 520r803S

82 of 522

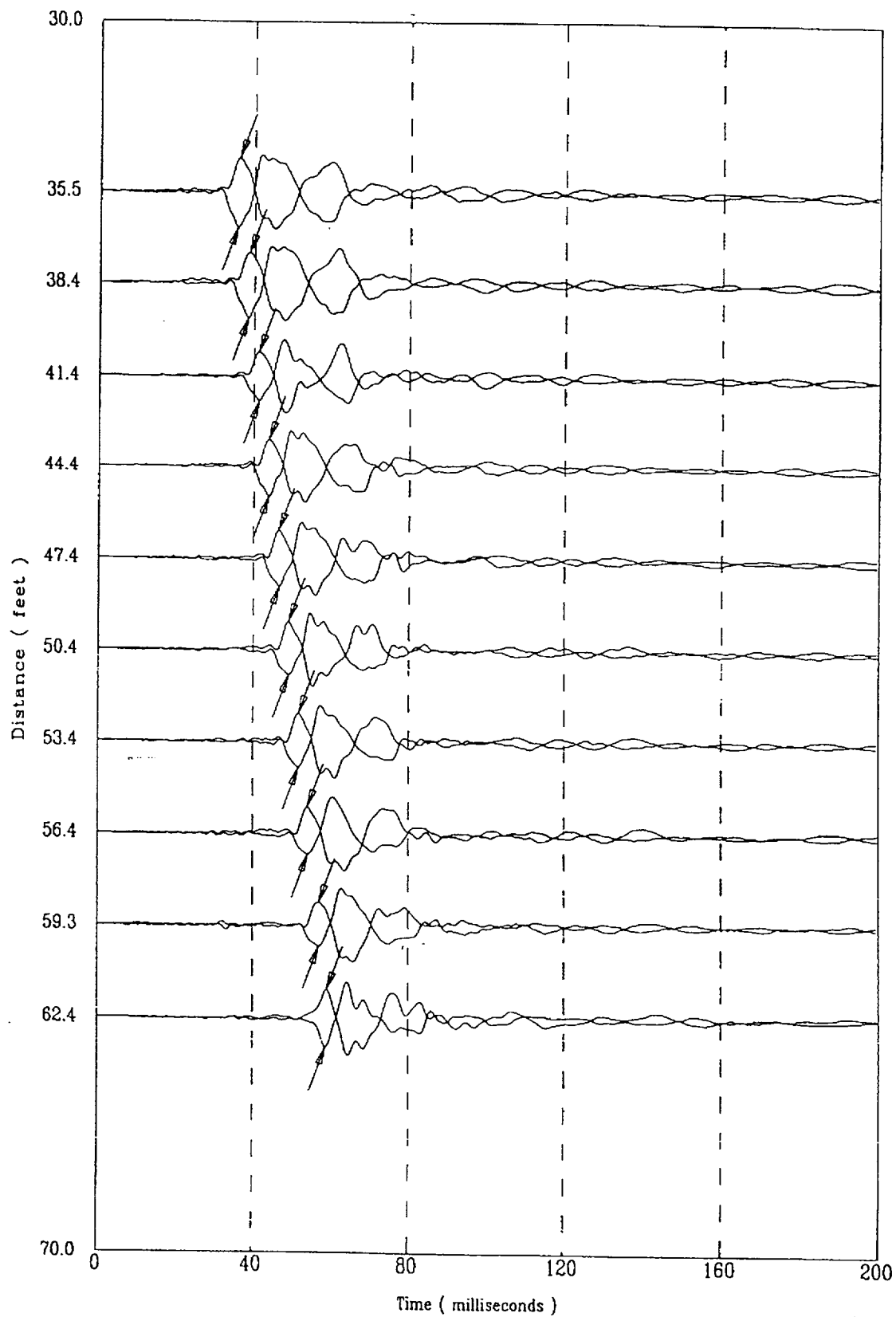
Applied Research Associates, Inc.
CPT-116

S Wave
02/20/98



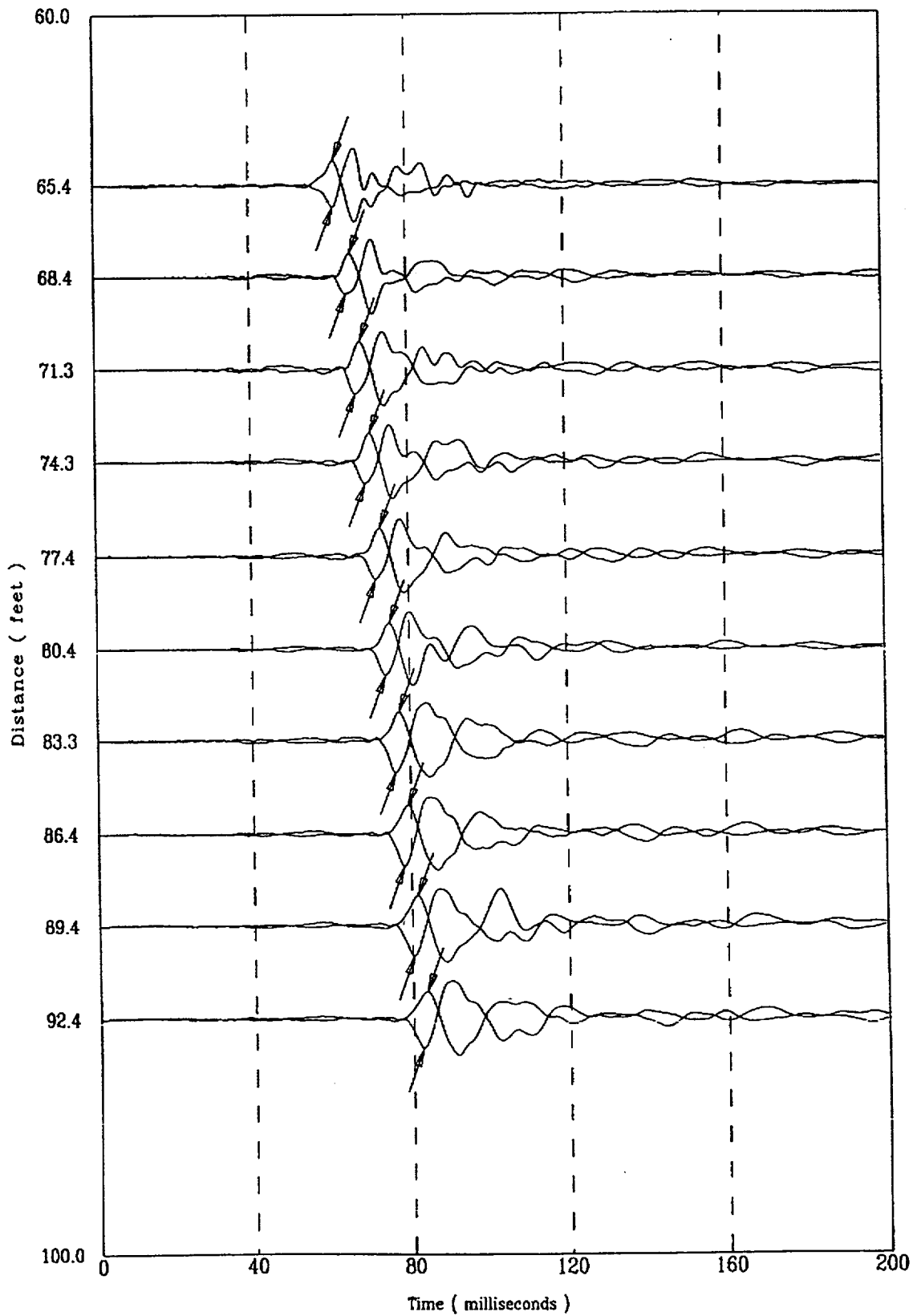
File 520f803S

83 of 522



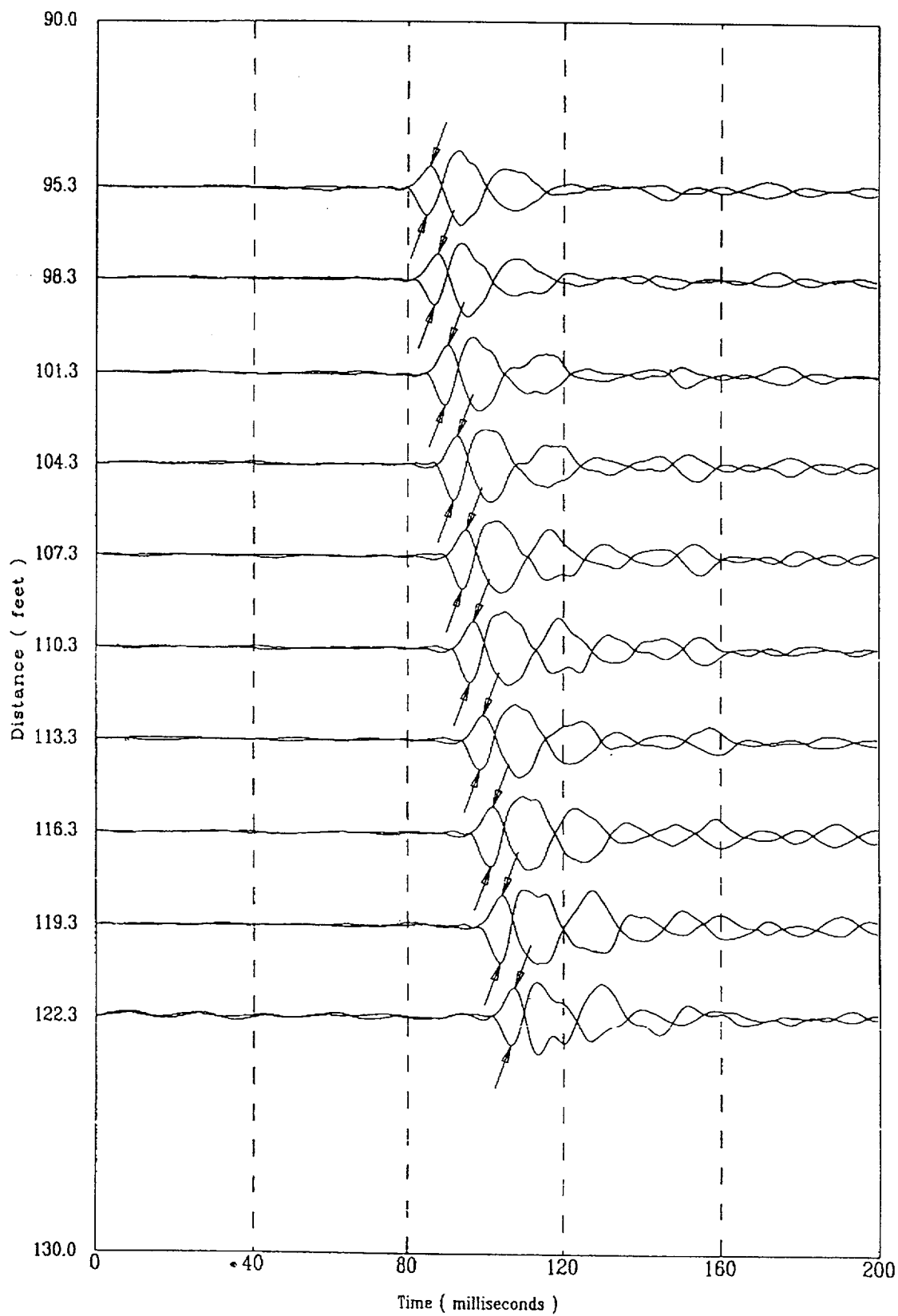
Applied Research Associates, Inc.
CPT-116

S Wave
02/20/98



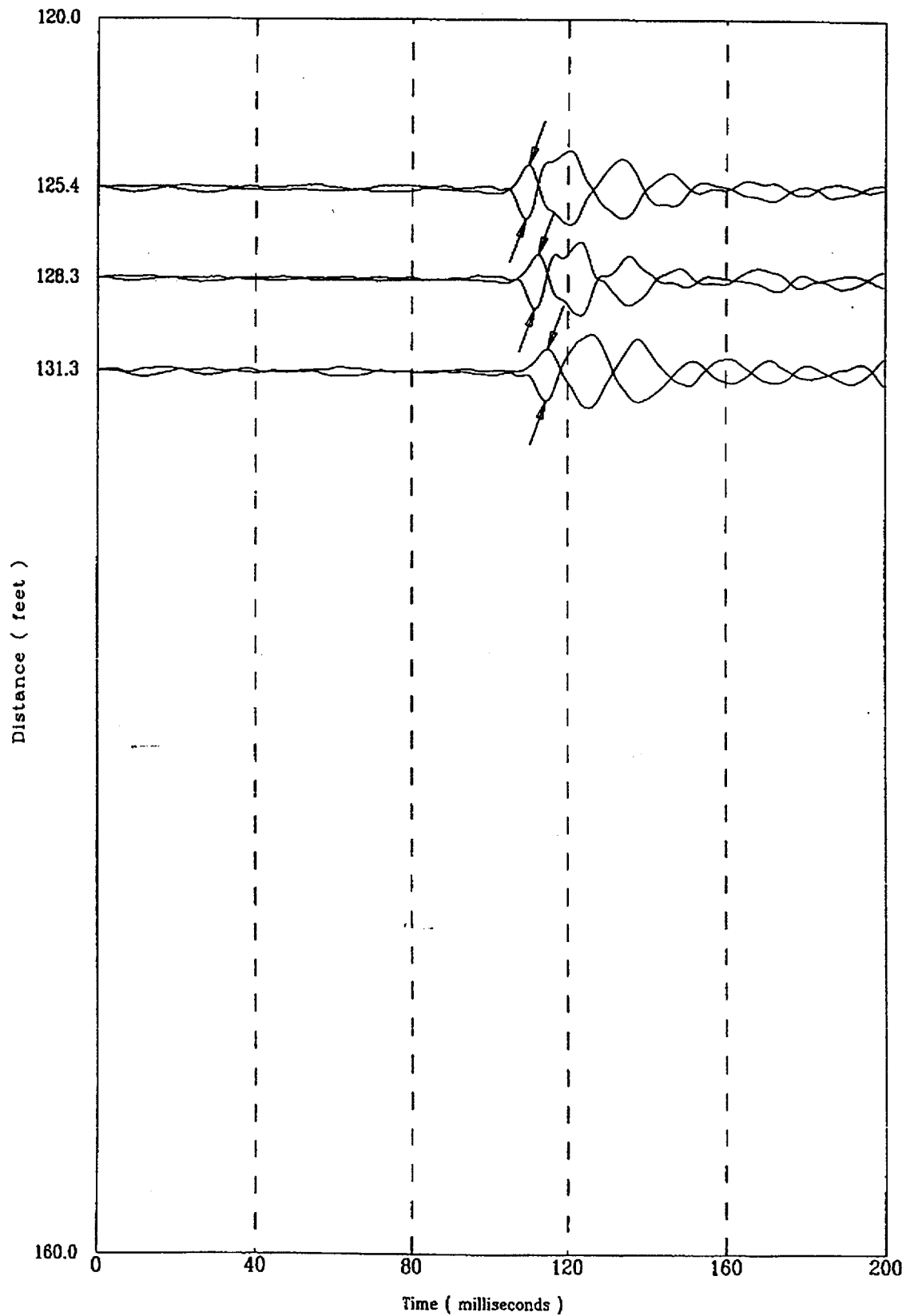
Applied Research Associates, Inc.
CPT-116

S Wave
02/20/98



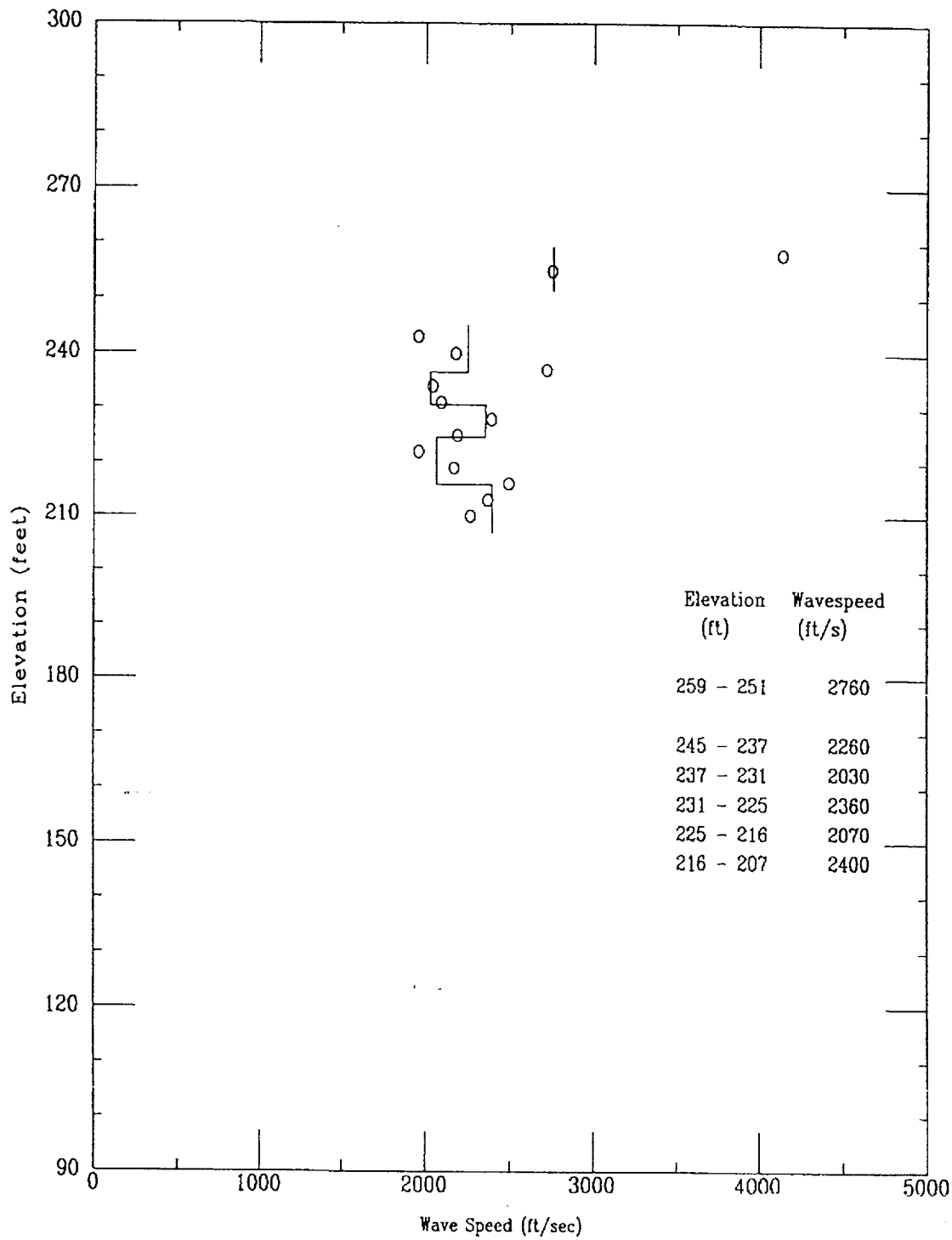
Applied Research Associates, Inc.
CPT-116

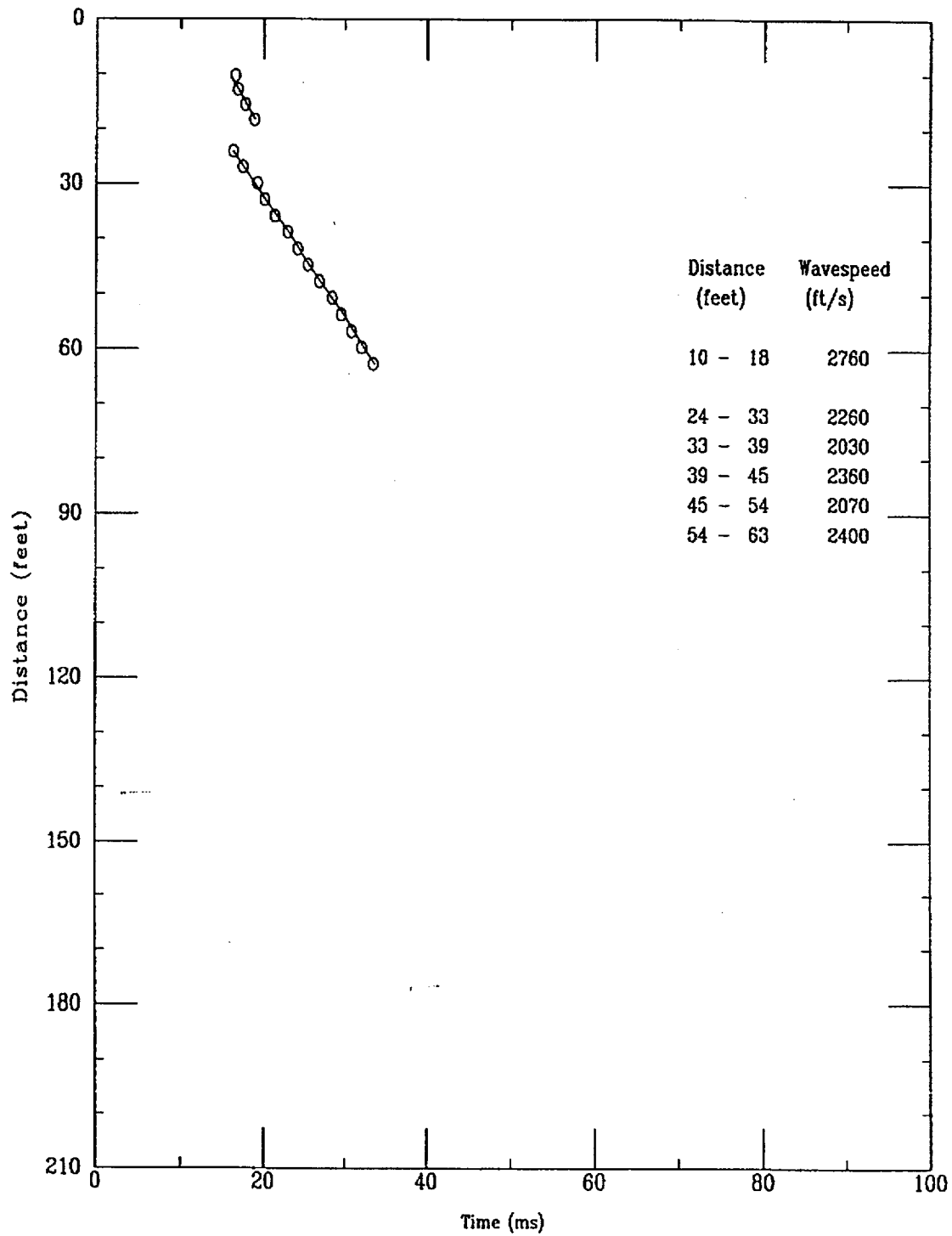
S Wave
02/20/98



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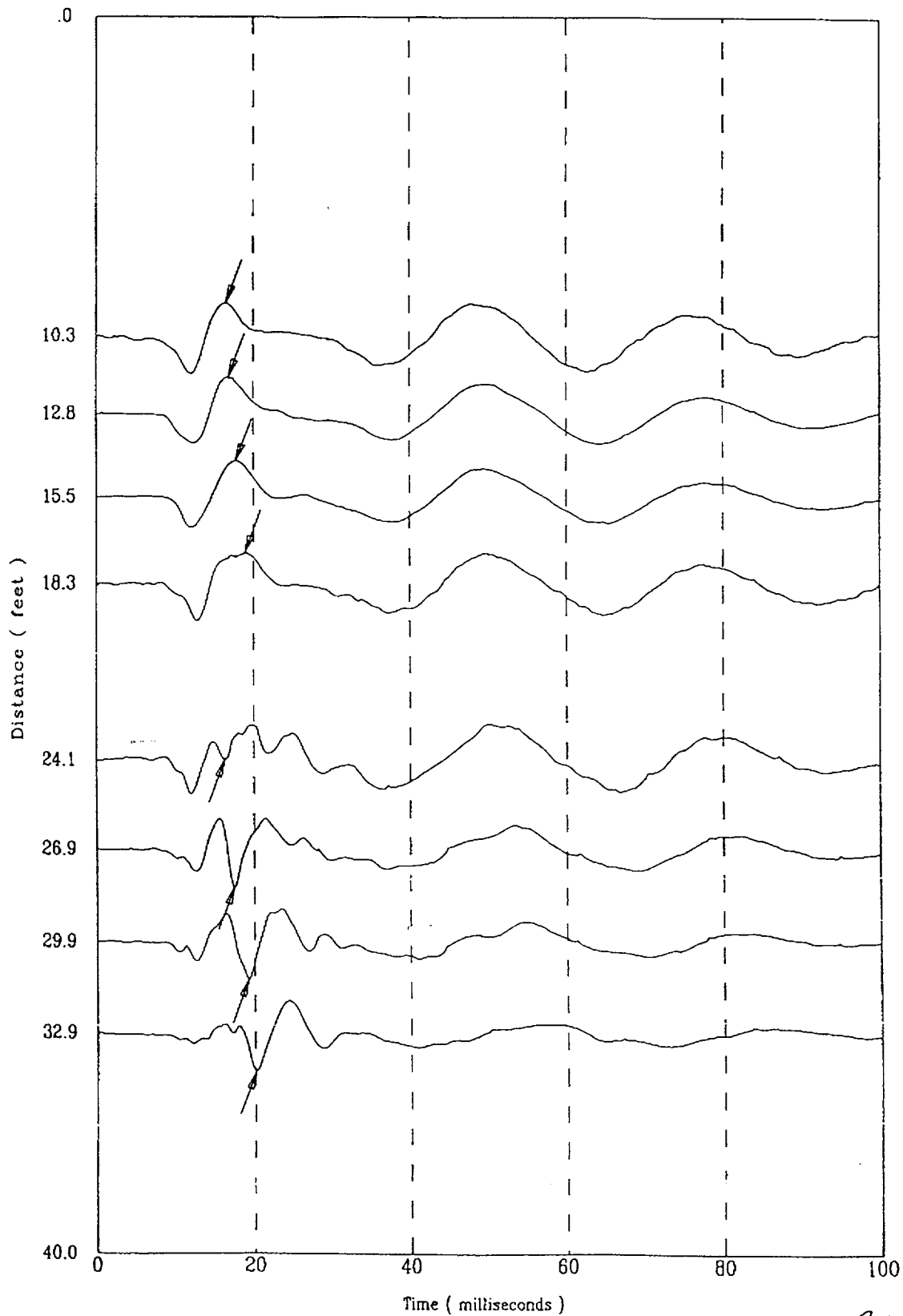
Compression Wave Speeds

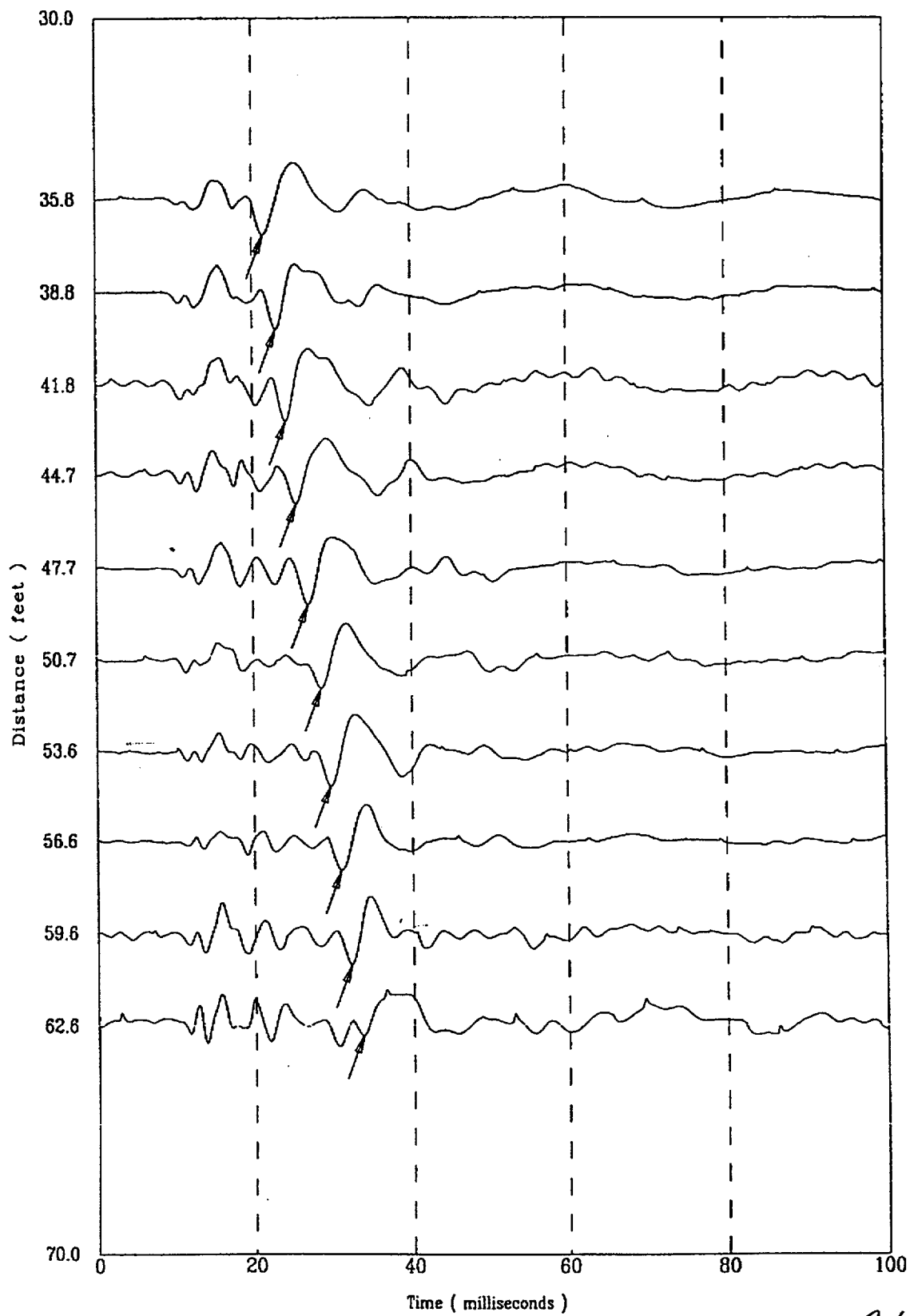




Applied Research Associates, Inc.
CPT-116

P Wave
02/20/98





CPT-126

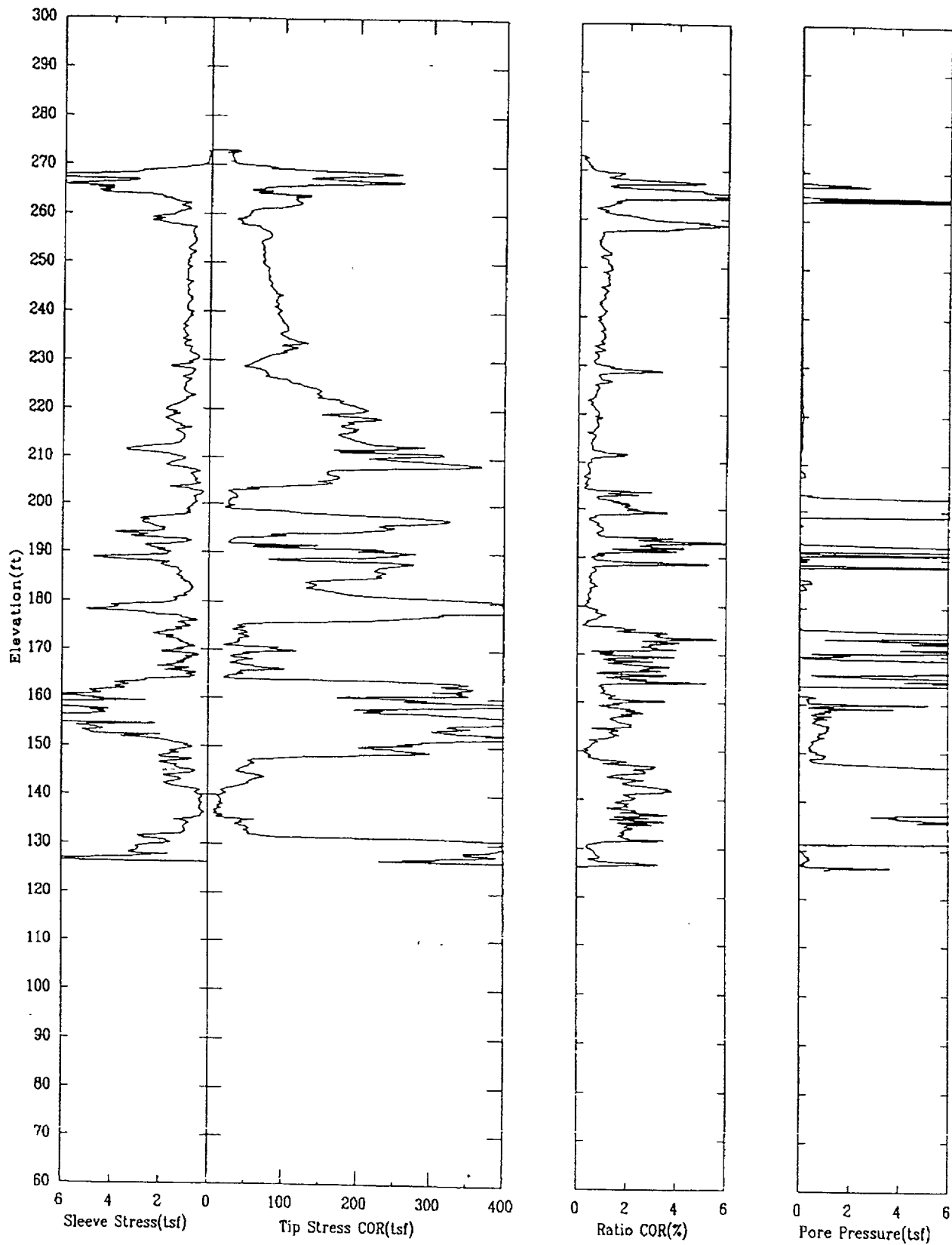
APPLIED RESEARCH ASSOCIATES, INC.

02/24/98

North 79650.07

East 54825.03

Elevation 278.9



CPT-126

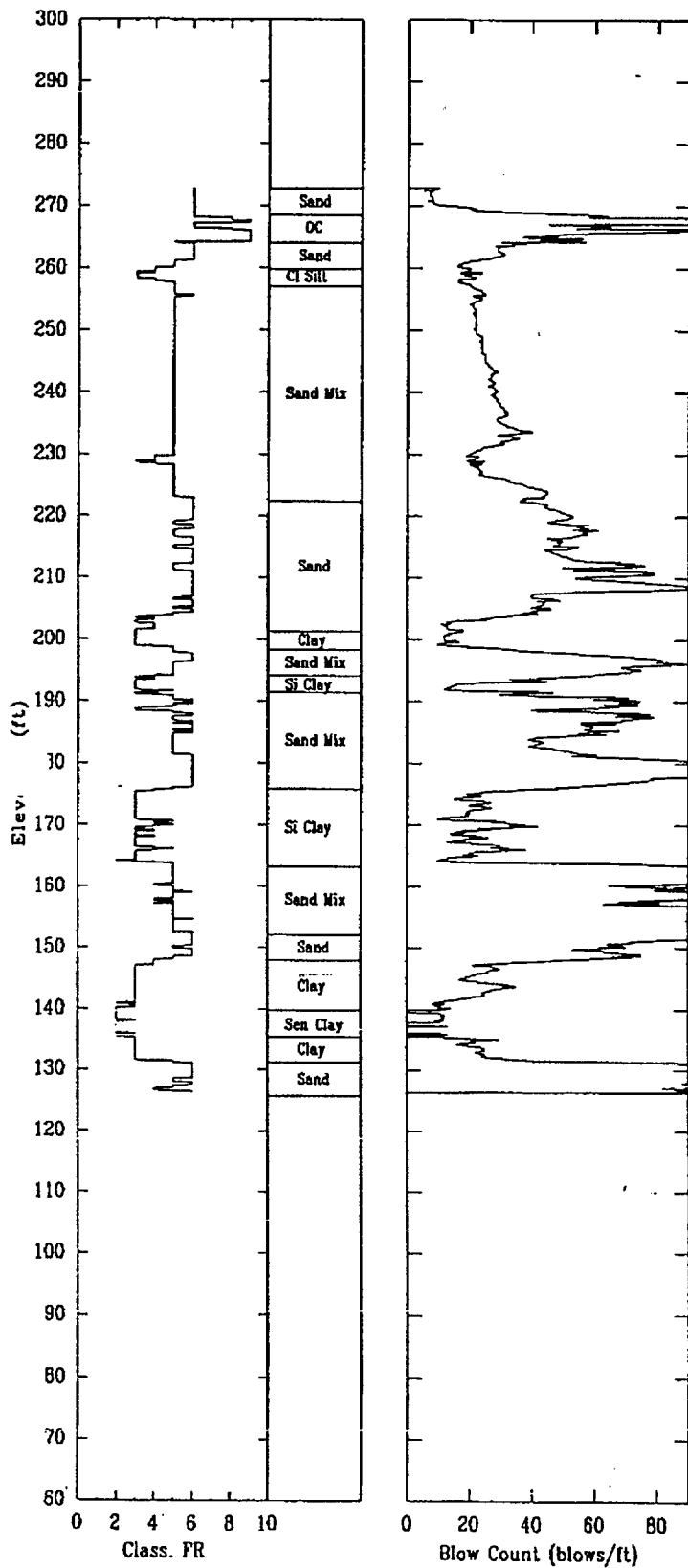
APPLIED RESEARCH ASSOCIATES, INC.

02/24/98

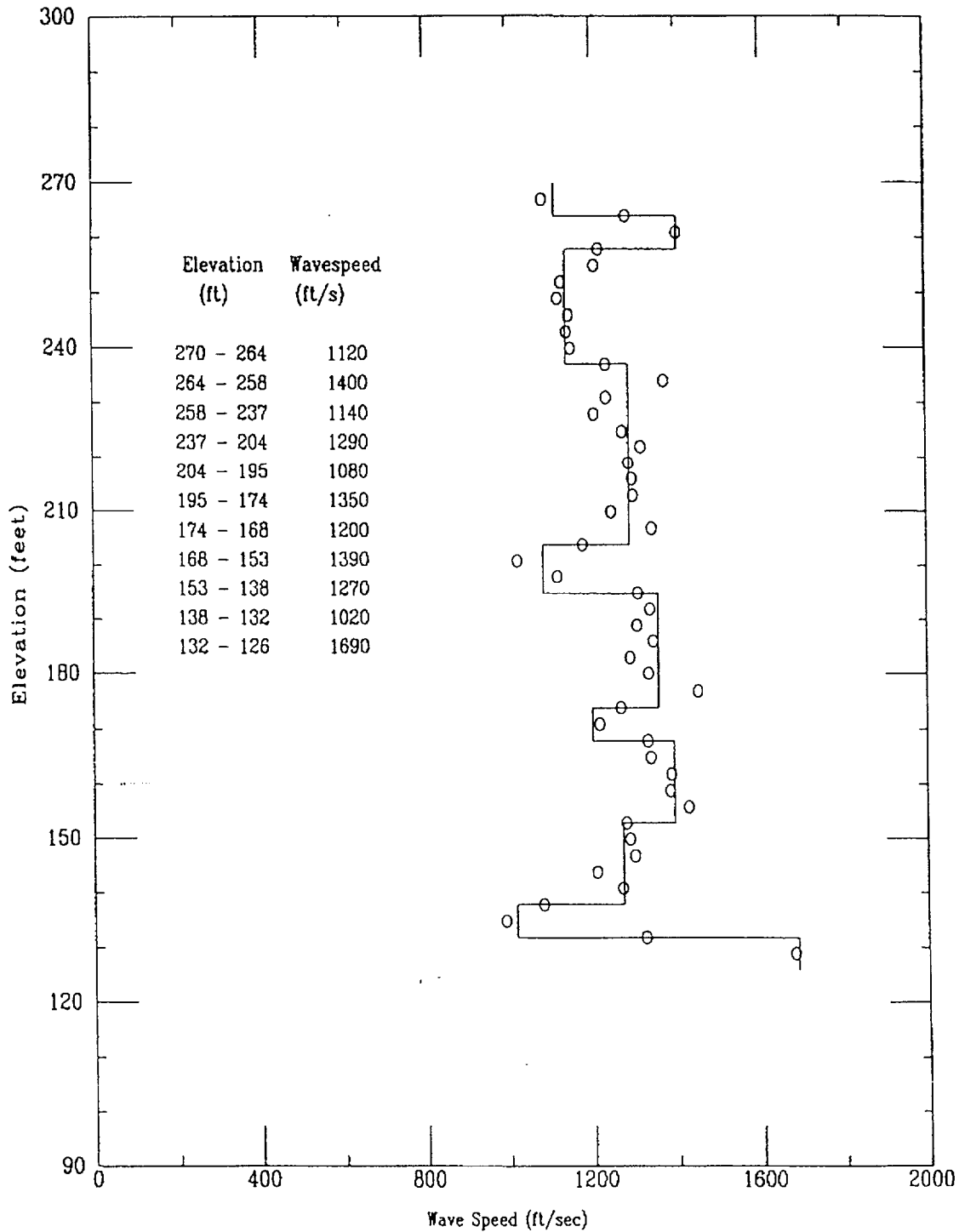
North 79650.07

East 54825.03

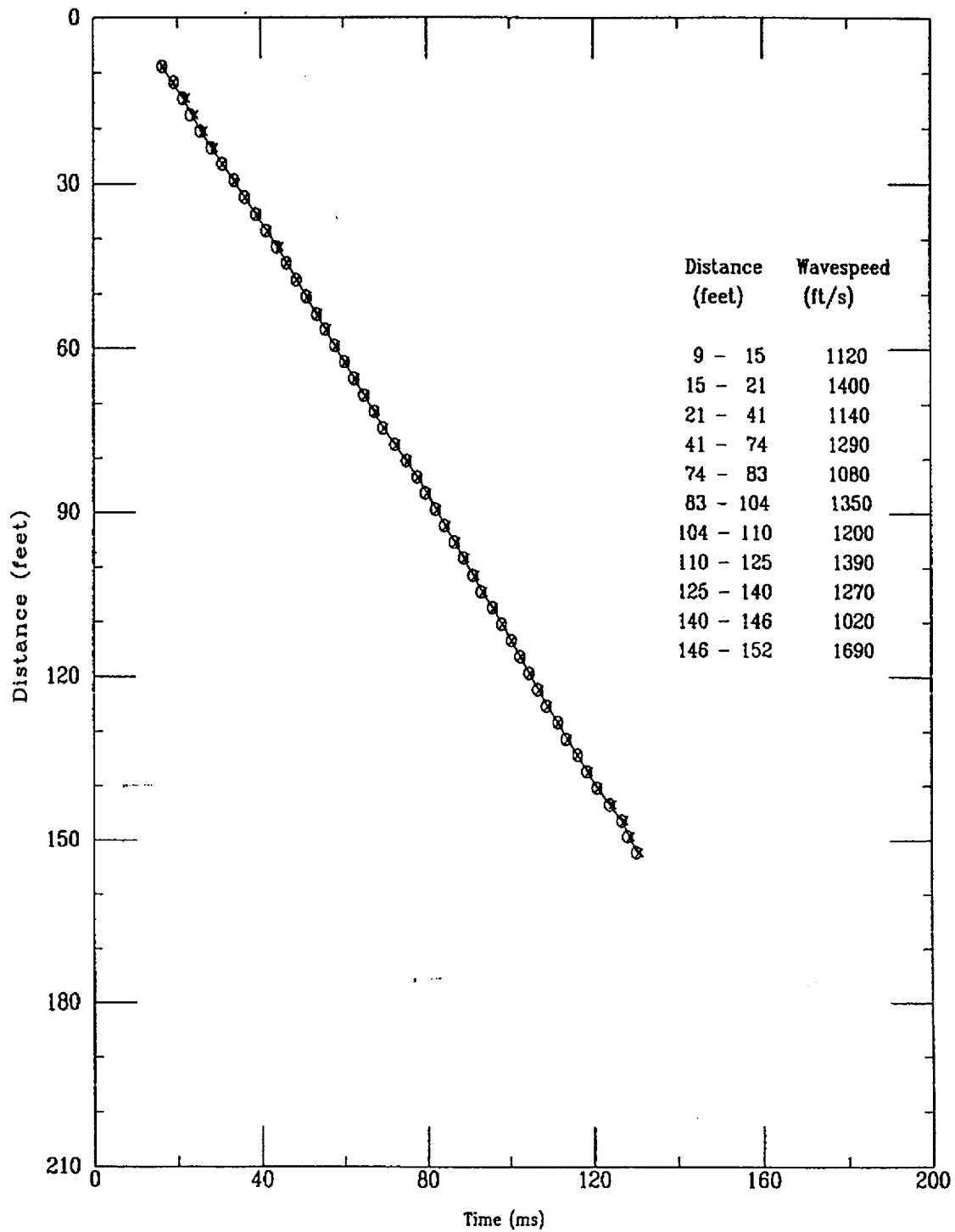
Elevation 278.9



Shear Wave Speeds

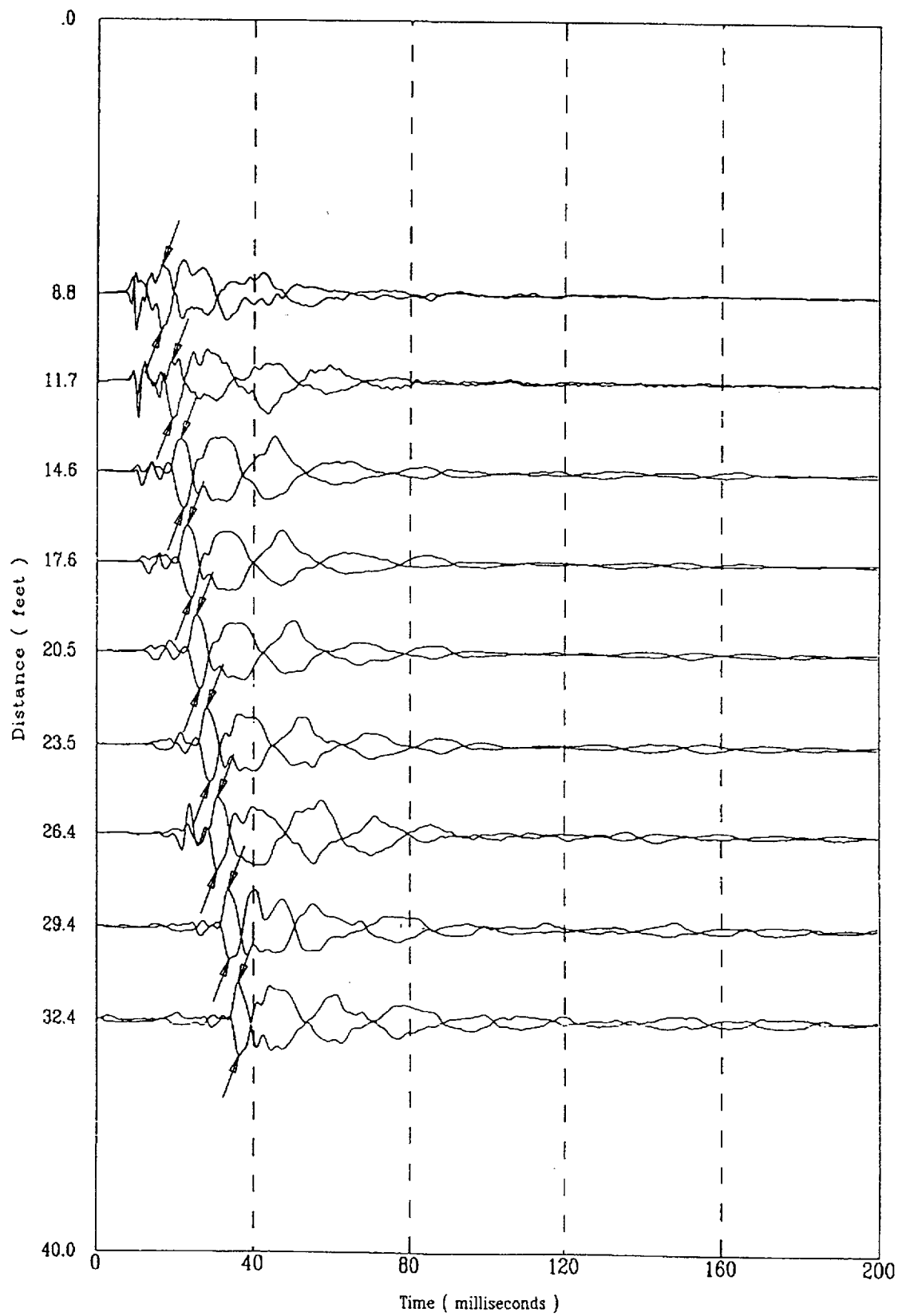


Shear Wave Time of Peak



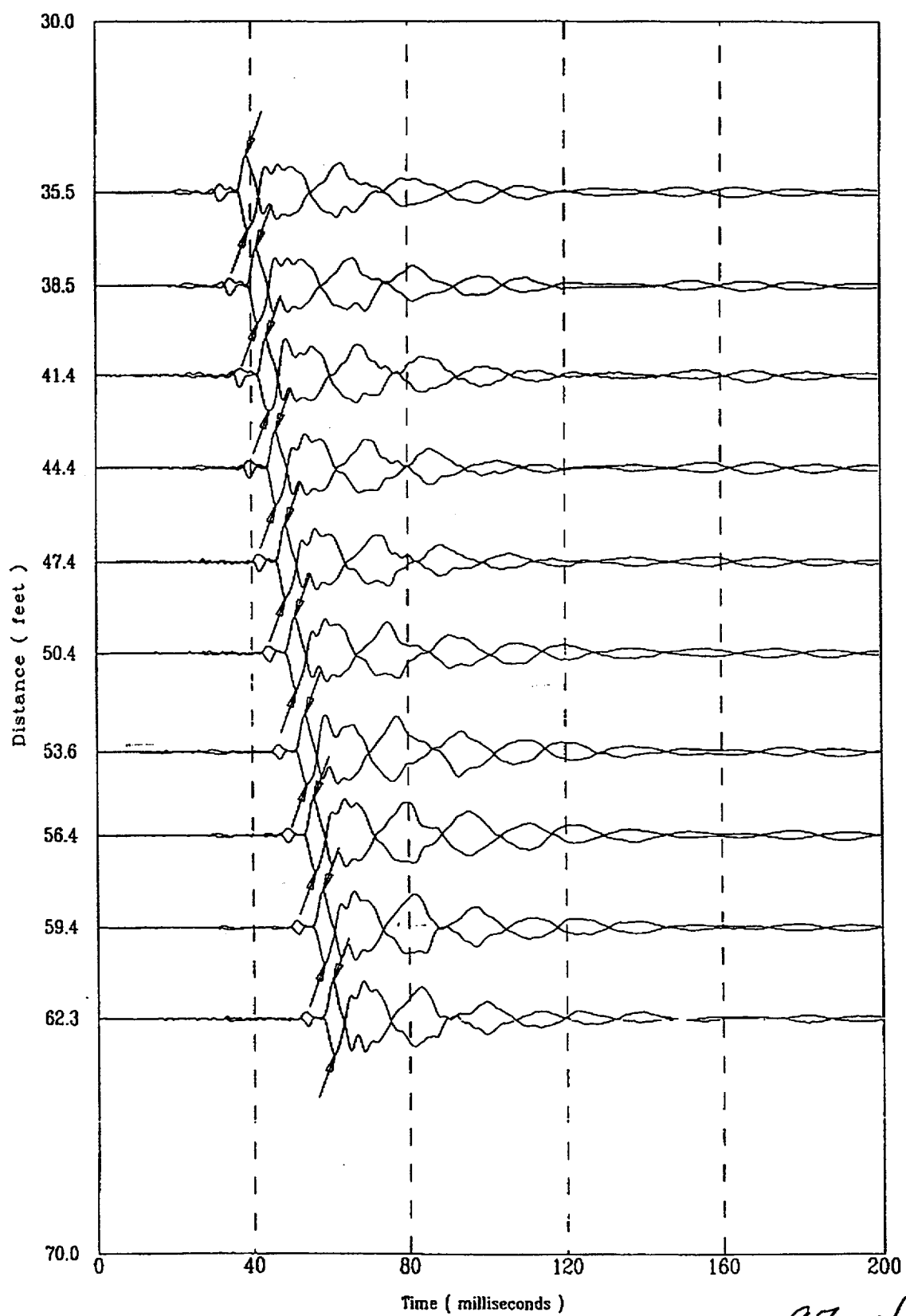
Applied Research Associates, Inc.
CPT-126

S Wave
02/24/98



Applied Research Associates, Inc.
CPT-126

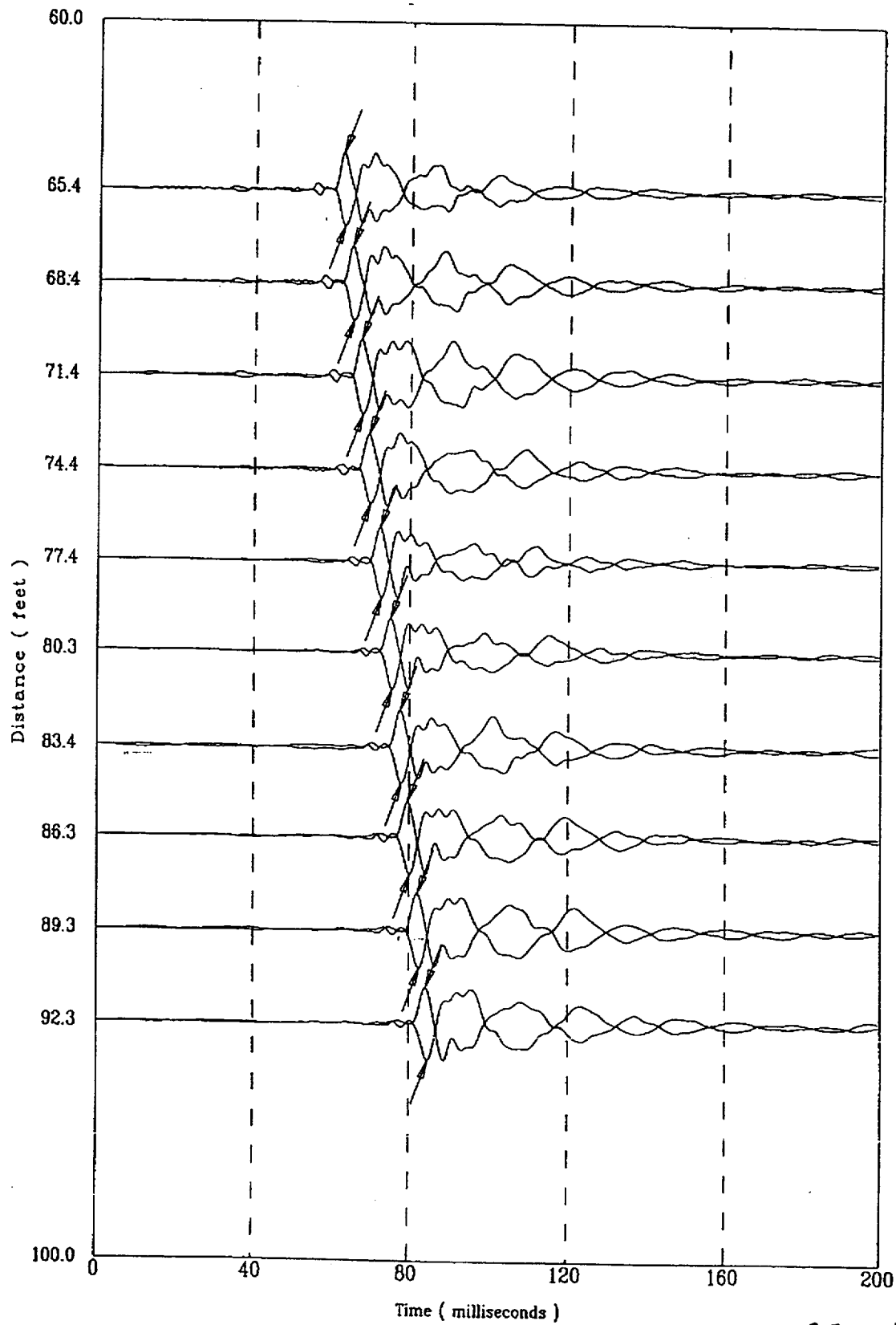
S Wave
02/24/98



97 of 522

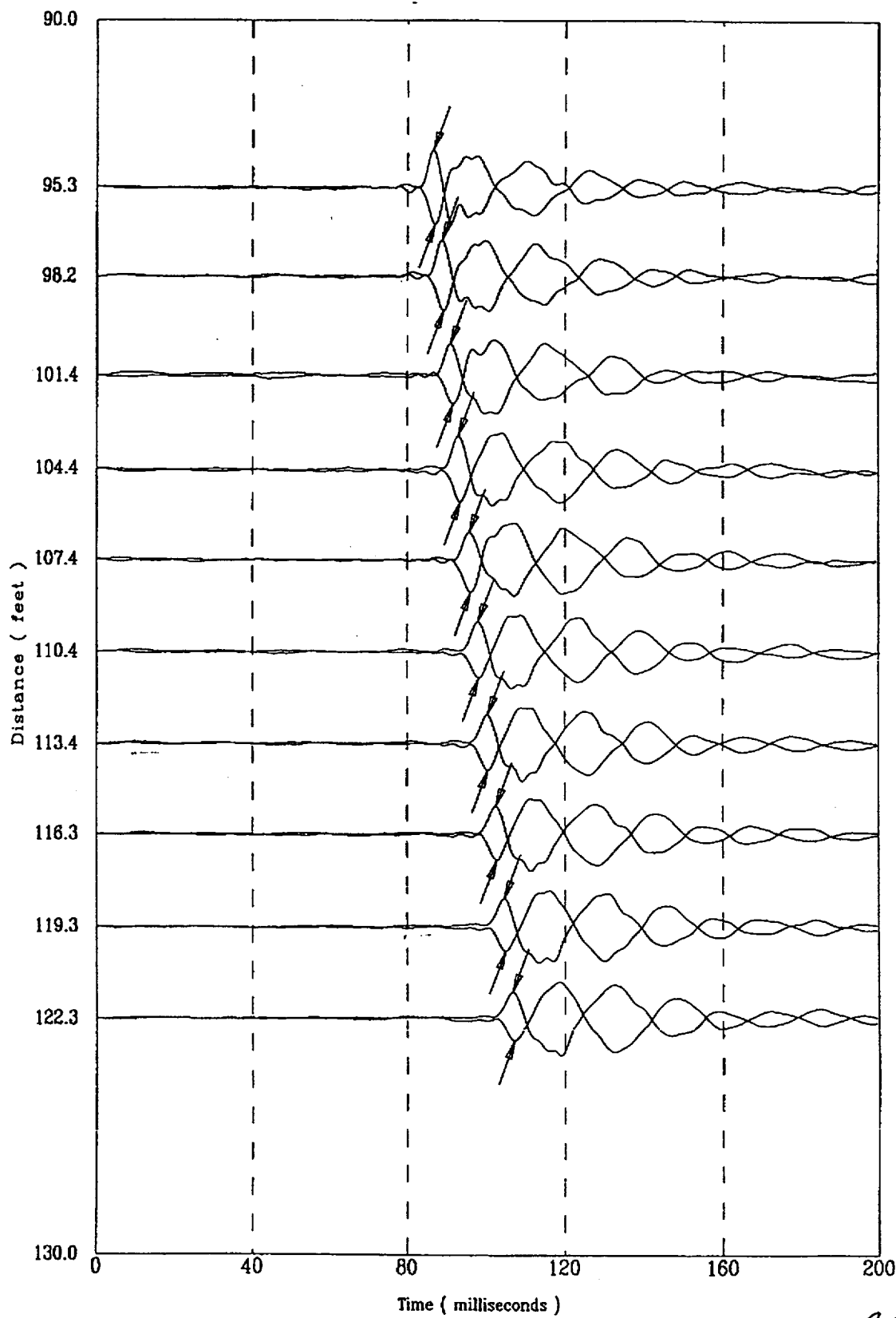
Applied Research Associates, Inc.
CPT-126

S Wave
02/24/98



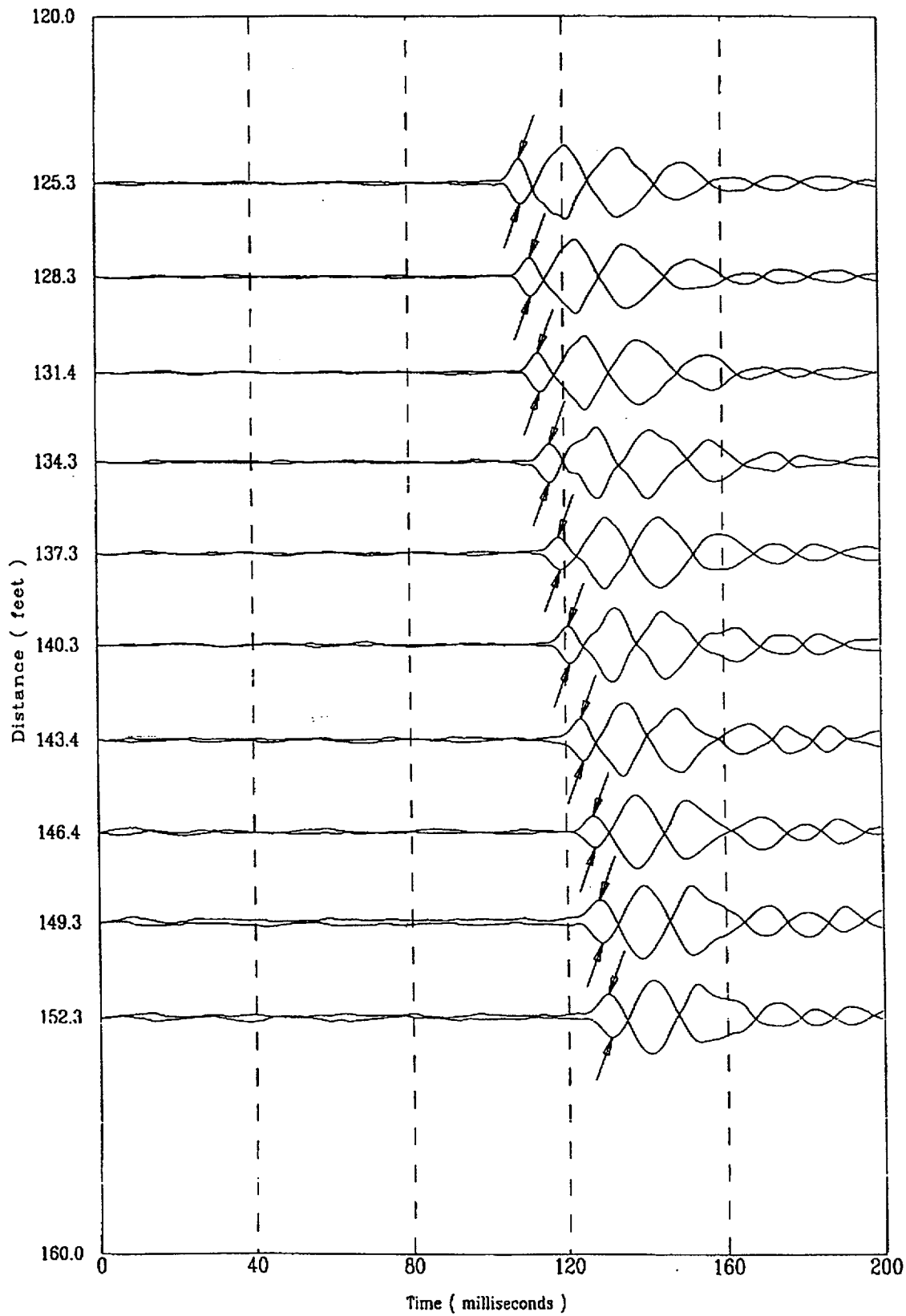
File 5241805S

98 of 522

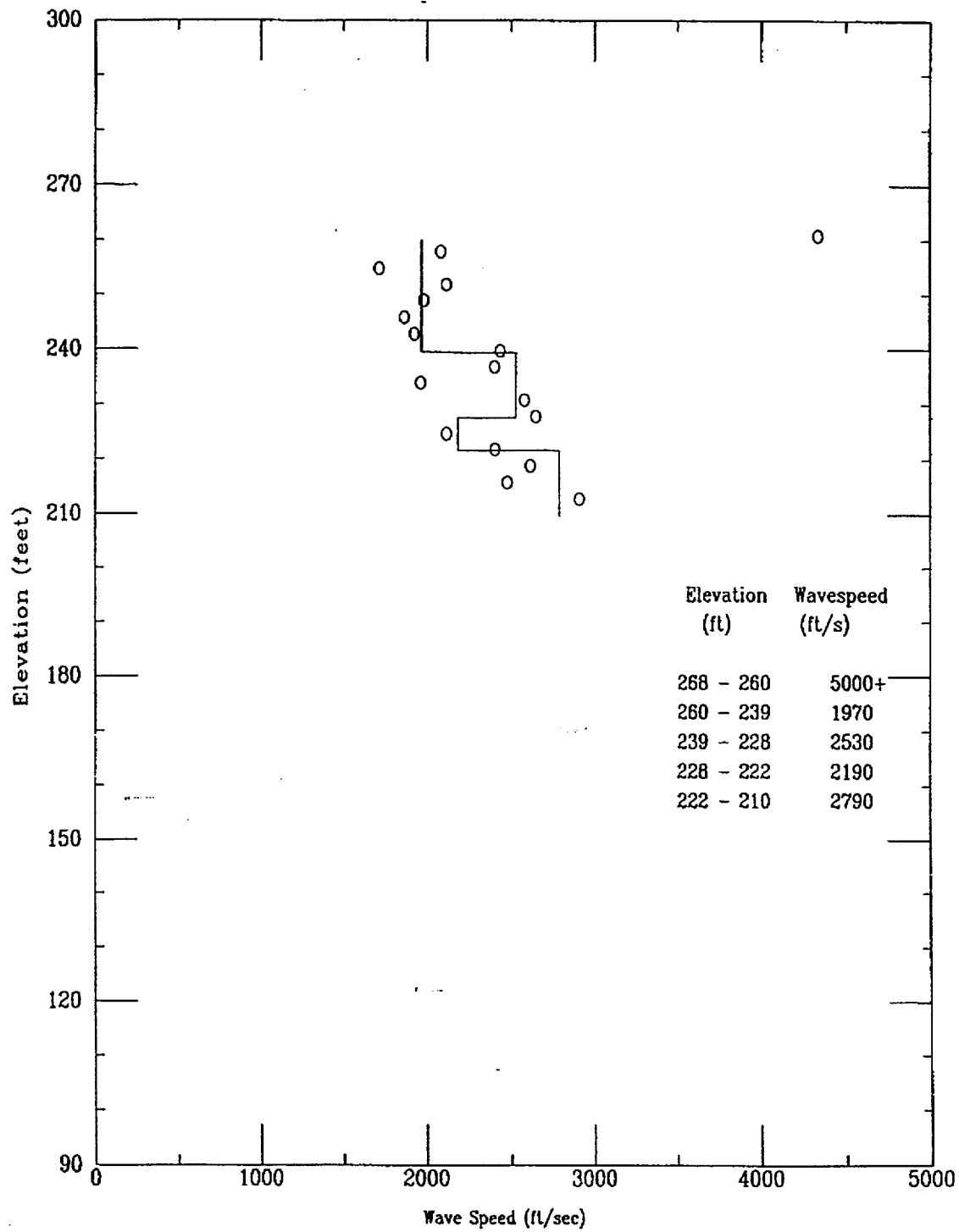


Applied Research Associates, Inc.
CPT-126

S Wave
02/24/98



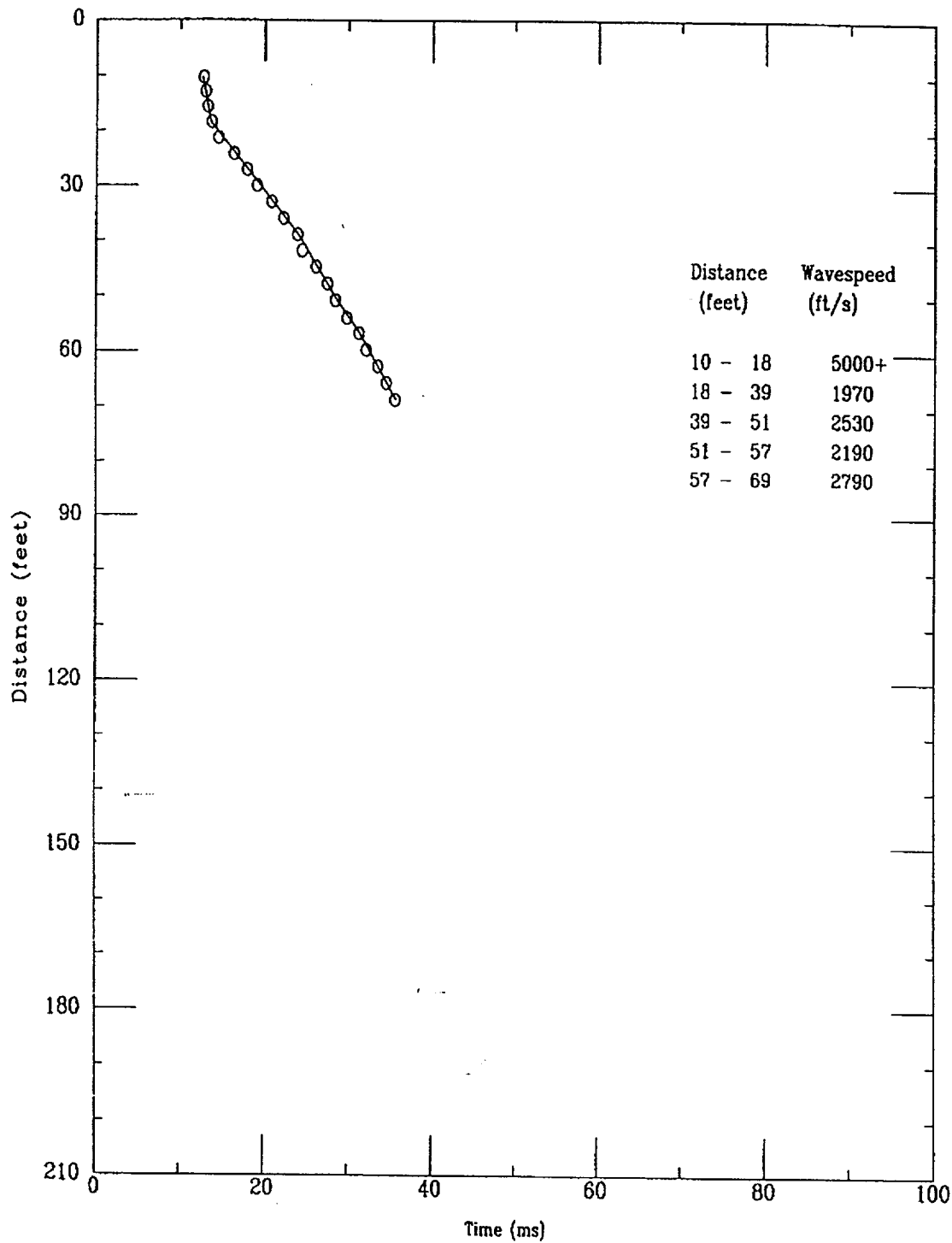
Compression Wave Speeds



CPT-126

APPLIED RESEARCH ASSOCIATES, INC.
Compression Wave Time of Peak

02/24/98

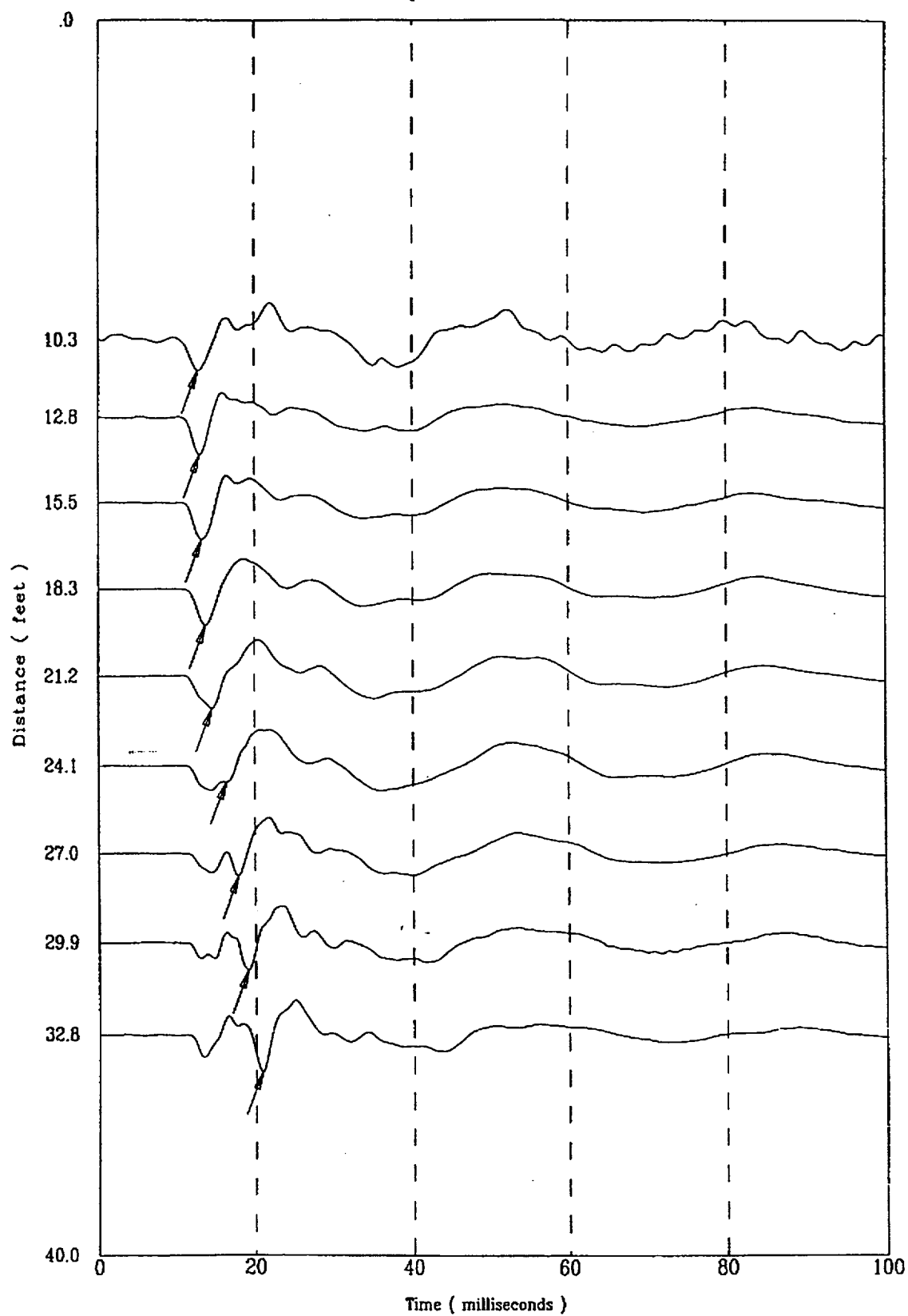


File 5247805S

102 of 522

Applied Research Associates, Inc.
CPT-126

P Wave
02/24/98

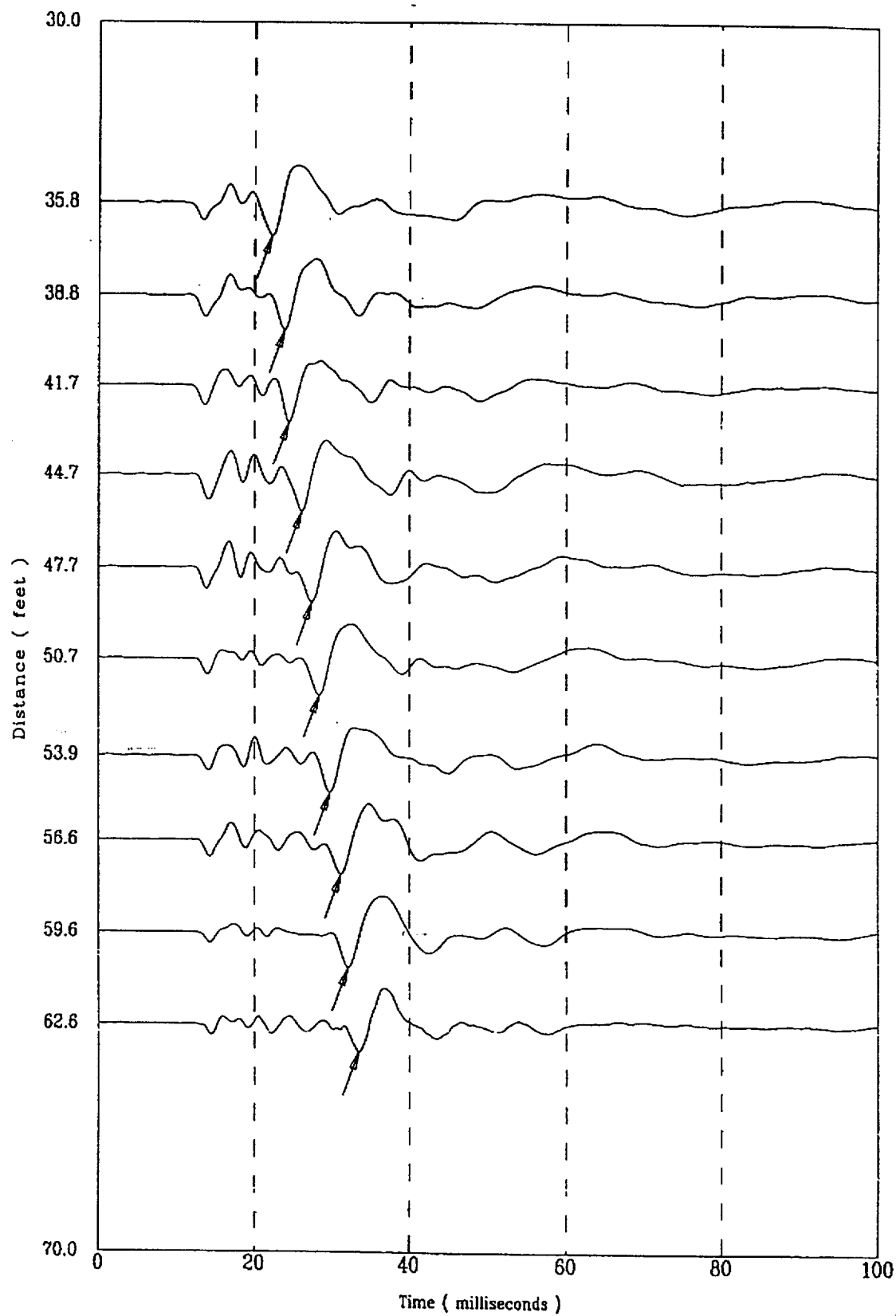


File 52418055

103 of 522

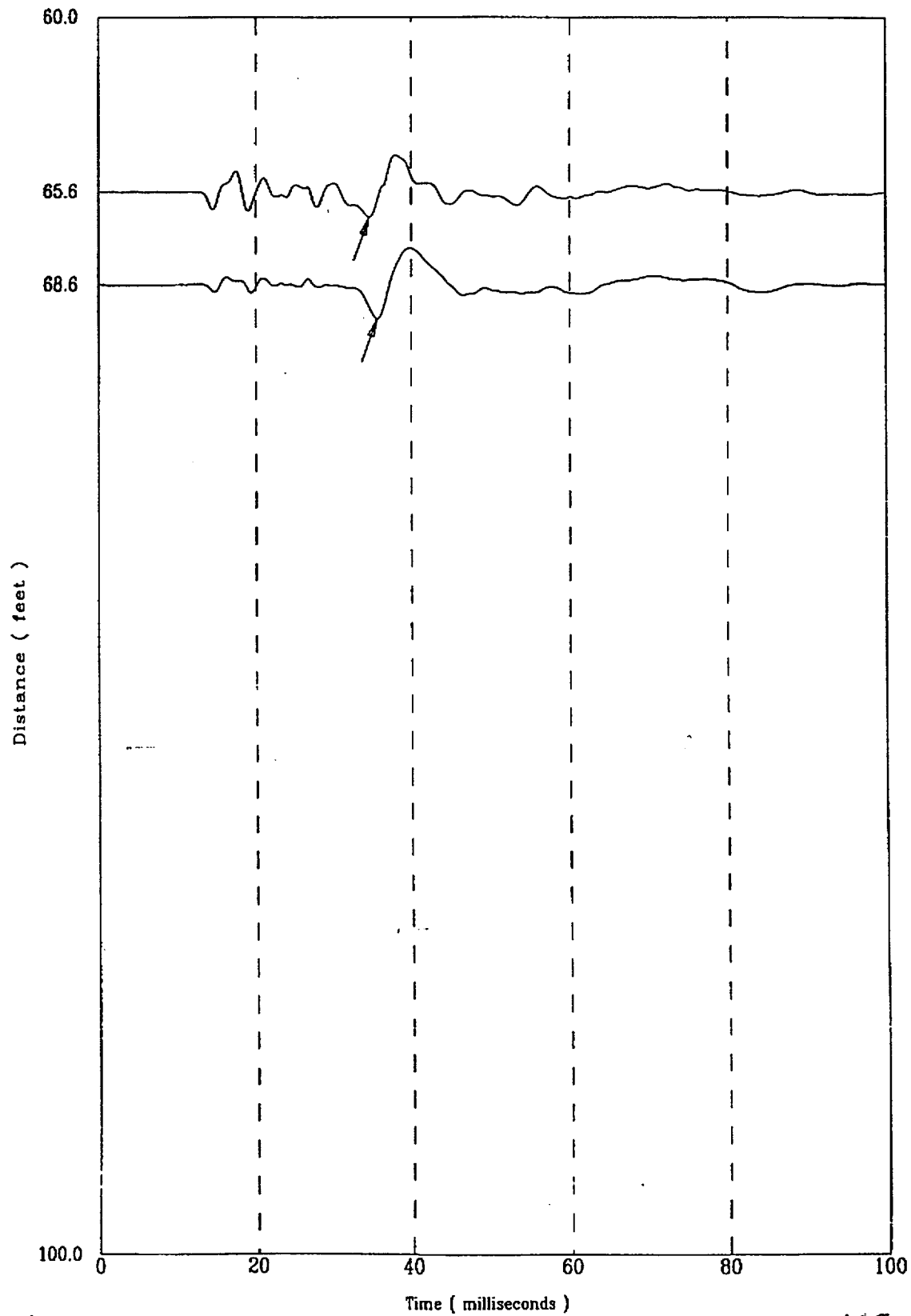
Applied Research Associates, Inc.
CPT-126

P Wave
02/24/98



Applied Research Associates, Inc.
CPT-126

P Wave
02/24/98



5241805S

105 of 522

CPT-127

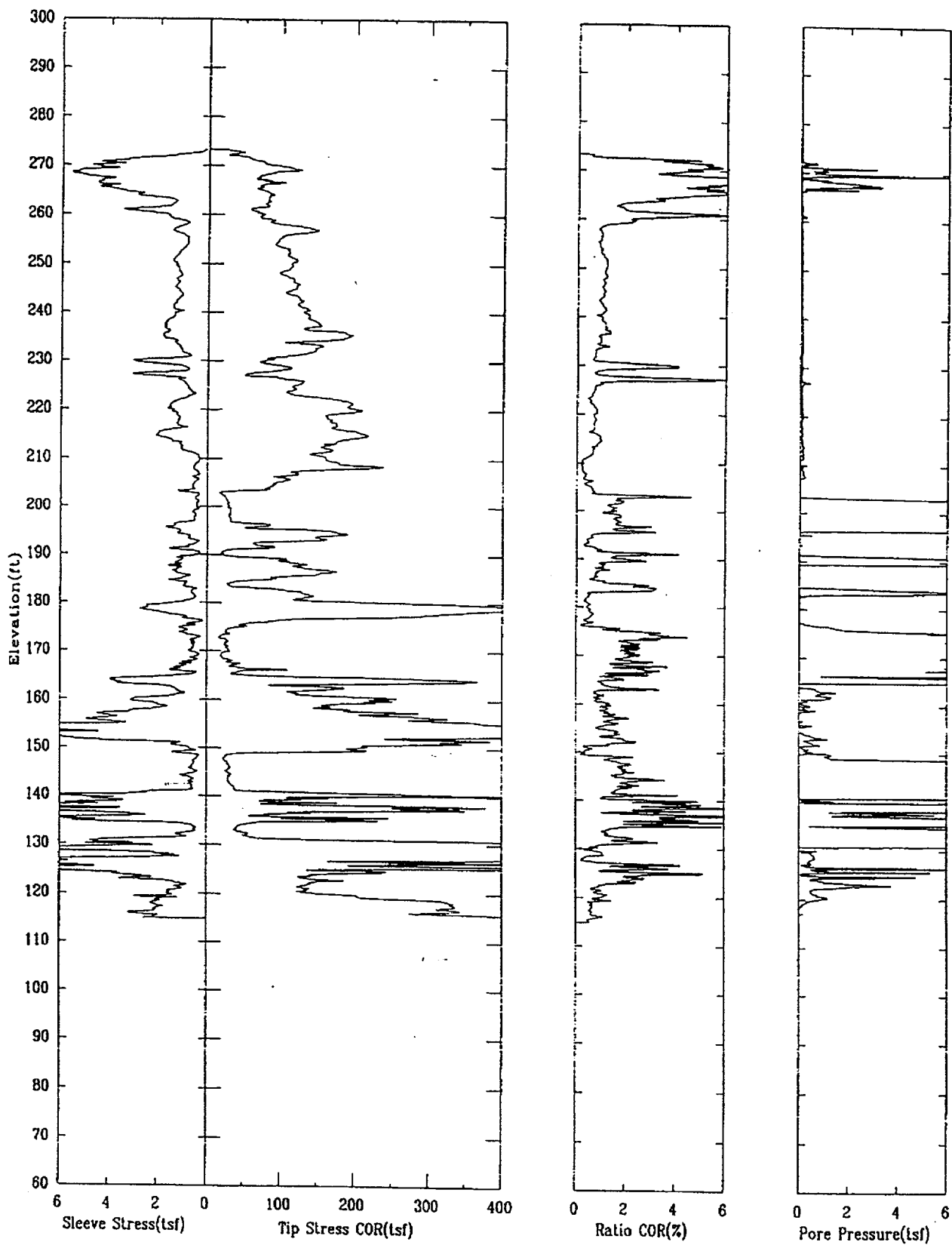
APPLIED RESEARCH ASSOCIATES, INC.

