Preliminary Siting Characterization Salt Disposition Facility - Site B

by

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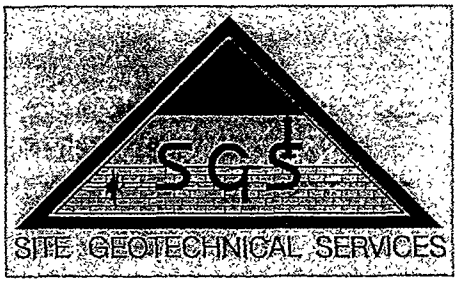
Salt Disposition Facility – Site B (U)

Site Geotechnical Services Department



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DISCLAIMER

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EXECUTIVE SUMMARY

A siting and reconnaissance geotechnical program has been completed in S-Area at the Savannah River Site (SRS) in South Carolina. This program investigated the subsurface conditions for the area known as "Salt Disposition Facility (SDF), Site B" located northeast of H-Area and within the S-Area (Figure 0-1). Data acquired from the Site B investigation includes both field exploration and laboratory test data.

The purpose of the investigation was to obtain geotechnical information to characterize the subsurface conditions within the proposed Site B footprint. Specific characterization objectives included the preliminary definition of the engineering stratigraphy, a comparison of the continuity, thickness and relative elevation of stratigraphic units; a determination of the index properties of each stratigraphic layer; an evaluation of the presence, thickness and stratigraphic position of soft zones, if any; an evaluation of the presence, style, orientation, and age of potential faulting within the area, and an evaluation of the subsurface conditions in terms of relative geotechnical and foundation suitability. The field exploration scope completed for the SDF Site B investigation included: 6 Seismic Piezocone Penetrometer Test Soundings, 4 Resistivity Piezocone Penetrometer Soundings, 1 Standard Penetration Test Boring to 180 feet with laboratory index properties and coring from 180 to 340 feet, and 1 groundwater sample obtained from the cone penetrometer. The CPT soundings were pushed to refusal (depths ranging from 130.1 to 156.7 feet). Data from two existing borings were also utilized for correlation. Seismic data, located near Site B and obtained during the DWPF characterization, were also reviewed for local geologic structure.

The CPT data were correlated and interpreted for engineering stratigraphy. Boring SDFB-B1 was stratigraphically correlated with local borings and regional type well P-27. The boring and CPT data were then correlated. Soil samples from the boring were analyzed in the laboratory for index properties associated with each engineering layer.

The results of this investigation are:

- Site topography is suitable for potential construction. There are no natural drainage, cut and fill or road and rail profile problems.

- There are no surface hydrology or potential floodplain problems that might affect construction suitability.

- Groundwater was encountered at an elevation (approximately 238 feet, msl) which may impact excavation, depending on final facility design.

- The groundwater sample was analyzed for tritium and volatile organic analytes. Analyses of the groundwater sample indicate that tritium and organic volatiles were below the drinking water standards.

- Soft zones were detected in two of the ten CPT soundings and along the northeastern portion of Site B. Further evaluation of these soft zones may be warranted. Siting and design of new facilities in this area should account for the presence of these soils either by avoiding the placement of critical facilities where these zones are known to exist, or determining the potential settlement and then designing the facility to accommodate the estimated movement.

- No geologic structure was noted at Site B. A review of regional information indicates that there are no known faults in the area that affect the Gordon Aquitard.

- The stratigraphy and average index properties determined for the Salt Disposition Facility - Site B are consistent with those determined for other facilities in S-Area. Geologic conditions are also directly comparable between these areas.

- Based on the preliminary data obtained from this geotechnical investigation, Site B is acceptable for continued construction consideration.

Design and construction of new PC-3 and higher facilities, heavily loaded structures or capital investment projects in the Site B area will require structure specific investigations for foundation design and construction, as well as, proper characterization of soft zone intervals. Foundation specific investigations should consider structure size, geometry, loading, foundation type and depth, performance classification and functional classification. A limited program of field testing to confirm dynamic soil properties may be required to obtain baseline subsurface information such that a site-specific comparison with results of this investigation can be made. A thorough review of the data included in this report is recommended for planning further investigations.

1. INTRODUCTION

A siting and reconnaissance investigation has been completed in S-Area at the Savannah River Site (SRS) in South Carolina. This program included an investigation of the subsurface conditions for the area known as "Salt Disposition Facility (SDF), Site B" located northeast of H-Area and within the S-Area (Figure 0-1). This preliminary geotechnical investigation serves as a baseline characterization program to determine suitability and guide foundation specific geotechnical investigations for design. Site B was selected as one of several potential facility locations following the evaluation of the Site Selection Panel (WSRC-RP-99-00513, Rev. A). The primary focus of the Site B investigation was to gather subsurface information within the potential facility footprint and tie this information with the historical studies completed for the Defense Waste Processing Facility (DWPF) located northwest and adjacent to the Site B area.

Data acquired from the Site B investigation include both field exploration and laboratory data, which are included within this report. Results of this investigation are intended to be used as a baseline for the siting of the Salt Disposition Facility. Further, these data will augment specific foundation design investigations for the proposed SDF facilities to be constructed in this area once the geometry and layout have been finalized. The program consisted of a field exploration program including a Standard Penetration Test (SPT) to 180 feet and a core boring to 340 feet, four Seismic and six Resistivity Piezocone Penetration Test (SCPTU and CPTU) soundings; a laboratory testing program and an evaluation of subsurface conditions. Data from two historical borings and two historical seismic lines were also reviewed as part of the Site B evaluation. Figure 1.0-1 shows the locations of the CPT's and the SPT boring, existing seismic data and the nearby borings.

This preliminary geotechnical program was performed by the SRS Project Engineering and Construction Division (PE&CD), Site Geotechnical Services (SGS) Department; in conformance with DOE Order 420.1, Procedure Manual E7, (WSRC, 1996a), and SGS Procedure Manual E9 (WSRC, 1996b).

1.1 Purpose and Objectives

The purpose of the investigation was to obtain geotechnical information to characterize the subsurface conditions within the Site B footprint, determine suitability, and compare these conditions with the adjacent areas. The specific geotechnical siting considerations are listed below in Table 1.1-1. Specific characterization objectives included:

- define the engineering stratigraphy including the continuity, thickness and relative elevation of stratigraphic units across the study site;
- determine the index properties of each stratigraphic layer;

- compare the field results (SPT and CPT measurements) to results obtained in S-Area,
- evaluate the presence, thickness and stratigraphic position of soft zones, if any;
- evaluate the presence, style, orientation, and age of potential faulting within the area, and
- evaluate the subsurface conditions in terms of relative geotechnical and foundation suitability.

Table 1.1-1. Geotechnical Siting Criteria

Topography
Site topography
Natural drainage localized
Natural drainage at facility footprint
Balanced cut and fill
Road and rail profiles
Surface Hydrology
Proximity to floodplain
Local flooding
Subsurface Hydrology
Ground water depth
Ground water contamination
Geology (soft zone carbonates)
Seismology (proximity to known fault)

1.2 Report Organization

The text of this report includes six sections. These sections are: Section 1, Introduction; Section 2, Subsurface Exploration; Section 3, Subsurface Conditions; Section 4, Geotechnical and Foundation Assessment, Section 5, Conclusions and Recommendations; and Section 6, References. These sections are followed in succession by tables and figures.

Appendices to this report include: Appendix A, Boring Logs; Appendix B, Laboratory Test Data; and Appendix C, Seismic Piezocone Penetrometer Test Soundings, Appendix D, Resistivity Piezocone Test Soundings, and Appendix E, Water Quality Laboratory Analysis.

1.3 Quality Assurance

Quality related activities performed by WSRC/BSRI organizations during the Geotechnical Investigation were controlled in accordance with the WSRC QA Program as delineated in WSRC Procedure Manual 1Q and WSRC 3Q5.. Activities were also controlled via compliance to the applicable administrative and technical

procedures contained in WSRC Procedure Manual E9, "Site Geotechnical Services."

Cone Penetration Testing (CPT) was conducted in accordance with the Quality Assurance (QA) Plan for WSRC Subcontract AA82276N, with Applied Research Associates, Inc. (ARA) and the ARA Quality Assurance Program for Cone Penetration Testing, Revision 3 (7/30/96). Subcontractor compliance with their implementing procedures and instructions (ARA-Q-101 through 107) also ensured the integrity of the CPT results and interpretations.

Soil testing performed by Law Engineering of Atlanta, Georgia (WSRC Subcontract No. AB80111N) was accomplished through compliance with the Law Engineering QA Program as delineated in the Law Engineering Quality Assurance Manual, Revision 1 (7/25/97), and applicable national/industry test standards (as specified in procurement specification K-SPC-G-00016, Revision 0).

SGS QA provided oversight over all quality-related activities of the geotechnical investigation. SGS QA oversight activities included: the review and approval of all technical and quality procedures and instructions developed specifically for the investigation; monitoring field activities, sample handling, and soil testing laboratory activities; and providing direct QA oversight over seismic piezocone penetration testing activities.

QA/QC activities were also performed by Law Engineering and Applied Research & Associates personnel as prescribed in their respective QA plans, QA programs, and QA technical procedures.

2. SUBSURFACE EXPLORATION

In May, 1999, a siting and reconnaissance investigation program to support siting of the Salt Disposition facility (SDF) was completed. The information from this program forms the basis for this report.

The exploration program consisted of the following:

- 6 Seismic Piezocone Penetrometer Test (SCPTU) Soundings
- 4 Resistivity Piezocone Penetrometer Tests (CPTU) Soundings
- 1 Standard Penetration Test (SPT) Boring to 180 feet and coring from 180 to 340 feet
- Down-hole Geophysical Logging (Natural Gamma Ray & Resistivity)
- 1 CPT Groundwater Sample

In addition, the data from two existing borings, SBH-14 and SBH-16, were utilized for correlation. Two existing seismic lines, S-2 and S-7, acquired for the DWPF geotechnical characterization, and located near the SDF Site B footprint, were also reviewed for geologic structure. Figure 1.0-1 shows the locations of the boring, seismic lines and CPT soundings.

The boring and soundings were advanced in an approximate grid pattern, roughly 100 feet by 100 feet, covering an area approximately 200 by 300 feet, the approximate footprint of SDF Site B.

The CPT was used as the primary exploration technique with direct correlation to a new SPT boring. The SPT boring was located centrally to the soundings to measure N-values and retrieve soil samples for laboratory classification testing. Test methods, equipment, and general field procedures, are summarized in the following sections.

2.1 Field Test Location and Clearance

The selection of the boring location, CPT soundings, and other field work with Site B was based primarily on the following criteria and factors:

- Existing Data;
- Data coverage;
- Site conditions (topography, wooded areas, etc.);
- Type of data required;
- Under-and-above ground interferences; and

- Presence of known or suspected soft zones and subsurface geologic structure.

Approval of the selected location for the fieldwork was preceded by a series of work coordination steps as summarized below (the organization responsible for each step is noted in parentheses):

- Selection of general area based upon the factors listed above (SGS);
- Preliminary interference research (Construction Layout);
- Ground penetrating radar survey (E&I, Site Services)
- Preparation of work package (SGS/ Operations Department);
- Work Process Control (Operations Department); and
- Field surveys (Construction Layout).

This detailed site clearance routine was essential for safe field operations. Any obstacles or restrictions encountered in any step during this process required the relocation of the proposed boring or sounding location, and therefore the re-initiation of the process. A minimum surface clearance of 10 feet from any obstacle or interference was required to assure safe operations of the DWPF.

2.2 Equipment and Field Test Methods

Equipment used in the field investigations met applicable ASTM standards, site standards and procedures as listed below:

- WSRC E9 SGS-GT-202 - Drilling Practices;
- WSRC E9 SGS-GT-203 - Sample Preparation, Handling and Storage;
- WSRC E9 SGS-GT-206 - Engineering Soil Descriptions;
- WSRC E9 SGS-GT-207 - Field Log Preparation;
- WSRC E9 SGS-GT-210 - Standard Penetration Test;
- WSRC E9 SGS-GT-211 - Cone Penetration Test Soundings; and
- WSRC 3Q5 Manual - Hydrogeologic Data Collection.

2.2.1 Exploration Contractor(s) and Equipment

One drilling contractor was utilized for the SPT boring and one contractor was used for the SCPTU and CPTU soundings. A description of the scope of each contractor and the equipment used is provided below.

Graves Environmental, Inc.

Graves Environmental, Inc., of Jackson, South Carolina performed the drilling and sampling for the SPT boring and coring. The Graves Environmental drillers involved with the drilling and sampling activities were experienced with geotechnical

investigations and have performed the drilling and sampling for numerous investigations on site. The drilling equipment utilized is described below.

Failing 1500

The Failing 1500 drill rig is gasoline engine powered with a 40-foot mast. The rig has a 23-foot Kelly assembly which allows for a 20-foot stroke and is capable of mud rotary, augering, and rotary coring techniques. The drill string is controlled by the Kelly arrangement, as well as, by a mechanical winch. This rig was used for all deeper borings requiring mud rotary.

Applied Research Associates (ARA)

Applied Research Associates (ARA) of Royalton, Vermont the SCPTU and CPTU soundings and data processing activities. The CPT rig used for this investigation is described below.

Mac I

The 22-ton Mac I CPT rig is capable of a 30-ton push when fully ballasted. The push rod and piezocone conformed to ASTM D5778 (ASTM 1995) consistent with WSRC E9 SGS-GT-211 - Cone Penetration Test Soundings. This rig was equipped with a hydraulic skid coupled to the surface beneath the rig for generating a shear wave source. Compressional waves were generated with a hydraulic vertical hammer located on the outside of the rig. The operator controlled all components.

2.2.2 Standard Penetration Test (SPT)

Tests were performed in accordance with WSRC E9 SGS-GT-210 using a standard 24-inch long by 2-inch outside diameter (OD), split-spoon sampler with a 2-foot bleeder and check valve located above the sampler, NX drill stem, and a 140-lb safety hammer falling 30 inches. SPT N-values were determined by adding the number of blows required to drive the split-spoon sampler the middle 12 inches of the standard 24-inch drive.

The general test procedure, as noted in sequence, is outlined below:

1. Split spoon is lowered into nominal 4-inch diameter borehole;
2. Depth is checked and any rod settlement noted;
3. Six-inch intervals, totaling 24 inches, are marked on the drill rod above the turntable;
4. Sampler is driven by blows applied using a 30-inch stroke with the rope wrapped twice over the cathead;
5. Sampler retrieved and recovery noted;
6. Sampled interval reamed and drilled out to next sample interval; and

7. Process repeated.

Prior to each SPT, the Geotechnical Oversight professional verified that the spoon was properly assembled, making sure the bleeder and check valve were clean and the drive shoe was in good condition.

2.2.3 Undisturbed Sampling

No undisturbed samples were obtained as part of this effort

2.2.4 Piezocone Penetration Soundings (CPTU)

CPTU, including seismic (SCPTU) soundings and resistivity (CPTU), were performed in accordance with ASTM D5778. The CPT was used because of the relatively quick and clean operation and its ability to provide a continuous soil profile for determining stratigraphy and defining the extent of soft and/or loose soil zones. All CPT soundings included either shear wave velocity measurements at 3-foot intervals or continuous measurements of resistivity. Target penetration depths were based upon the estimated elevation of the top of the Congaree formation (approximate El. 120-125 feet MSL), a dense sandy layer (see section 3) that is considered incompressible. However, actual depths varied, depending upon ground surface elevations and subsurface conditions.

2.2.5 Borehole and Penetration Abandonment

Abandonment of borings and soundings was performed per WSRC Manual 3Q5, Hydrogeologic Data Collection (WSRC, 1992). The standard grout mix consisted of the following:

- One sack Type 1 Portland Cement (94 lb. sack);
- Two pounds of dry sodium bentonite; and
- 6.5 to 7.5 gallons of potable water.

The boring was abandoned immediately upon completion of testing. Grouting was accomplished via the tremie method by lowering a grout pipe to the bottom of the boring and jetting grout until the boring fluid was displaced and grout returned to the surface. The boring was subsequently topped off until the grout column remained static.

Cone penetrometer soundings were also abandoned via the tremie method by pressure grouting through a push rod that was re-pushed down to the bottom of the sounding. A grout tube extending to the bottom of the push rod was used to pump grout into the hole as the push rod was retracted. Holes were also topped off until the column remained static.

2.3 Sample Preparation, Handling, Storage, Transportation, and Control

Samples were prepared and handled in accordance with WSRC E9 SGS-GT-203 - Sample Preparation, Handling and Storage.

For the SPT boring, a sample was typically collected from the top and bottom of the sample spoon. If a material change occurred within the sample, additional samples were collected, as appropriate. Samples were placed in 8-ounce glass jars. The tops were closed tightly, wrapped, sealed with electrical tape, and samples were labeled on both the jar and the lid. While onsite, all samples were stored in accordance with WSRC E9 Procedure SGS-GT-203.

All soil samples selected for testing were turned over to Law Engineering for transport to their laboratory in Atlanta. Once in Atlanta, the samples were maintained in a controlled area according to the Law Engineering Quality Assurance Program.

3. SUBSURFACE CONDITIONS

Both existing regional geological information and information obtained from this field exploration program have been used to characterize the subsurface conditions in the Site B area. This included establishing the regional geological ties, engineering stratigraphy and soil index properties.

The Site B subsurface data were tied to existing S-Area borings and regional well P-27 (reference Figure 3.0-1) located adjacent to the ITP Facility, according to the correlation shown on Figure 3.0-2. The CPT data were tied to the boring data as shown in Figure 3.0-3. Further, the presence of soft sediments defined as zones with measured tip resistances less than 15 tons per square foot (tsf) over two continuous feet or SPT N-values of 5 or less, were evaluated. Groundwater conditions were determined from nearby monitoring well information and CPT data.

Subsurface three-dimensional models (Figures 3.4-3 through 3.4-5) were developed to show the engineering stratigraphy, Tip Stress and Friction Ratio across the Site B area. The models of the CPT Tip Resistance (q_t) and the Friction Ratio (FR) were made to show the detailed stratigraphy underlying the site. These subsurface models were based on information collected during this investigation. Some variation from these conditions can be expected.

3.1 Regional Geological Evaluation

The SRS is situated on the upper Atlantic Coastal Plain approximately 30 kilometers southeast of the Fall Line which separates the relatively unconsolidated coastal plain sediments from the crystalline igneous and metamorphic rocks of possibly late Precambrian to late Paleozoic age in the Piedmont Province. Early to middle Mesozoic (Triassic to Jurassic) rocks occur in isolated fault-bounded valleys either exposed within the crystalline belts or buried beneath the coastal plain sediments. The coastal plain sediments were derived from erosion of the crystalline rocks during late Mesozoic (Cretaceous) through Eocene to possibly Miocene time. Younger late Tertiary to Recent sediments form alluvial fill in stream and river valleys and locally are represented by gravel deposits adjacent to present-day streams and by sediments filling upland depressions (sinks and bays). The Cretaceous and younger sediments are not significantly indurated. The total thickness of the sediment package at SRS varies between approximately 700 feet at the northwest boundary and 1200 feet at the southeast boundary.

3.2 The Atlantic Coastal Plain Stratigraphy Underlying Site B

The Atlantic Coastal Plain stratigraphic column used in this report is given in Figure 3.2-1. A discussion of the Cretaceous and Tertiary-Paleocene and early Eocene subsurface units underlying the SRS and Site B can be found in Aadland et al, (1995), and in the Generic Safety Analysis Report, G-SAR-G-00001 Rev. 4 (1999).

The following describes the character of the shallow sediments (Warley Hill Fm. to the surface) underlying Site B and is based on geologic descriptions from borehole SDFB-B1, Fallaw and Price, (1994) and Aadland et al. (1995). A photograph of samples of the subsurface strata (upper 100 feet) is shown on Figure 3.2-2. Detailed field sediment descriptions may be found in Appendix A. where the formation, depth of occurrence in boring SDFB-B1 and a general sediment description are given.

Fill Material (elev. 274 ft. -surface, msl) This udorthent interval consists of backfilled material graded or excavated from local construction activities overlying the naturally deposited "Upland Unit". This material is not shown in Figure 3.2-2.

Upland Unit (elev. 250-274 ft. msl) The "Upland Unit" is an informal stratigraphic term that has been applied to relatively local deposits that outcrop at higher elevations in the coastal plain of southwestern South Carolina. Units in a similar stratigraphic position in Georgia are usually called Altamaha Formation. It consists of dark red, brown, orange, poorly sorted clayey to silty sand locally contains lenses and layers of conglomerate, pebbly sand and clay. Cross bedding and white flecks, which may be very weathered feldspar, are locally common. Figure 3.2-2 shows this mixture of sediment to a depth of approximately 30 – 32 feet averaging approximately 24 feet thick. The "Upland Unit" is generally fluvial, and is deposited on a scoured, erosional surface on the Tobacco Road Formation. The age has not been definitively determined, and correlation with similar deposits in the region is not yet clear. The "Upland Unit", Tobacco Road Formation, and Dry Branch Formation may be part of the same cyclic regressive/transgressive depositional system with the "Upland" being the most continental end member and the Dry Branch the most marine.

Tobacco Road Fm. (elev. 214-250 ft. msl) The Upper Eocene Tobacco Road Formation conformably overlies the Dry Branch Formation. It consists of moderately to poorly sorted, red, brown to variegated purple and orange quartz sand, commonly with clay stringers. Pebble layers and muscovite are locally distributed throughout the formation as well. The Tobacco Road Formation is widely exposed in road cuts and outcrops at the SRS, and at the surface. Figure 3.2-2 shows the color and grain size variation to a depth of approximately 75 feet. The Tobacco Road averages approximately 36 feet thick at Site B. The gradational nature and non definitive color change render the lower Tobacco Road - Dry Branch contact difficult to clearly distinguish, especially in core.

Dry Branch Fm. (elev. 173-214 ft. msl) This formation is a clastic deposit of Upper Eocene age disconformably overlying the Clinchfield Formation. It averages approximately 41 feet thick at Site B. The Dry Branch Formation can be divided into the lower Dry Branch which includes the Griffins Landing and Twiggs Clay Members and an upper Dry Branch consisting of the Irwinton Sand Member. The Twiggs Clay

is locally referred to informally as the "tan clay". The Griffins Landing Member is a distinctive carbonate-bearing facies. The Irwinton Sand Member, a tan, yellow and orange, moderately well sorted quartz sand, locally interlaminated or intercalated with clay, occurs in a facies relationship with the Griffins Landing and Twiggs Clay Members but generally maintains a superior stratigraphic position to these facies.

Tinker-Santee-Clinchfield Fms. (elev. 133-173 ft. msl) These formations are deposited above the Warley Hill and exist as three distinctive members, although not all may be present at Site B. The Tinker is a thin zone of moderately to well sorted, fine to coarse, calcareous quartz sand. A very thin vertically and laterally discontinuous, partially indurated to indurated, shelly limestone may be present. The Santee Limestone, which consists of cream-colored, micritic to shelly, partially indurated to indurated, biomoldic limestone, may also be present. Overlying the Tinker Formation is the Clinchfield Formation, which consists mostly of tan and yellow, fine to coarse, locally calcareous, quartz sands. An indurated, bioclastic and biomoldic, glauconitic limestone facies, commonly containing abundant echinoid fragments is often present. The Tinker-Santee-Clinchfield interval averages approximately 40 feet thick at Site B.

Warley Hill Fm. (elev. 120-133 ft. msl) The Warley Hill Fm. is a glauconite bearing lithic unit immediately overlying the Congaree Formation consisting variably of clay, clayey sand and silty fine - to medium-grained quartz sand. Thickness across Site B varies from 13 to 15 feet. At the base of this packet of sediments there usually occurs a dark-colored, commonly glauconitic sandy mudstone of variable thickness. This lithology is widespread, consists of clays and interbedded clayey sands and is known as the "green clay" horizon that produces a distinctive signature on the gamma geophysical log.

3.3 Basement Geology Underlying Site B

Very few borings or wells have penetrated the crystalline rocks beneath the central SRS and S-Area. Those that have include DRB (deep rock boring) 1 through 8, as well as HPC-1 and H-1. At Site B, the bedrock is anticipated to correspond with the Cumbest et al. (1992) description of "quartz-feldspathic schists, gneisses, amphibolite, hornblende-chlorite schists, metagabbro, and serpentenite, some of which record penetrative mylonitic and cataclastic fabrics, indicating the presence of rocks with felsic, mafic, and ultramafic protoliths". Crystalline rock is buried beneath approximately 960 feet (elev. –680 ft.) of coastal plain sediments. The crystalline rocks are the principal acoustic/seismic velocity interface underlying the SRS.

3.4 Geological Structure Underlying Site B

A review of regional data suggests that there are no known tectonic faults that breach the Gordon Confining Zone within a one-half mile radius of Site B. In

addition, as evidenced by generally flat-lying horizons on the regional correlation panel (Figure 3.0-2), the seismic data adjacent to Site B (Figures 3.4-1 and 3.4-2), the CPT three dimensional engineering strata (Figures 3.4-3) and the CPT cross-section (Figure 3.4-4) there is no apparent offset that would suggest geologic structure or faulting within the Site B footprint. The three-dimensional models (Figures 3.4-5 and 3.4-6) demonstrate no consistent offsets in lateral variation, for sediment character or type that might suggest geologic structure that cannot be explained by variation due to geologic depositional, diagenetic or erosional processes.

3.5 Engineering Stratigraphy

The subsurface engineering stratigraphy was determined from the SPT boring, CPT measurements including tip resistance, sleeve resistance, friction ratio, and pore pressure signatures, shear wave velocity, as well as correlation with adjacent soil boring data. The layering system is based on observed changes in the CPT measurements that are correlative between soundings as well as boring information. The layer nomenclature follows an alphanumeric system with layer numbers increasing from top to bottom. Subdivided layers are identified with a letter designation (e.g., 3A). The green clay, which is an informal stratigraphic interval at the SRS, is considered the basal unit for the engineering stratigraphy and is included in the lower most engineering layer 5. This geologic unit is locally continuous and provides a reliable marker bed. The Green Clay overlays the Congaree Formation which is predominantly a dense, coarse-grained to silty sand.