02/24/98

North 79650.01

East 54975.00

Elevation 279.3



CPT-127

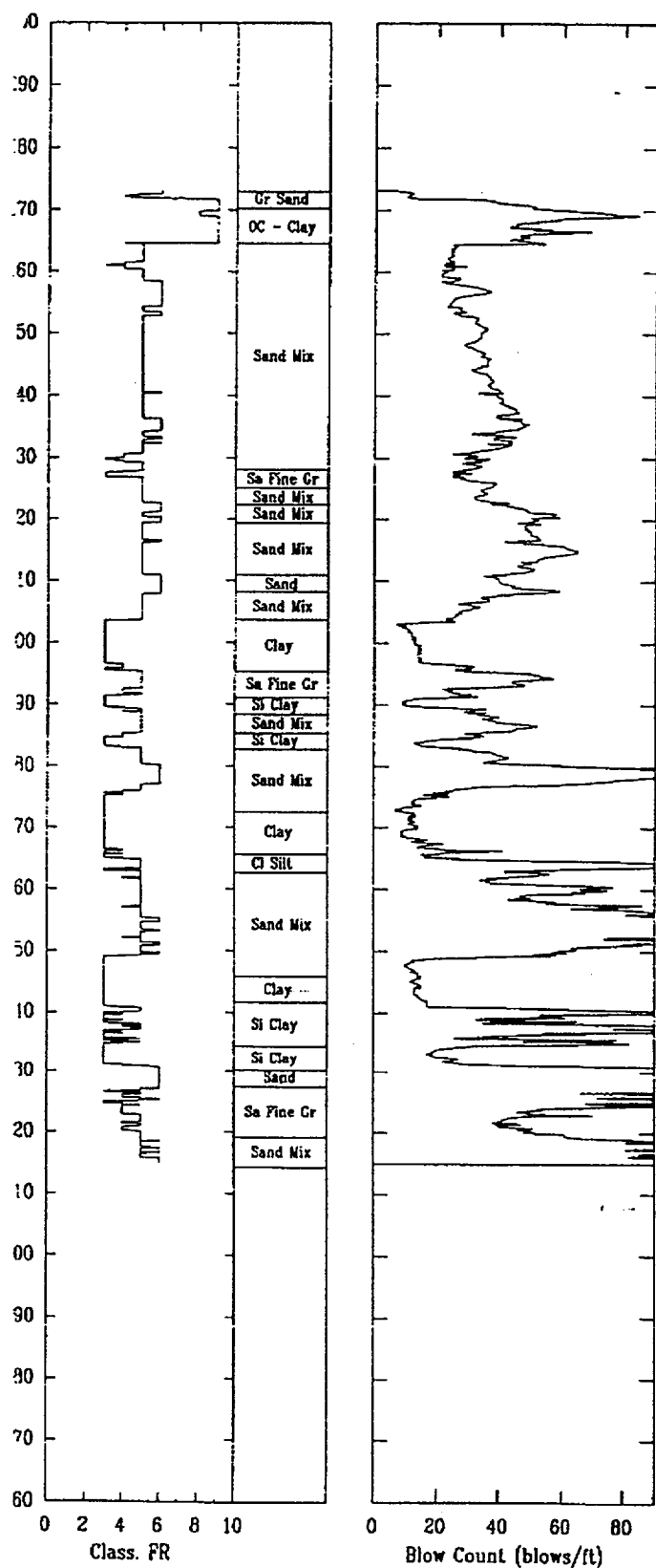
APPLIED RESEARCH ASSOCIATES, INC.

02/24/98

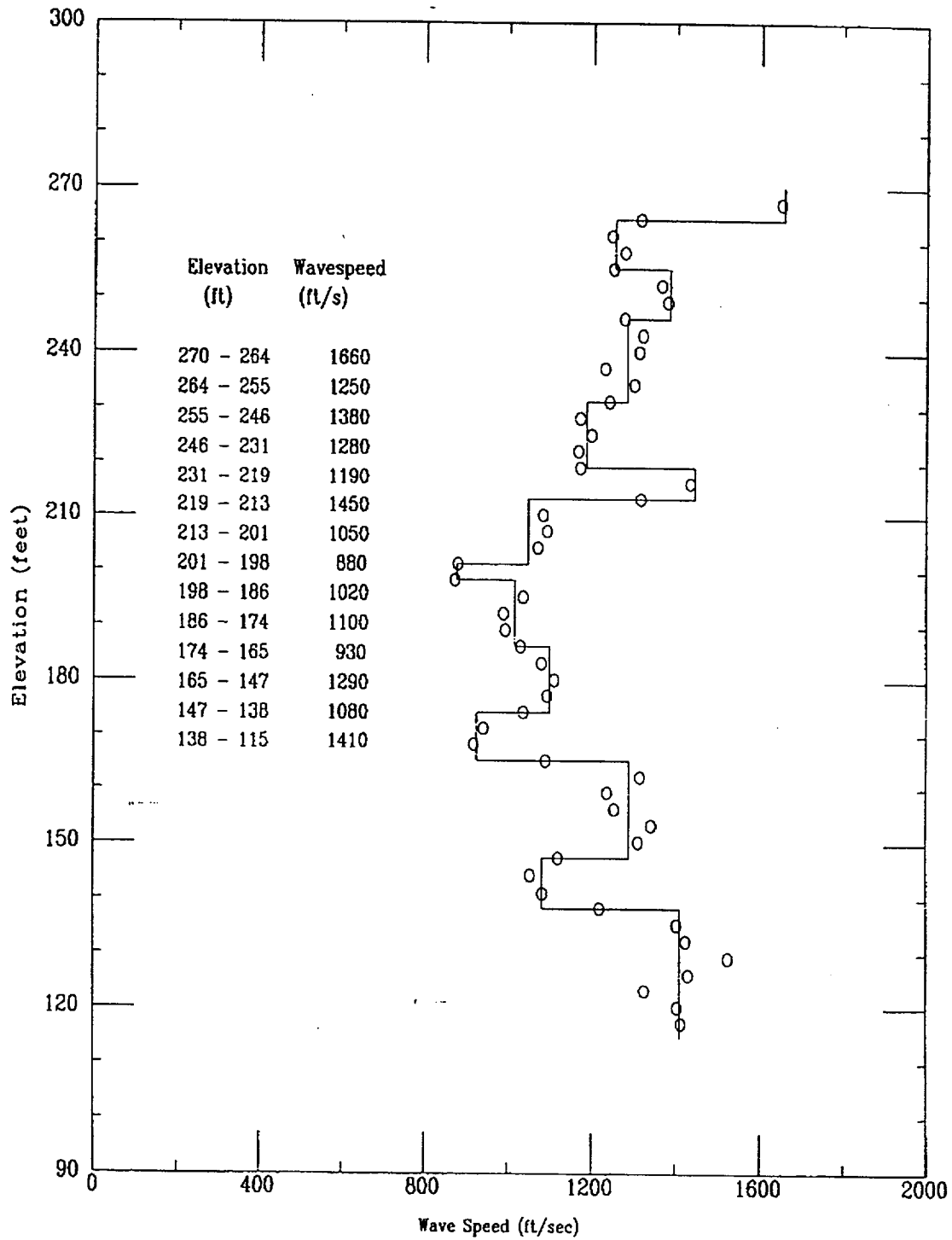
North 79650.01

East 54975.00

Elevation 279.3



Shear Wave Speeds

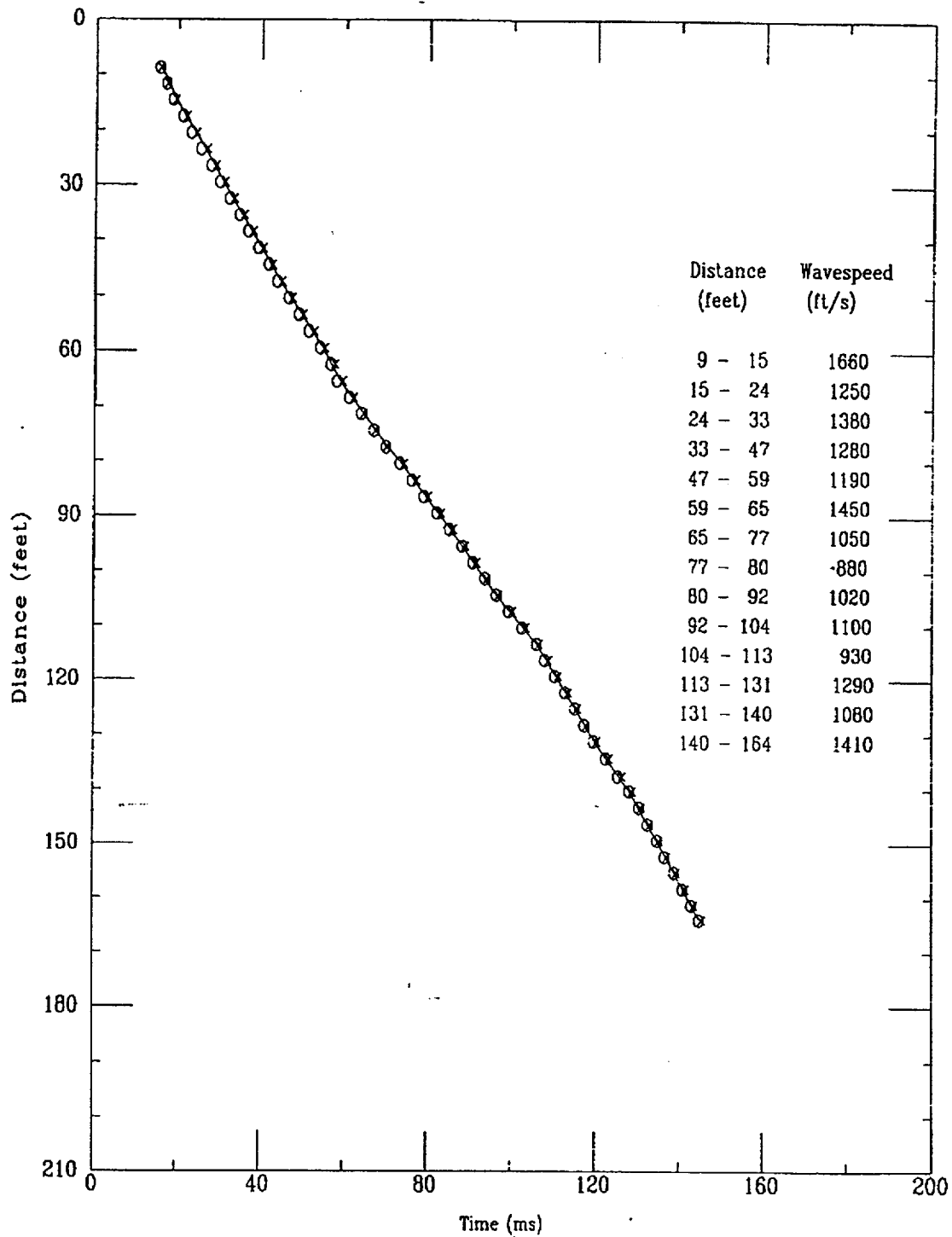


CPT-127

APPLIED RESEARCH ASSOCIATES, INC.

02/24/98

Shear Wave Time of Peak

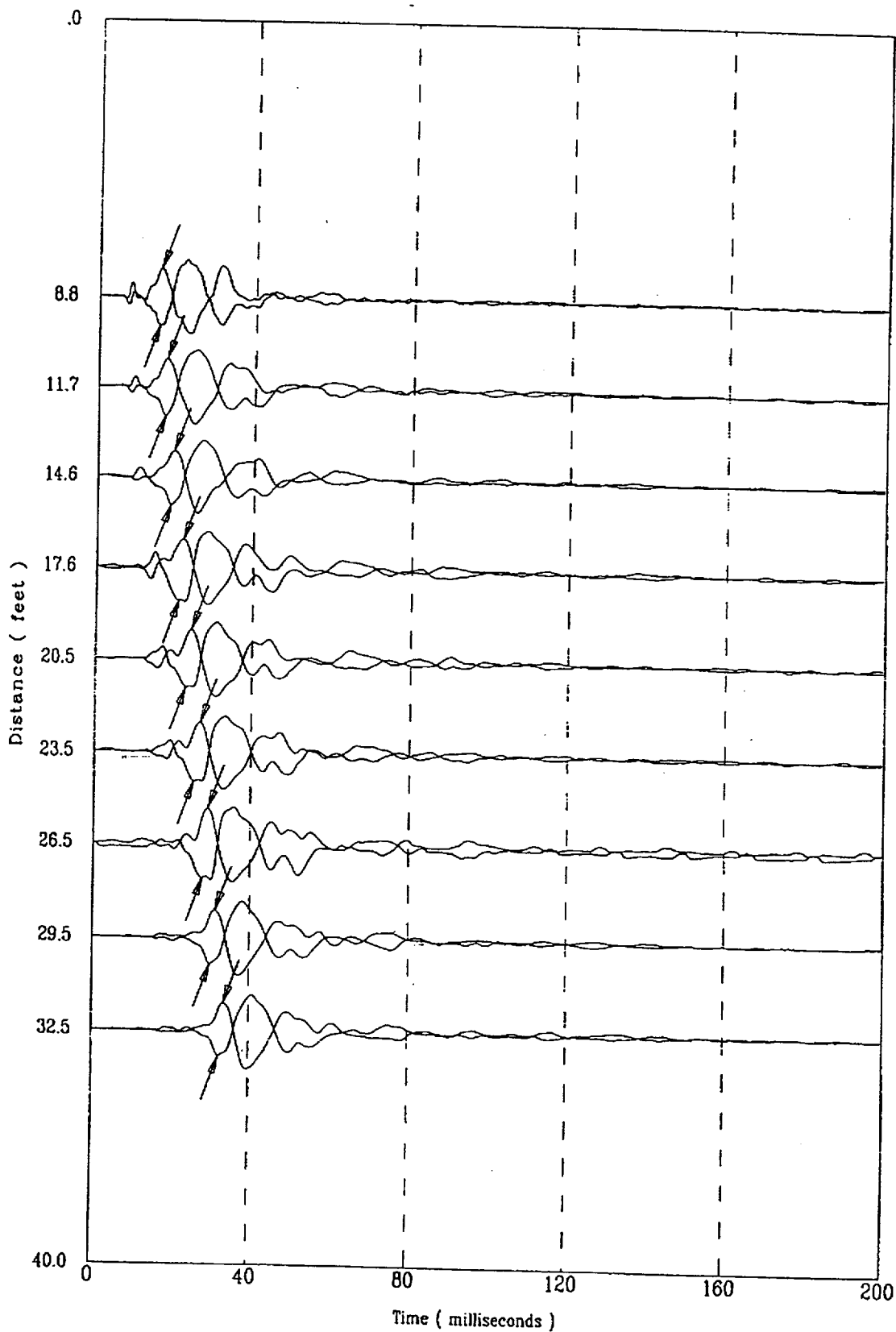


File 5247802S

109 of 522

Applied Research Associates, Inc.
CPT-127

S Wave
02/24/98

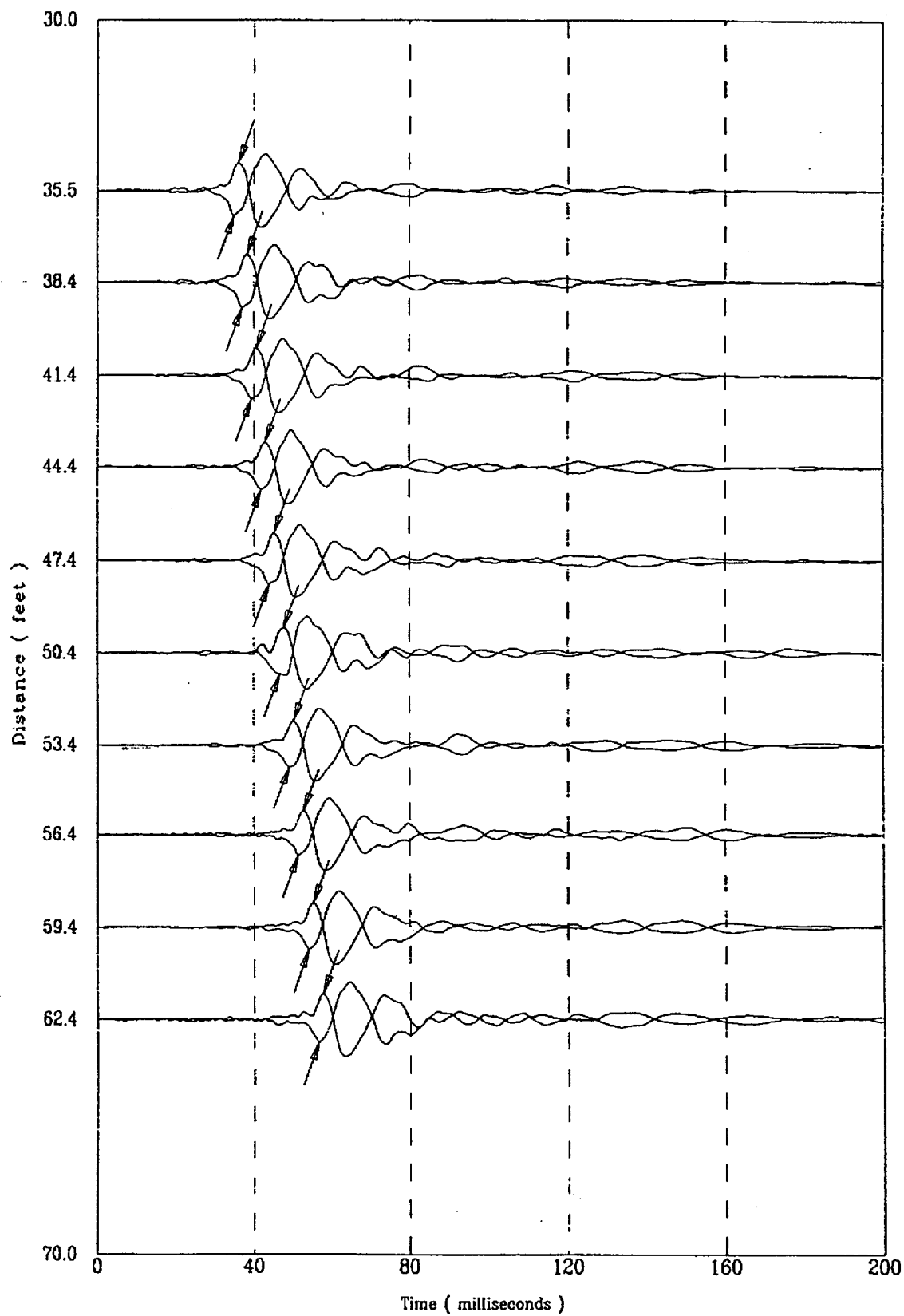


5241802S

110 of 522

Applied Research Associates, Inc.
CPT-127

S Wave
02/24/98

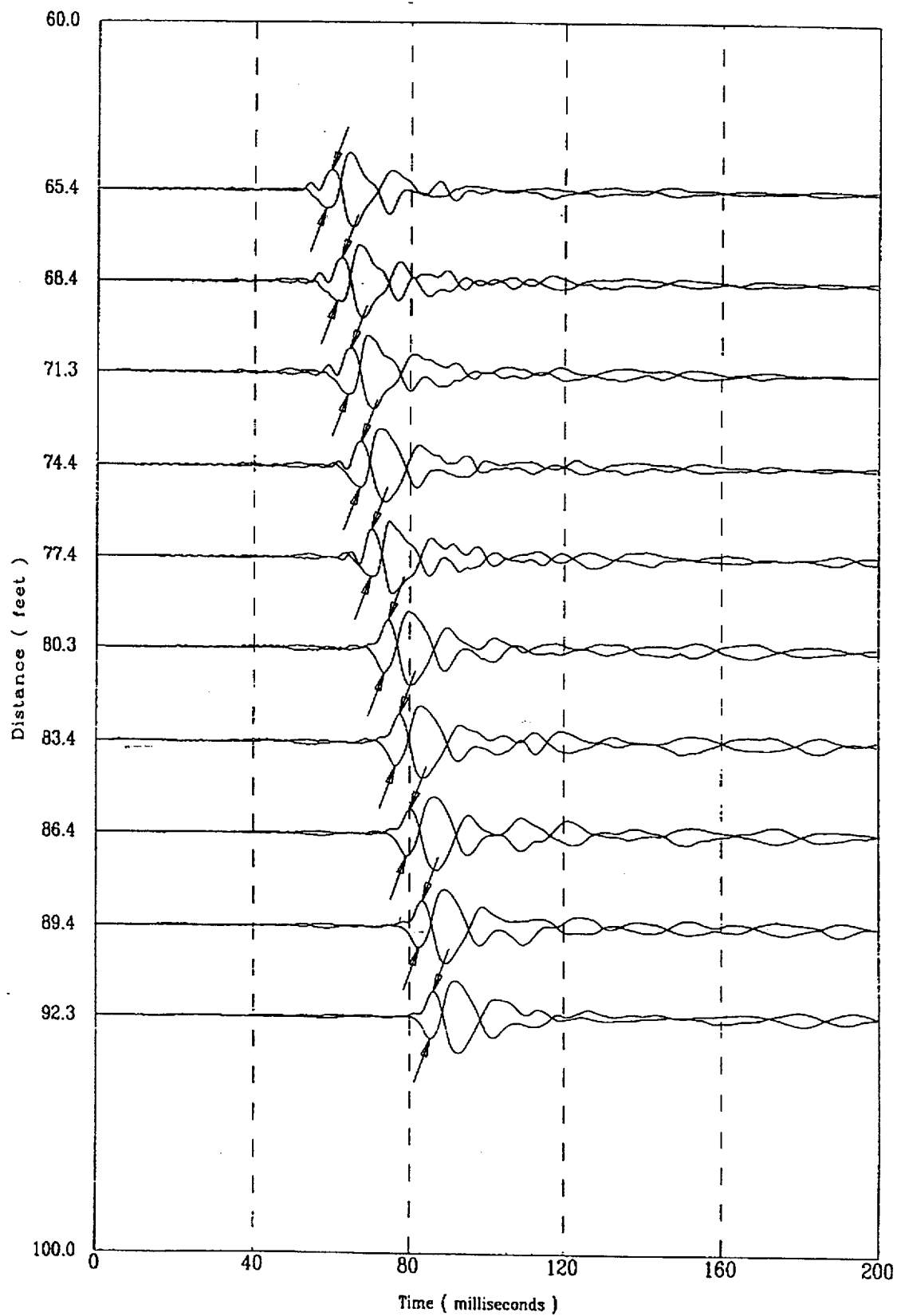


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111 of 522

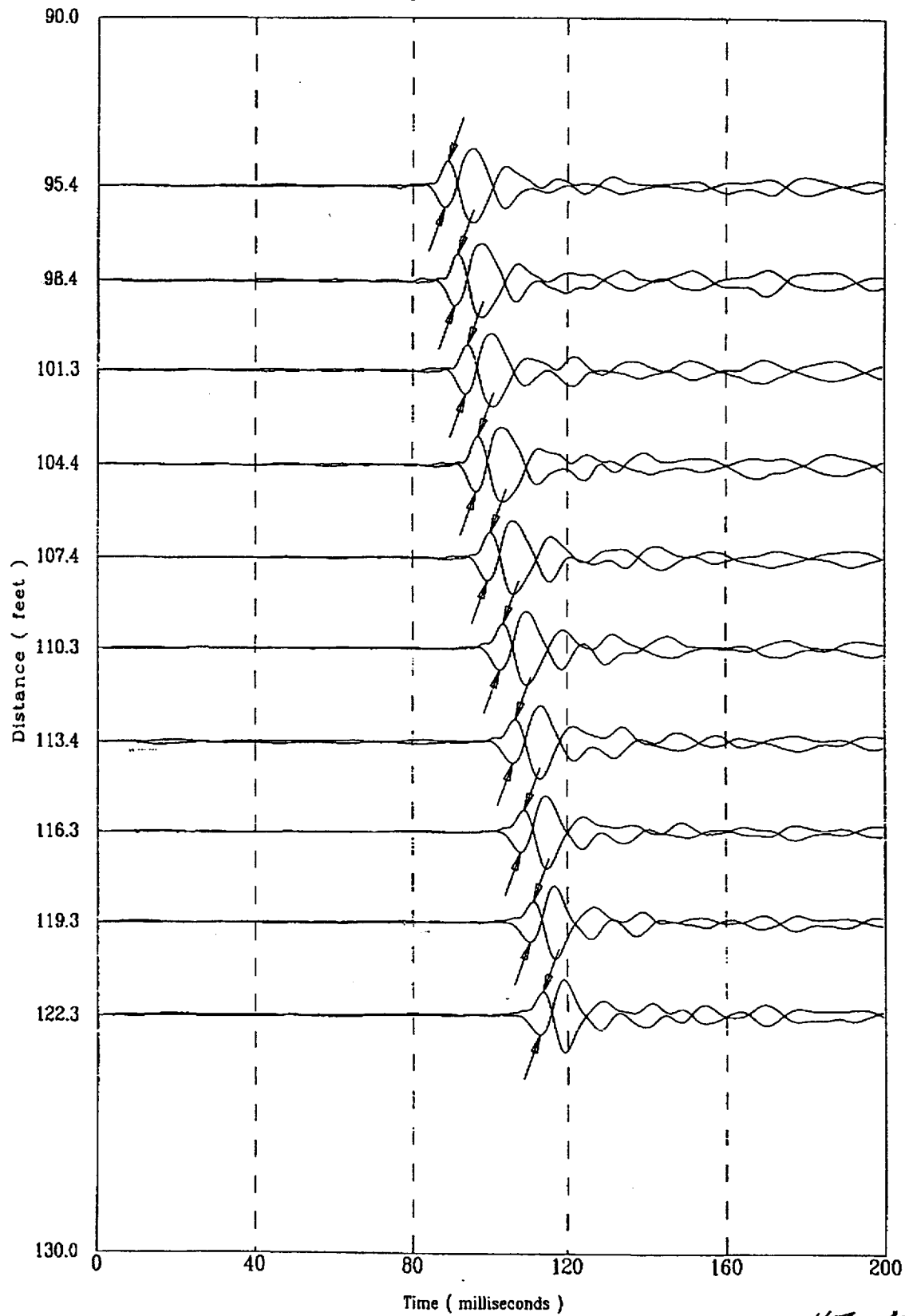
Applied Research Associates, Inc.
CPT-127

S Wave
02/24/98



Applied Research Associates, Inc.
CPT-127

S Wave
02/24/98

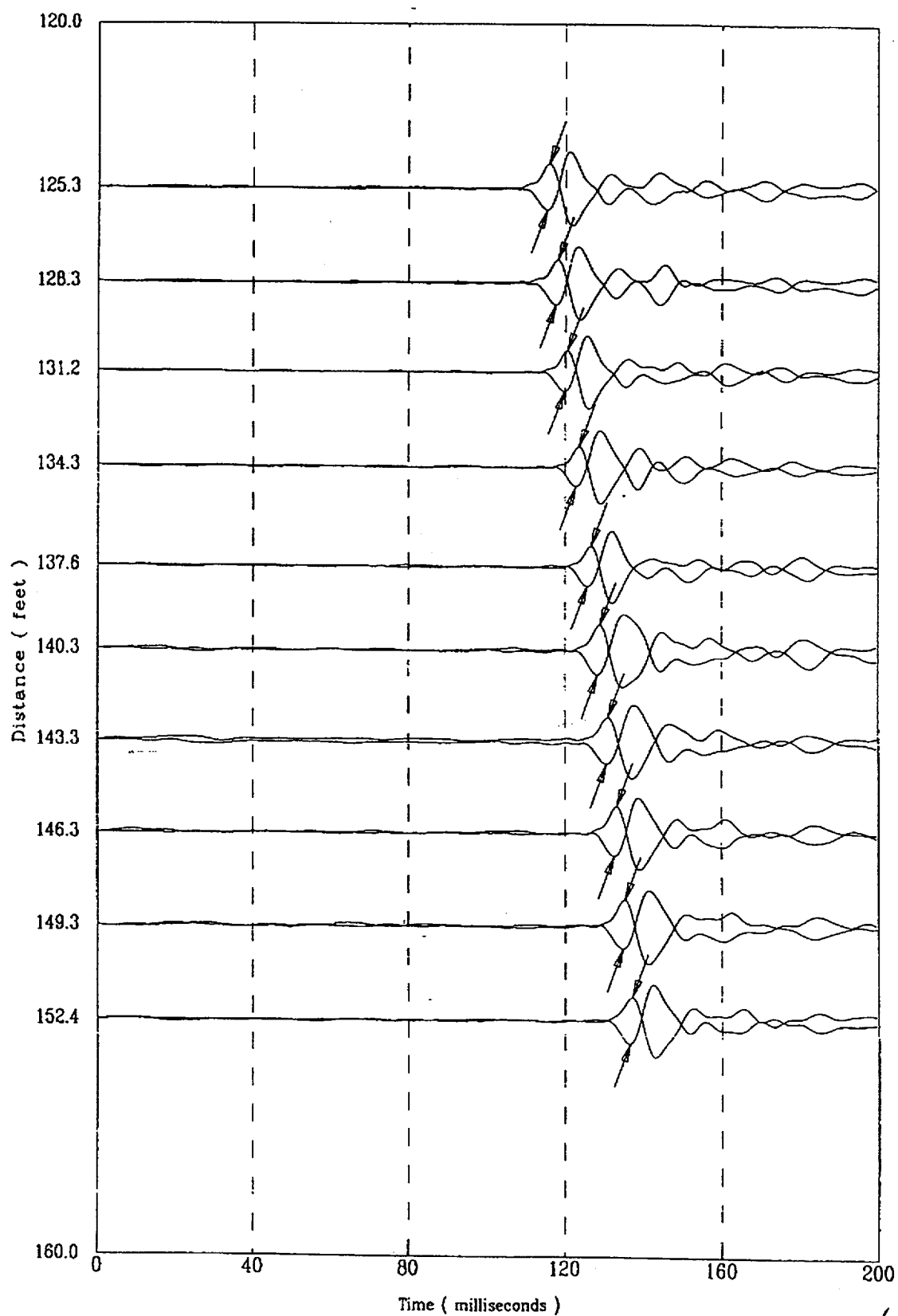


J241802S

113 of 522

Applied Research Associates, Inc.
CPT-127

S Wave
02/24/98

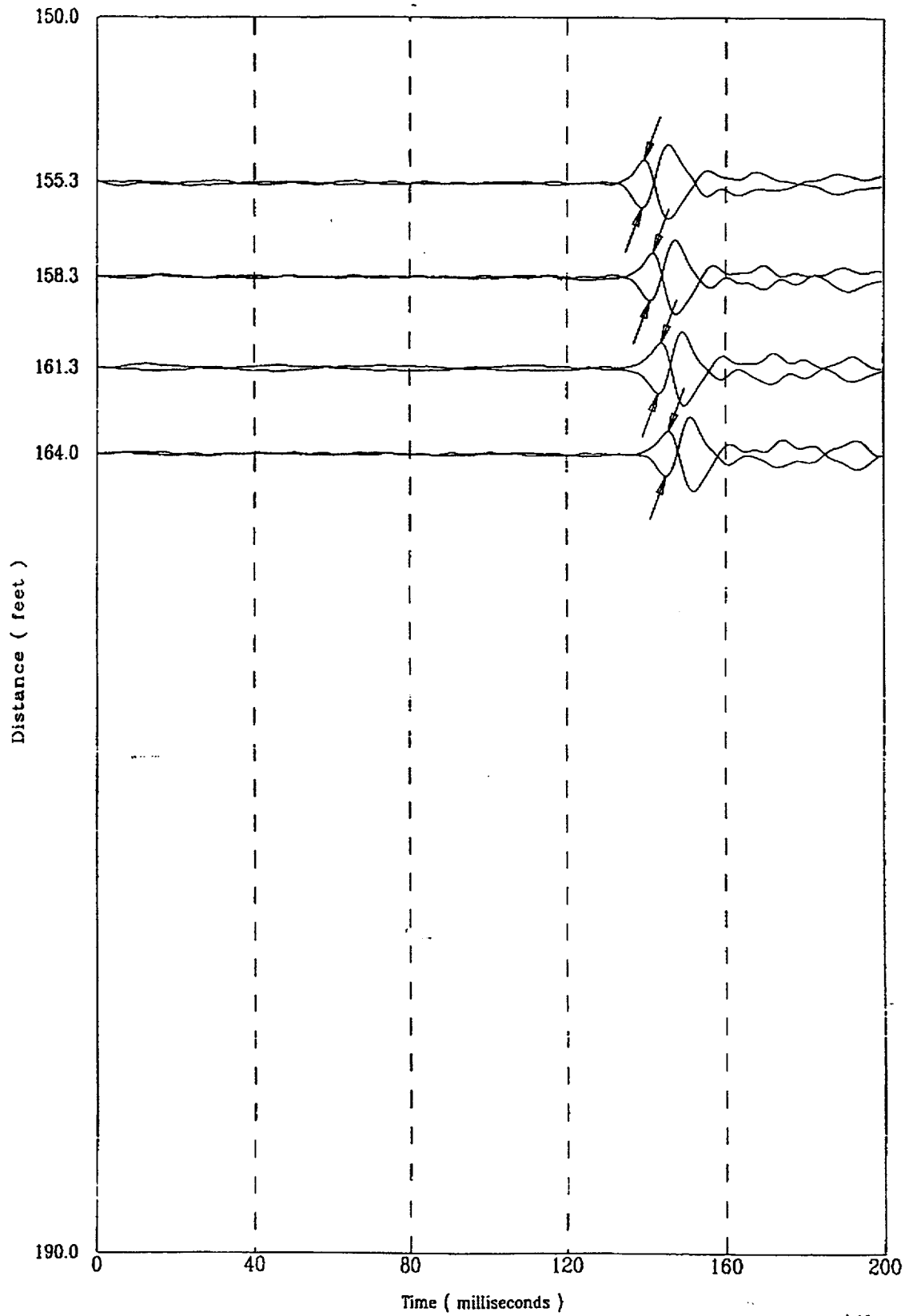


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114 of 522

Applied Research Associates, Inc.
CPT-127

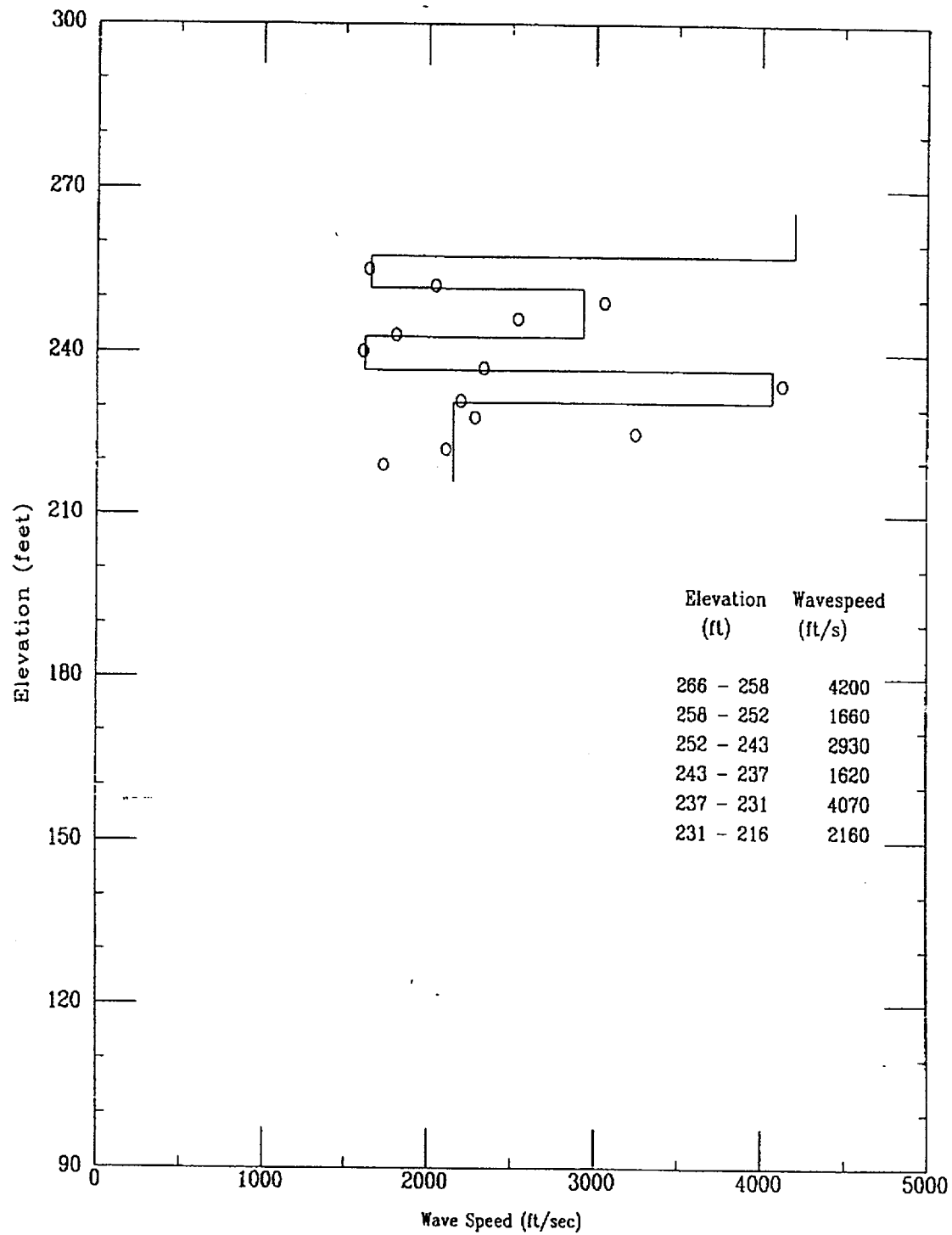
S Wave
02/24/98

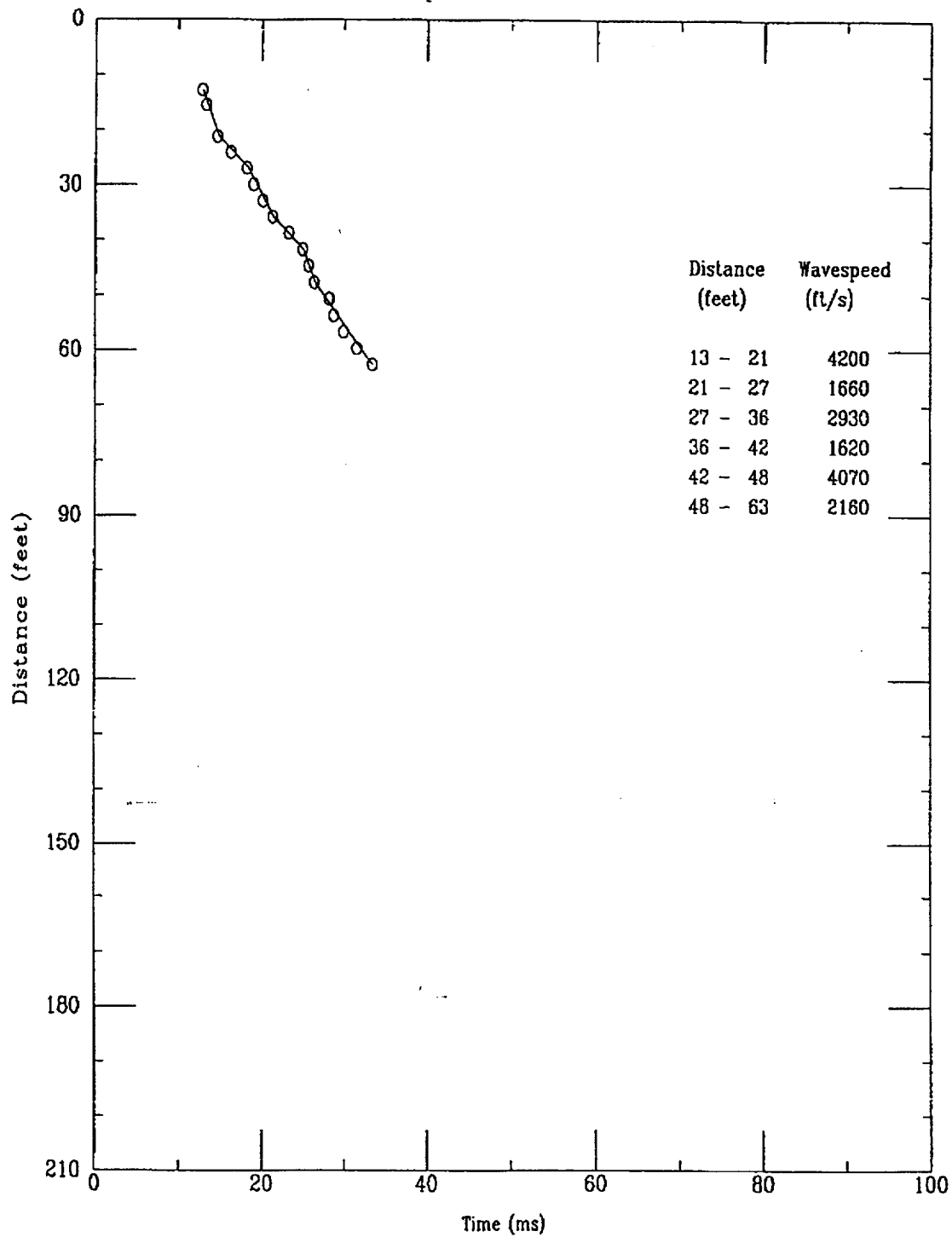


41802S

115 of 522

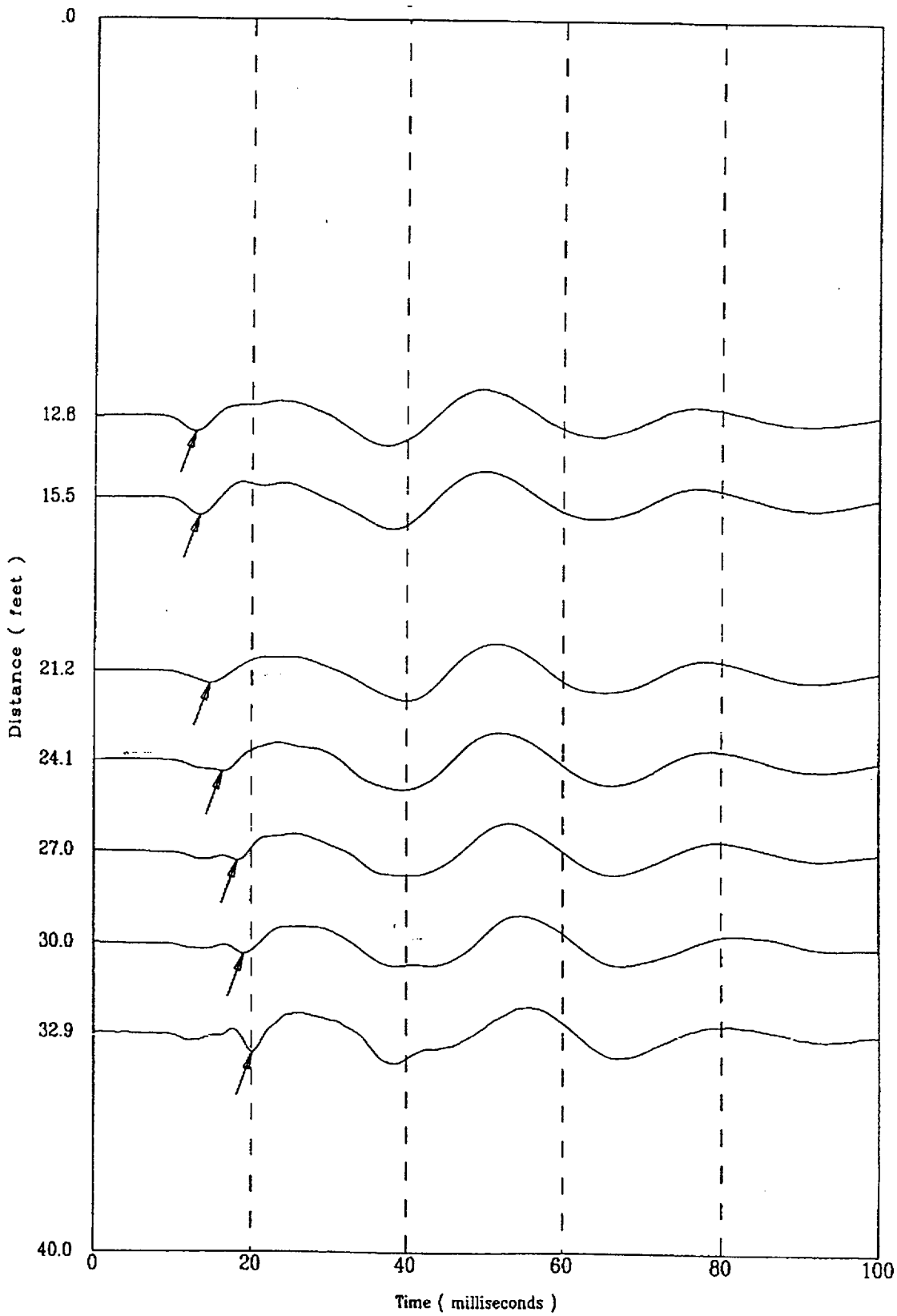
Compression Wave Speeds





Applied Research Associates
CPT-127

P Wave
02/24/98



5241802S

118 of 522

CPT-128

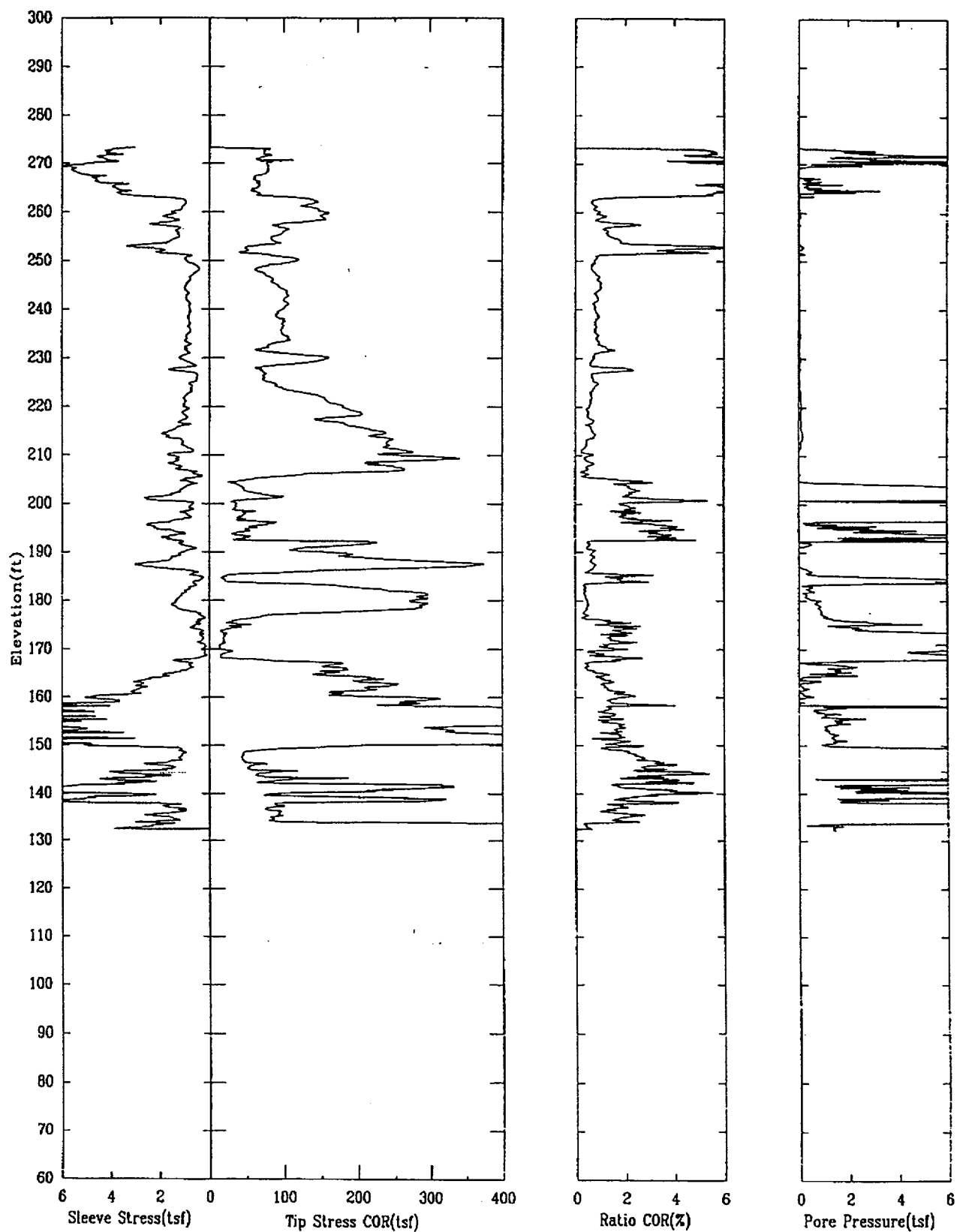
APPLIED RESEARCH ASSOCIATES, INC.

02/23/98

North 79650.01

East 55124.95

Elevation 279.3



CPT-128

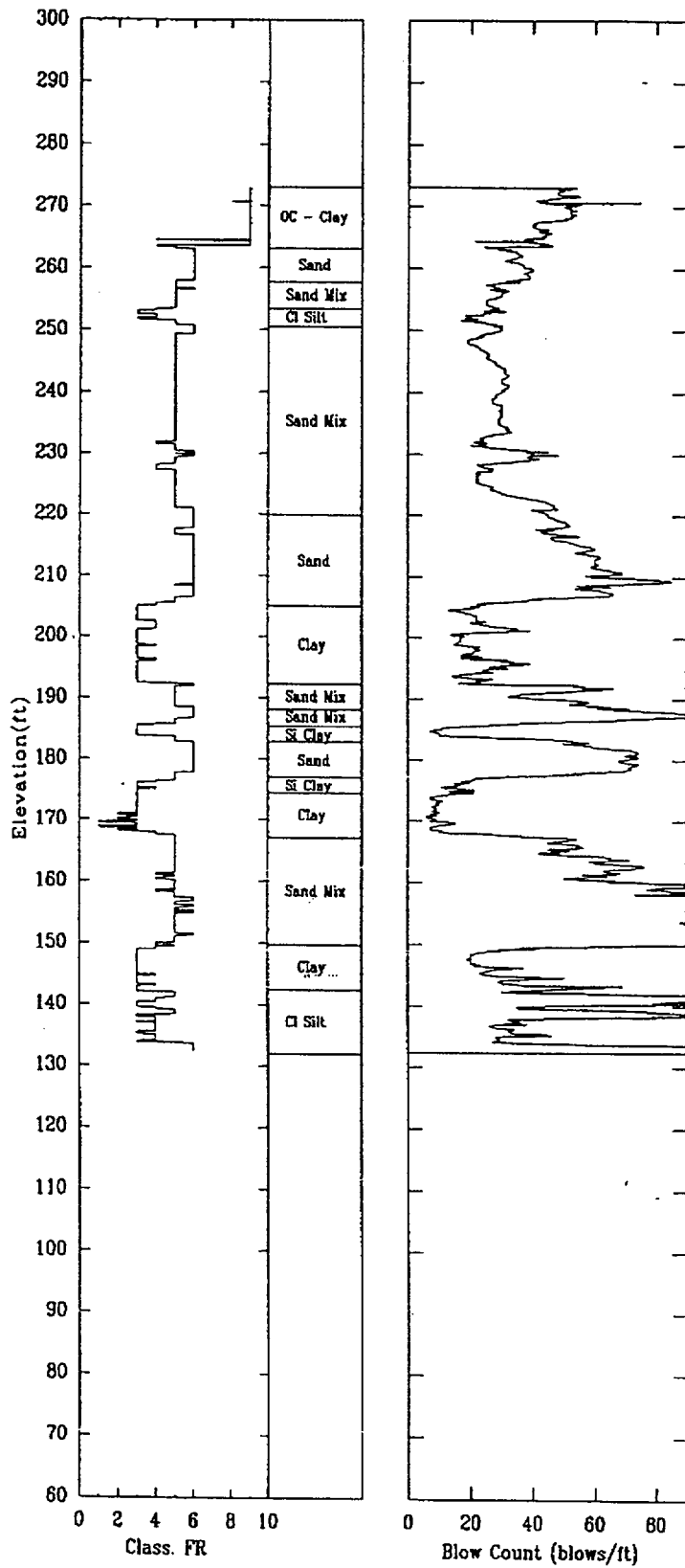
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02/23/98

North 79650.01

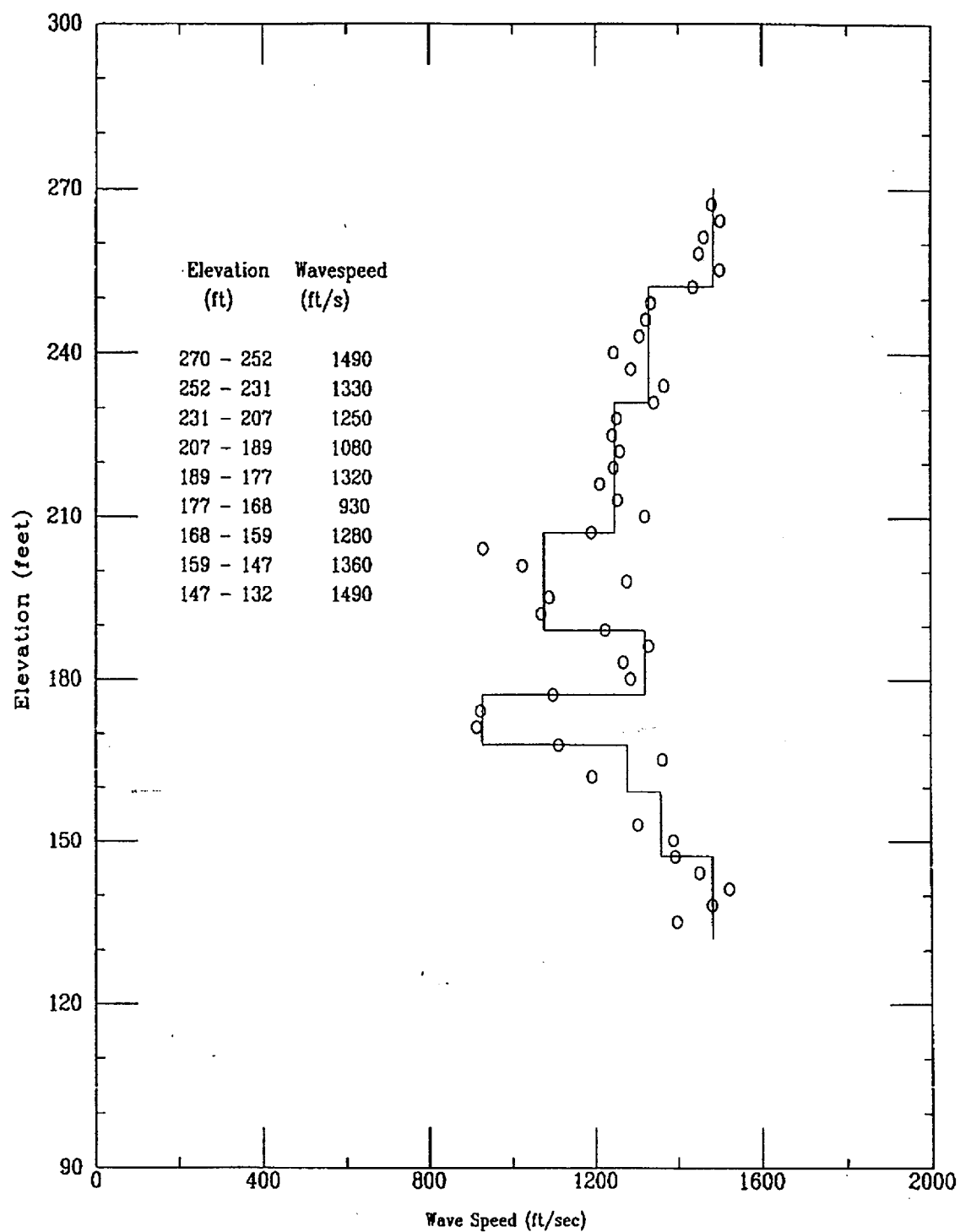
East 55124.95

Elevation 279.3



120 of 522

Shear Wave Speeds

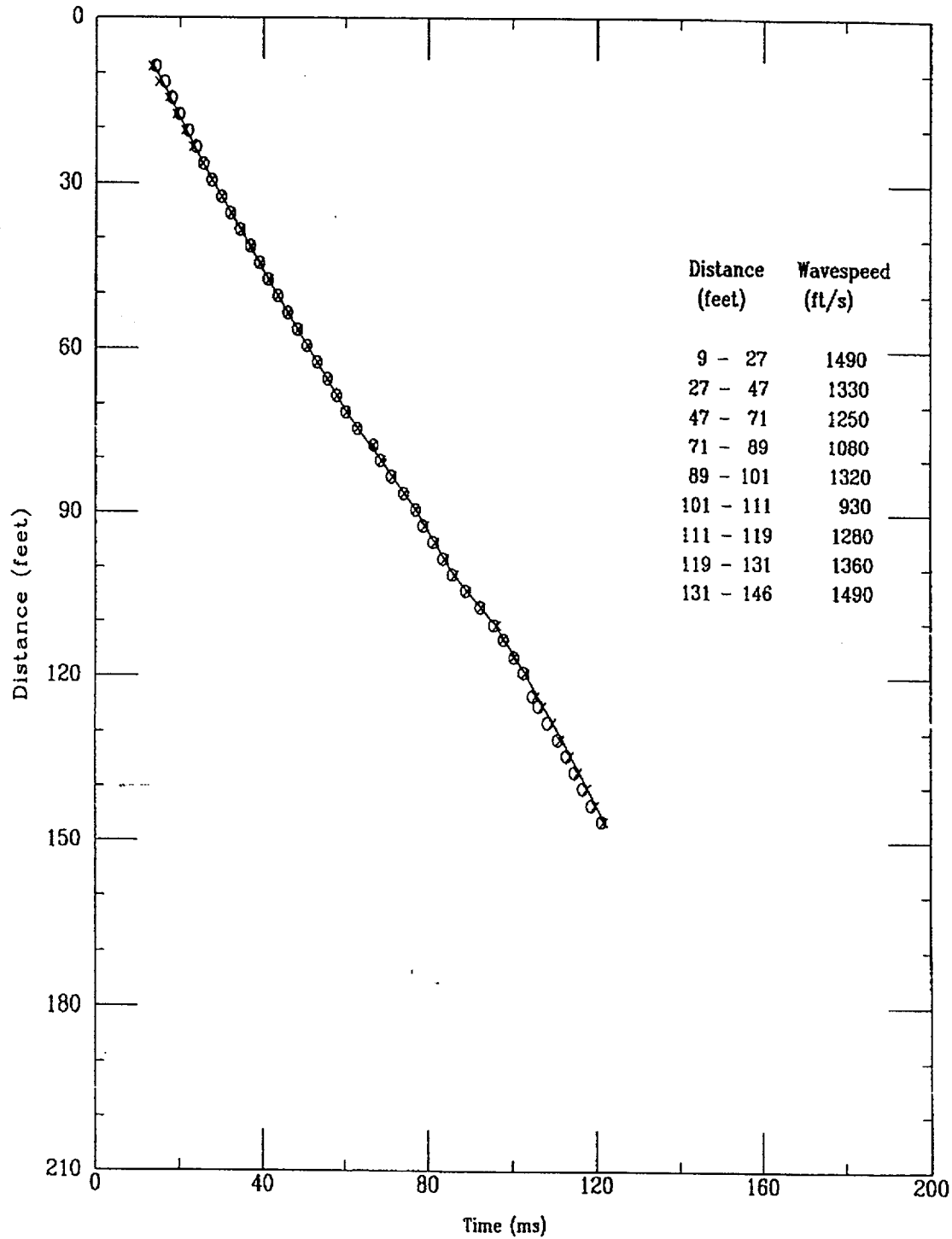


CPT-128

APPLIED RESEARCH ASSOCIATES, INC.