The following sections describe the physical attributes used to delineate each layer of the 5 engineering stratigraphic layers. Average engineering soil layer top elevations as determined for the CPT soundings are provided in Table 3.5-1. Average soil index properties, SPT values, CPT measurements and shear wave velocity measurements are provided in Table 3.5-2. These parameters were developed as part of this investigation. These results were then compared with results from the Defense Waste Processing Facility (DWPF) Balance of Plant Geotechnical Report, D'Appolonia (1982a, Section 3.6).

3.5.1 Layers 1 and 1A

Layers 1 and 1A represent the uppermost layers characterized in the study area. The combined thickness of layers 1 and 1A averages about 36 feet thick with layer 1A averaging about 5 feet thick. Layer 1 is characterized by moderate CPT tip resistances (avg. 100 tsf), relatively high friction ratios (avg. 3 percent), a relatively high N-value (42 blows/foot) and shear wave velocity (1199 fps) while layer 1A is less dense with lower tip resistances (avg. 32 tsf), high pore pressure measurements (avg. 1.4 tsf), low N-values (13) and lower shear wave velocities (1117 fps). Layer 1A is mappable across the entire study area with the exception of

CPT sounding 7 and located at the base of layer 1. Layer 1A was subdivided from layer 1 due to the nearly continuous extent and relatively shallow position of the layer. From available boring data, the soils of Layer 1 and 1A consist of red, purple and brown poorly sorted sands ranging from fine to gravel size with the dominant soil classification being clayey to silty sands (SC to SM). Layer 1A probably contains a higher fines content than layer 1 (i.e., silt and clay sized material).

3.5.2 Layer 2

Layer 2 averages about 39 feet thick. Layer 2 is distinguished from the overlying layer 1 and 1A by increased tip resistances (avg. 162 tsf), lower friction ratio values (avg. 1 percent), moderate N-values 25 blows/foot) and shear wave velocities (1122 fps). Layer 2 is predominantly sands and clayey sands (SP-SM to SP-SC) as determined by laboratory classification tests.

3.5.3 Layers 3 and 3A

The combined thickness of layers 3 and 3A is about 21 feet over the study area. Layer 3 and 3A represent stratigraphically equivalent layers however layer 3A is used to distinguish where the interval has become denser noted from increased tip resistances. Layer 3 is distinguished by relatively lower tip resistances (avg. 31 tsf) than layer 3A (avg. 89 tsf), and higher Friction ratio (1.7% versus 0.8%). Shear wave velocities are correspondingly higher in layer 3A than layer 3 (1079 fps versus 966 fps). Based on laboratory test data, the dominant unified soil classifications for layer 3A is SC and SM with minor layers of CL material occurring as laminations. Layer 3 probably contains slightly more fines (i.e. more clayey) than layer 3A.

3.5.4 Layers 4 and 4A

The combined thickness of layer 4 and 4A is about 20 feet thick. This layer is distinguished from the overlying layer 3 and 3A by increased tip resistances. As with layer 3 and 3A, layer 4 and 4A are stratigraphically equivalent layers with layer 4A being used to distinguish were average tip resistances are lower than layer 4. Layer 4 has notably higher tip resistances (avg. 184 tsf) than layer 4A tip resistances (avg. 108 tsf). The dominant unified soil classification for layer 4 and 4A is SP-SM where layer 4A may contain slightly higher fines content than layer 4.

3.5.5 Layer 5

Layer 5 is about 41 feet thick and is characterized by alternating layers of low and high CPT tip resistances (max. 813 tsf, min. 11 tsf, avg. 88 tsf), friction ratios (max. 8.4 percent, min. 0.2 percent, avg. 1.6 percent), tip resistances (27 blows/foot) and an average shear wave velocity of 1142 fps. Characteristically, CPT soundings in this stratigraphic interval layer show a pronounced sawtooth trace with large variations over relatively small vertical intervals. The depositional history of these

sediments is complex and highly variable in both its lithology and material properties. Soil types range from sands to silty sands (SP-SM to SM) with varying amounts of carbonate material. Within the study area, relatively little to no carbonate material was encountered with the SPT boring SDFB B1.

The lower portion of layer 5 contains the "green clay" (GC) which is an informal stratigraphic name at SRS for stiff, green to gray clays, silts, and clayey sands that are commonly found at the base of the Santee/Tinker Formation and as part of the Warley Hill Fm. In general, these soils classify as SM to ML with varying amounts of clay. This layer is locally continuous within the study area and has been used to define the lower boundary of the shallow stratigraphy.

3.6 Soil Characteristics

A summary of all CPT engineering layer picks for Site B is provided in Table 3.5-1. Average soil index properties and results from the SPT and CPT measurements are provided in Table 3.5-2. Layer continuity across the area is shown on the three-dimensional model in Figure 3.4-3 and on the cross-section on Figure 3.4-4. Figures 3.6-1 through 3.6-3 show mean and standard deviations of shear wave velocity (V_s), CPT tip resistance (q_t) and CPT friction ratio (R_f) with the generalized average engineering stratigraphy. SPT N-values are plotted on Figure 3.6-4 showing the range of values versus elevation, as well as, the generalized engineering stratigraphy. Note on Figures 3.6-1, 3.6-2 and 3.6-4 that average values determined for DWPF from Defense Waste Processing Facility, Balance of Plant Geotechnical Report, D'Appolonia (1982a) are included for comparison. For the most part, the results show that the conditions at Site B are consistent with the conditions at DWPF. Laboratory test results are included in Appendix D.

3.7 Soft Zone Characteristics

Weight of rod and occasional rod drops have been described in numerous drilling reports for monitoring wells and geotechnical borings located in the central part of the SRS. Early subsurface investigations performed by the United States Army Corps of Engineers (COE) frequently described these zones as soft zones, or even voids, and numerous subsequent subsurface investigations have described these same conditions at the SRS. These soft zones typically occur in the carbonate-bearing sediments of the Santee Limestone, Utley Limestone, and the Griffins Landing Member of the lower Dry Branch Formation. The prevailing assumption about the origin of these soft zones is dissolutioning of carbonate-rich, clastic sediments, resulting in vugular porosity (open pore space). When drilling these zones, the drill rod meets little shear resistance and drops (COE, 1951). However, much of the time, recovery of soil in the sampler precludes the zone from being characterized as a void.

Soft zones are defined by SPT-N values ≤ 5 or CPT tip resistance ≤ 15 tsf over a continuous thickness of two feet or greater. These zones are generally restricted to the lower Dry Branch Formation and the Santee/Tinker Formation. However, soft zones may be found in other horizons at the SRS.

Soft zones were detected in two of the ten CPT soundings (SDFBC1 and SDFBC6). In CPT sounding SDFBC1, two soft zone intervals were noted. The first between El. 197 feet msl to El. 195 feet msl; and the second between El. 188 feet ml to El. 186 feet msl. In CPT sounding SDFBC6, three soft zone intervals were noted. The first between El. 202 feet msl to El. 193 feet MSL; the second between El. 188 feet msl to El. 186 feet msl; and the third between El. 166 feet msl to El. 158 feet msl. With the exception of the lowermost (third) interval in sounding SDFBC6, these intervals correspond to Layer 3. The lower zone in sounding SDFBC6 corresponds to the uppermost portion of layer 5. It is noted that the pore pressure measurements and friction ratio values through all of these intervals are relatively high suggesting that these intervals contain fine grained soils. The two soundings are both located on the northern edge of Site B. The soft zones encountered at elevations of approximately 193 to 202 feet msl are within the "Tan Clay". Figure 3.7-1 is a kriged three-dimensional model of the distribution of soft zones underlying Site B.

3.8 Groundwater Conditions

Groundwater data were derived from the adjacent water-table monitoring well SBG-4, the CPT data, and from WSRC-TR-98-00045, The Regional Water Table of the Savannah River Site and Related Coverages. Monitoring well SBG-4 is the nearest to the Site B footprint. As shown on Figure 3.8-1, the water table elevation from August, 1990 to February, 1995 ranges from approximately El. 238.1 feet MSL to about El. 241.9 msl. The mean water-table elevation is 240 feet msl. The water-table as indicated by the pore pressure curves from the CPTs suggests that the current water table elevation is 238 feet msl corresponding to the lower water level. The dominant water table gradient within Site B is oriented to the northeast and is largely controlled by tributaries to McQueen Branch immediately eastward of the S-Area. Local water-table contours are shown on Figure 3.0-1. The high water table, (241.9 feet msl) and the water table at the time of this investigation, (238 feet msl) are shown on Figure 3.4-3.

3.8.1 Water Quality

Well SBG-4, adjacent to Site B, has historical levels of tritium and trichloroethene (TCE) above the Drinking Water Standards (DWS). In order to assess the water quality underlying Site B, a water sample was taken adjacent to boring SDFB-B1 and analyzed for tritium and volatile organic analytes (VOA's). This sample was obtained from a depth interval of 40 – 42 feet using CPT methodology. The water table depth at the time of the sample was approximately 38 feet. The results of these analyses are:

Tritium	4.06 +/- 0.817 pCi/ml (DWS = 20 pCi/ml)
Trichloroethene (TCE)	<1 ppb (DWS = 5 ppb)
Tetrachloroethene (PCE)	<1 ppb (DWS = 5 ppb)
Benzene	<1 ppb (DWS = 5 ppb)
Carbon Tetrachloride (CCl4)	<1 ppb (DWS = 5 ppb)
Trichloroflouromethane(Freon11)	<1 ppb (DWS = 5 ppb)

The results of these analyses indicate that VOA's and tritium are well below the DWS in the groundwater underlying Site B.

3.9 Topography and Surface Hydrology

Site B is located within an engineered area associated with the DWPF facility. The area is flat-lying, backfilled and drained. There are no topographic or drainage problems. The area is away from immediate roads and rail lines and no cut and fill problems are anticipated.

Site B exists well above the 100 year floodplain of the tributaries to McQueen Branch, which is located eastward from the site. The site is located on a topographic high and away from drainages or streams. Local flooding is not a problem.

4. GEOTECHNICAL AND FOUNDATION ASSESSMENT

The conditions encountered during this program are not unlike conditions found elsewhere at the SRS. In fact, they are very similar in terms of:

- Geology and soil classification;
- SPT N-values;
- CPT resistances; and
- Shear wave velocity.

Figures 3.6-1 through 3.6-4 show the range of SPT N-values, the mean and range of CPT corrected tip resistance (q_t), CPT friction ratio (R_f) and shear wave velocity (V_s) from this investigation. Based on these results, the soils encountered can support structure and foundation loads currently constructed at the SRS with no adverse consequences. These data also confirm and correlate with the engineering layer picks for Site B. Typical foundation loading for existing critical facilities at the SRS is in the range of 4 to 7 kips per square foot (ksf). Higher loads could be supported depending on the layout, geometry and foundation depths of the proposed facilities and the results of a structure specific geotechnical investigation program, which is required for the proposed SDF mission facilities.

The water table within Site B is approximately 38 to 42 feet below the ground surface, however, perched water should be expected. Local clay layers may be continuous and should be considered for any deep excavations and/or dewatering.

5. CONCLUSIONS AND RECOMMENDATIONS

The stratigraphy and average engineering properties determined for the Salt Disposition Facility- Site B are consistent with those determined for other facilities in S-Area. Geologic conditions are also directly comparable.

The results of this investigation are:

- Site topography is suitable for potential construction. There are no natural drainage, cut and fill or road and rail profile problems.

- There are no surface hydrology or potential floodplain problems that might affect construction suitability.

- Groundwater may occur at an elevation (approximately 238 feet, msl ranging up to 242 feet, msl) that will impact excavation, depending on final facility design.

- The groundwater sample was analyzed for tritium and volatile organic analytes. Analyses of the groundwater sample indicate that tritium and organic volatiles were below the Drinking Water Standards.

- Soft zones were detected in two of the ten CPT soundings and along the northeastern portion of Site B. Further evaluation of these soft zones may be warranted. Soft zone intervals detected at Site B are consistent with soft zone sediments encountered at the ITP area. Siting and design of new facilities in this area should account for the presence of these soils either by avoiding the placement of critical facilities where these zones are known to exist, or determining the potential settlement and then designing the facility to accommodate the estimated movement. A thorough review of the data included in this report is recommended for planning further investigations.

- No geologic structure was noted at Site B. A review of regional information indicates that there are no known faults in the area that affect the Gordon Aquitard.

- The stratigraphy and average engineering properties determined for the Salt Disposition Facility- Site B are consistent with those determined for other facilities in the H- and S-Areas. Geologic conditions are also directly comparable between these areas.

- Based on the preliminary data obtained during this investigation, Site B is acceptable for continued construction consideration.

Design and construction of new PC-3 and higher facilities, heavily loaded structures or capital investment projects in the Site B area will require structure specific investigations for foundation design and construction, as well as, proper characterization of soft zone intervals. Foundation specific investigations should consider structure size, geometry, foundation type and depth, performance classification and functional classification.

Heave monitoring for excavations greater than ten feet deep and settlement monitoring is required for all major and/or critical new facilities throughout the construction phase until final turn-over or when operations commence. After operations commence, settlement monitoring is required on an established interval. Settlement results should be compiled and reviewed by competent geotechnical and structural engineers.

New critical facilities should consider seismic instrumentation in the structure design and facility operation. An SRS Engineering Standard for seismic instrumentation is currently under development. This standard will provide specifications for seismic instrumentation installation and performance.

6. REFERENCES

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Table 3.5-1. Engineering Layer Horizon Picks (elevation above mean sea level).

CPT ID	1	1A	2	3	3A	4	4A	5
SDFBC1	280	248	240	202	NP	NP	182	161
SDFBC2	277	244	239	NP	197	180	NP	160
SDFBC3	276	246	241	201	NP	184	NP	163
SDFBC4	278	247	240	201	NP	184	NP	164
SDFBC5	276	244	240	NP	200	180	NP	160
SDFBC6	277	246	244	206	NP	NP	187	167
SDFBC7	274	NP	240	200	NP	181	NP	160
SDFBC10	277	246	240	NP	201	180	NP	158
SDFBC14	279	248	241	200	NP	184	NP	163
SDFBC15	275	249	245	201	NP	182	NP	159

Table 3.5-2 Average Soil Parameters

AVERAGE PROPERTIES Layer	1	1A	2	3	3A	4	4A	5
SPT N-Value (blows/foot)	42	13	24	15	-	18	-	27
q_t/N	2.4	2.5	6.7	2.1	-	6.1	-	3.3
Shear Wave Velocity (V_s) (ft/sec)	1199	1117	1122	966	1079	1280	-	1142
Corrected Tip Resistance (q_t) (tons/foot^2)	101	32	162	31	89	108	184	88
Friction Ratio (R_f) (%)	2.9	3.5	0.9	1.7	0.8	0.9	0.6	1.58
Percent Fines (%)	20	31	13	19	-	18	-	27
Plasticity Index (%)	23	-	-	41	-	26	-	8
Liquid Limit (%)	44	-	-	66	-	53	-	35
Water Content (%)	16	20	22	31	-	32	-	33

Notes

1. Data for the SDF Investigation includes CPTs 1-7, 10, 14, 15 and Boring SDFB-B1.
2. Layers 3A and 4A were not correlated to boring SDFB-B1 and values were not calculated.

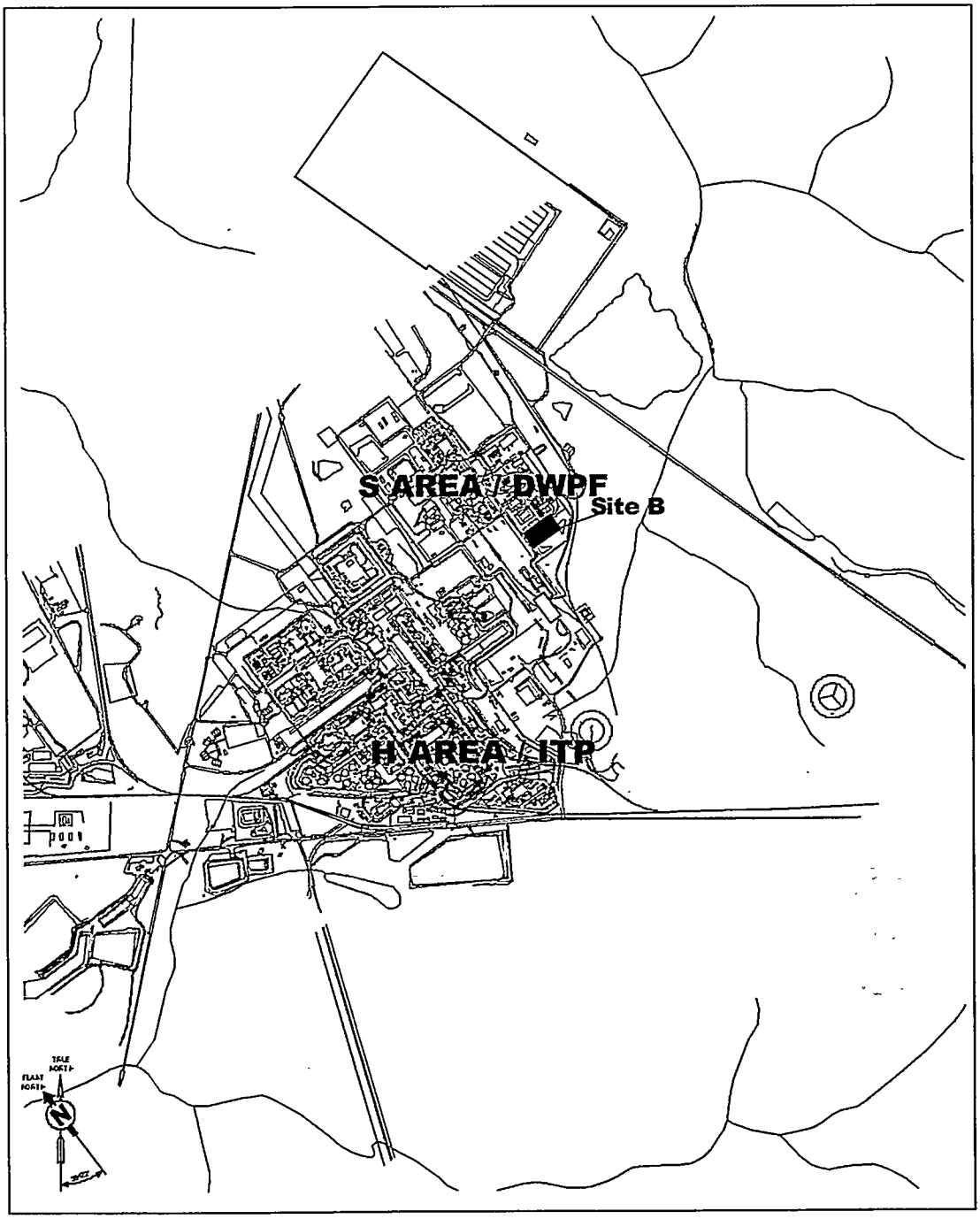


Figure 0-1. Location of Site B relative to H-Area and S-Area.

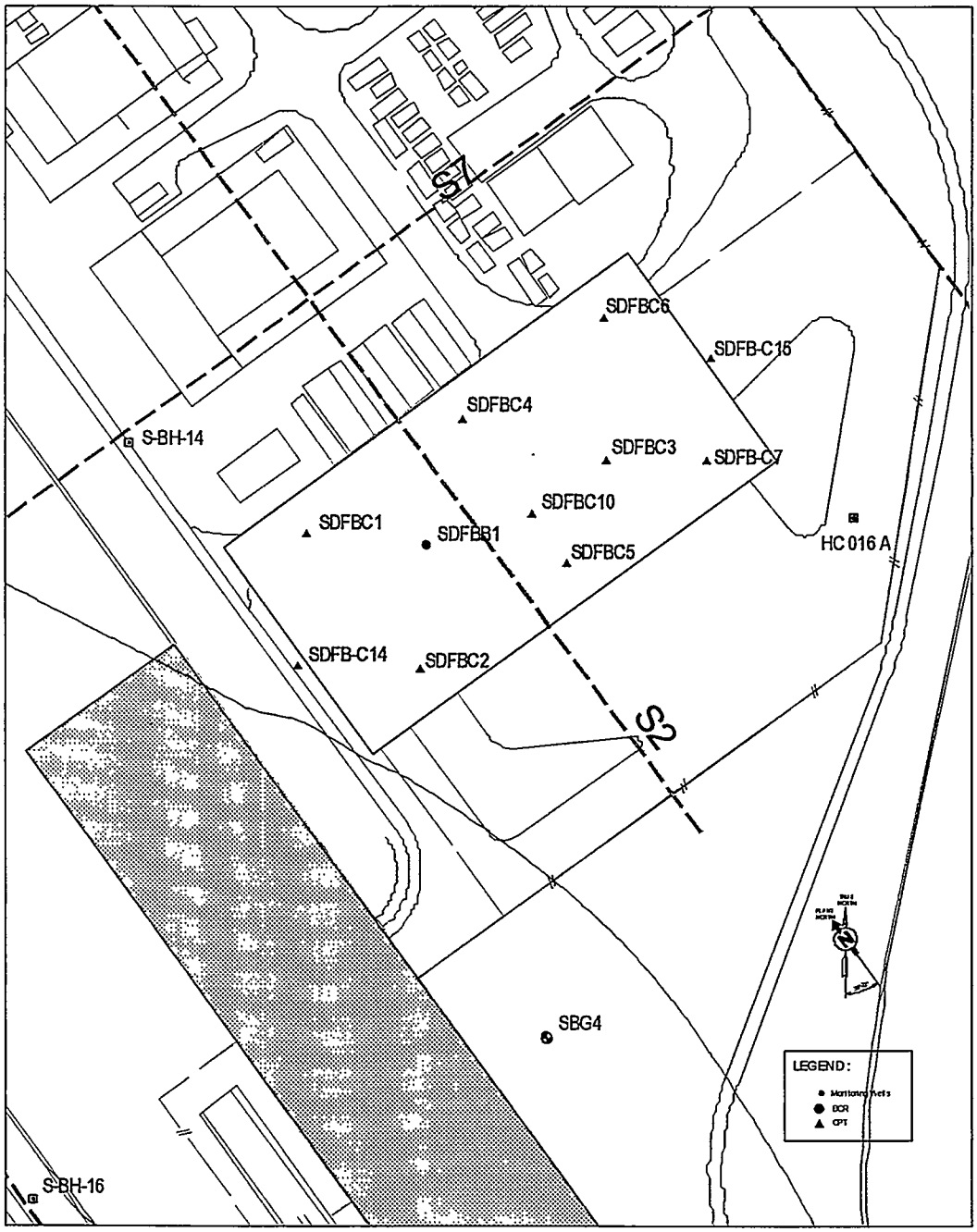


Figure 1.0-1. Location of boring SDFB-B1 and the CPT's within the Site B footprint. Line A – A' is the engineering cross-section (Figure 3.4-4 HC-16A is an abandoned piezometer cluster. The shaded northwest-southeast trending rectangle is the boundary of the S-Area Sand Blast Area, a potential RCRA/CERCLA waste unit.