02/23/98

Shear Wave Time of Peak

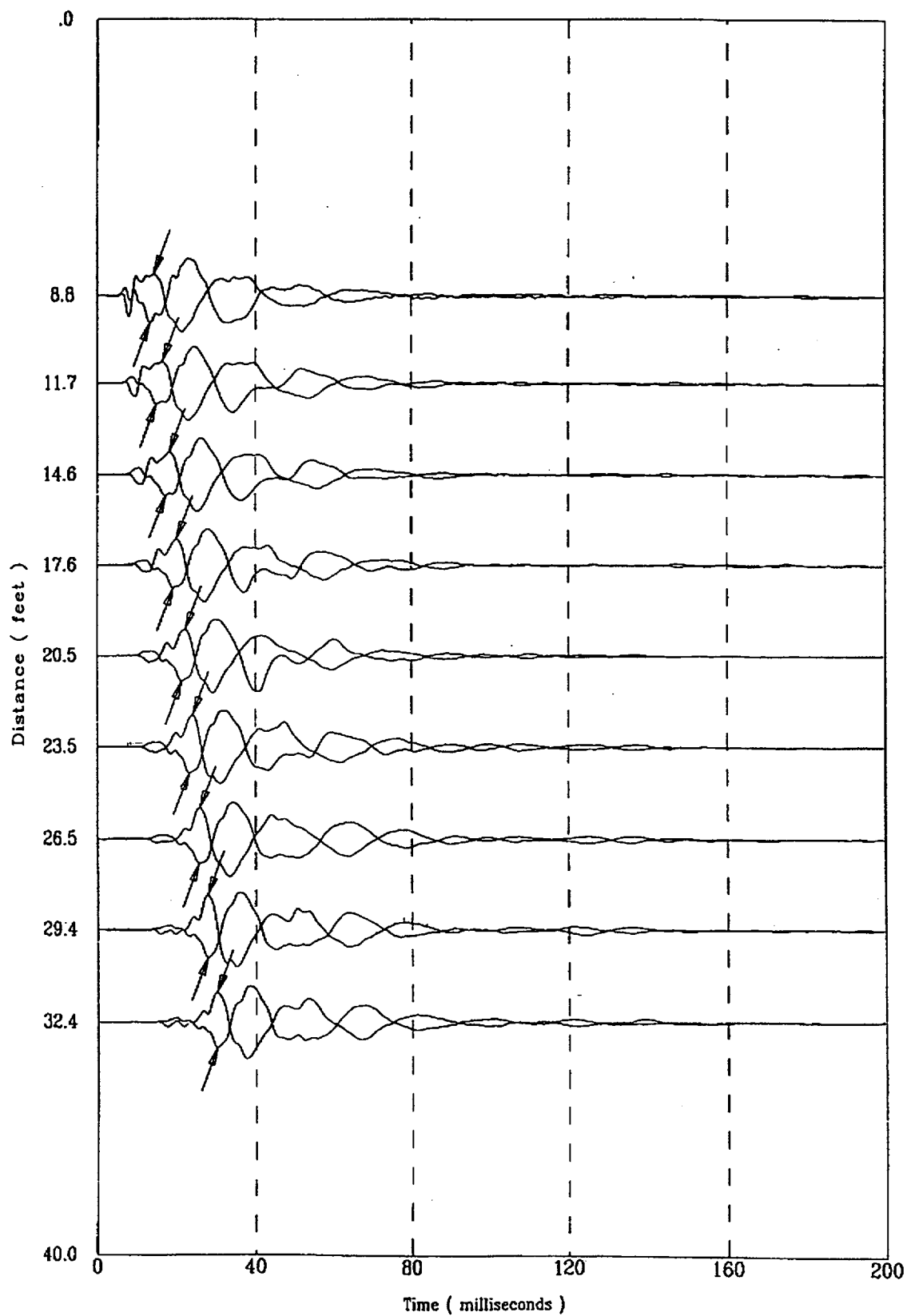


File 52318045

122 of 522

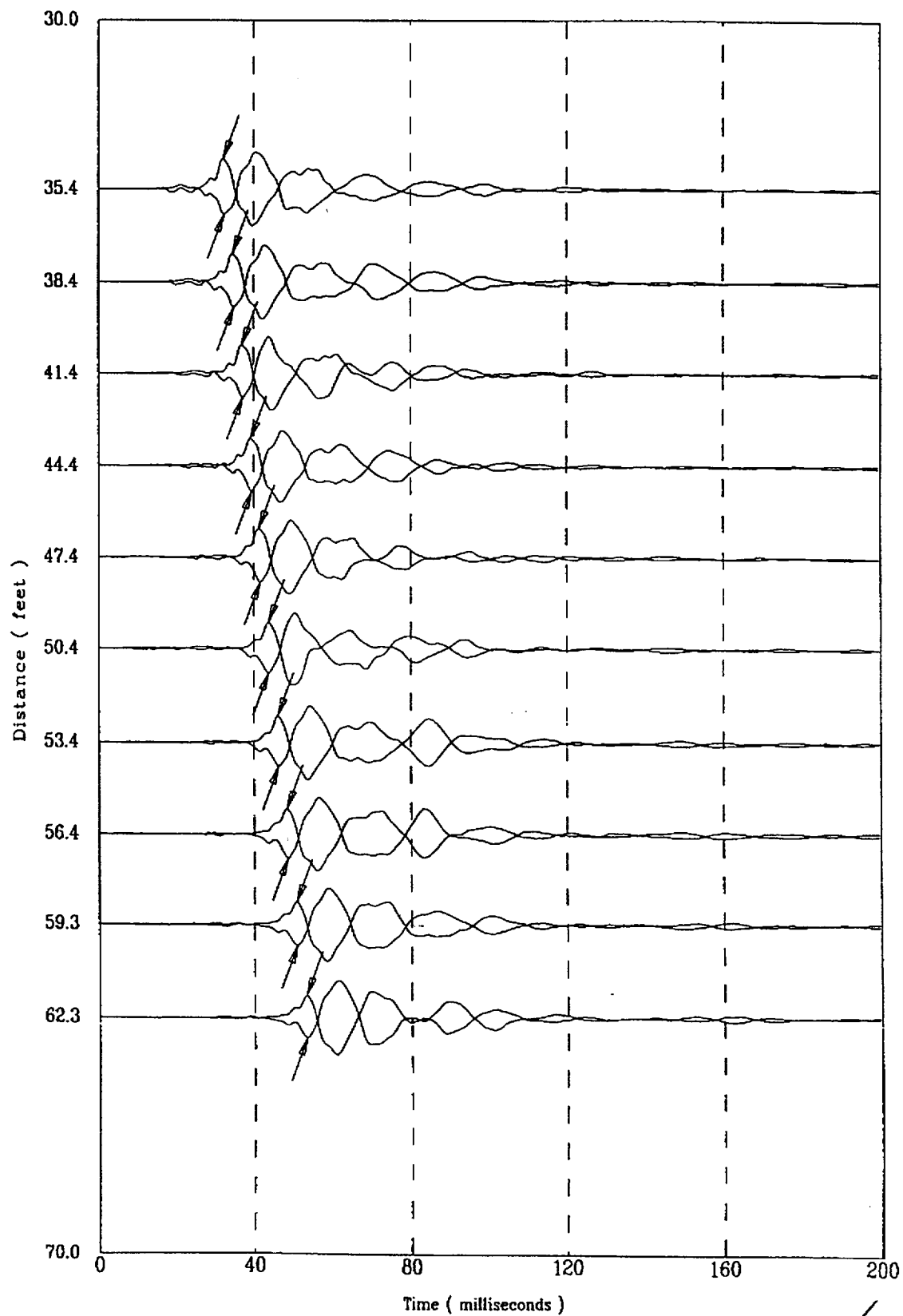
Applied Research Associates, Inc.
CPT-128

S Wave
02/23/98



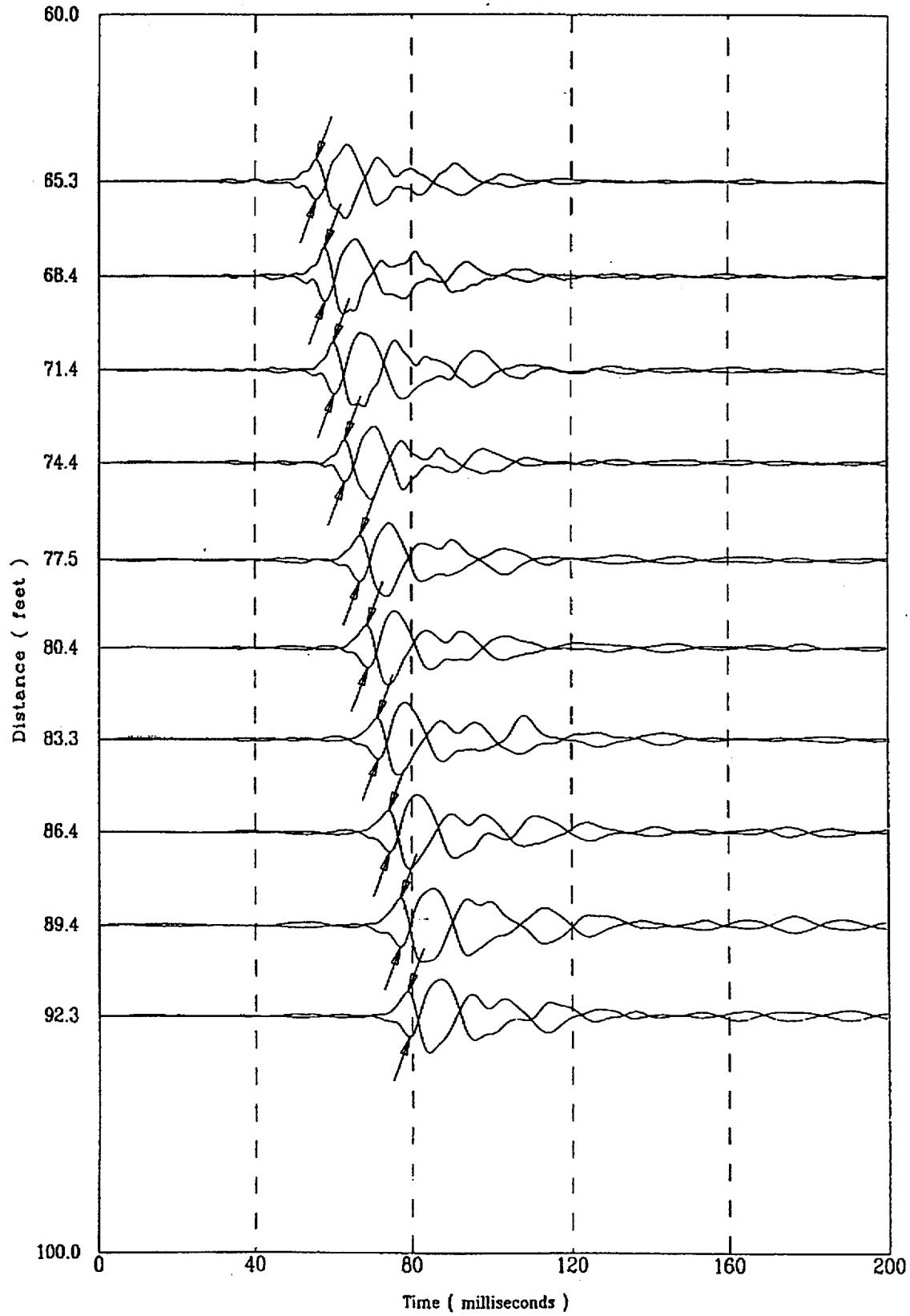
Applied Research Associates, Inc.
CPT-128

S Wave
02/23/98



Applied Research Associates, Inc.
CPT-128

S Wave
02/23/98

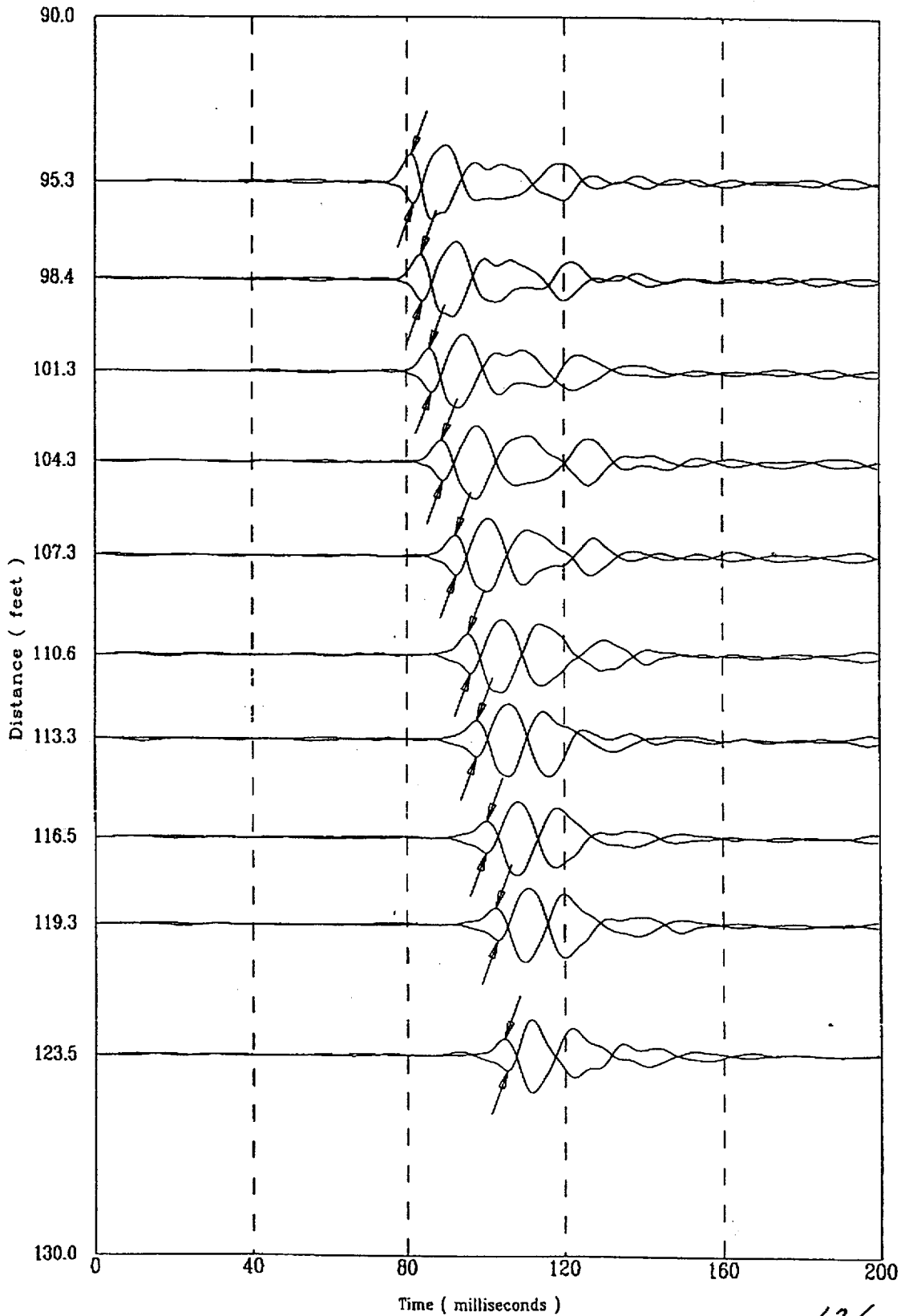


File 523F804S

125 of 522

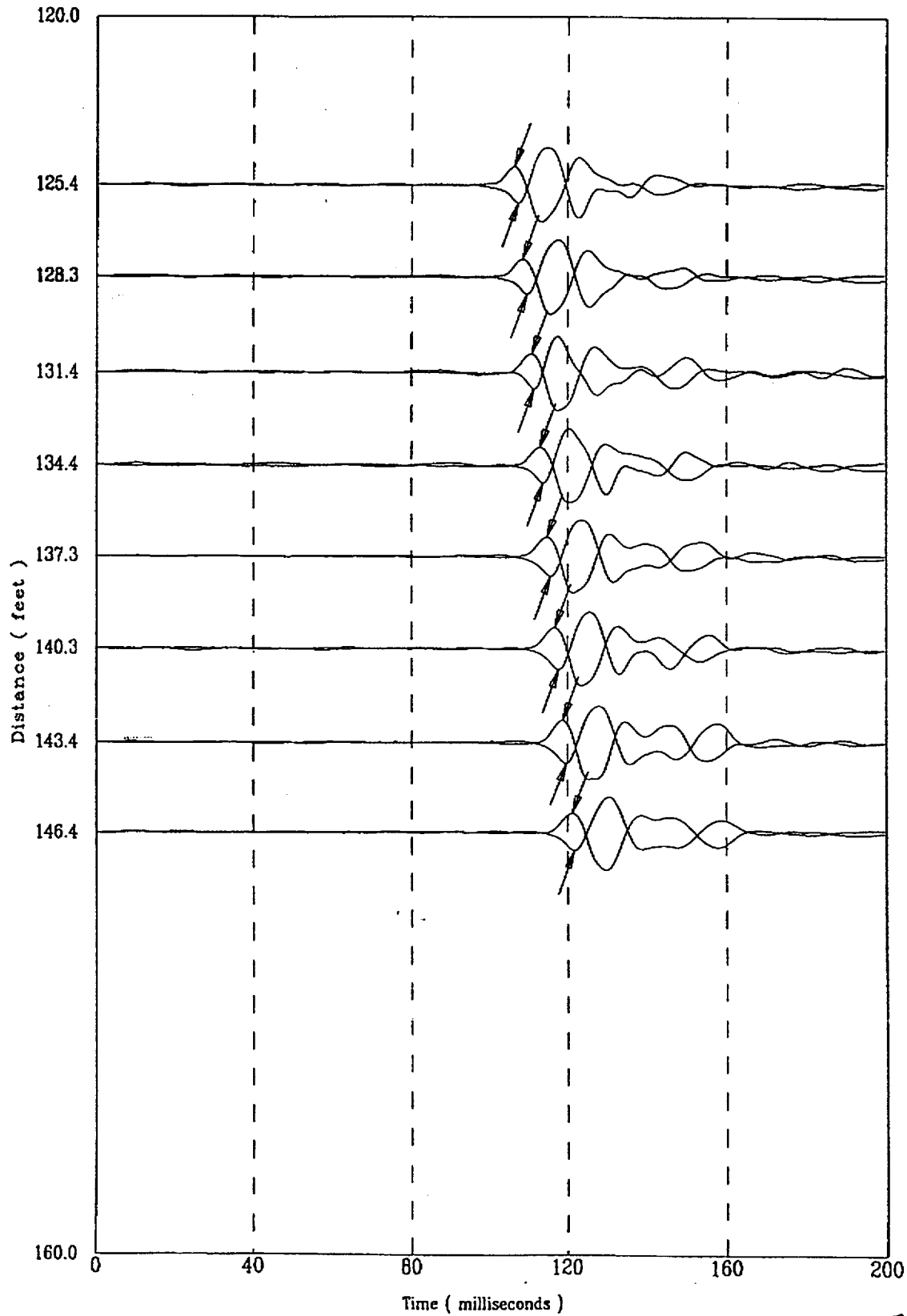
Applied Research Associates, Inc.
CPT-128

S Wave
02/23/98



Applied Research Associates, Inc.
CPT-128

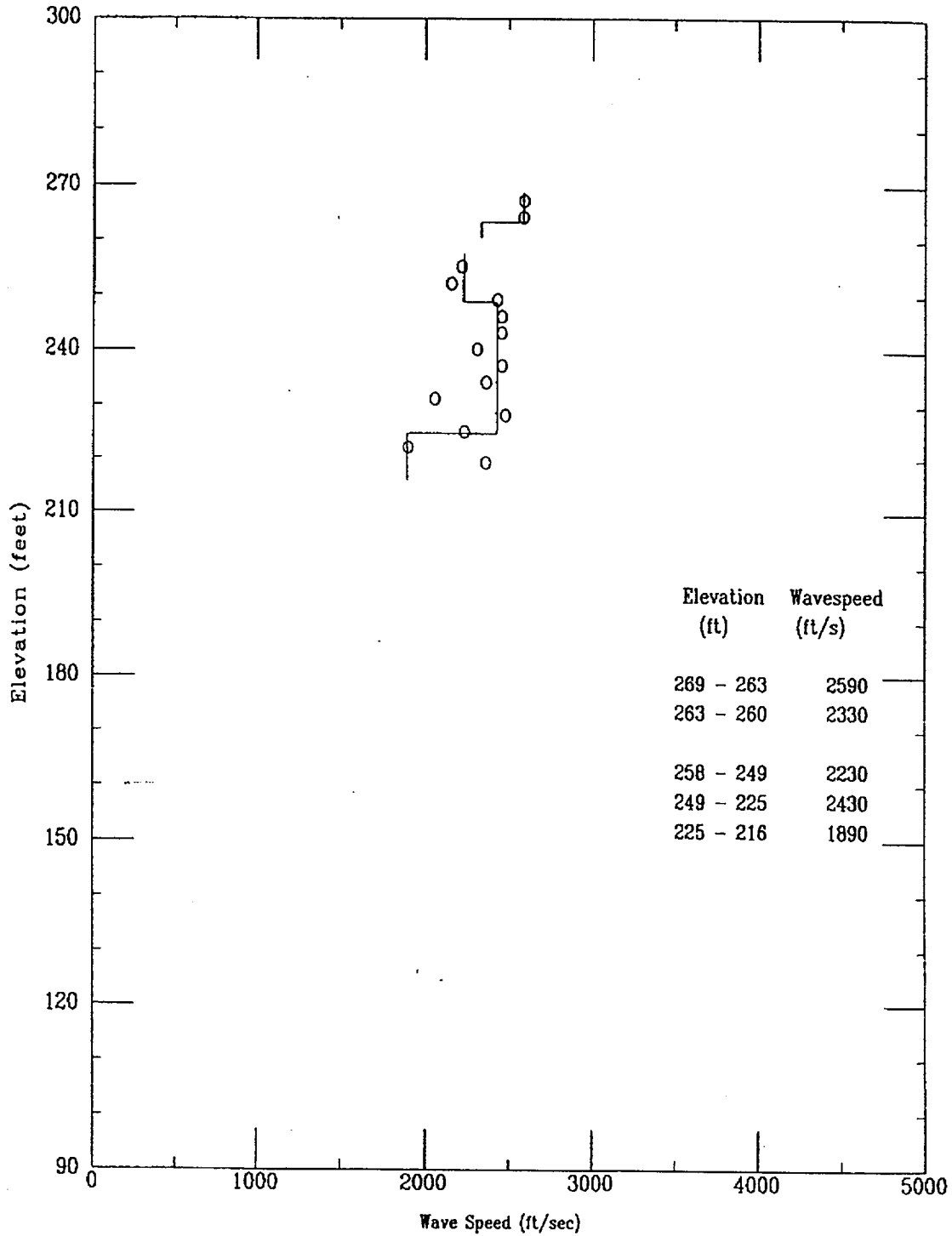
S Wave
02/23/98



File 523F804S

127 of 522

Compression Wave Speeds

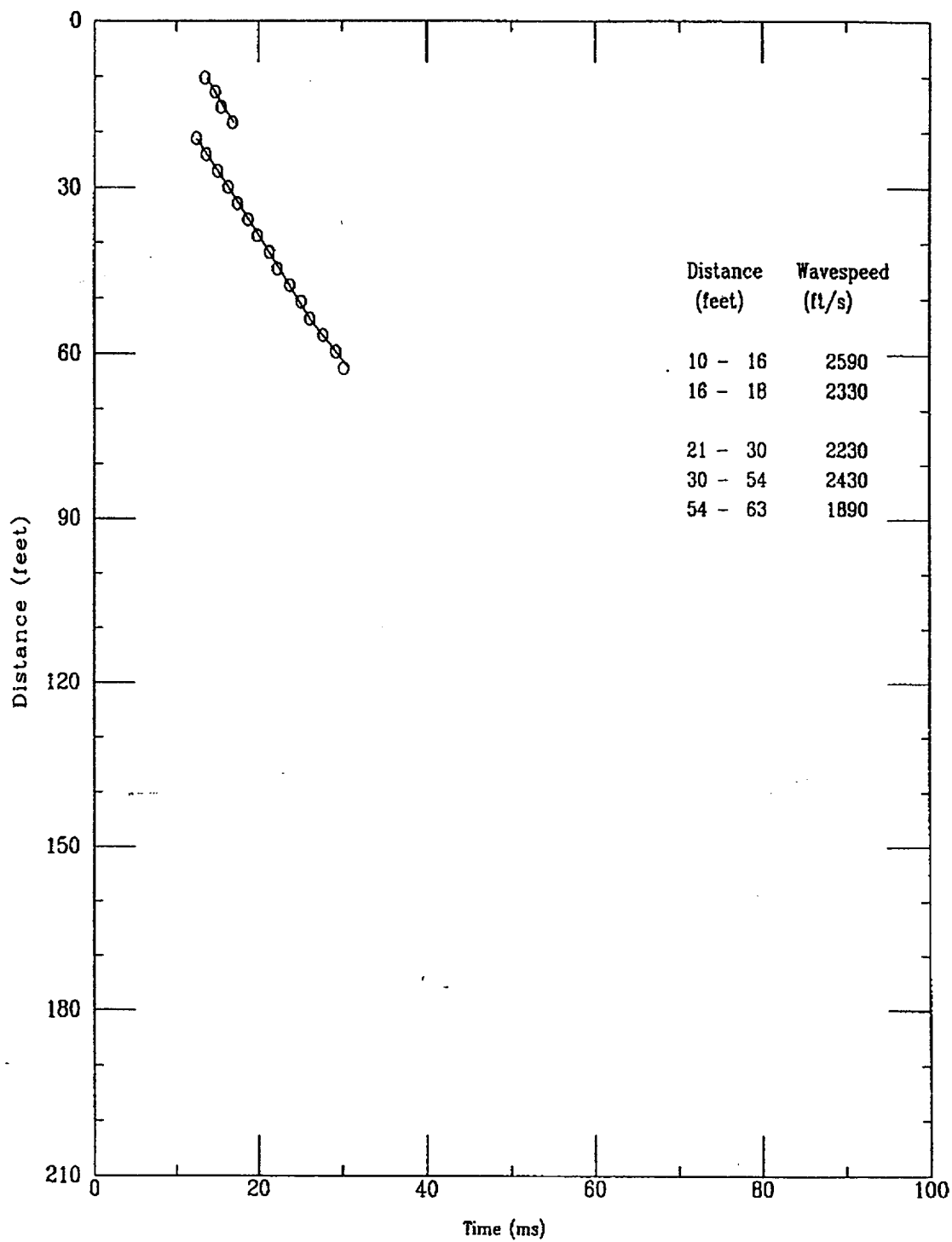


CPT-128

APPLIED RESEARCH ASSOCIATES, INC.

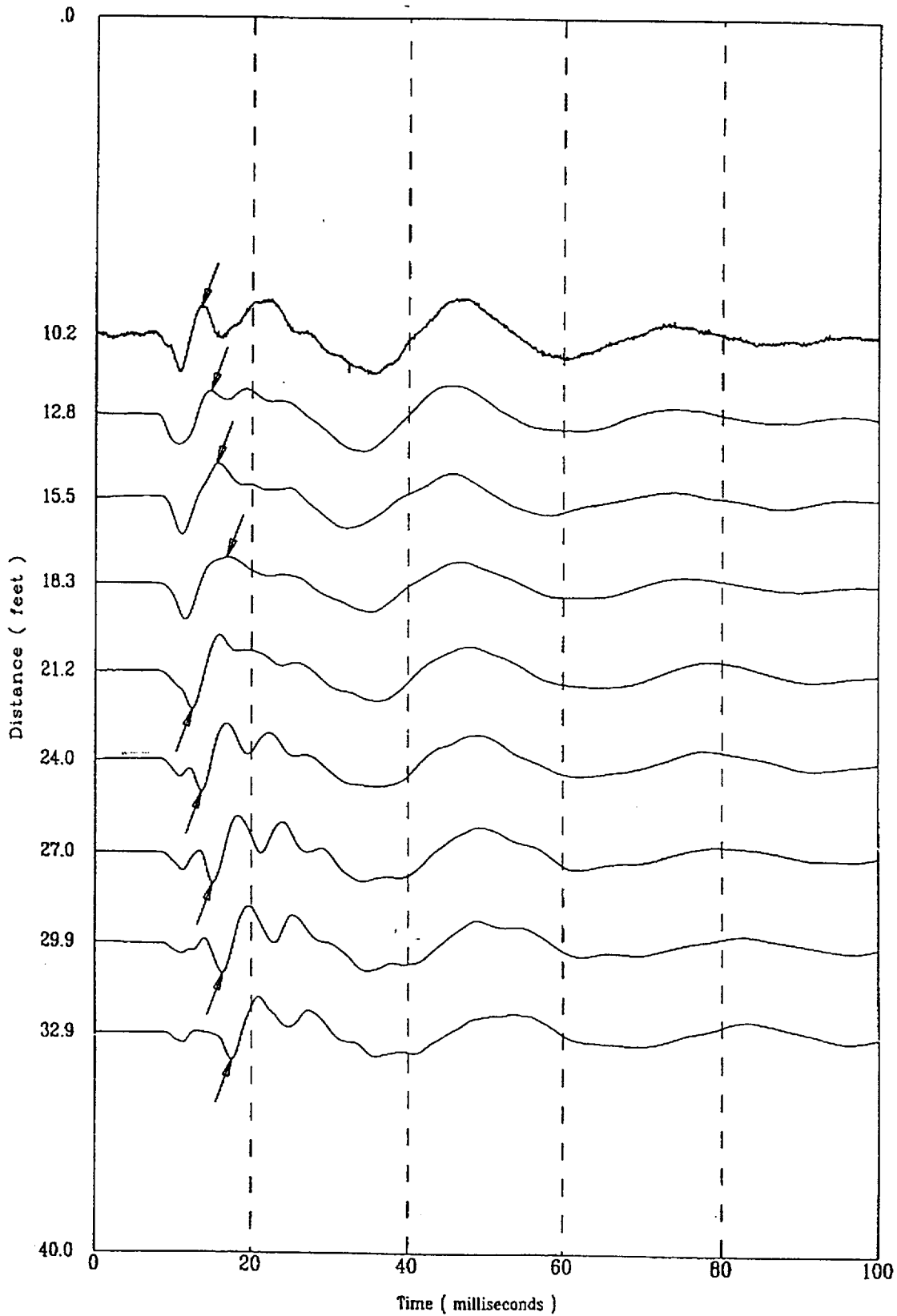
02/23/98

Compression Wave Time of Peak



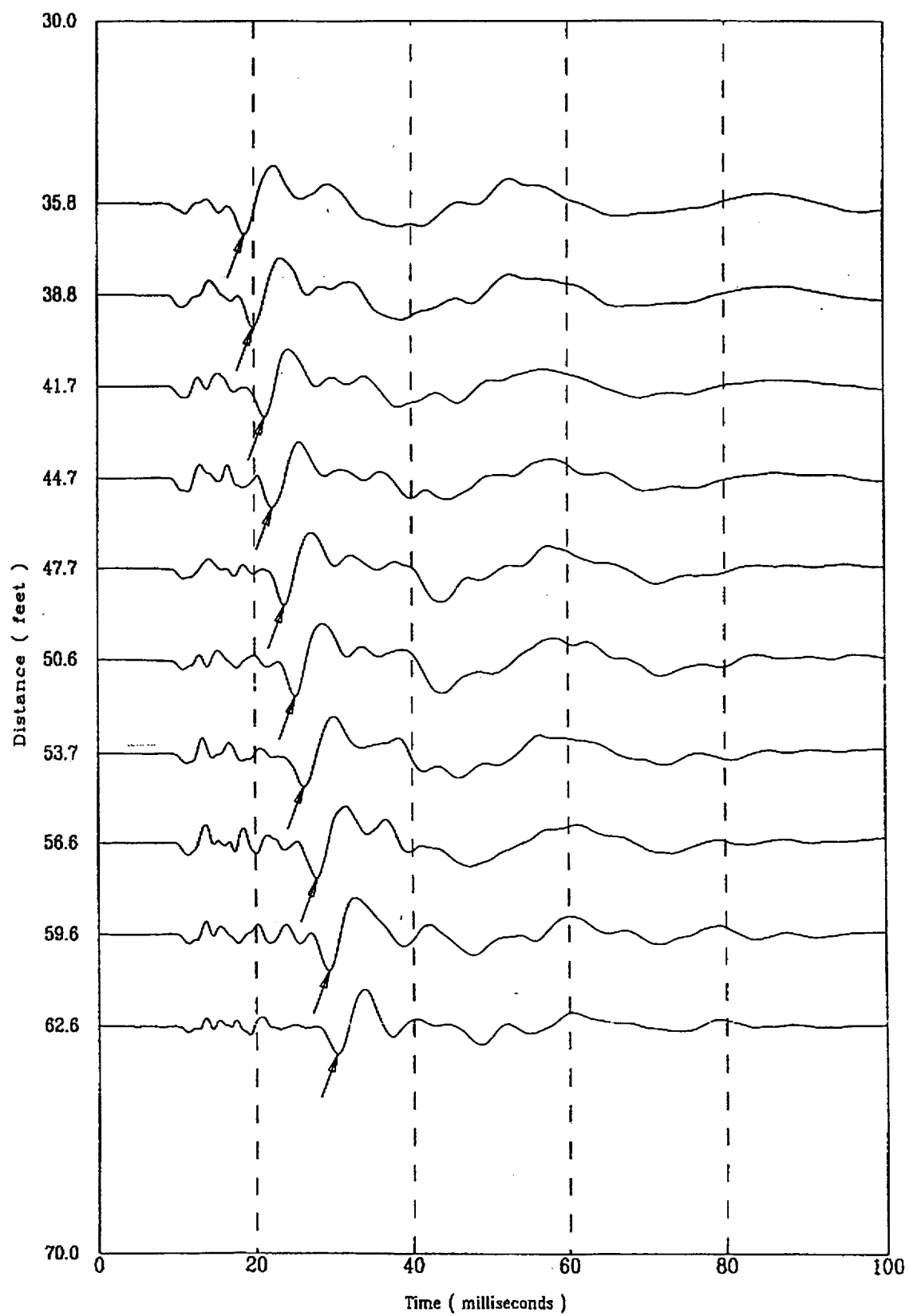
File 523/804S

129 of 522



Applied Research Associates, Inc.
CPT-128

P Wave
02/23/98



File 523f804S

131 of 522

CPT-129

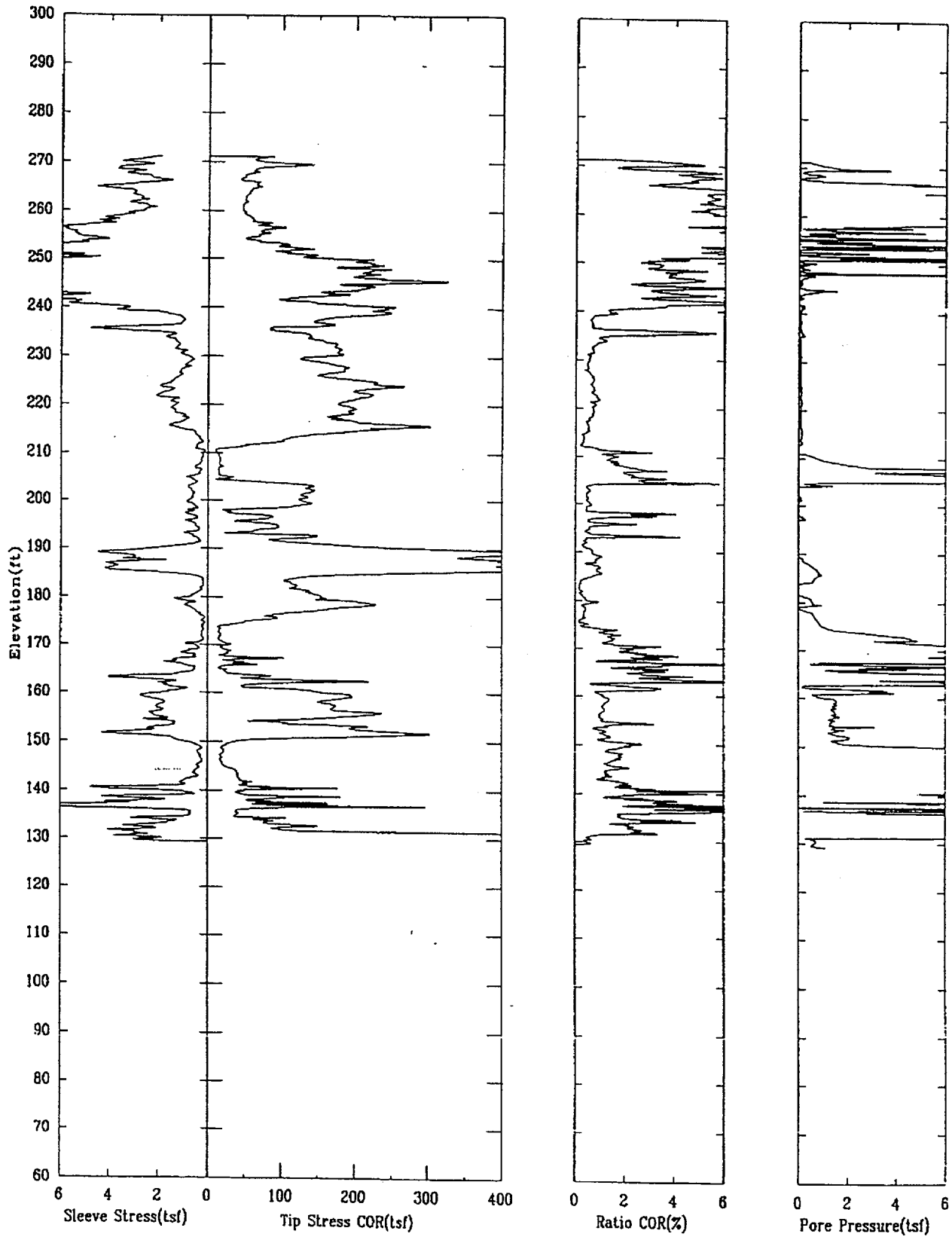
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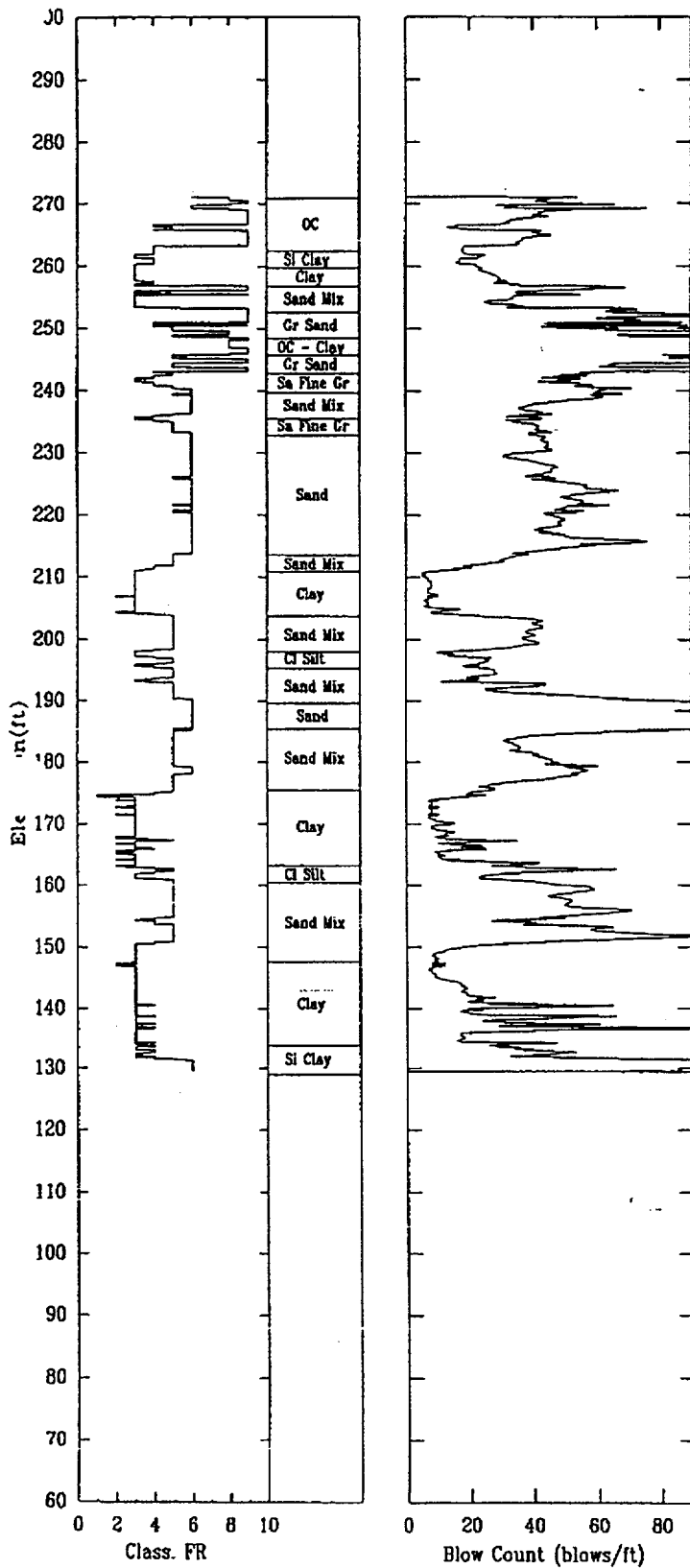
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North 79650.00

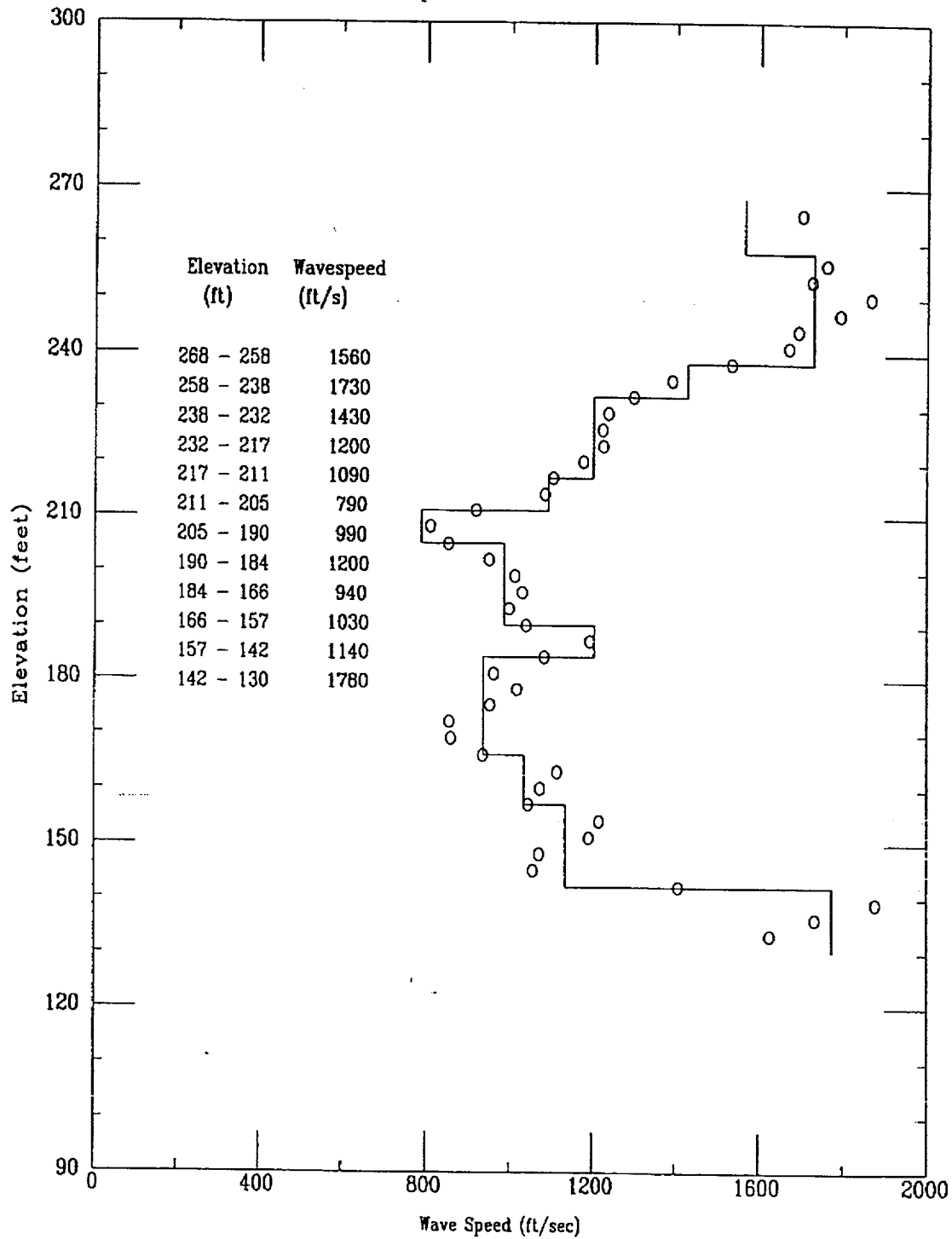
East 55261.00

Elevation 277.2

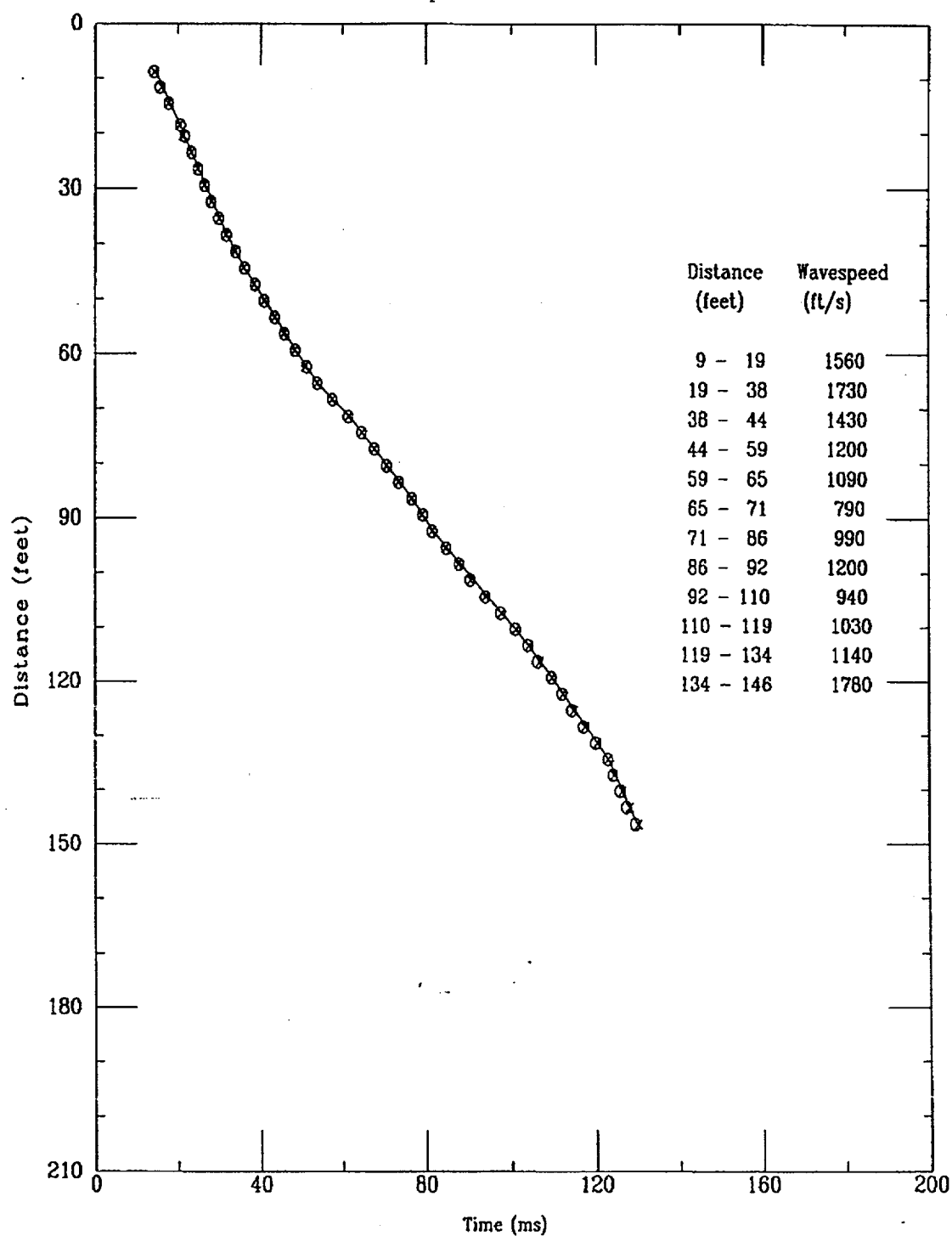




Shear Wave Speeds

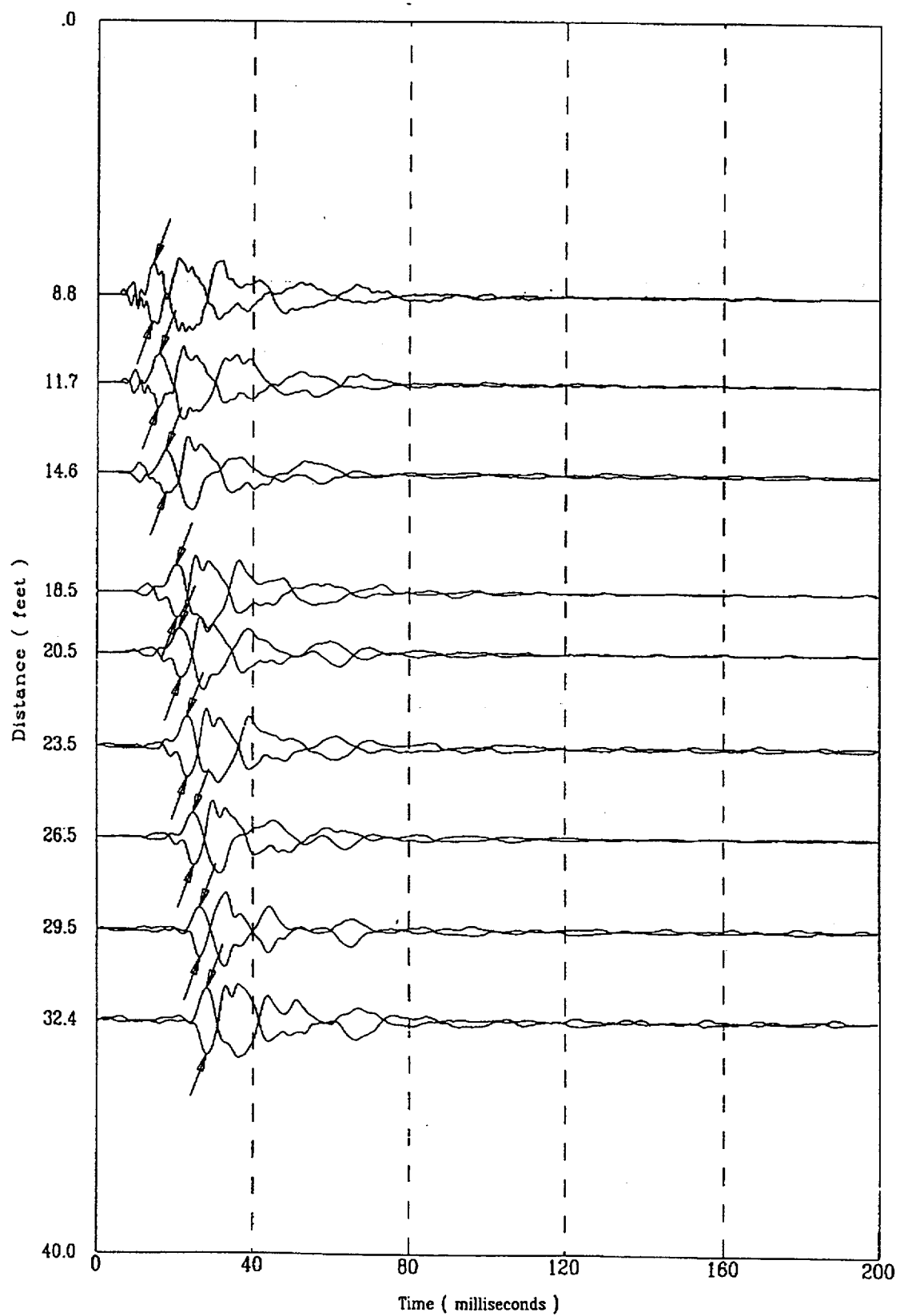


Shear Wave Time of Peak



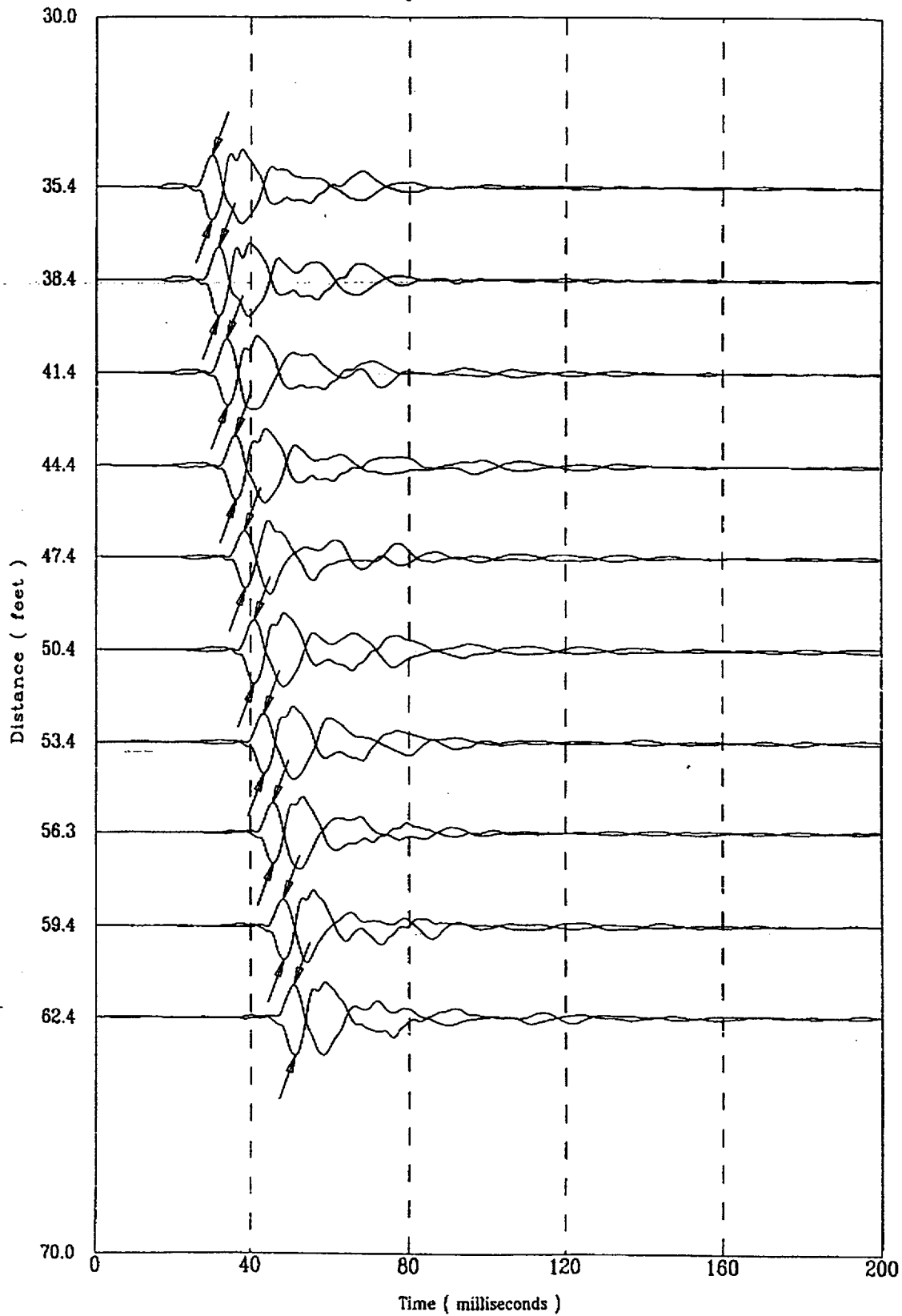
Applied Research Associates, Inc.
CPT-129

S Wave
02/23/98



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CPT-129

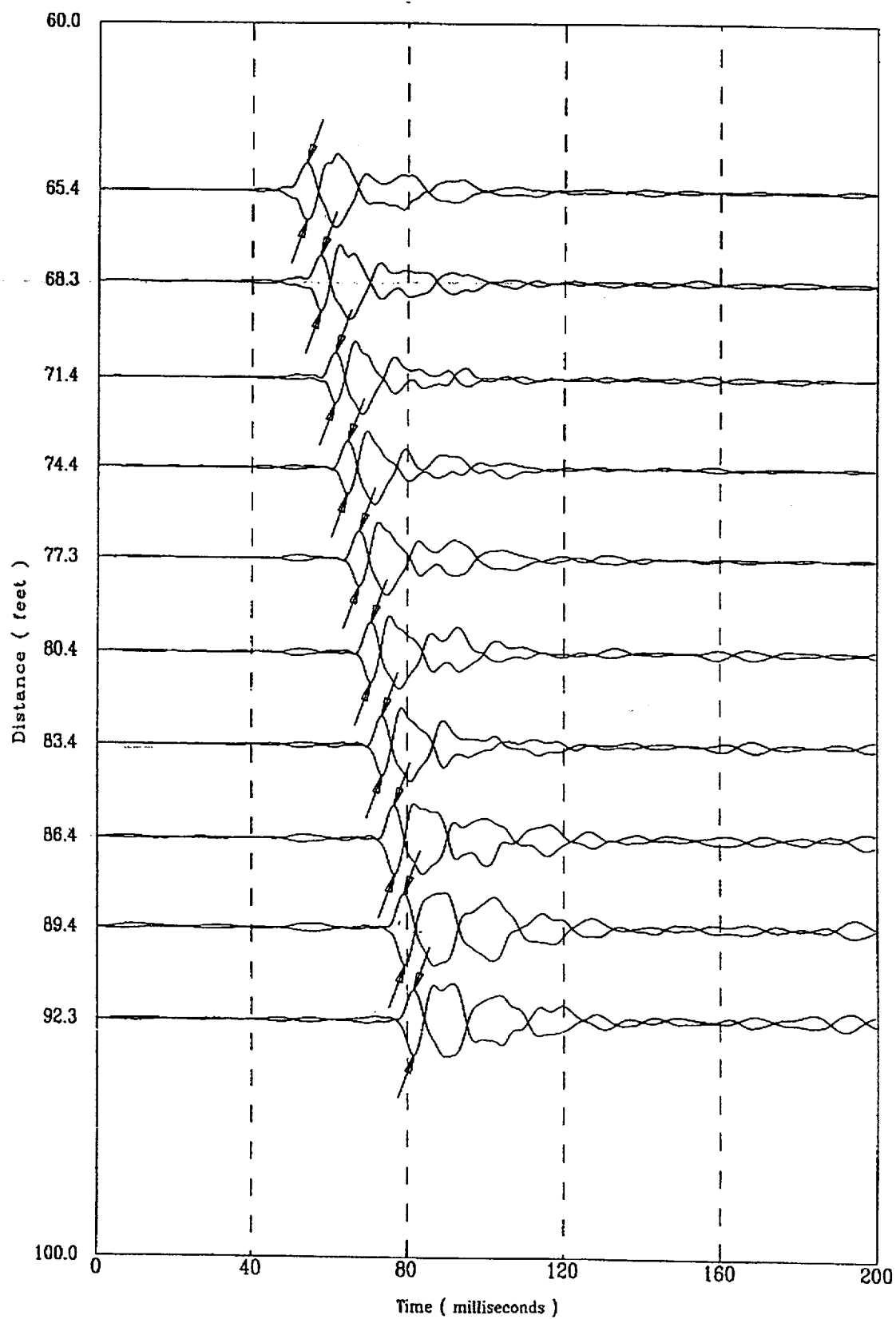
S Wave
02/23/98



023F801S

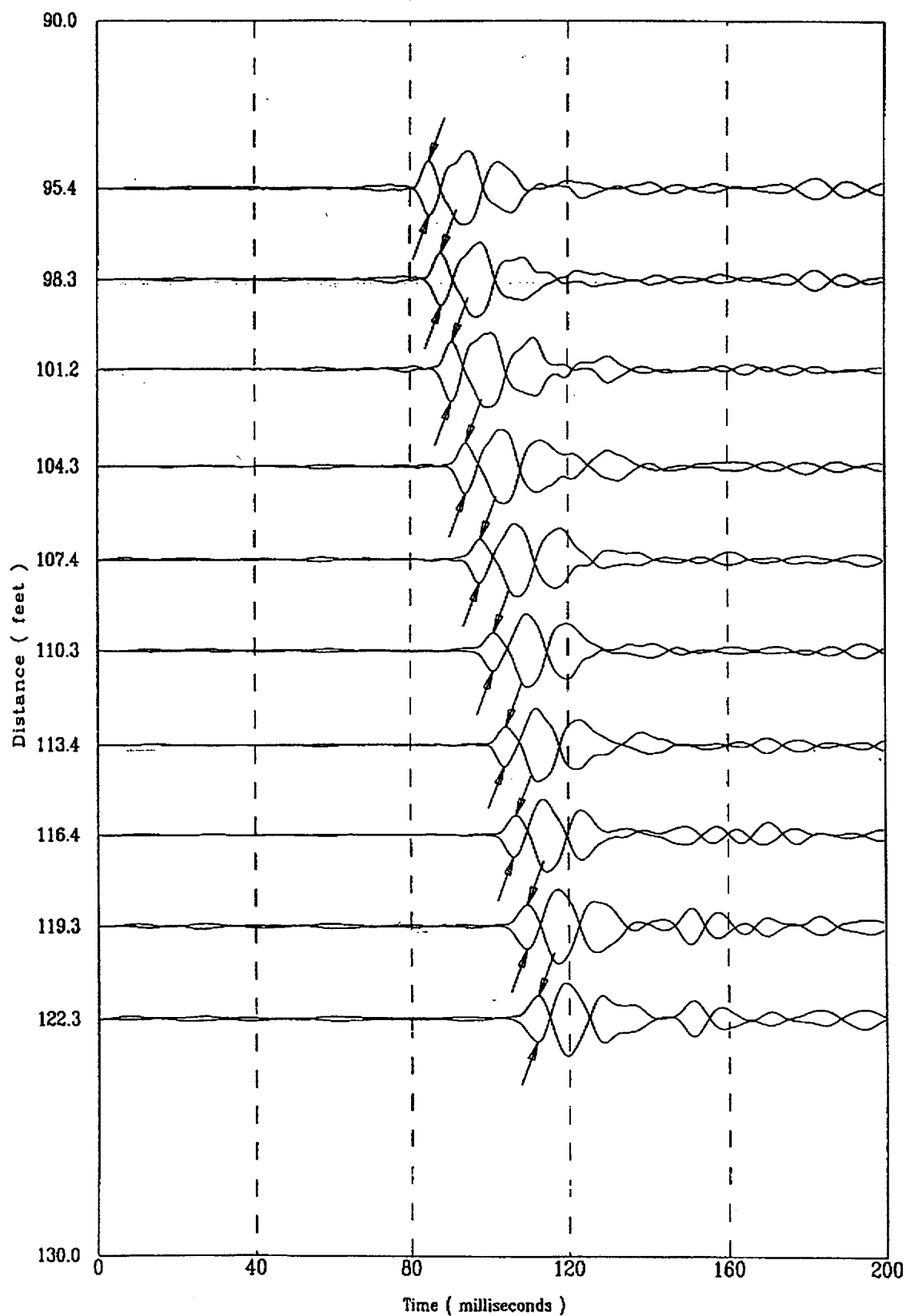
Applied Research Associates, Inc.
CPT-129

S Wave
02/23/98



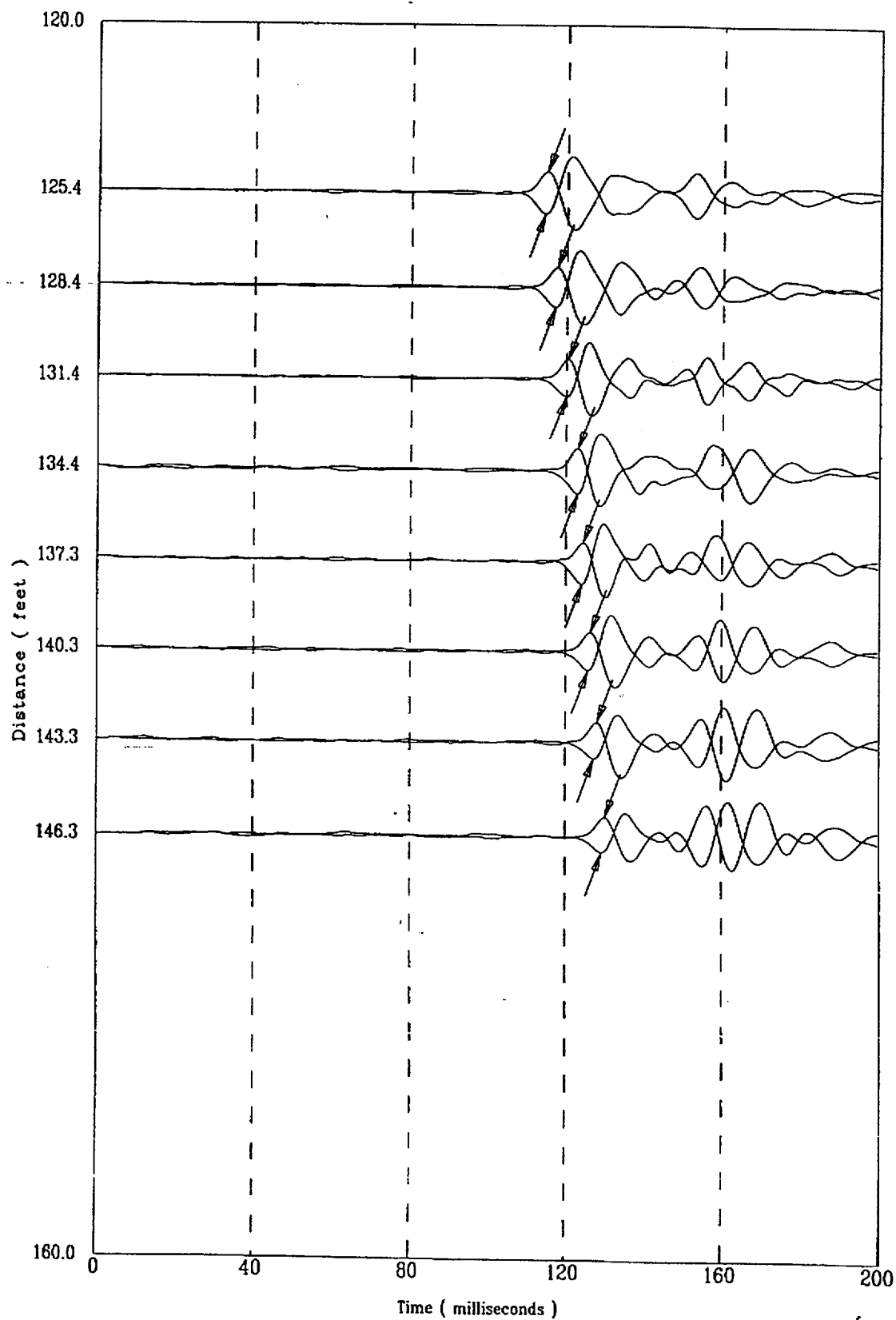
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138 of 522



Applied Research Associates, Inc.
CPT-129

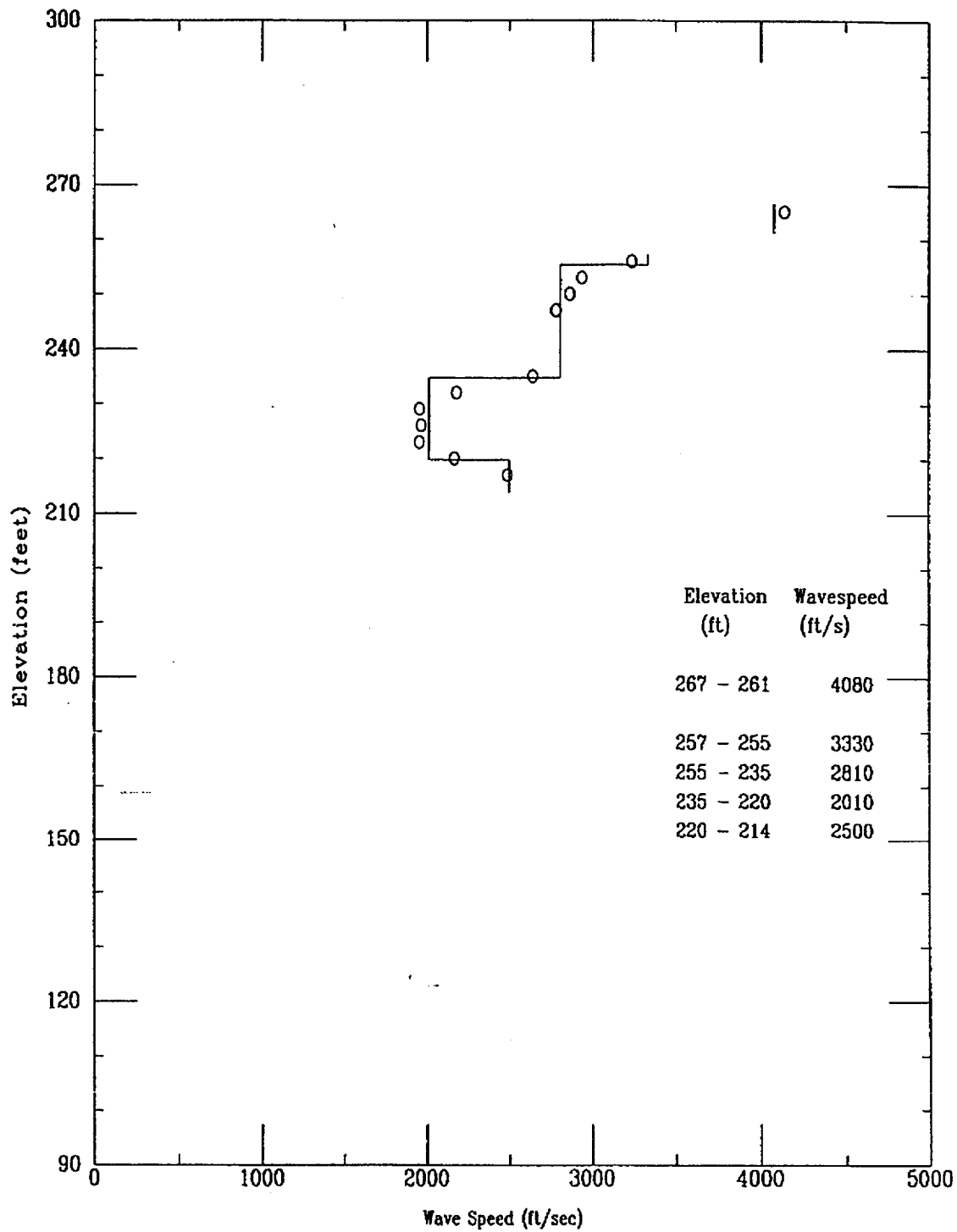
S Wave
02/23/98

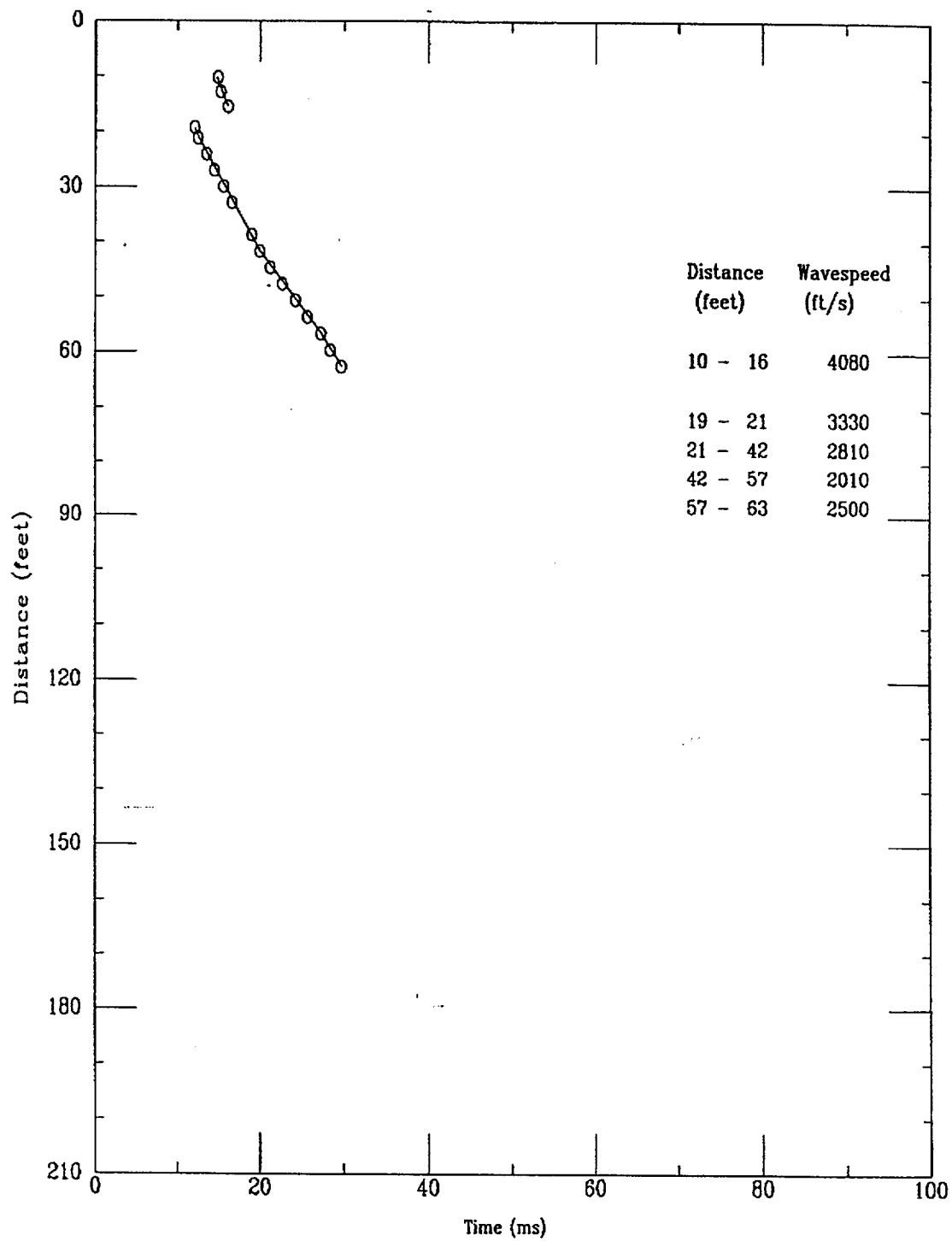


File 523F801S

140 of 522

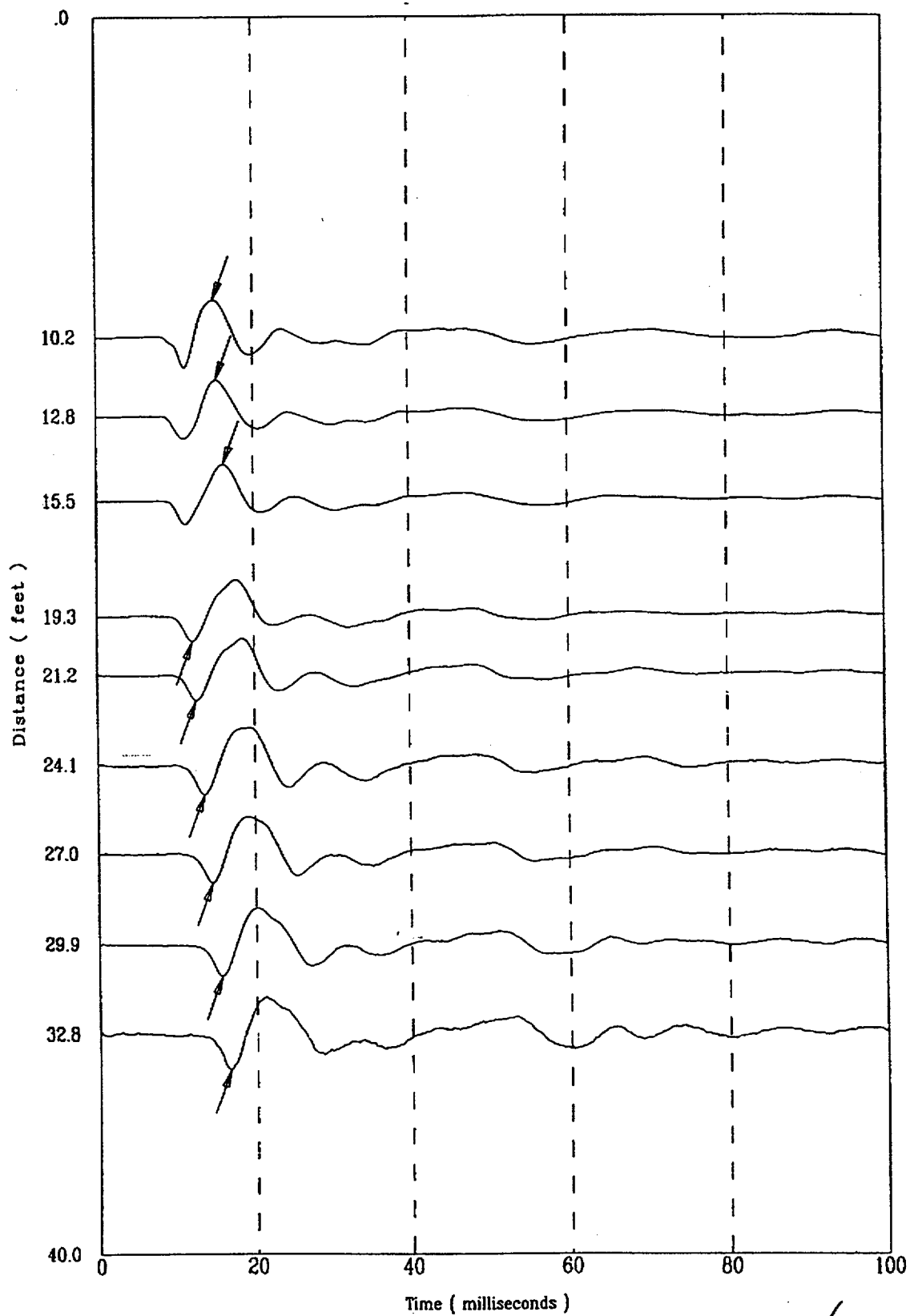
Compression Wave Speeds





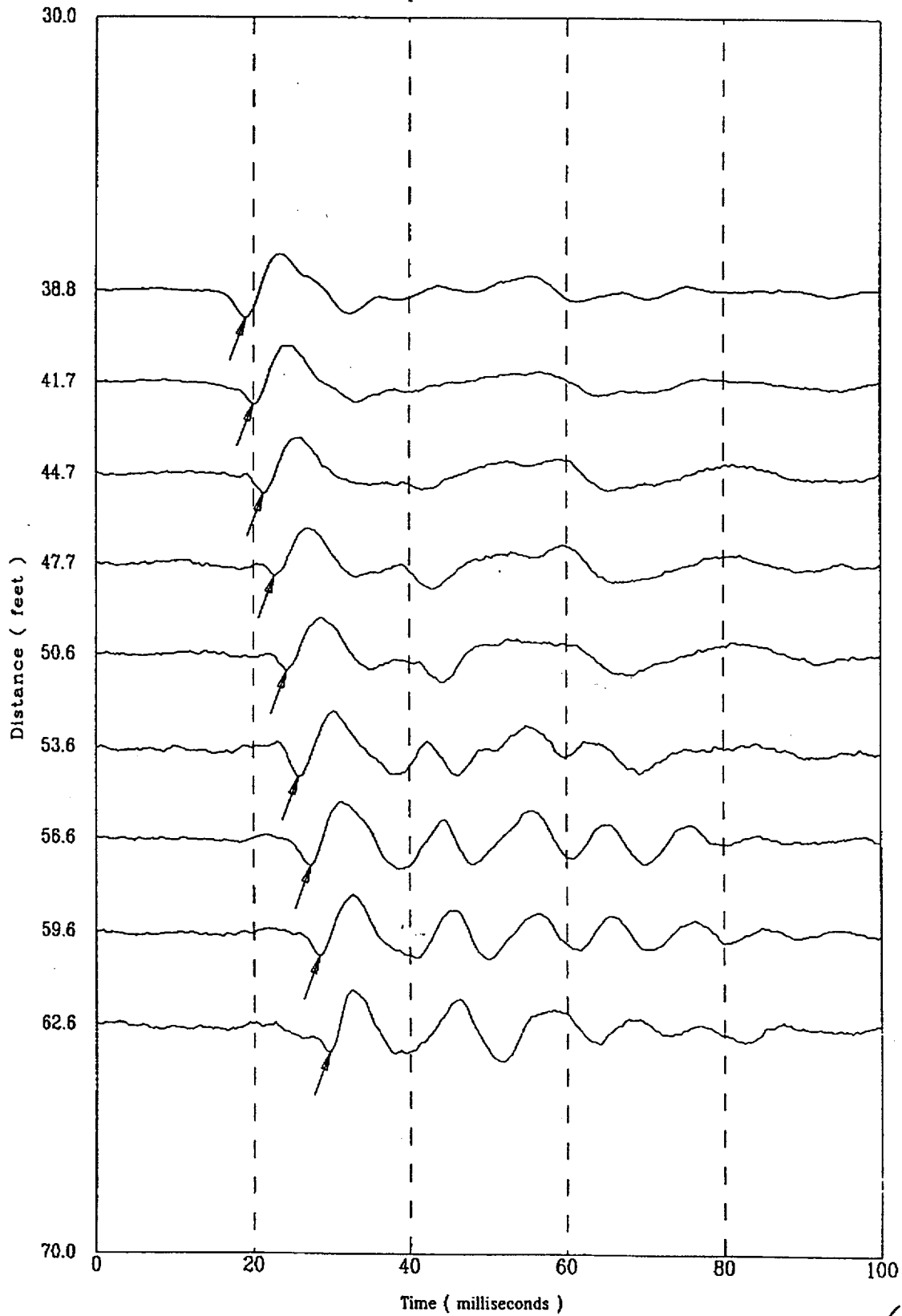
Applied Research Associates, Inc.
CPT-129

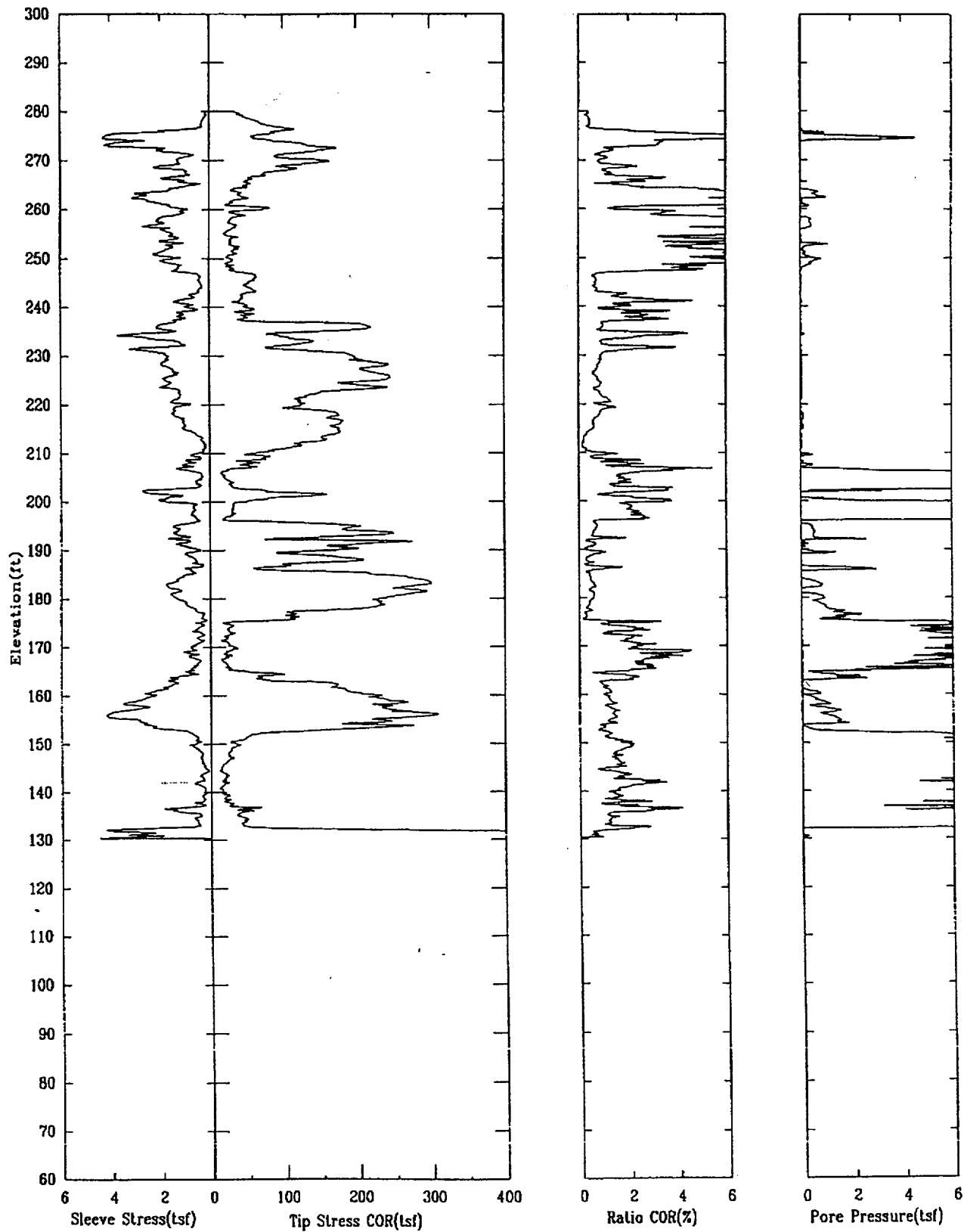
P Wave
02/23/98



5231801S

143 of 522





CPT-143

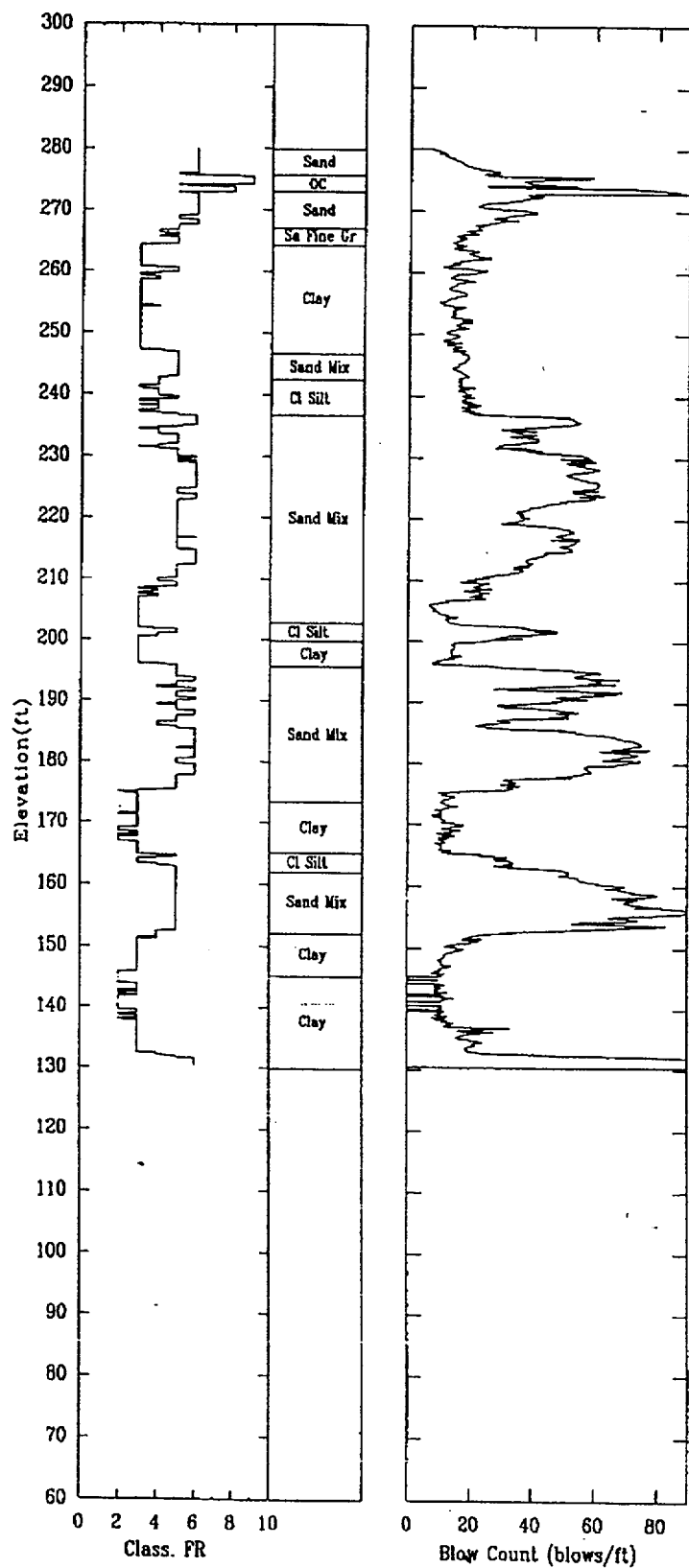
APPLIED RESEARCH ASSOCIATES, INC.