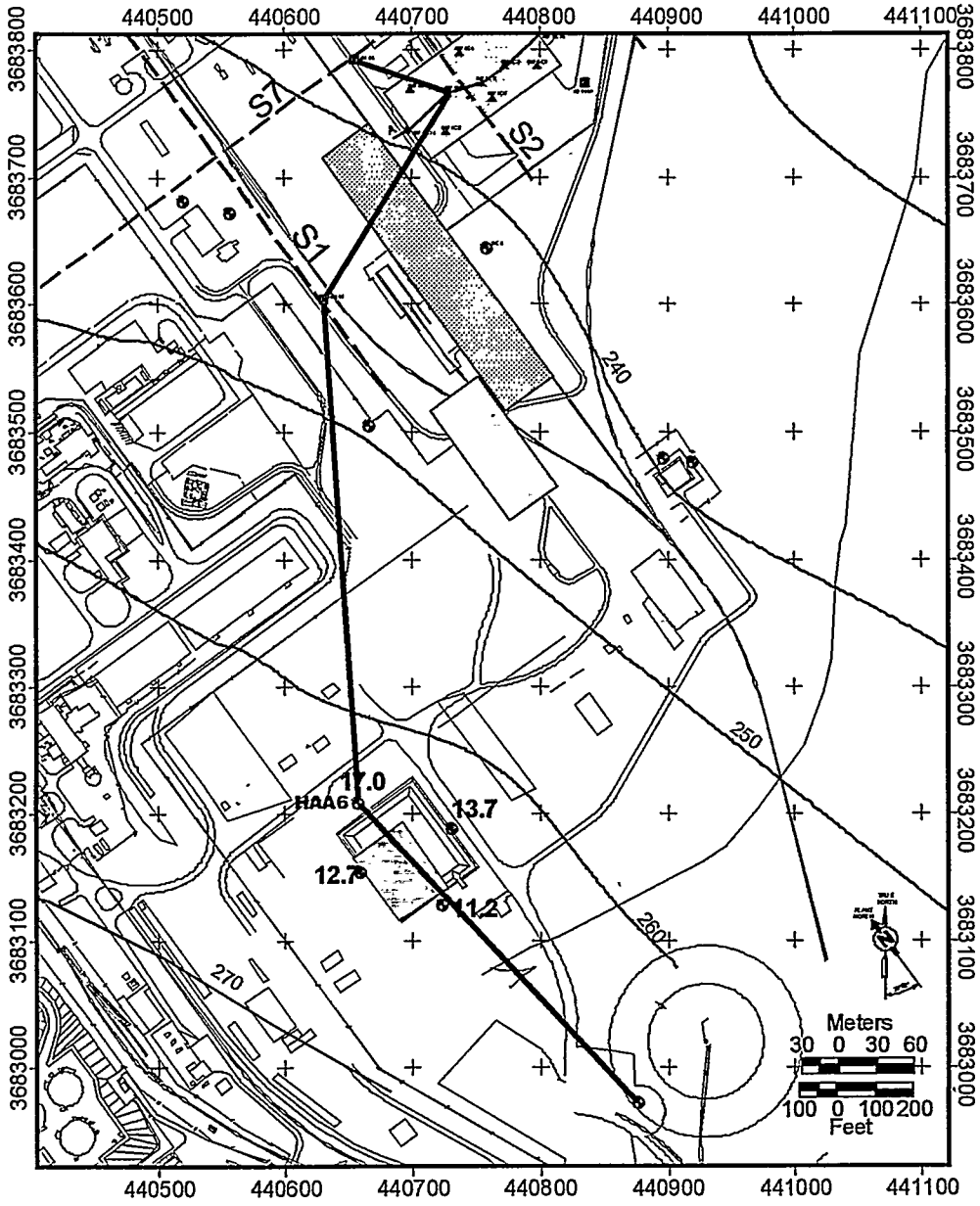
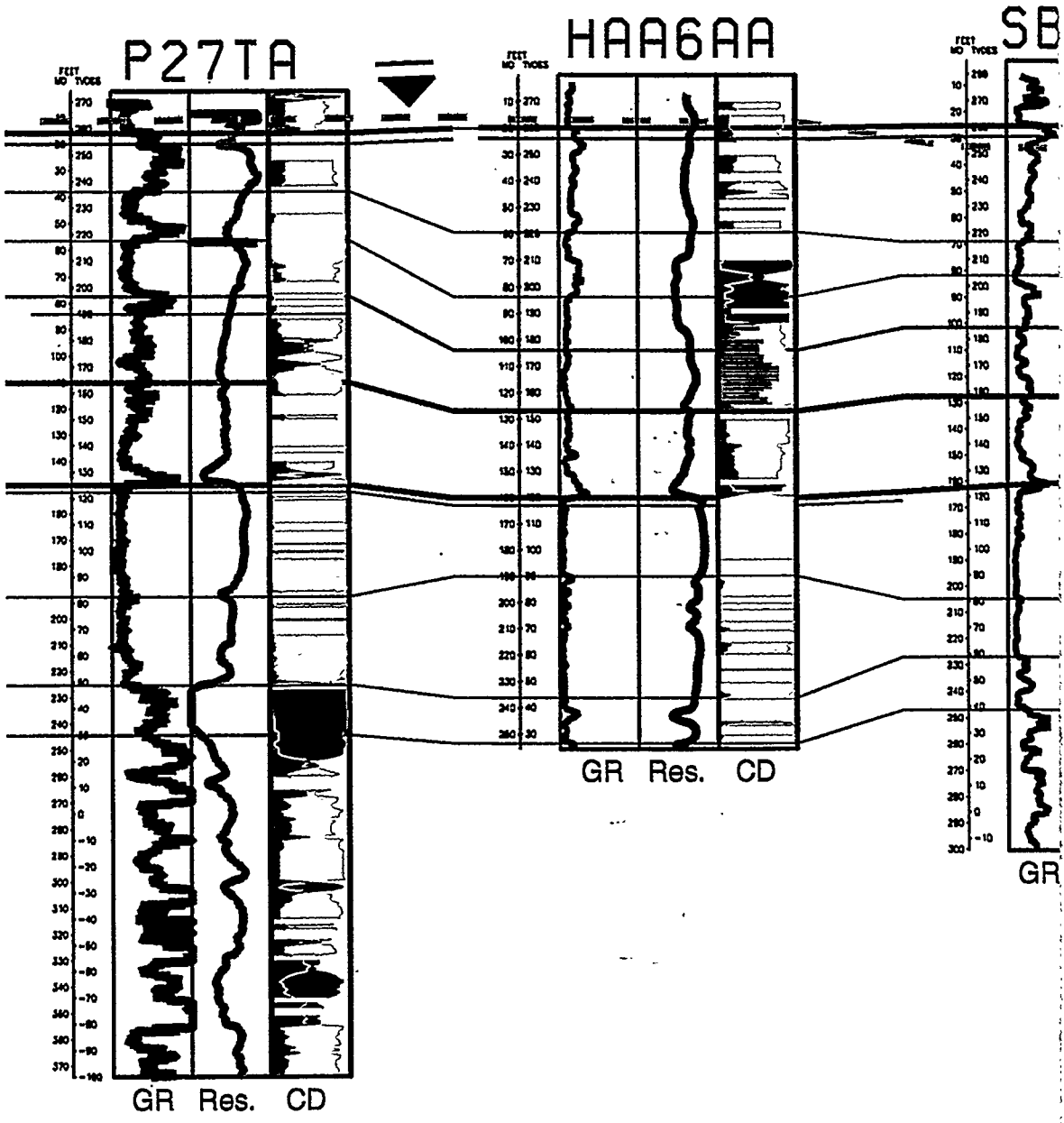


Figure 3.0-1. Correlation tie line from SDFB-B1 to regional well P-27. Blue contour lines are the water table elevations.



V.E. = 1x
MD = measured depth from surface
TVDSS = true vertical depth, subsea
CD = core data, yellow is relative percent sand, green is percent clay, red percent gravel and blue percent carbonate
GR = gamma ray, Res. = Resistivity
scale values for GR and Res. vary

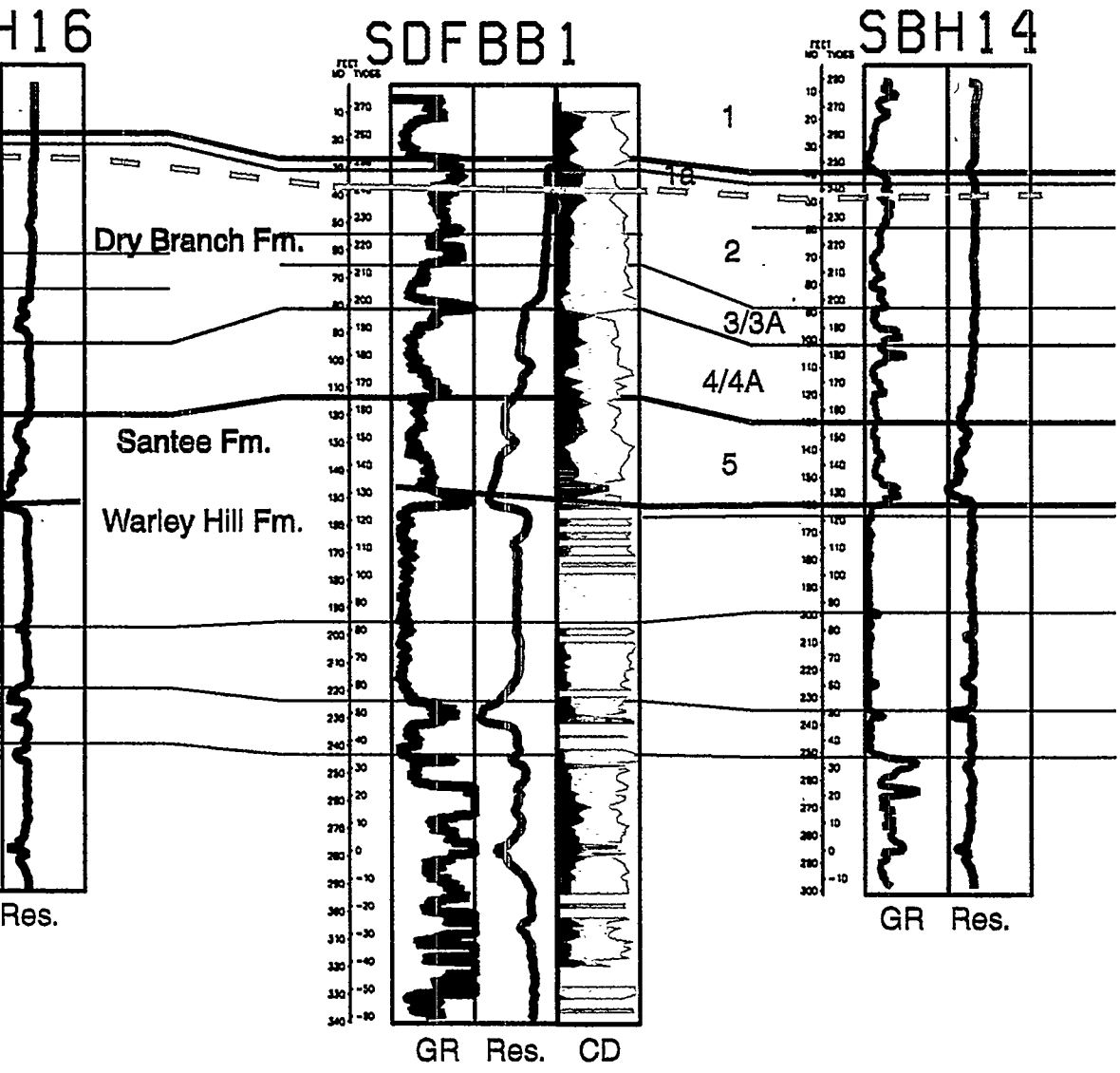


Figure 3.0-2. Correlation panel from regional well P-27 to SDFB-B1. Darker lines are formation markers. Lighter lines are correlation markers on similar sediment packages. The numbered horizons approximately correspond with the engineering layers. The solid blue line is the water table level at the time of the investigation, the dashed line the inferred water table level.

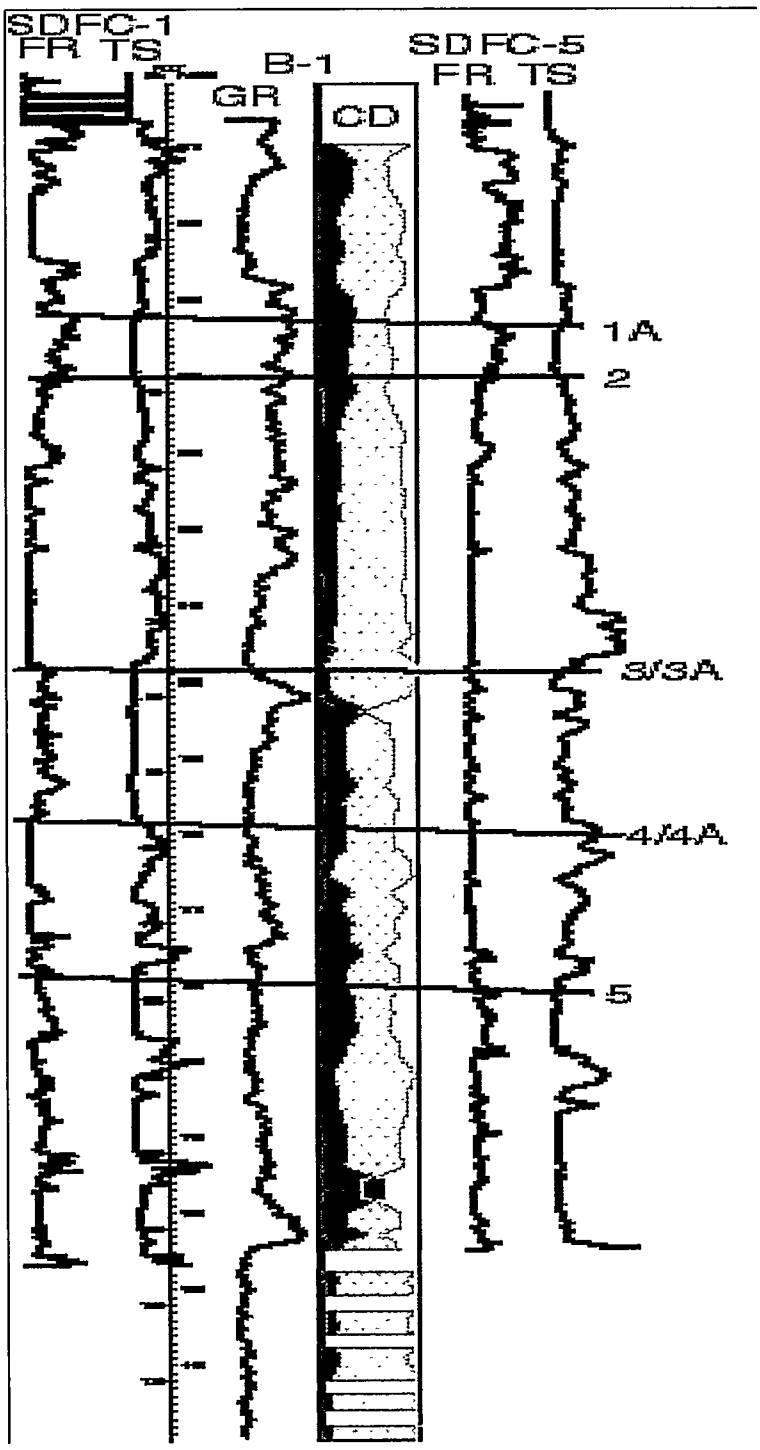


Figure 3.0-3. Correlation between engineering picks from CPT C-1 and C-5 and boring SDFB-B1 (reference Figure 1.0-1). The tops of the engineering layers are shown. "FR" is Friction Ratio, "TS" is Tip Stress, "GR" is natural gamma ray and "CD" is core data shown as relative percentage of sand (yellow), clay (green), gravel (red) and carbonate (blue).

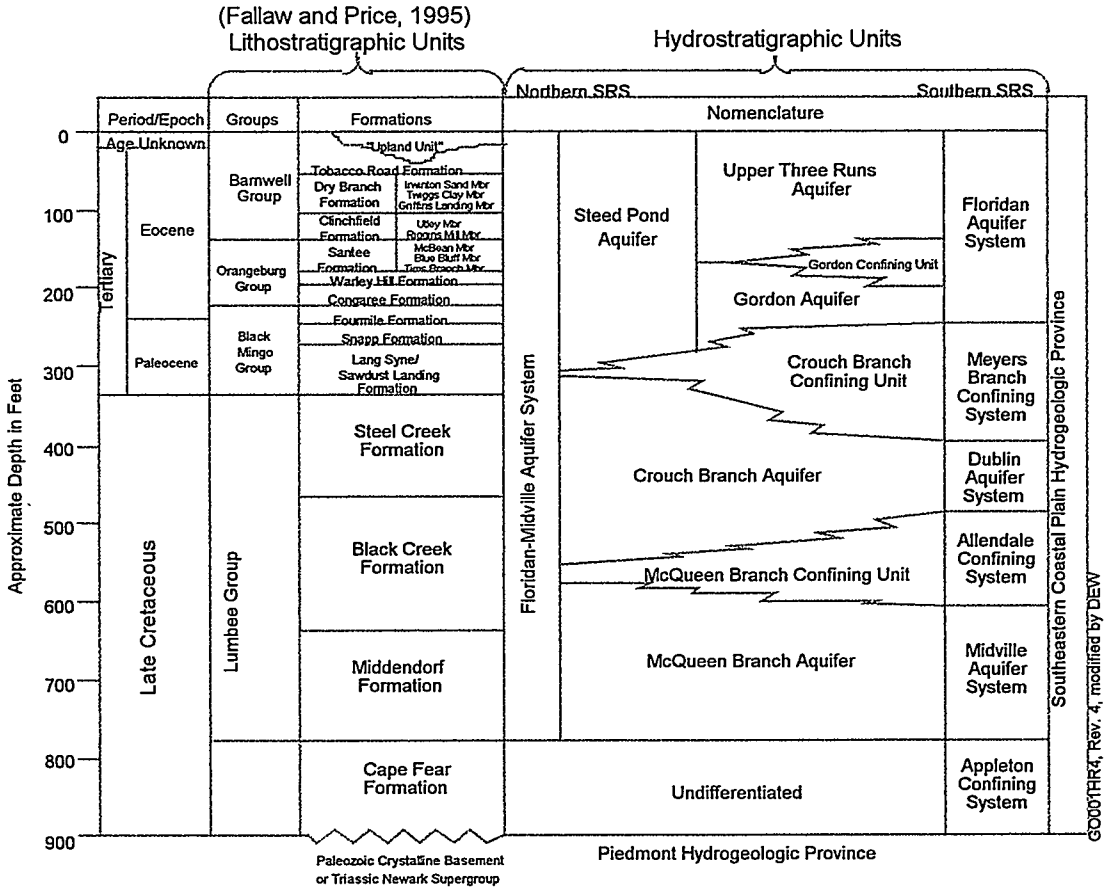


Figure 3.2-1. Generalized Coastal Plain stratigraphy underlying Site B. Figure is from Aadland et al., (1995).

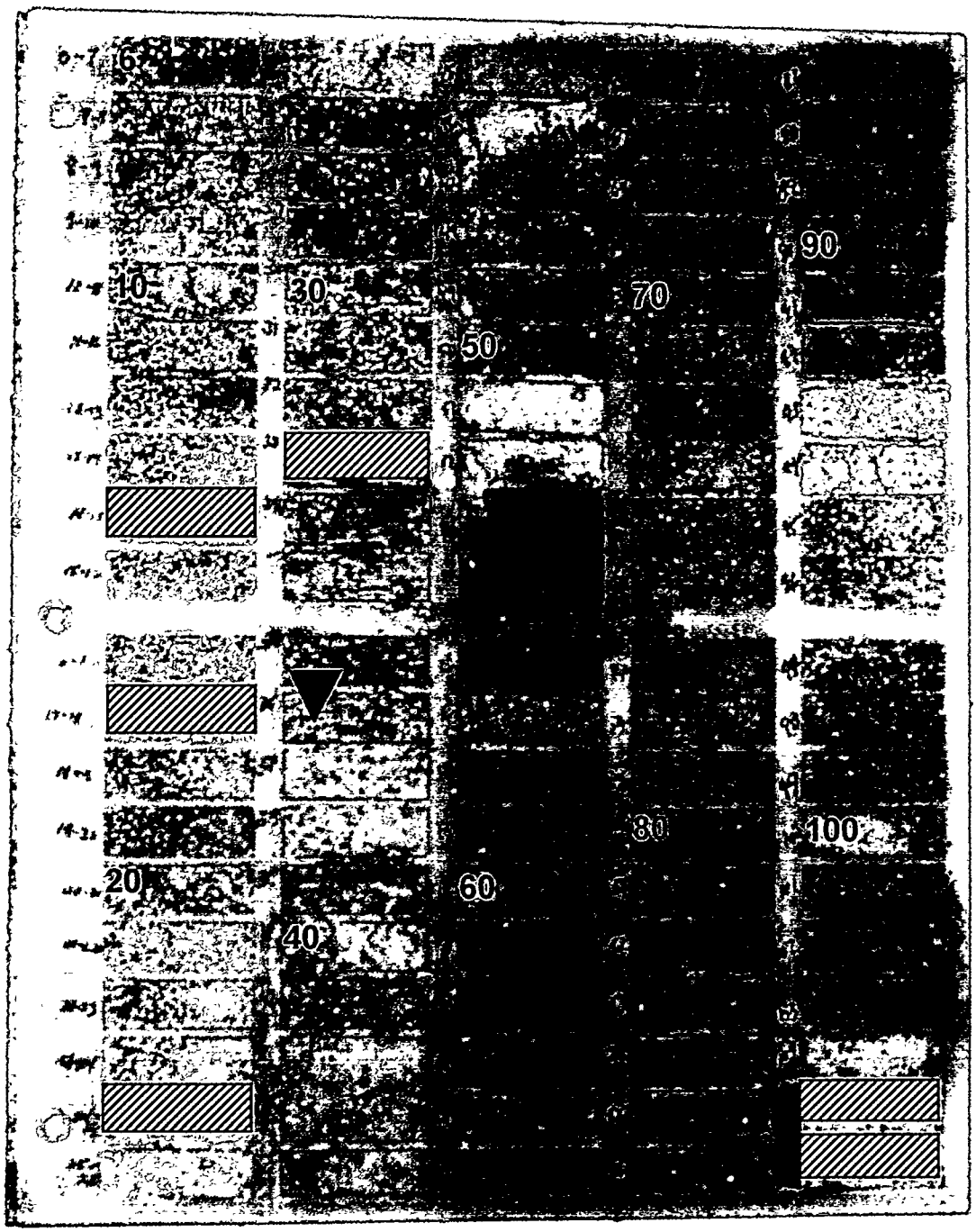


Figure 3.2-2. Photograph of subsurface sediments from boring SDFB-B1. Each box represents one foot of sediment. Shallower samples are in the upper left and deeper samples in the lower right. The numbers represent depth below the surface in ten foot increments. The striped boxes represent intervals where no sample was recovered. The triangle is located at the approximate water table horizon.

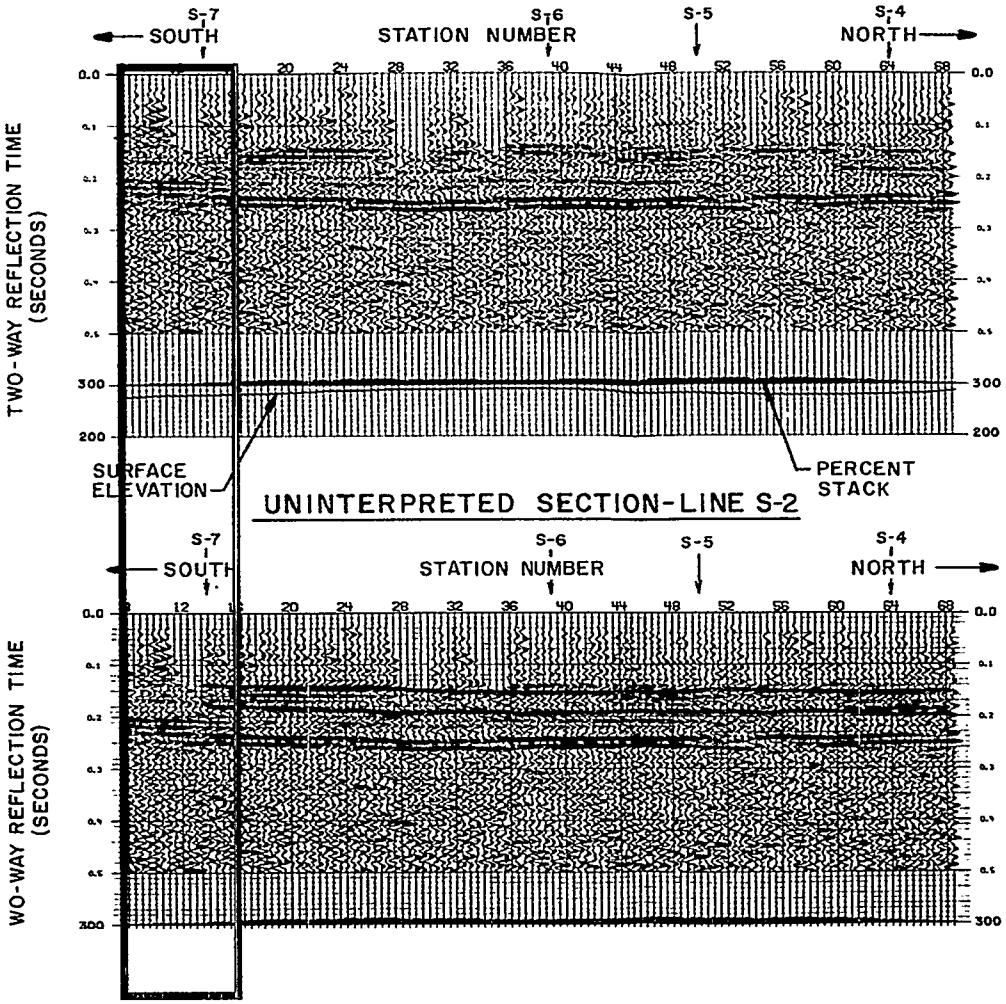


Figure 3.4-1. DWPF seismic line S-2 (refer to Figure 1.0-1). The box outlines the approximate area of SDF Site B relative to this seismic line. This seismic line crosses Site B on its southernmost end. The interpreted data represent horizons that were used for local subsurface mapping for the DWPF. The seismic data in this portion of the line are not in full fold and no geological structure is evident. These data are from D'Appolonia (1982b).

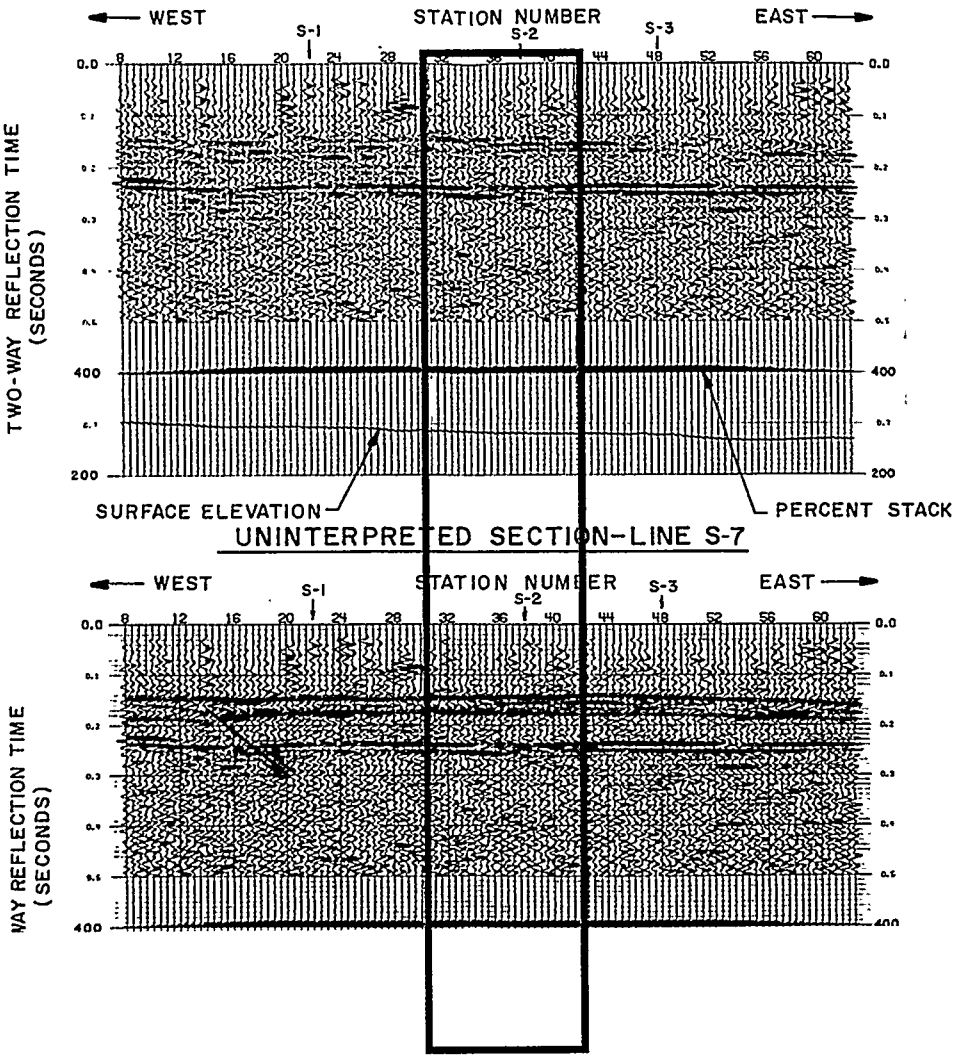
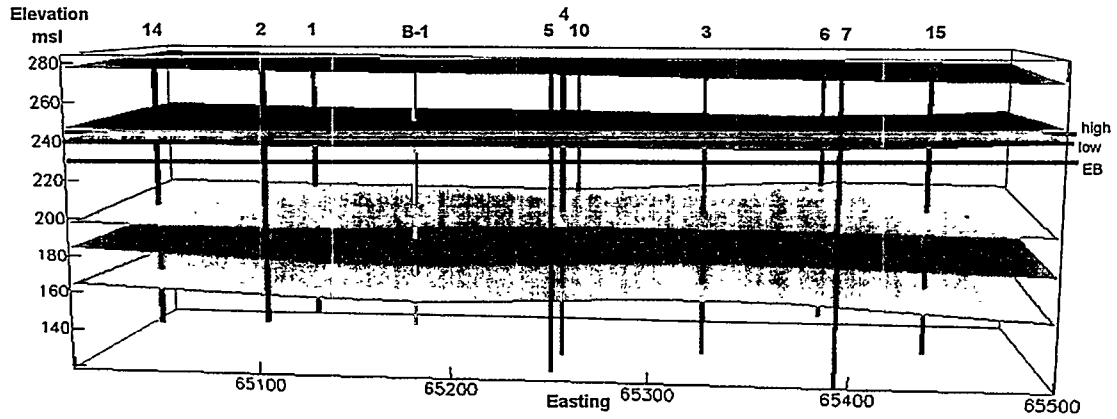


Figure 3.4-2. DWPF seismic line S-7 (refer to Figure 1.0-1). The box outlines the approximate area of SDF Site B relative to this seismic line. This seismic line was acquired approximately 100 feet to the northwest of Site B. The interpreted data represent horizons that were used for local subsurface mapping for the DWPF. No geological structure is seen in these data. These data are from D'Appolonia (1982b).

SDF Site B
Engineering Layers



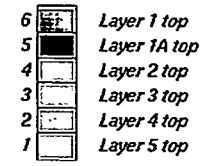
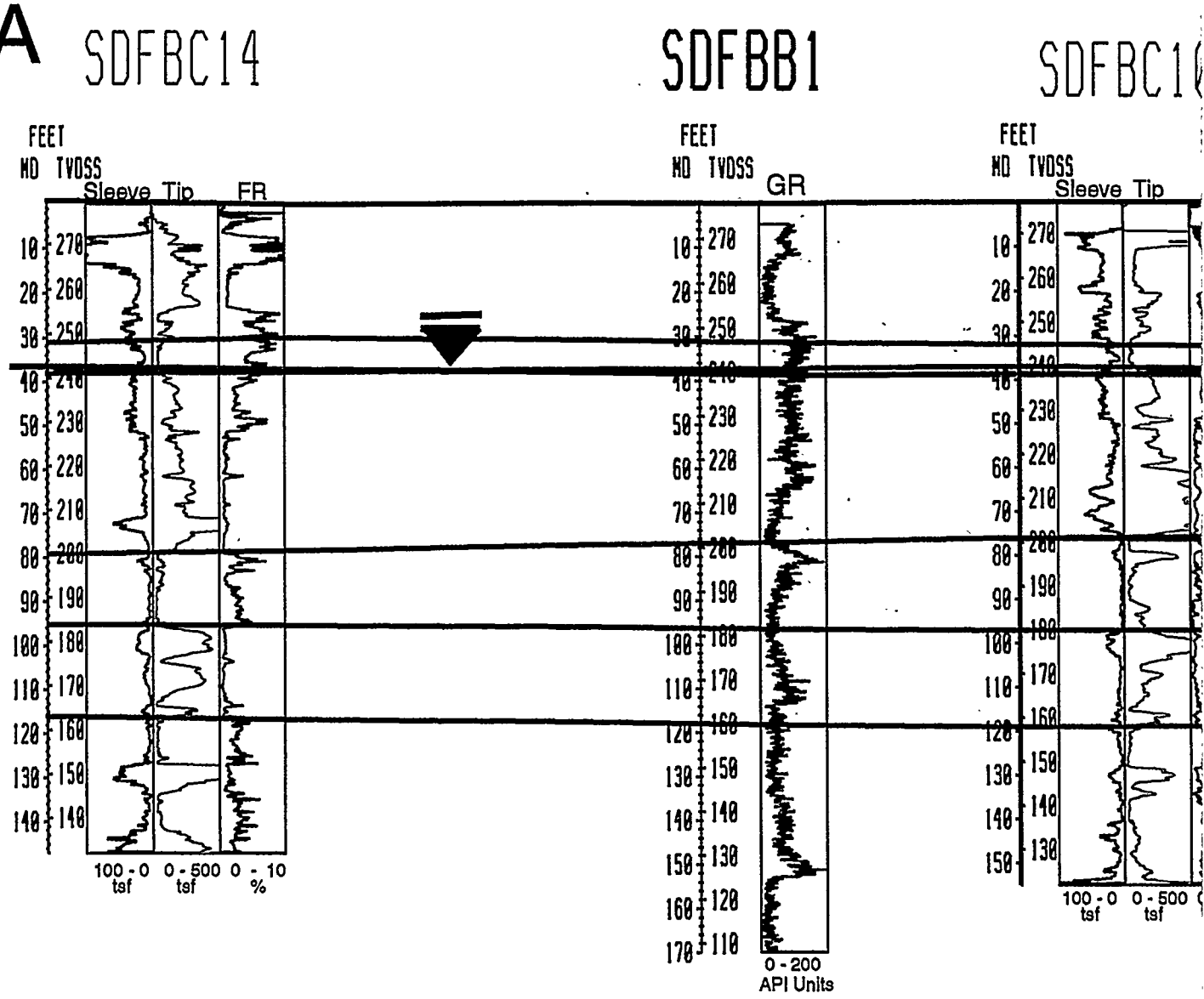


Figure 3.4-3. Engineering layer model for the Site B strata. 'low' is the water table measured from the CPT data at the time of the investigation, which corresponds with the historical low value. The light blue line labeled 'high' is the highest water table measured in the adjacent monitoring well SBG-4 over the last five years. The red line, labeled 'EB' is the anticipated excavation base for the proposed Small-Tank Precipitation canyon facility. View is facing SRS north. The CPT's and boring B-1 are labeled. Depths are in feet relative to mean sea level.

A



V.E. = 2x
MD = measured depth from surface
TVDSS = true vertical depth, subsea

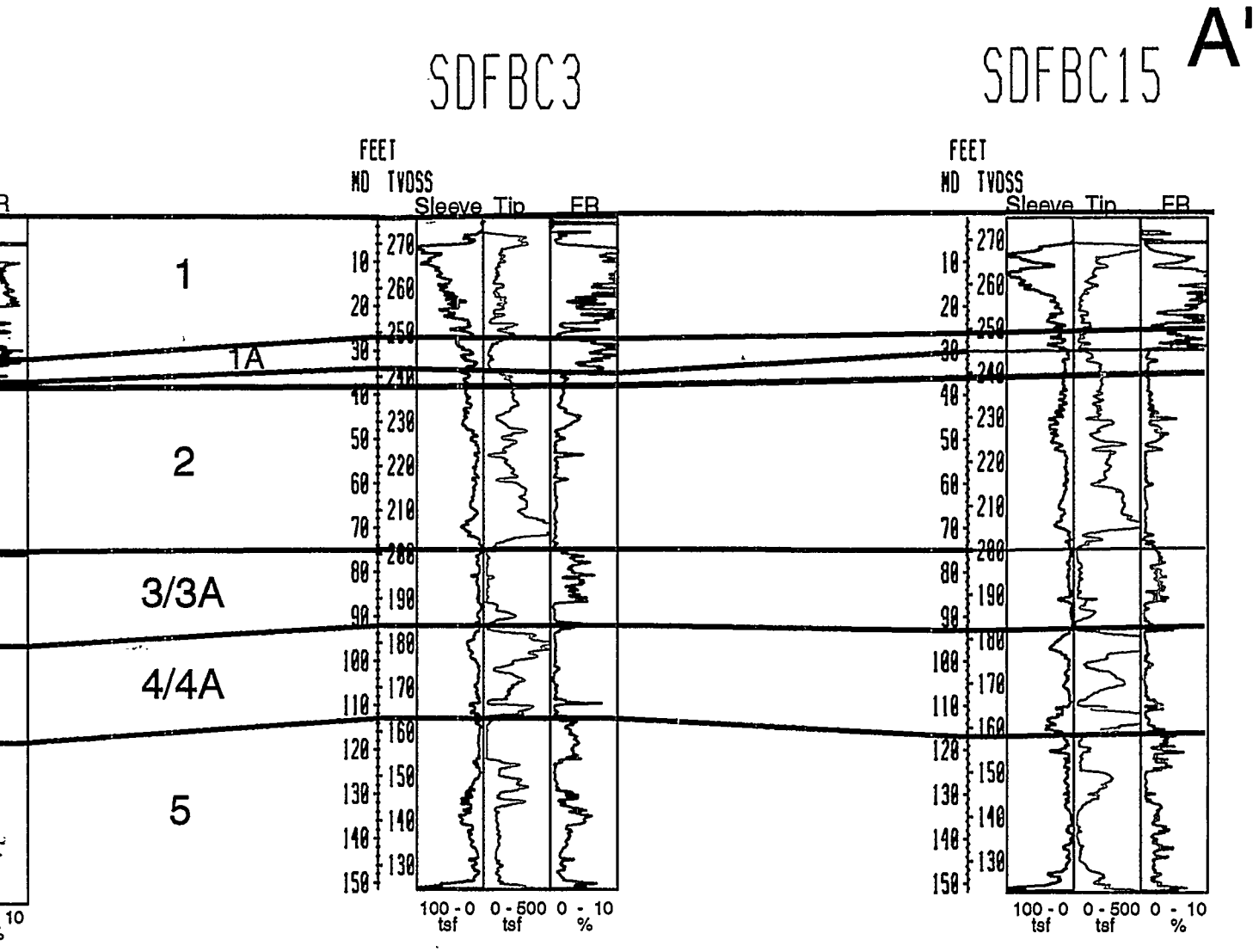


Figure 3.4.4. CPT cross-section A - A'. Line of section is shown on Figure 1.0-1. The engineering layers are shown. For each CPT the Sleeve Pressure (black curve), Tip Resistance (green curve) and Friction Ratio (red curve) are shown. The water table depth at the time of the invesigation is shown in blue. The CPT data are tied to the regional data through boring SDFB-B1.

SDF SITE B
Tip Stress

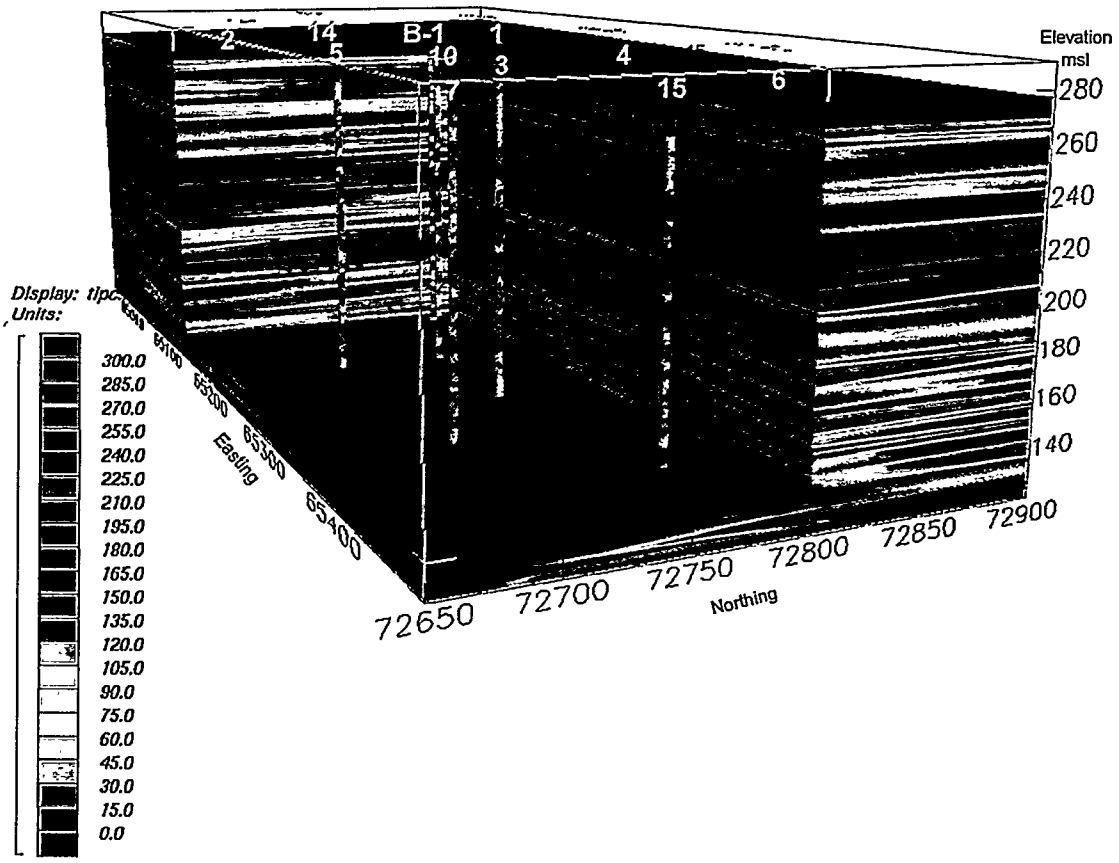


Figure 3.4-5. Three-dimensional model of measured tip stresses from the CPT data. Each CPT is numbered according to the layout pattern on Figure 1.0-1. View is to the northwest towards the DWPF facility. Depths are in feet. The coordinate system shows SRS Northing and Easting. Red colors indicate low tip stresses (generally clayey soils) and blue colors high tip stresses (generally sandy soils). The vertical and lateral variation in subsurface sediments is obvious in this figure.

SDF Site B
Friction Ratio

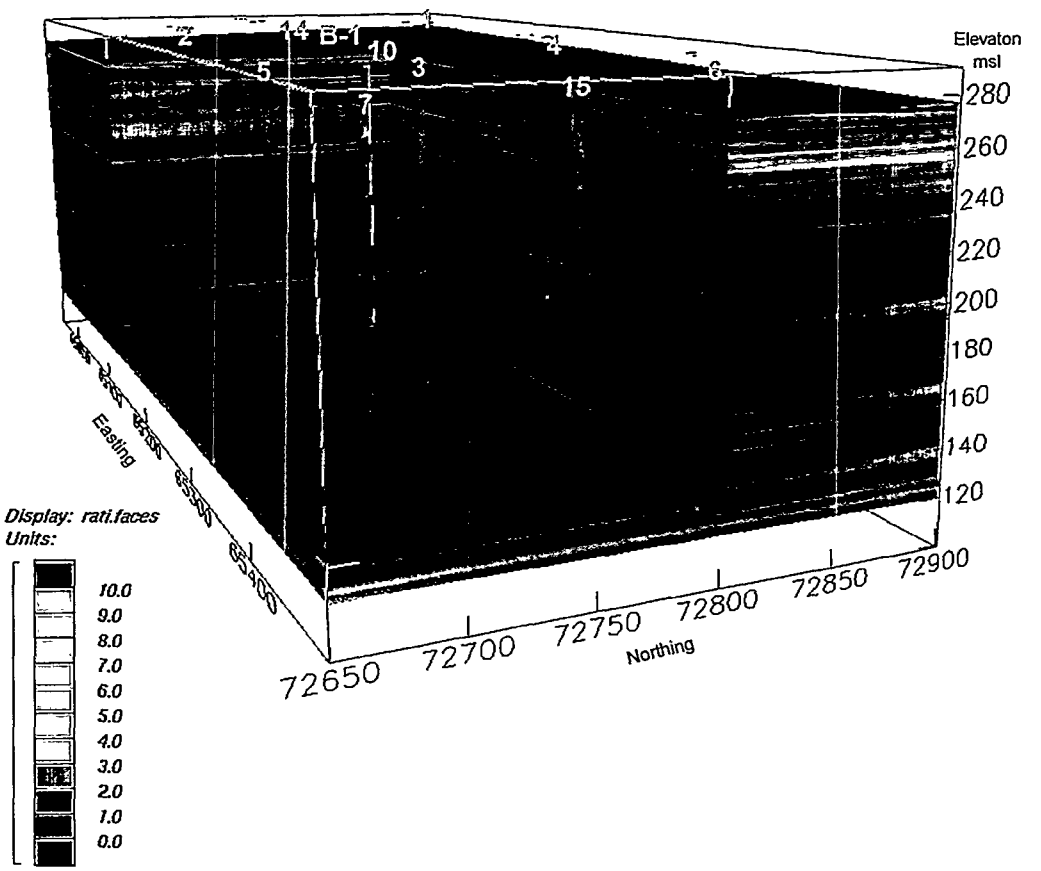


Figure 3.4-6. Three-dimensional model of the Friction Ratio based on the CPT data. Darker blue colors indicate soils that are mostly sand. Lighter blues and greens indicate soils that have are higher in clay content. View is to the northwest. Depth is in feet relative to mean sea level. Coordinates are in SRS Northing and Easting. This figure demonstrates the relative variation in grain size (sand versus finer grained sediments) underlying the site.

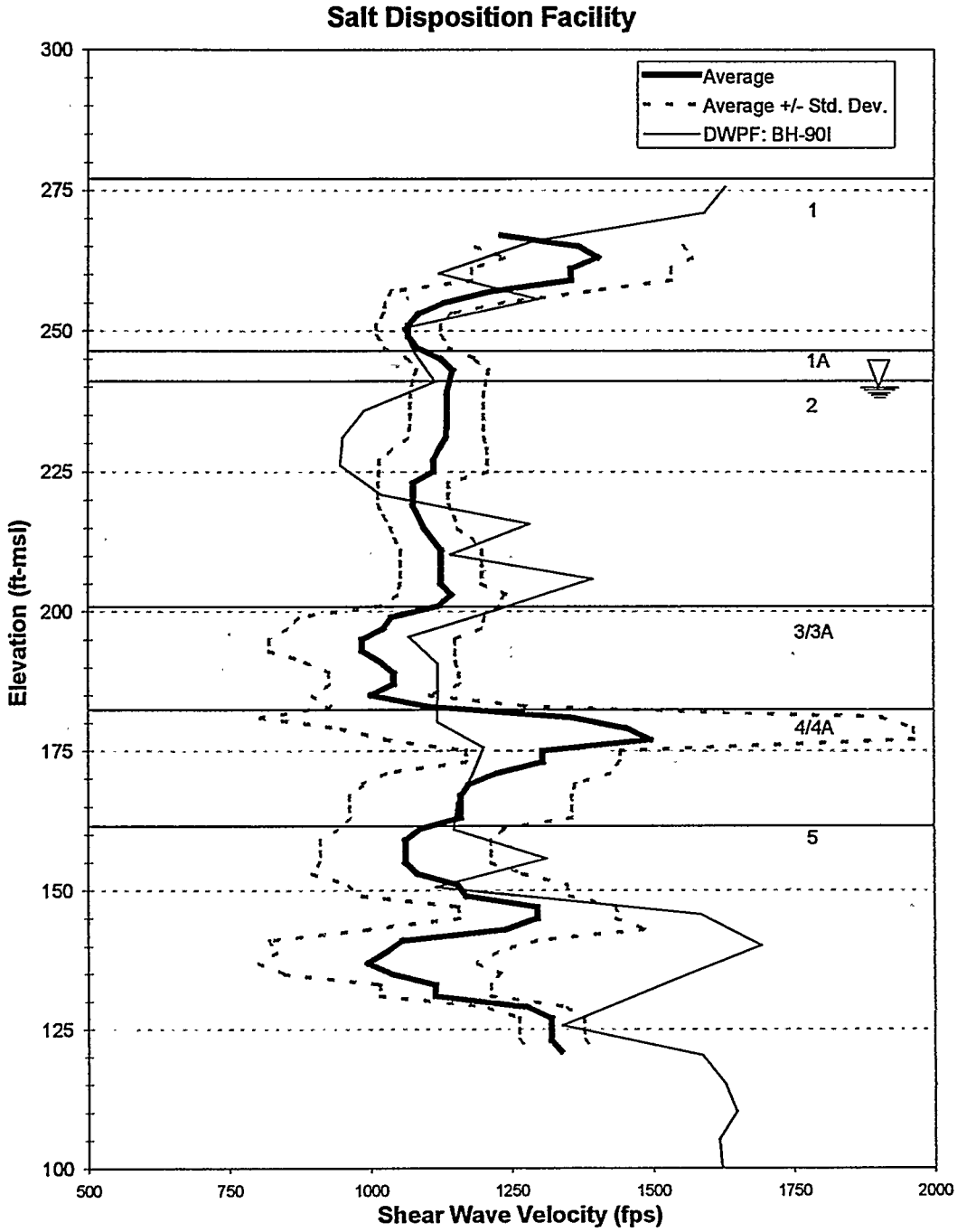


Figure 3.6-1. Average shear wave velocity from CPT's on Site B as compared to historical DWPF data. Engineering layers from Site B are shown.

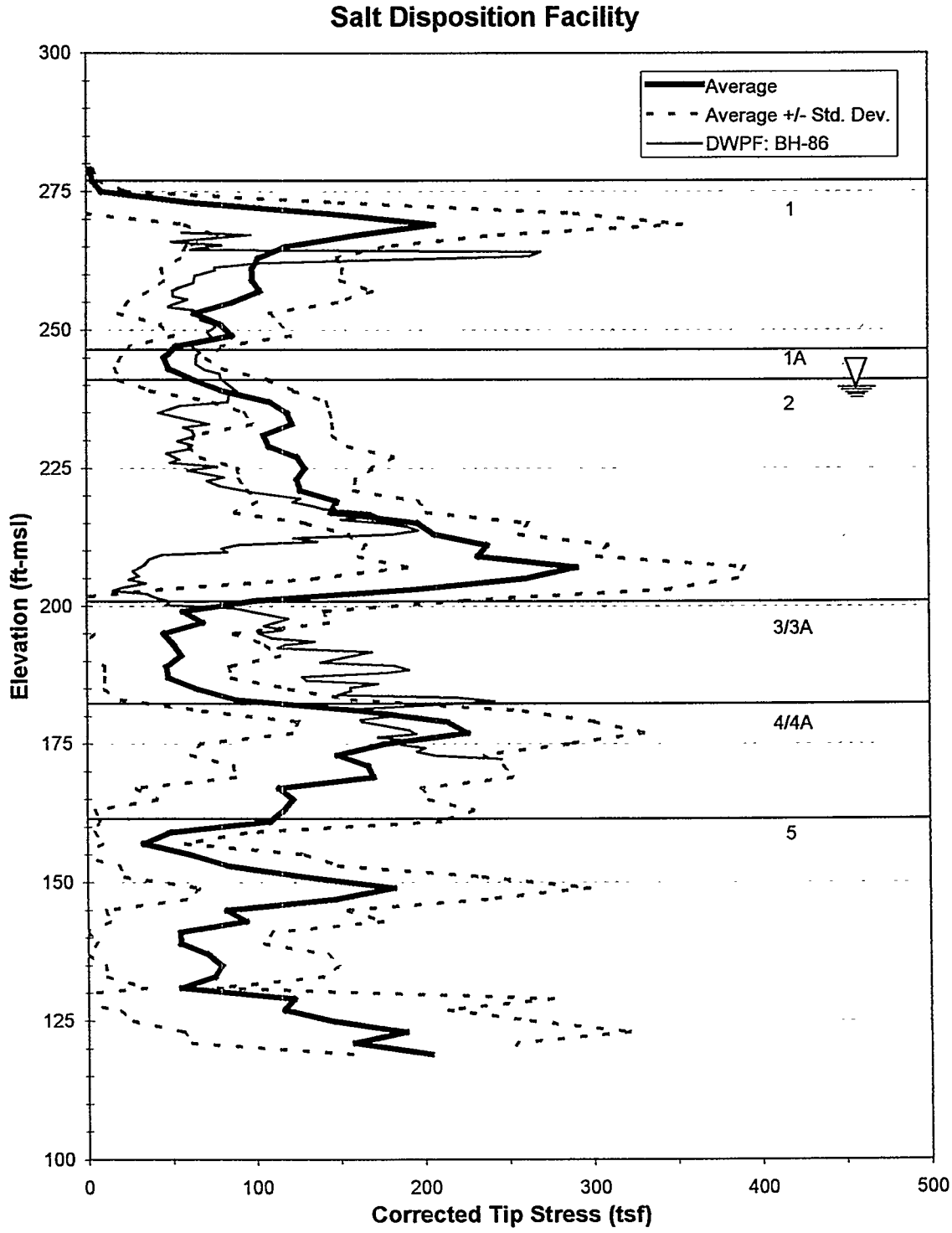


Figure 3.6-2. Tip Stress averaged from the Site B CPT's compared to DWPF data. The engineering layering from Site B is shown.