02/25/98

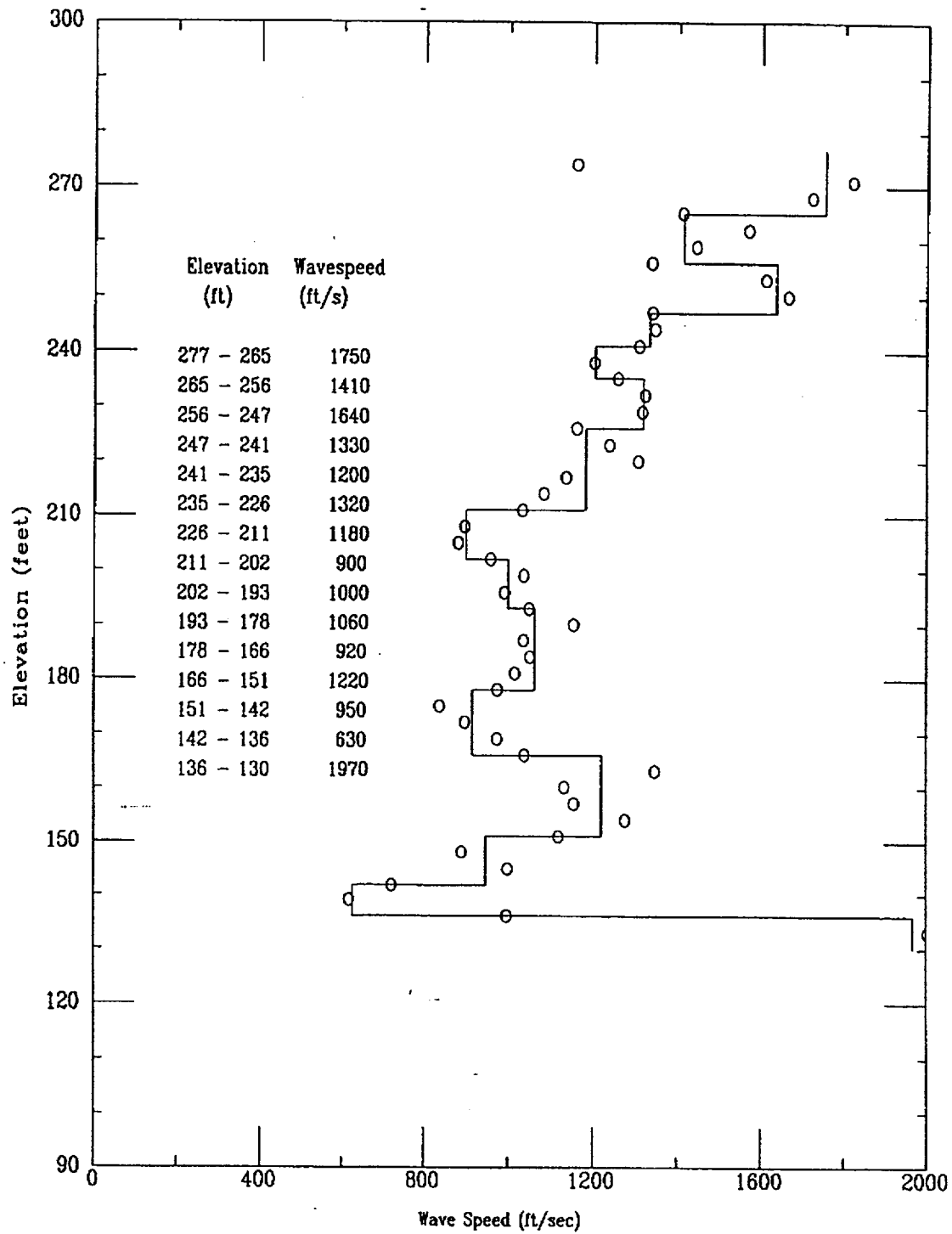
North 79442.5

East 55195

Elevation 286.1



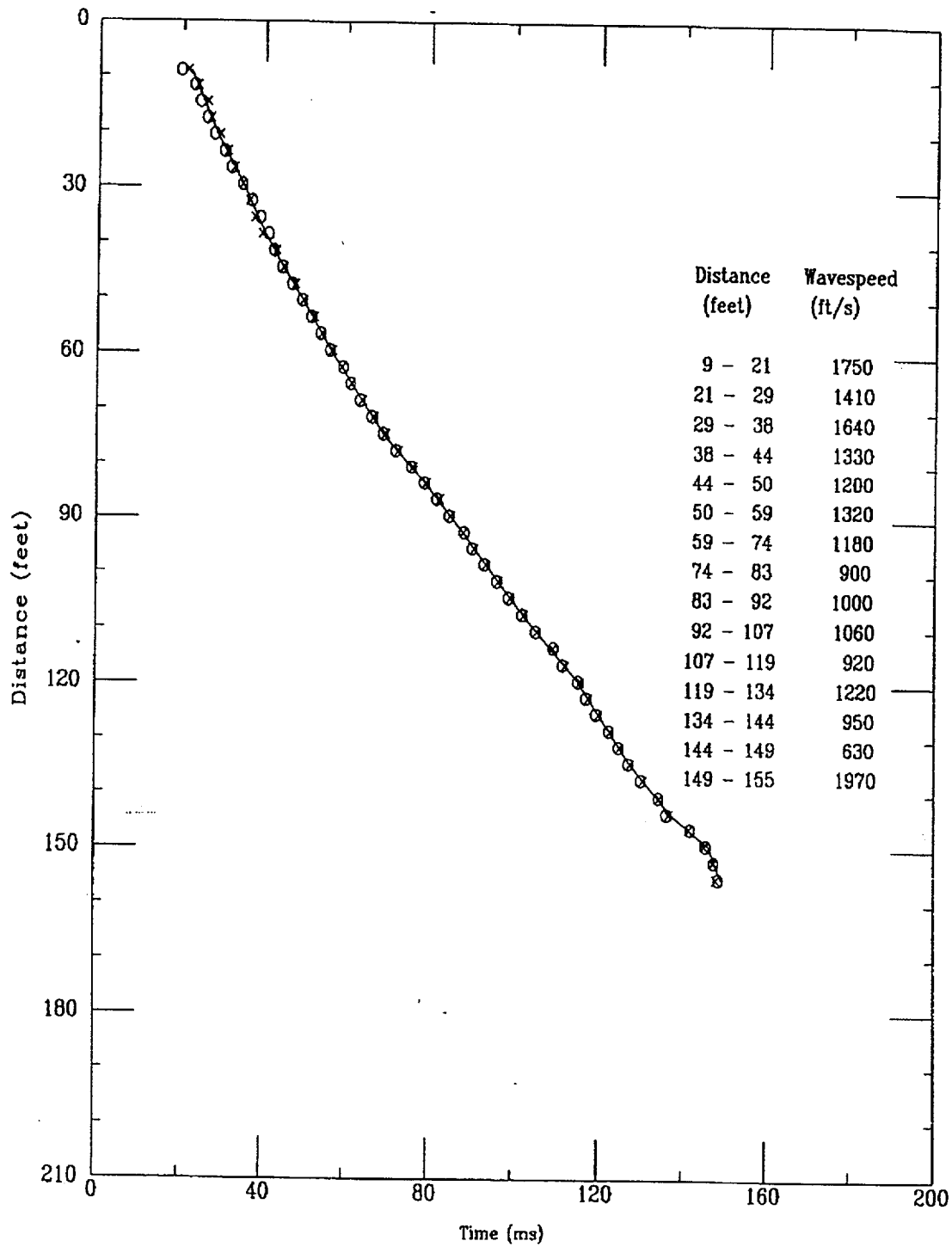
Shear Wave Speeds



CPT-143

APPLIED RESEARCH ASSOCIATES, INC.
Shear Wave Time of Peak

02/25/98

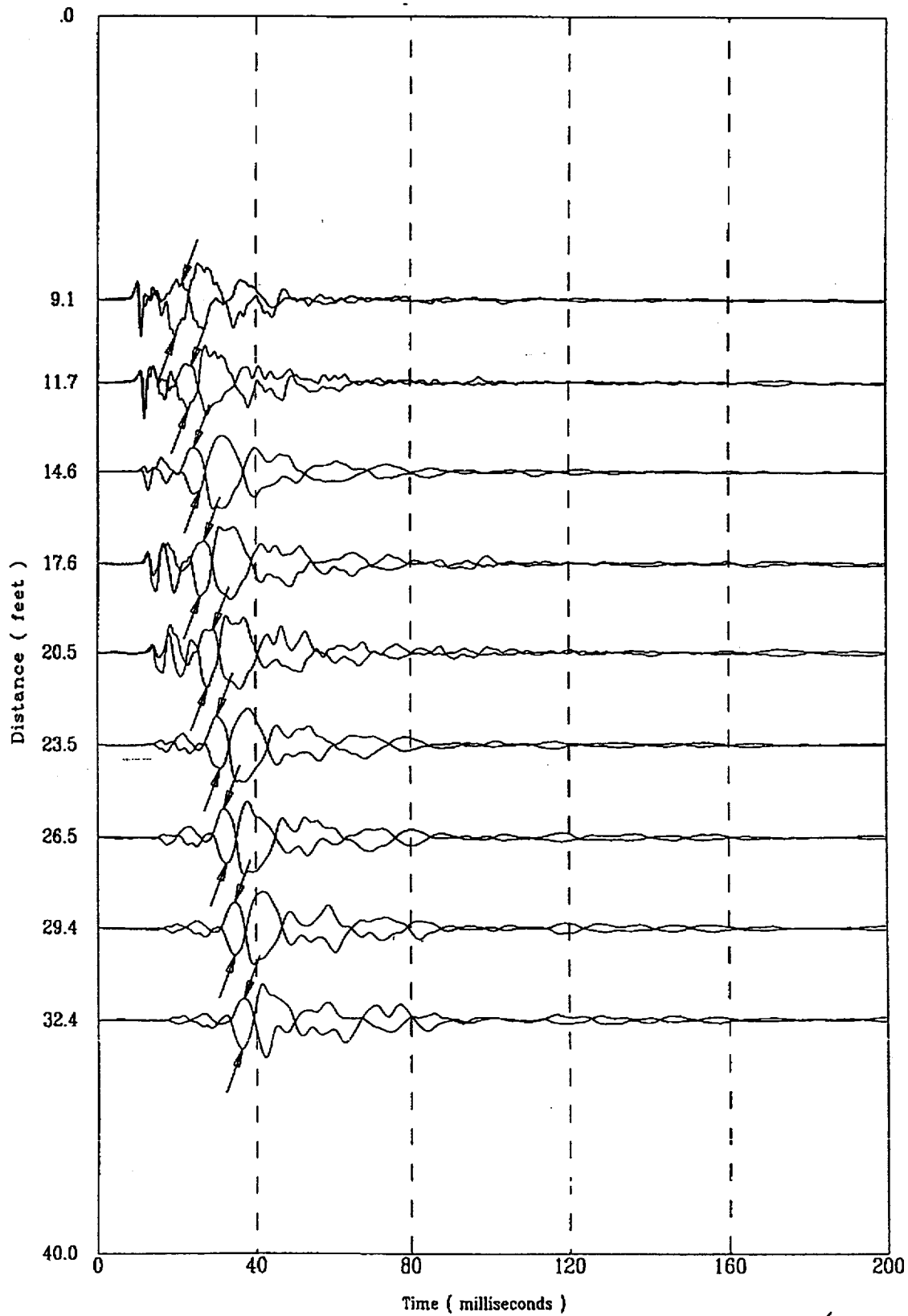


File 525f804S

148 of 522

Applied Research Associates
CPT-143

S Wave
02/25/98

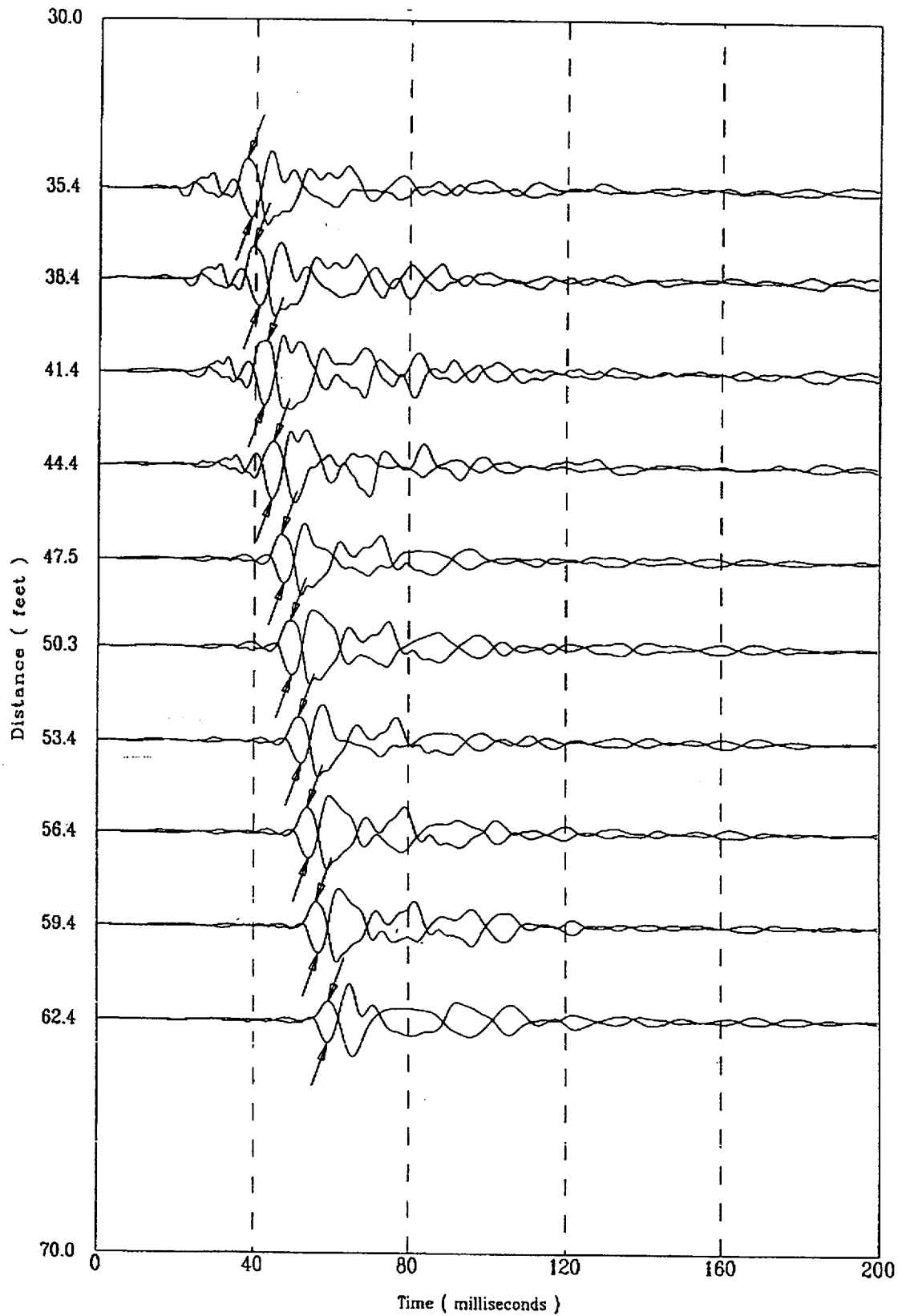


325f804S

149 A 522

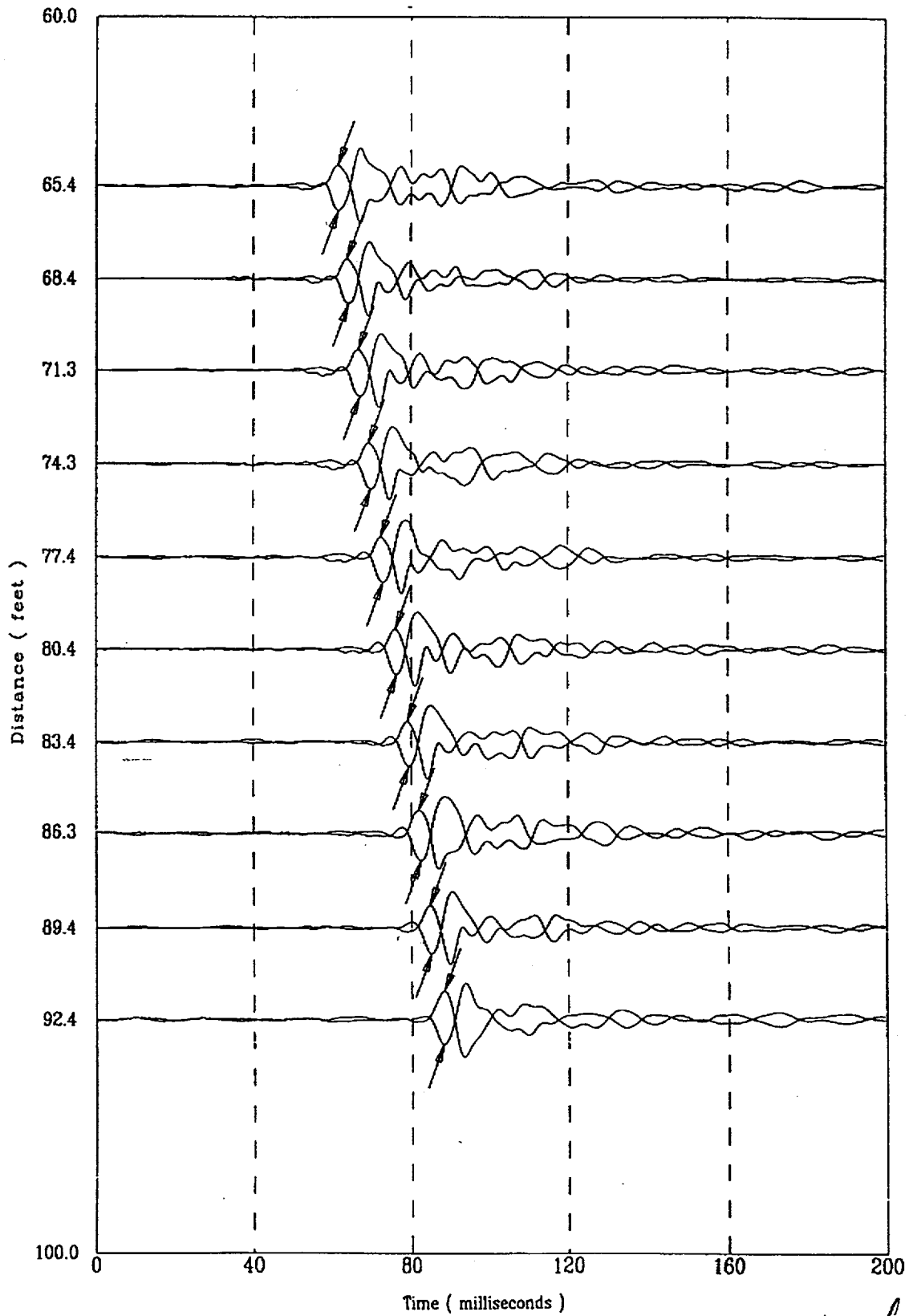
Applied Research Associates
CPT-143

S Wave
02/25/98



Applied Research Associates
CPT-143

S Wave
02/25/98

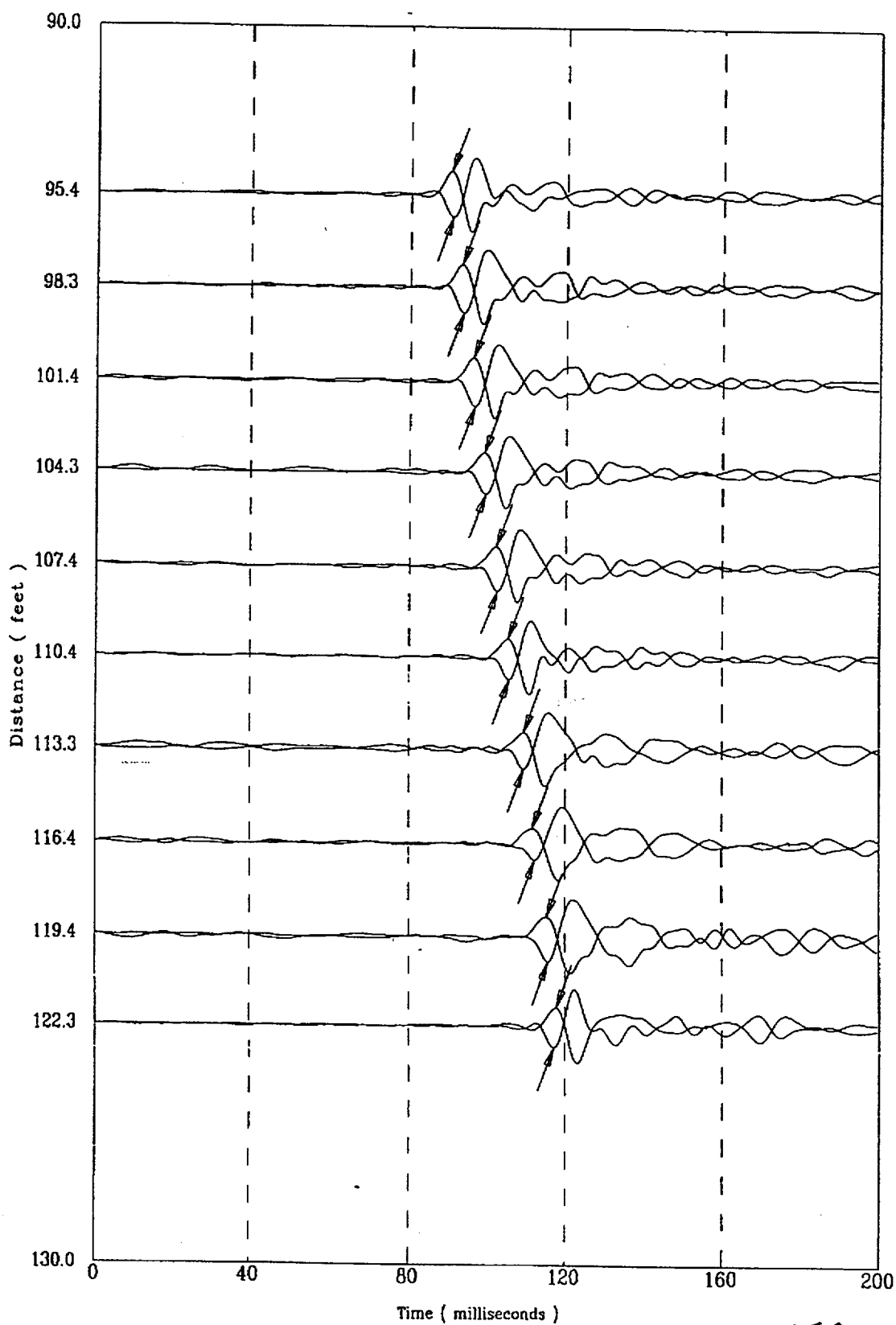


257804S

151 of 522

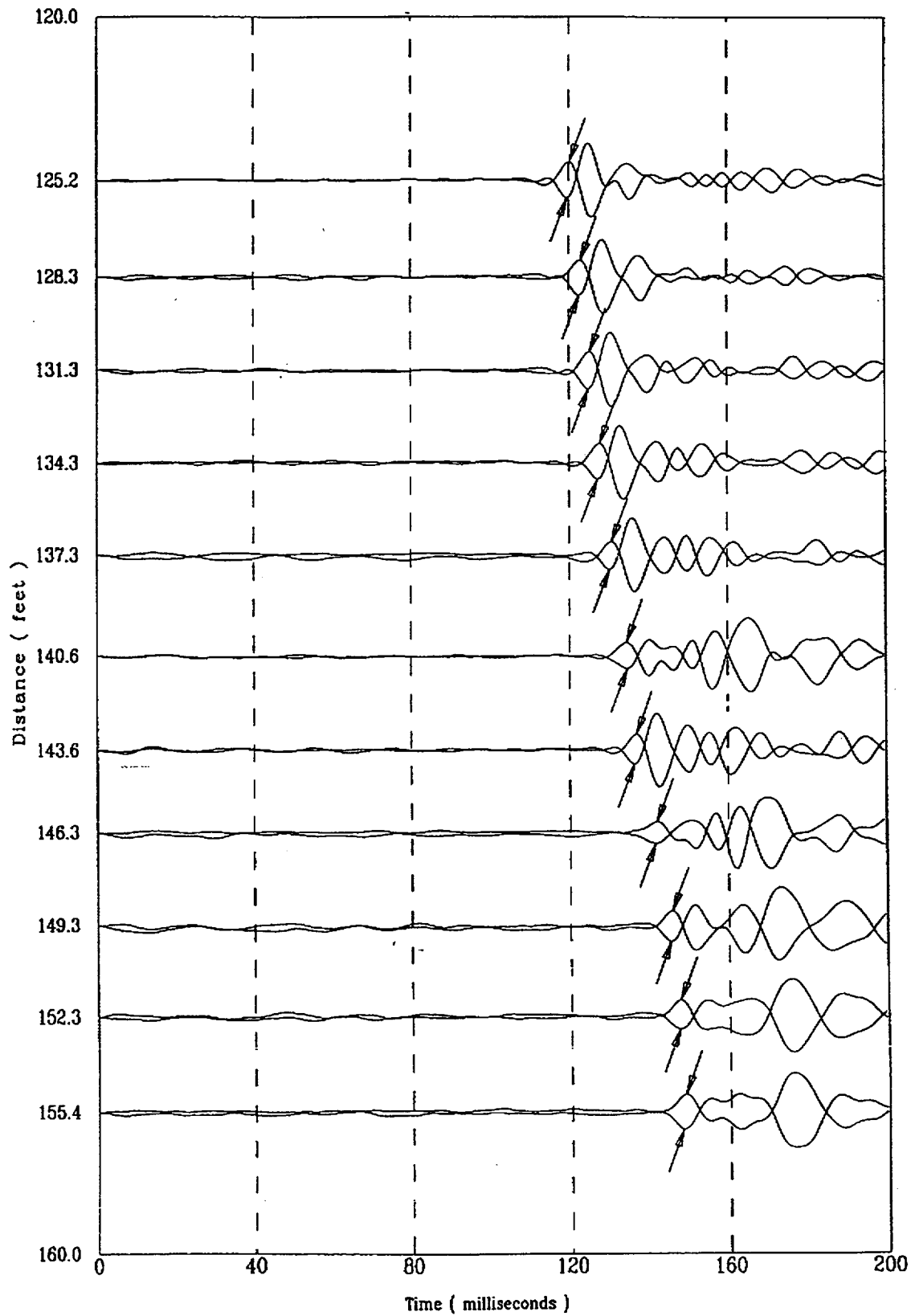
Applied Research Associates
CPT-143

S Wave
02/25/98



Applied Research Associates
CPT-143

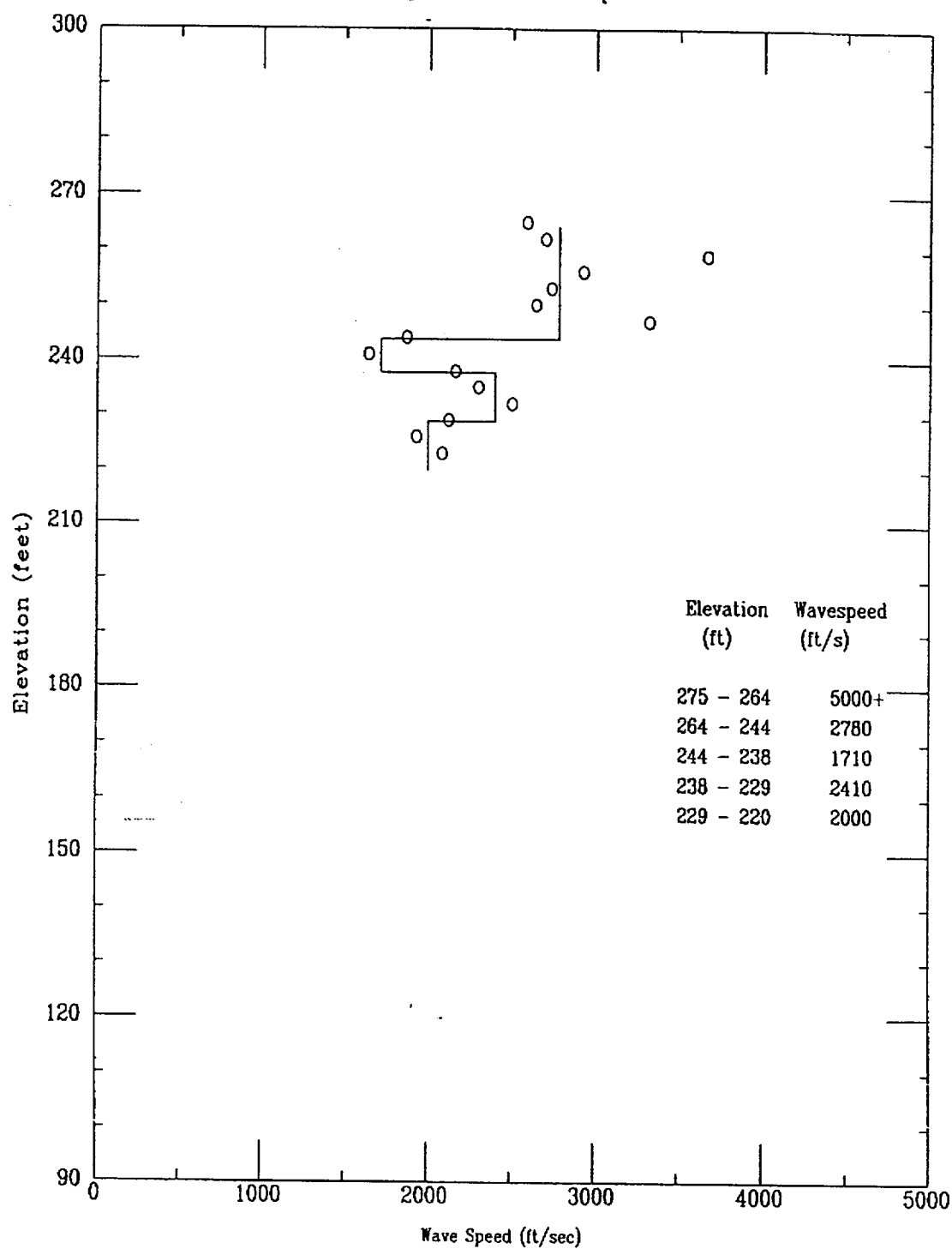
S Wave
02/25/98



251804S

153 of 522

Compression Wave Speeds

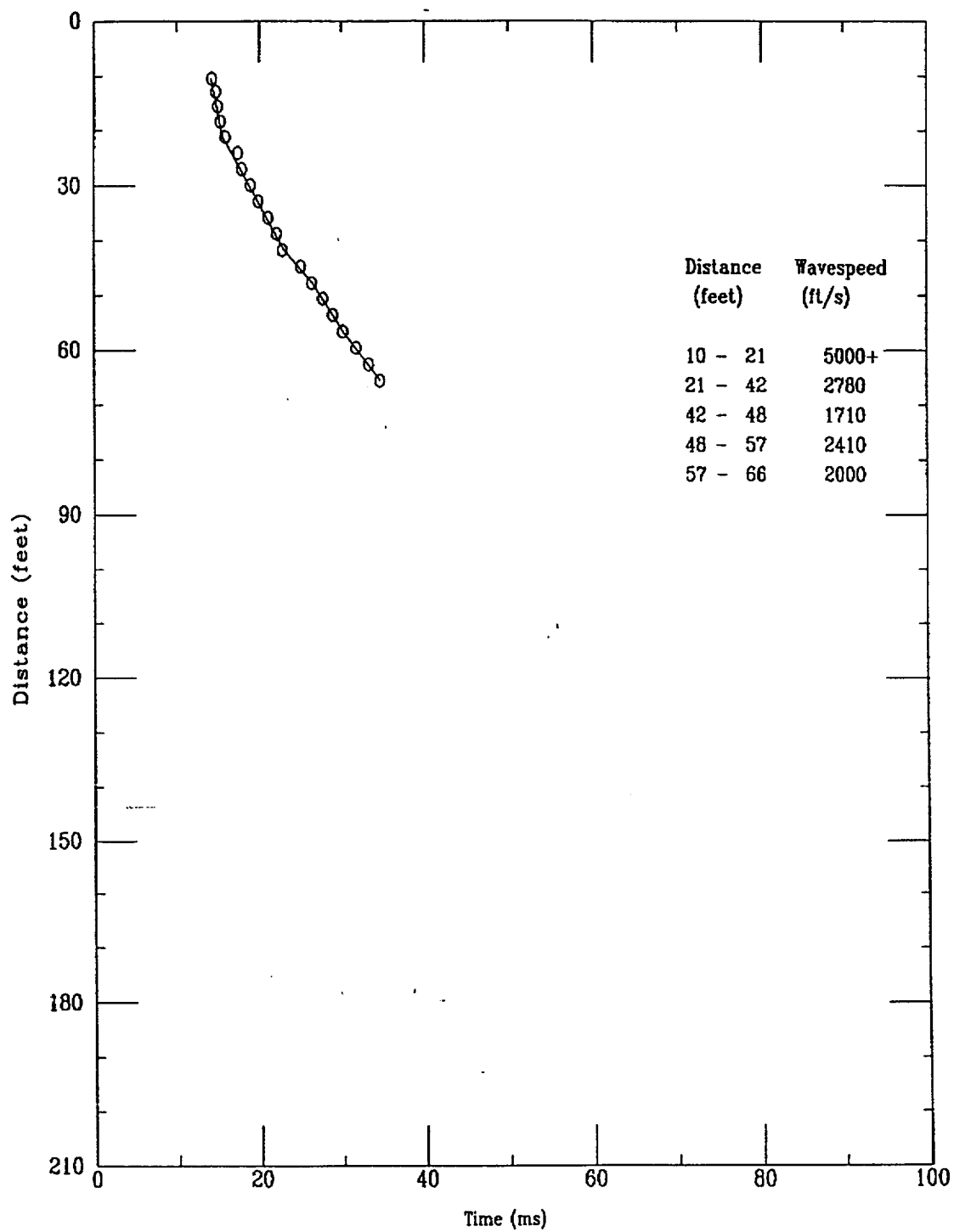


CPT-143

APPLIED RESEARCH ASSOCIATES, INC.

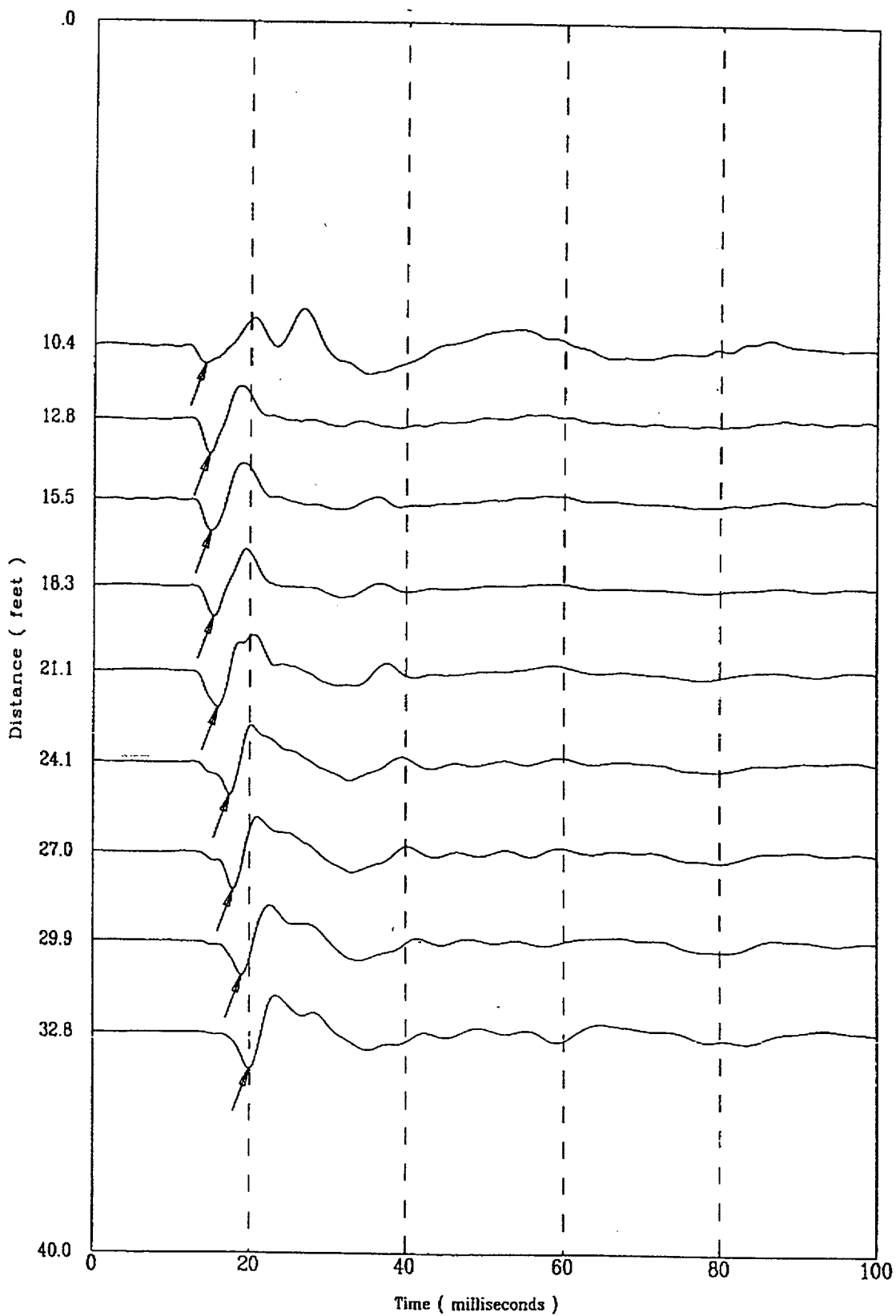
02/25/98

Compression Wave Time of Peak



Applied Research Associates
CPT-143

P Wave
02/25/98

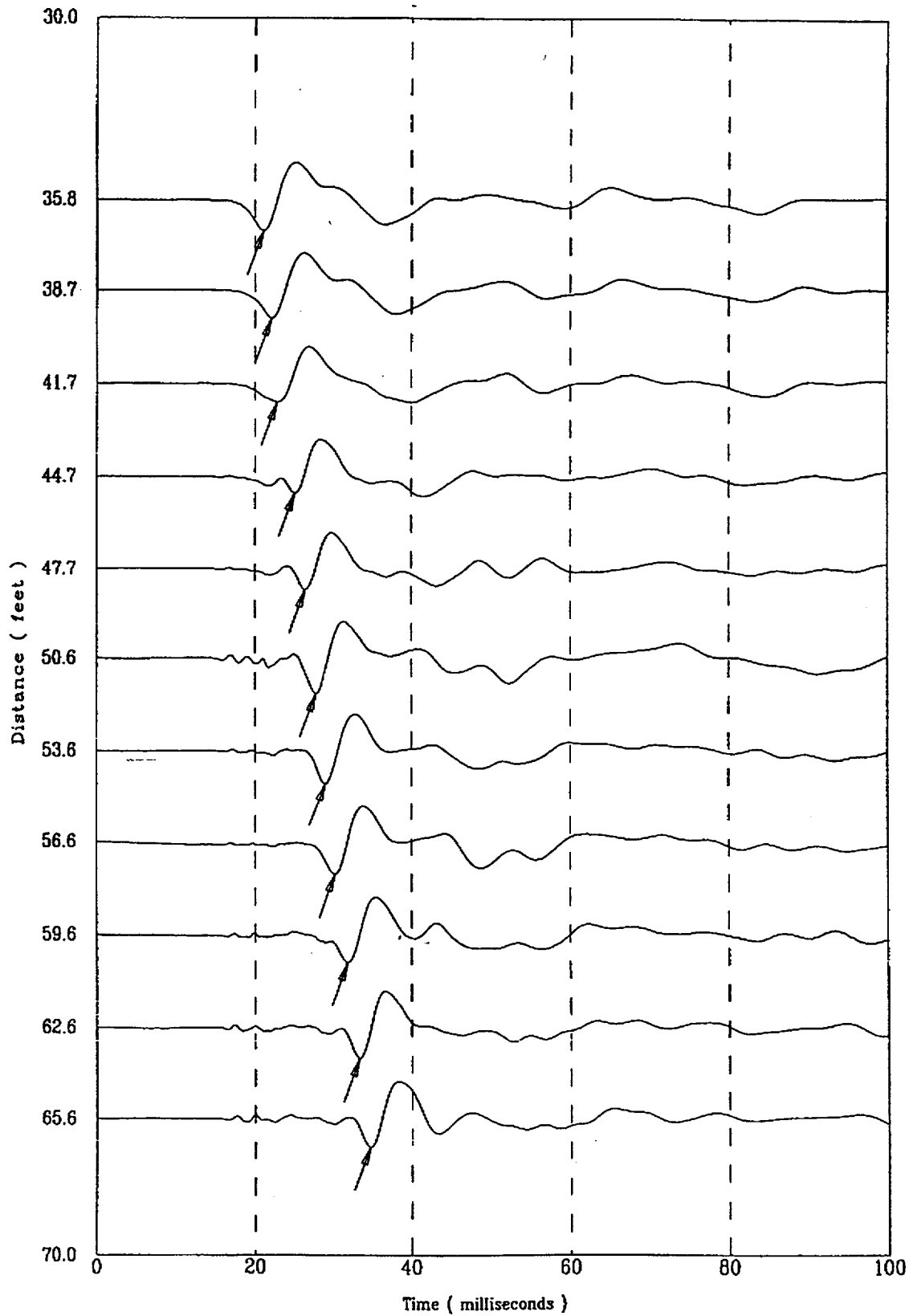


File 525f804S

156 of 522

Applied Research Associates
CPT-143

P Wave
02/25/98



.25/804S

157 of 522

CPT-147

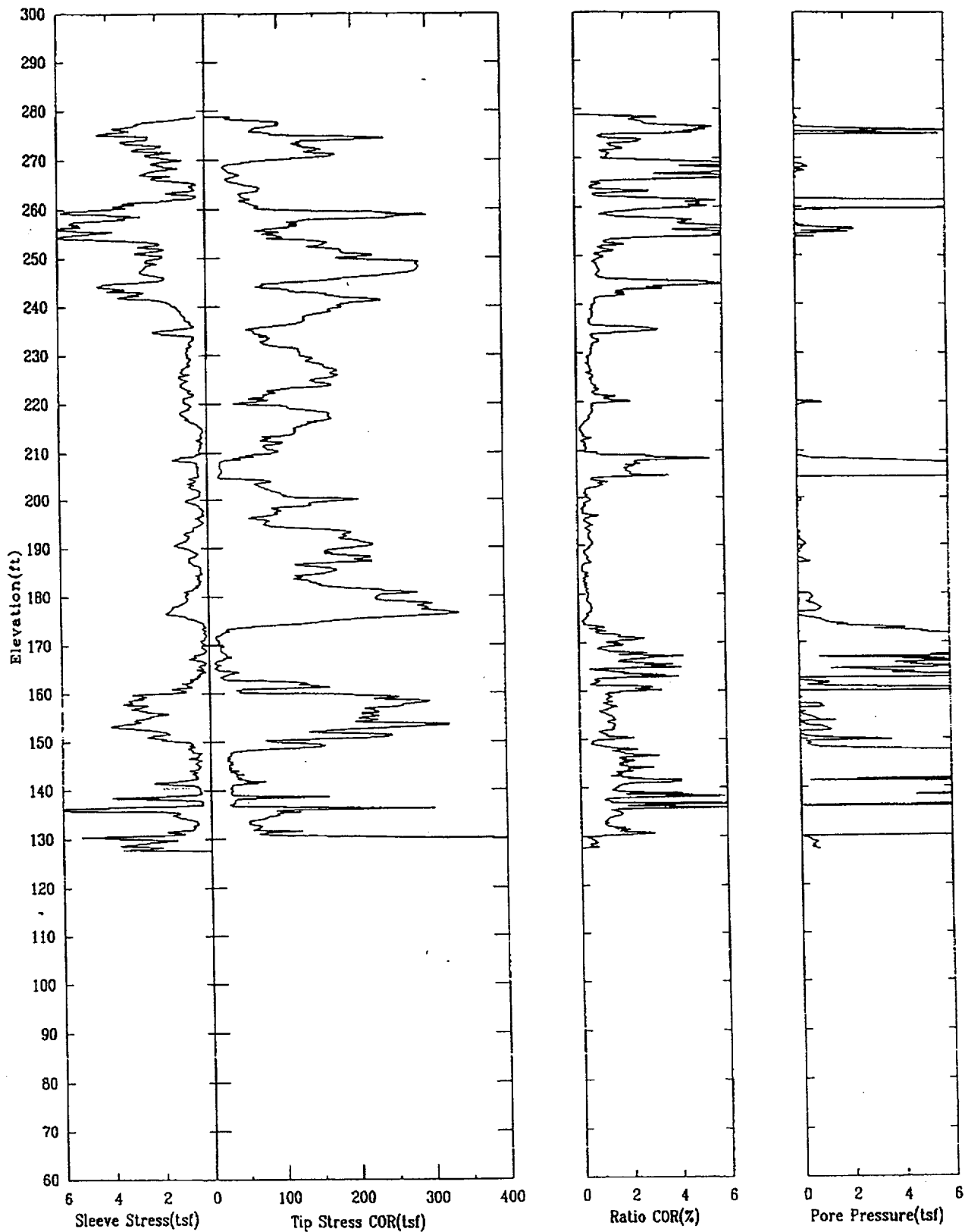
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02/24/98

North 79372

East 55261

Elevation 284.8



CPT-147

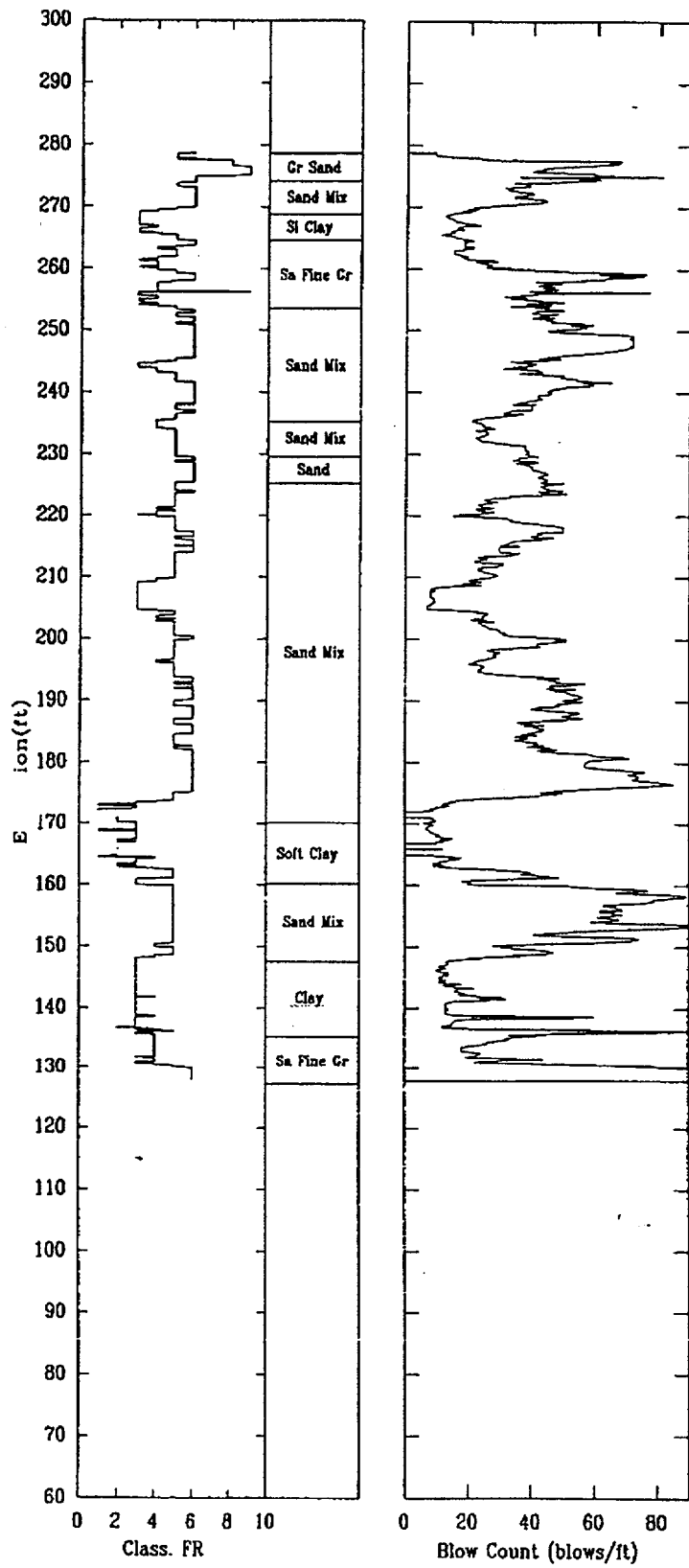
APPLIED RESEARCH ASSOCIATES, INC.

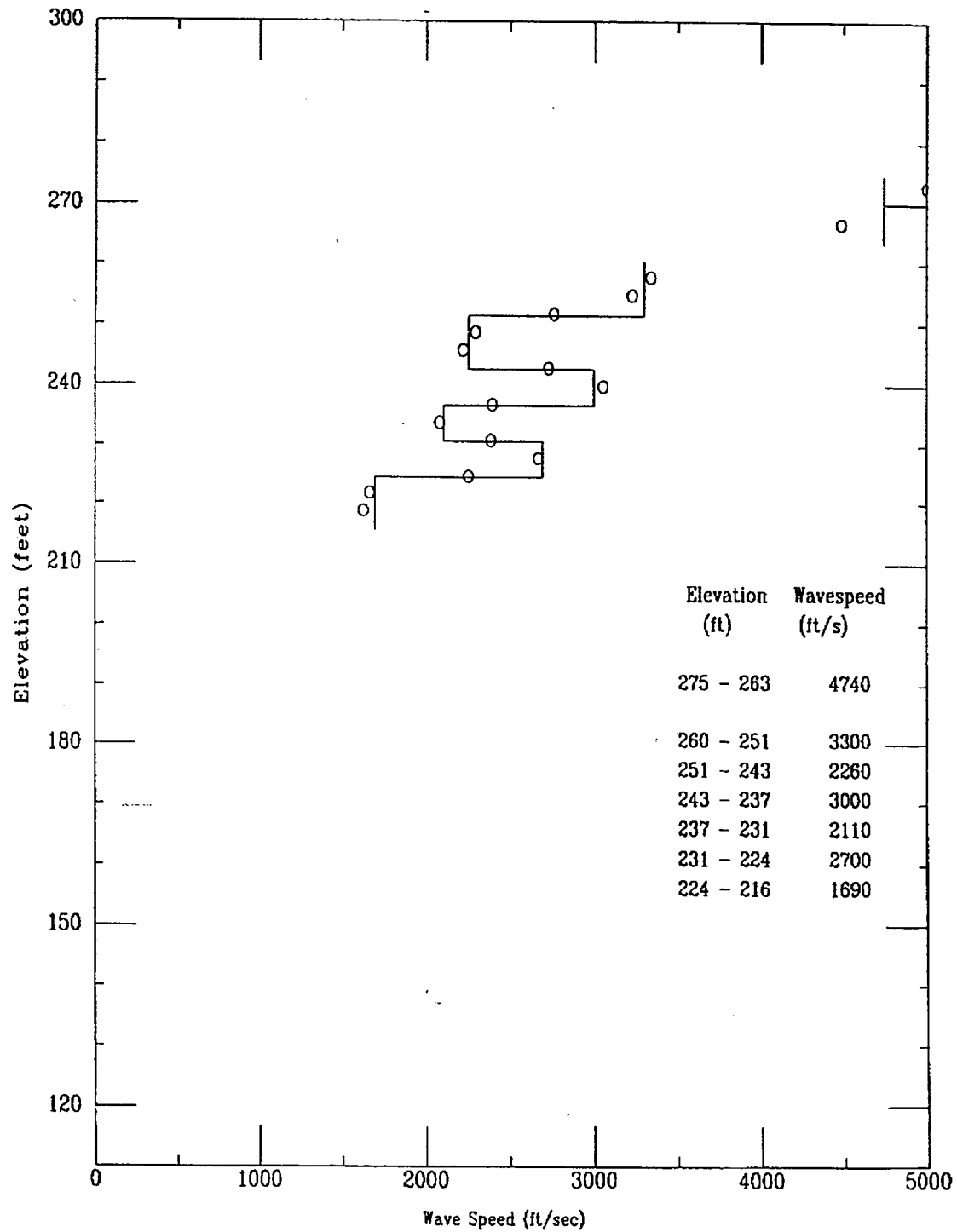
02/24/98

North 79372

East 55261

Elevation 284.8



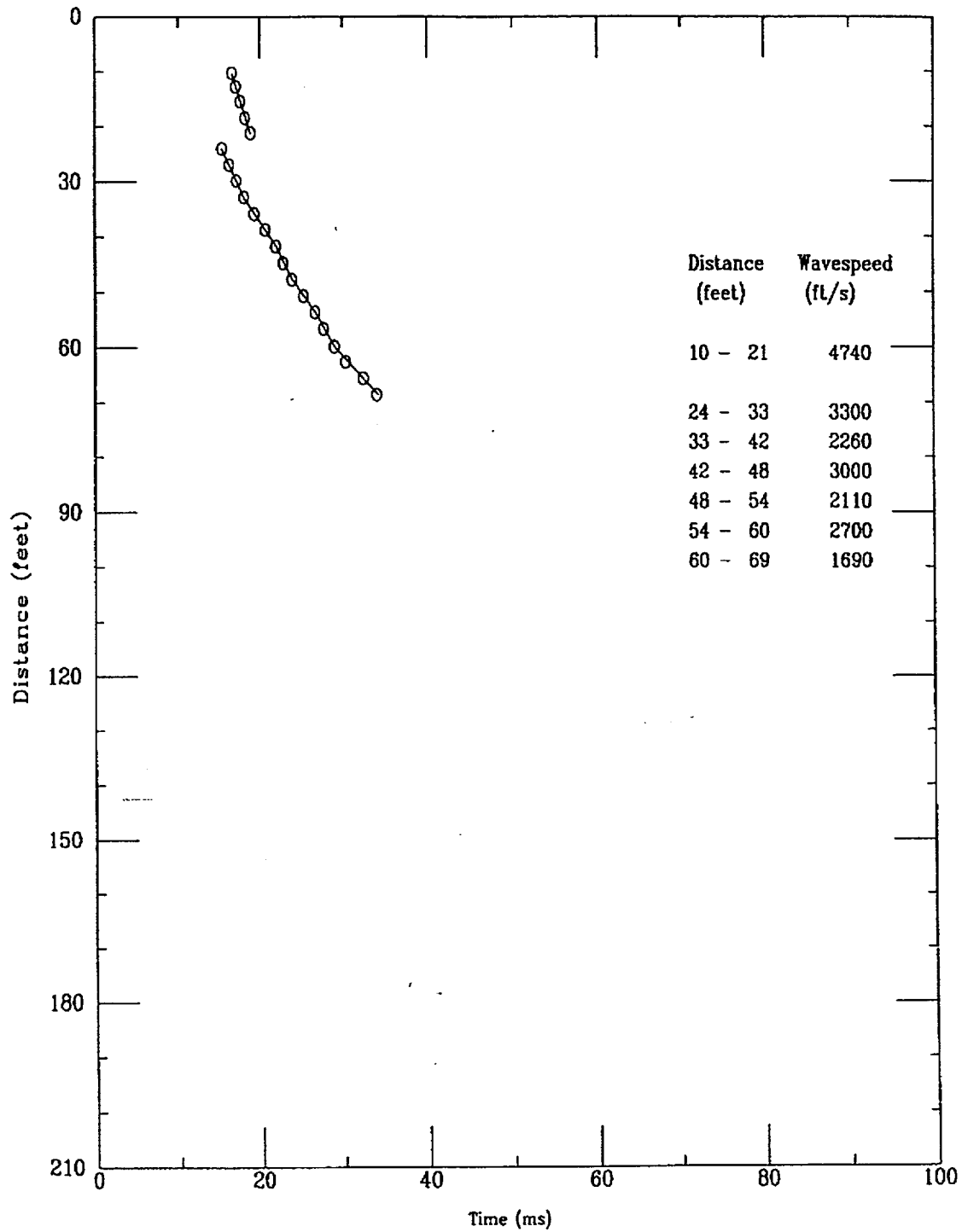


CPT-147

APPLIED RESEARCH ASSOCIATES, INC.

02/24/98

Compression Wave Time of Peak

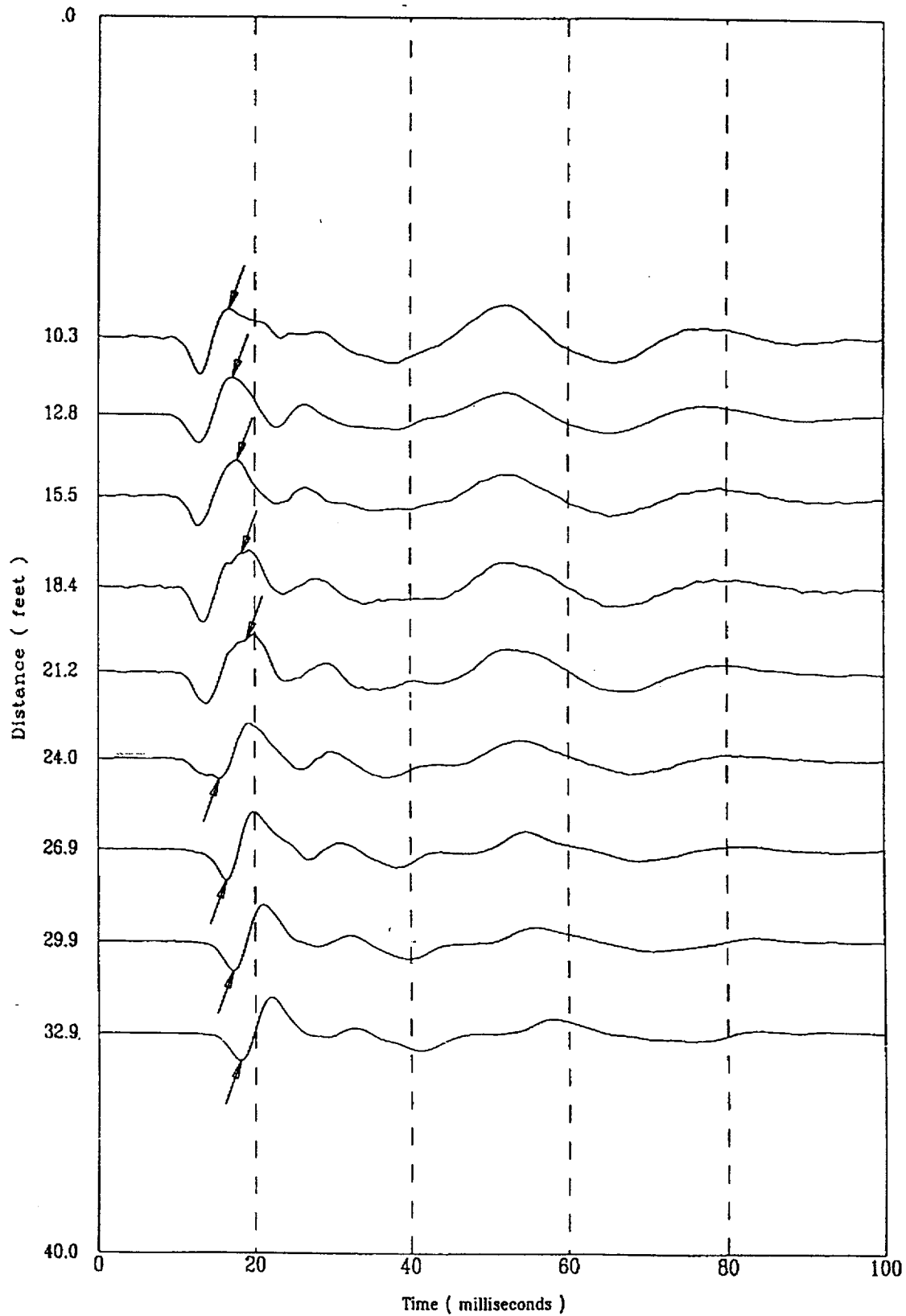


File 424f801S

161 of 522

Applied Research Associates, Inc.
CPT-147

P Wave
02/24/98

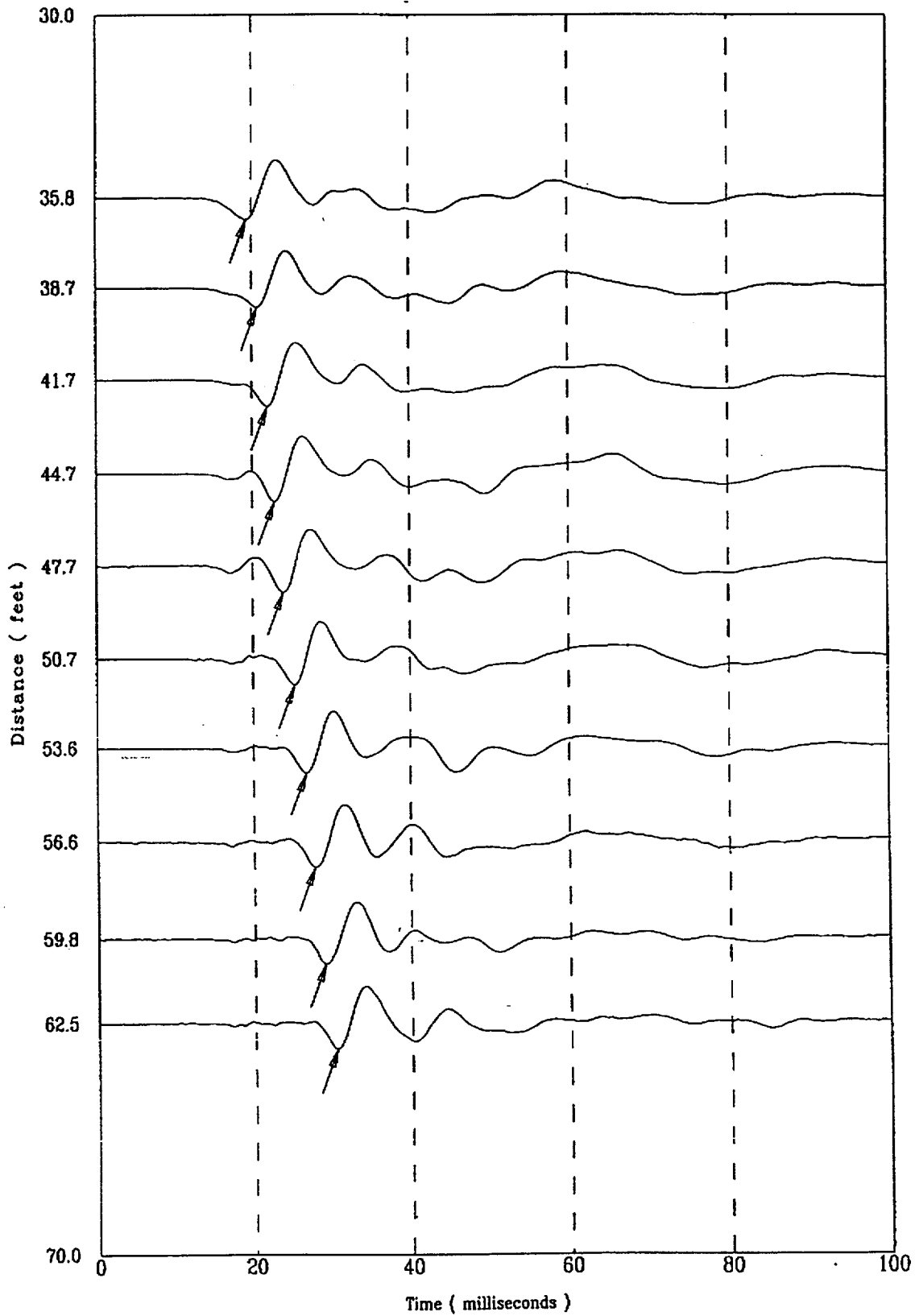


File 424(801S

162 of 522

Applied Research Associates, Inc.
CPT-147

P Wave
02/24/98

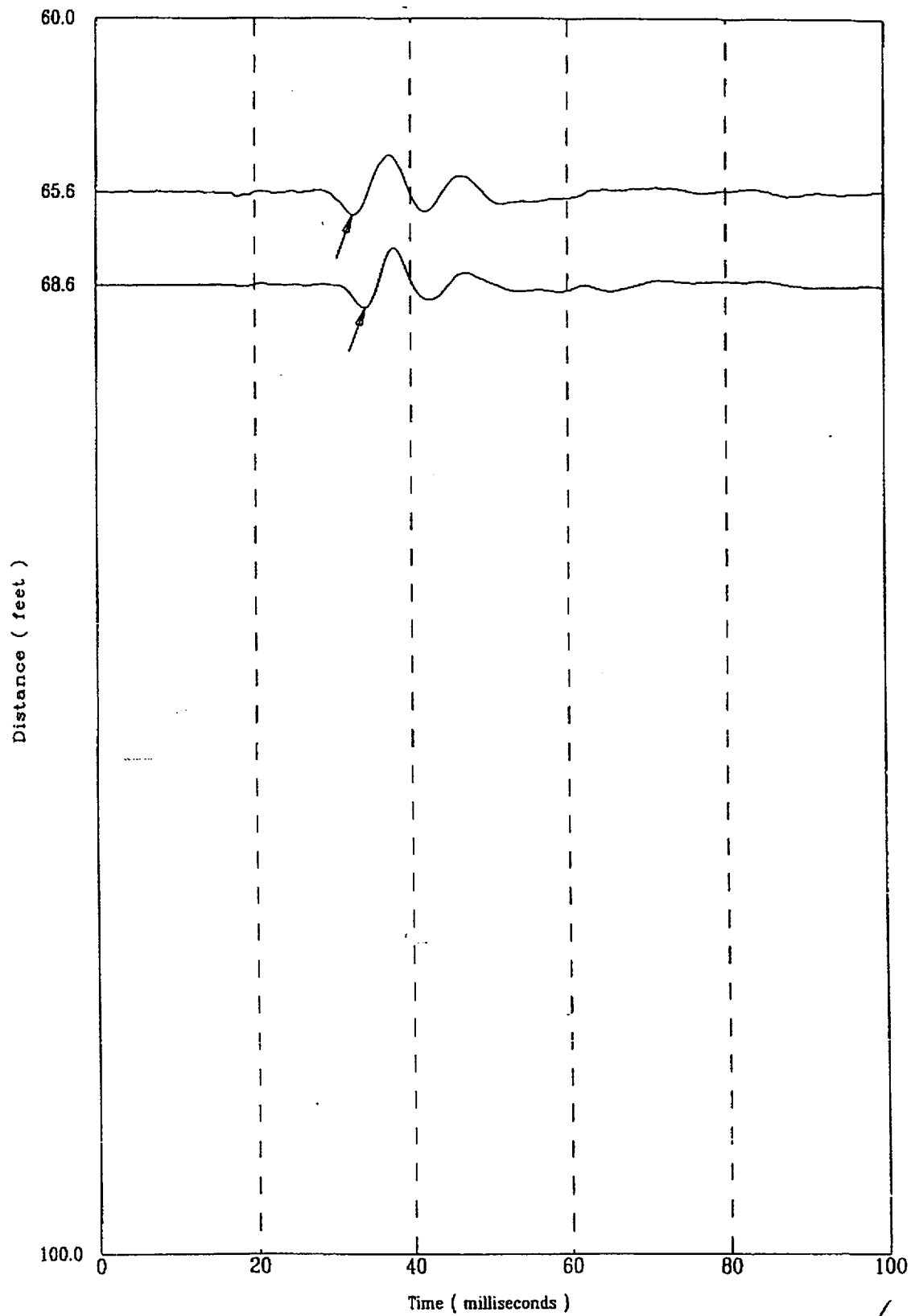


.... 4247801S

163 of 522

Applied Research Associates, Inc.
CPT-147

P Wave
02/24/98



CPT-148

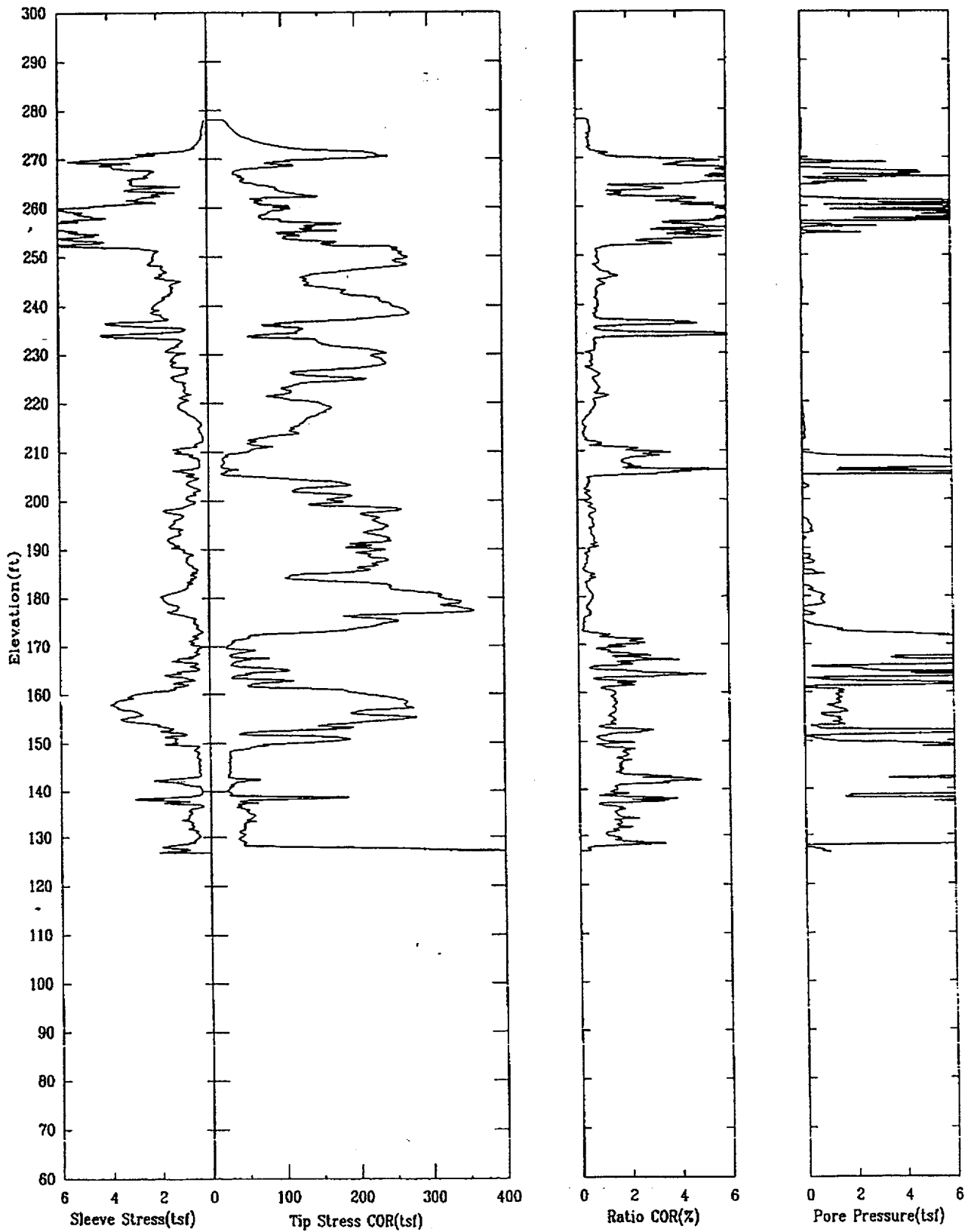
APPLIED RESEARCH ASSOCIATES, INC.

02/27/98

North 79372.07

East 55385.00

Elevation 284.1



CPT-148

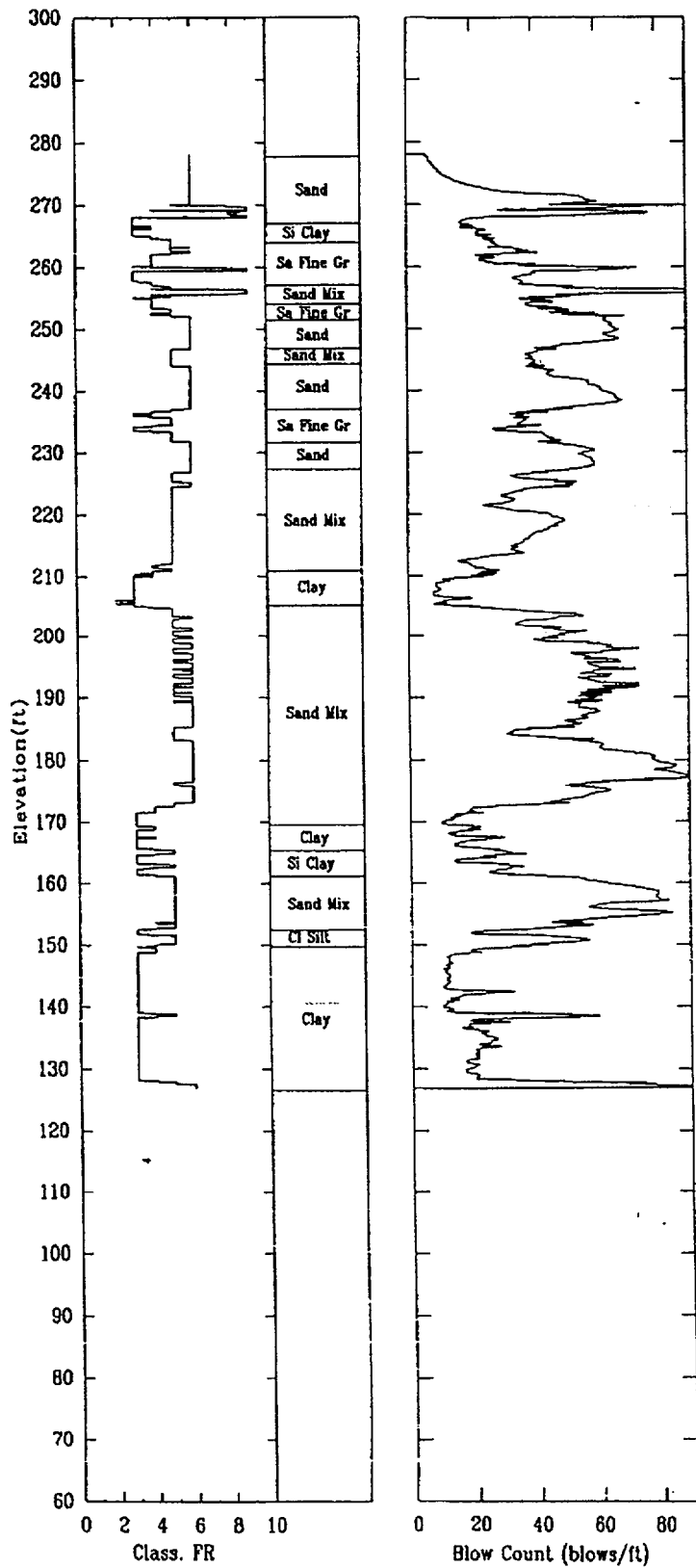
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02/27/98

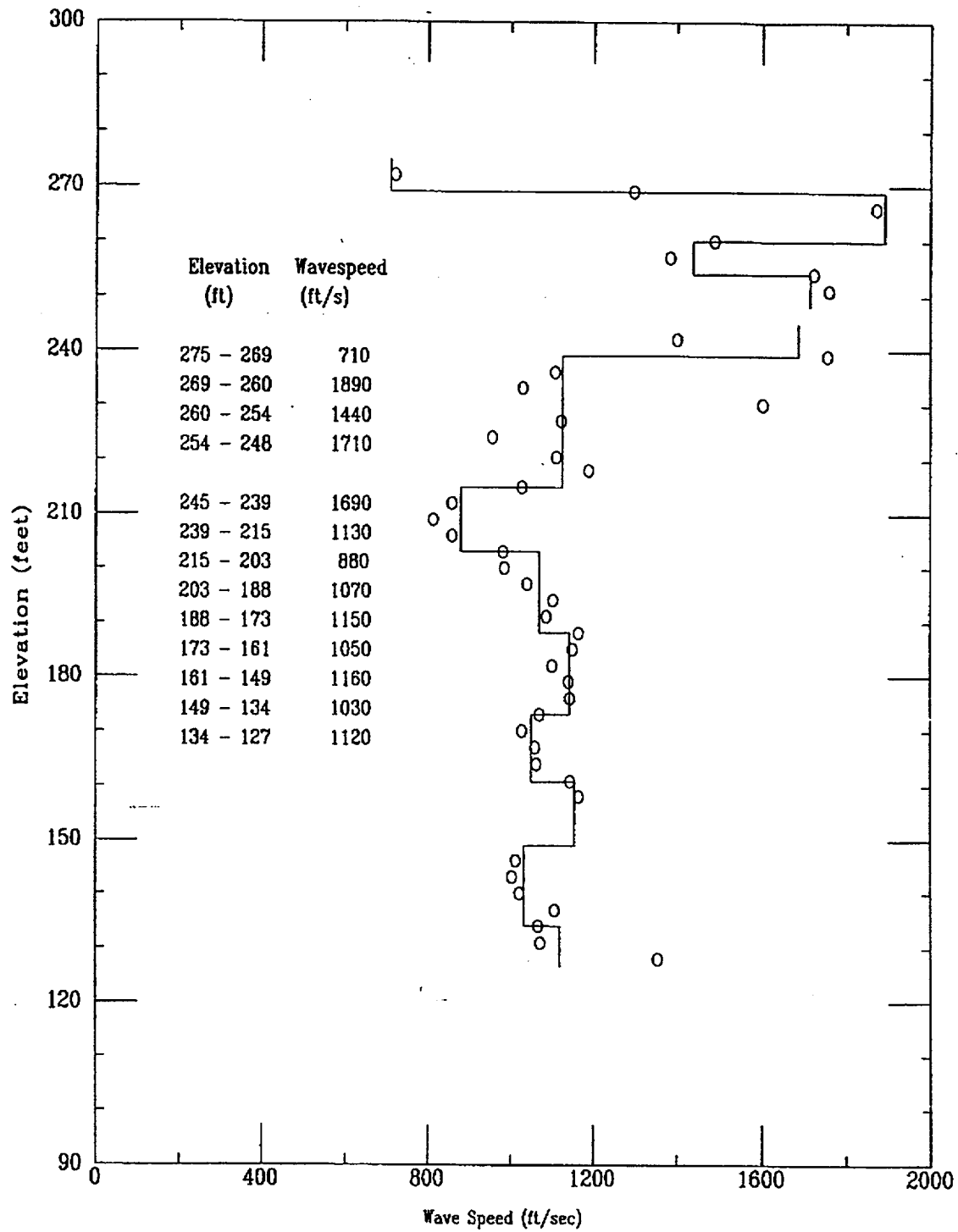
North 79372.07

East 55385.00

Elevation 284.1



Shear Wave Speeds

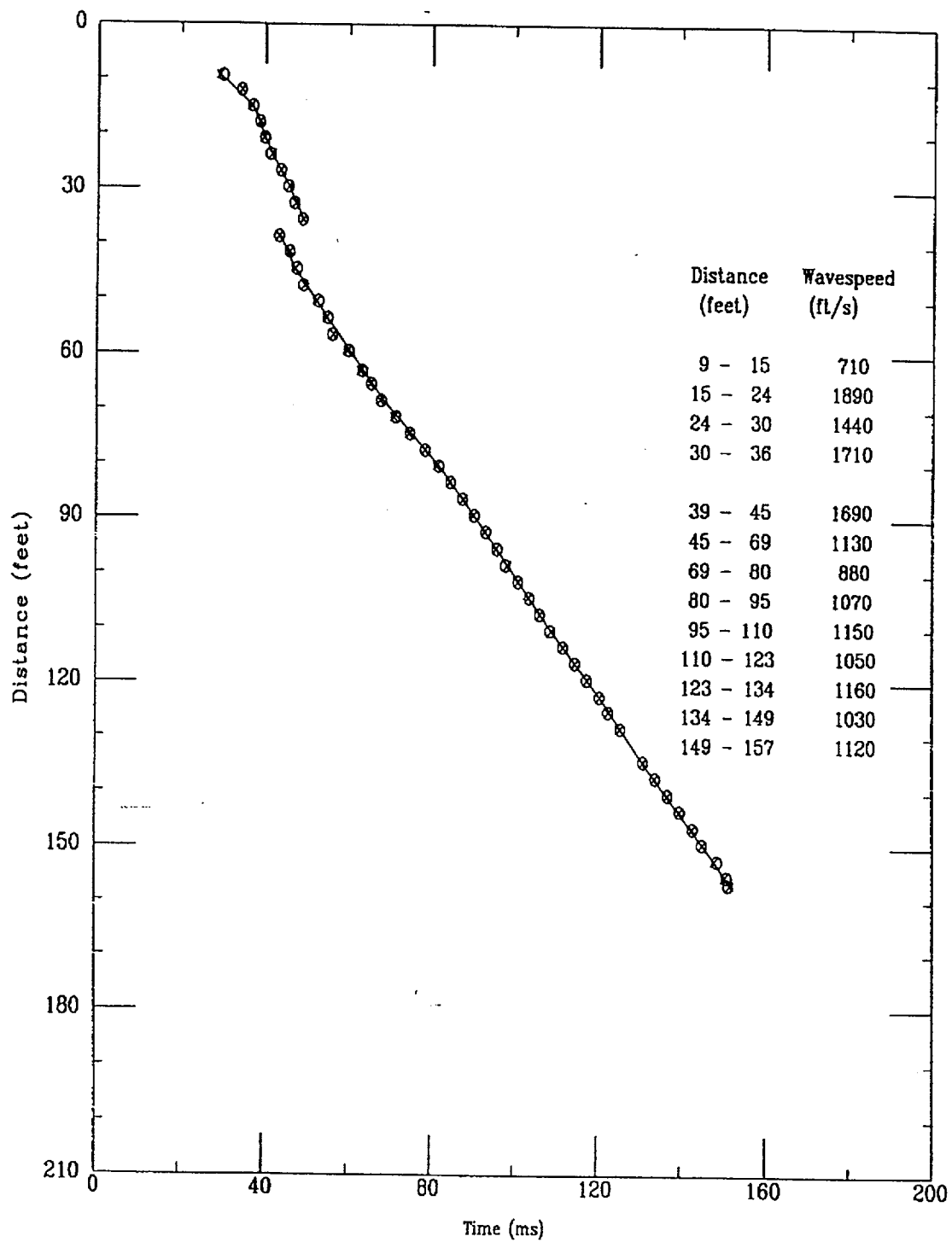


CPT-148

APPLIED RESEARCH ASSOCIATES, INC.