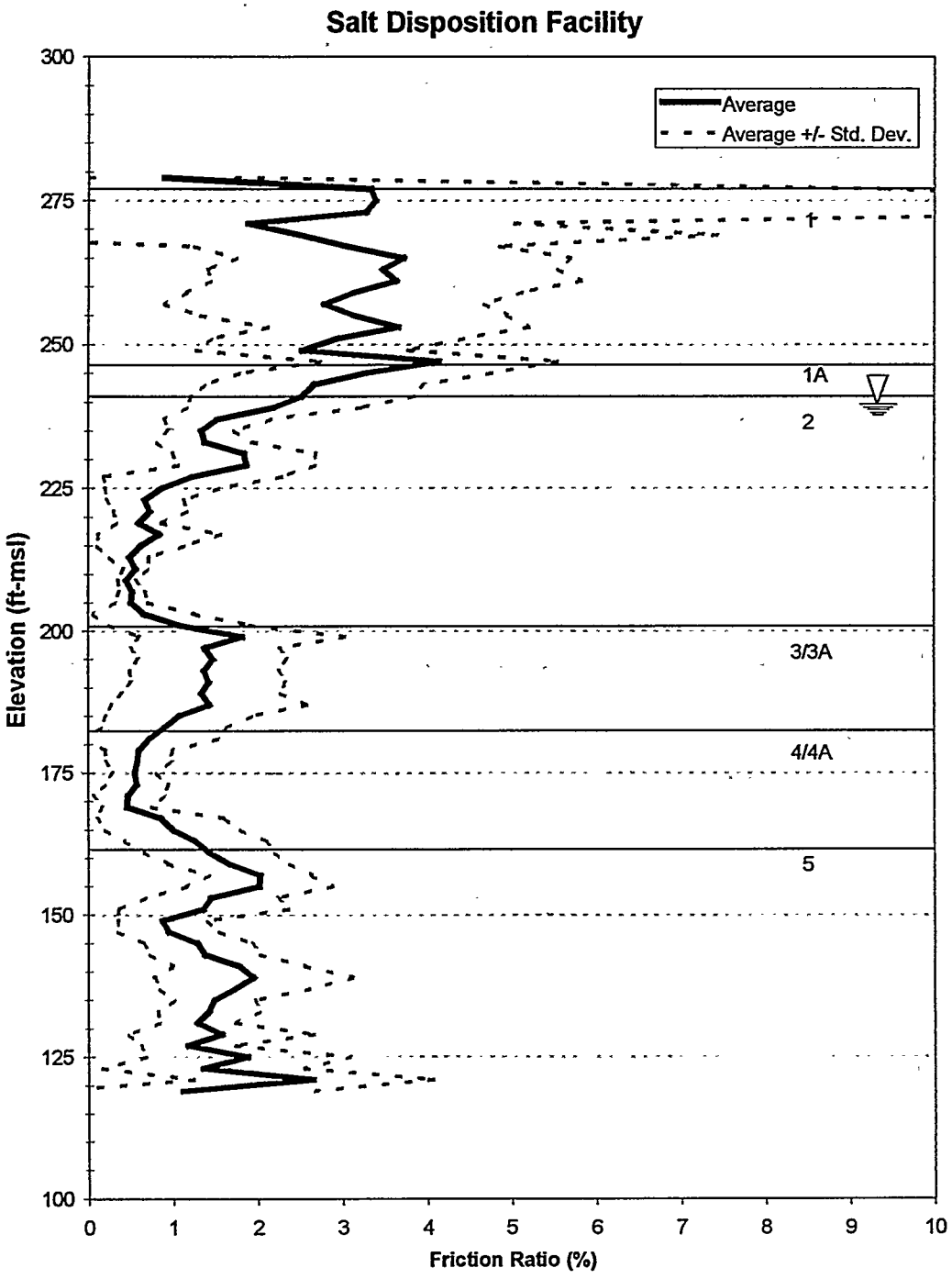


Figure 3.6-3. Averaged Friction Ratio from Site B compared with DWPF data. The Site B engineering layering is shown.

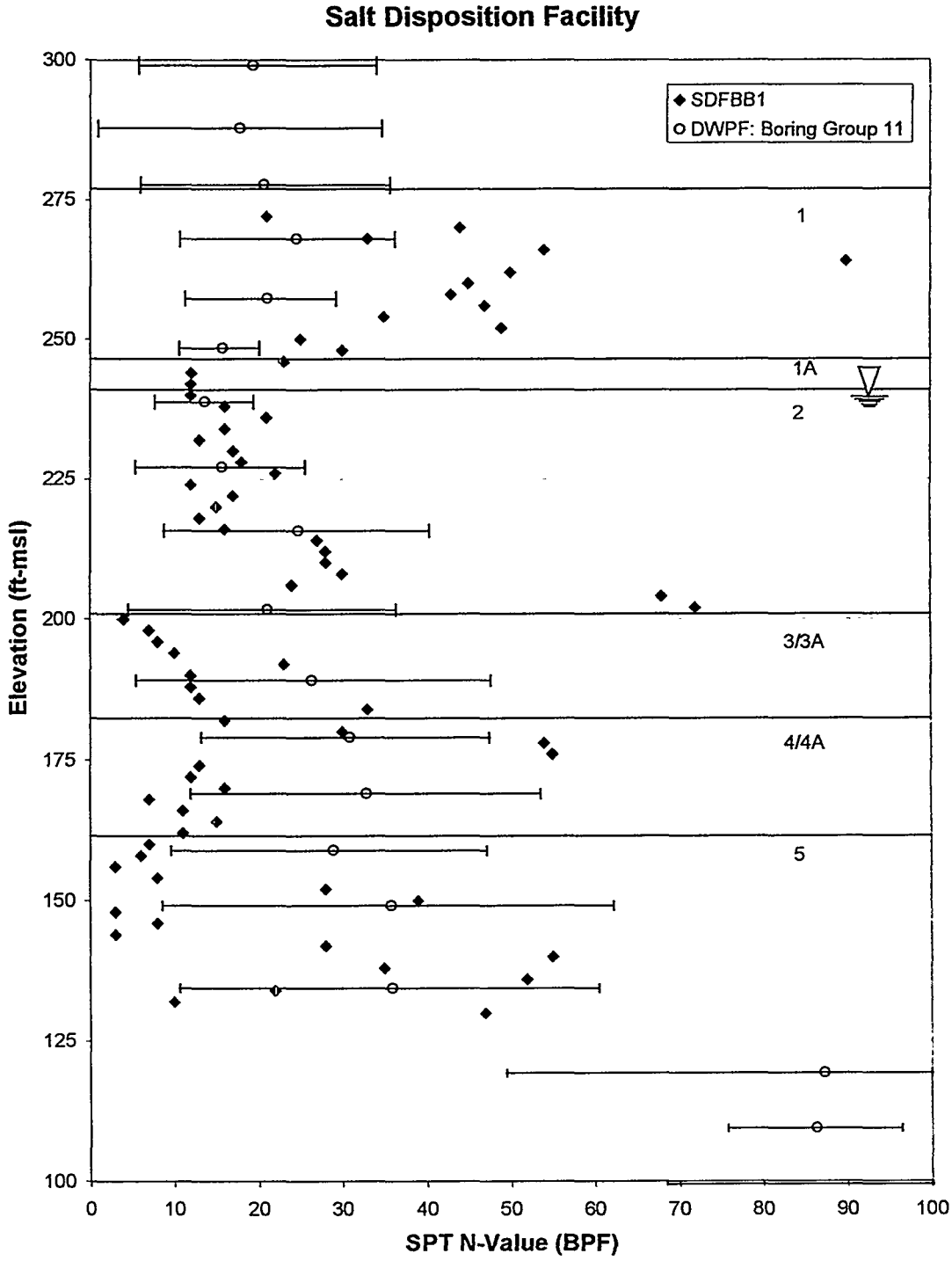


Figure 3.6-4. N-Value averaged for the Site B SPT and compared to historic DWPF data for each engineering layer. The error bars on the DWPF data represent 1 Standard Deviation.

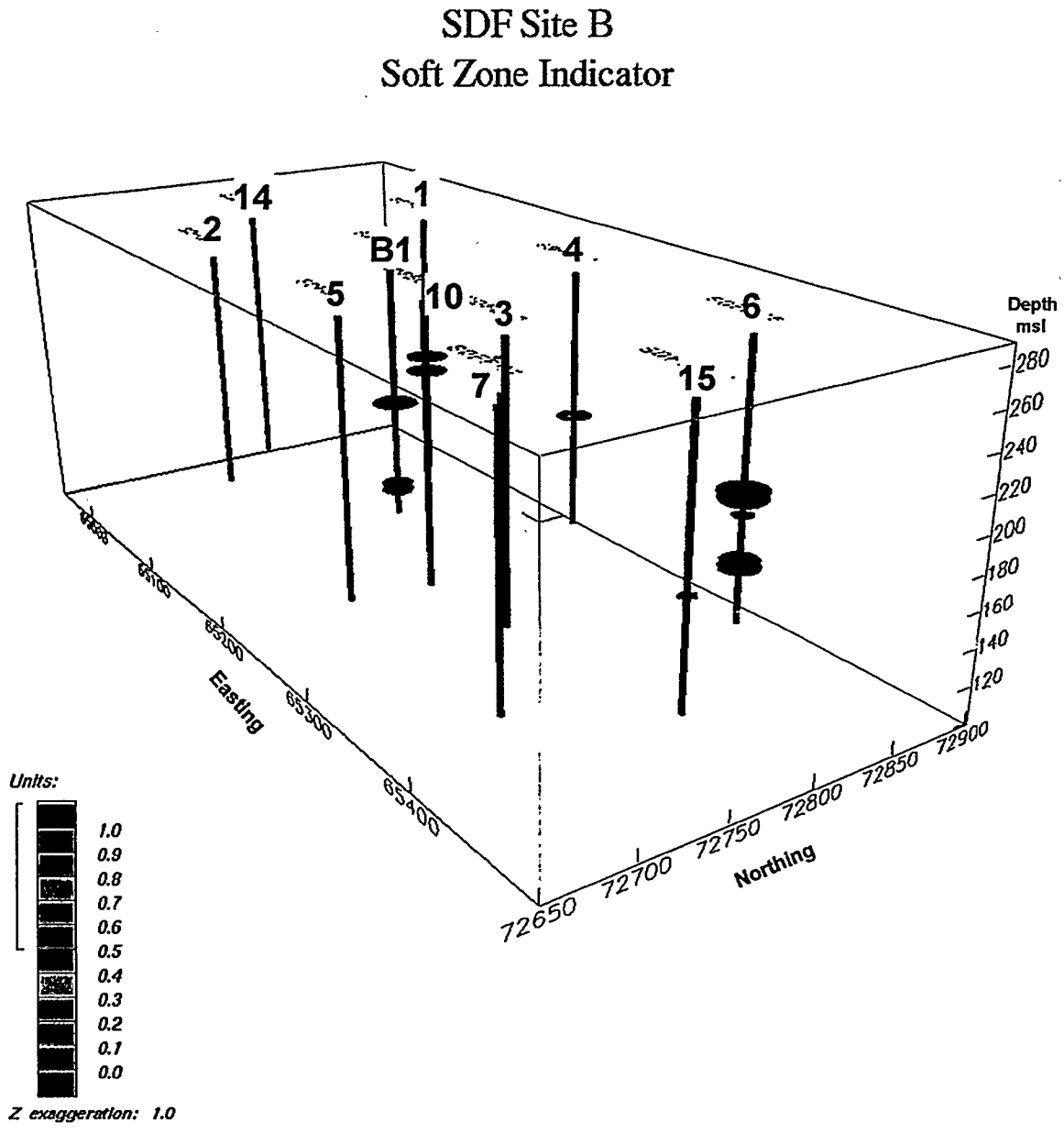


Figure 3.7-1. Interpreted soft zones based on the CPT data. The coordinates show SRS Northing and Easting. View is to the northwest. Elevations are in feet relative to mean sea level. Two soft zones are apparent in the northeastern portion of the site. The lateral variation of the soft zones may be an artifact of the modeling or sampling density and further investigation is necessary.

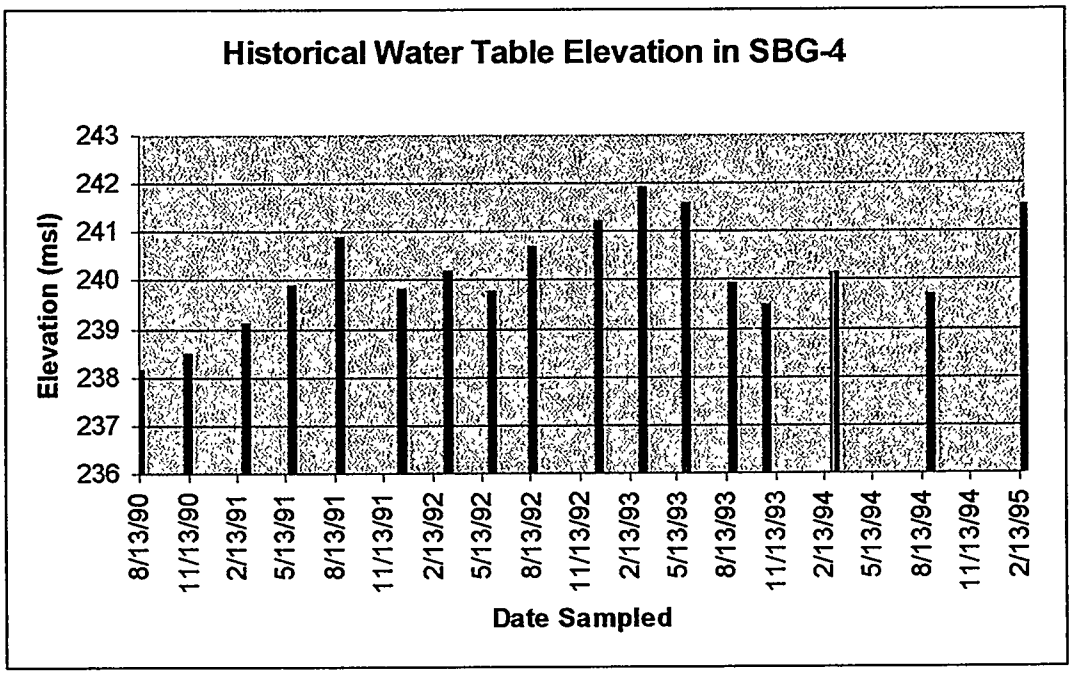


Figure 3.8-1. Comparison of historical water table elevations in monitoring well SBG-4 located adjacent to Site B. Low water table levels (approximately 238 feet relative to mean sea level) were measured in dry summer or drought conditions. Higher levels, approximately 242 feet) were measured in wetter years or during the winter season.

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Appendix A
SDFB-B1 Geotechnical Log

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GEOTECHNICAL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Salt Disposition Facility	None	1 OF 9	SDFBB1

SITE	COORDINATES	ANGLE FROM HORIZONTAL
SDF	N 3683766 E 440729	90

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	HOLE SIZE	SAMPLE HAMMER WEIGHT/FALL	TOTAL DEPTH
5/12/99	5/26/99	John Jones	Failing 1500		140 lb/30 in	340.0

GROUND EL.	DEPTH/EL. GROUND WATER	LOGGED BY:
278.0	▽ / ▼ /	B. Baker/SAIC

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %
20 40 60 80

SAMP. TYPE AND NO.	SAMPLE	BLOW COUNT	ELEVATION IN FEET	DEPTH IN FT	GRAPHICS	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING
			278.0				GSH = grain size + hydrometer AL = Atterberg Limits MC = moisture content GS = grain size
SS 1		2-6-15-30		5		POORLY GRADED SAND WITH CLAY (SP-SC) trace fine gravel; medium brown; medium dense; moist; subangular; poorly graded; medium grained	0-6 ft hand augered to clear utilities.
SS 2		1-20-24-26	270.0			CLAYEY SAND (SC); medium red varigated white and yellowish orange; dense; moist; subangular; poorly graded; medium to lower coarse grained	
SS 3		2-15-18-23	268.0	10		CLAYEY SAND (SC); light red varigated white and tan; dense; moist; subangular; poorly graded; fine to medium grained	GSH, AL, MC
SS 4		8-24-30-35	266.0			CLAYEY SAND (SC); medium red varigated white and tan; very dense; moist; subangular; poorly graded; fine to medium grained	
SS 5		22-42-48-50	264.0	15		POORLY GRADED SAND WITH CLAY (SP-SC); light red with whisps of white clay and varigated tan; very dense; moist; subangular; poorly graded; fine to medium grained	
SS 6		5-25-25-2	262.0			POORLY GRADED SAND WITH CLAY (SP-SC); white and tan; dense; moist; subangular; poorly graded; medium grained	GS
SS 7		1-22-23-27	260.0			CLAYEY SAND (SC); light yellowish brown; dense; moist; subangular; poorly graded; medium grained	
SS 8		5-21-22-23	258.0	20		POORLY GRADED SAND WITH CLAY (SP-SC); light yellowish brown slight moderate red varigations; dense; moist; subangular; poorly graded; medium grained	HP rad scan (no detects)
SS 9		2-23-24-33	256.0			POORLY GRADED SAND WITH SILT (SP-SM); very light red color actually appears lt. purple; dense; moist; subangular; poorly graded; medium grained	GS
SS 10		3-16-19-24	254.0			(SP-SM); same as above	
SS 11		7-26-23-15	252.0	25		POORLY GRADED SAND WITH SILT (SP-SM) interbedded clayey sand at 29.7 ft. bls; medium red with whisps of white clay; moist; medium grained	
SS 12		6-9-16-18	250.0			SANDY LEAN CLAY (CL); dark red with whisps of white clay; very stiff; moist; low plasticity; medium grained sand approximately 45 percent	GSH, AL, MC
SS 13		7-12-18-18	248.0	30		CLAYEY SAND (SC); light red actually lt. purple with laminations of moderate red clay; medium dense; moist; subangular; poorly graded; sand-very fine grained	
SS 14		11-13-10-9	246.0			CLAYEY SAND (SC); medium red with whisps of white clay; medium dense; moist; subangular; poorly graded; medium to fine grained	GSH, AL, MC
SS		4-5-7-7	244.0			CLAYEY SAND (SC); medium red; medium dense; moist;	

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE
PRELIMINARY LOG

HOLE NO.
SDFBB1

GEOTECHNICAL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Salt Disposition Facility	None	2 OF 9	SDFBB1

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %
20 40 60 80

SAMP. TYPE AND NO.	BLOW COUNT	ELEVATION IN FEET	DEPTH IN FT	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING
15		242.0		subangular; poorly graded; thin laminations of white clay; medium to fine grained	
SS 16	3-5-7-8			POORLY GRADED SAND WITH CLAY (SP-SC); light red color actually lt. purple with mod. red laminations; medium dense; moist; subangular; poorly graded; sand is medium to fine grained	GS
SS 17	4-6-6-8	240.0		CLAYEY SAND (SC); light red actually lt. purple to 39.0 ft. bls banded color change to mod. yellowish orange from 39.0 to 40.0 ft. bls; medium dense; moist; subangular; poorly graded; graine size fine from 38.0-39.0 ft. bls. and medium to coarse from 39.0 to 40.0ft. bls.	GS
SS 18	5-7-9-12	238.0	40	CLAYEY SAND (SC); medium brownish yellow; medium dense; moist; subangular; poorly graded; sand ranges from med to very coarse	HP rad scan (no detects)
SS 19	6-8-13-17	236.0		POORLY GRADED SAND WITH CLAY (SP-SC); medium brownish yellow; medium dense; moist; subangular; poorly graded; sand is medium grained with trace of gravel	GS
SS 20	6-7-9-14	234.0		POORLY GRADED SAND WITH CLAY (SP-SC); medium yellowish; medium dense; damp; subangular; poorly graded; medium	
SS 21	6-6-7-8	232.0	45	POORLY GRADED SAND WITH CLAY (SP-SC); medium yellowish; damp; subangular; poorly graded; medium grained	
SS 22	5-7-10-14	230.0		POORLY GRADED SAND WITH CLAY (SP-SC); medium yellowish brown; medium dense; damp; subangular; poorly graded; medium grained	GS
SS 23	8-8-10-14	228.0	50	POORLY GRADED SAND WITH CLAY (SP-SC); medium yellowish brown; medium dense; damp; subangular; poorly graded; medium grained	
SS 24	5-6-16-12	226.0		POORLY GRADED SAND WITH CLAY (SP-SC); medium yellow; medium dense; damp; subangular; poorly graded; medium grained	
SS 25	5-6-6-15	224.0		POORLY GRADED SAND WITH CLAY (SP-SC); medium yellowish brown; medium dense; moist; subangular; poorly graded; medium grained	GS
SS 26	7-8-9-10	222.0	55	POORLY GRADED SAND WITH CLAY (SP-SC); medium yellowish brown; medium dense; moist; medium grained, subrounded	
SS 27	7-7-8-12	220.0		POORLY GRADED SAND WITH CLAY (SP-SC); medium yellowish brown; moist; subangular; poorly graded; medium grained	
SS 28	5-5-8-12	218.0	60	POORLY GRADED SAND WITH CLAY (SP-SC); medium yellowish brown; medium dense; moist; subangular; poorly graded; medium grained	GS; HP rad scan (no detects)
SS 29	6-7-9-7	216.0		POORLY GRADED SAND WITH CLAY (SP-SC); medium yellowish brown ,bands of purple; medium dense; moist; subangular; poorly graded; medium grained	
SS 30	4-10-17-20	214.0		POORLY GRADED SAND WITH CLAY (SP-SC) trace mn Staining; medium grayish brown; medium dense; moist; subangular; poorly graded; fine to medium grained	
SS 31	9-14-14-20	212.0	65	POORLY GRADED SAND WITH CLAY (SP-SC) trace gravel ; medium brown; medium dense; moist; medium grained, subrounded	GS
SS 32	8-12-16-21	210.0		POORLY GRADED SAND WITH CLAY (SP-SC); same as above	
SS 33	2-15-15-20	208.0	70	POORLY GRADED SAND (SP) trace of clay; medium yellowish brown; medium dense; moist; subangular; poorly graded; medium grained	
SS 34	8-7-17-48	206.0		POORLY GRADED SAND (SP) trace of clay; medium brown; medium dense; moist; subangular; poorly graded; medium grained	GS
SS	8-31-37-48	204.0		POORLY GRADED SAND (SP) trace of clay; dark yellow	

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

PRELIMINARY LOG

HOLE NO. SDFBB1

GEOTECHNICAL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Salt Disposition Facility	None	3 OF 9	SDFBB1

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %
20 40 60 80

SAMP. TYPE AND NO.	BLOW COUNT	ELEVATION IN FEET	DEPTH IN FT	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING
35		202.0		bands of gray; medium dense; moist; subangular; poorly graded; medium grained	
SS 36	16-38-34-28			POORLY GRADED SAND (SP) trace of clay; light yellowish brown; very dense; moist; subrounded; poorly graded; medium grained	GS
SS 37	4-2-2-4	200.0		POORLY GRADED SAND (SP) Trace Clay; medium yellowish brown; loose; moist; subrounded; poorly graded; medium grained	
SS 38	WOR-3-4-7	198.0	80	CLAYEY SAND (SC); light yellowish brown; loose; damp; subangular; well graded; fine grained	GS, AL, MC; HP rad scan (no detects)
SS 39	4-4-4-5	196.0		CLAYEY SAND (SC); light yellowish brown; loose; damp; subangular; well graded; fine grained	
SS 40	5-3-7-7	194.0	85	CLAYEY SAND (SC); medium yellow; loose; damp; subangular; well graded; fine grained	GSH
SS 41	3-12-11-11	192.0		SILTY SAND (SM); medium yellow; medium dense; damp; subangular; fine grained	
SS 42	4-6-6-9	190.0		SILTY SAND (SM); light yellowish brown; medium dense; damp; subangular; fine grained	GS, AL, MC
SS 43	5-6-6-7	188.0	90	CLAYEY SAND (SC); very light yellowish brown; medium dense; damp; subangular; well graded; fine qrained	
SS 44	3-5-8-15	186.0		SILTY SAND (SM); very light yellowish green; medium dense; damp; subangular; well graded; fine qrained	GS
SS 45	10-19-14-13	184.0		SILTY SAND (SM); very light brown wisp of white; dense; damp; subangular; well graded; fine grained	
SS 46	3-5-11-18	182.0	95	SILTY SAND (SM); light brown; medium dense; damp; subangular; well graded; fine grained	
SS 47	6-13-17-30	180.0		SAND WITH CLAY (SC); light yellow; medium dense; damp; subangular; poorly graded; medium grained	GS
SS 48	12-26-28-37	178.0	100	SAND WITH CLAY (SP-SC); light brown; very dense; damp; subrounded; poorly graded; medium grained	HP rad scan (no detects)
SS 49	12-21-34-5	176.0		POORLY GRADED SAND WITH CLAY (SP-SC); light brown; very dense; damp; subangular; poorly graded; medium grained	GS
SS 50	8-7-6-7	174.0	105	POORLY GRADED SAND WITH CLAY (SP-SC); light yellowish brown; medium dense; moist; subrounded; poorly graded; medium grained sand	Rig chatter
SS 51	6-6-6-7	172.0		POORLY GRADED SAND WITH SILT (SP-SM); medium yellowish brown varigated med. gray from 107.0 to 108.0 ft. bls.; medium dense; moist; subrounded; poorly graded; medium grained sand.	
SS 52	7-7-9-10	170.0		POORLY GRADED SAND WITH SILT (SP-SM); light brownish yellow with whisps of lt. gray clay; medium dense; moist; subrounded; poorly graded; medium grained sand	GS
SS 53	7-4-3-4	168.0	110	POORLY GRADED SAND WITH SILT (SP-SM); light brownish yellow with whisps of lt. gray clay; loose; moist; subrounded; poorly graded; fine grained sand	
SS 54	5-3-8-20	166.0		CLAYEY SAND (SC); medium brownish yellow varigated lt. gray and very dk. gray; medium dense; moist; subrounded; poorly graded; fine-med grained	
SS	7-9-6-8	164.0		CLAYEY SAND (SC); medium brownish yellow with	

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE
PRELIMINARY LOG

HOLE NO.
SDFBB1

GEOTECHNICAL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Salt Disposition Facility	None	4 OF 9	SDFBB1