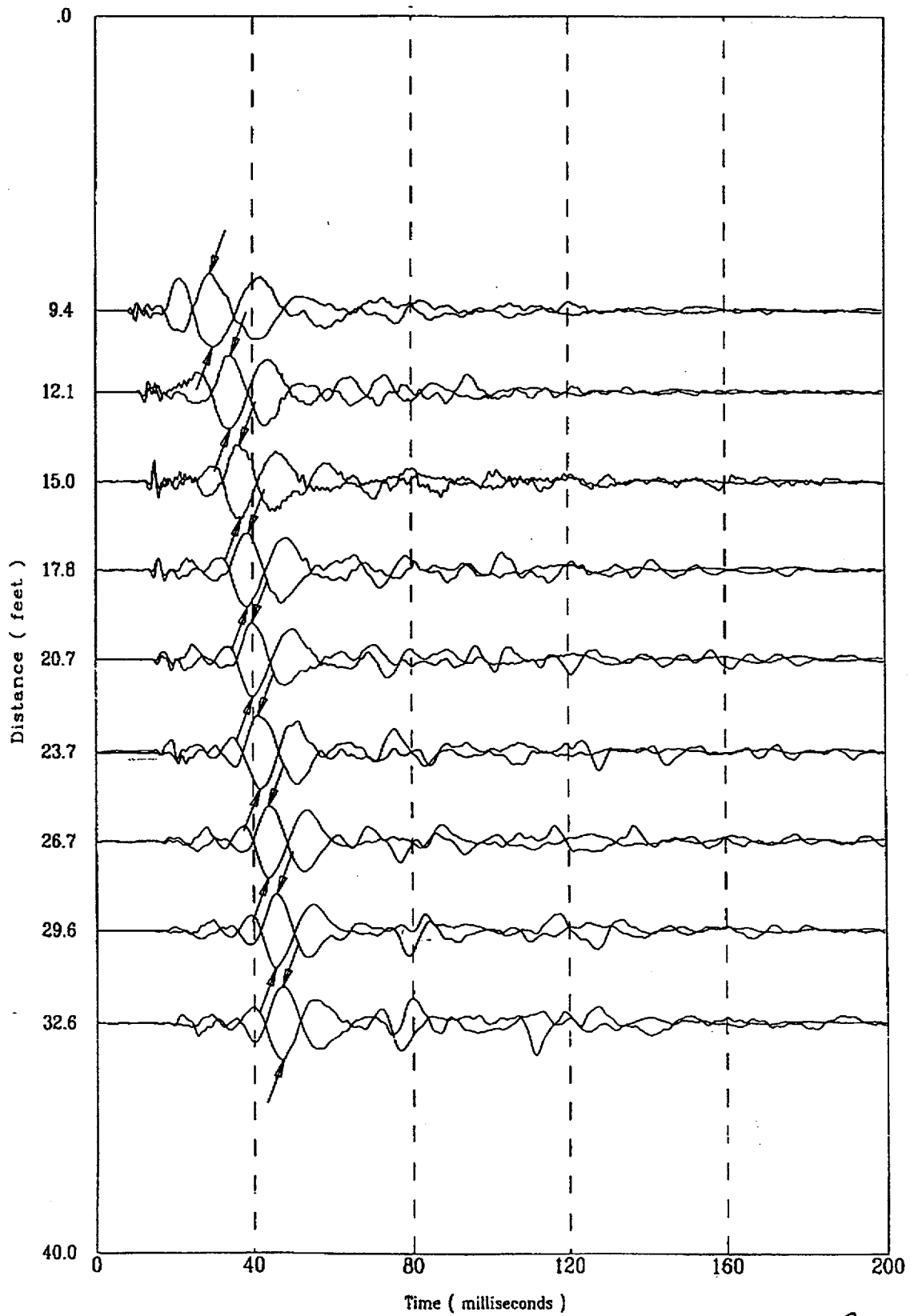
02/27/98

Shear Wave Time of Peak



Applied Research Associates, Inc.
CPT-148

S Wave
02/27/98

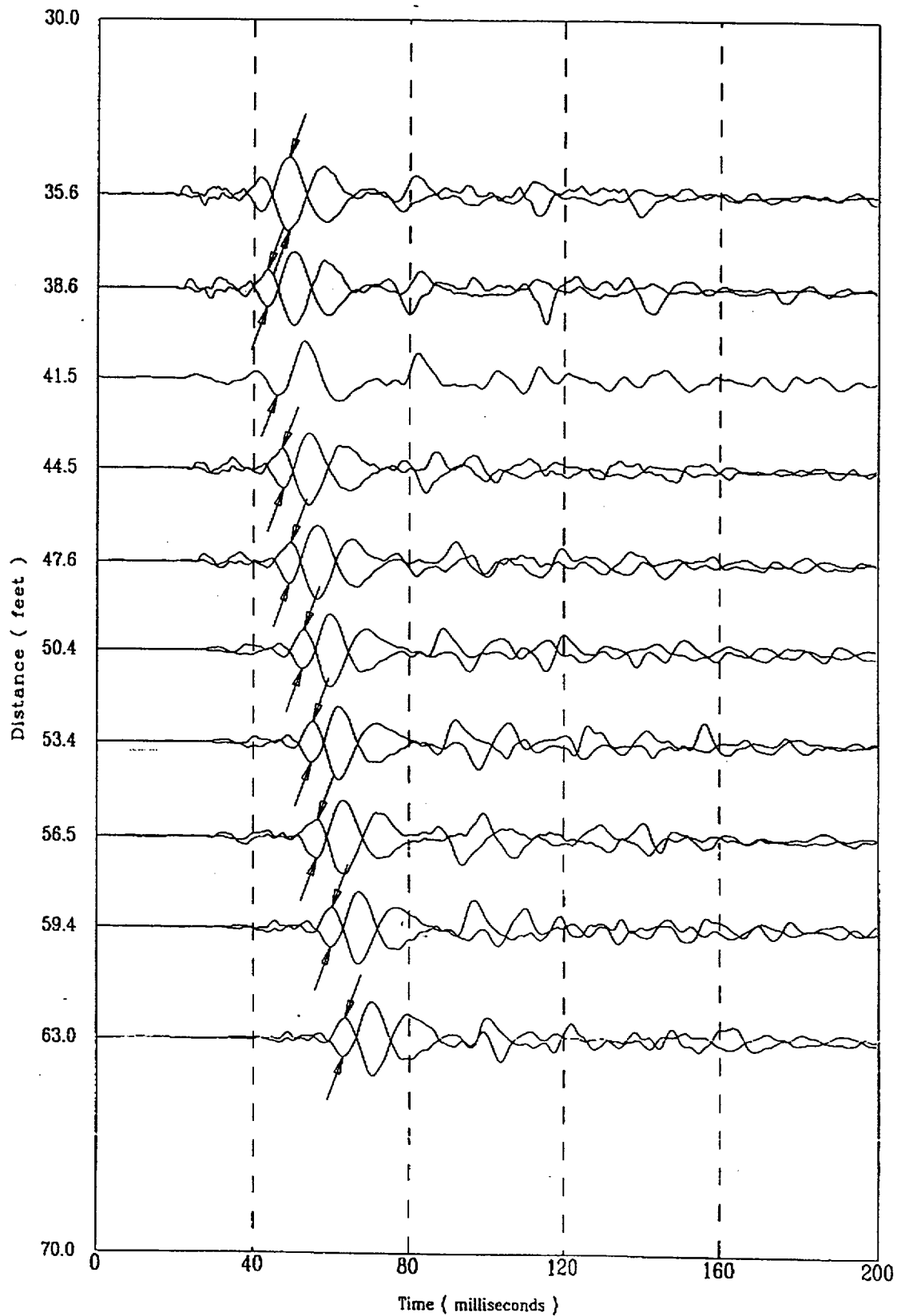


271801S

169 of 522

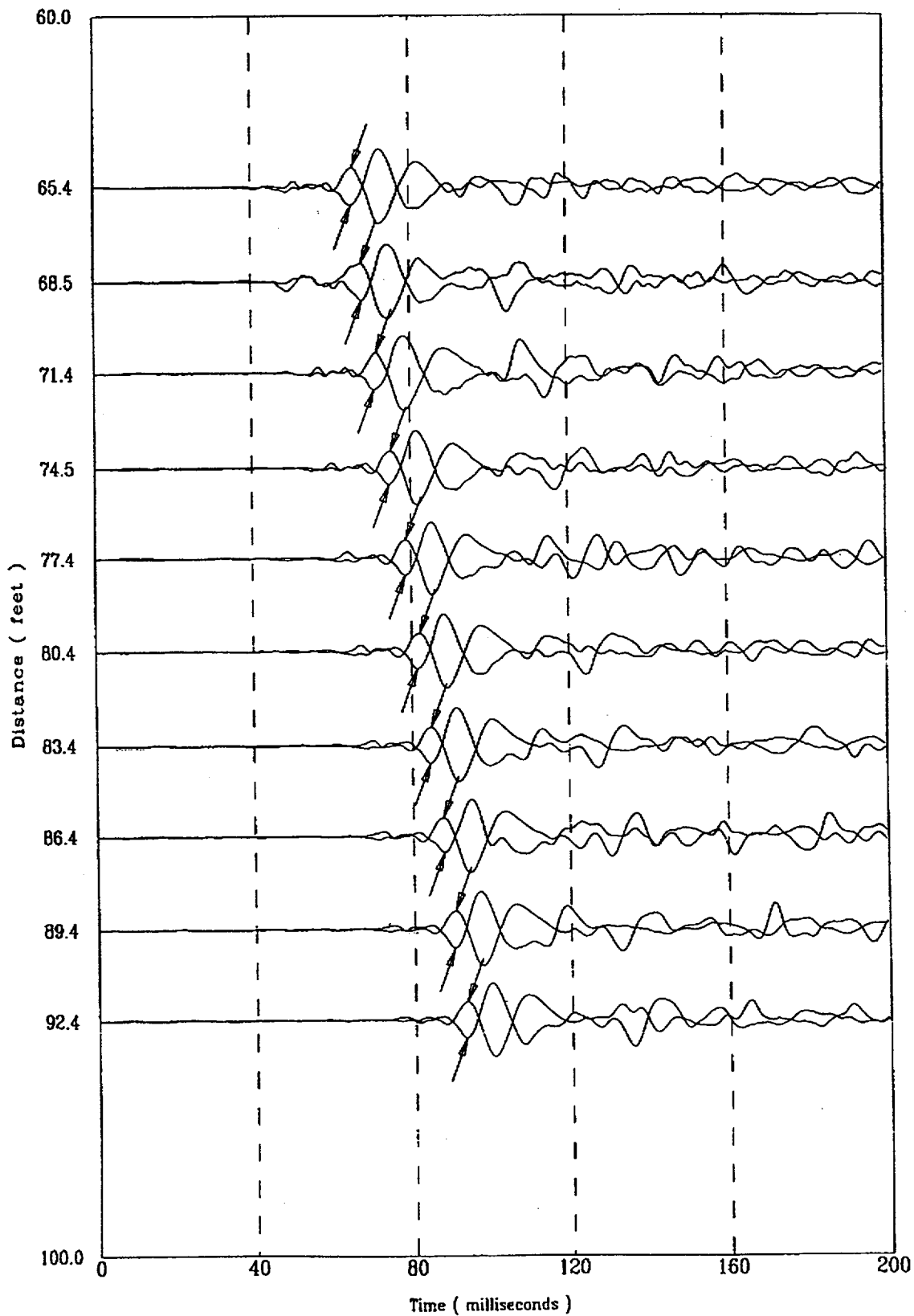
Applied Research Associates, Inc.
CPT-148

S Wave
02/27/98



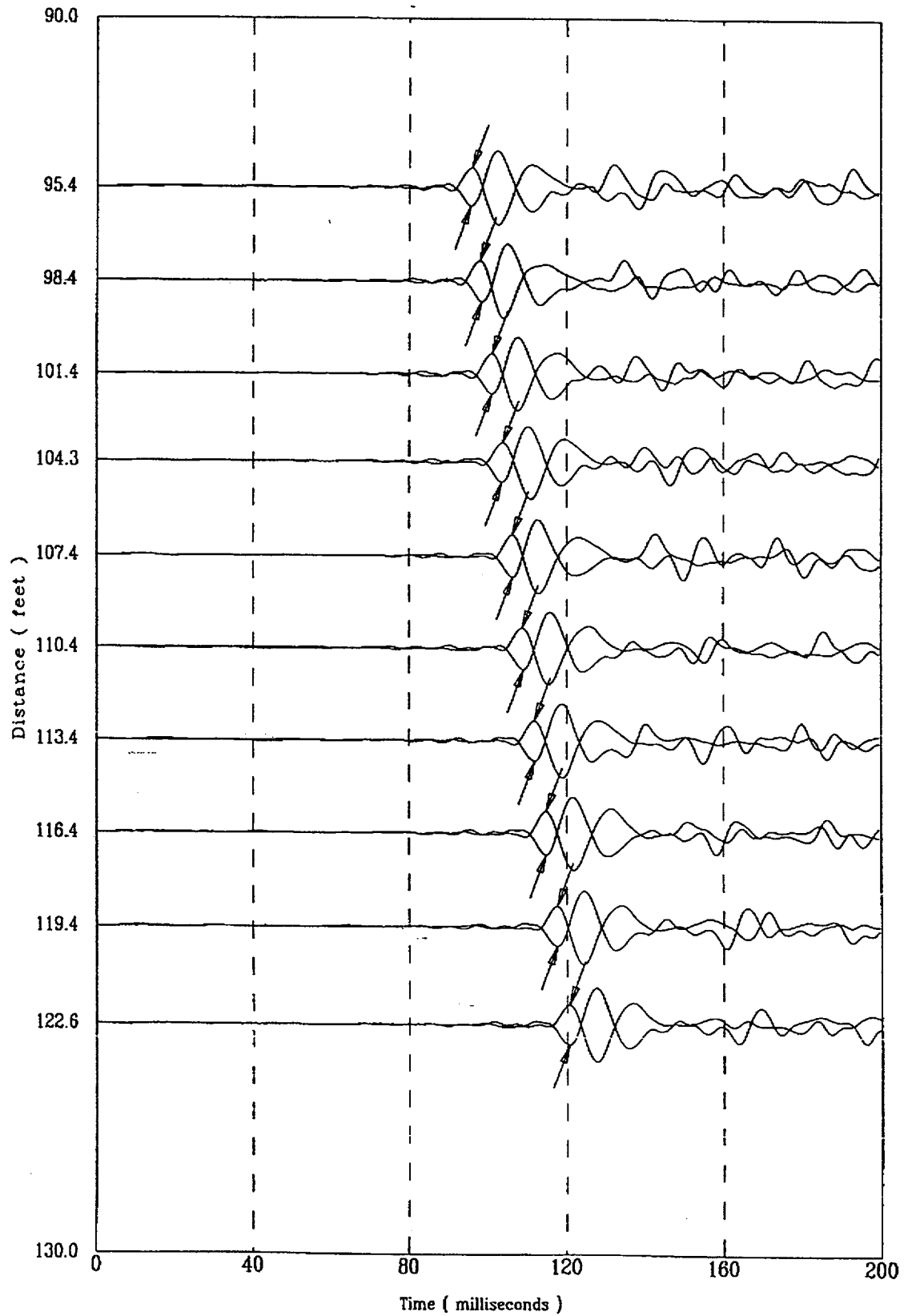
File 4271801S

170 of 522



Applied Research Associates, Inc.
CPT-148

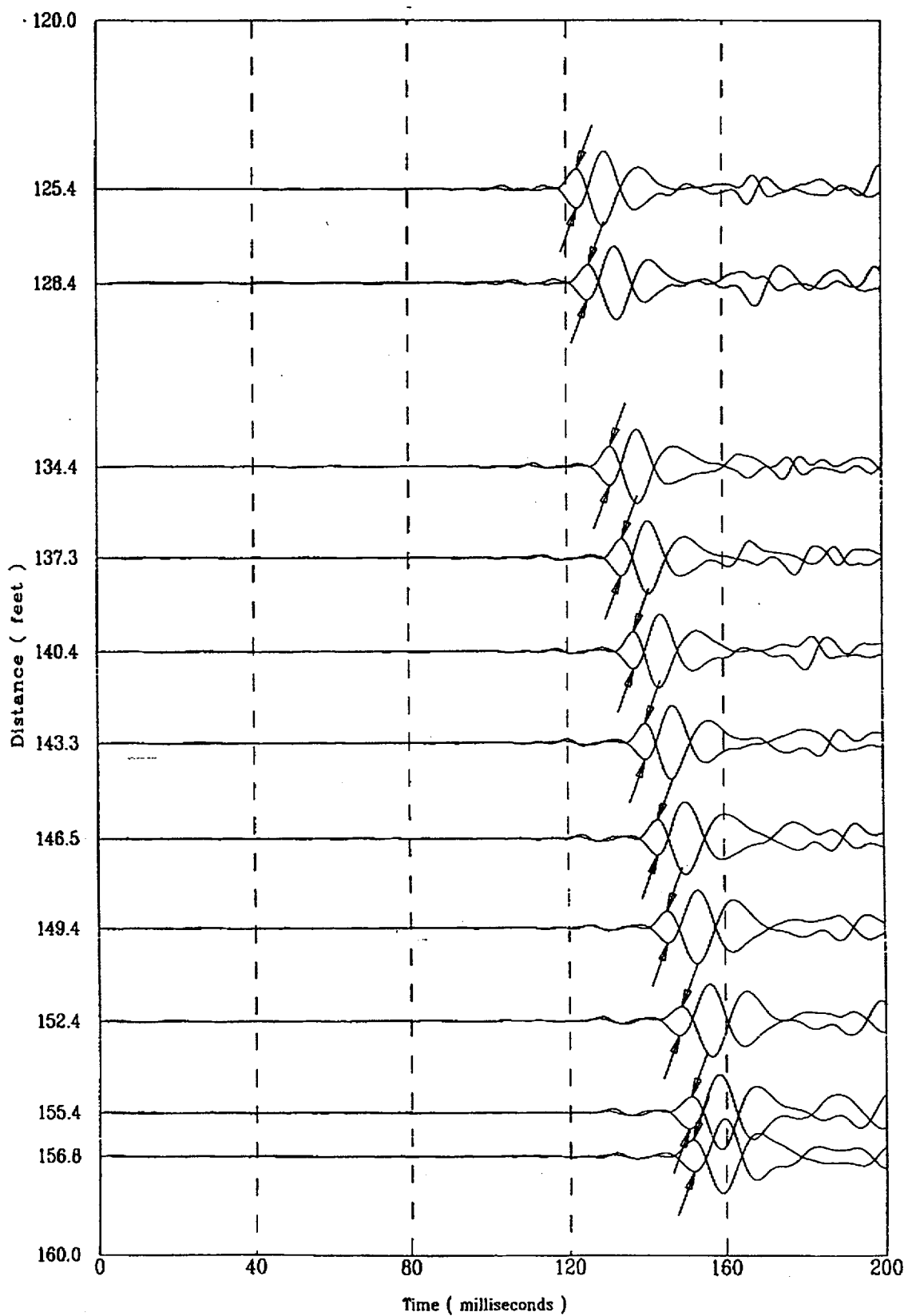
S Wave
02/27/98



File 4271801S

Applied Research Associates, Inc.
CPT-148

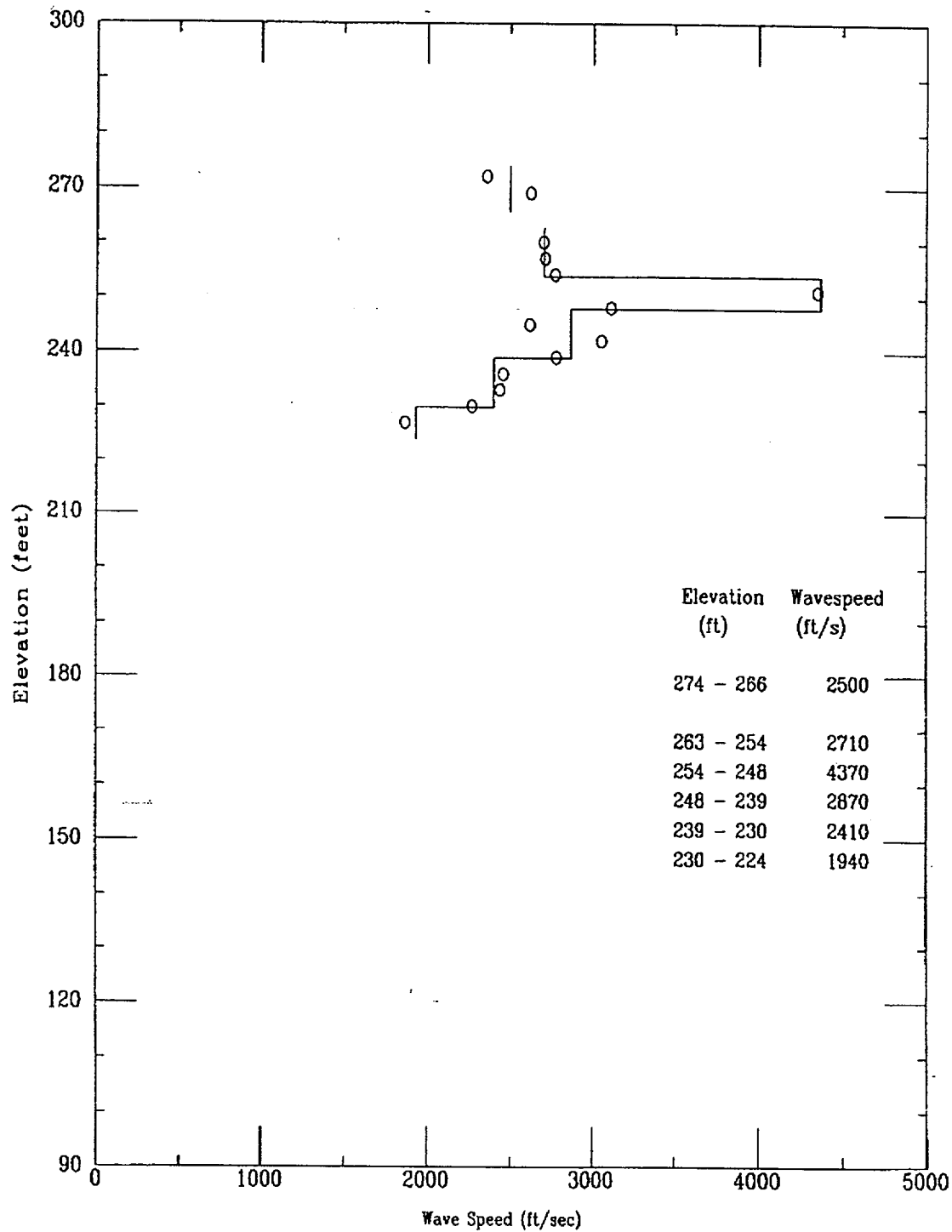
S Wave
02/27/98



4271801S

173 of 522

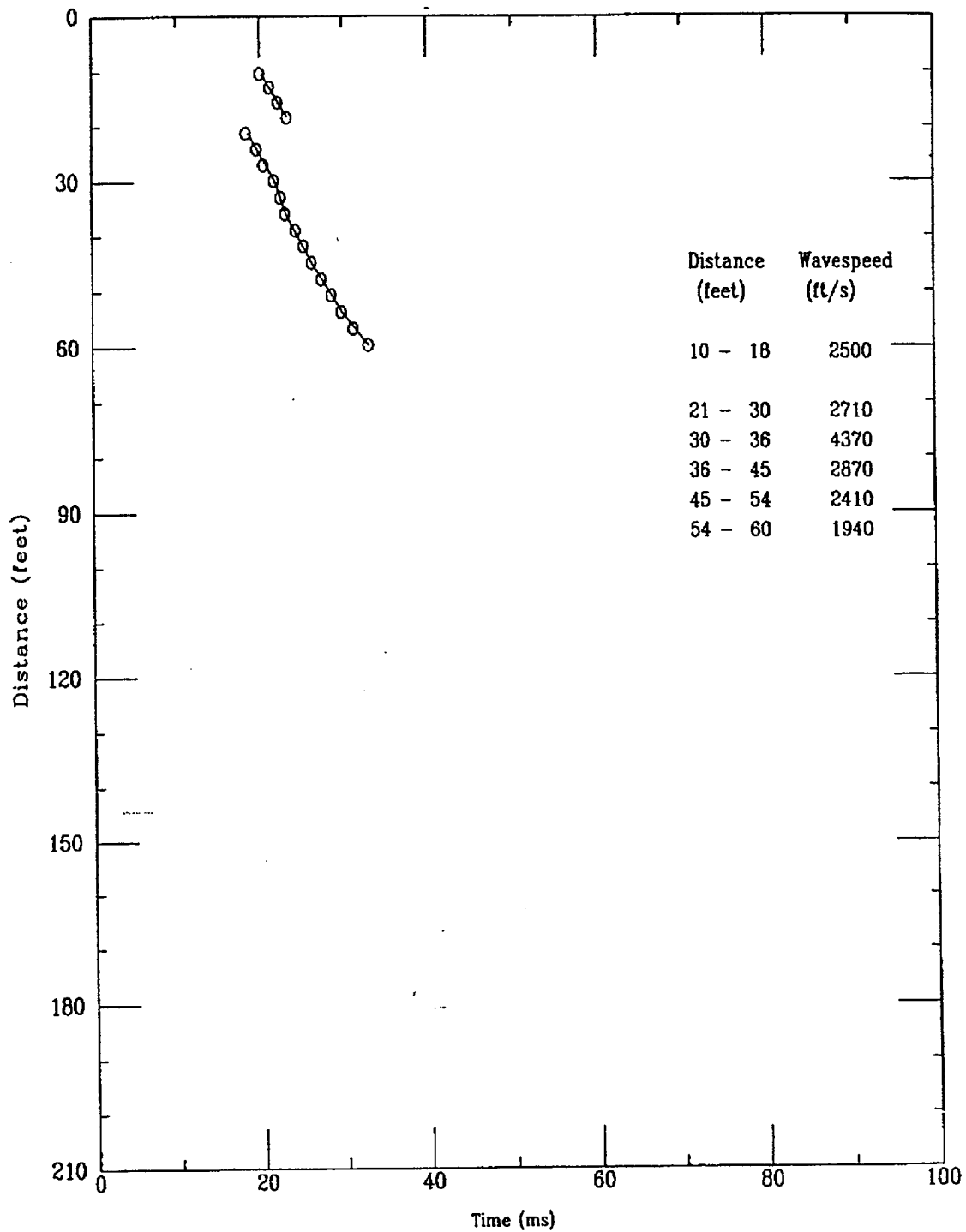
Compression Wave Speeds



CPT-148

APPLIED RESEARCH ASSOCIATES, INC.
Compression Wave Time of Peak

02/27/98

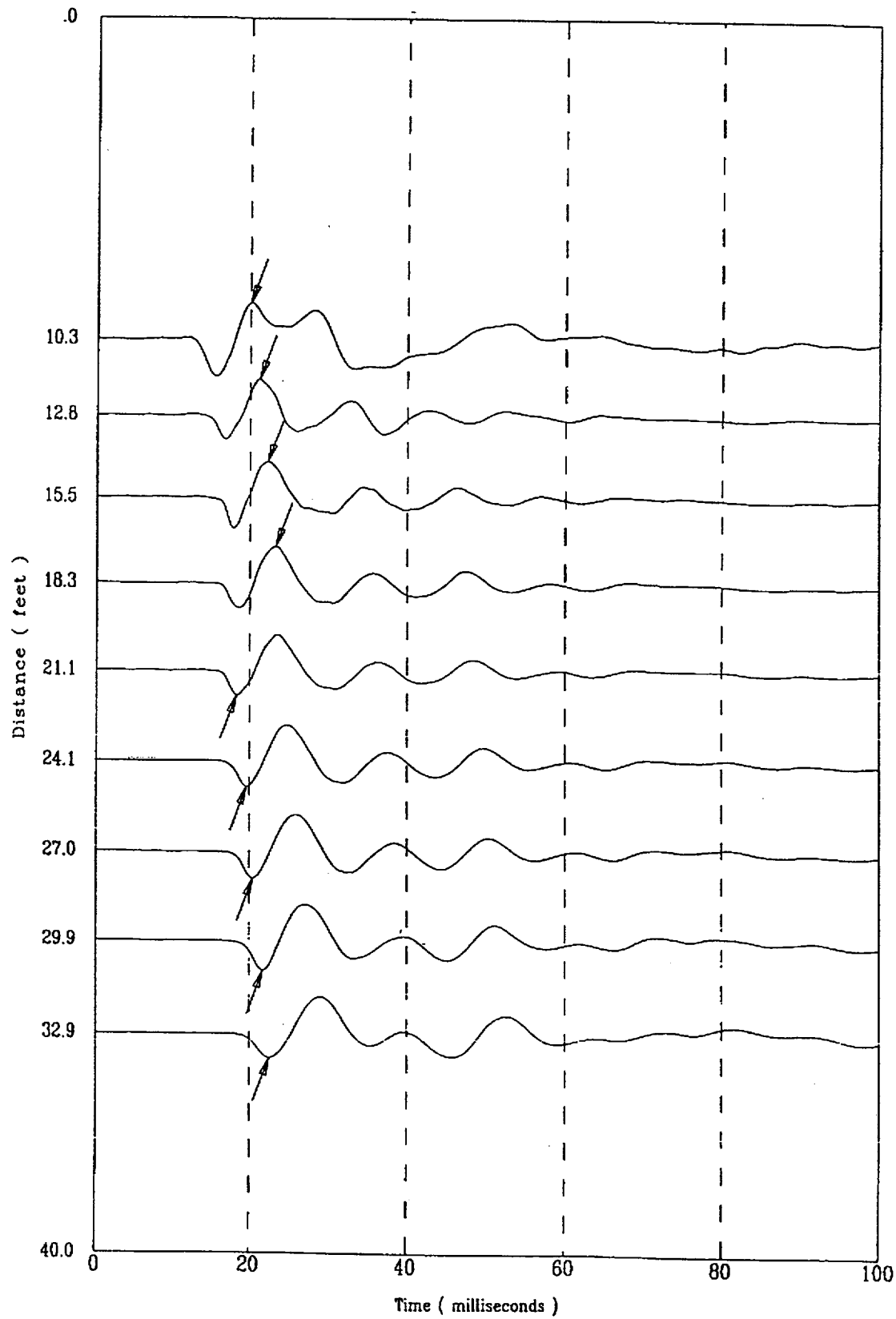


File 4271801S

175 of 522

Applied Research Associates, Inc.
CPT-148

P Wave
02/27/98

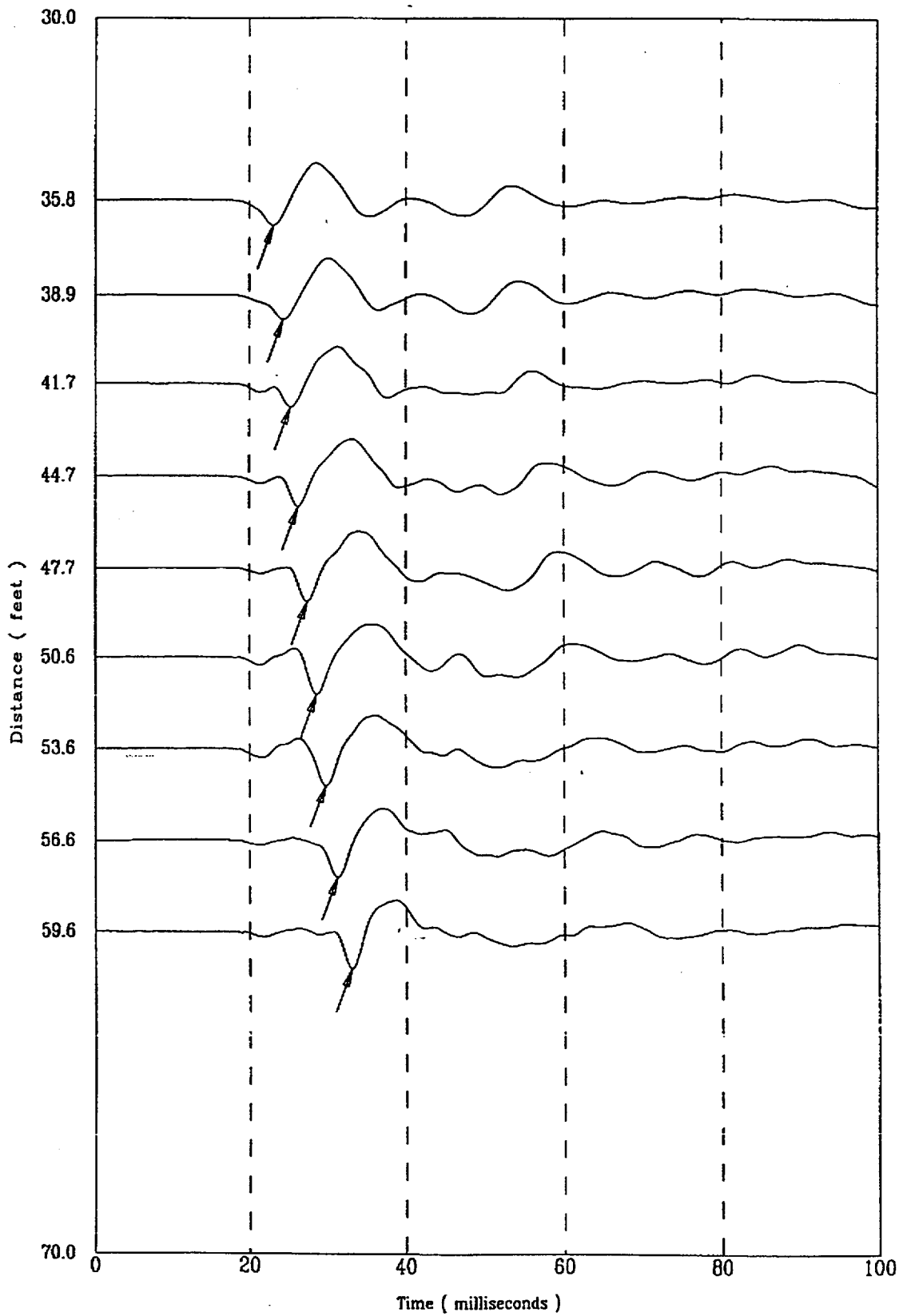


File 4271801S

176 of 522

Applied Research Associates, Inc.
CPT-148

P Wave
02/27/98



1. 271801S

177 of 522

CPT-149

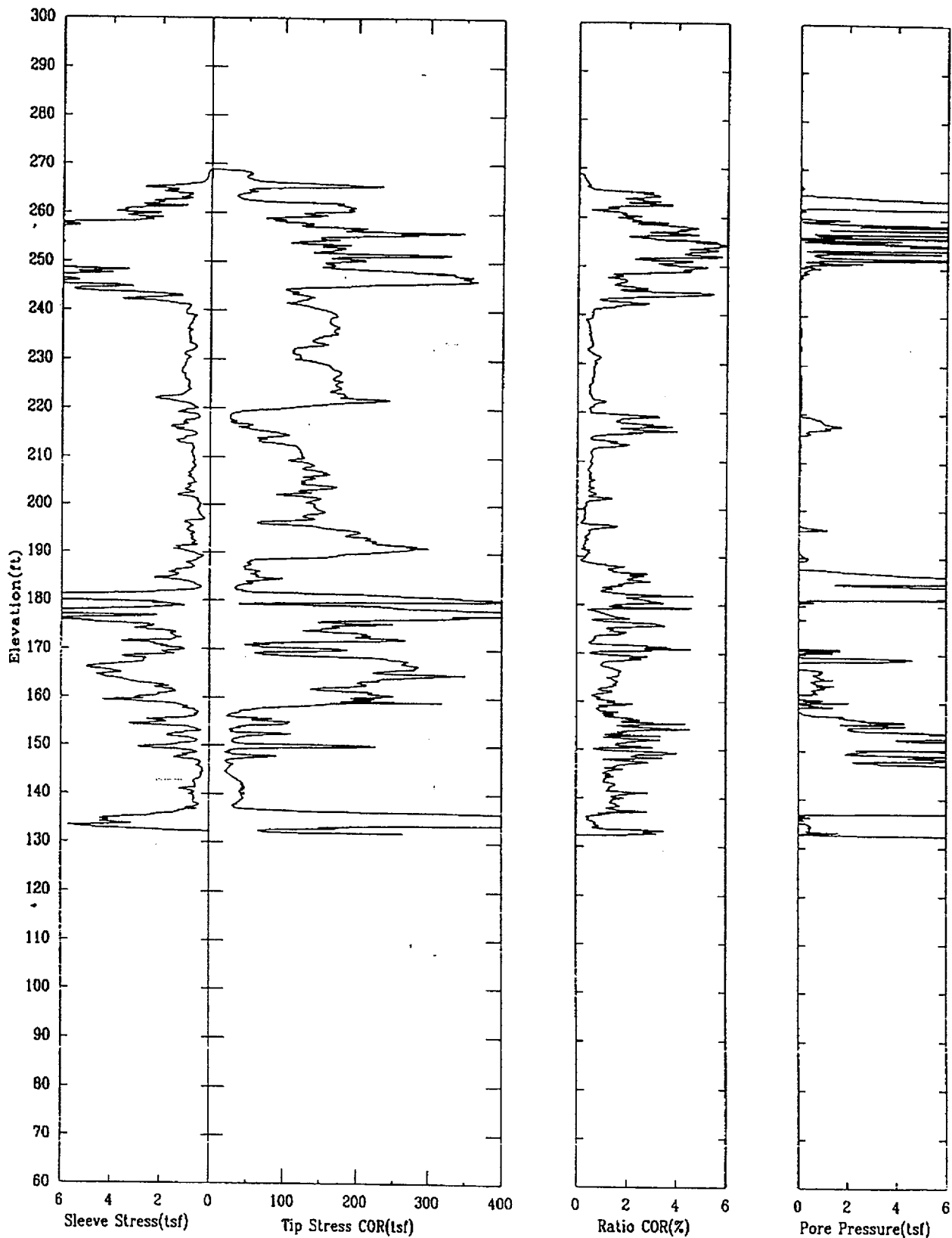
APPLIED RESEARCH ASSOCIATES, INC.

03/04/98

North 79372.04

East 55517.96

Elevation 274.8



CPT-149

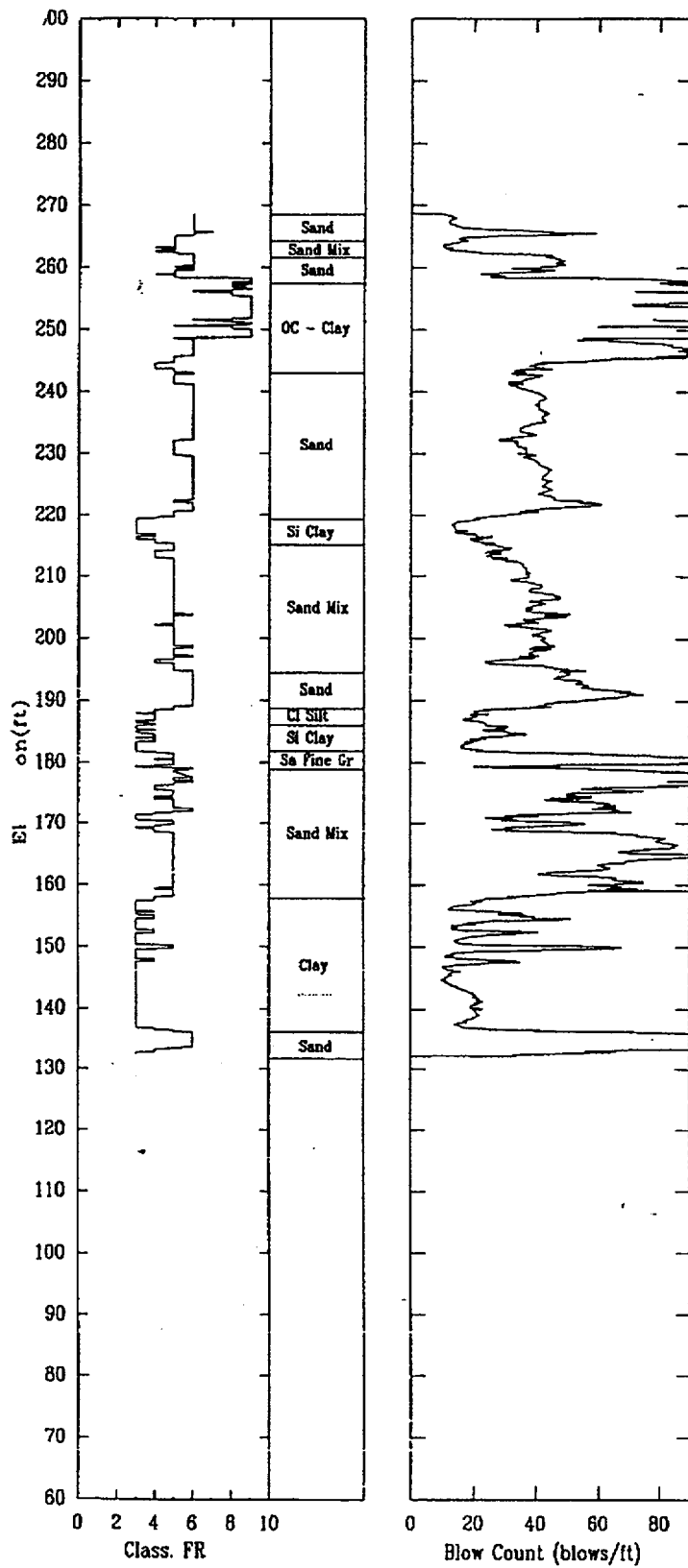
APPLIED RESEARCH ASSOCIATES, INC.

03/04/98

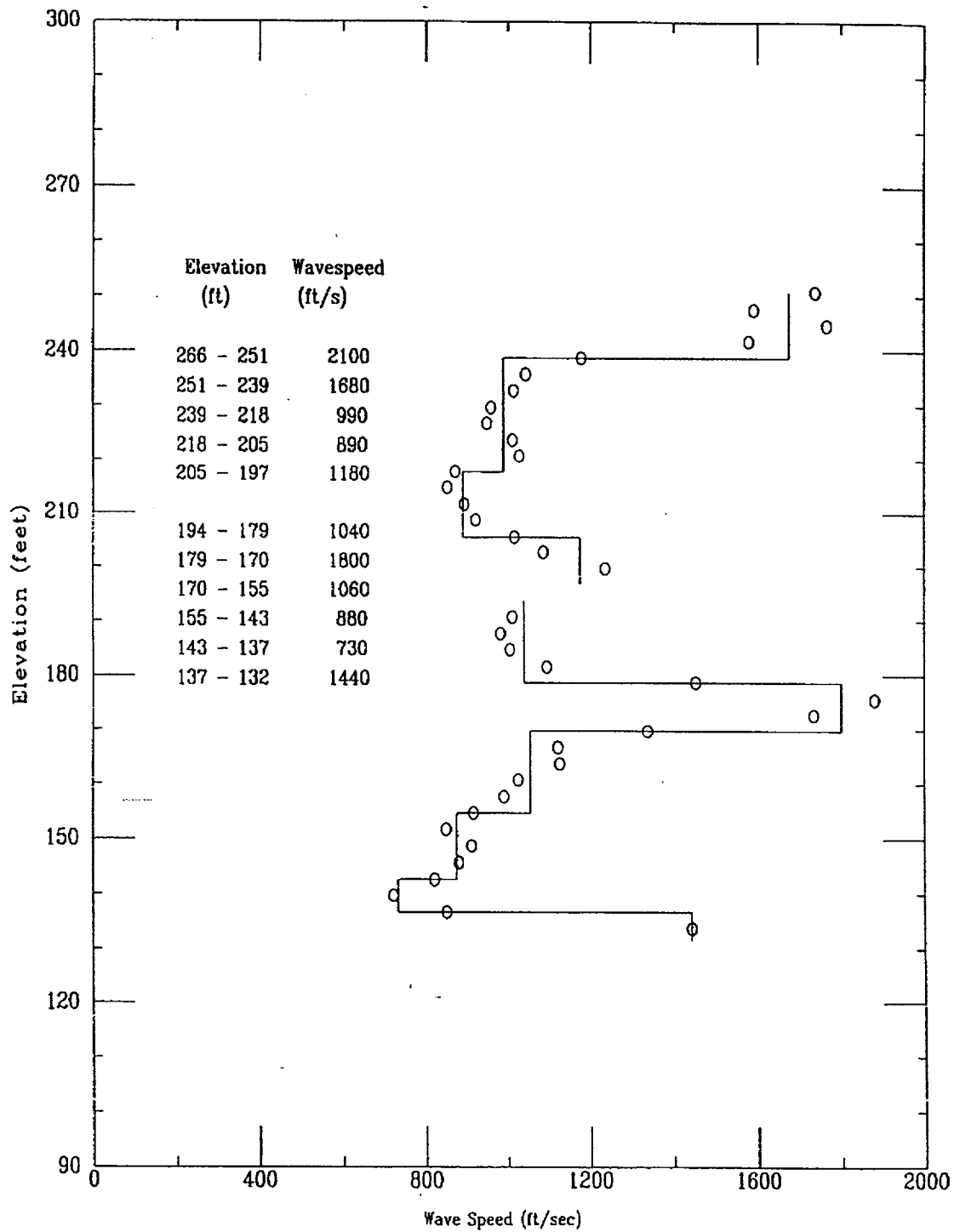
North 79372.04

East 55517.96

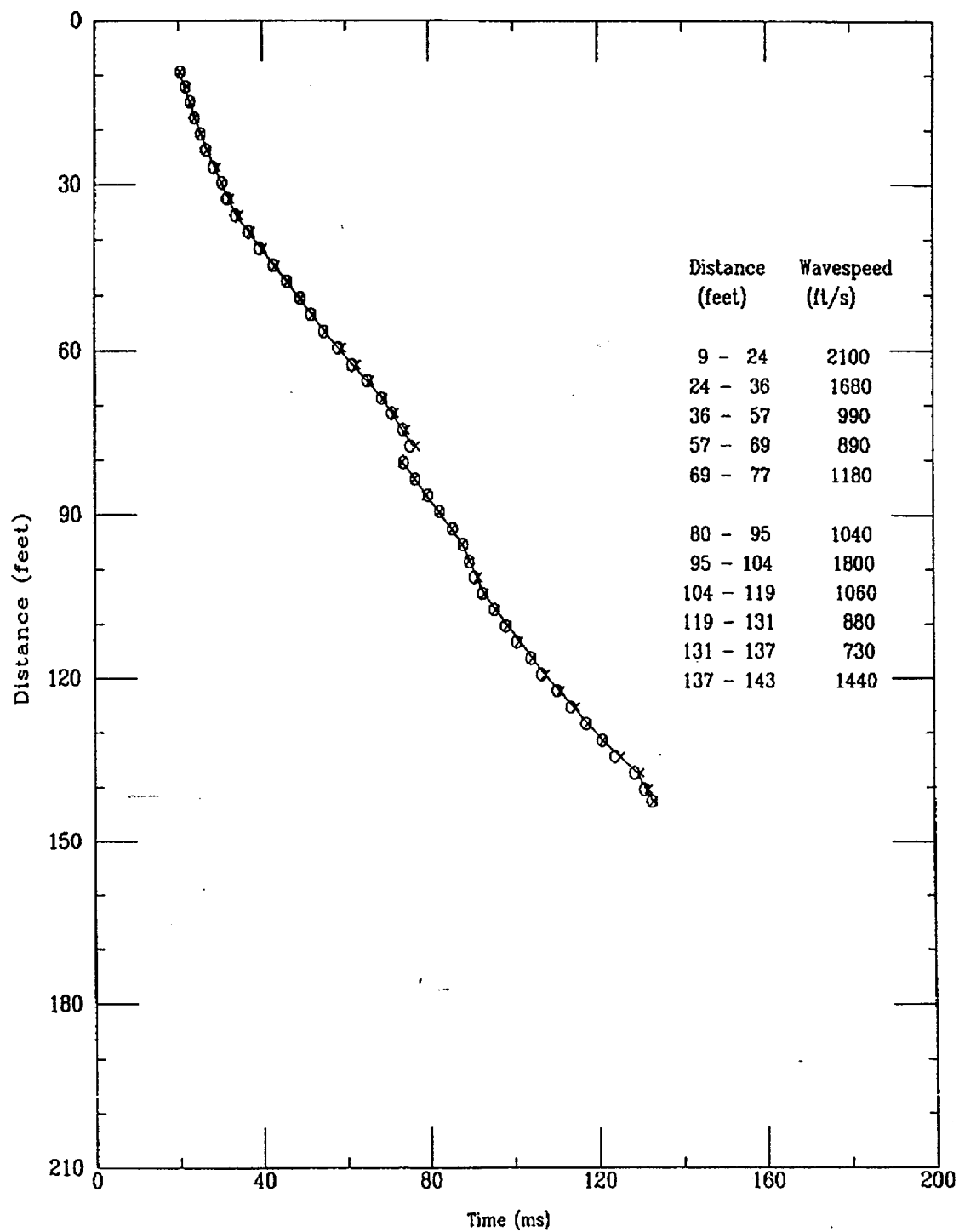
Elevation 274.8



Shear Wave Speeds

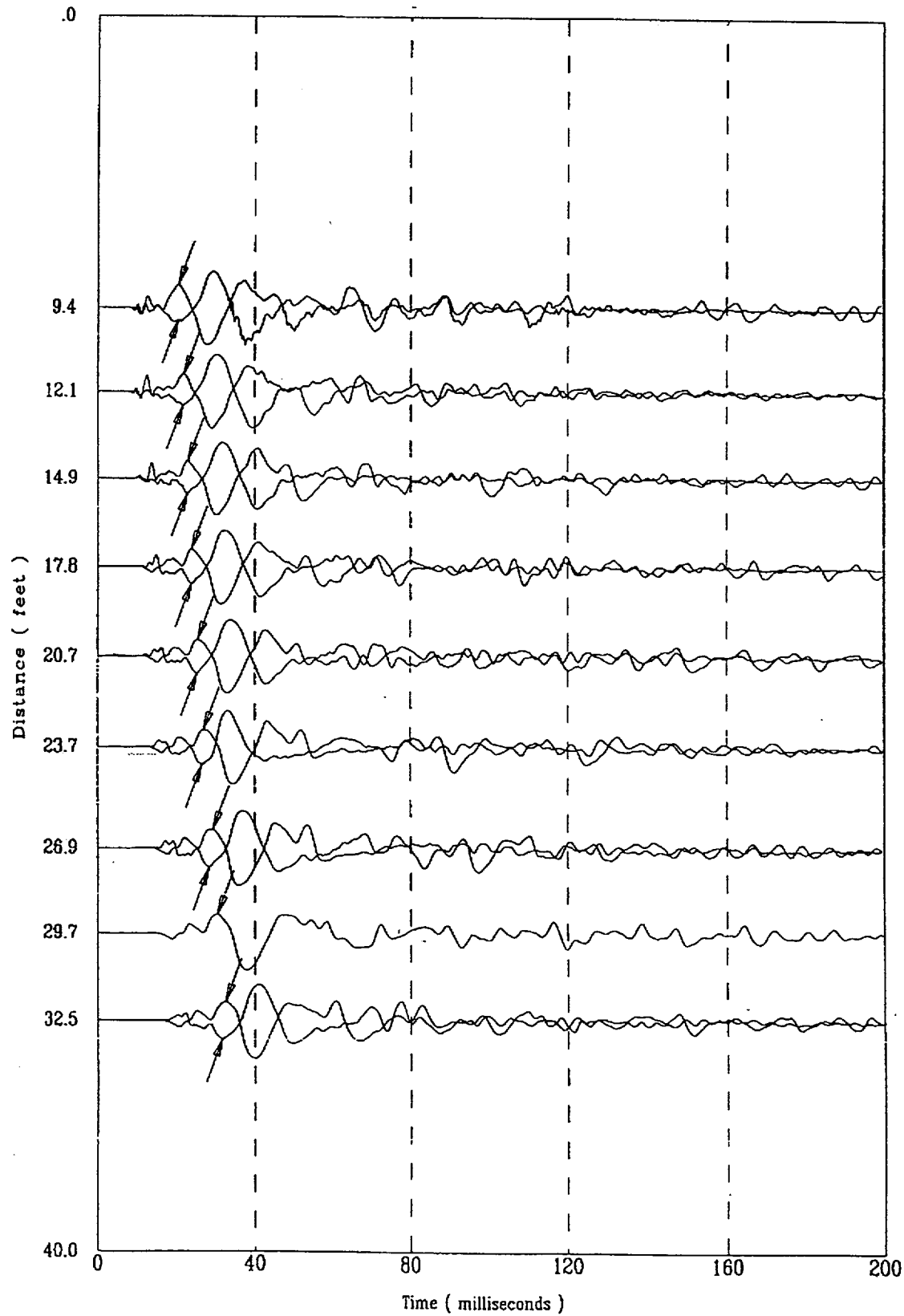


Shear Wave Time of Peak



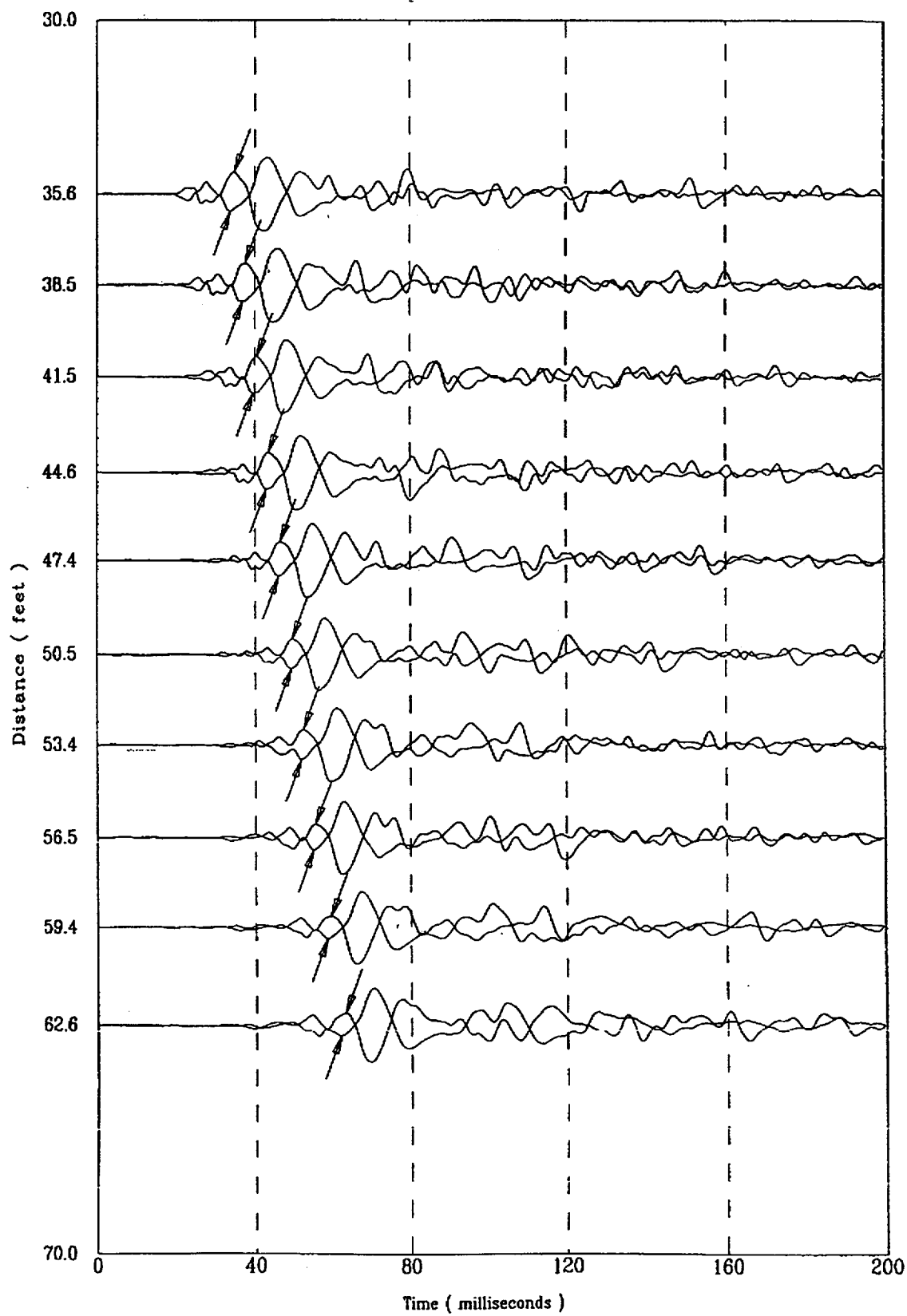
Applied Research Associates, Inc.
CPT-149

S Wave
03/04/98



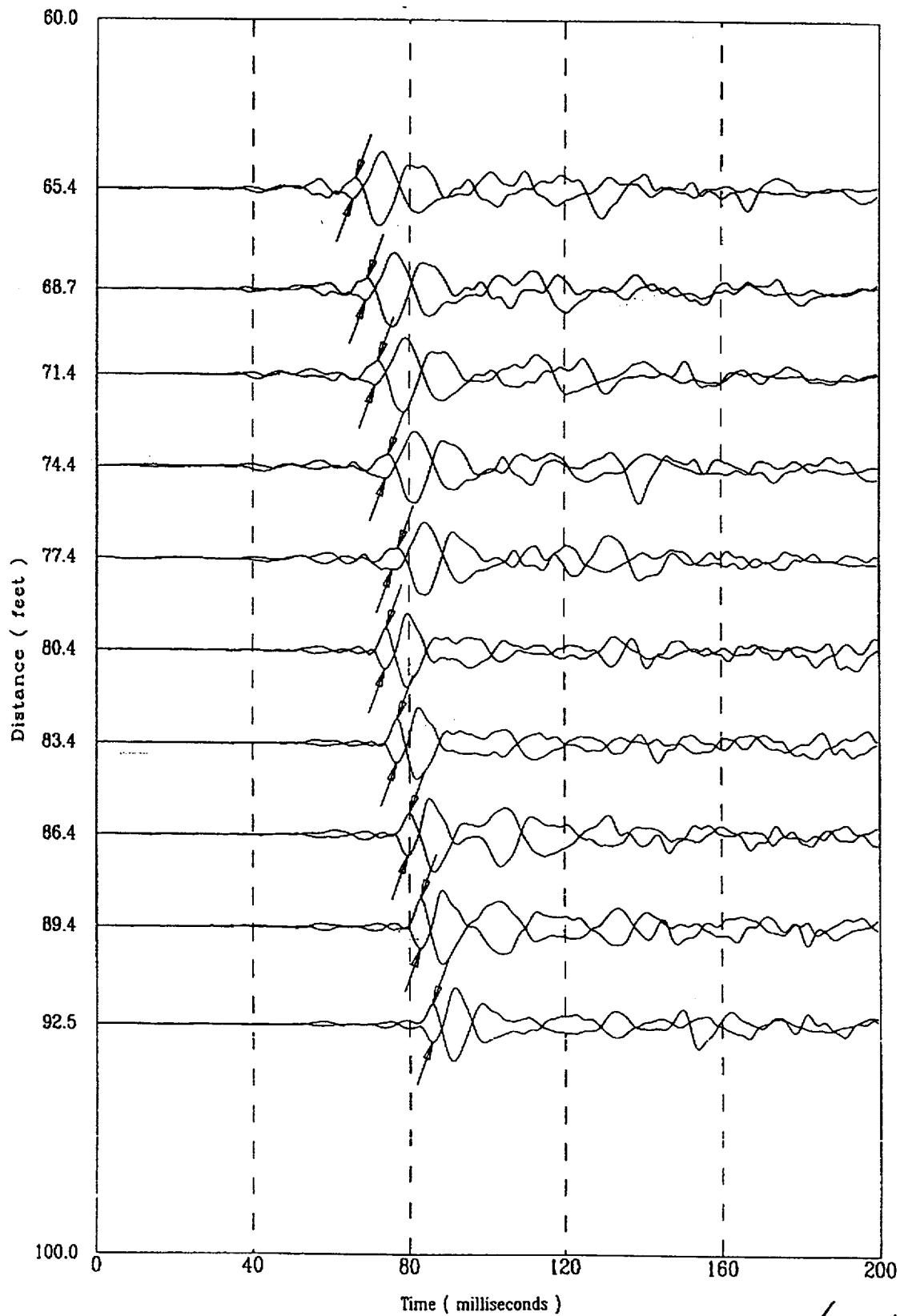
File 404m804S

182 of 522



Applied Research Associates, Inc.
CPT-149

S Wave
03/04/98

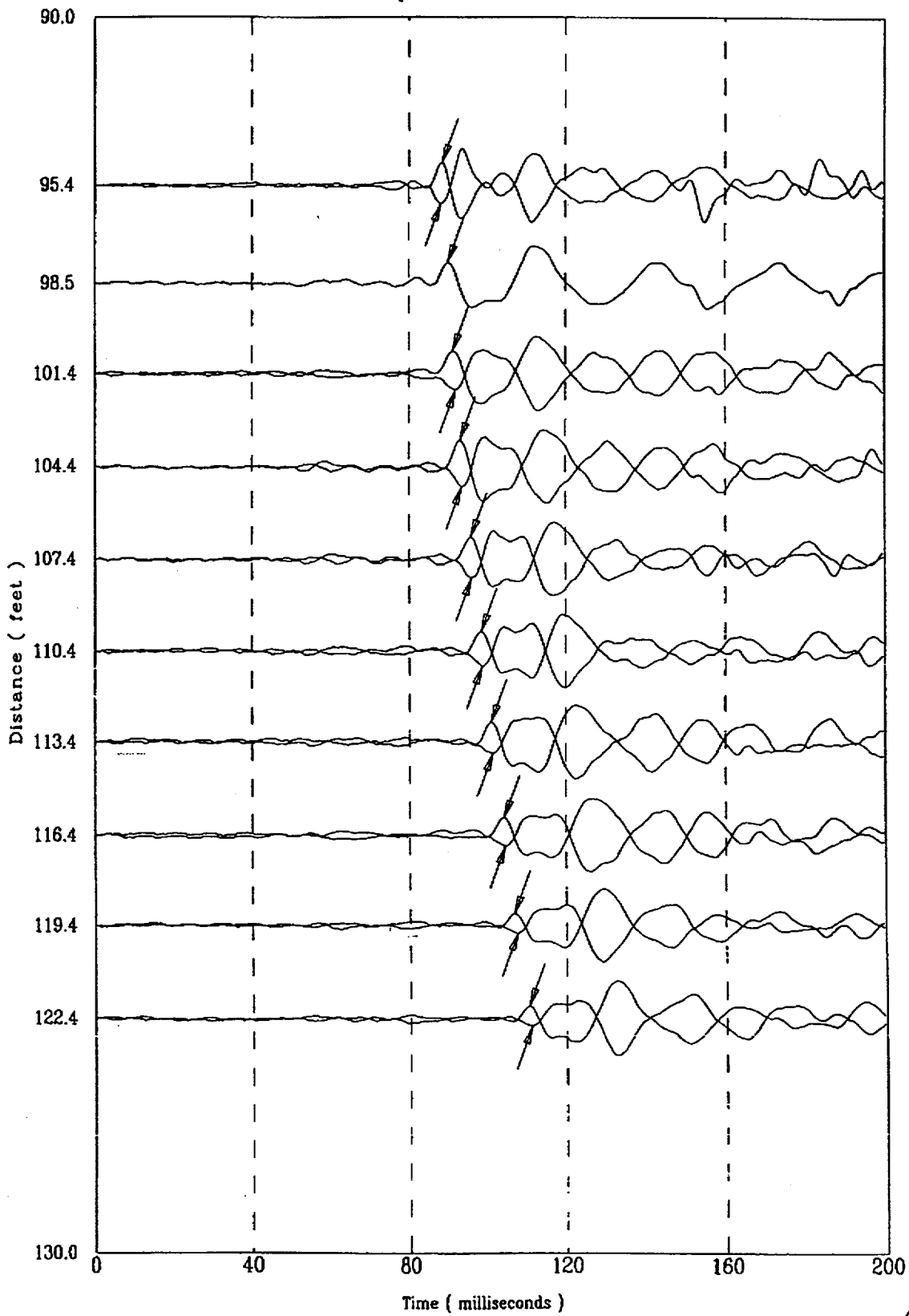


File 404m804S

184 of 522

Applied Research Associates, Inc.
CPT-149

S Wave
03/05/98

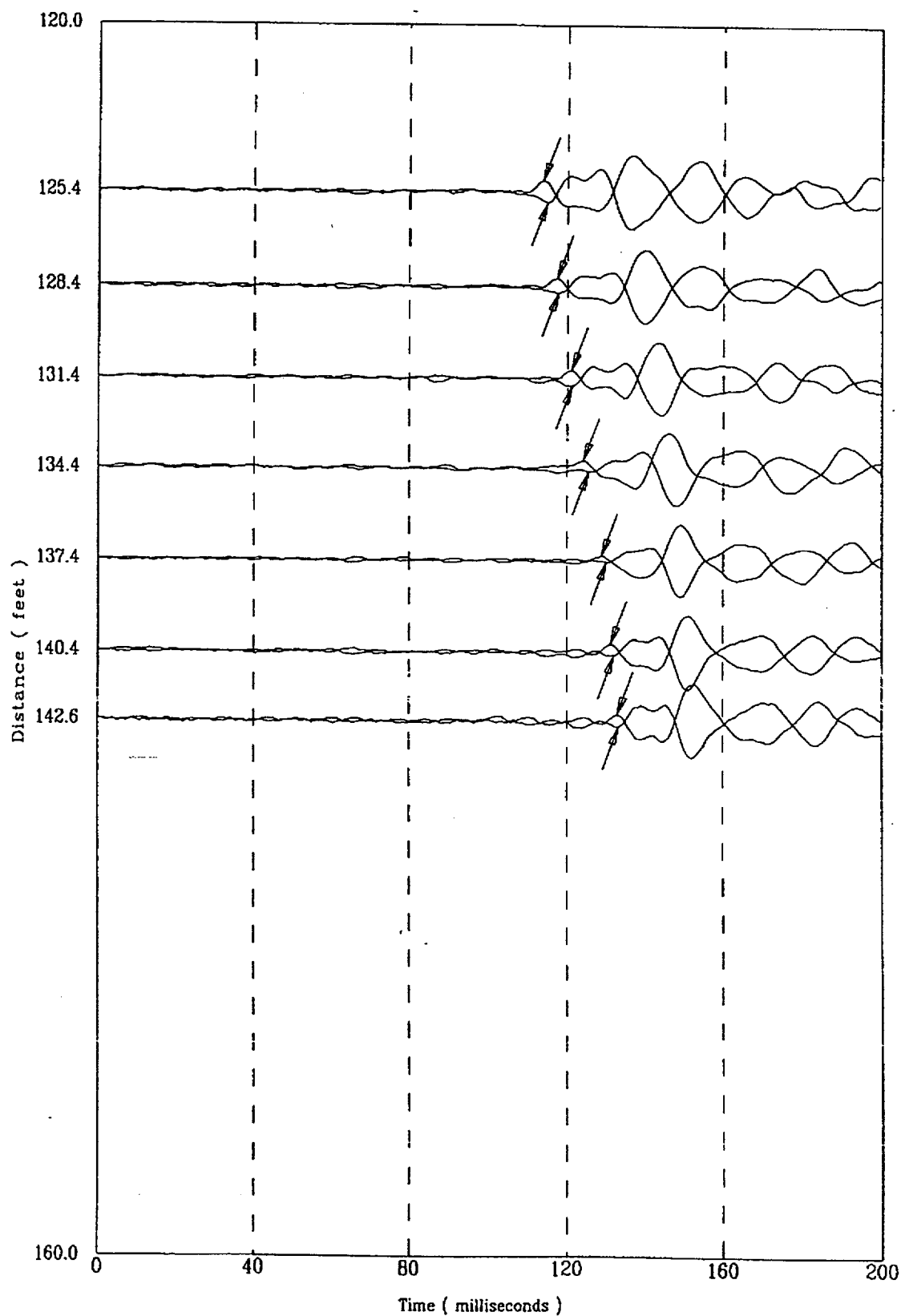


404m804S

185 of 522

Applied Research Associates, Inc.
CPT-149

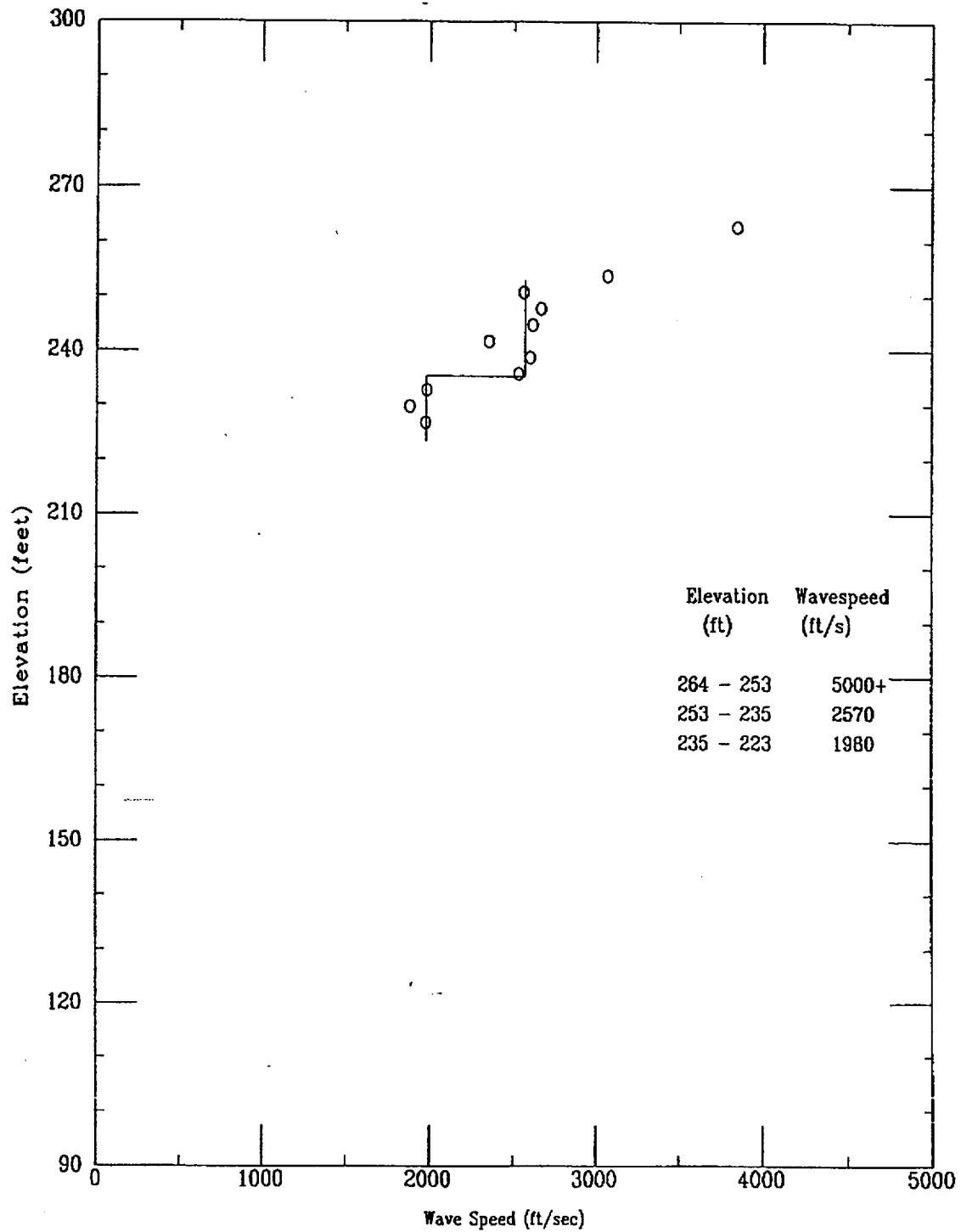
S Wave
03/05/98



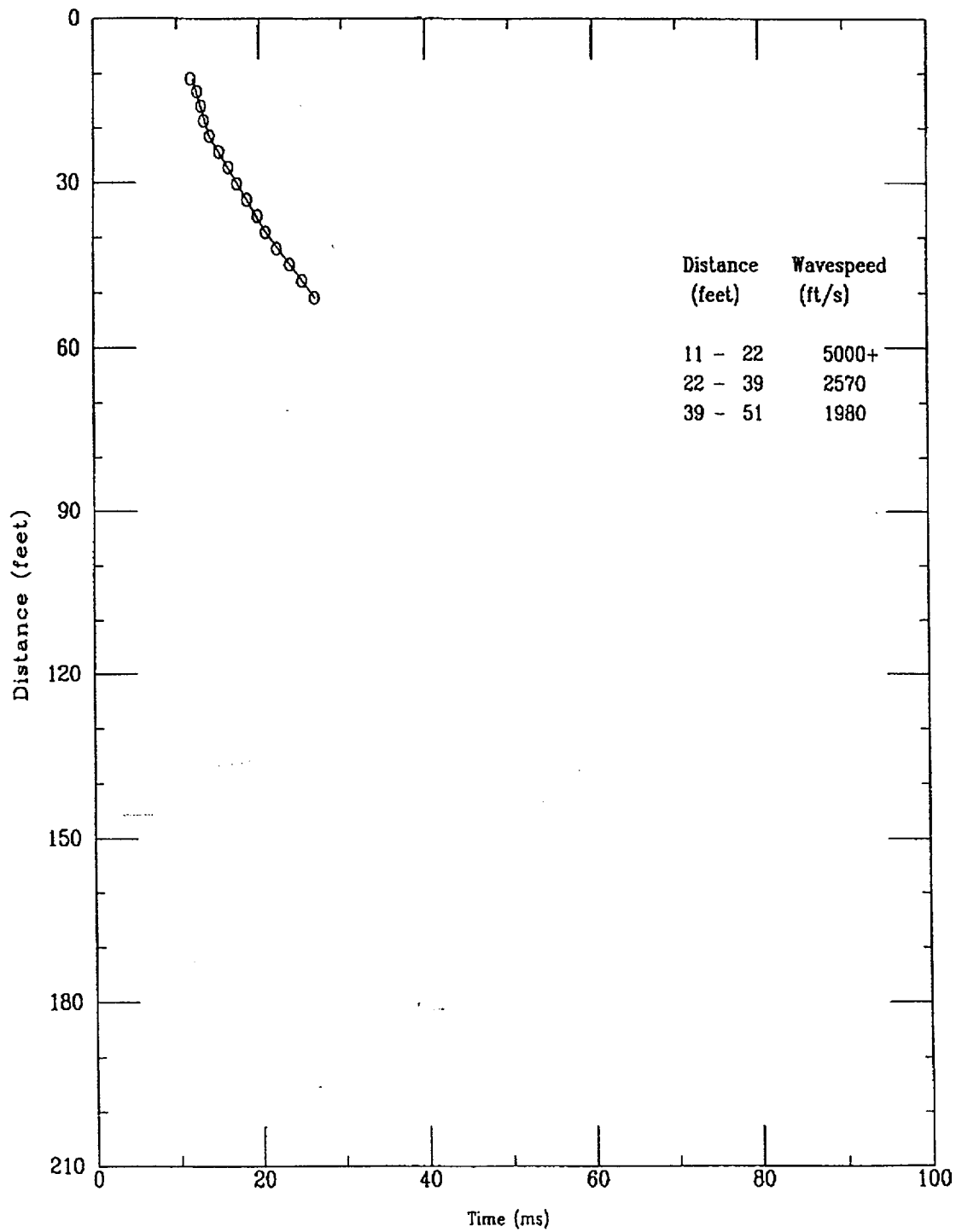
File 404m804S

186 of 522

Compression Wave Speeds

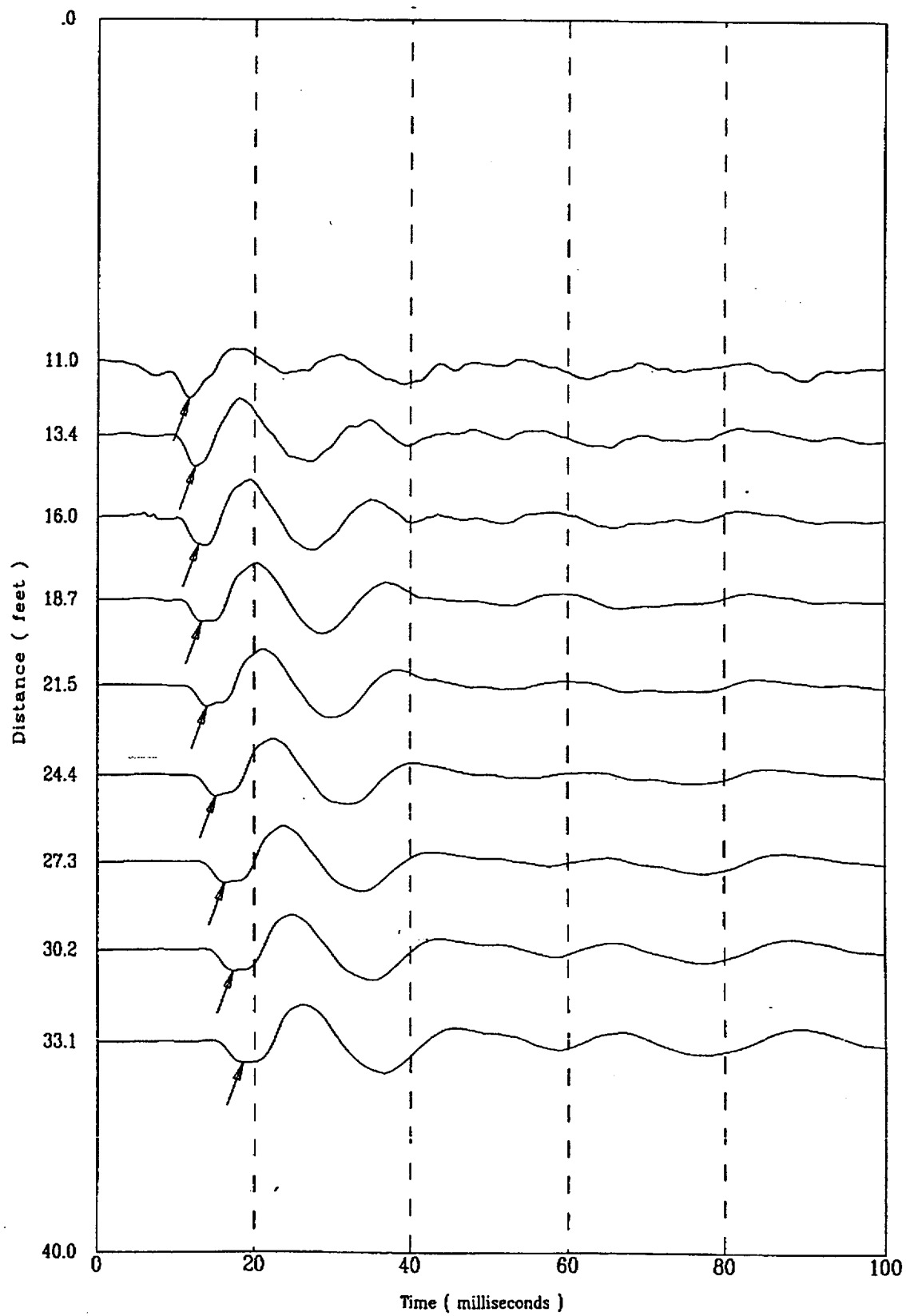


Compression Wave Time of Peak



Applied Research Associates, Inc.
CPT-149

P Wave
03/30/98

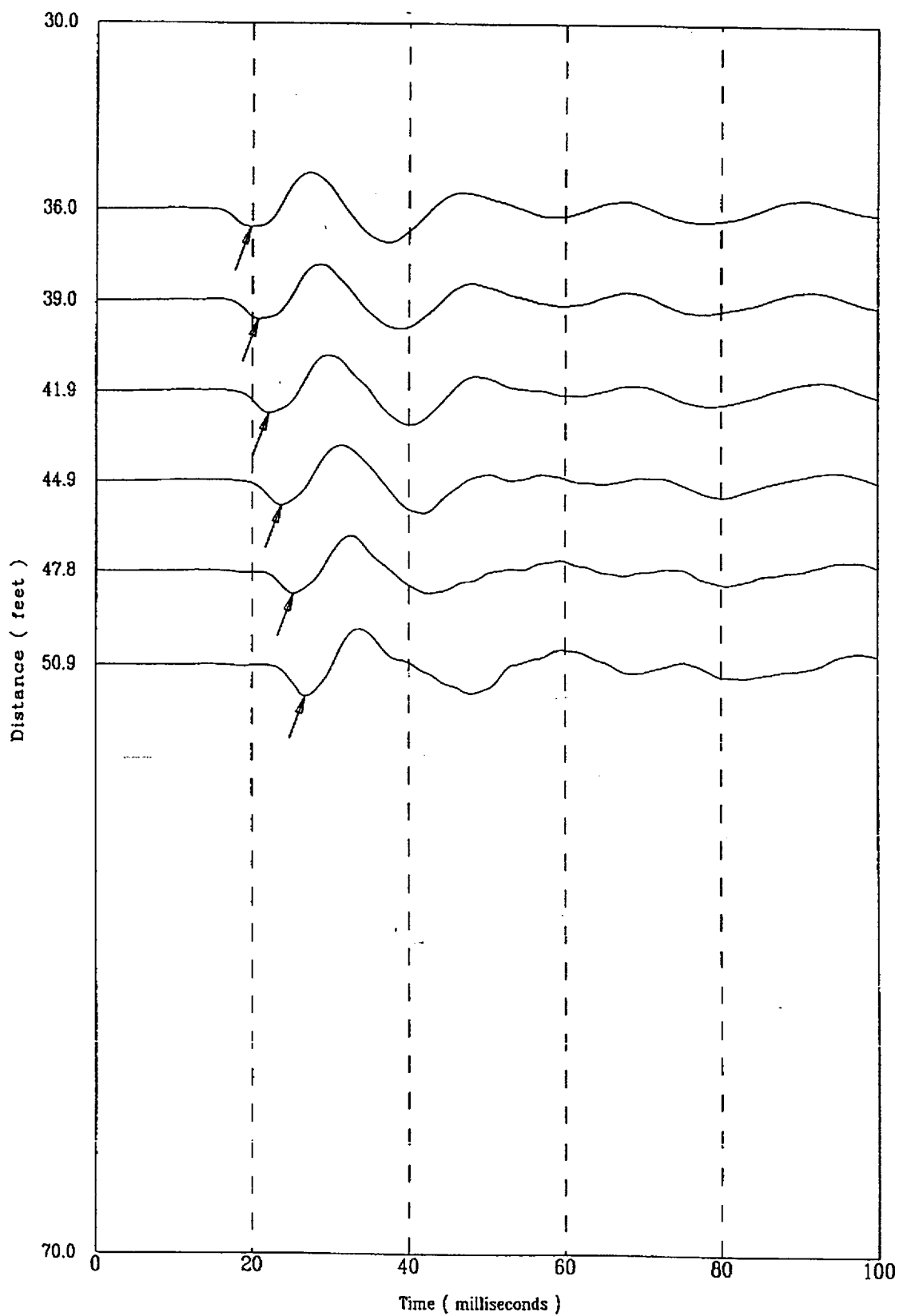


J0m802S

189 of 522

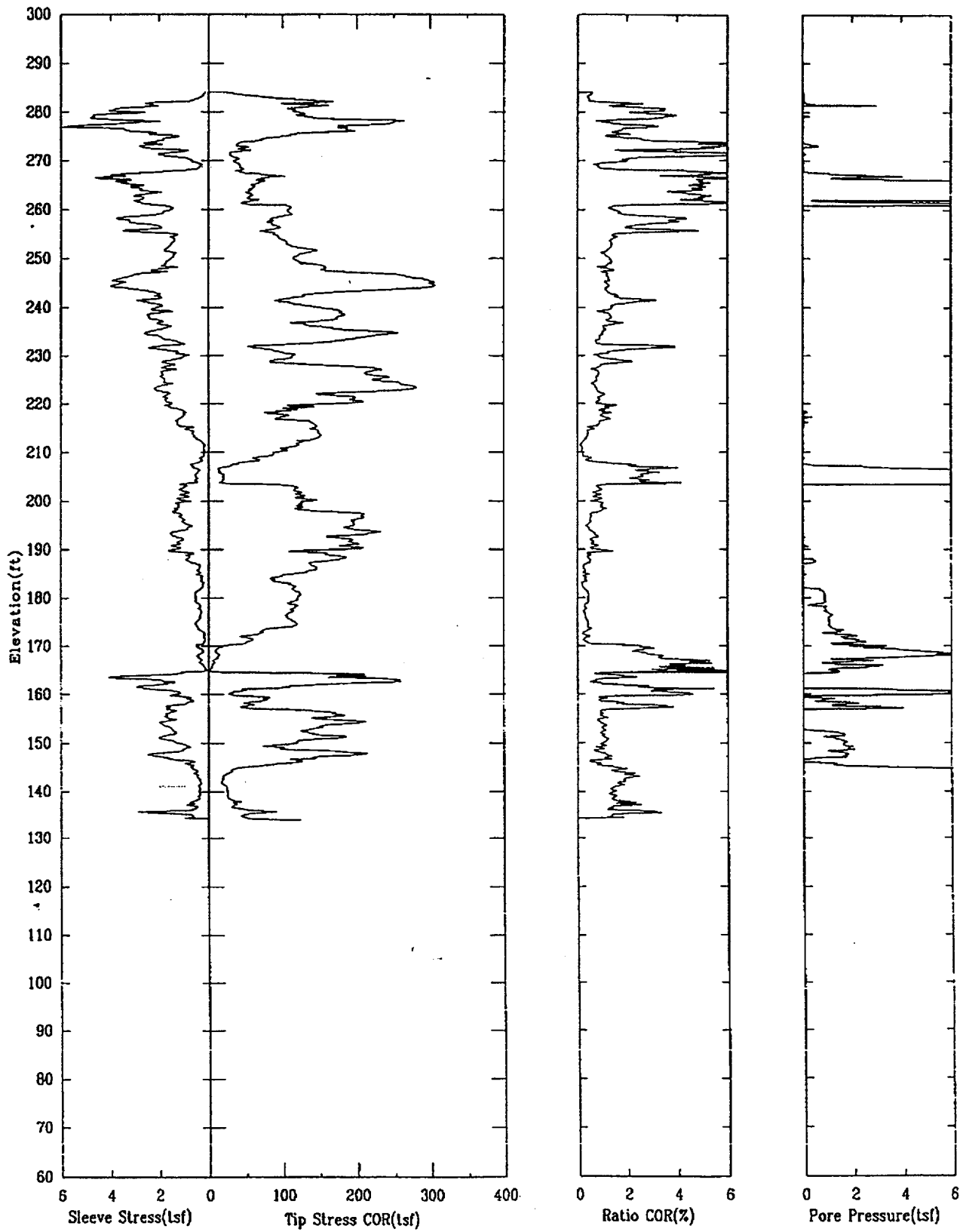
Applied Research Associates, Inc.
CPT-149

P Wave
03/30/98



File 330m802S

190 of 522



CPT-151

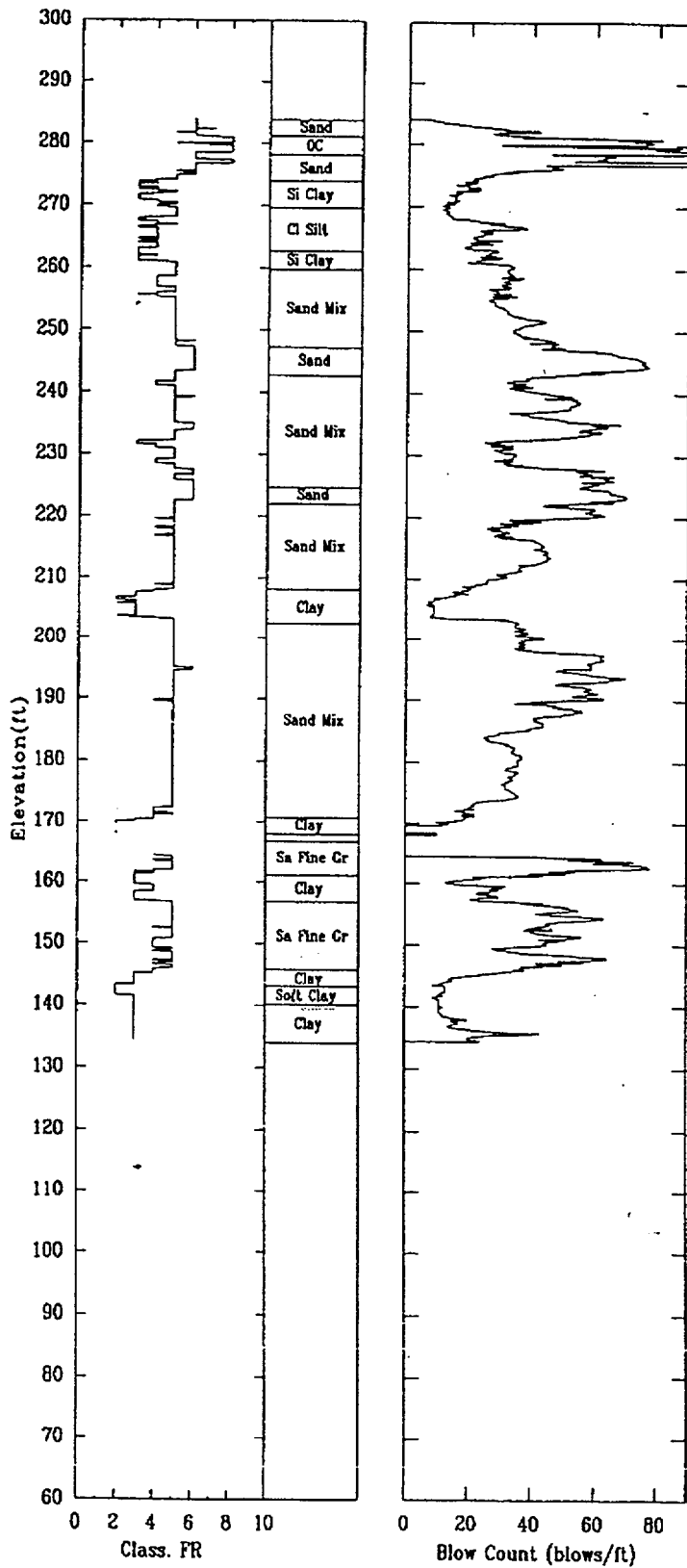
APPLIED RESEARCH ASSOCIATES, INC.

02/24/98

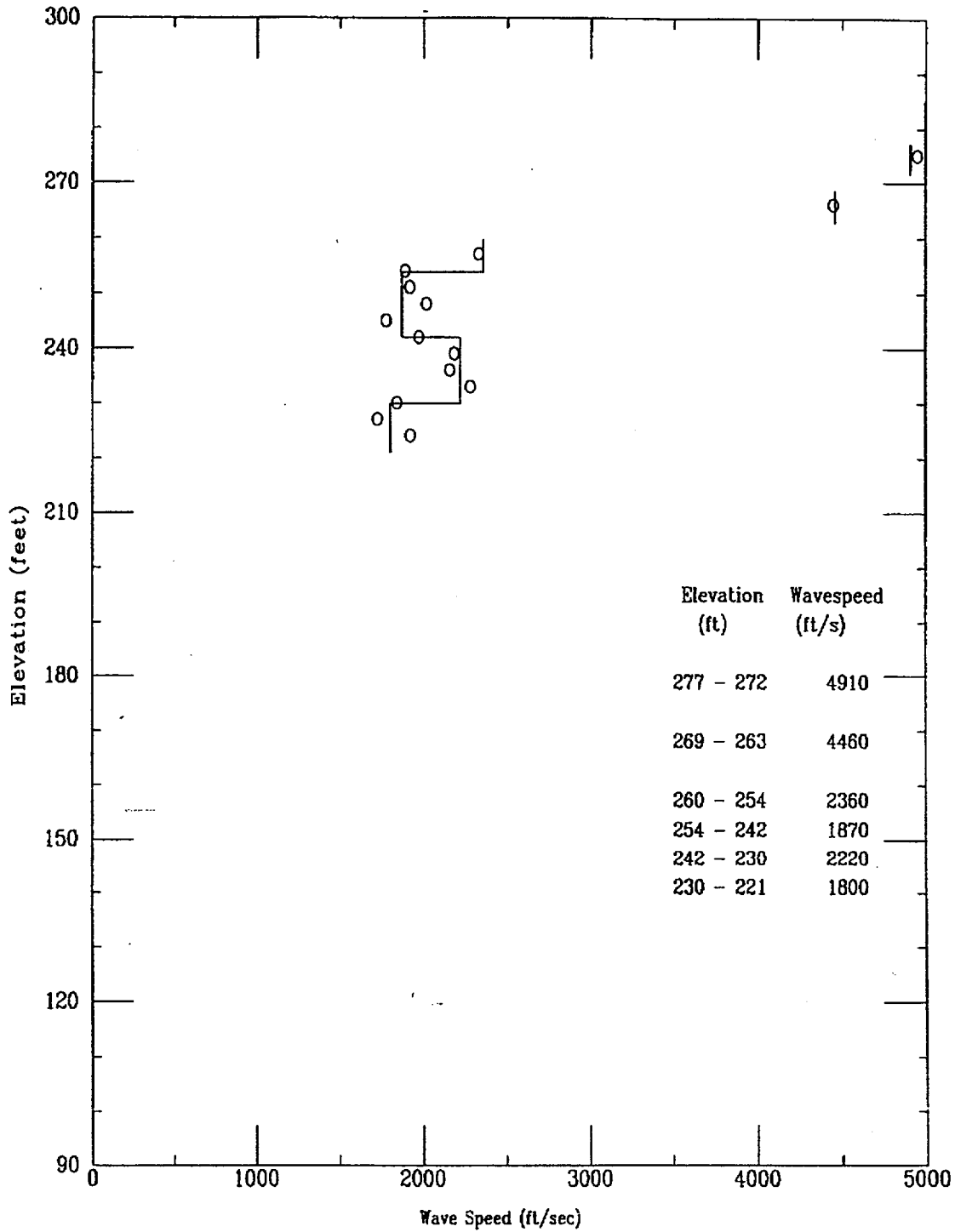
North 79305

East 55195

Elevation 290.1



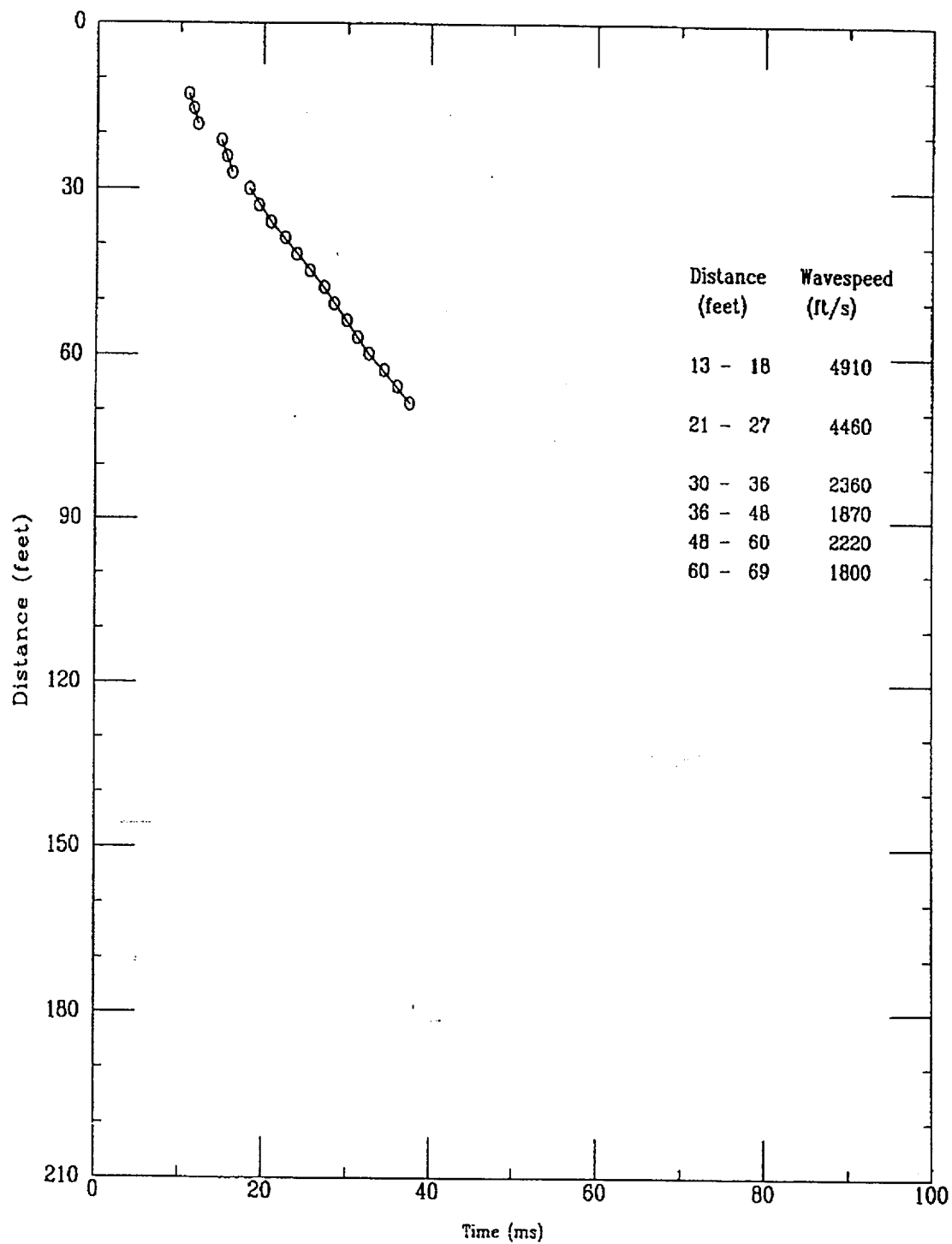
Compression Wave Speeds



CPT-151

APPLIED RESEARCH ASSOCIATES, INC.
Compression Wave Time of Peak

02/24/98

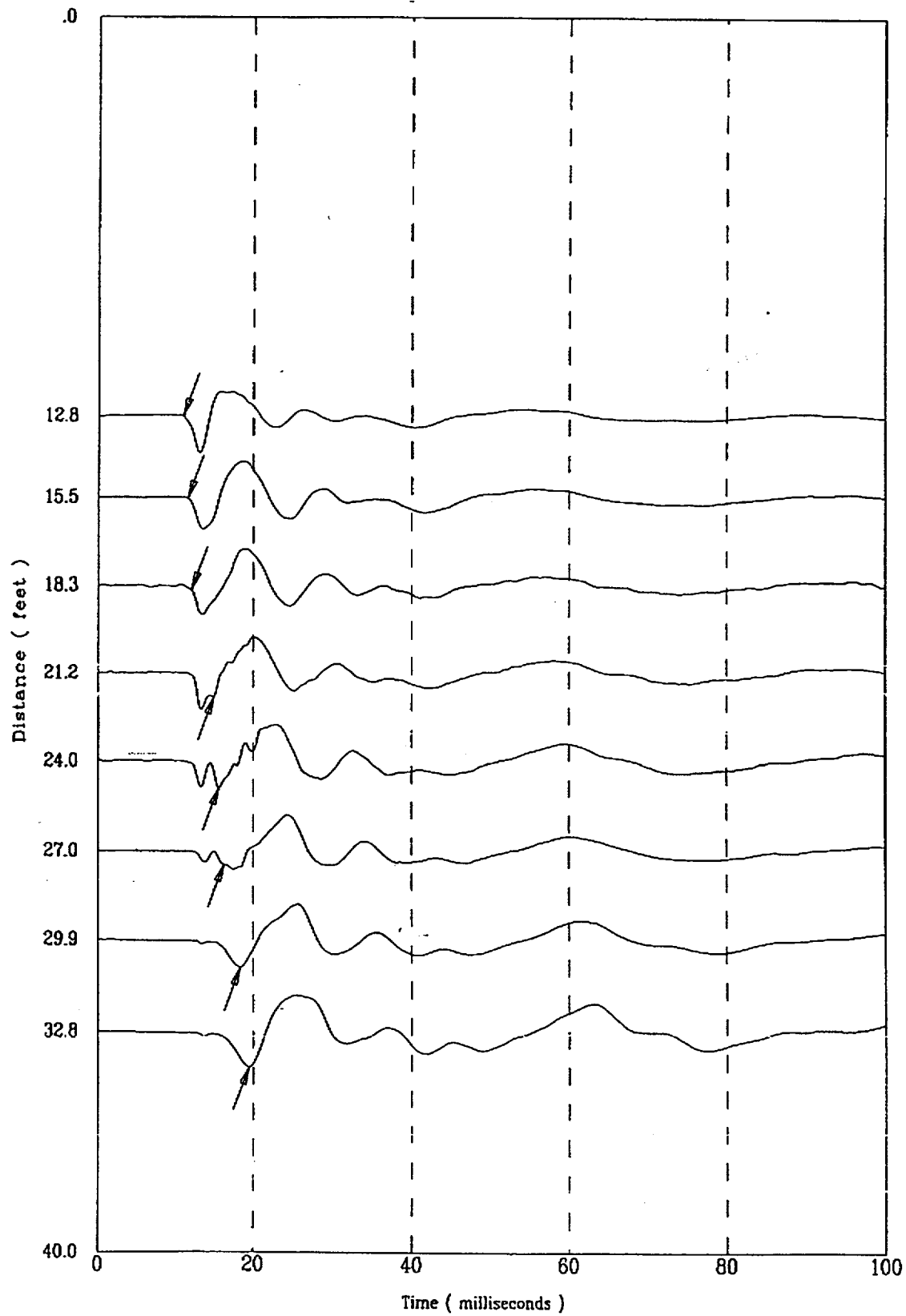


File 424f804S

194 of 522

Applied Research Associates
CPT-151

P Wave
02/24/98

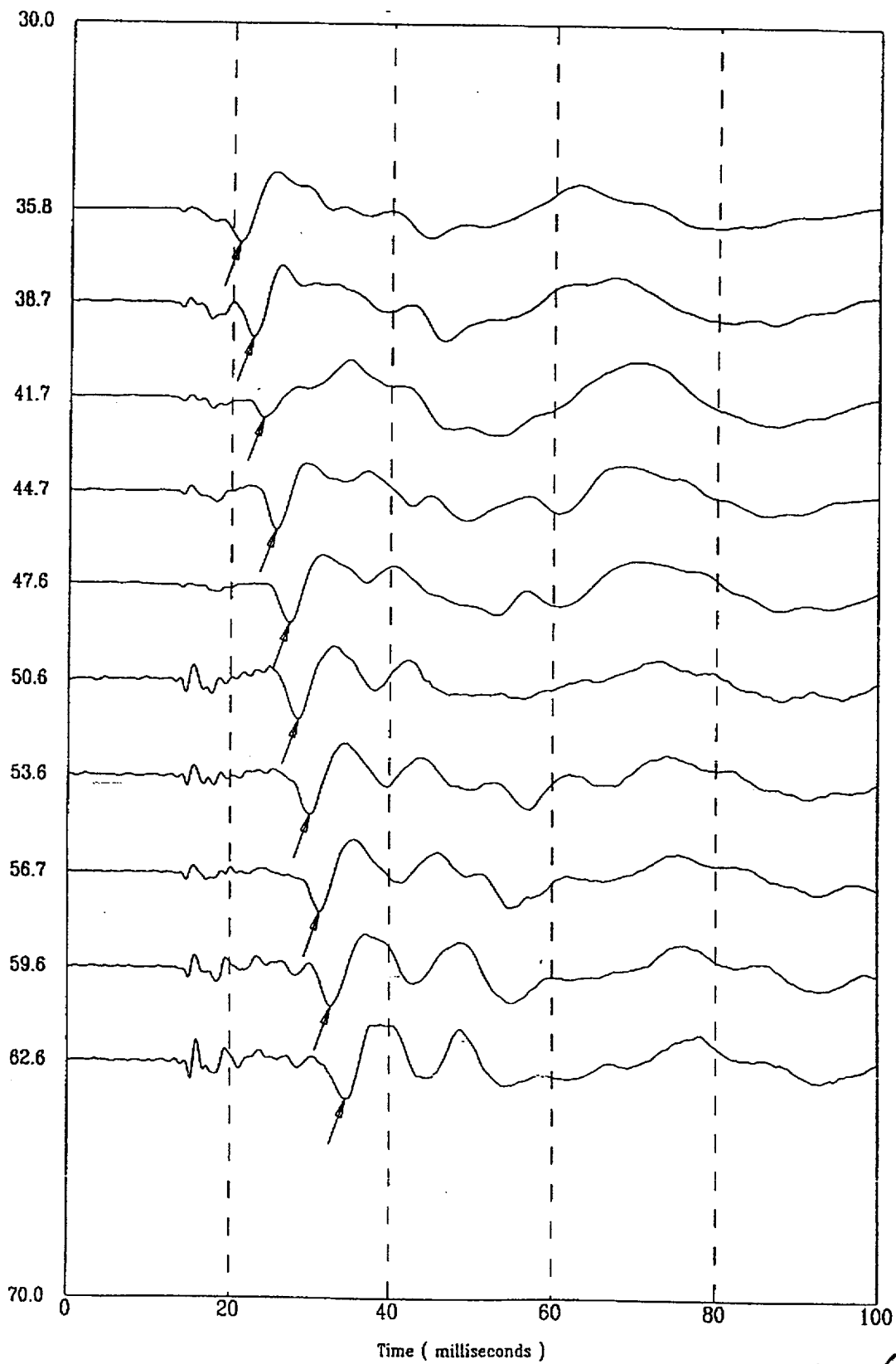


241804S

195 of 522

Applied Research Associates
CPT-151

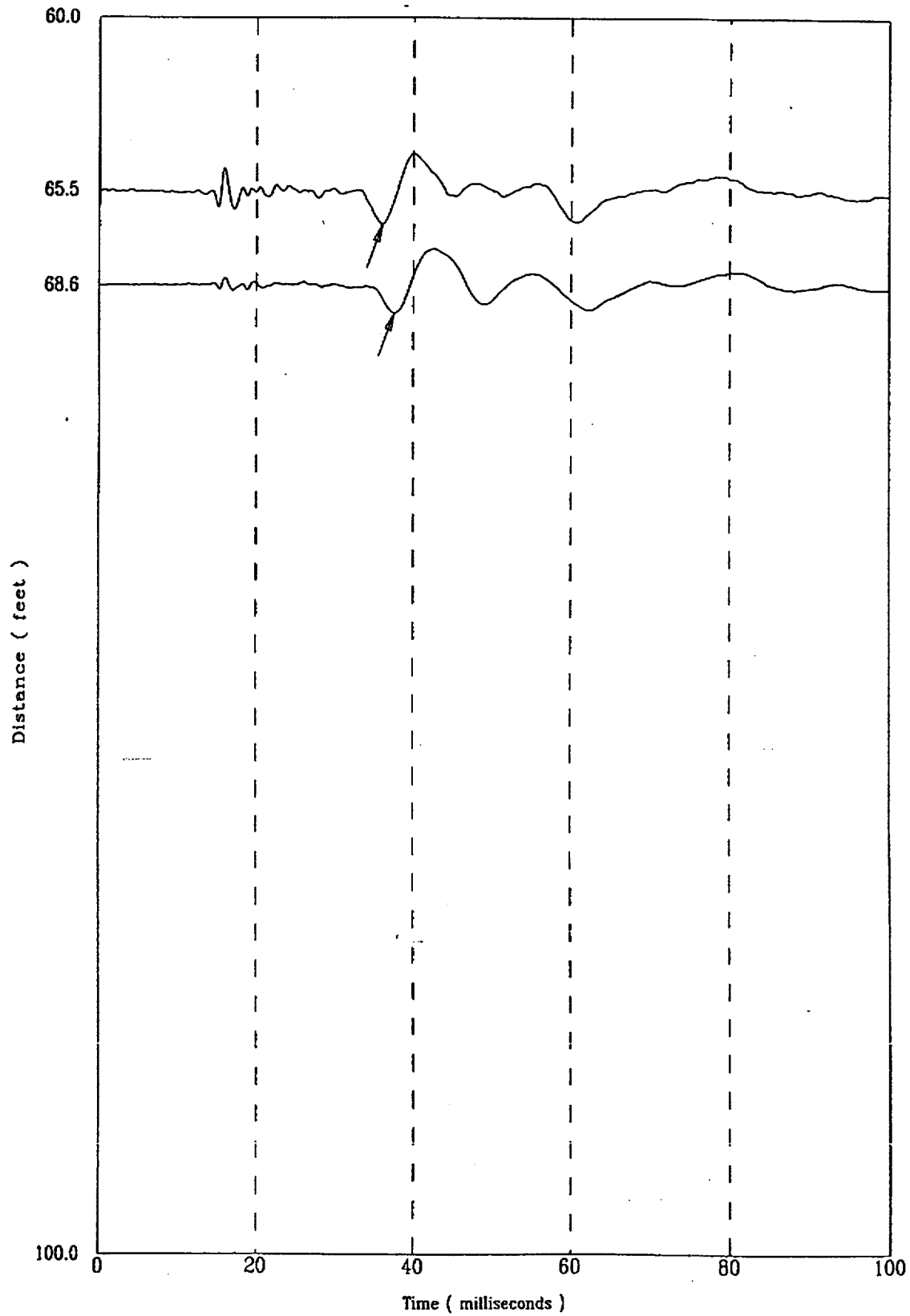
P Wave
02/24/98



196 of 522

Applied Research Associates
CPT-151

P Wave
02/24/98



241804S

197 of 522

CPT-155

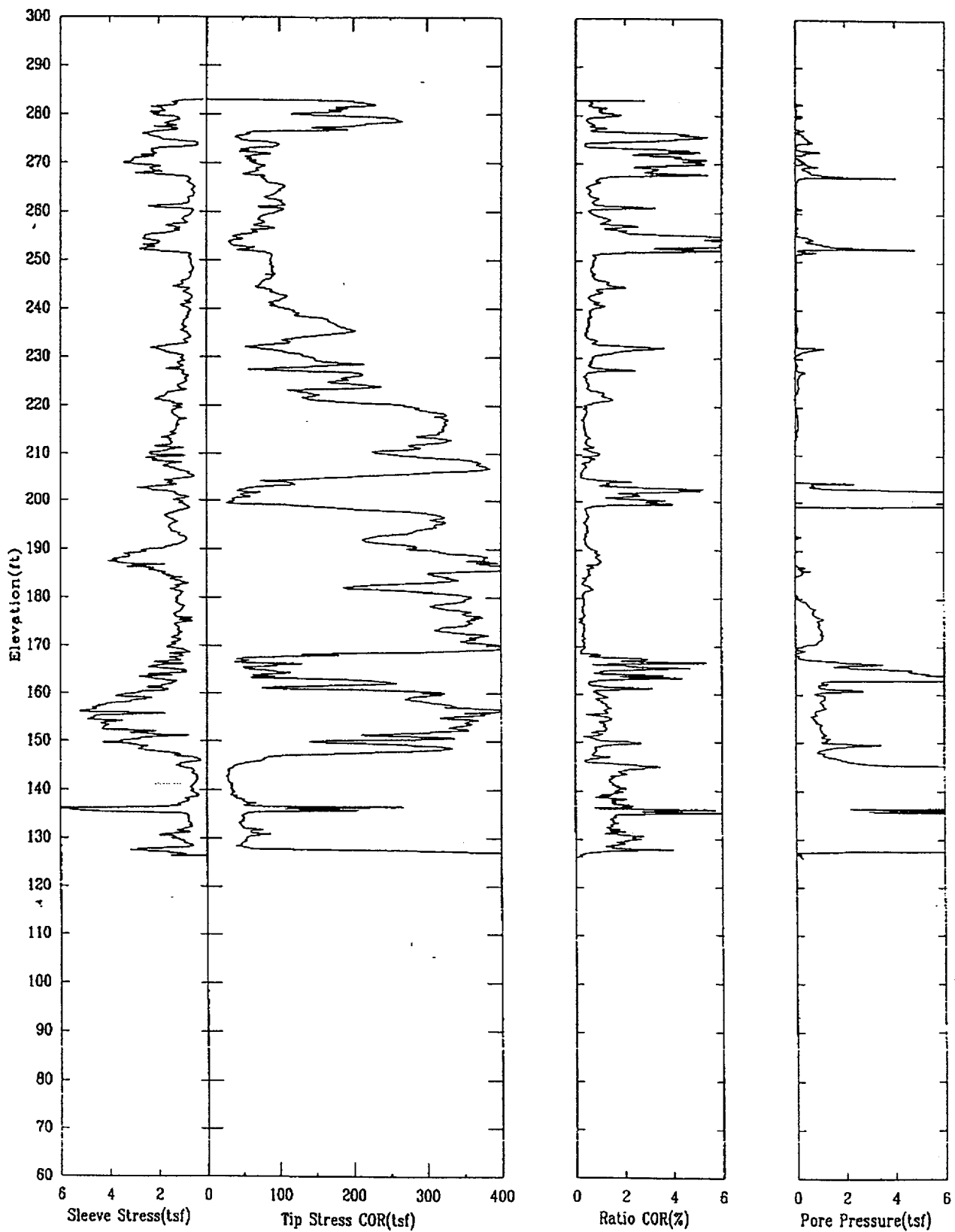
APPLIED RESEARCH ASSOCIATES, INC.

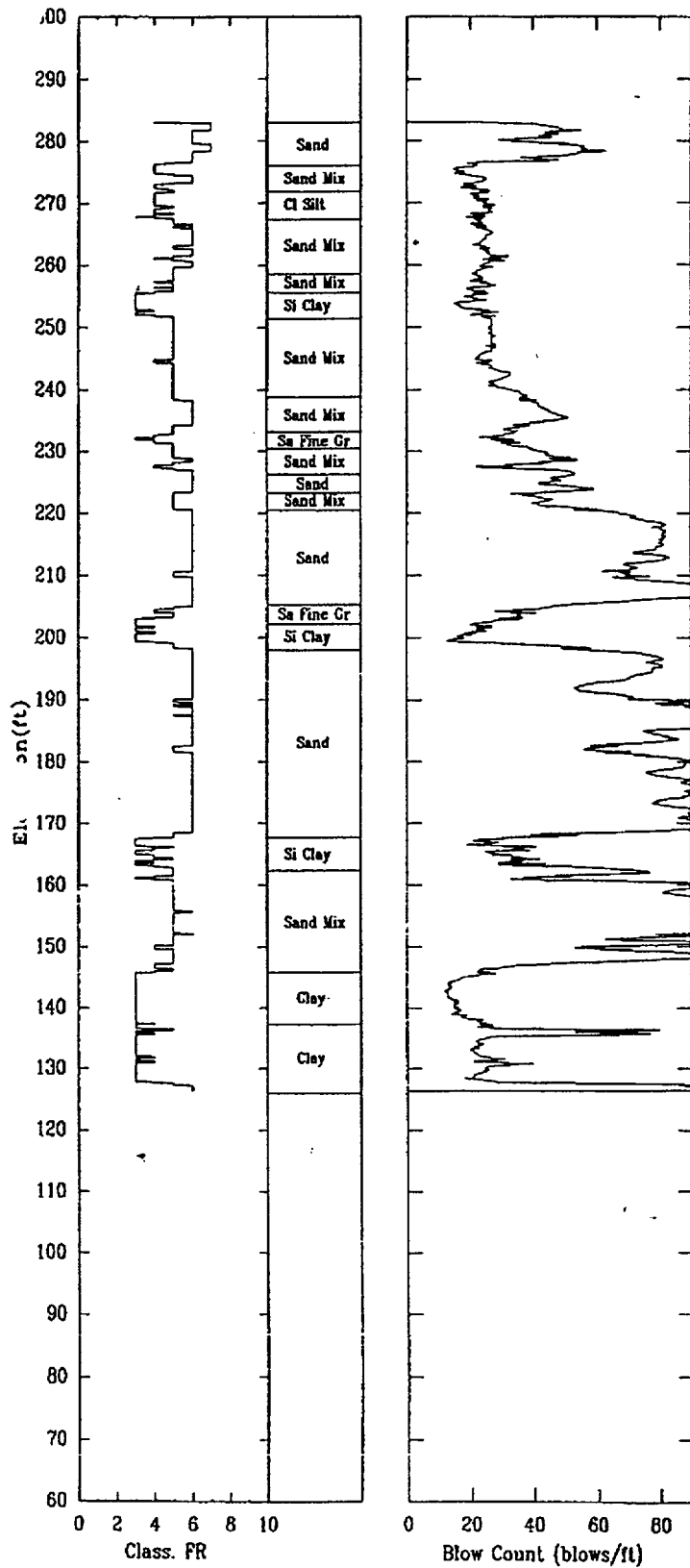
02/18/98

North 79245.0

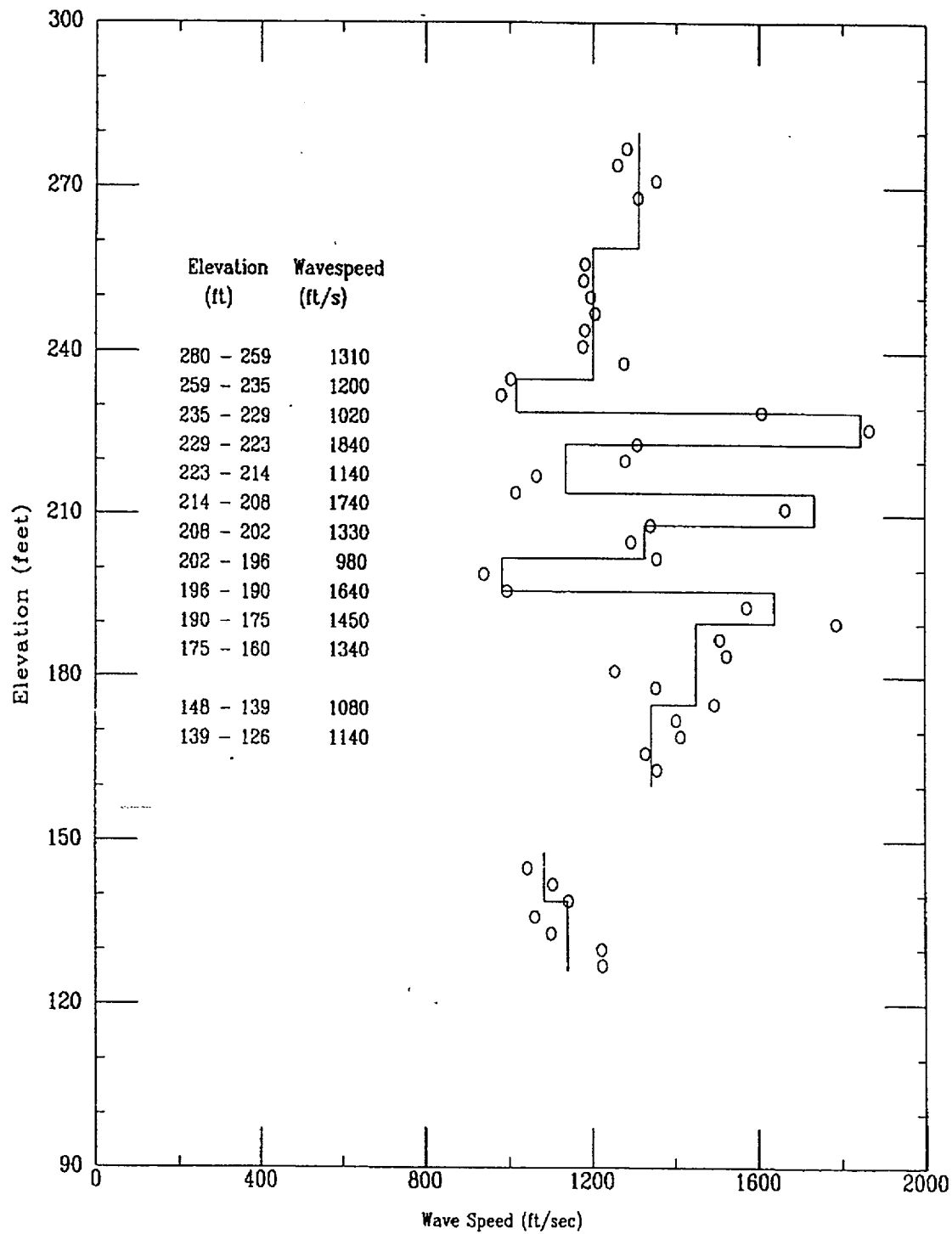
East 55261.0

Elevation 289.1

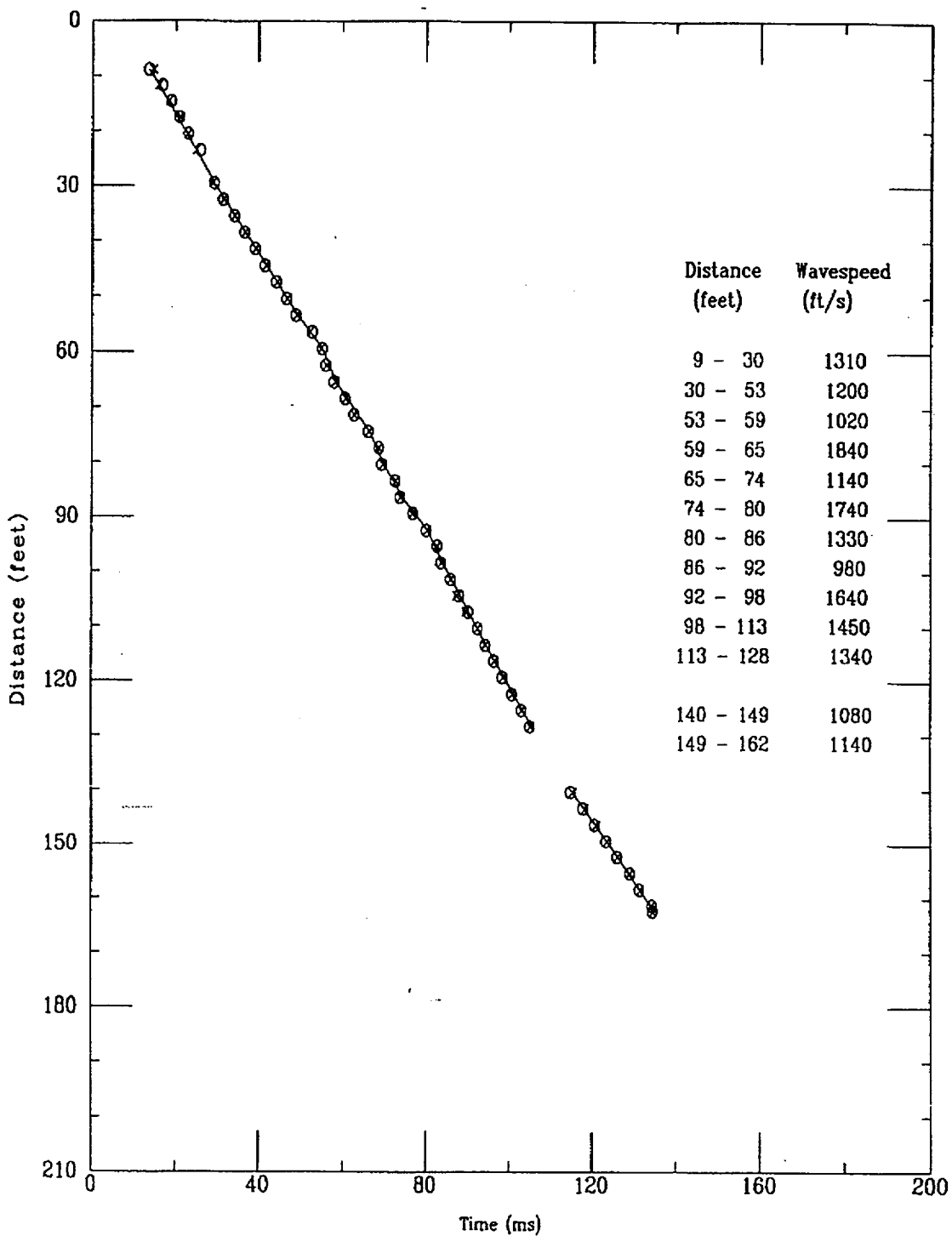




Shear Wave Speeds

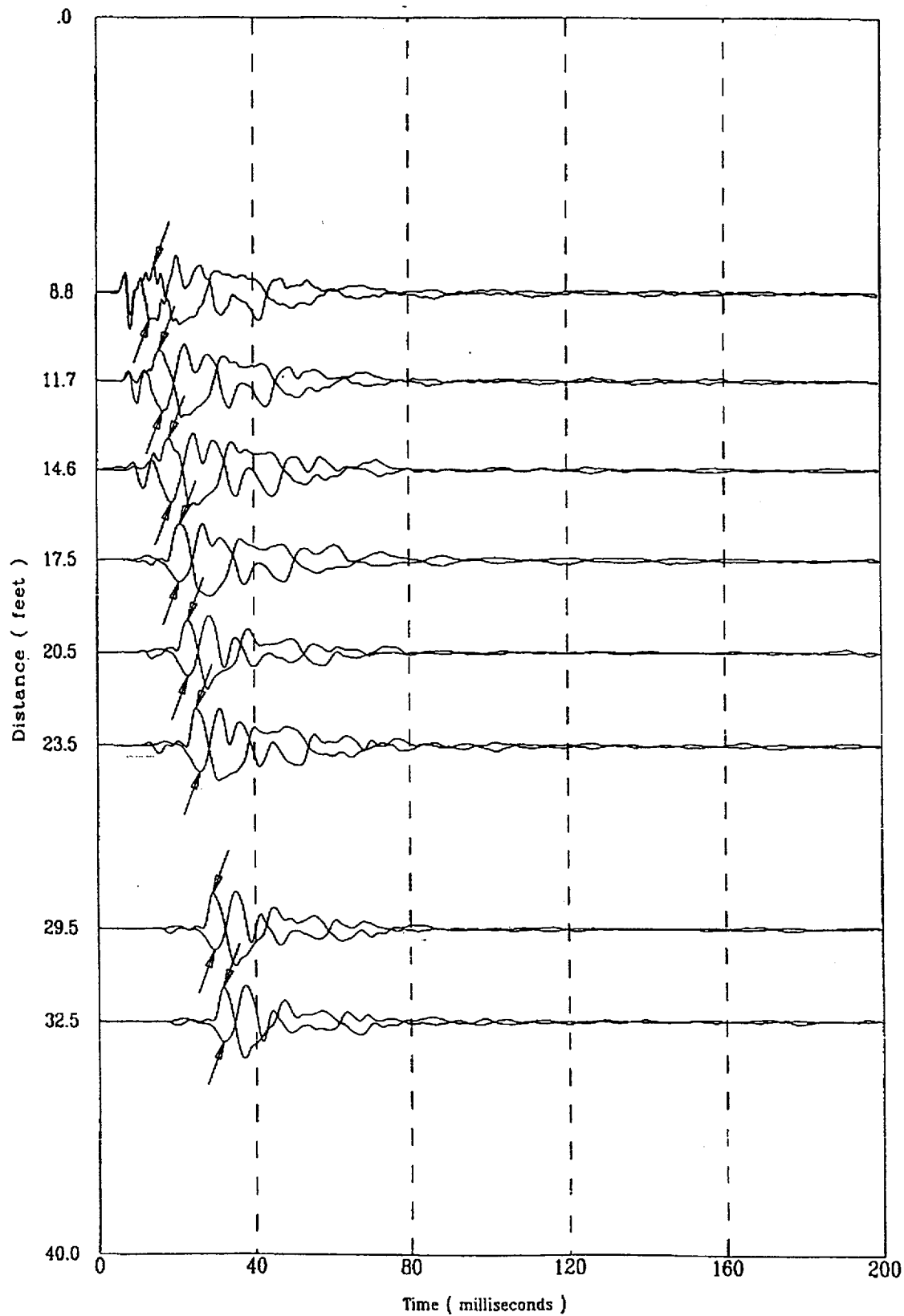


Shear Wave Time of Peak



Applied Research Associates, Inc.
CPT-155

S Wave
02/18/98

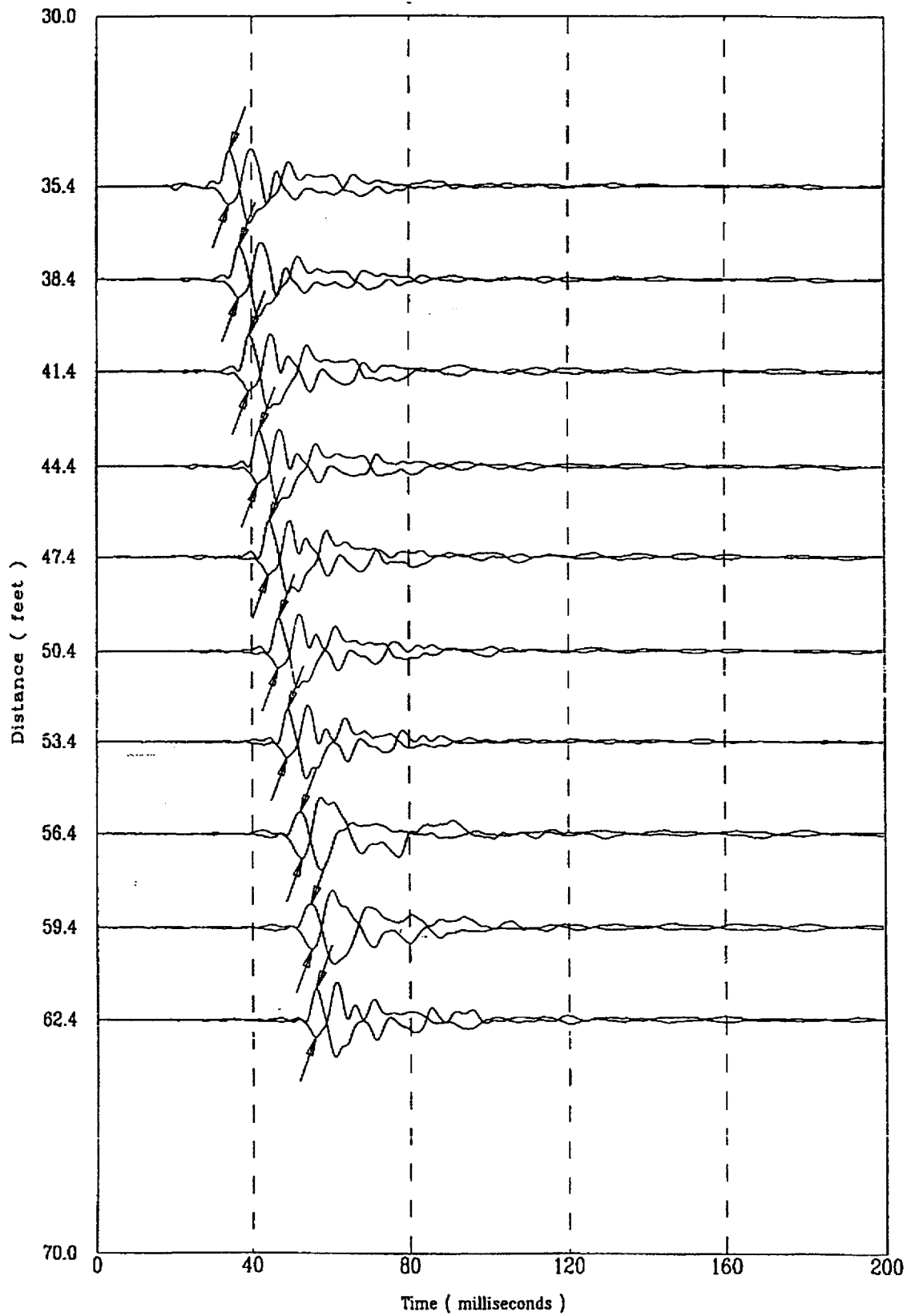


File 518f801S

202 of 522

Applied Research Associates, Inc.
CPT-155

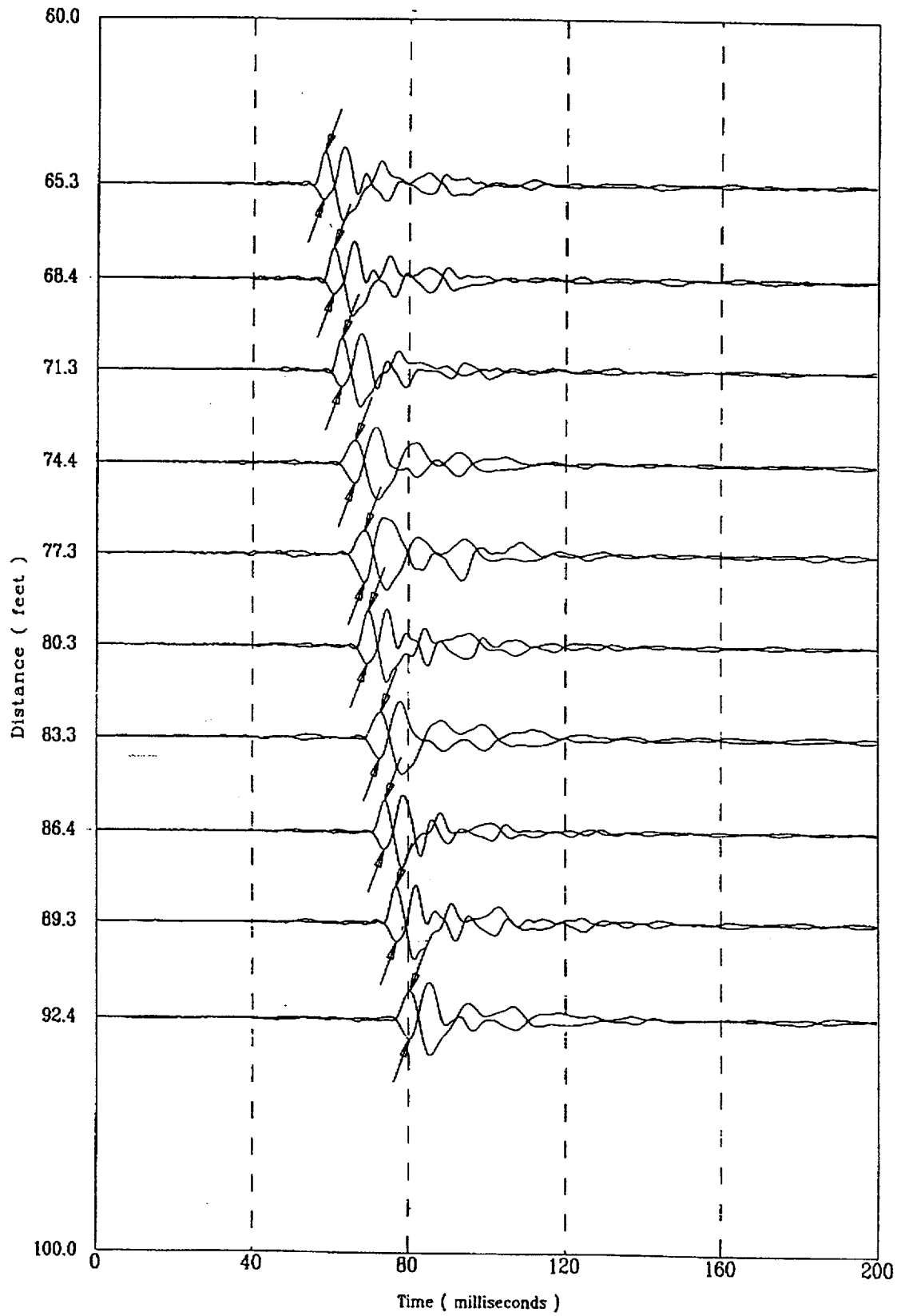
S Wave
02/18/98



203 of 522

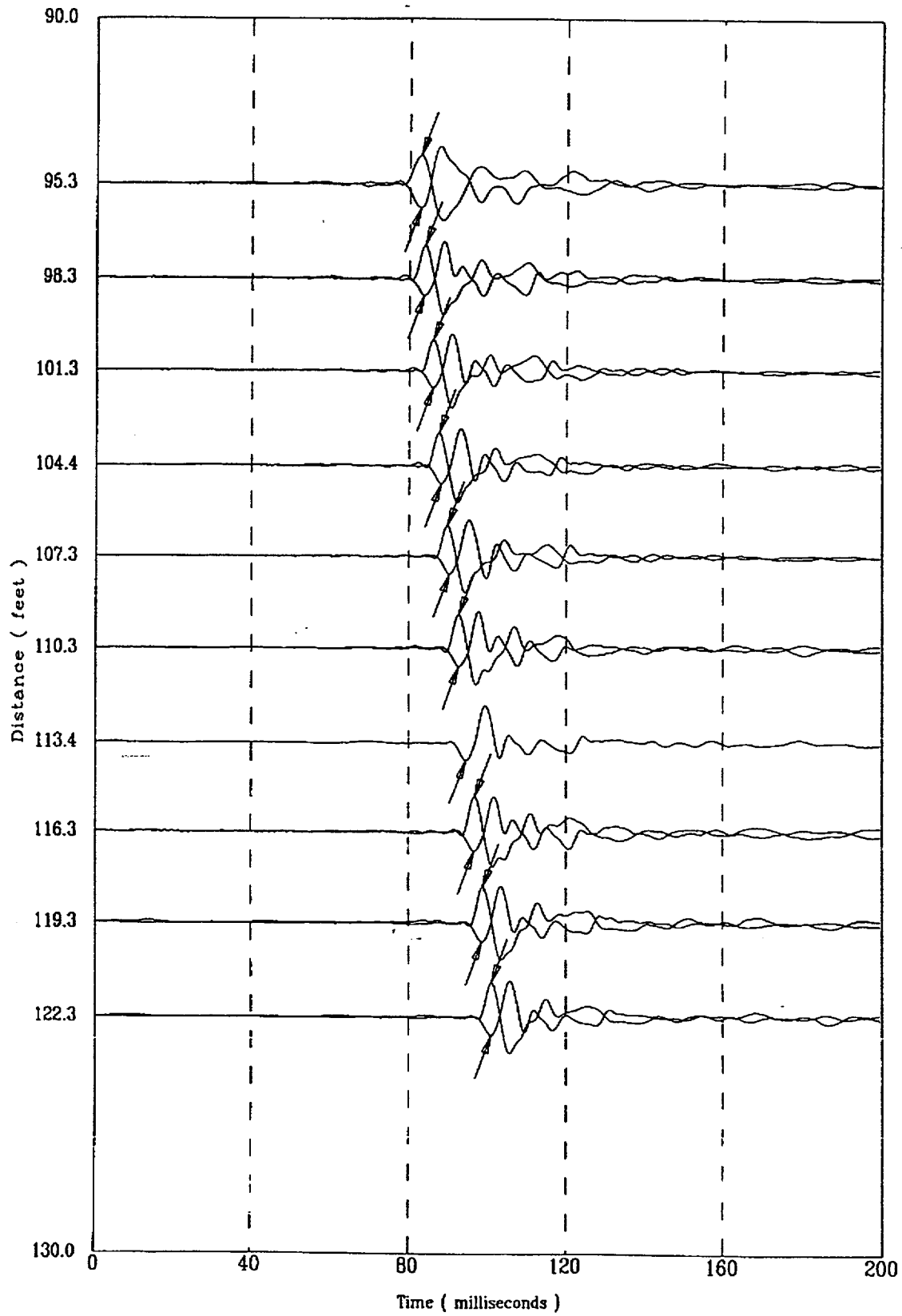
Applied Research Associates, Inc.
CPT-155

S Wave
02/18/98



Applied Research Associates, Inc.
CPT-155

S Wave
02/18/98

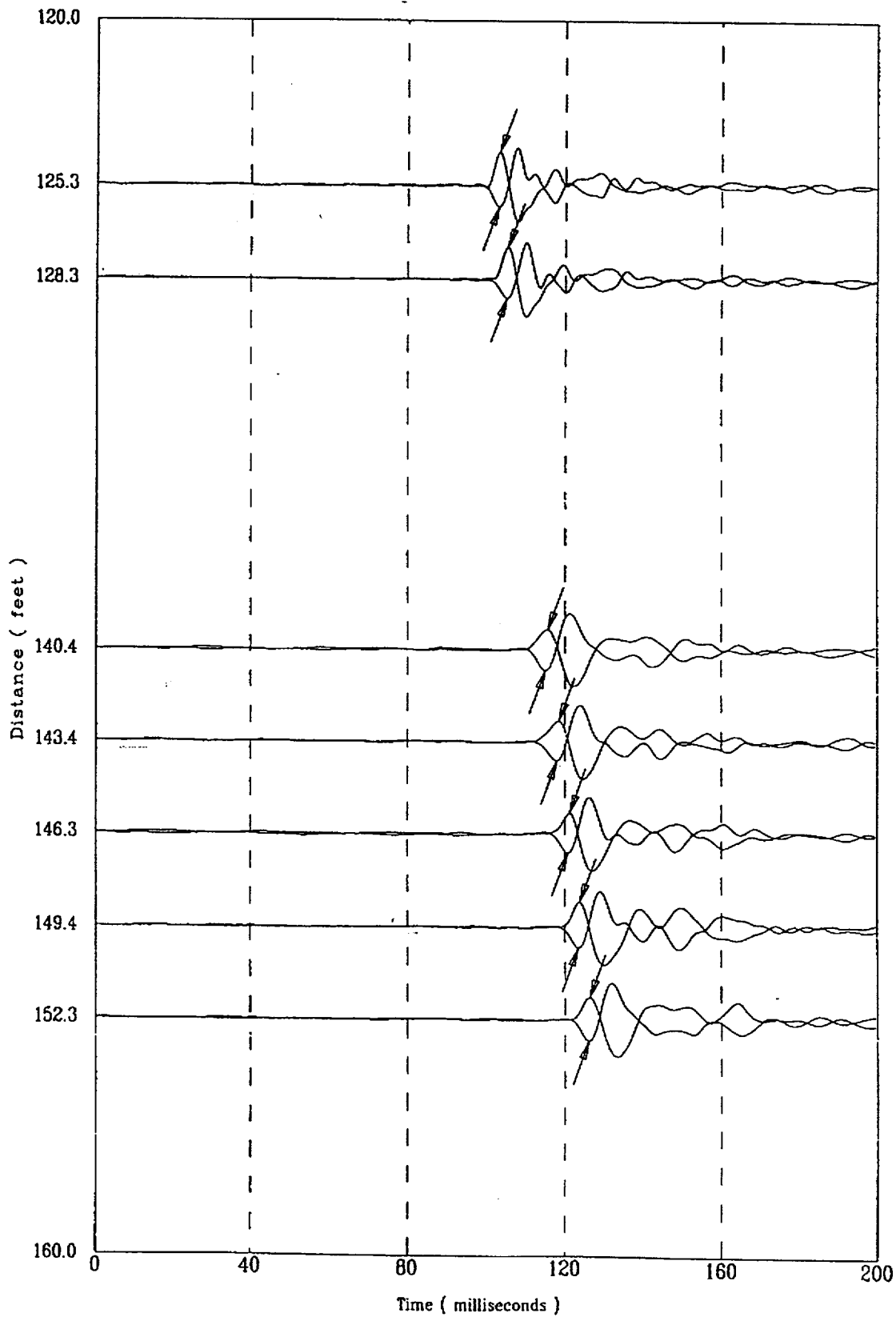


J181801S

205 of 522

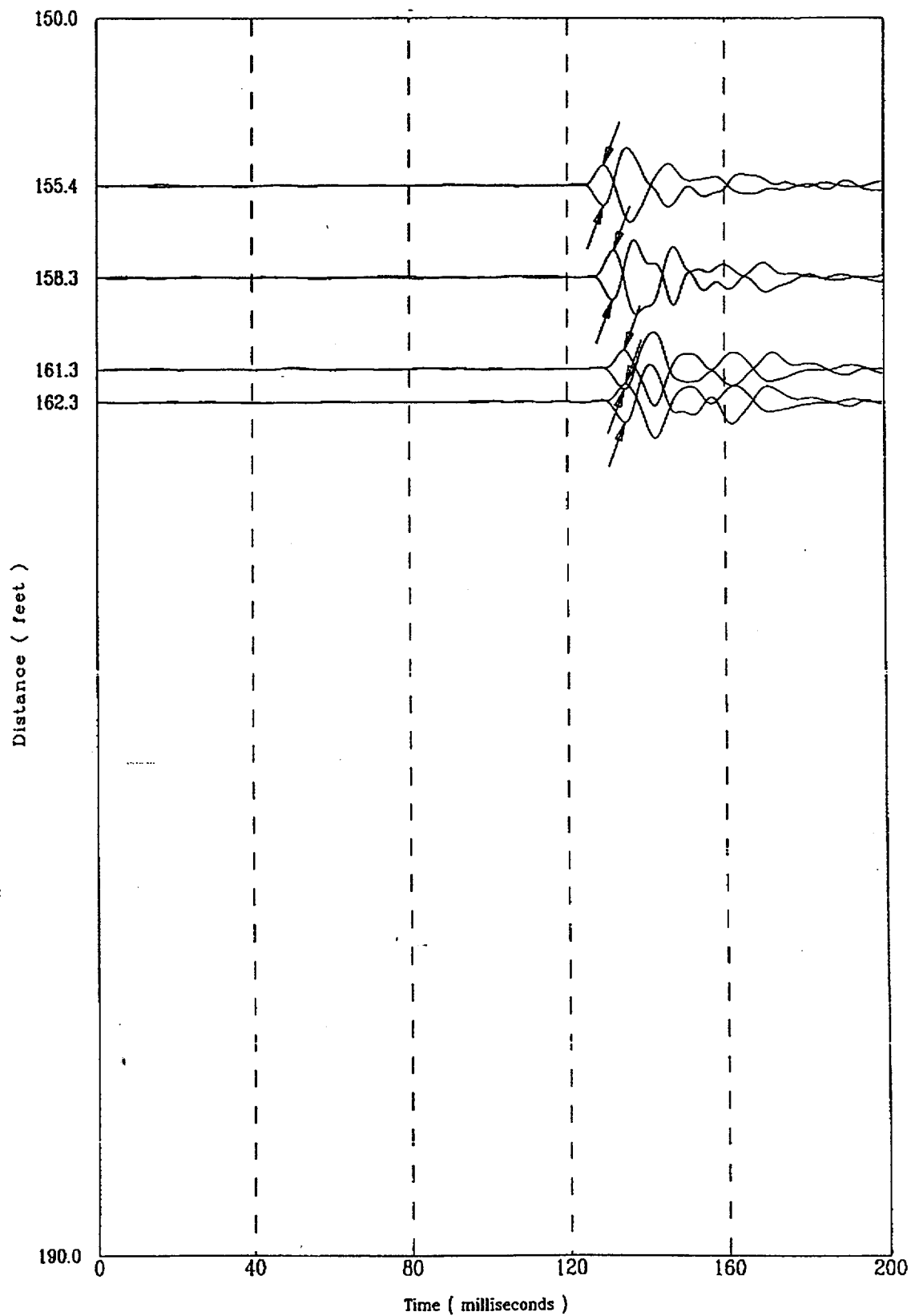
Applied Research Associates, Inc.
CPT-155