SAMP. TYPE AND NO.	SAMPLE	▲ N-VALUE (SPT) ○ RECOVERY % + ATT. LIMITS % (20 40 60 80)	BLOW COUNT	ELEVATION IN FEET	DEPTH IN FT	GRAPHICS	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING
55				162.0			whisps of lt. gray clay; medium dense; moist; subrounded; poorly graded; medium grained sand	
SS 56		▲ ○	5-6-5-6				CLAYEY SAND (SC); medium brownish yellow with whisps of lt. gray clay ; medium dense; moist; subrounded; poorly graded; med. to fine grained sand	GS
SS 57		▲	1-3-4-5	160.0			CLAYEY SAND (SC); medium brownish yellow color change to white varigated lt. red at 119.0 ft. bls; loose; moist; subangular; poorly graded; sand medium grained	
SS 58		▲	2-3-3-5	158.0	120		CLAYEY SAND (SC); light red banded yellowish gray; loose; moist; subrounded; poorly graded; clay/silt approx. 40% ; sand med-fine grained	GS
SS 59		▲	2-1-2-7	156.0			SILTY SAND (SM); light yellowish gray varigated lt. red; very loose; moist; subrounded; poorly graded; fine grained; silt approx. 45 percent	GS, AL, MC; Depth check after SS-58 8-in high; cleaned out to 122.0 ft
SS 60		▲	4-3-5-8	154.0	125		SILTY SAND WITH CLAY (SM); light greenish yellow; loose; moist; subangular; poorly graded; sand: fine grained; no reaction w/hcl appears as leached carbonate	GS
SS 61		▲ ○	0-11-17-19	152.0			POORLY GRADED SAND WITH SILT (SP-SM); light yellowish gray varigated lt. red with whisps of lt. gray clay ; medium dense; moist; subrounded; poorly graded; fine -medium grained sand	
SS 62		▲ ○	0-21-18-16	150.0			POORLY GRADED SAND WITH SILT (SP-SM); medium brownish yellow; dense; moist; subrounded; poorly graded; fine grained	
SS 63		▲ ○	7-1-2-1	148.0	130		CLAYEY SAND (SC); medium brownish yellow with whisps of lt. gray clay; very loose; moist; subrounded; poorly graded; fine grained	GS, AL, MC
SS 64		▲	5-4-4-5	146.0			SILTY SAND (SM); medium brownish yellow banded light greenish yellow; loose; moist; subrounded; poorly graded; fine grained	GS
SS 65		▲	1/12"-2-2	144.0	135		SANDY SILT (ML); light yellowish green; soft; moist; low plasticity; no reaction w/hcl, appears as leached carbonate; v. fine grained sand approx. 40 percent	GSH, AL, MC
SS 66		▲	8-10-18-34	142.0			SANDY SILT (ML); light yellowish green; very stiff; moist; low plasticity; sand v. fine grained; leached carbonate matrix w/ calcareous shell frags. present approx 5 percent	
SS 67		▲ ○	9-19-36-50/4"	140.0			SANDY SILT (ML); light yellowish green; hard; moist; low plasticity; v. fine sand , leached carbonate matrix with approx. 5 percent shell frags. ; recovery is actually 100 percent of the 1.85 ft. penetrated	GS
SS 68		▲	8-27-50/5"	138.0	140		SANDY CLAY WITH SILT (CL); dark greenish yellow banded light greenish yellow; hard; moist; low plasticity; white calcareous shell frags. present approx. 5 percent;fine grained sand	
SS 69		▲ ○	4-25-27-28	136.0			LEAN CLAY WITH SAND (CL); light greenish yellow banded dk grayish green; hard; moist; low plasticity; fine grained sand, color change at 143.0 ft. bls [dk grayish green], carbonate shell frags. present approx. 10 percent; slightly fissle [horizontally]	GSH, AL, MC
SS 70		▲	6-9-13-15	134.0	145		LEAN CLAY WITH SAND (CL); medium green; very stiff; moist; low plasticity; fine grained sand; carbonate shell frags. approx. 20 percent	
SS 71		▲	WOR-3-7-10	132.0			LEAN CLAY WITH SAND (CL); dark green; stiff; moist; low plasticity; fine grained sand; trace carbonate shell frags.	GSH, AL, MC
SS 72		▲	8-15-32-40	130.0			SANDY LEAN CLAY (CL); dark green; hard; moist; low plasticity; sand is medium grained approx. 20 percent, trace of carbonate shell frags	
CR 1		○		128.0 127.4	150		SANDY LEAN CLAY (CL); dark green; moist; low plasticity; medium grained sand	Begin wire-line coring at 150 ft depth with short shoe
CR 2		○		126.0			CLAYEY SAND WITH GRAVEL (SC); dark yellowish brown; moist; subangular; well graded; sand ranges from medium to granular	
				123.0			WELL-GRADED SAND WITH SILT AND GRAVEL (SW); dark brownish yellow; moist; subangular; well graded; coarse grained to granular	

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

PRELIMINARY LOG

HOLE NO. **SDFBB1**

GEOTECHNICAL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Salt Disposition Facility	None	5 OF 9	SDFBB1

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %
20 40 60 80

SAMP. TYPE AND NO.	SAMPLE	BLOW COUNT	ELEVATION IN FEET	DEPTH IN FT	GRAPHICS	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING
CR 3						POORLY GRADED SAND WITH SILT (SP-SM); medium reddish yellow; moist; subrounded; poorly graded; medium to coarse grained	Switch to long shoe
			118.0	160			
CR 4						POORLY GRADED SAND WITH SILT (SP-SM); medium yellowish brown banded light tan; moist; subrounded; poorly graded; coarse grained	
			113.0	165			
CR 5						POORLY GRADED SAND WITH SILT (SP-SM); medium yellowish brown; moist; subrounded; poorly graded; coarse grained (165-168 ft) medium grained (168-169.5 ft) interbedded lt. gray clay (167.5 to 167.6 ft) with thin lamination of fe cemented sand at base of clay. color change to lt. yellow at 168.0 ft. bls.	
			108.0	170			
CR 6			107.0			very hard zone, shoe destroyed	Very hard drilling, shoe destroyed
CR 7						POORLY GRADED SAND WITH SILT (SP-SM); light yellowish brown; moist; subrounded; poorly graded; fine grained with thin interbed of white clay [lamination]	
			103.0	175			
CR 8						POORLY GRADED SAND WITH SILT (SP-SM); light yellowish brown; moist; subrounded; poorly graded; fine grained sand with thin laminations of lt. gray clay [less than 5 percent]	
			98.0	180			
CR 9						POORLY GRADED SAND WITH SILT (SP-SM); light brownish yellow; moist; subrounded; poorly graded; fine grained	
			93.0	185			
CR 10						POORLY GRADED SAND WITH SILT (SP-SM); light brownish yellow; moist; subrounded; poorly graded; fine grained from 185 to 187.5 feet , medium grained from 187.5 to 190.0 ft.; thin interbeds of dk. yellowish brown clay [less than 10 percent]	
			88.0	190			
CR 11						POORLY GRADED SAND WITH SILT (SP-SM); light brownish yellow; moist; subrounded; poorly graded; medium to fine grained with whisps of lt. gray clay [less than 5 percent]	
			83.0				

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE
PRELIMINARY LOG

HOLE NO.
SDFBB1

GEOTECHNICAL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Salt Disposition Facility	None	6 OF 9	SDFBB1

▲ N-VALUE (SPT)
O RECOVERY %
+ ATT. LIMITS %
20 40 60 80

SAMP. TYPE AND NO.	SAMPLE	BLOW COUNT	ELEVATION IN FEET	DEPTH IN FT	GRAPHICS	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING
CR 12						POORLY GRADED SAND WITH SILT (SP-SM); medium brownish yellow; moist; subrounded; poorly graded; coarse grained	
			80.0				
CR 13						WELL GRADED SAND WITH SILT AND GRAVEL (SW-SM); dark brownish yellow; moist; subrounded; well graded; medium to very coarse grained w/granular sand approx 20 percent; whisp of lt. gray clay also present [trace]	
			78.0	200			
CR 14						POORLY GRADED SAND (SP); medium brownish yellow banded lt. brownish yellow; moist; subrounded; poorly graded; coarse grained	
			73.0	205			
CR 15						POORLY GRADED SAND WITH GRAVEL (SP); medium brownish yellow; moist; subrounded; poorly graded; coarse grained sand with approx. 10% granular	
			68.0	210			
CR 16						POORLY GRADED SAND WITH SILT (SP-SM); light brownish yellow; moist; subrounded; poorly graded; coarse grained	
			63.0	215			
CR 17						POORLY GRADED SAND WITH SILT (SP-SM); medium brownish yellow; moist; subrounded; poorly graded; very coarse grained with one thin interbed of bluish gray clay less approx. 0.05 ft. in thickness	
			58.0	220			
CR 18			57.3			POORLY GRADED SAND WITH SILT (SP-SM); dark brownish yellow; moist; subangular; poorly graded; coarse grained	
						POORLY GRADED SAND WITH SILT (SP-SM); dark gray; moist; subangular; poorly graded; coarse grained	
			53.2				
CR 19			53.0	225		CLAYEY SAND (SC); dark gray; moist; subangular; poorly graded; coarse sand; clay presence indicates ellenton formation contact	Circulation blocked off during CR-19
			51.0			CLAYEY SAND (SC); dark greenish gray; moist; subrounded; poorly graded; fine grained sand	
						LEAN CLAY WITH SAND (CL); dark greenish gray; moist; low plasticity; v. fine grained sand; fissle clay	
CR 20			49.0				
				230		LEAN CLAY WITH SAND (CL); dark greenish gray; moist; low plasticity; fine grained sand; fissle clay	
			44.0				
CR						POORLY GRADED SAND WITH CLAY (SP-SC); dark	

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE: PRELIMINARY LOG

HOLE NO. SDFBB1

GEOTECHNICAL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Salt Disposition Facility	None	7 OF 9	SDFBB1

SAMP. TYPE AND NO.	SAMPLE	▲ N-VALUE (SPT) O RECOVERY % + ATT. LIMITS % (20 40 60 80)	BLOW COUNT	ELEVATION IN FEET	DEPTH IN FT	GRAPHICS	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING
21							blueish gray; moist; subrounded; poorly graded; sand: v. coarse	
				39.0				
CR 22				38.0	240		POORLY GRADED SAND WITH CLAY (SP-SC); dark blueish gray; moist; subrounded; poorly graded; sand: v. coarse, trace gravel	
CR 23							POORLY GRADED SAND WITH SILT (SP-SM); medium blueish gray; moist; subrounded; poorly graded; sand: coarse	
				33.0	245			
CR 24							CLAYEY POORLY GRADED SAND (SC); medium blueish gray color change at 246.0 ft. ta lt. grayish white; moist; subrounded; poorly graded; sand: coarse grained, trace gravel	
				28.0	250			
CR 25							POORLY GRADED SAND WITH CLAY AND GRAVEL (SP-SC); light grayish white; moist; subangular; poorly graded; sand: coarse with gravel	
				23.0	255			
CR 26							CLAYEY WELL GRADED SAND (SC); light grayish white varigated dk. bluish gray; moist; subangular; well graded; sand ranges from fine to v. coarse, interbedded clay also present, micaceous	
				18.0	260			
CR 27							SANDY CLAY (CL); medium gray; moist; low plasticity; sand: medium grained	
				13.0	265			
CR 28							SANDY CLAY (CL); medium gray; moist; low plasticity; sand: medium to fine grained approx. 40 percent, micaceous approx. 10 percent	
				8.0	270			
CR 29							SANDY CLAY (CL); medium gray with dk. gray banding; moist; low plasticity; sand: fine grained approx. 20 percent, micaceous approx. 10 percent	
				3.0				

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

PRELIMINARY LOG

HOLE NO. SDFBB1

GEOTECHNICAL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Salt Disposition Facility	None	8 OF 9	SDFBB1

SAMP. TYPE AND NO.	SAMPLE	▲ N-VALUE (SPT) O RECOVERY % + ATT. LIMITS % (20 40 60 80)	BLOW COUNT	ELEVATION IN FEET	DEPTH IN FT	GRAPHICS	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING
CR 30				0.6			SANDY CLAY (CL); medium gray banded dk. gray; moist; low plasticity; sand fine grained, micaceous approx. 10 percent	
				-2.0	280		CLAY WITH SAND (CL); dark gray; moist; low plasticity; fissle, sand v. fine grained, interbedded sand at 279.4 ft. bls	
CR 31							CLAYEY SAND (SC); dark gray color change at 280.8 ft. bls , med. green with med. gray whips; moist; subangular; poorly graded; coarse sand	
CR 32				-7.0	285		CLAYEY SAND (SC); medium green with whisps of med. gray; moist; subangular; poorly graded; coarse sand, color change to med. gray at 288.0 ft. bls.	
CR 33				-12.0	290		POORLY GRADED SAND WITH SILT (SP-SM); medium gray; moist; subrounded; poorly graded; coarse grained	
CR 34				-17.0	295		CLAYEY SAND (SC); medium gray; moist; subangular; poorly graded; coarse grained, micaceous approx. 5 percent	
CR 35				-22.0	300		CLAYEY SAND (SC); light grayish white; moist; subangular; poorly graded; coarse sand, micaceous 10 percent	
CR 36				-27.0	305		CLAYEY SAND WITH GRAVEL (SC); light grayish white; moist; subangular; well graded; interbedded lignite [1.0 ft.], micaceous, v. coarse sand	
CR 37				-32.0	310		SAND WITH CLAY (SP-SC) trace gravel; light grayish white; moist; subangular; poorly graded; v. coarse grained, micaceous, intebedded gravel at 313.4 ft.	
				-37.0				

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE

PRELIMINARY LOG

HOLE NO. SDFBB1

GEOTECHNICAL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
Salt Disposition Facility	None	9 OF 9	SDFBB1

▲ N-VALUE (SPT)
○ RECOVERY %
+ ATT. LIMITS %
20 40 60 80

SAMP. TYPE AND NO.	SAMPLE	BLOW COUNT	ELEVATION IN FEET	DEPTH IN FT	GRAPHICS	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, CHARACTER OF DRILLING AND LABORATORY TESTING
CR 38			-38.0			POORLY GRADED SAND WITH CLAY (SP-SC); light grayish white; moist; subangular; poorly graded; coarse grained, micaceous GRAVEL WITH CLAY (GP-GC); light grayish white; moist; subangular; poorly graded; micaceous, interbedded lt. gray clay [316.3 -316.9 ft.], trace lignite at bottom of run.	Circulation blocked off due to lignite
CR 39			-42.0	320		POORLY GRADED SAND WITH CLAY (SP-SC); light grayish white; moist; subangular; poorly graded; med. to coarse grained, micaceous, interbedded med. gray clay [320.0 to 320.1 ft.]	
CR 40			-47.0	325		POORLY GRADED SAND WITH SILT (SP-SC); light grayish white; moist; subangular; poorly graded; coarse grained, micaceous, sulfides present [less than 5 percent]	
CR 41			-52.0	330		POORLY GRADED SAND WITH CLAY AND GRAVEL (SP-SC); light gray; moist; subangular; poorly graded; v. coarse grained, interbedded med. gray clay [330.8 - 331.0 ft.]	
CR 42			-55.0	335		POORLY GRADED SAND WITH SILT (SP-SM); medium gray; moist; subangular; poorly graded; coarse grained, micaceous	
CR 43			-60.0	340		POORLY GRADED SAND WITH SILT (SP-SM); medium gray; moist; subangular; poorly graded; medium grained, micaceous	Bottom of boring at 340.0 ft
			-62.0				

SS = SPLIT SPOON; ST = SHELBY TUBE;
PS = STATIONARY PISTON; PB = PITCHER

SITE
PRELIMINARY LOG

HOLE NO.
SDFBB1

Appendix B
Seismic Cone Penetrometer Data

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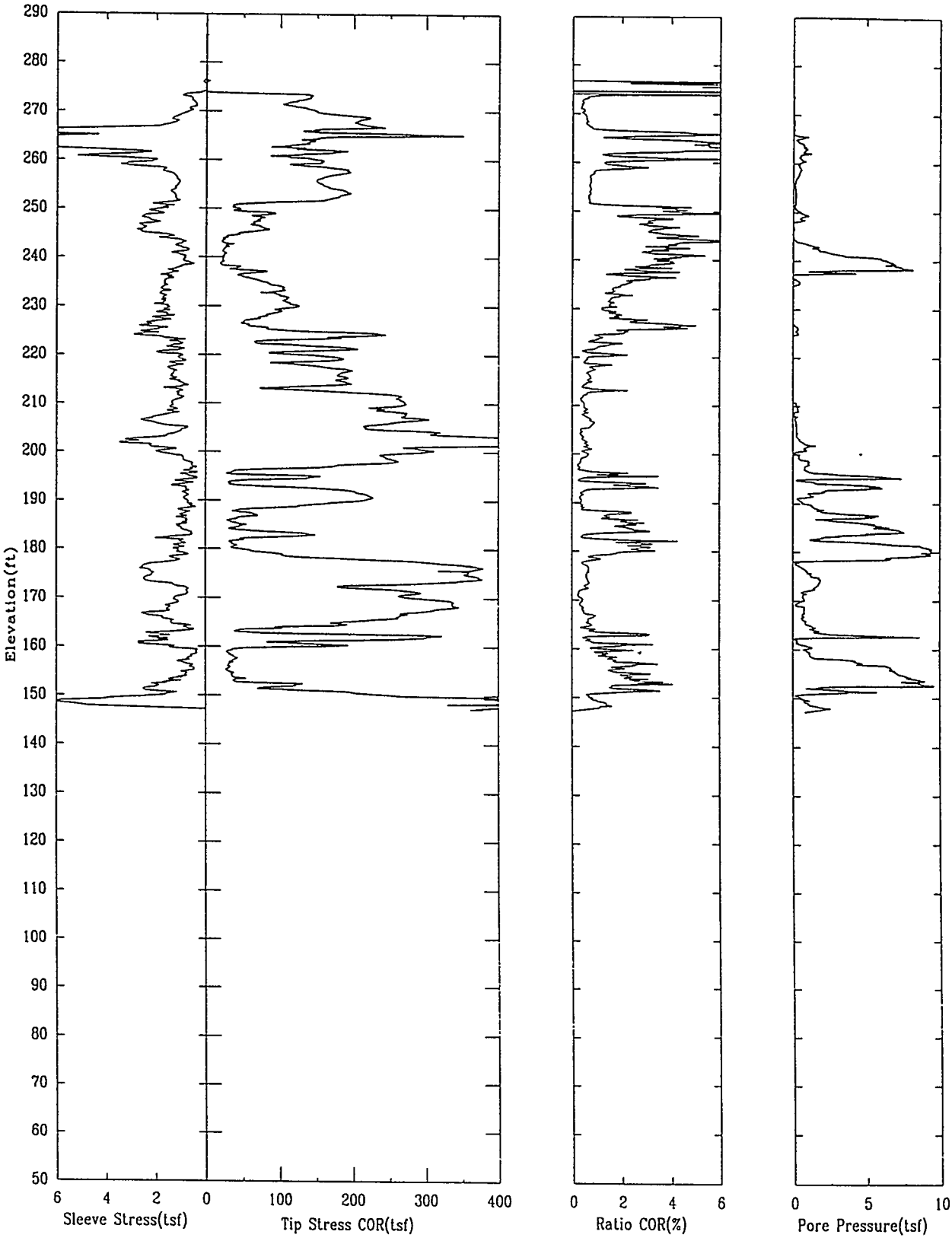
SDFBC2 APPLIED RESEARCH ASSOCIATES, INC. 04/27/99

North 72703.0 East 65104.3 Elevation 277.0



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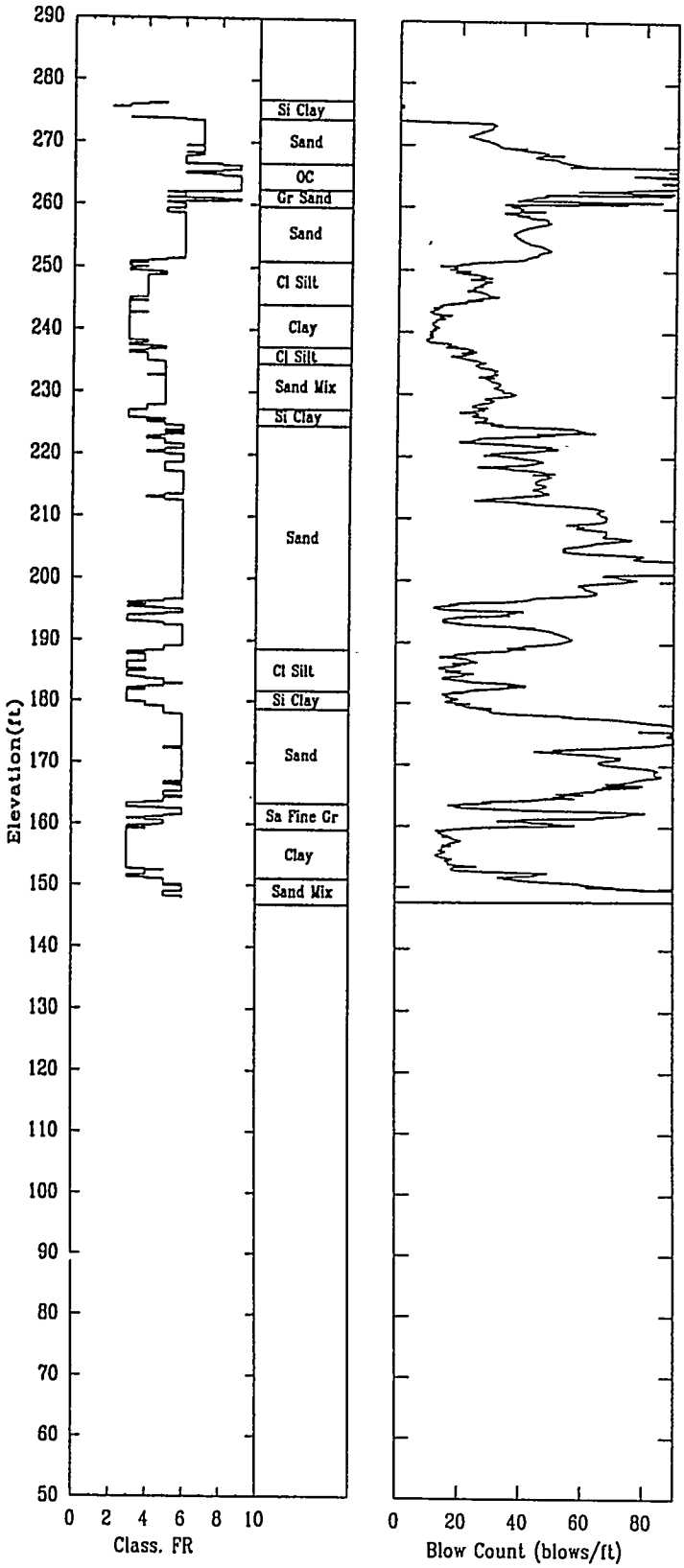
SDFBC2 APPLIED RESEARCH ASSOCIATES, INC. 04/27/99

North 72703.0 East 65104.3 Elevation 277.0



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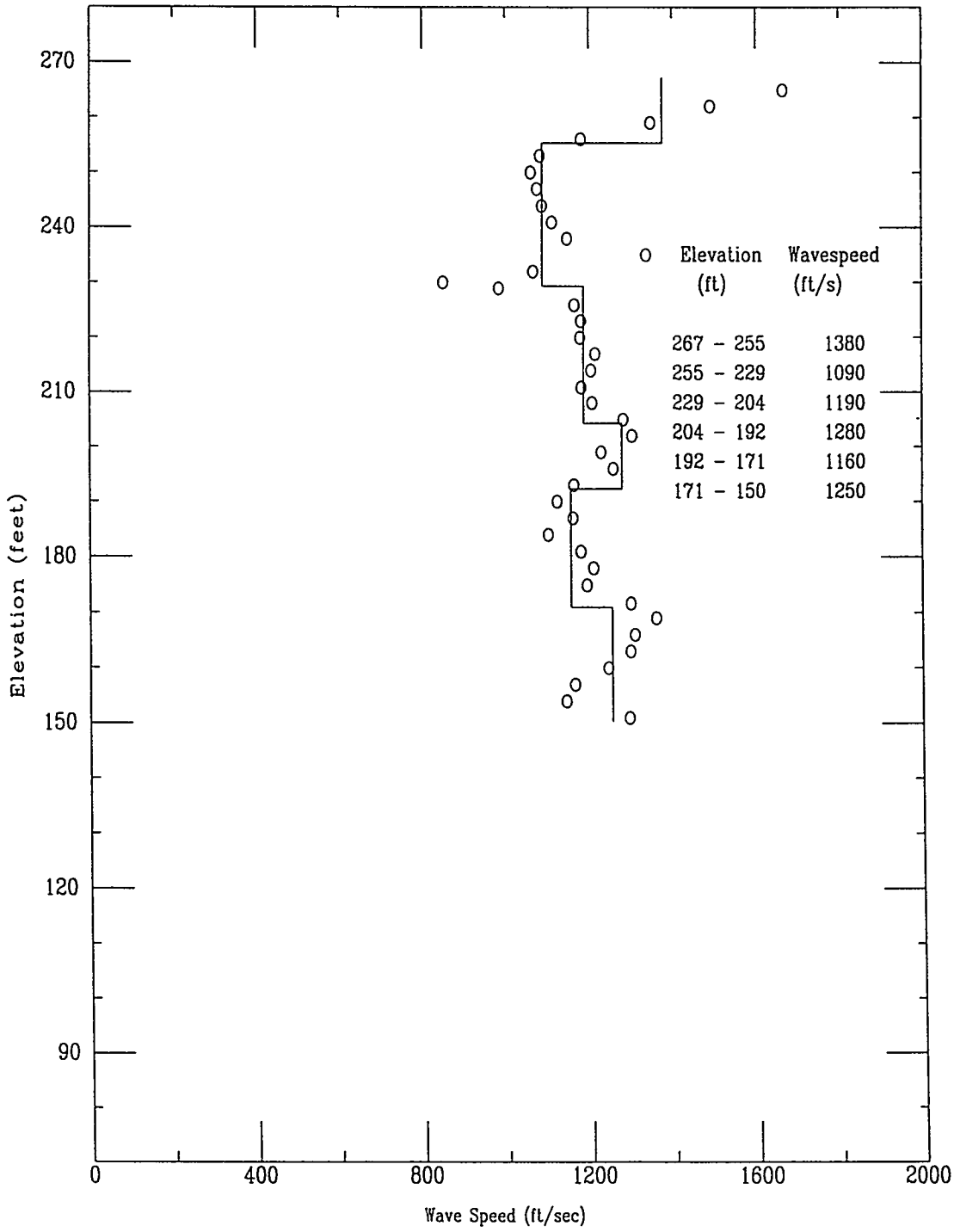
SDFBC2 APPLIED RESEARCH ASSOCIATES, INC. 04/27/99