S Wave
02/18/98



Applied Research Associates, Inc.
CPT-155

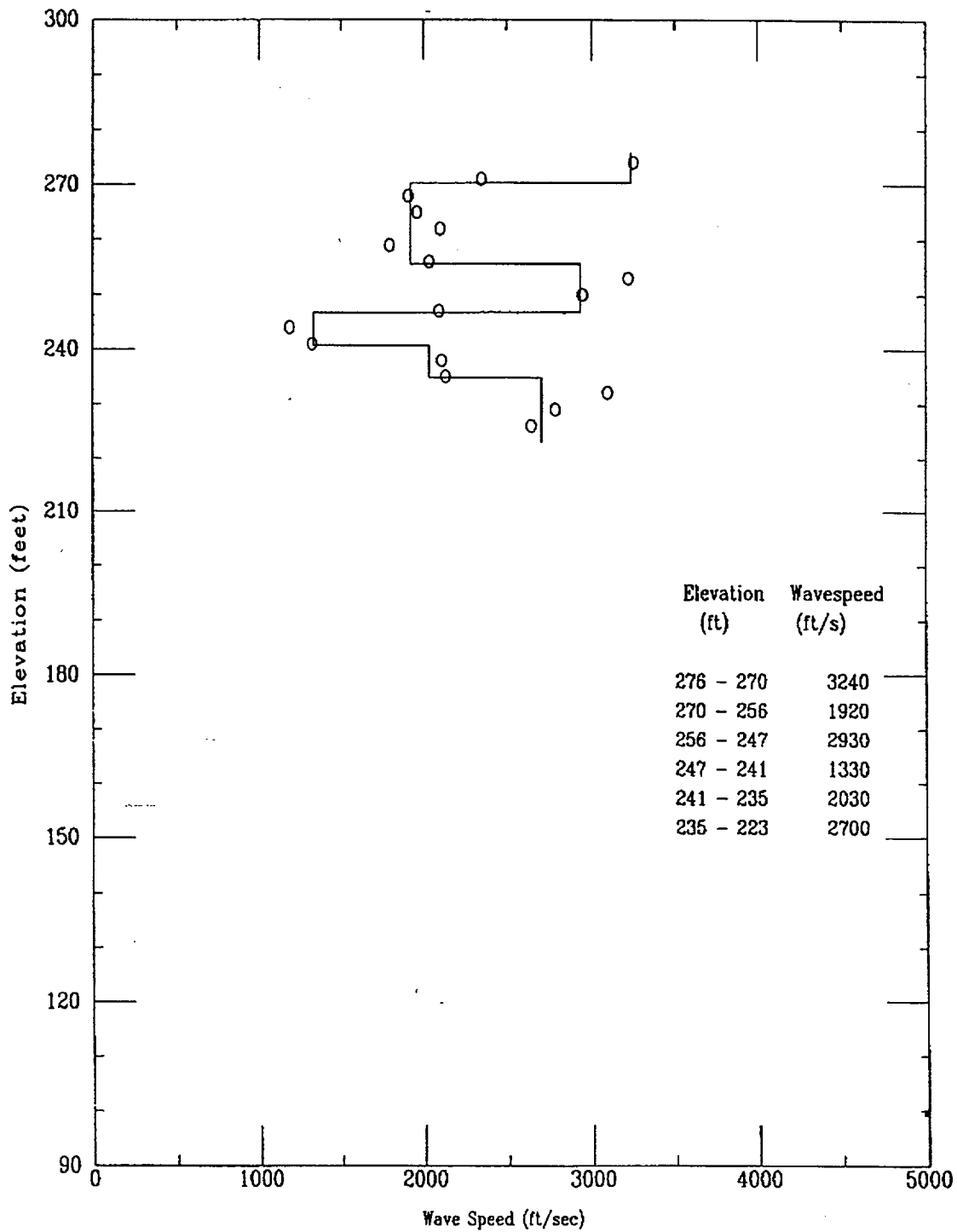
S Wave
02/18/98



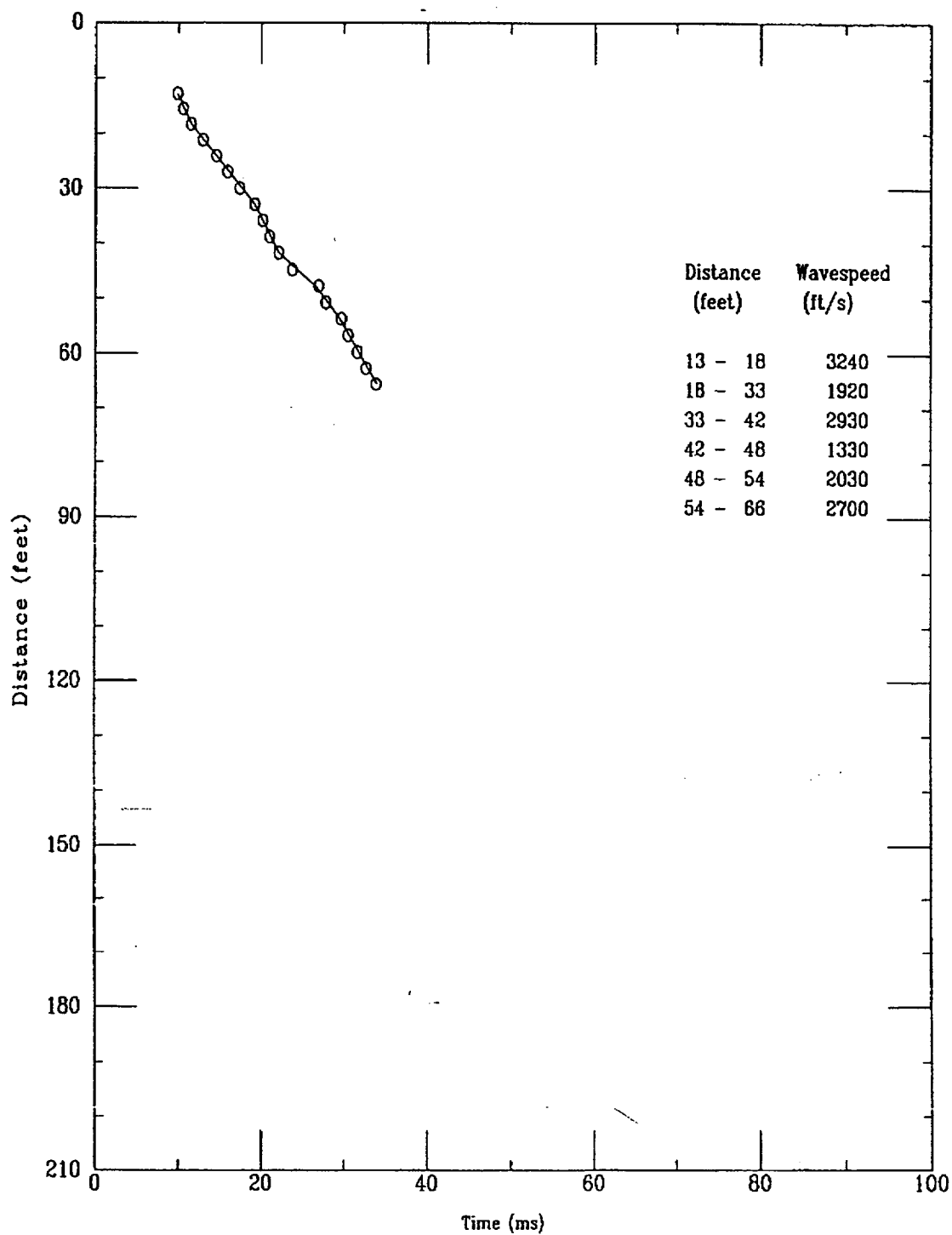
J181801S

207 of 522

Compression Wave Speeds

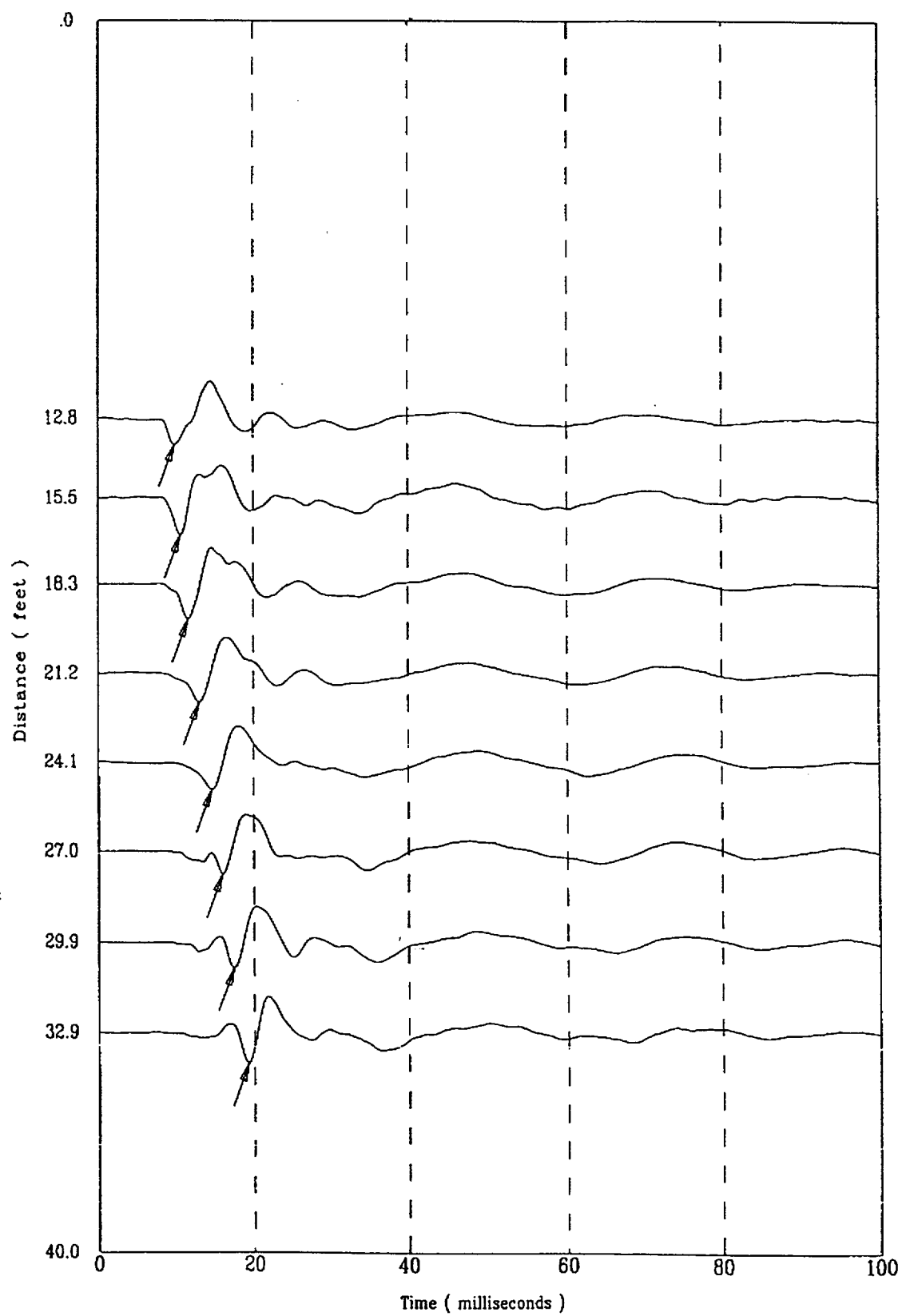


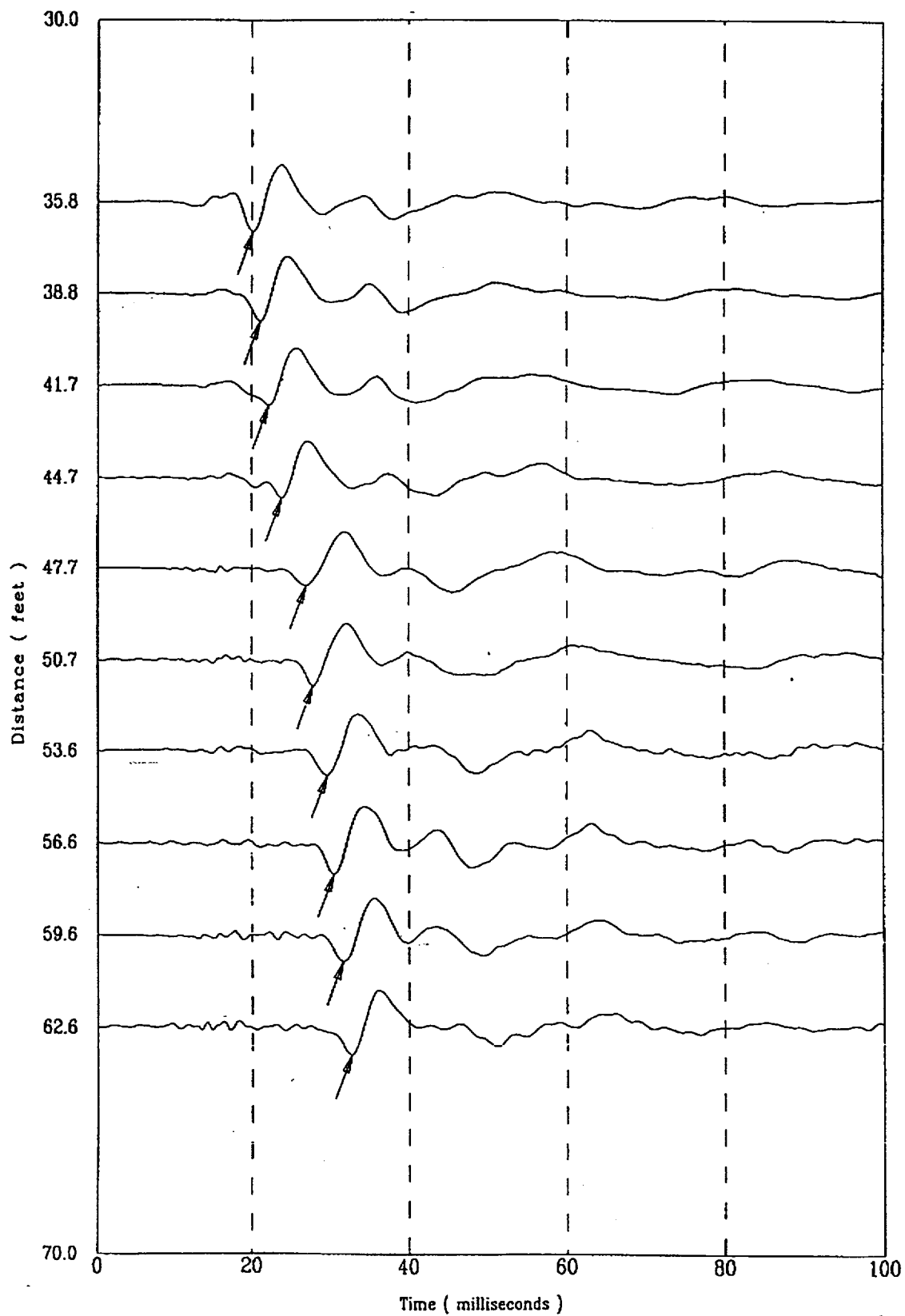
Compression Wave Time of Peak



Applied Research Associates, Inc.
CPT-155

P Wave
02/18/98

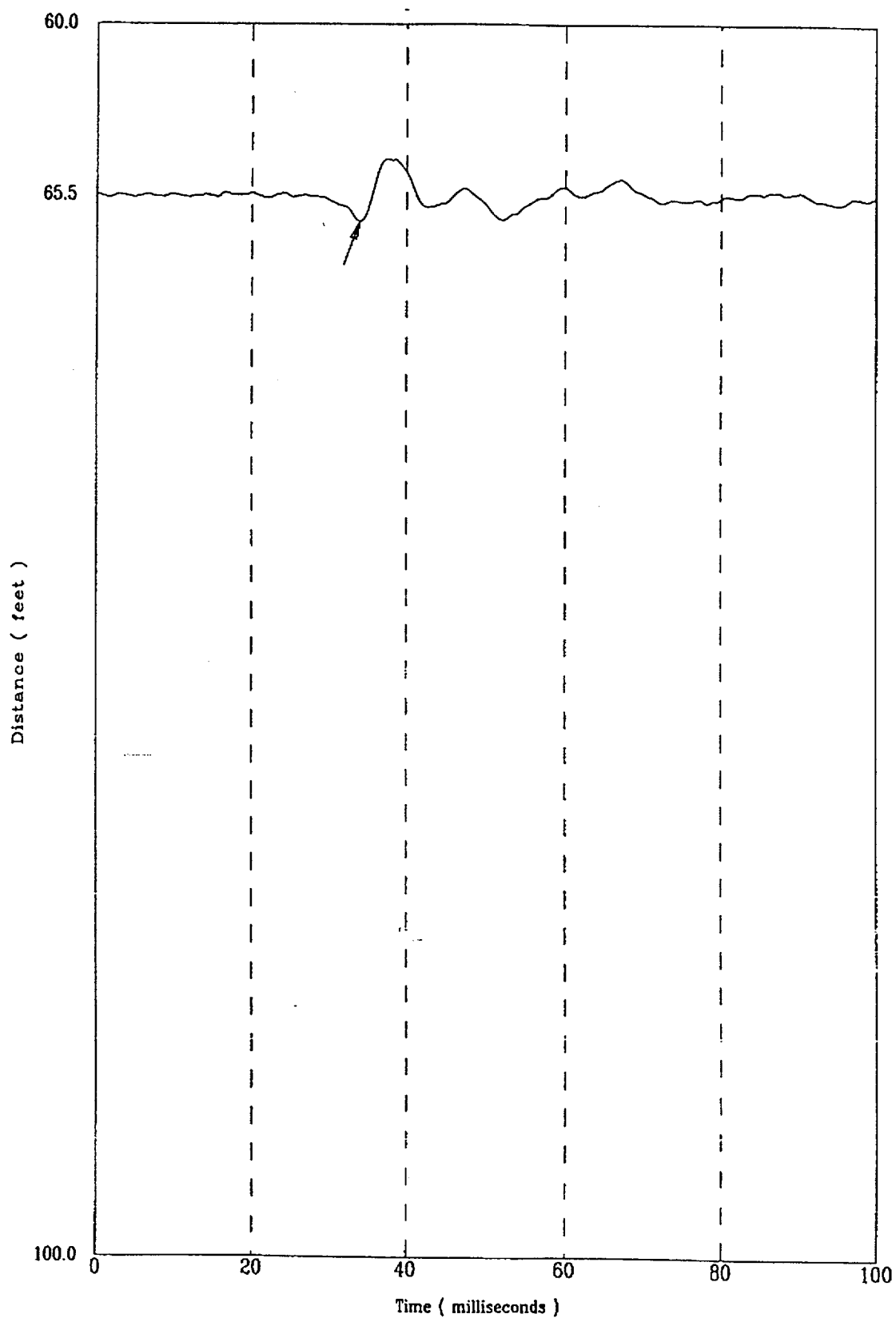




187801S

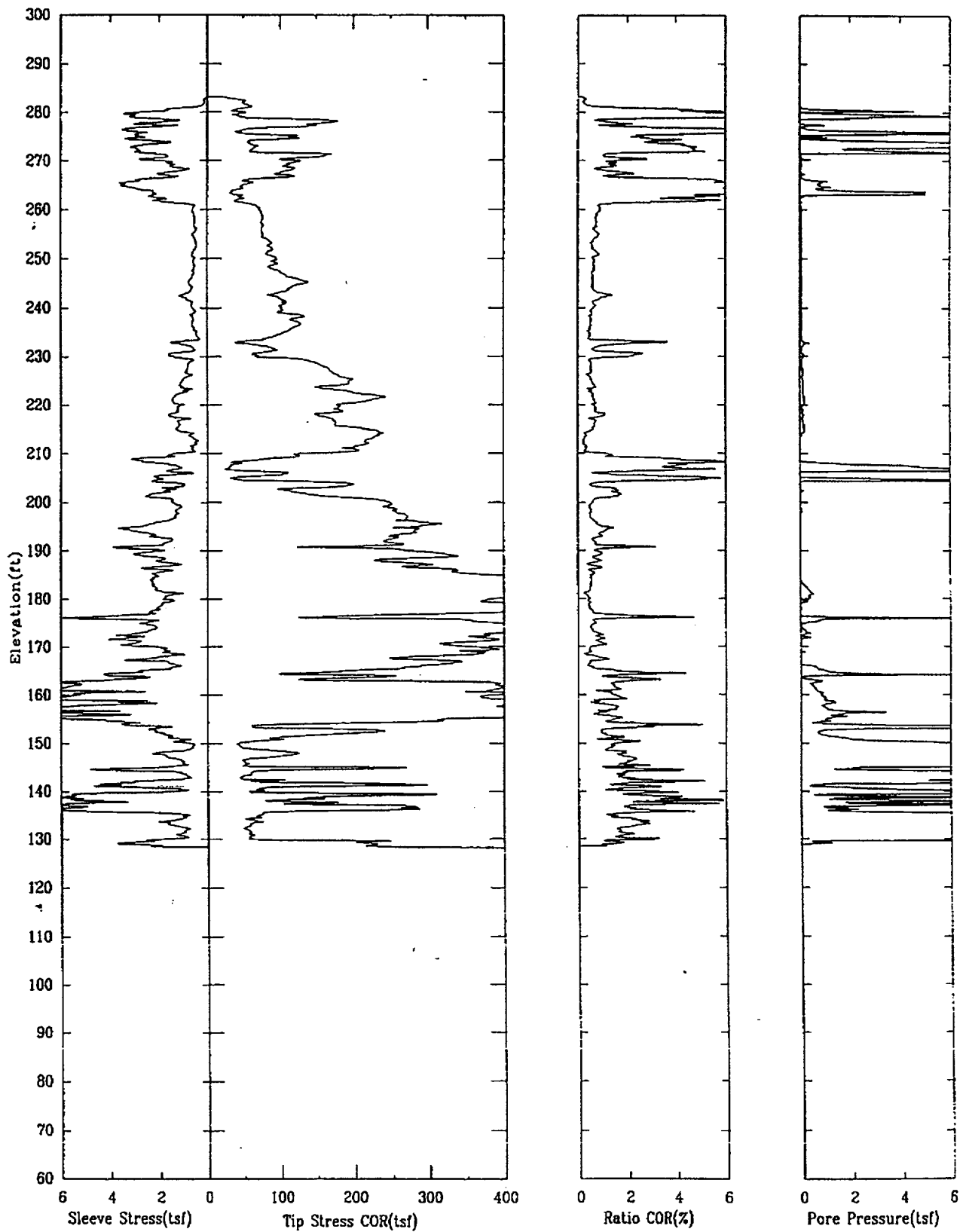
Applied Research Associates, Inc.
CPT-155

P Wave
02/18/98



File 5187801S

2/2 of 522



CPT-156

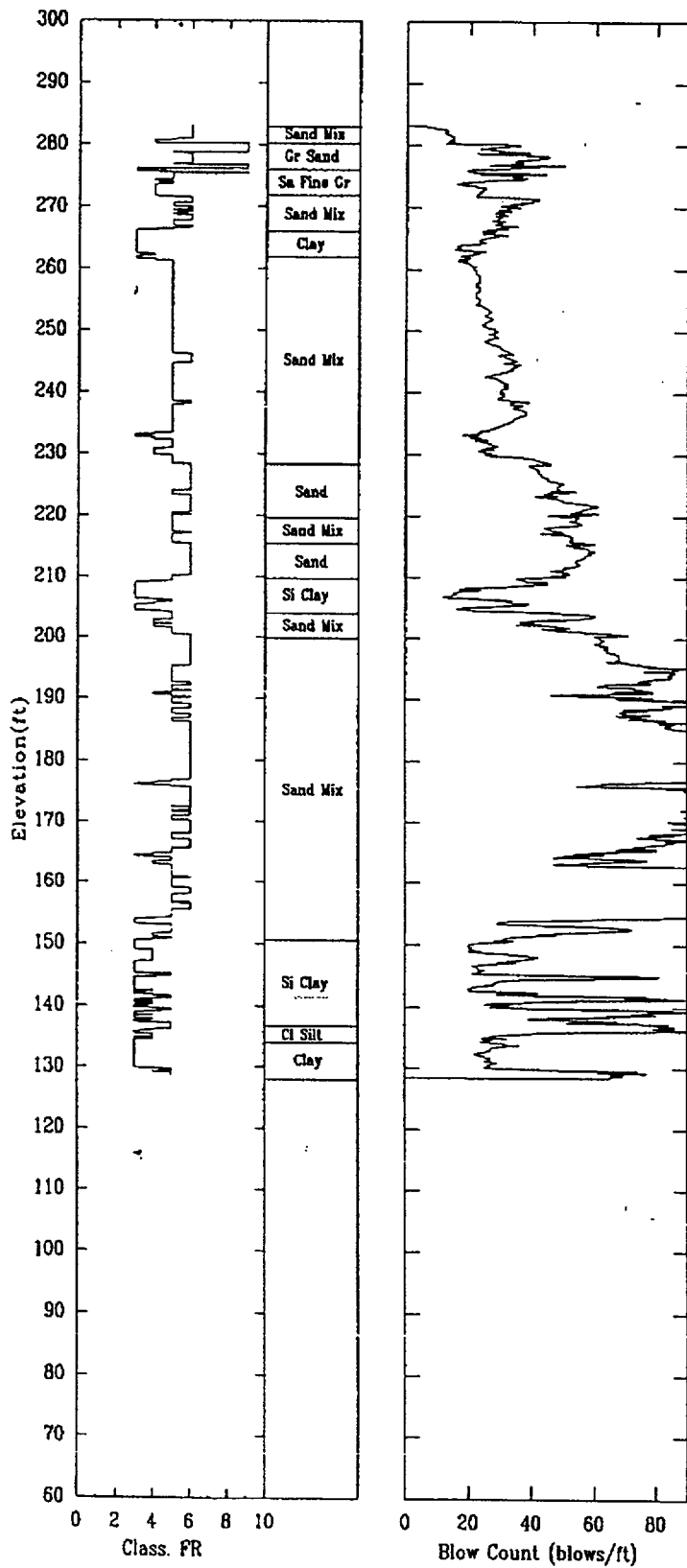
APPLIED RESEARCH ASSOCIATES, INC.

02/18/98

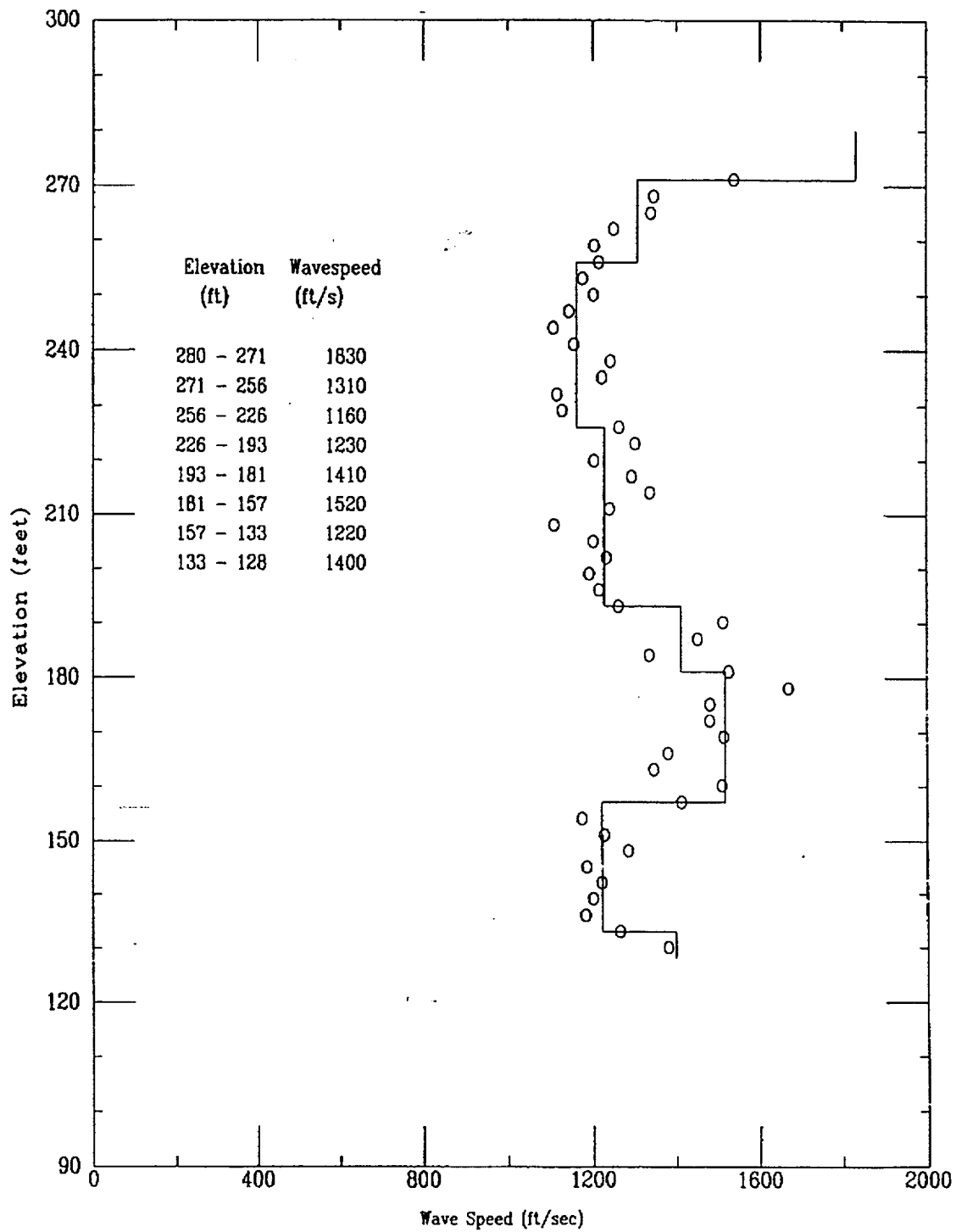
North 79244.97

East 55384.98

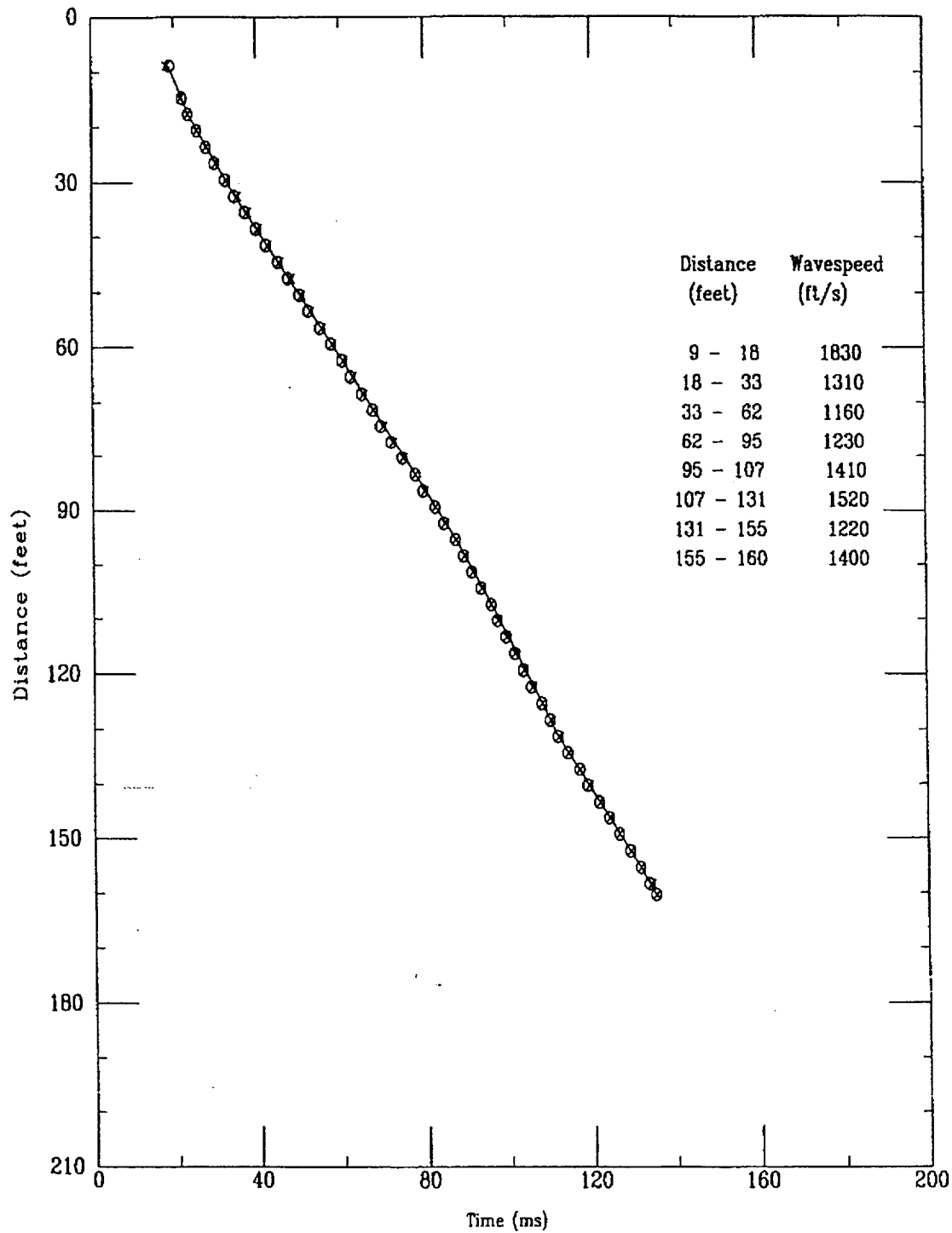
Elevation 289.2

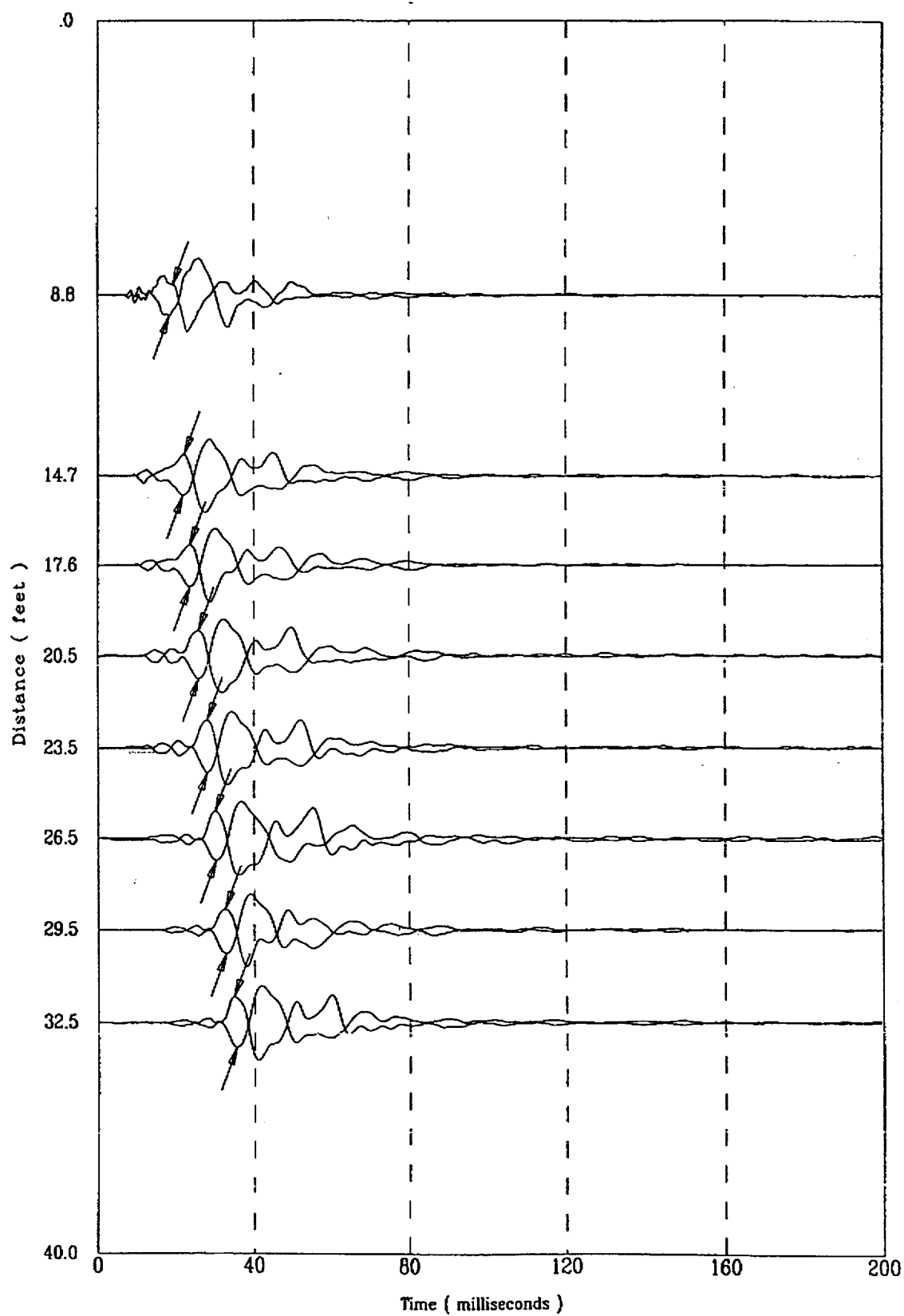


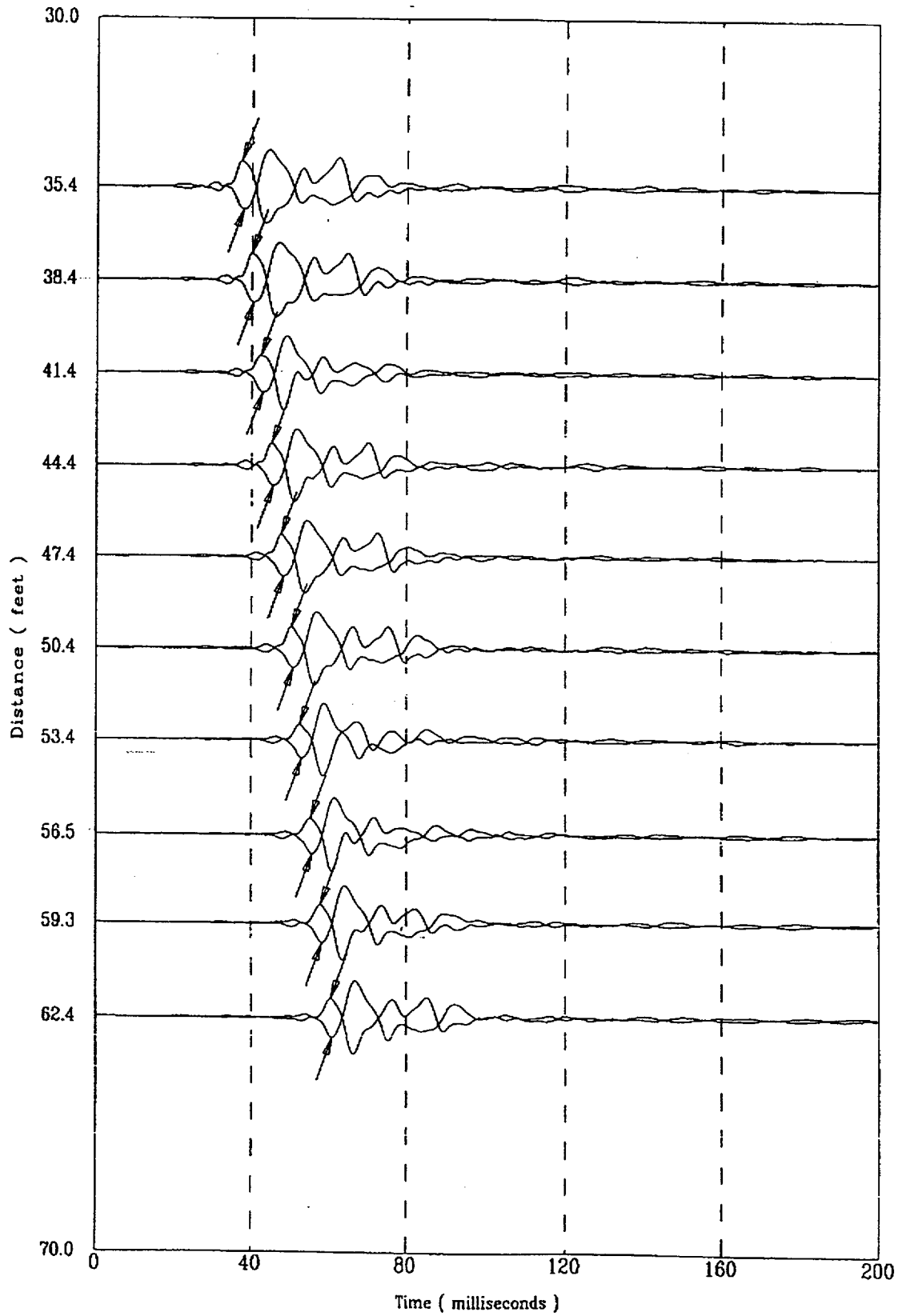
Shear Wave Speeds



Shear Wave Time of Peak

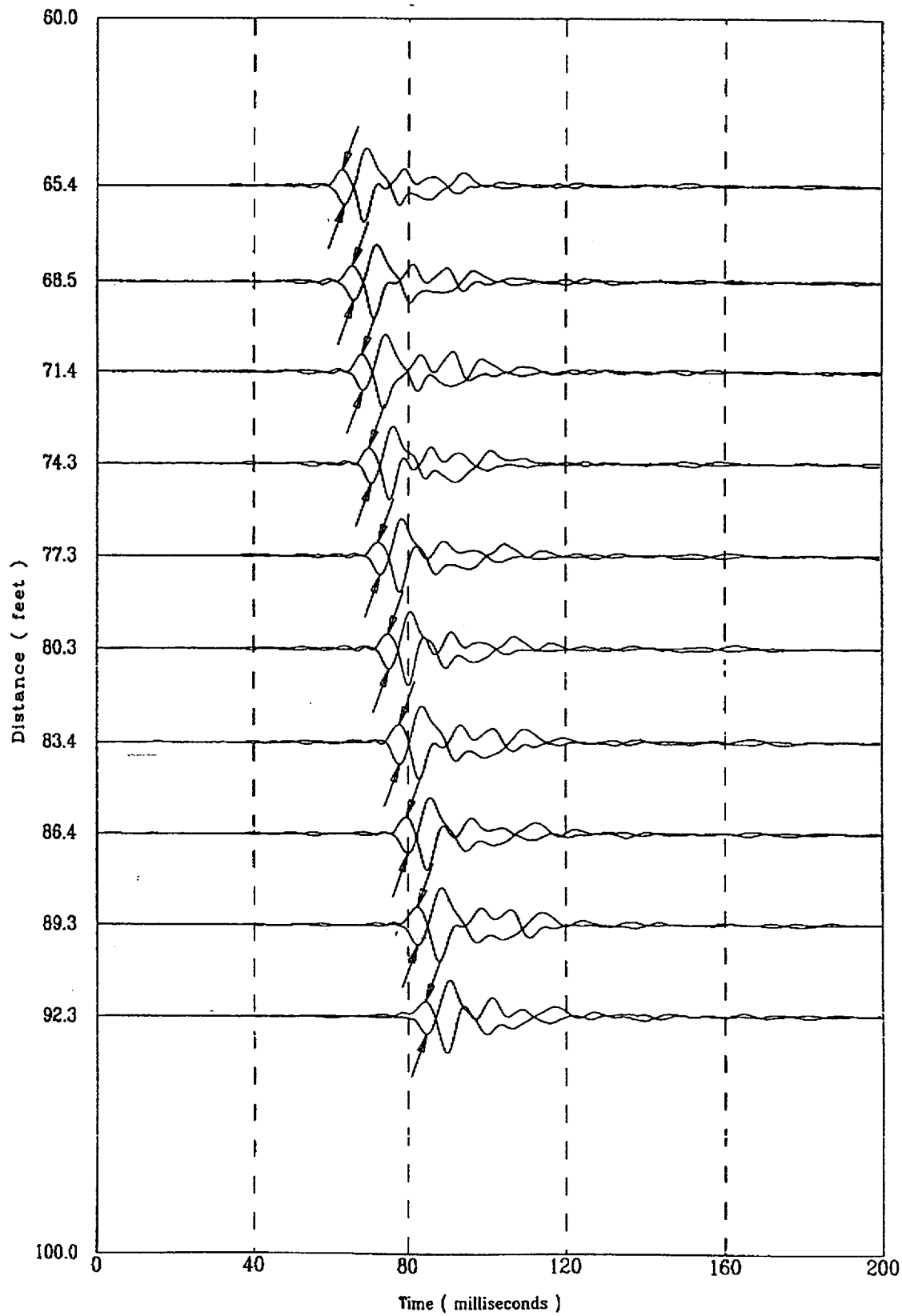






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CPT-156

S Wave
02/18/98

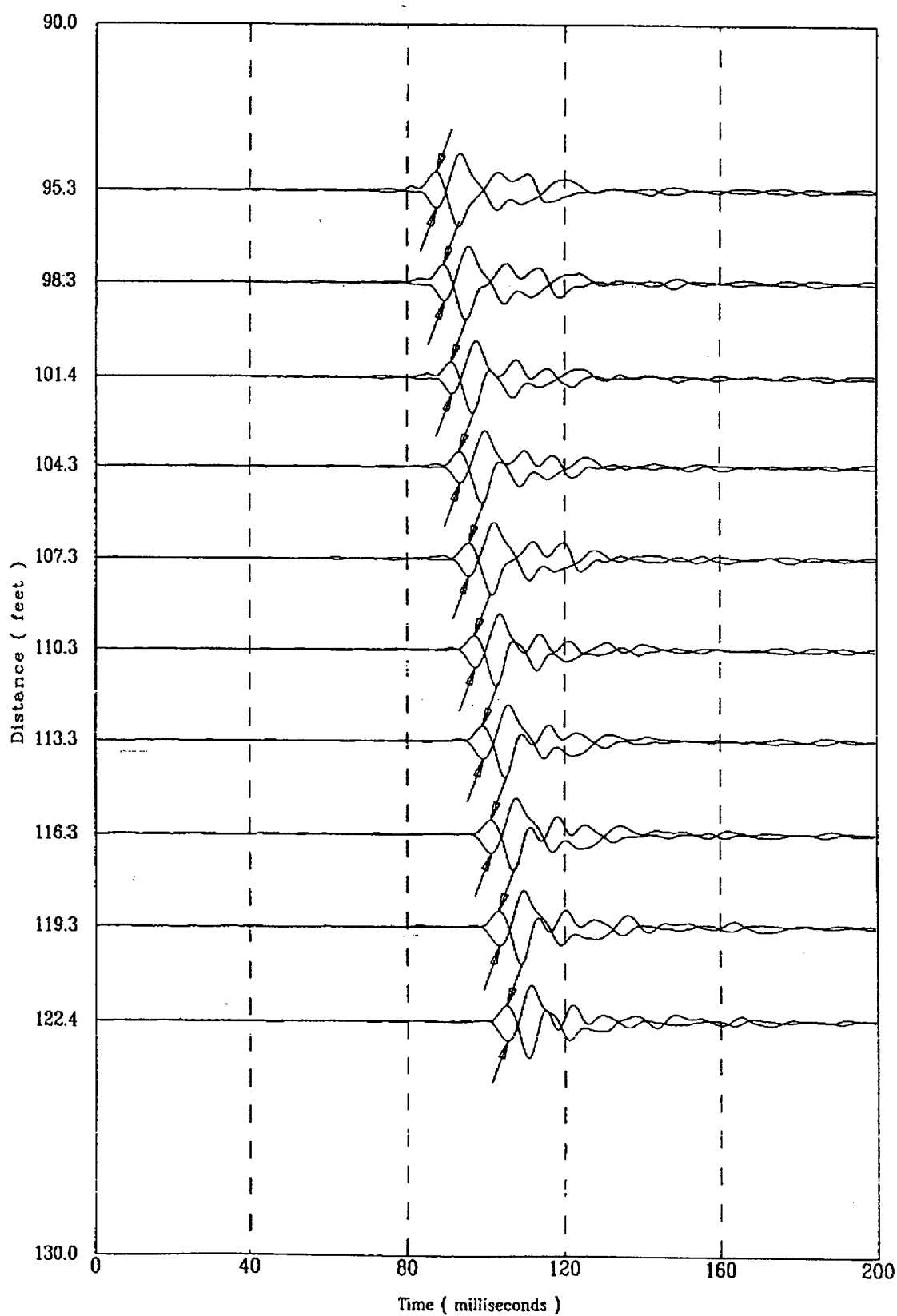


.181804S

219 of 522

Applied Research Associates, Inc.
CPT-156

S Wave
02/18/98

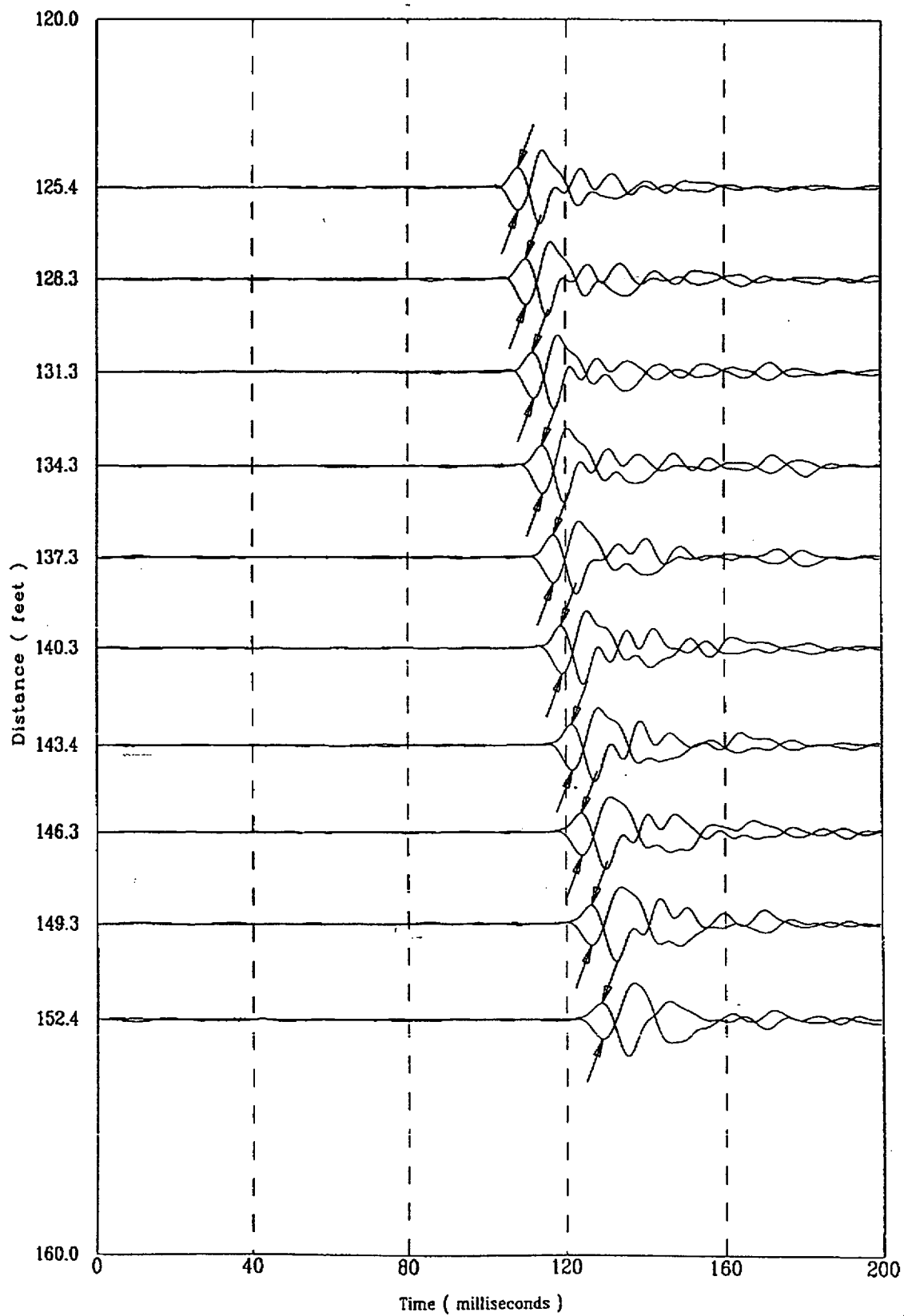


File 518/804S

220 of 522

Applied Research Associates, Inc.
CPT-156

S Wave
02/18/98

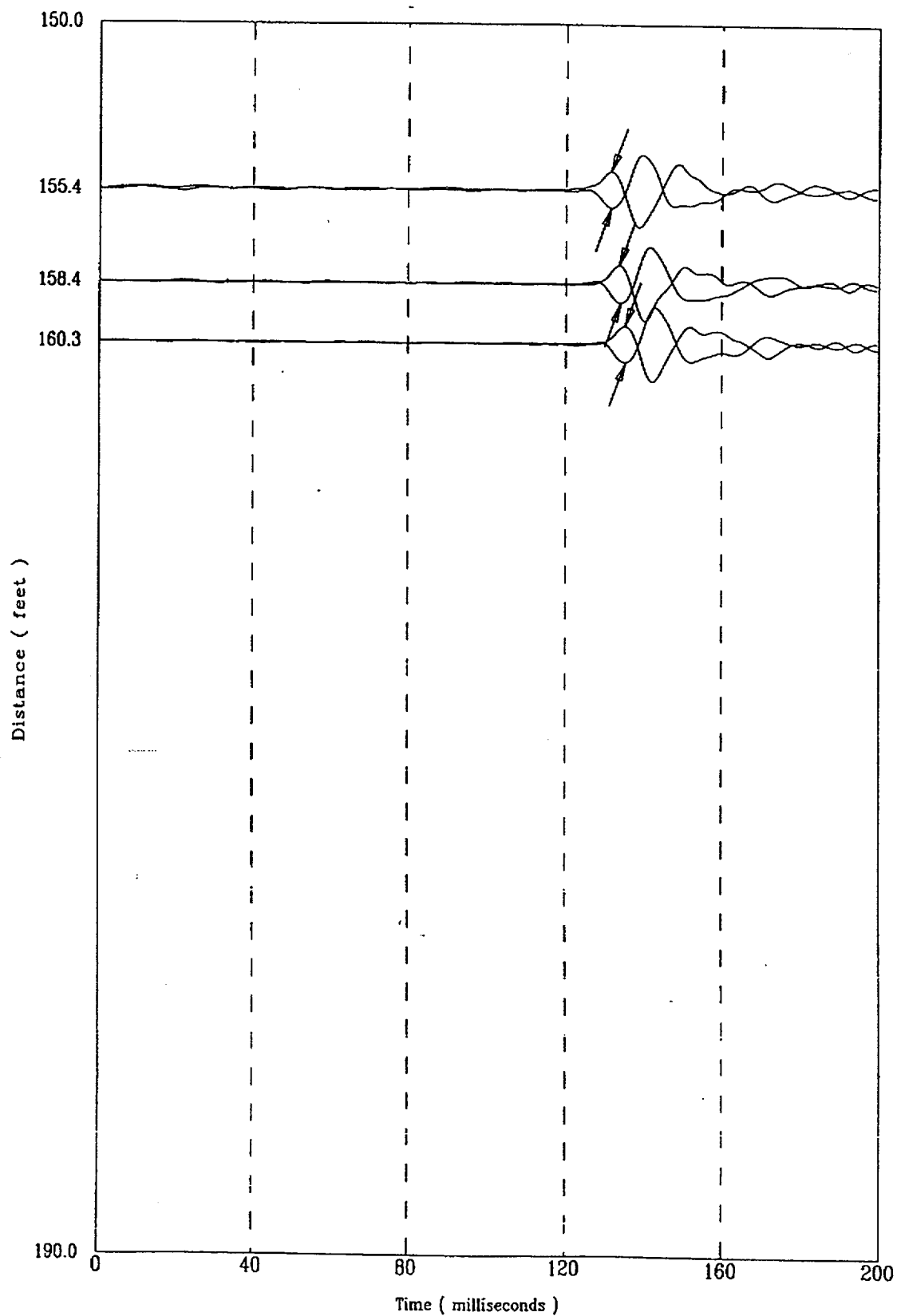


518/804S

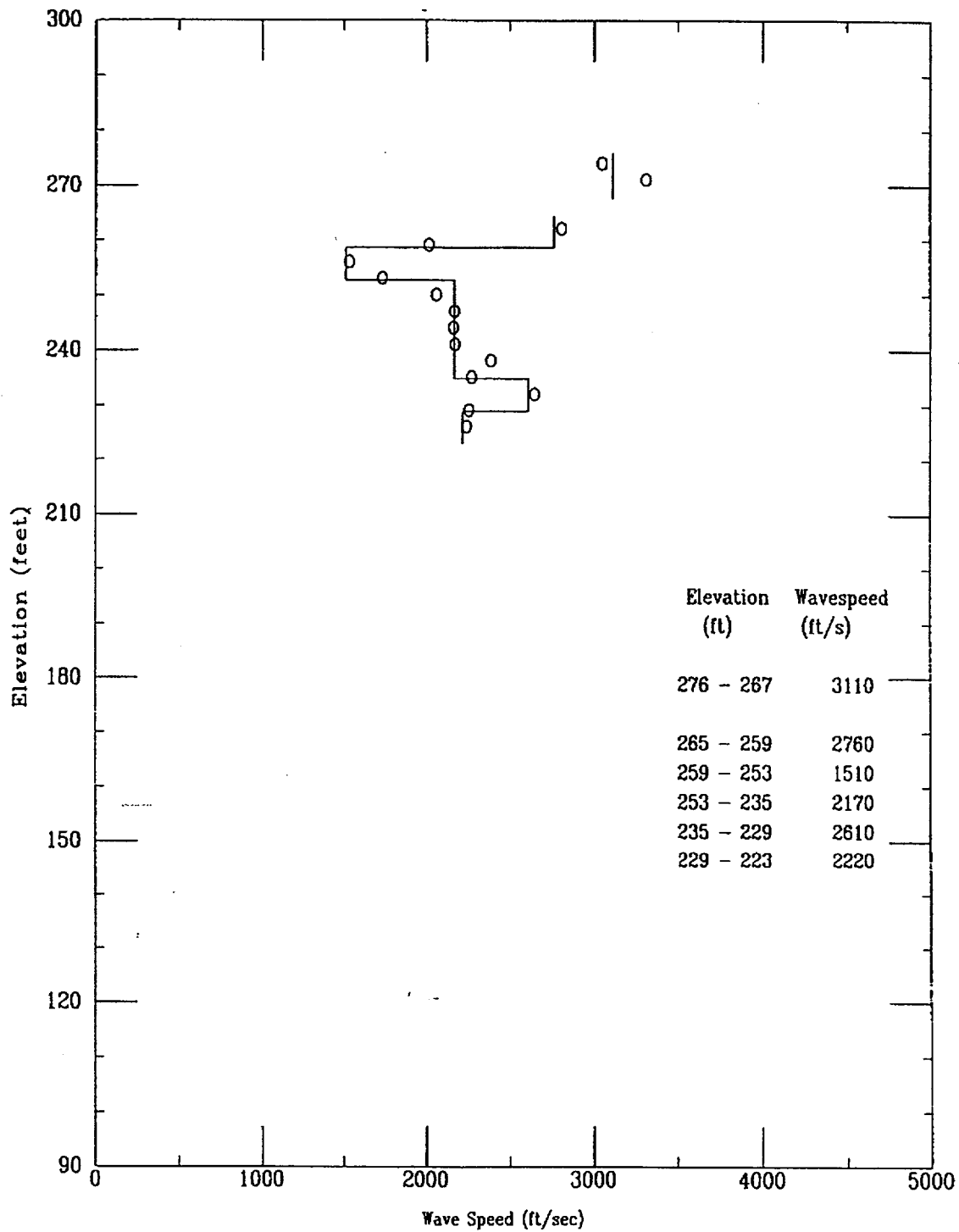
221 of 522

Applied Research Associates, Inc.
CPT-156

S Wave
02/18/98



Compression Wave Speeds

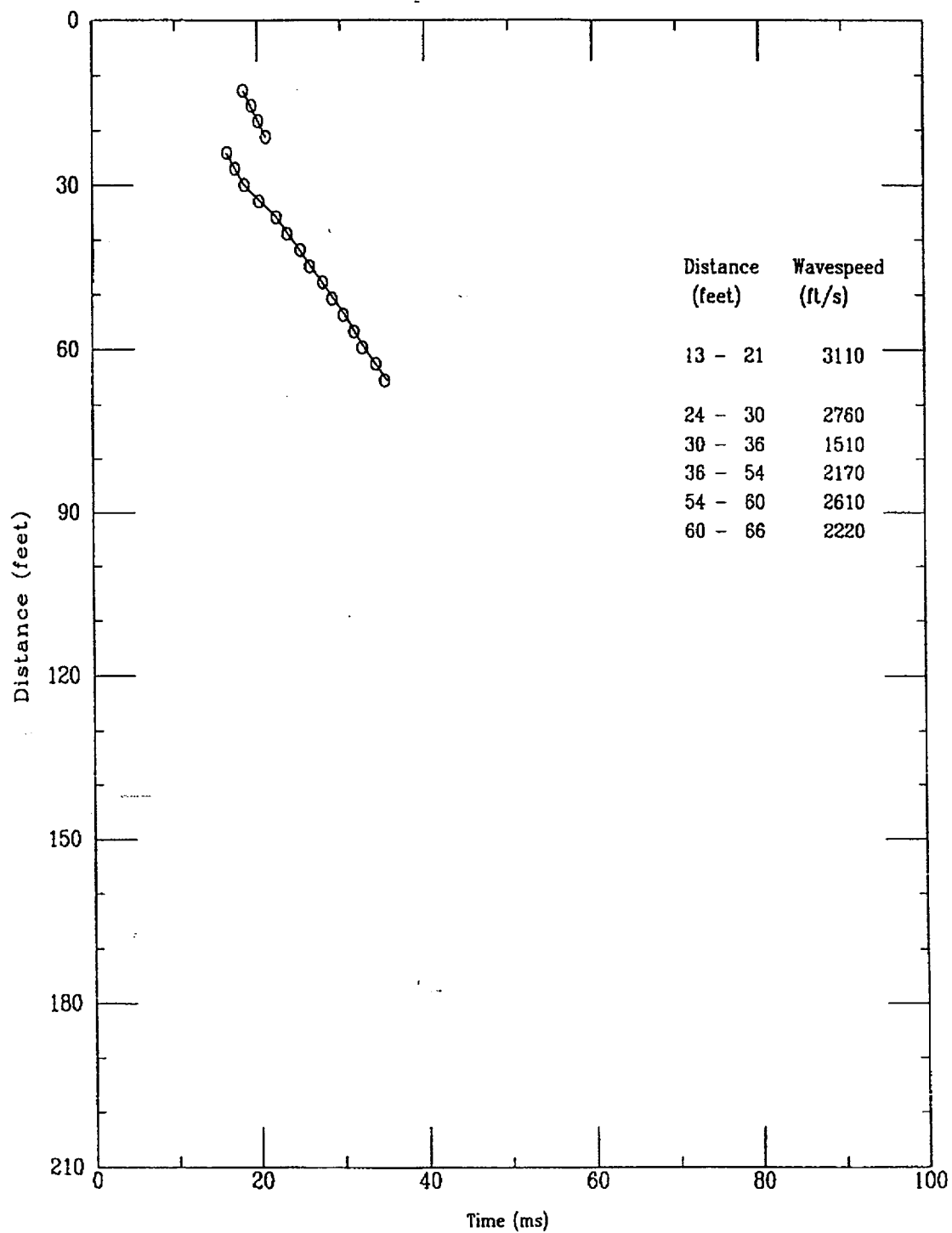


CPT-156

APPLIED RESEARCH ASSOCIATES, INC.

02/18/98

Compression Wave Time of Peak

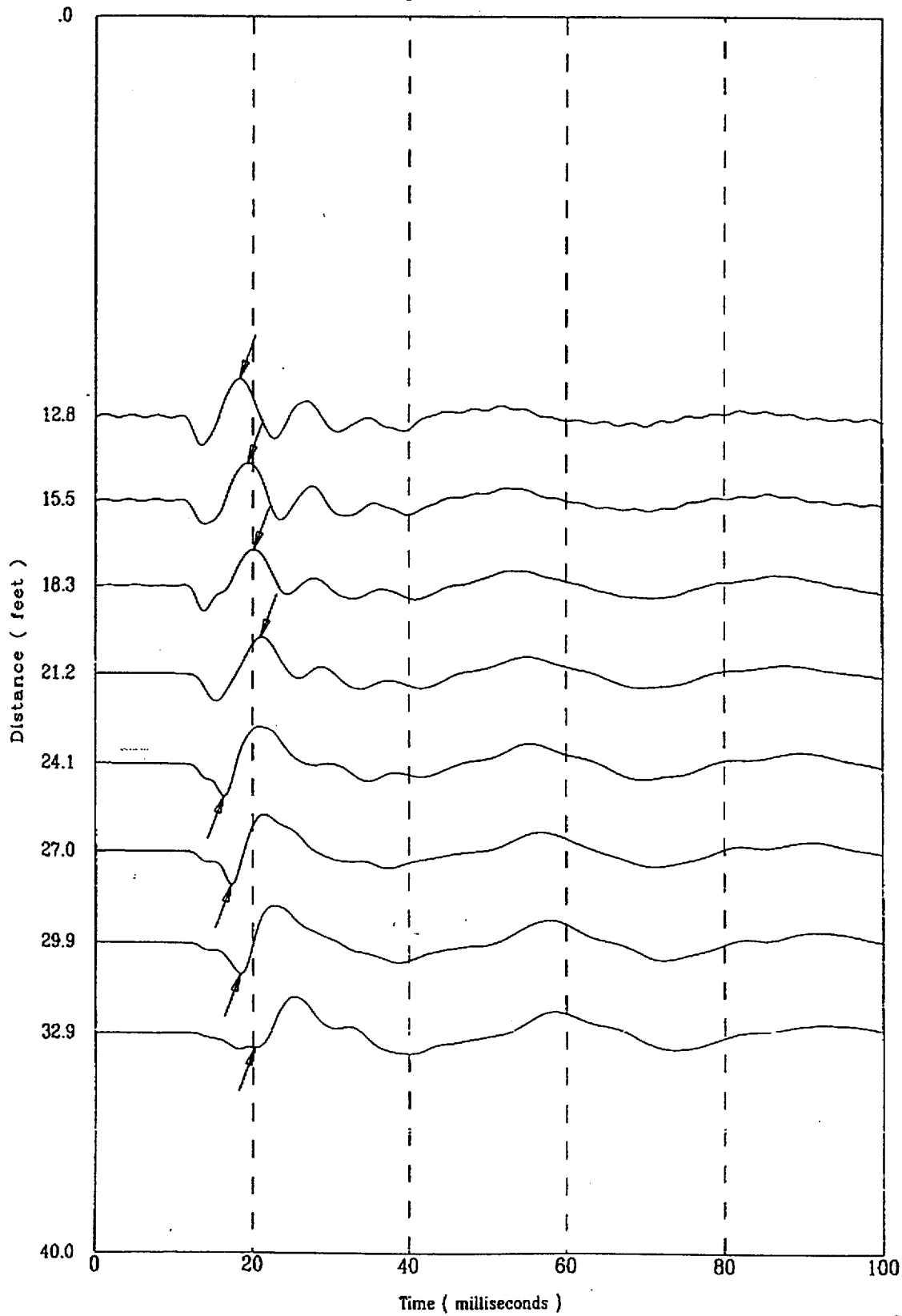


File 518f804S

224 of 522

Applied Research Associates, Inc.
CPT-156

P Wave
02/18/98

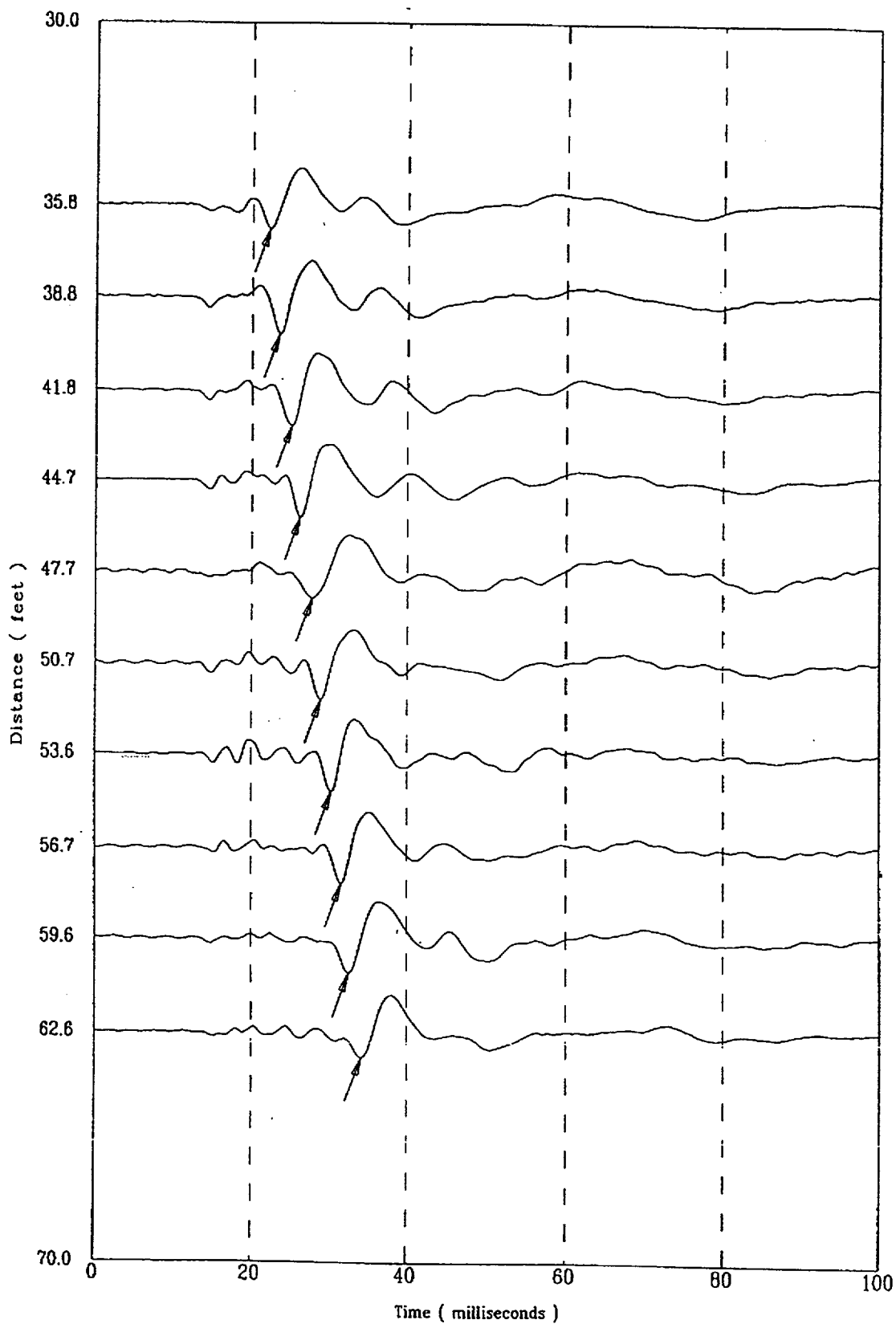


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225 of 522

Applied Research Associates, Inc.
CPT-156

P Wave
02/18/98

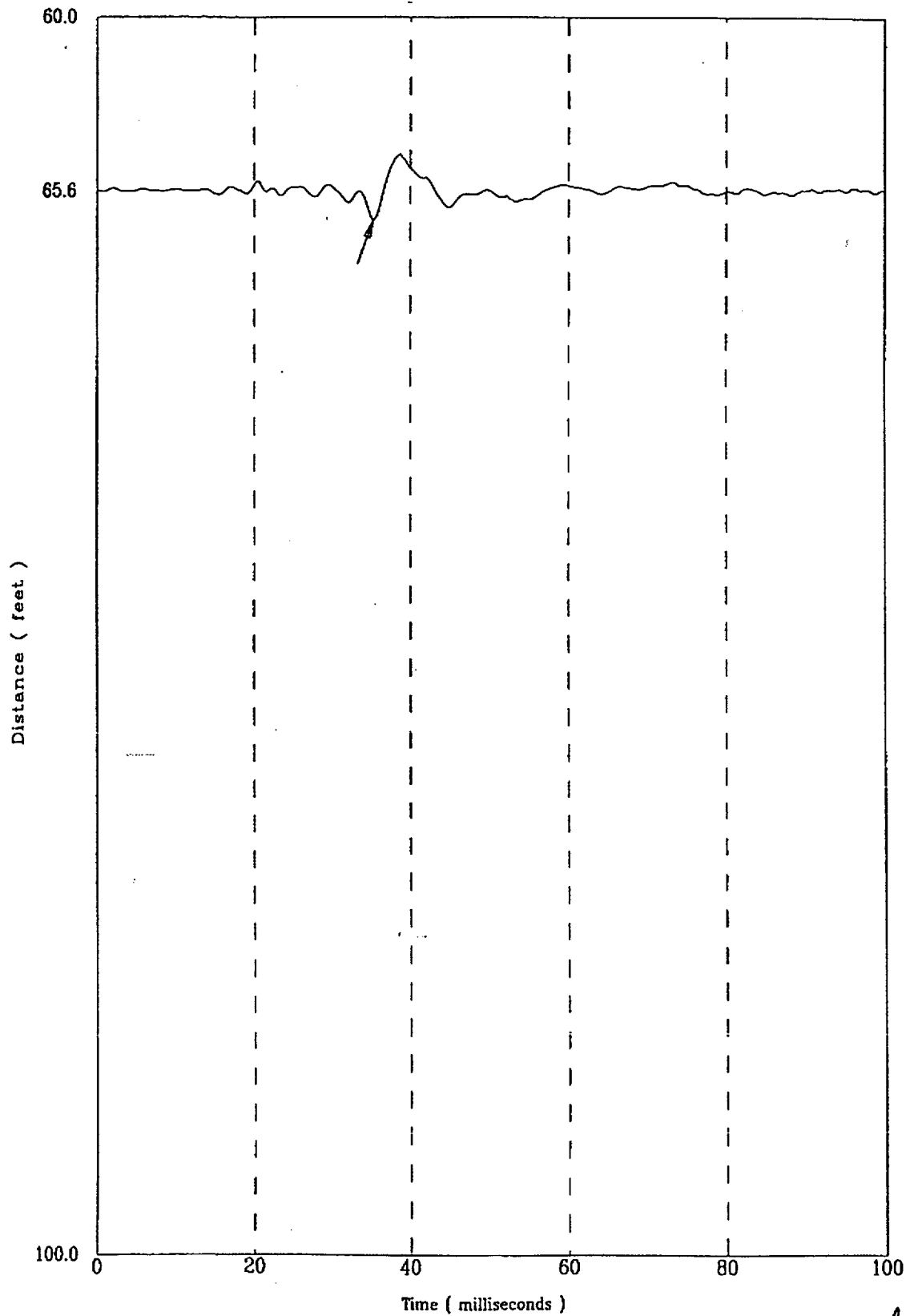


File 5181804S

226 of 522

Applied Research Associates, Inc.
CPT-156

P Wave
02/18/98



J1BR004S

227 of 522

CPT-157

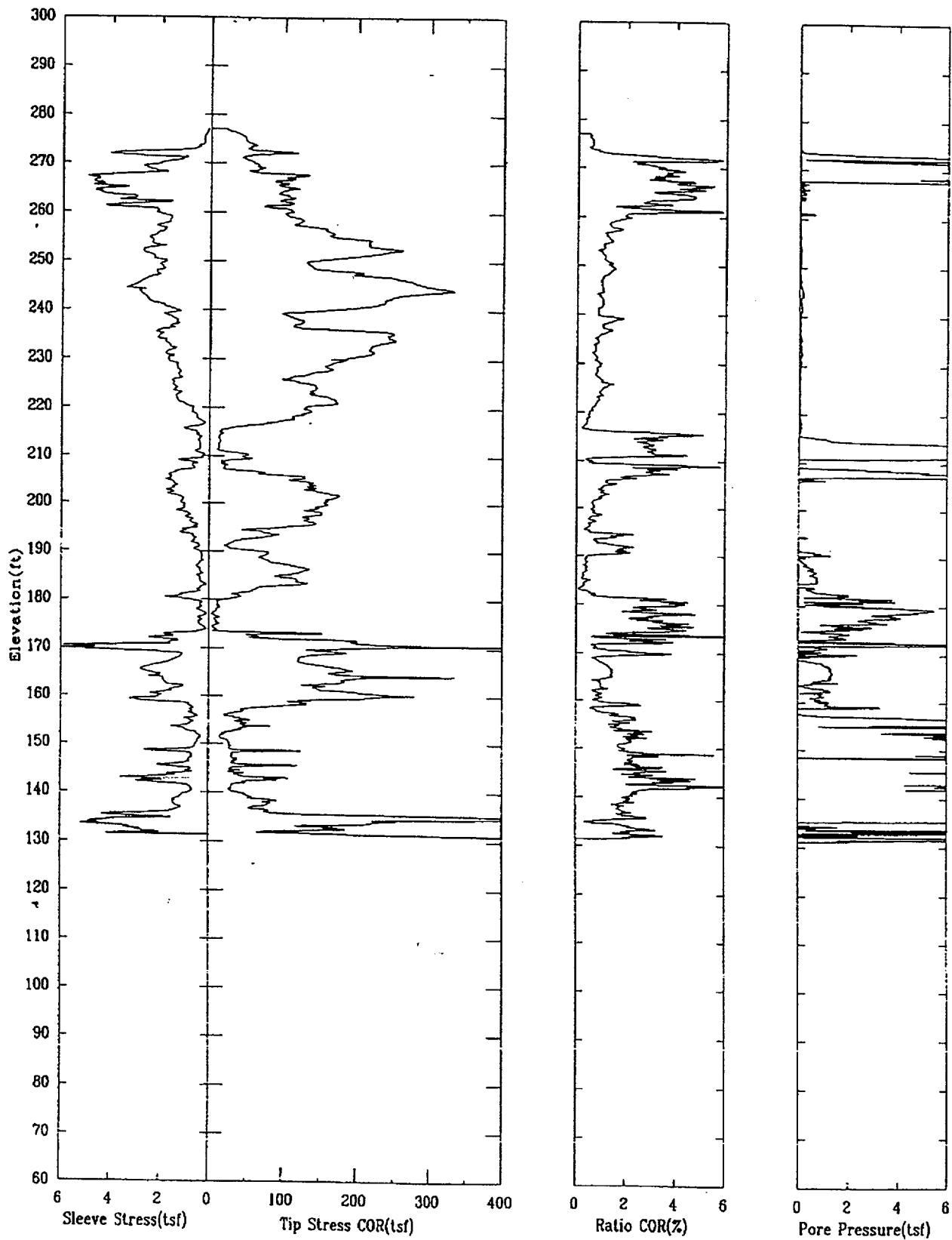
APPLIED RESEARCH ASSOCIATES, INC.

03/05/98

North 79244.98

East 55517.98

Elevation 283.1



CPT-157

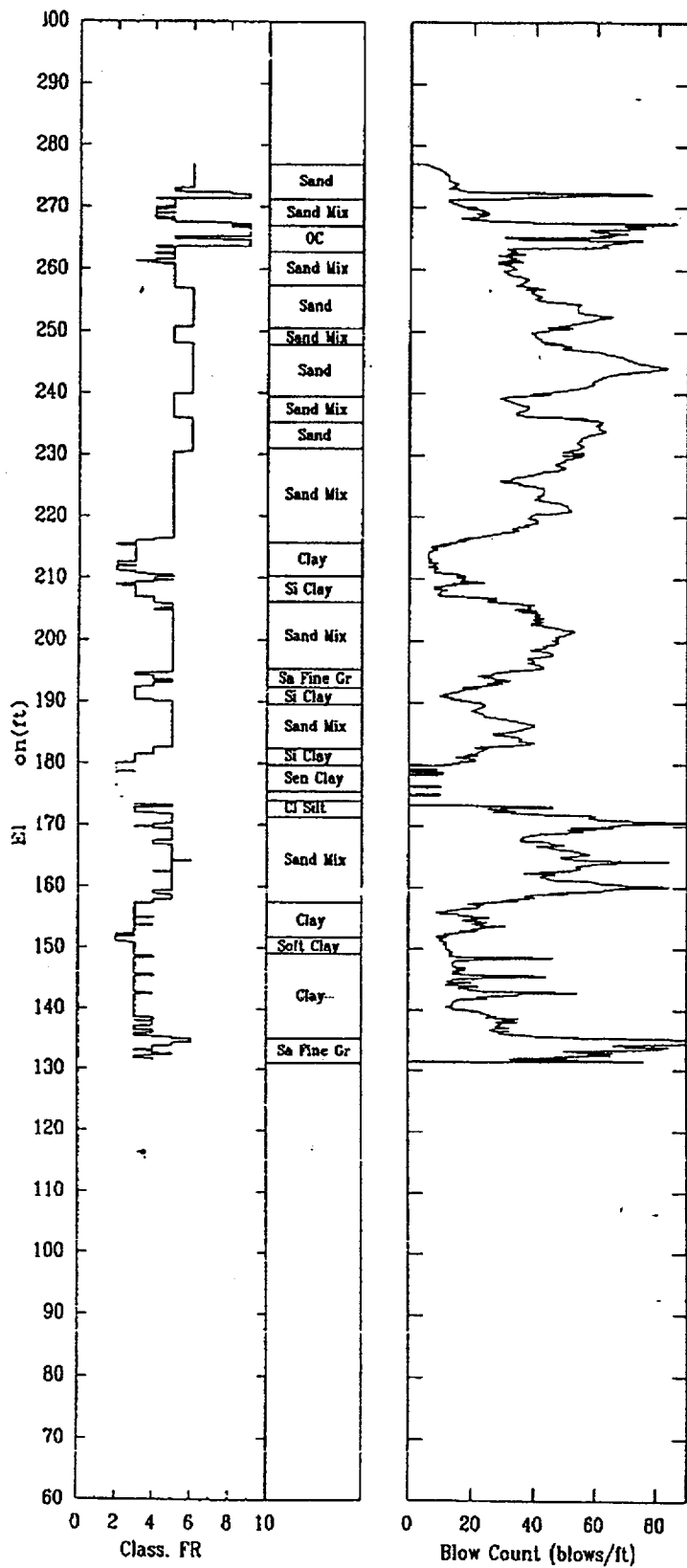
APPLIED RESEARCH ASSOCIATES, INC.

03/05/98

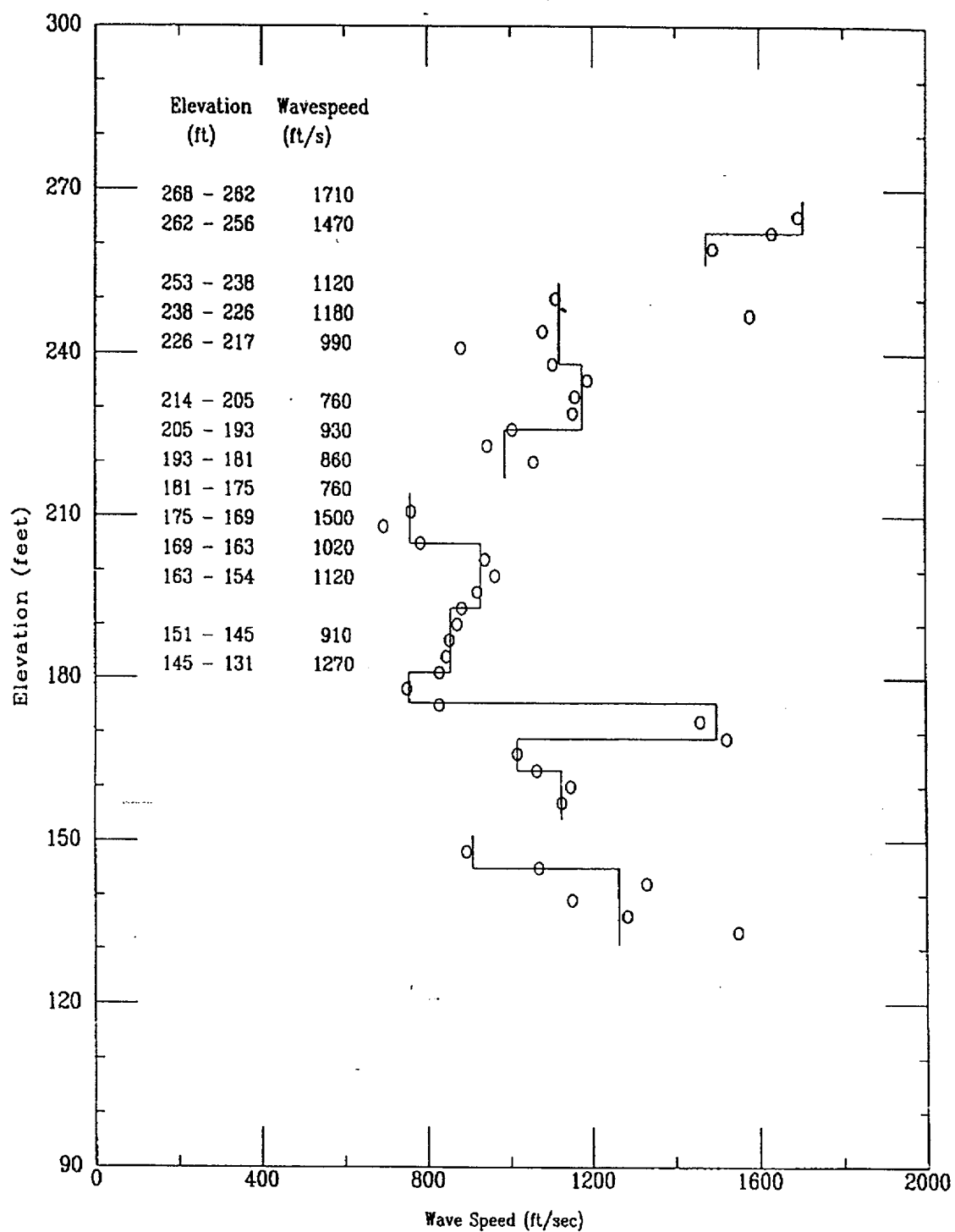
North 79244.98

East 55517.98

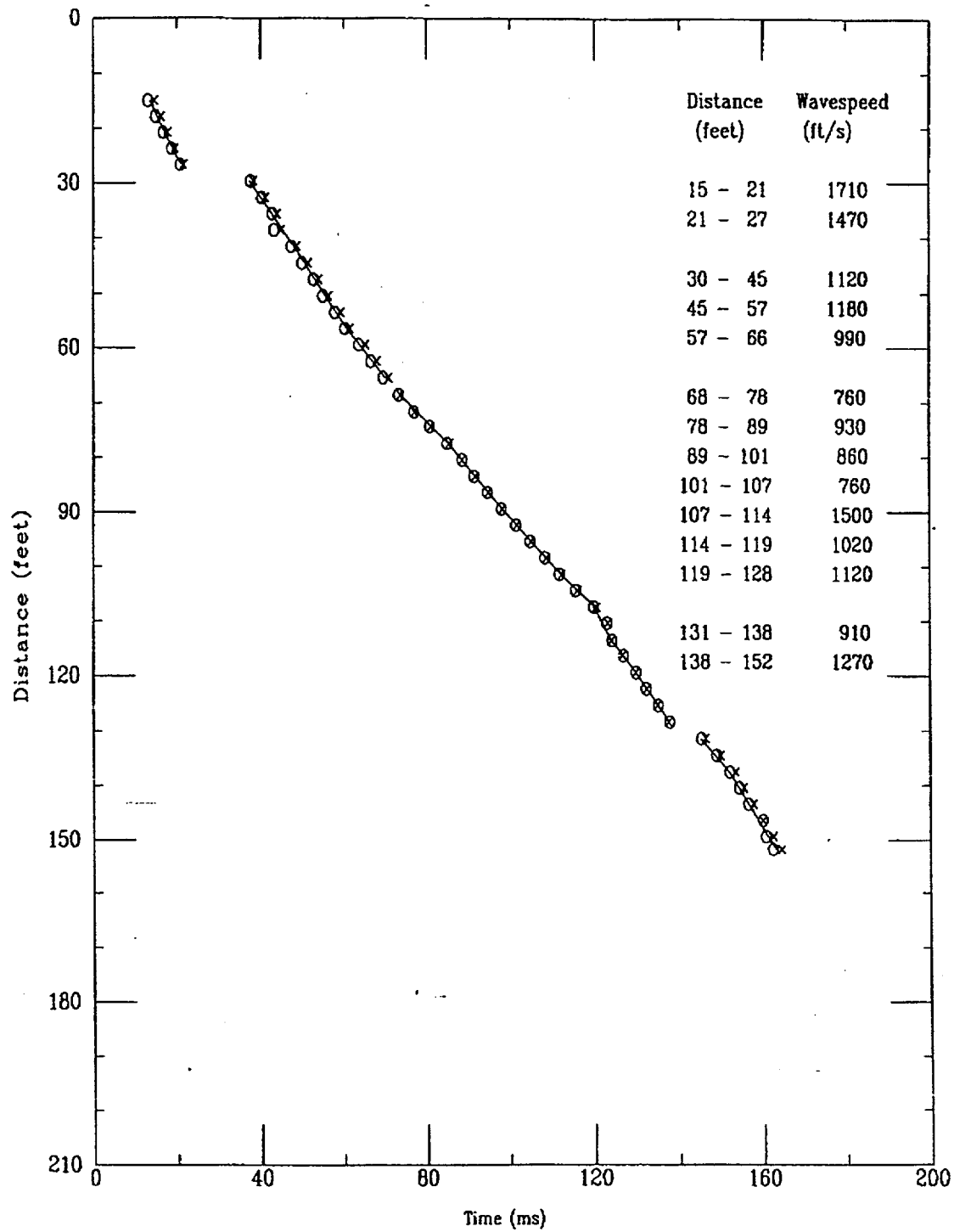
Elevation 283.1

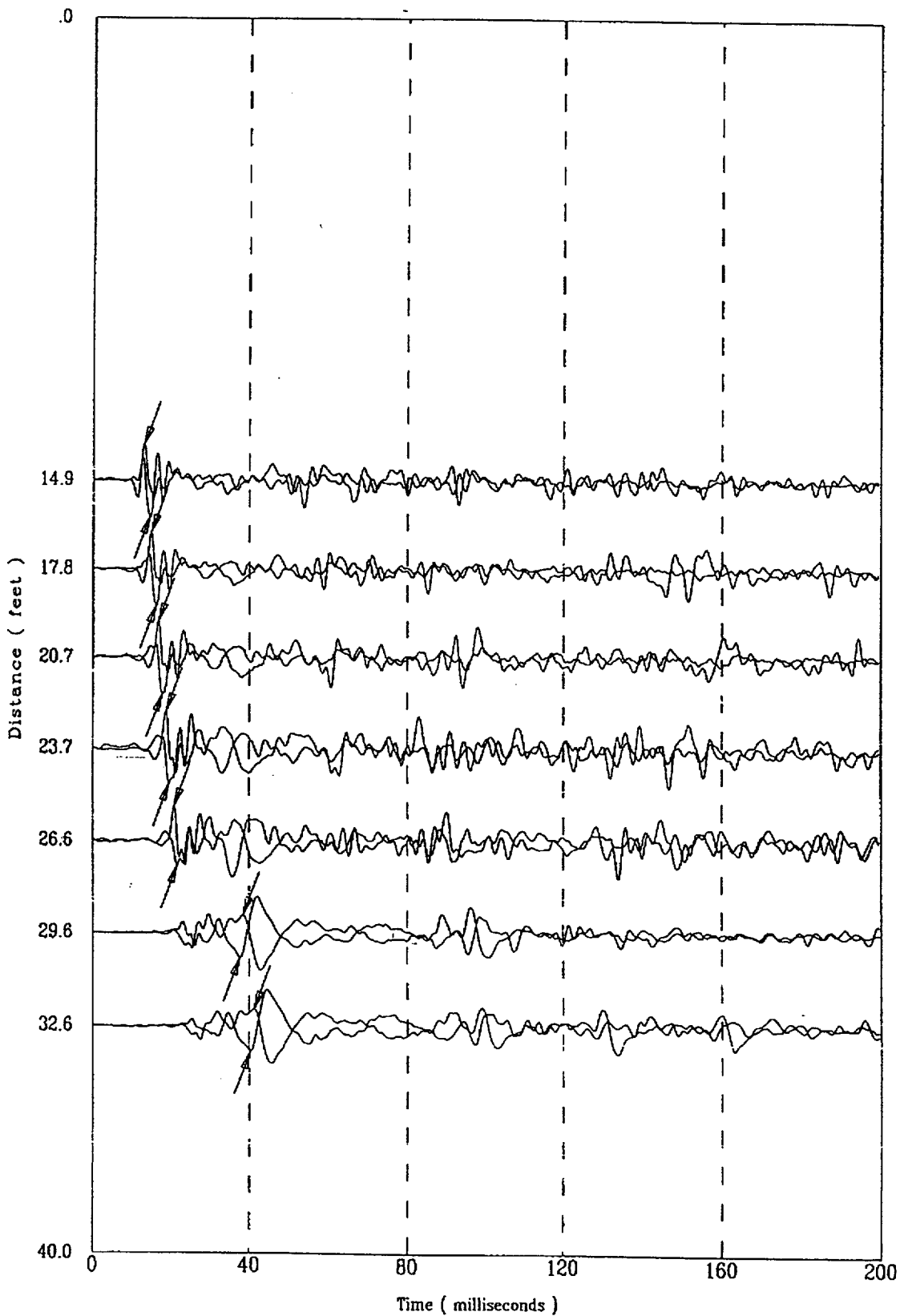


Shear Wave Speeds



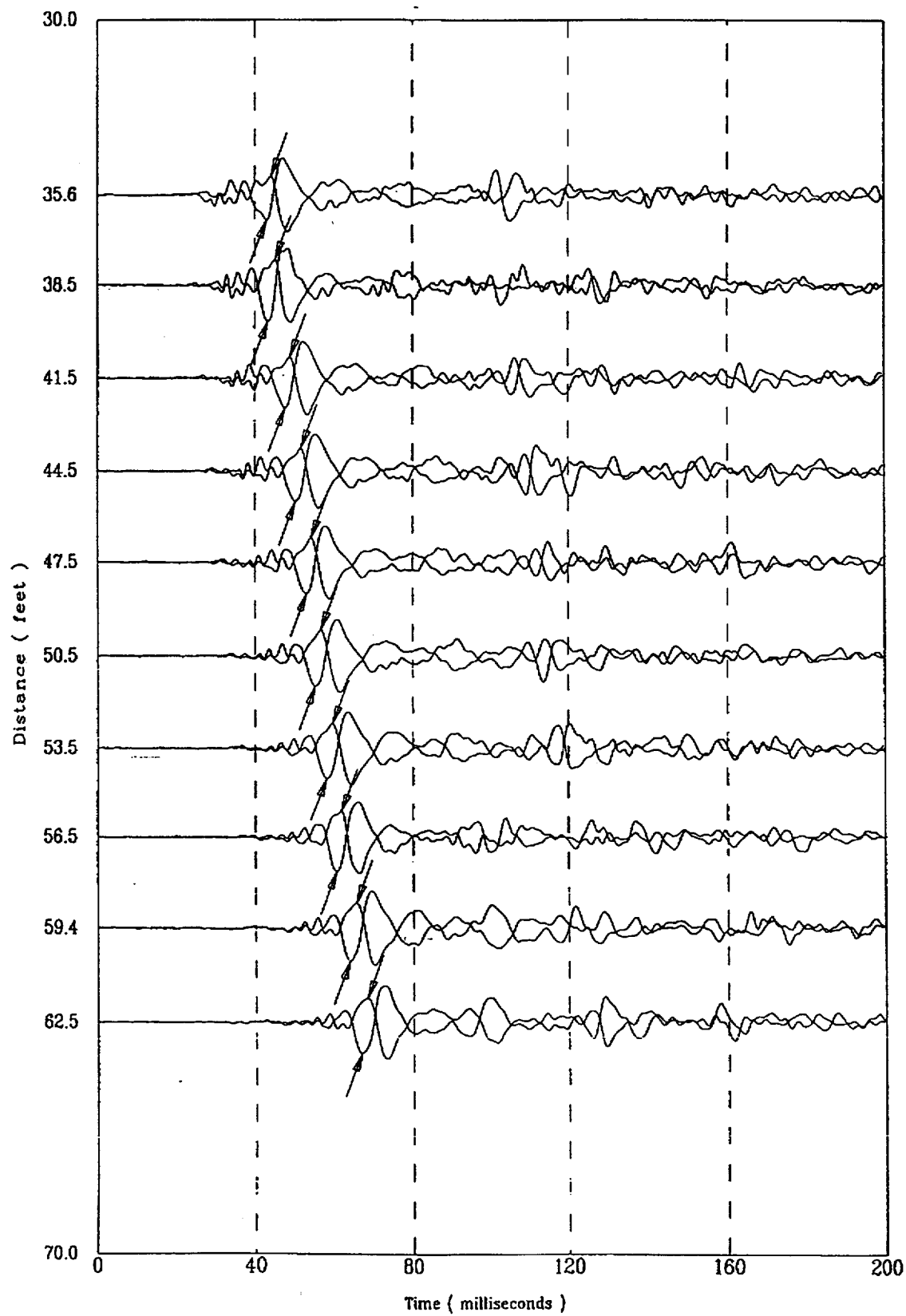
Shear Wave Time of Peak





Applied Research Associates, Inc.
CPT-157

S Wave
03/05/98

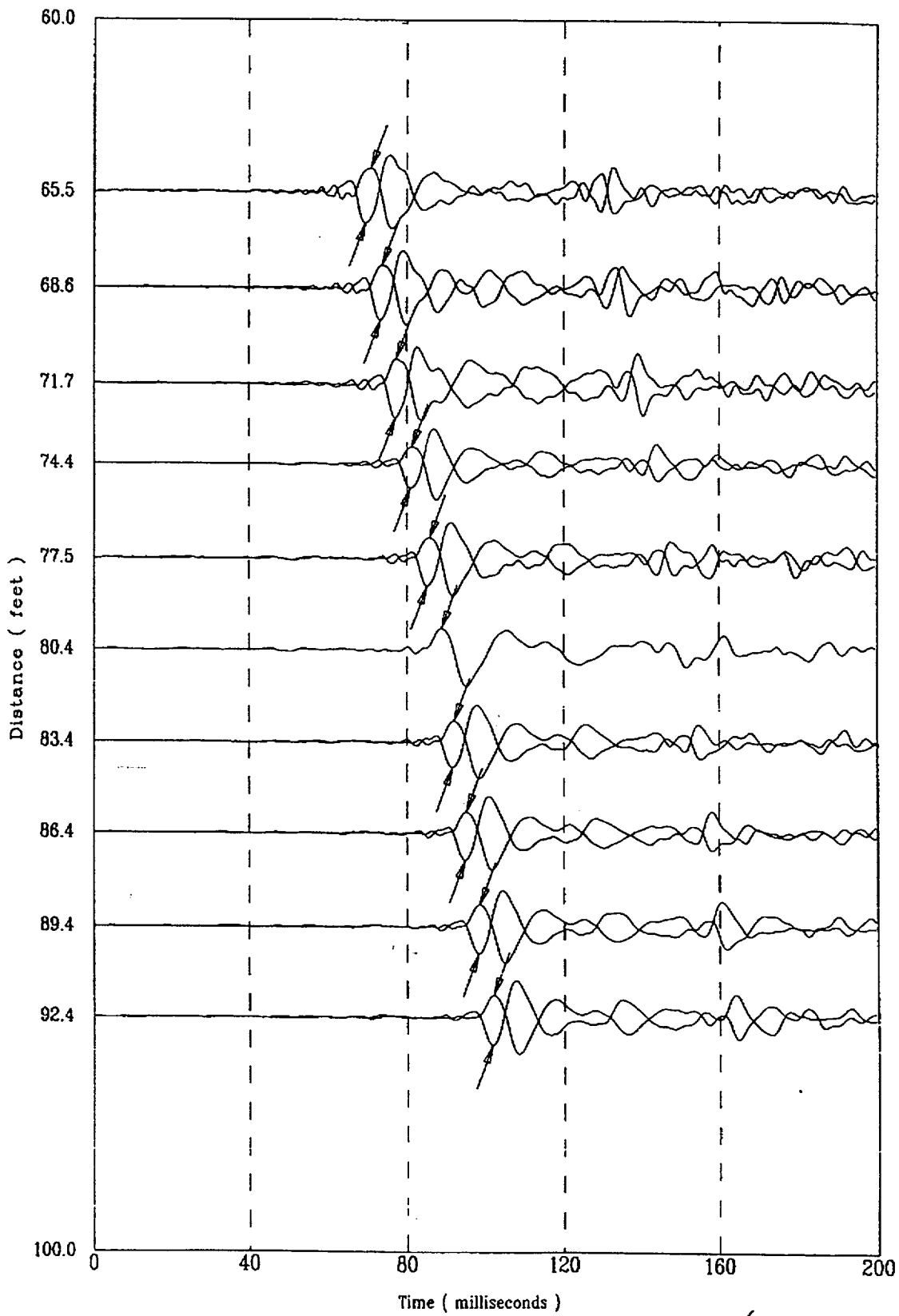


J5m804S

233 of 522

Applied Research Associates, Inc.
CPT-157

S Wave
03/05/98

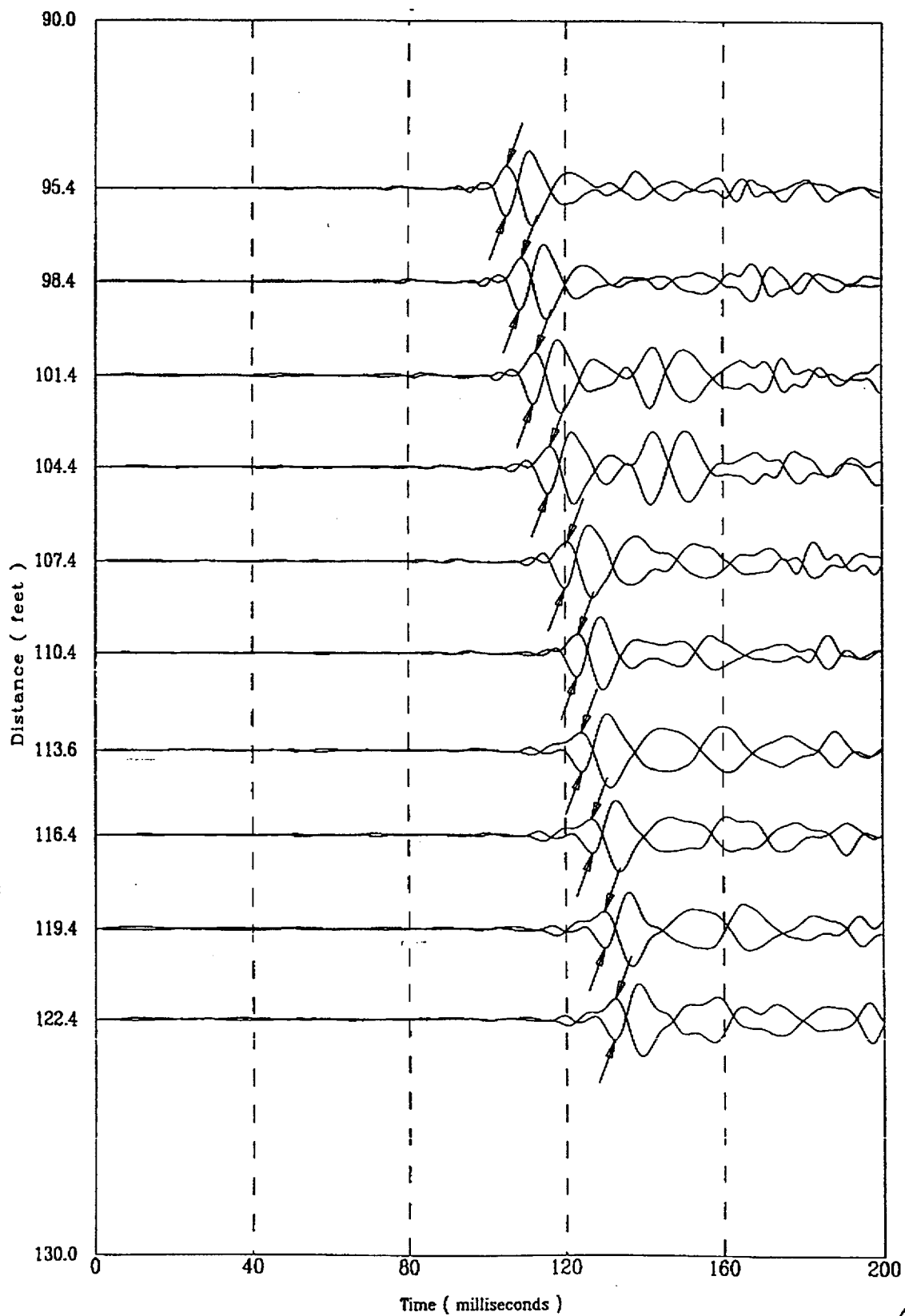


File 405m804S

234 of 522

Applied Research Associates, Inc.
CPT-157

S Wave
03/05/98

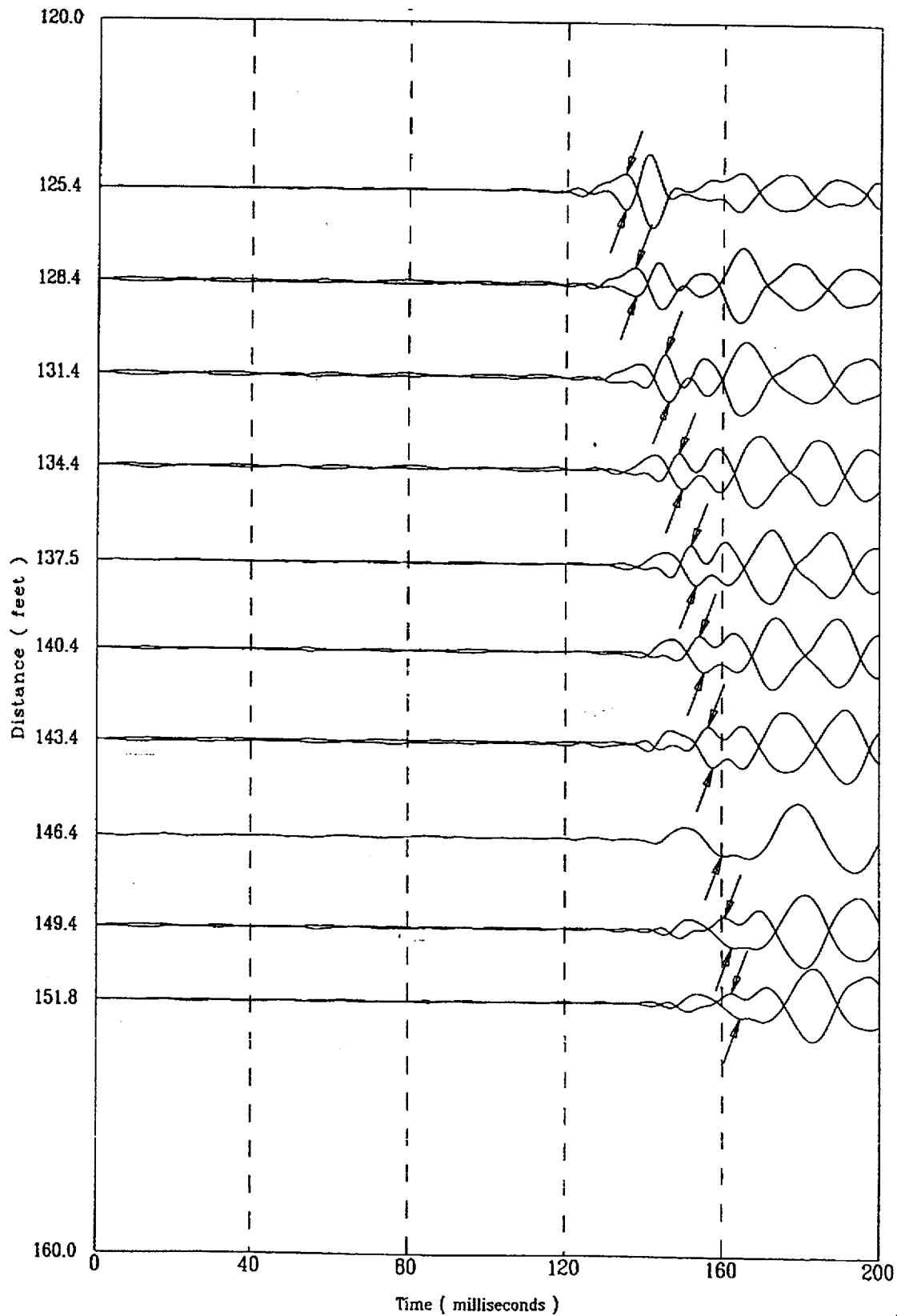


J5m804S

235 of 522

Applied Research Associates, Inc.
CPT-157

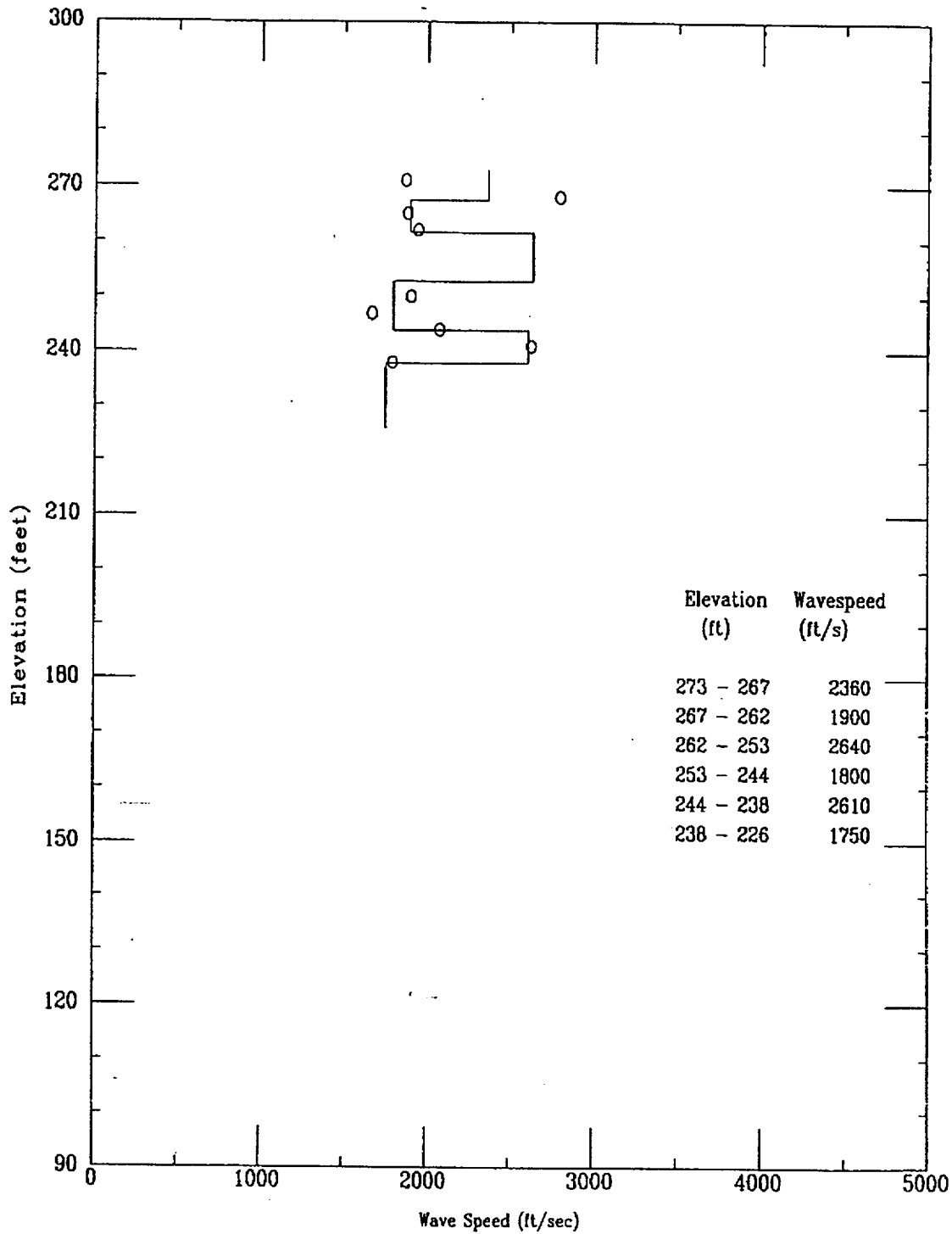
S Wave
03/05/98



File 405m804S

236 of 522

Compression Wave Speeds

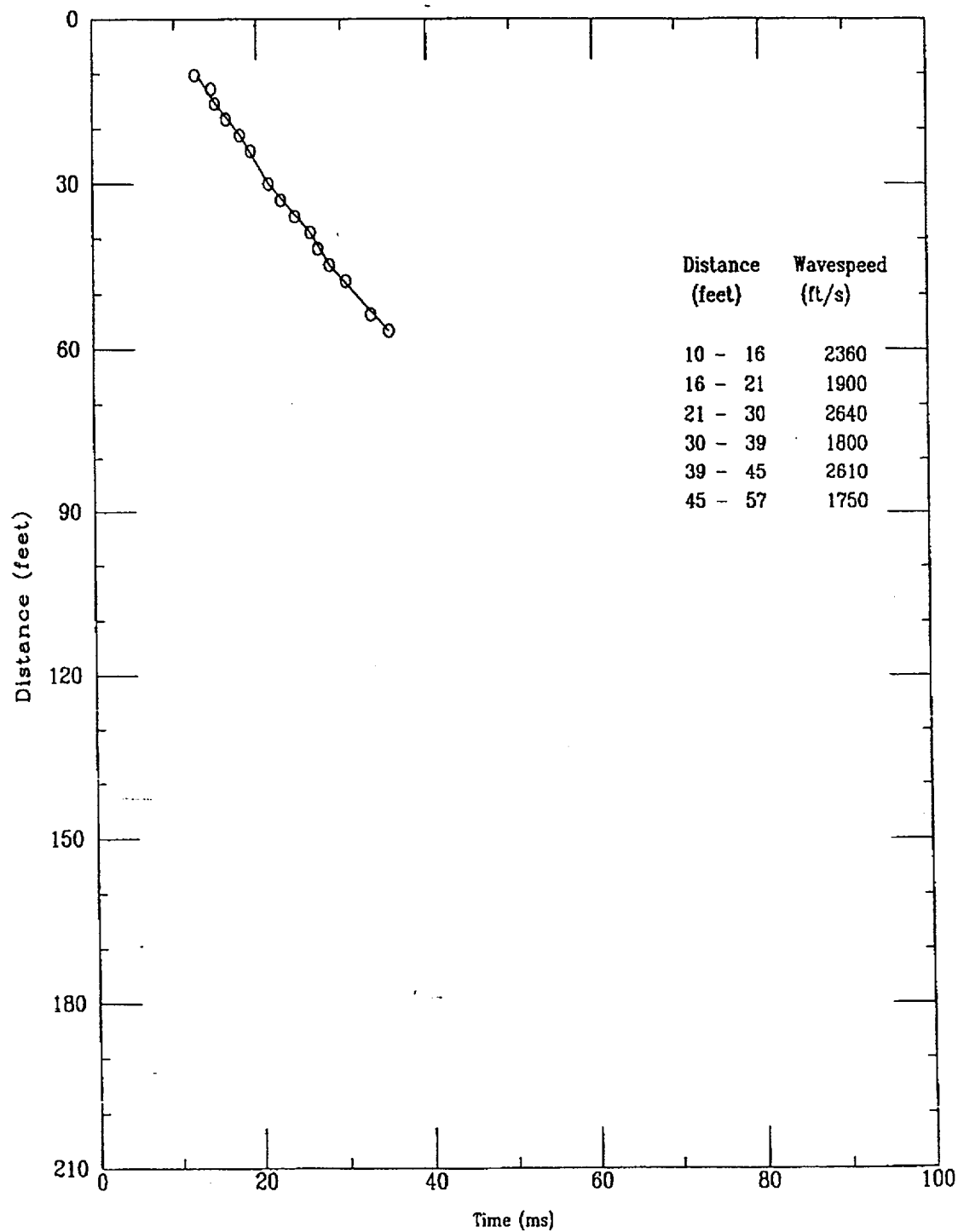


CPT-157

APPLIED RESEARCH ASSOCIATES, INC.

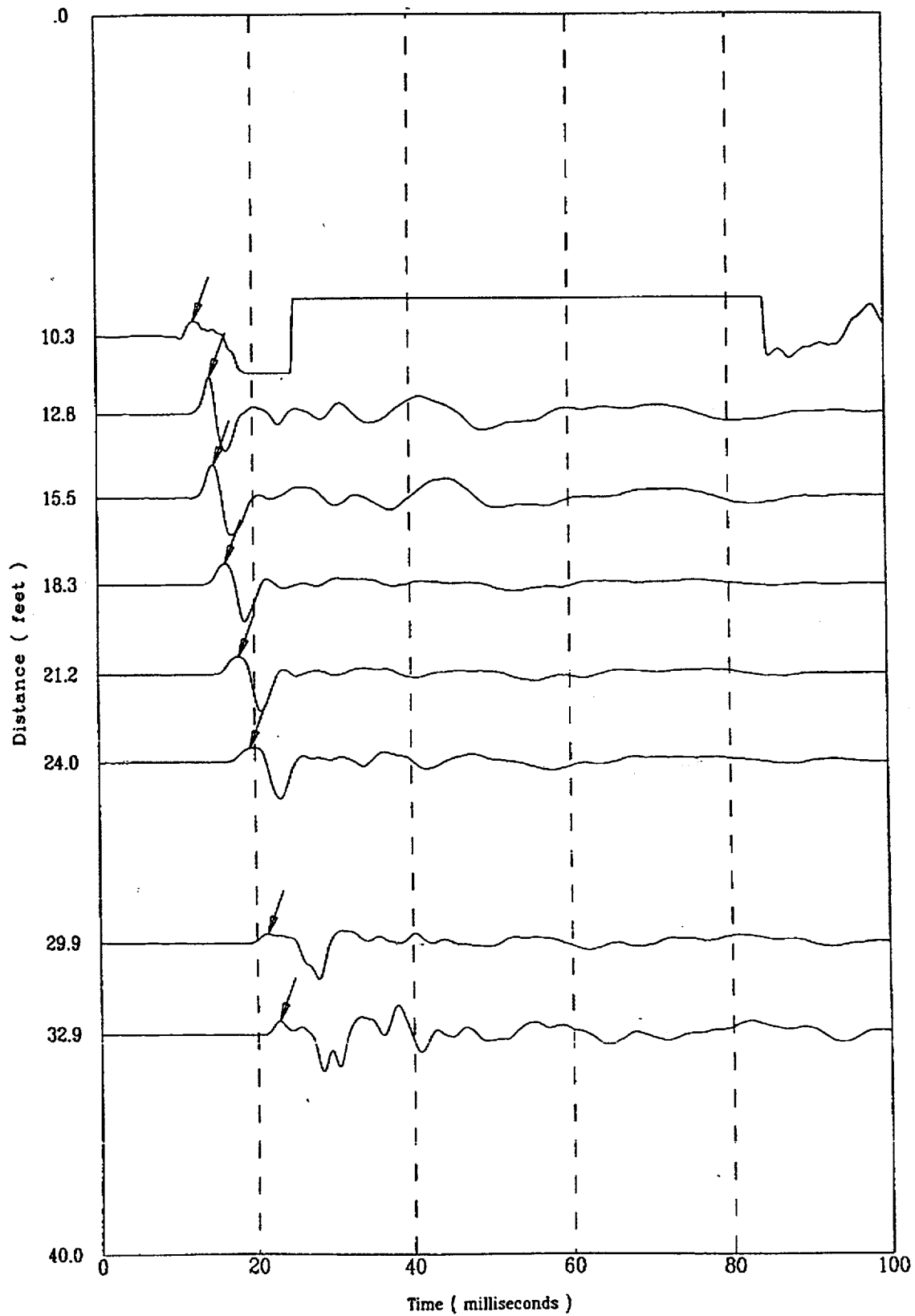
03/05/98

Compression Wave Time of Peak



File 405M804S

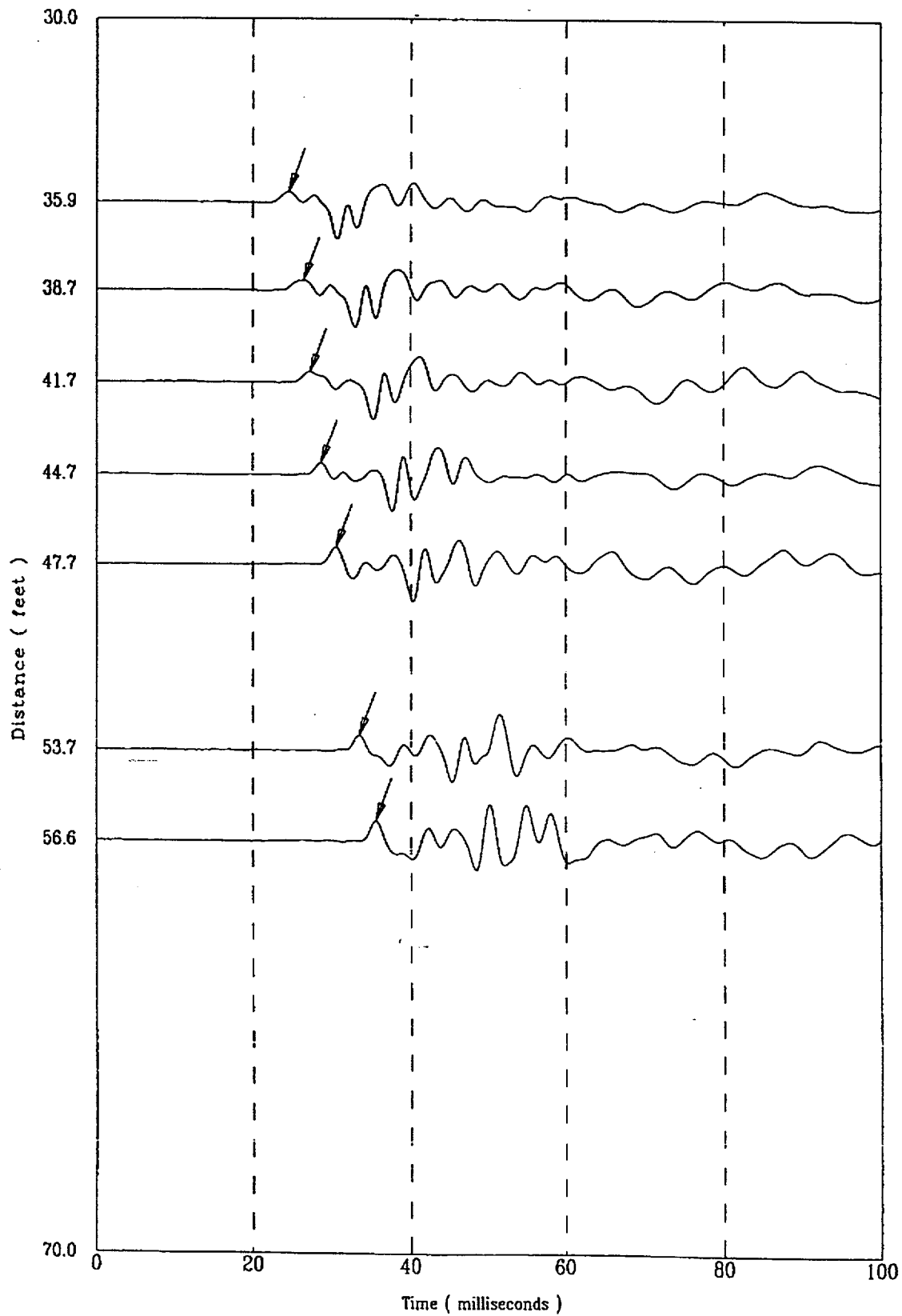
238 of 522



105MB04S

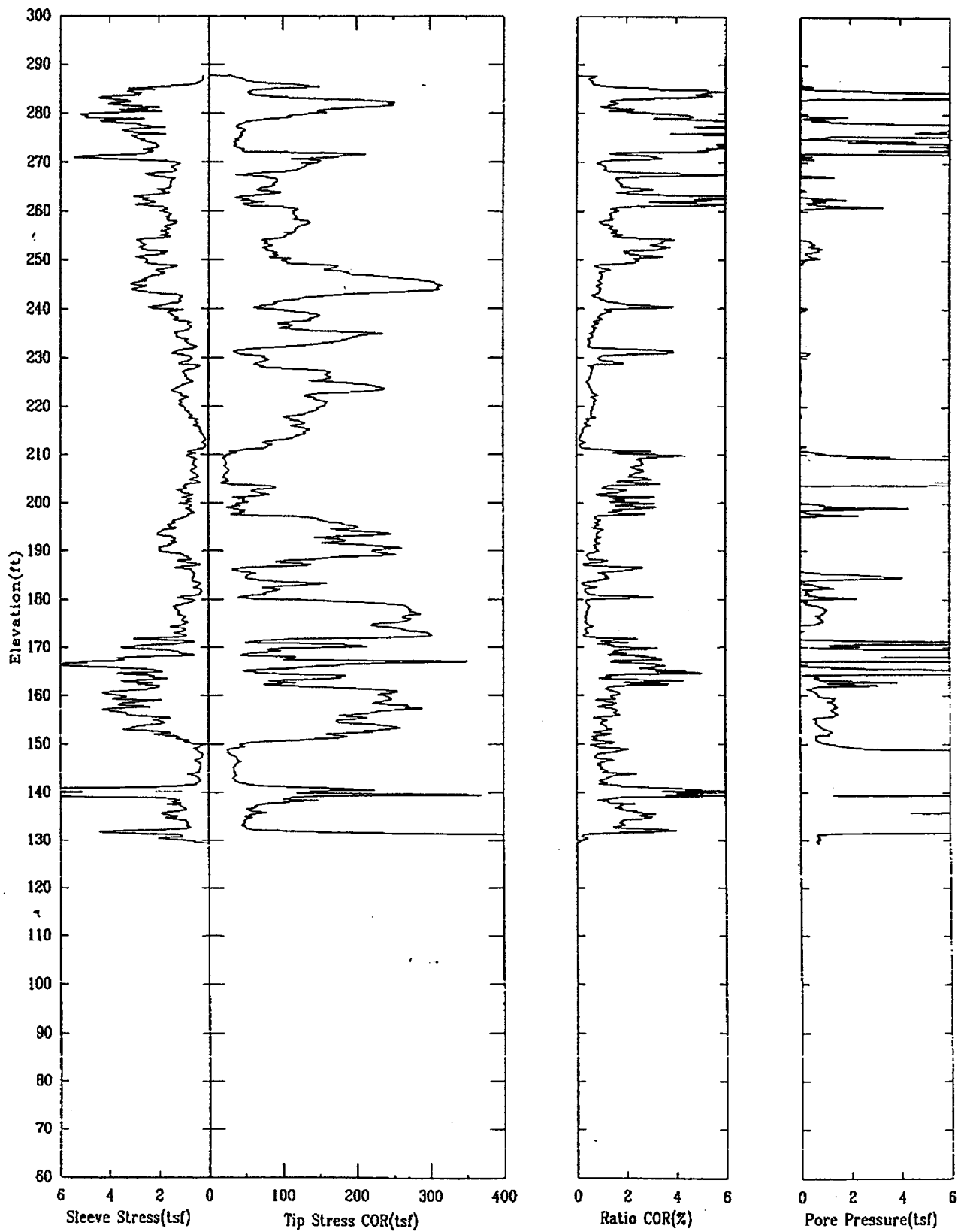
Applied Research Associates, Inc.
CPT-157

P Wave
03/05/98



File 405M804S

240 of 522



CPT-159

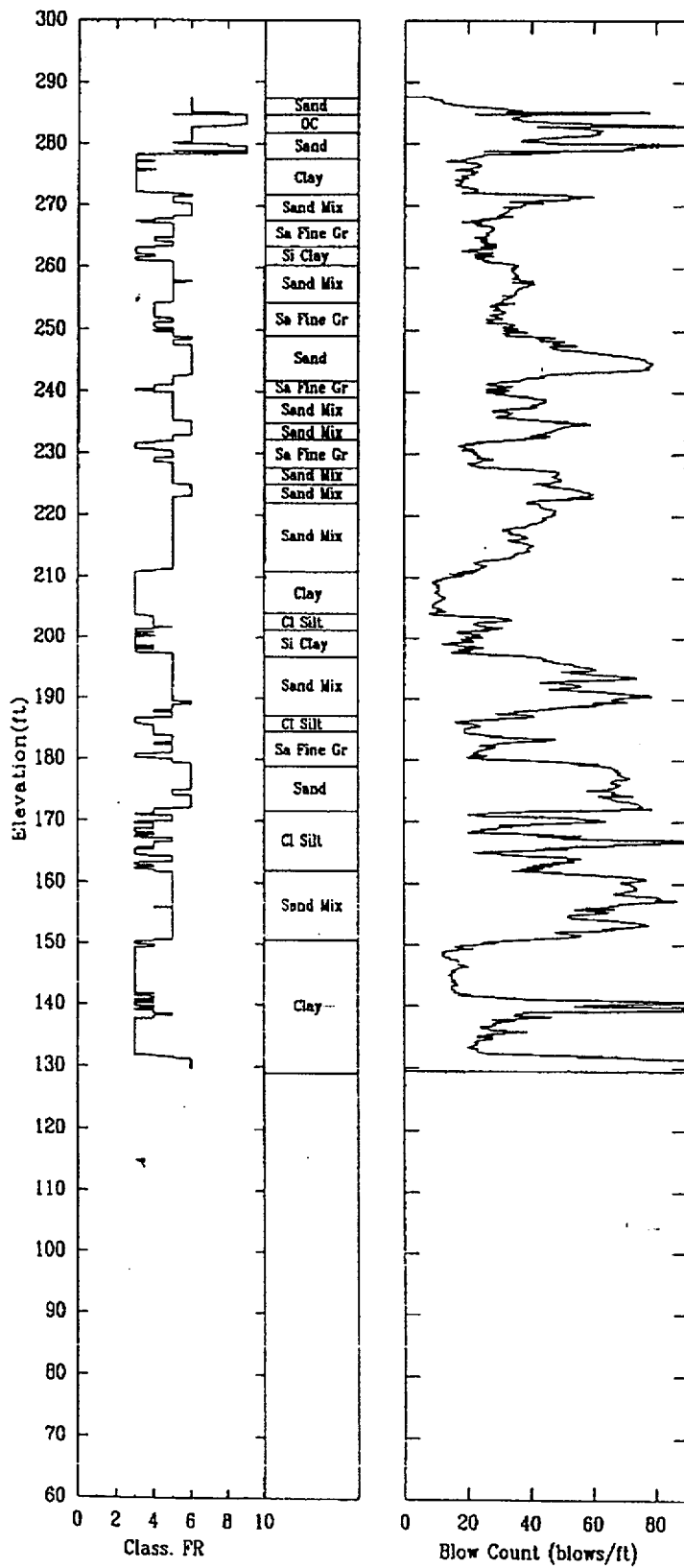
APPLIED RESEARCH ASSOCIATES, INC.

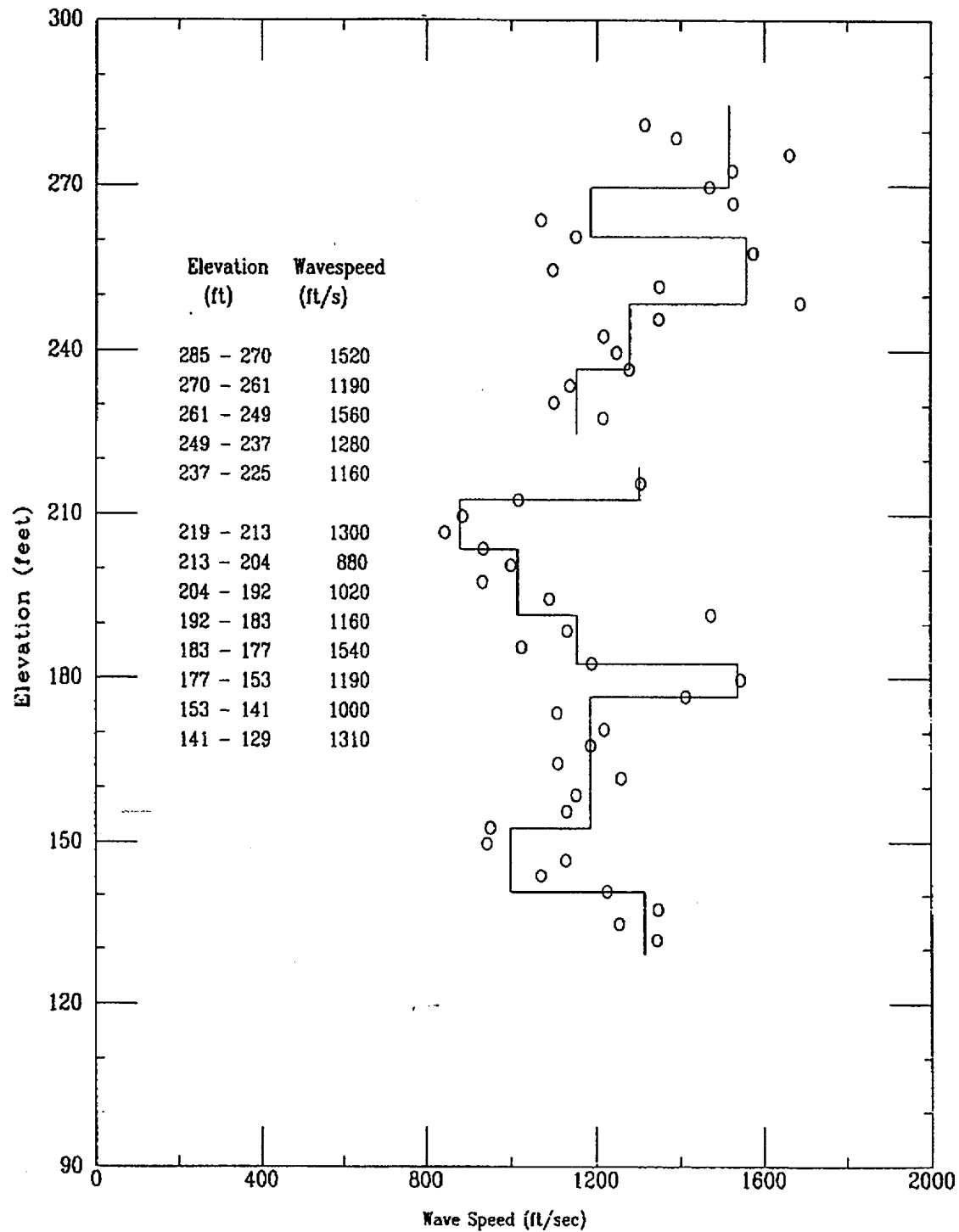
02/17/98

North 79171.1

East 55195.0

Elevation 293.7



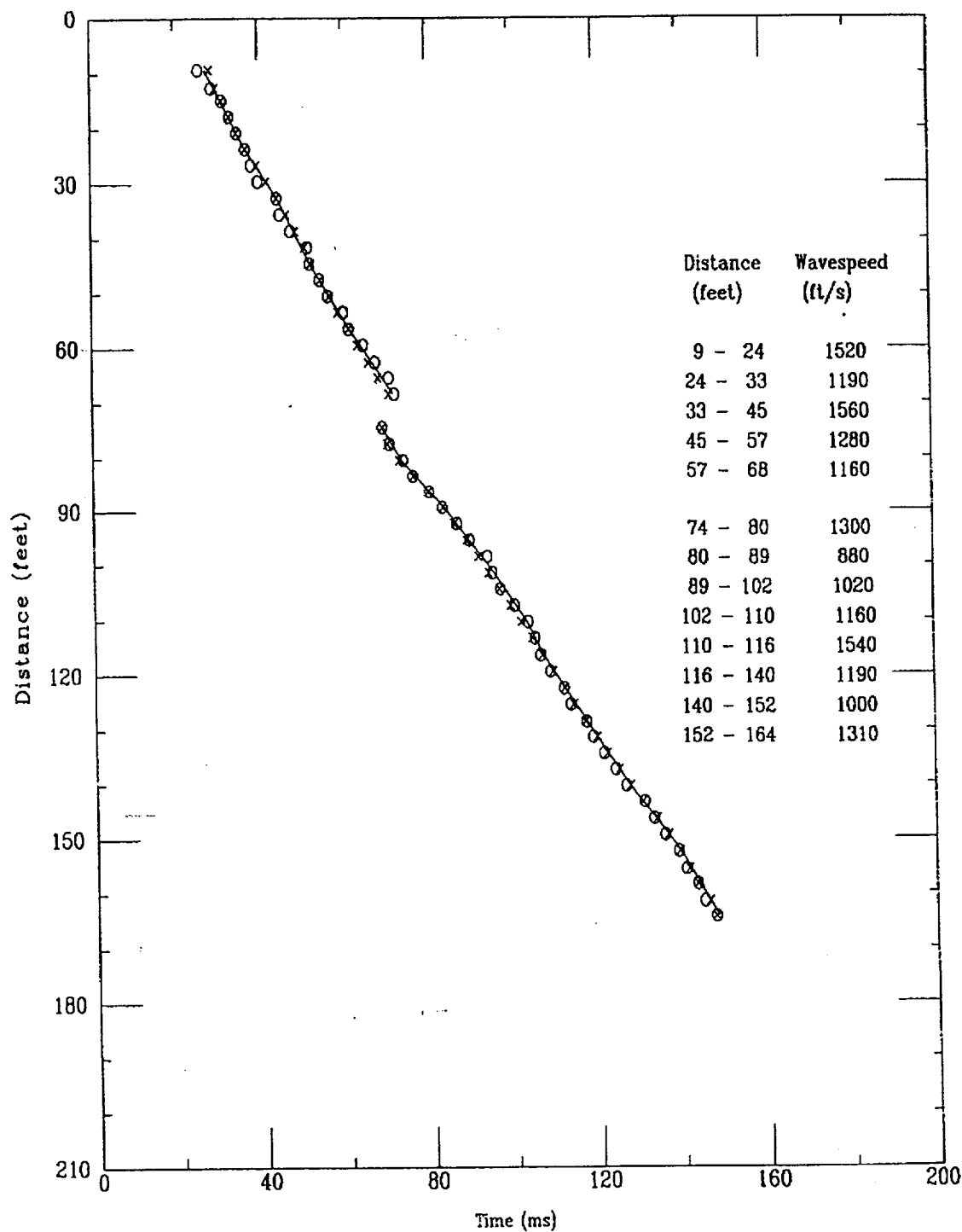


CPT-159

APPLIED RESEARCH ASSOCIATES, INC.

02/17/98

Shear Wave Time of Peak

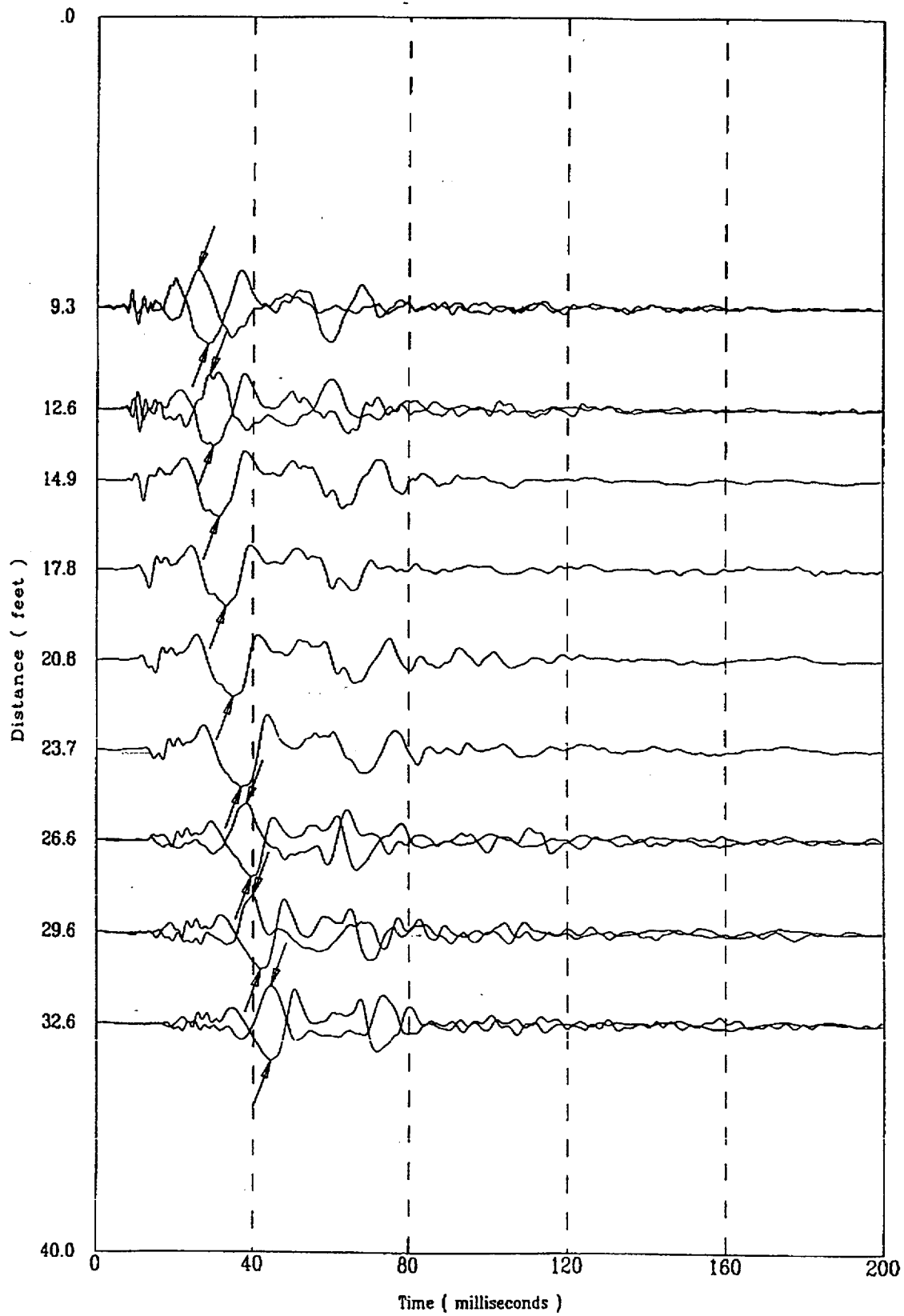


File 417/B01S

244 of 522

Applied Research Associates, Inc.
CPT-159

S Wave
02/17/98

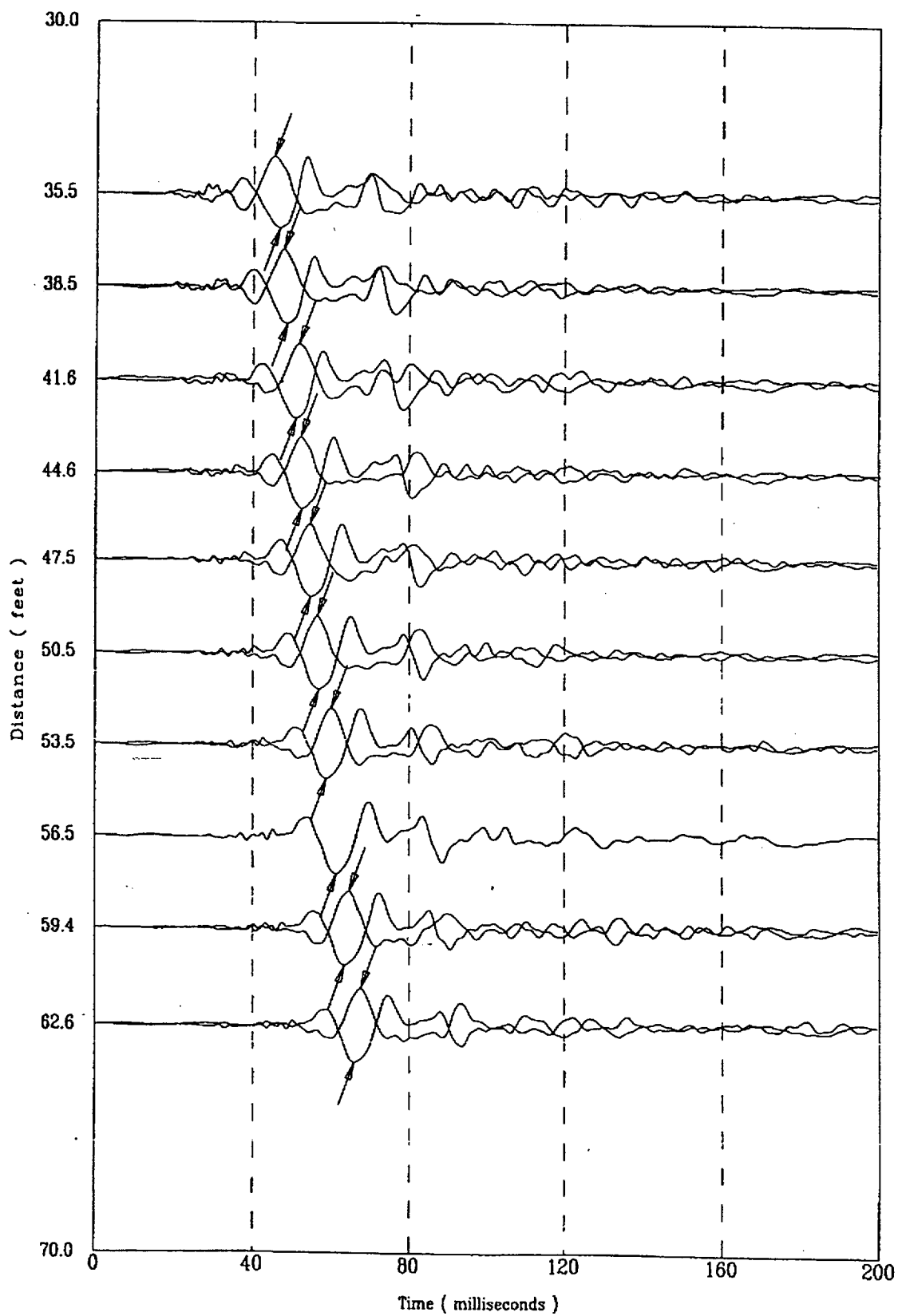


4171801S

245 of 526

Applied Research Associates, Inc.
CPT-159

S Wave
02/17/98

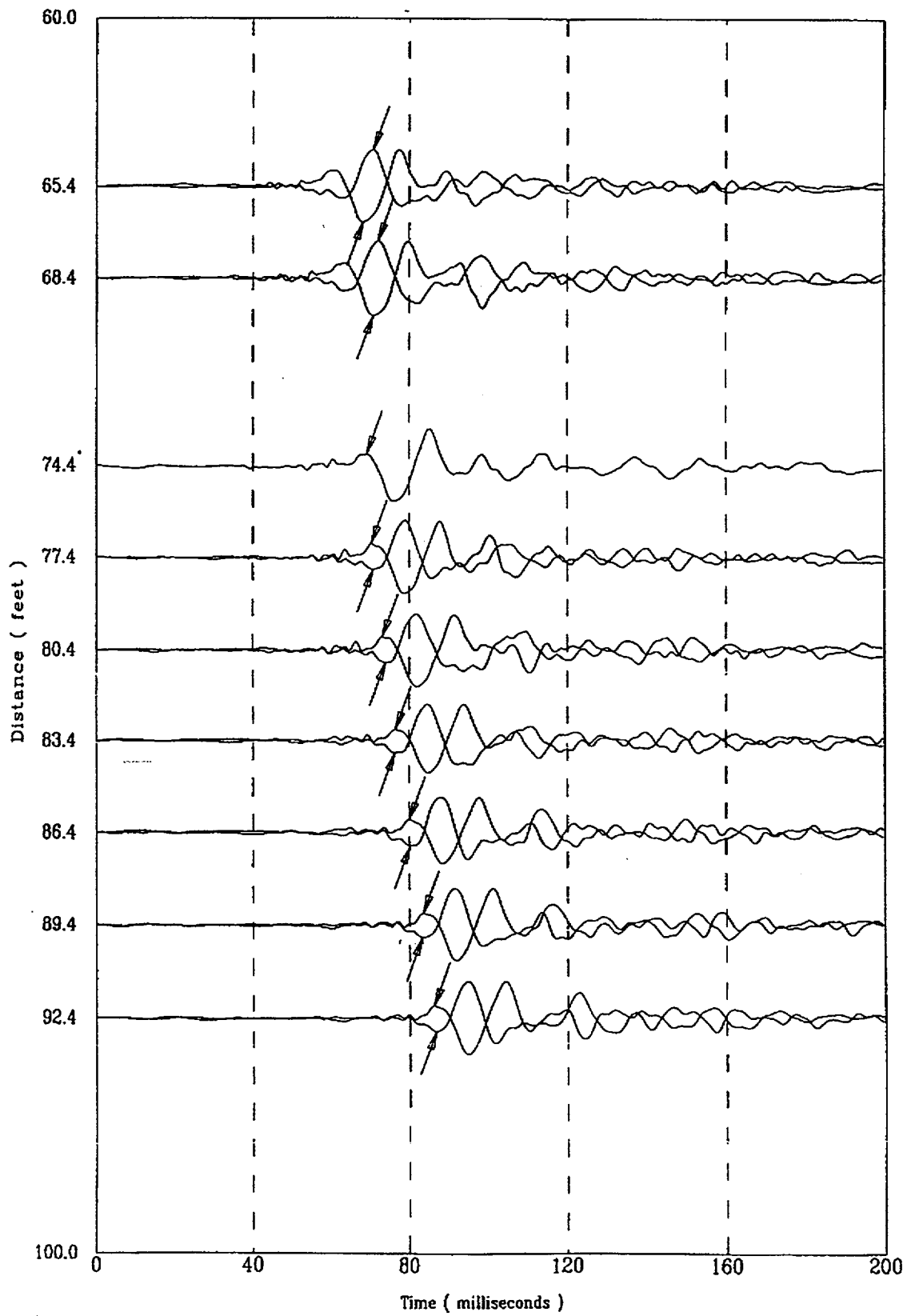


File 4171801S

246 of 50

Applied Research Associates, Inc.
CPT-159

S Wave
02/17/98

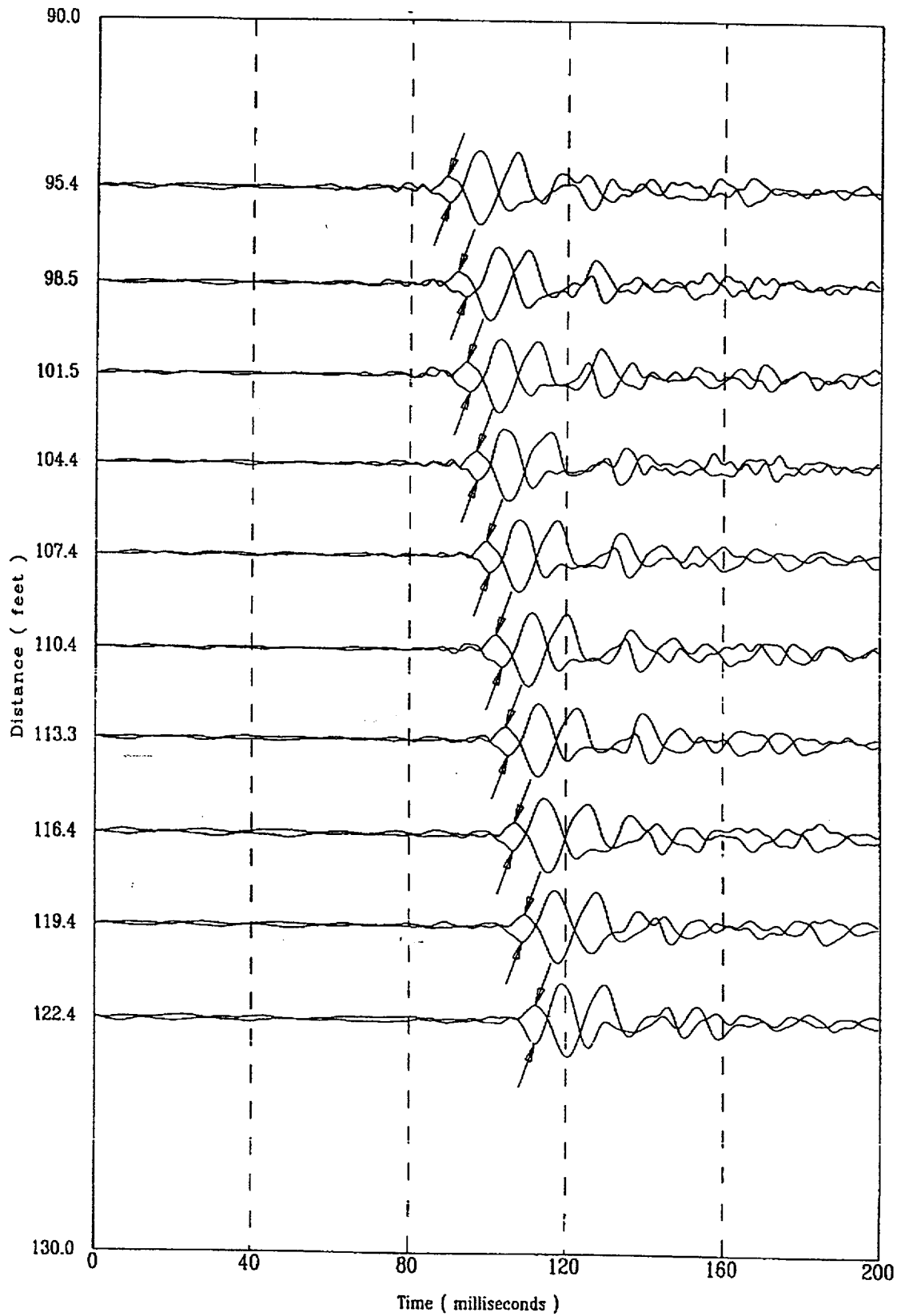


177801S

247 of 520

Applied Research Associates, Inc.
CPT-159

S Wave
02/17/98

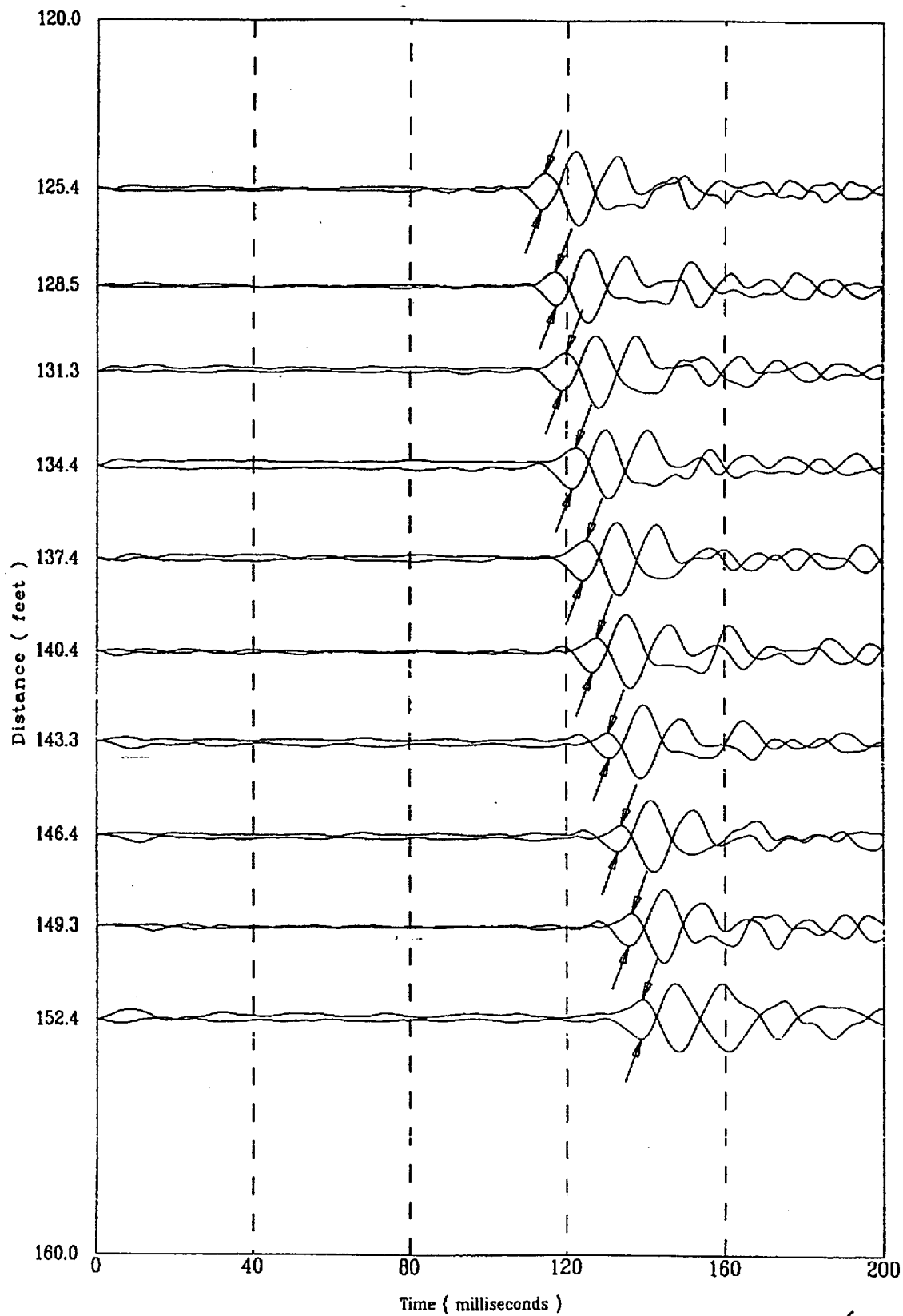


File 417f801S

248 of 522

Applied Research Associates, Inc.
CPT-159

S Wave
02/17/98

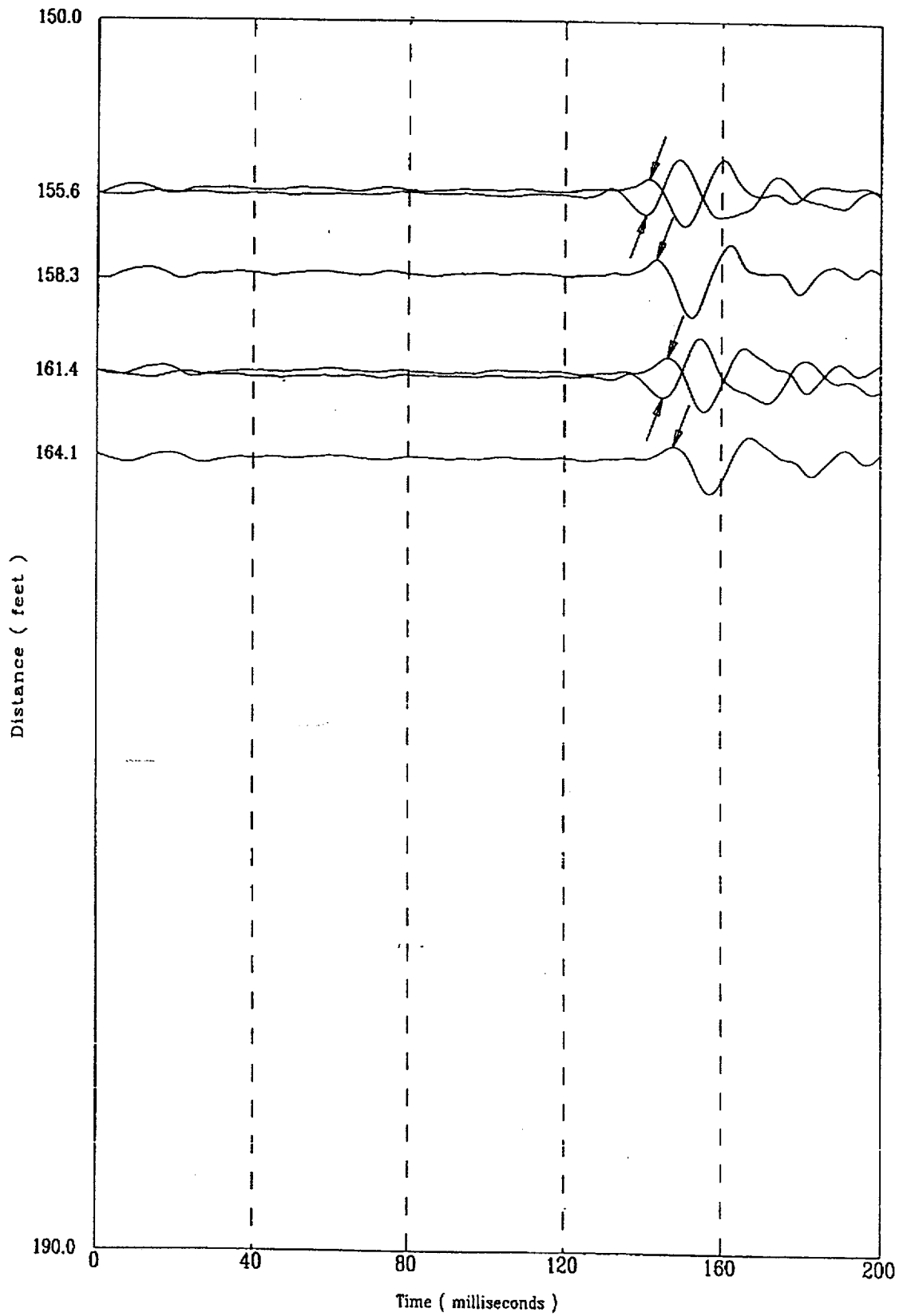


171801S

249 of 522

Applied Research Associates, Inc.
CPT-159

S Wave
02/17/98



File 4177801S