Shear Wave Speeds



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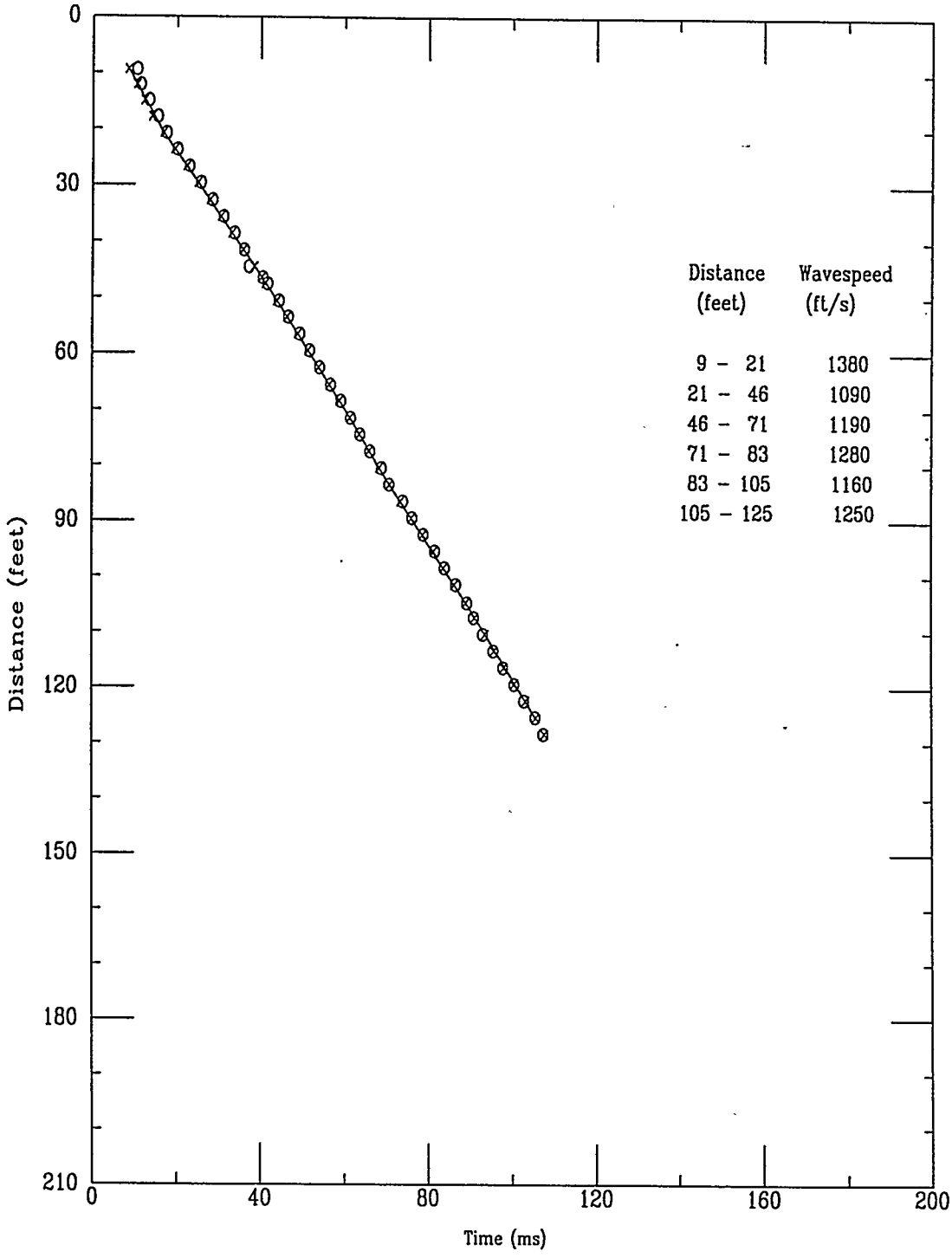
SDFBC2 APPLIED RESEARCH ASSOCIATES, INC. 04/27/99

Shear Wave Time of Peak



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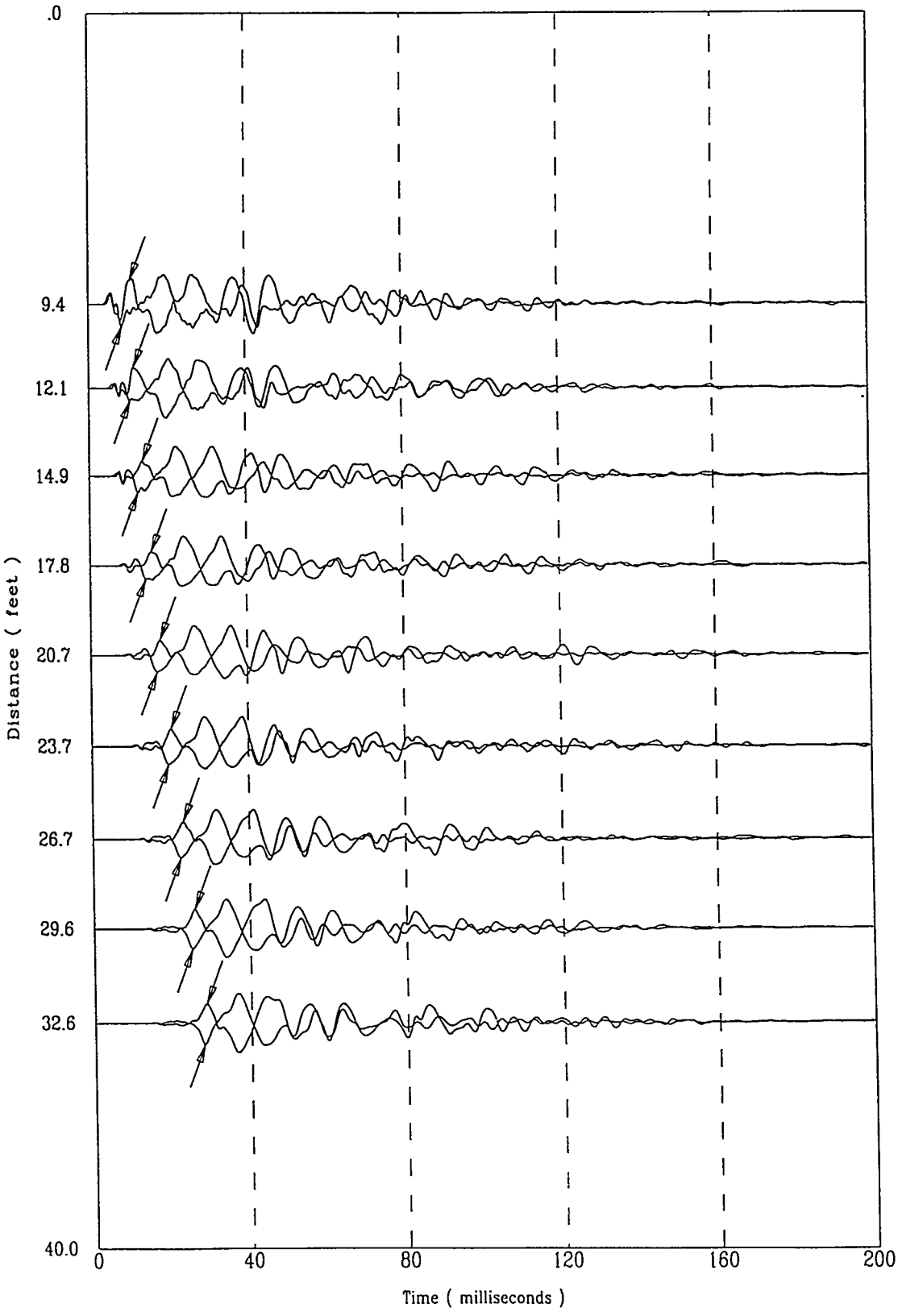
Applied Research Associates
SDFBC2

S Wave
04/27/99



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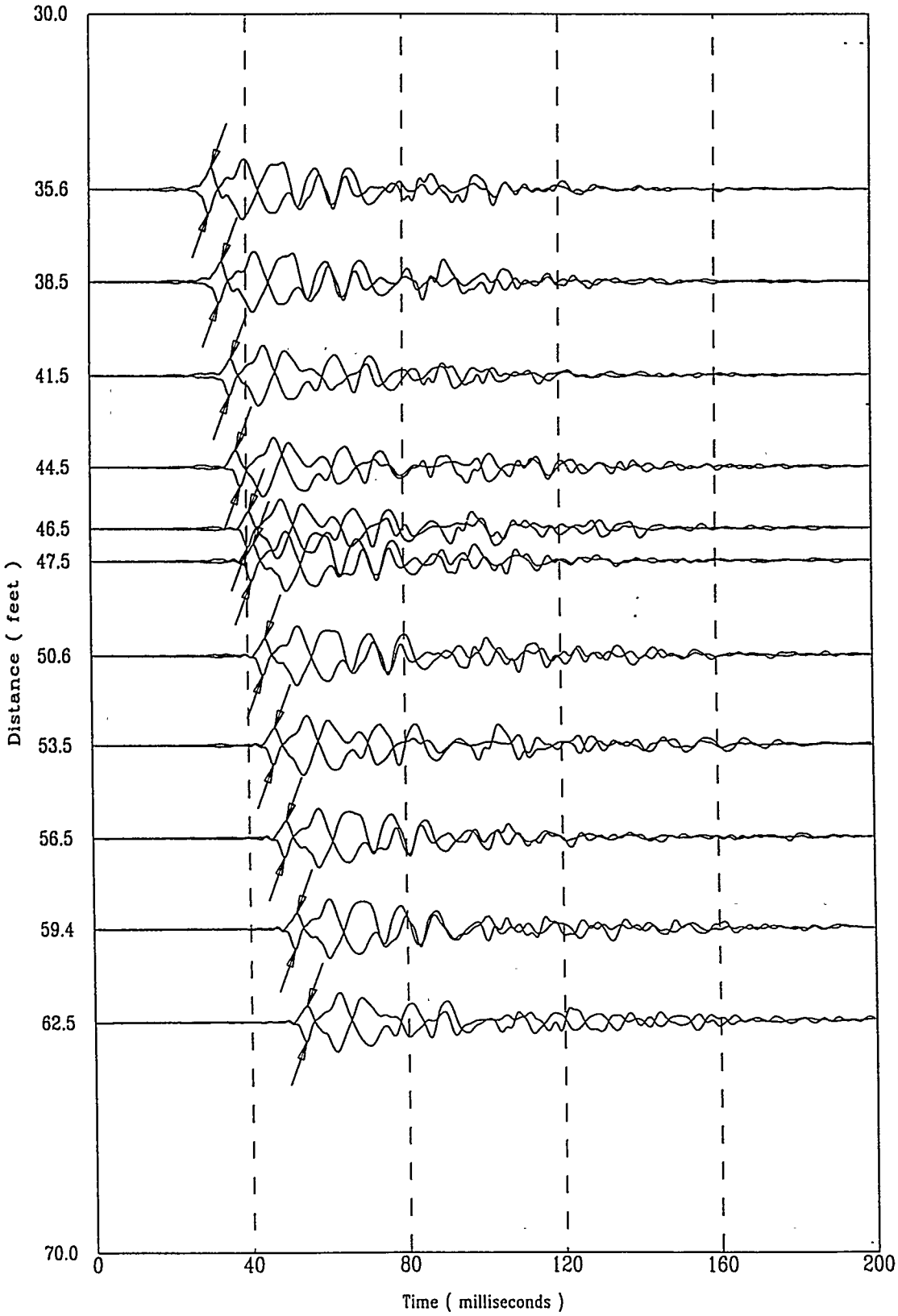
Applied Research Associates
SDFBC2

S Wave
04/27/99



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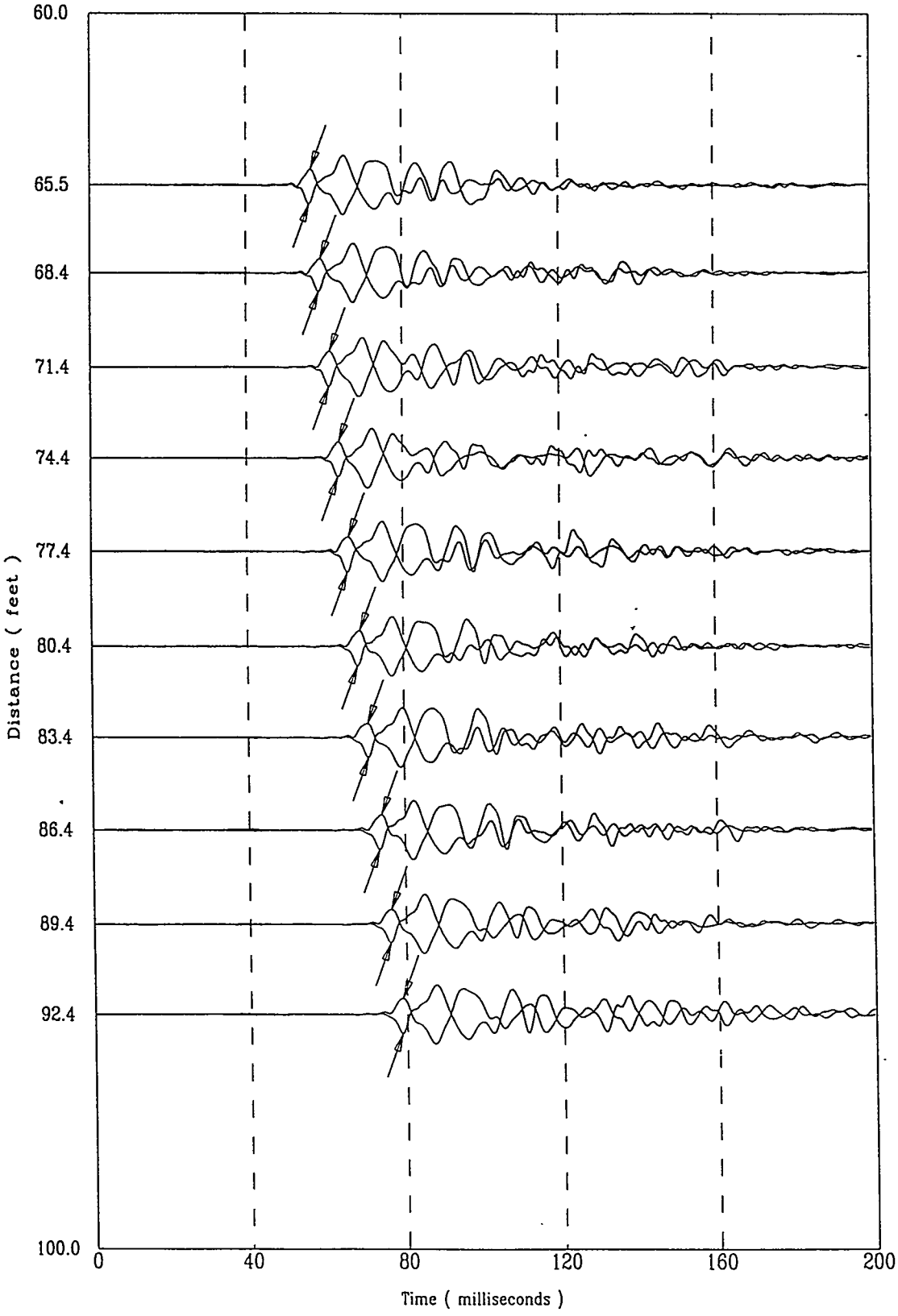
SDFBC2

S Wave
04/27/99



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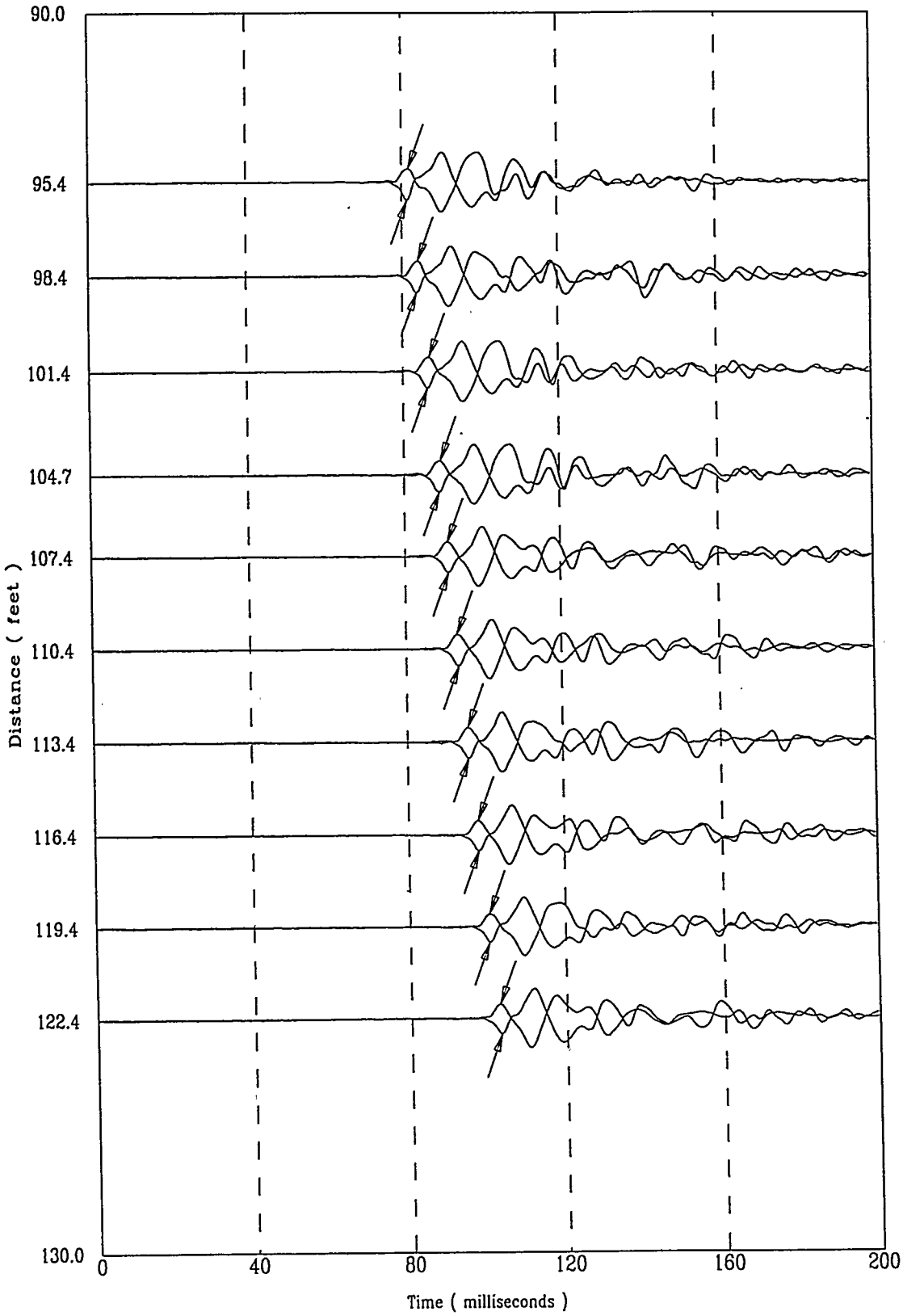
Applied Research Associates
SDFBC2

S Wave
04/27/99



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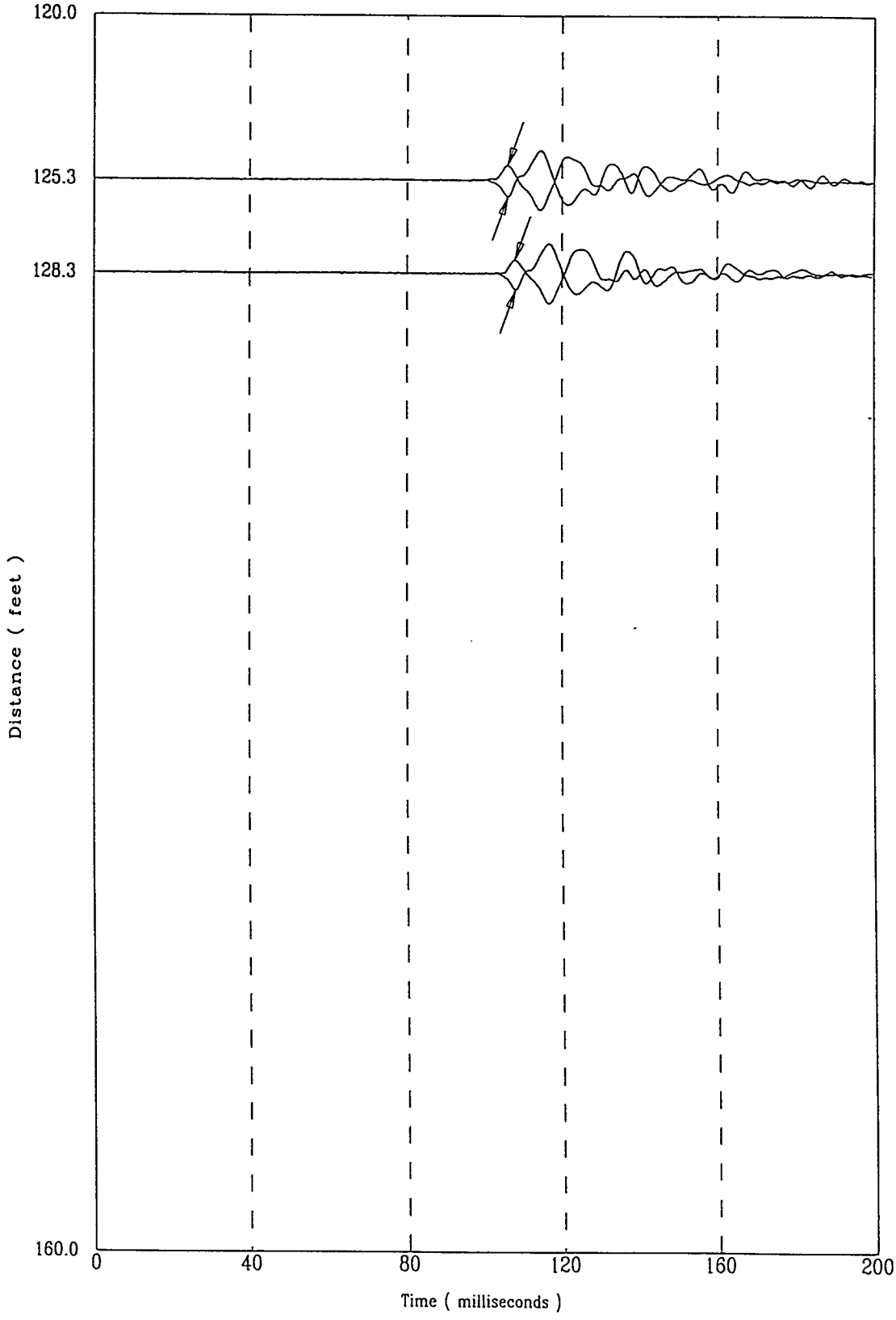

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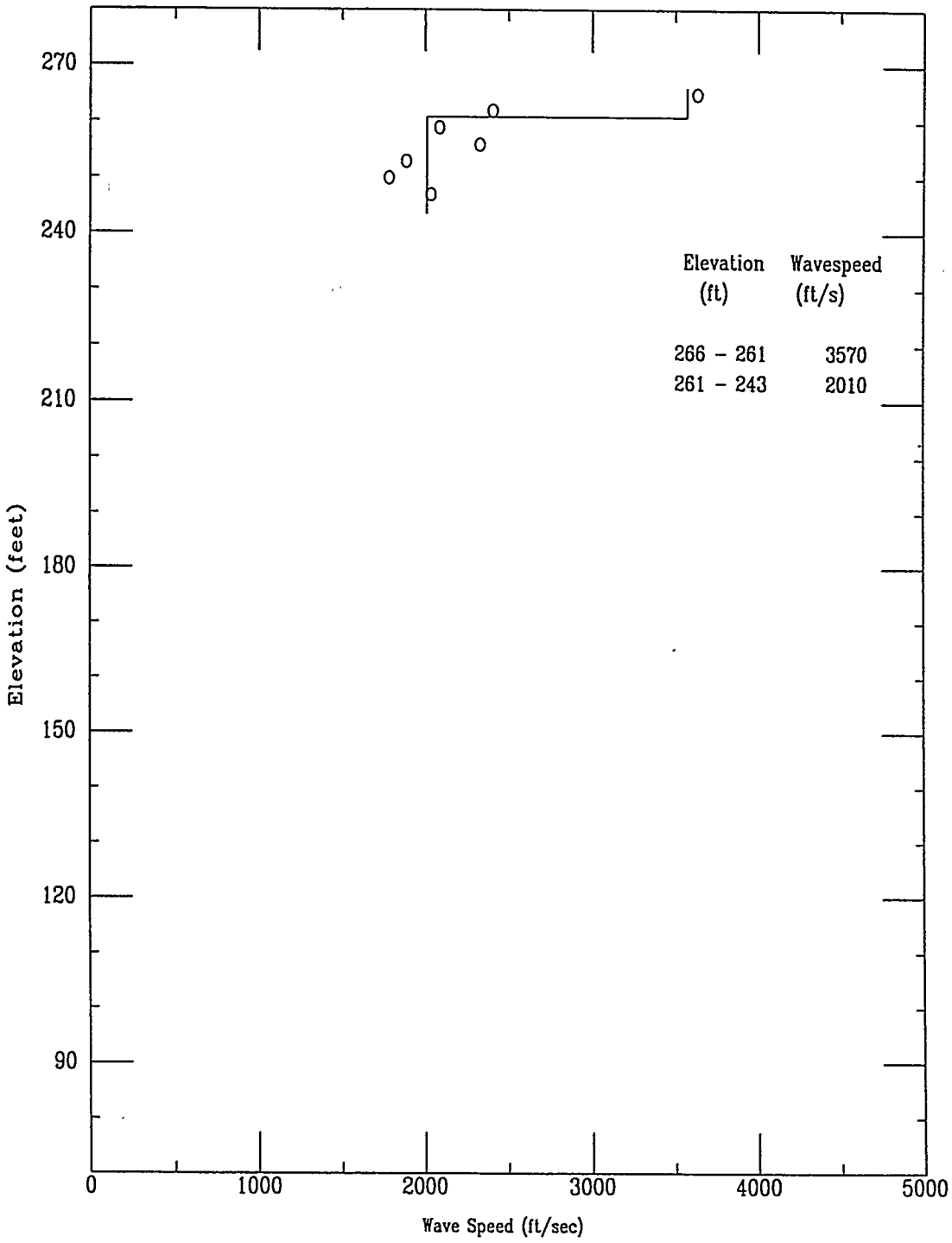
SDFBC2 APPLIED RESEARCH ASSOCIATES, INC. 04/27/99

Compression Wave Speeds



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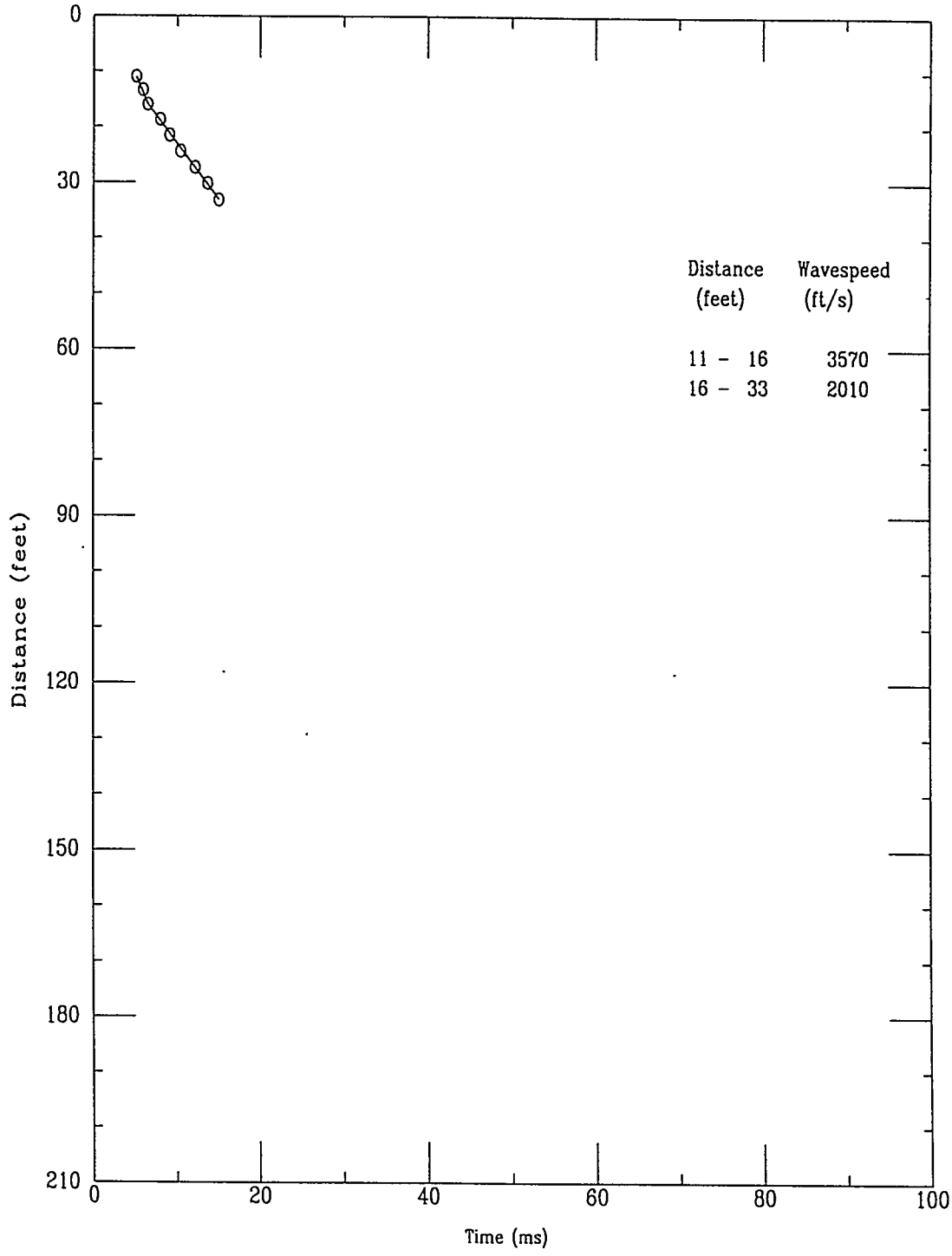

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Applied Research Associates
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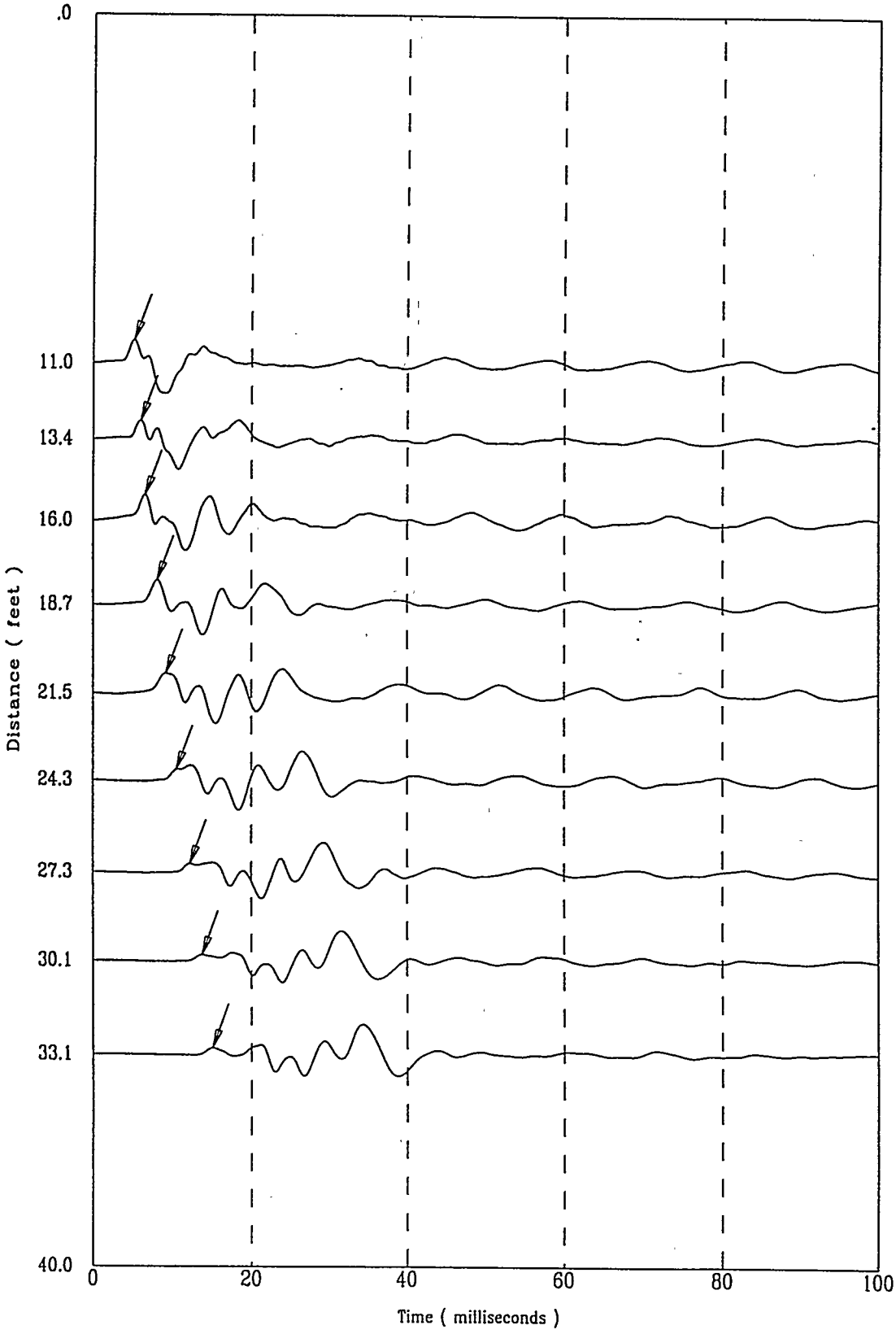
04/27/99



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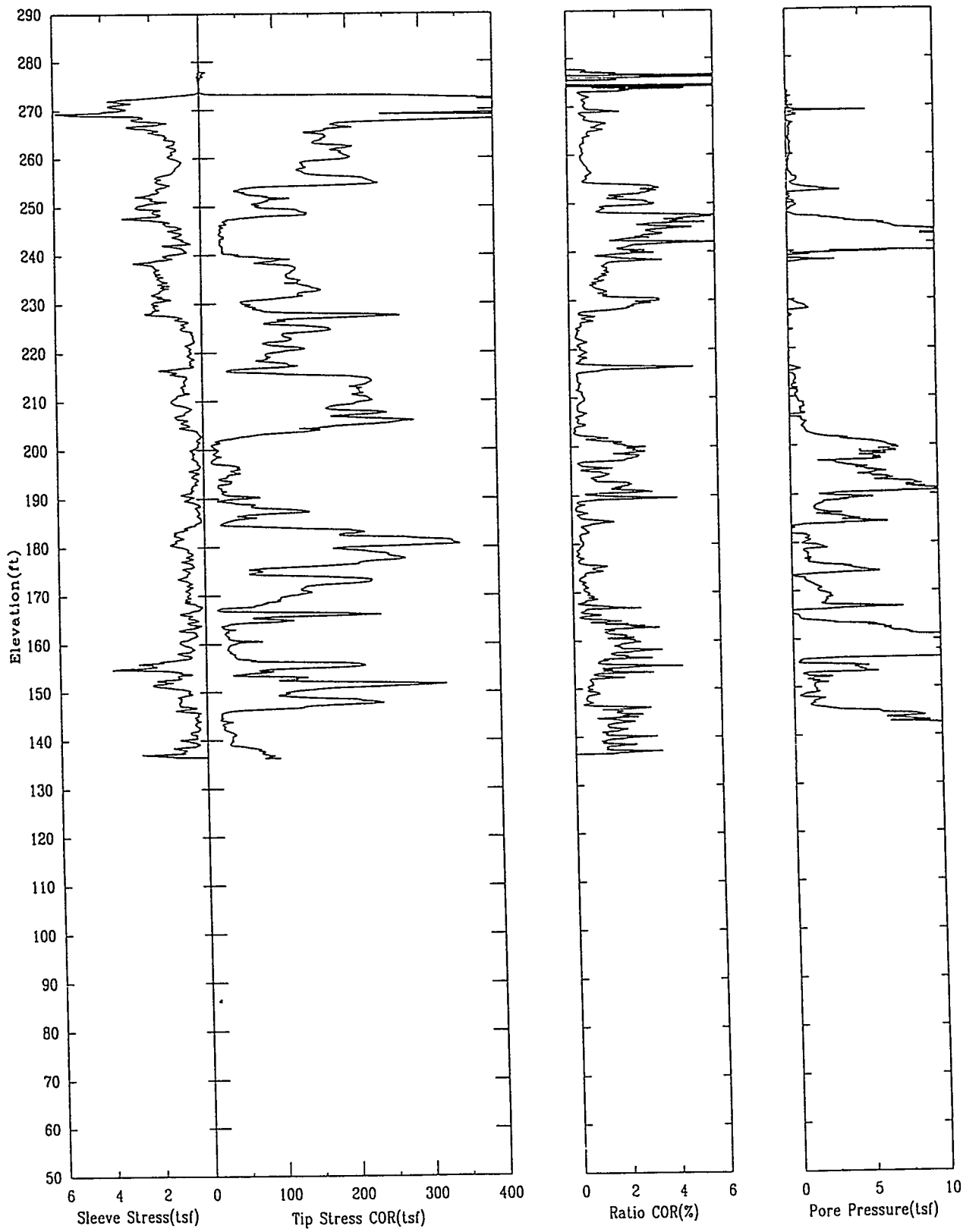
SDFBC4 APPLIED RESEARCH ASSOCIATES, INC. 04/26/99

North 72846.7 East 65251.9 Elevation 278.0



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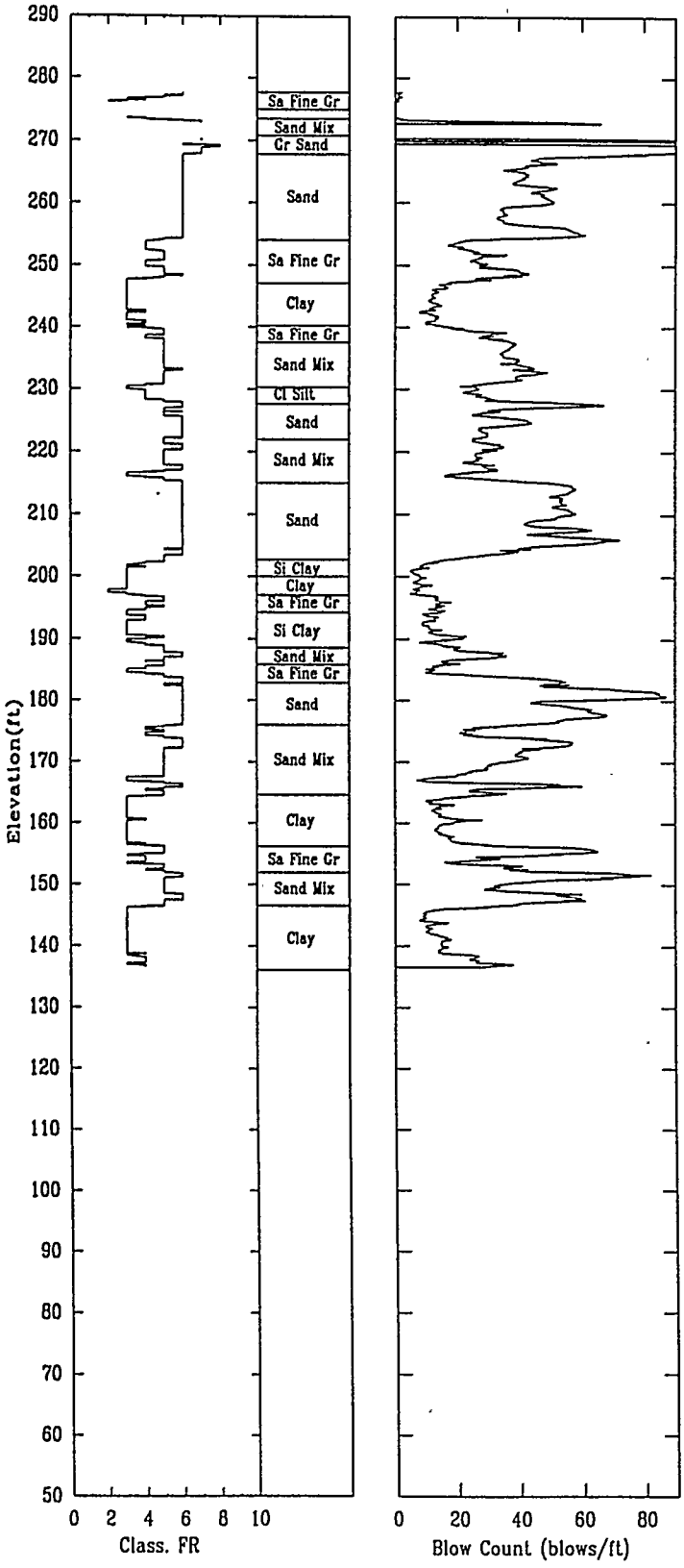
North 72846.7 East 65251.9 Elevation 278.0



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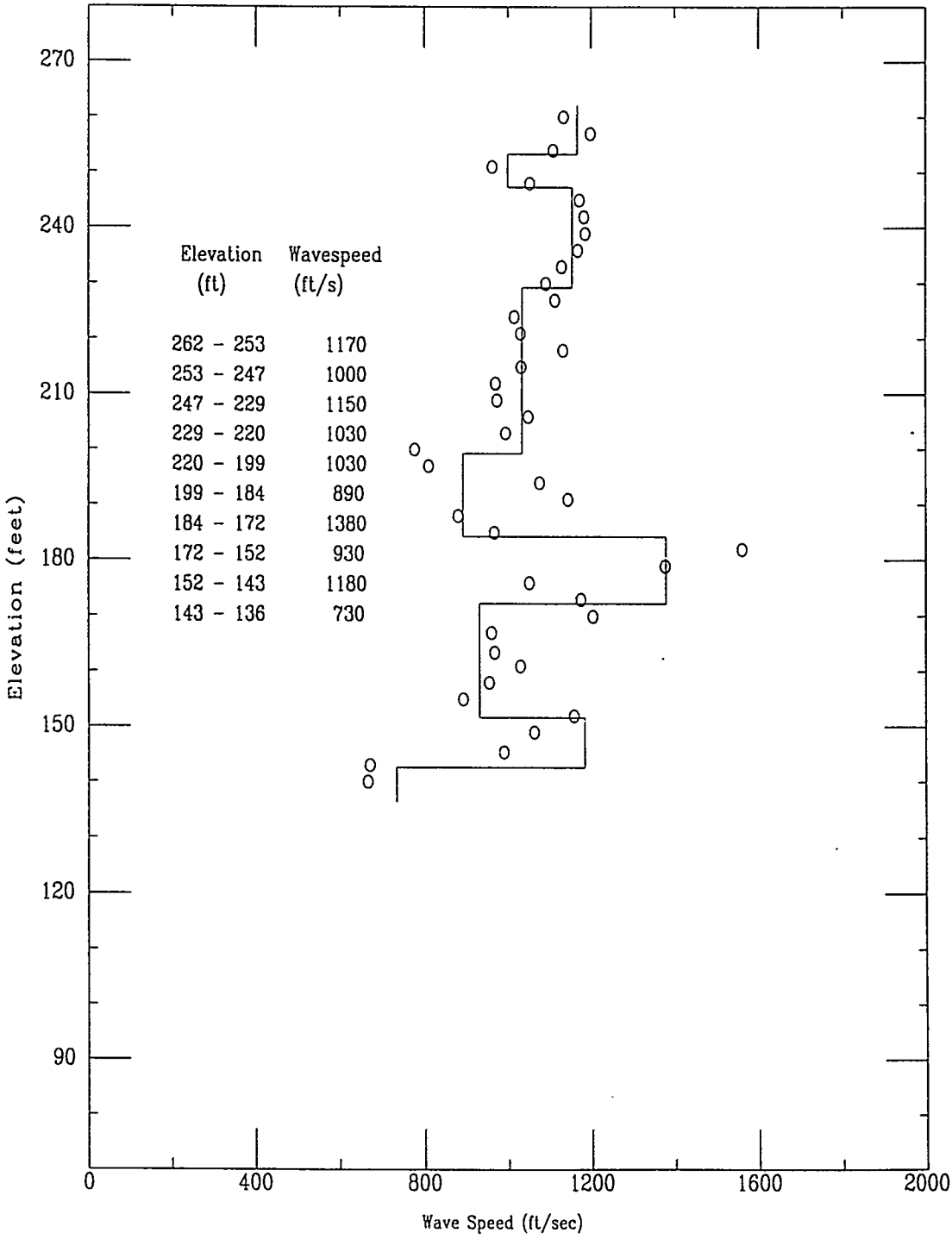
SDFBC4 APPLIED RESEARCH ASSOCIATES, INC. 04/26/99

Shear Wave Speeds



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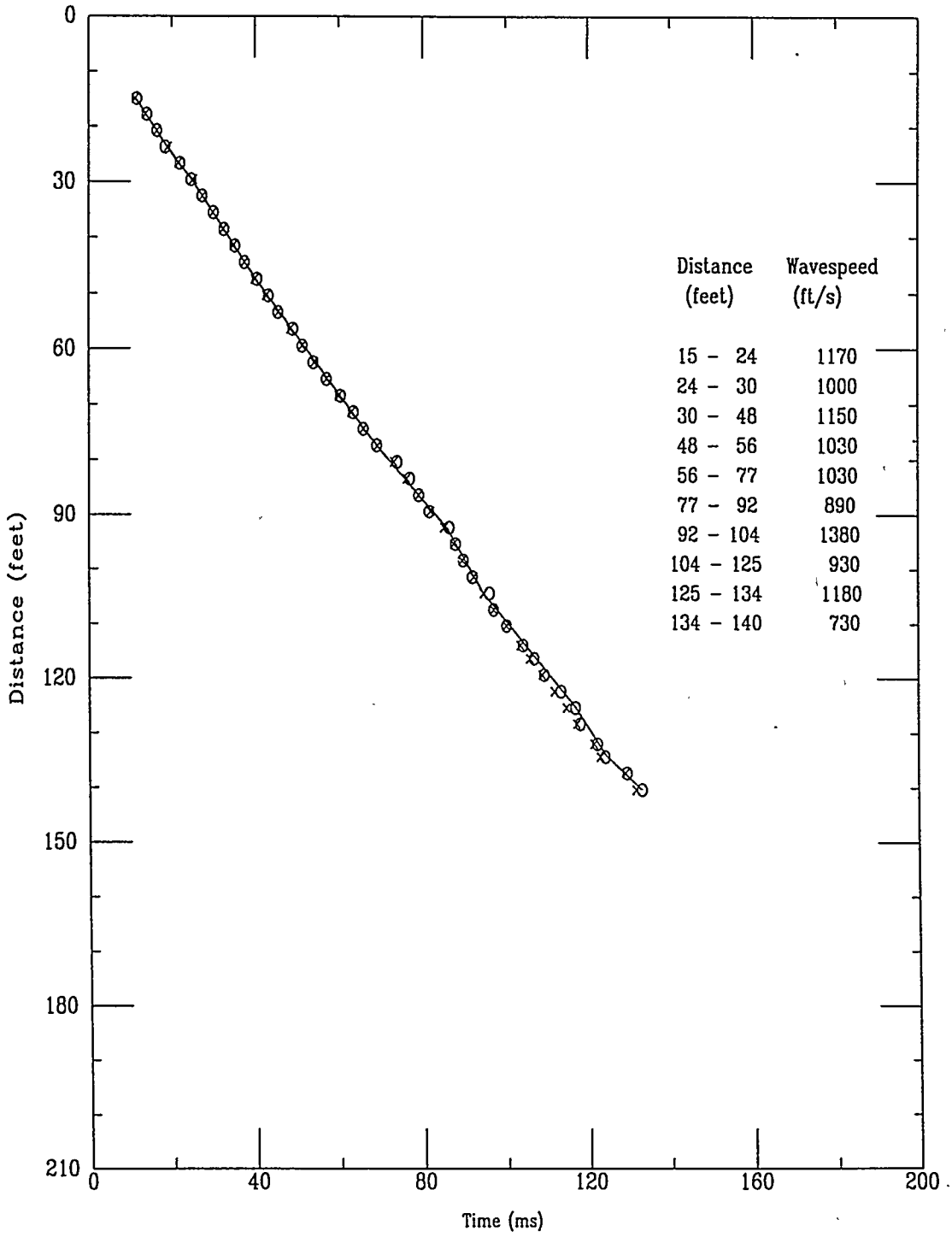
Shear Wave Time of Peak



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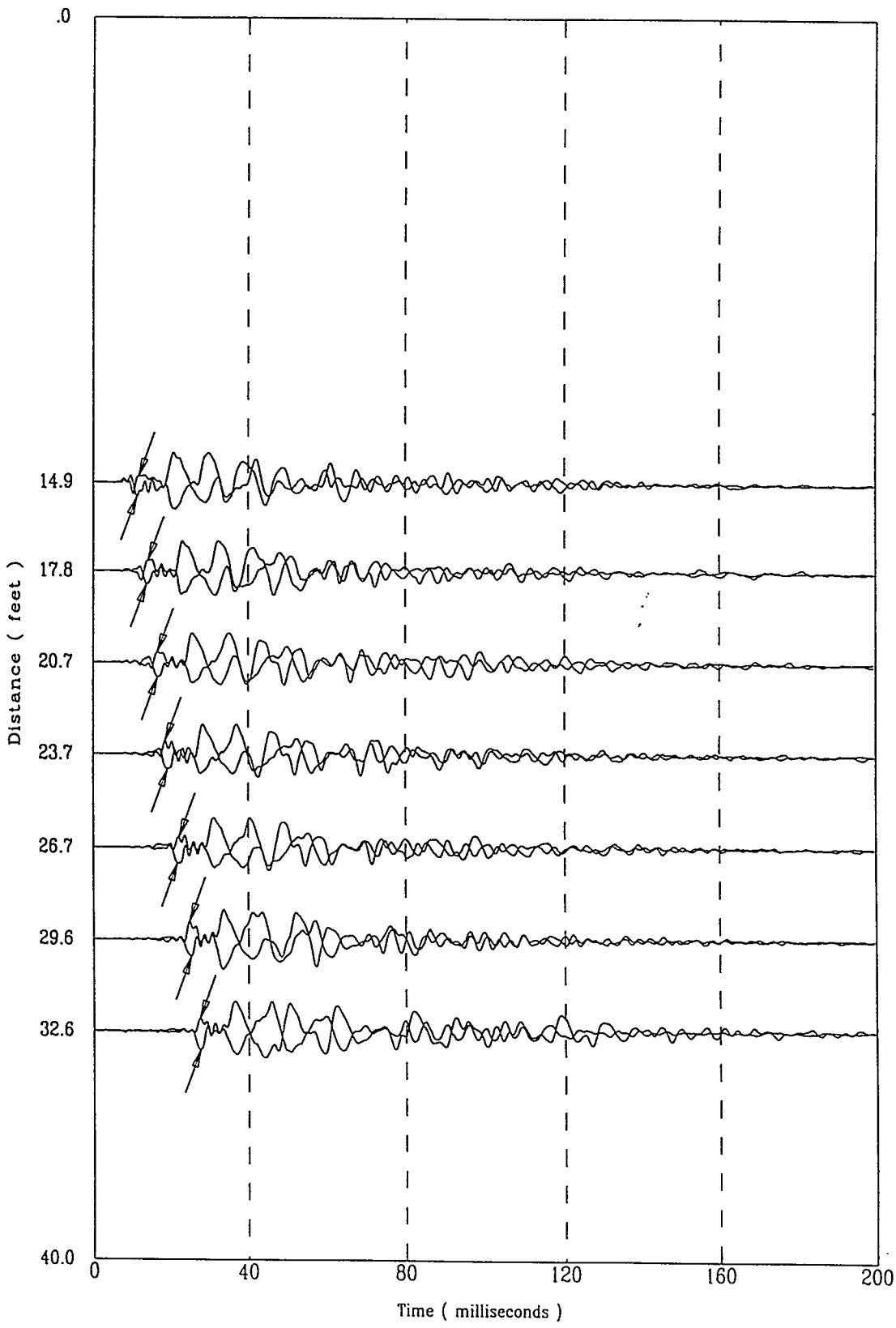

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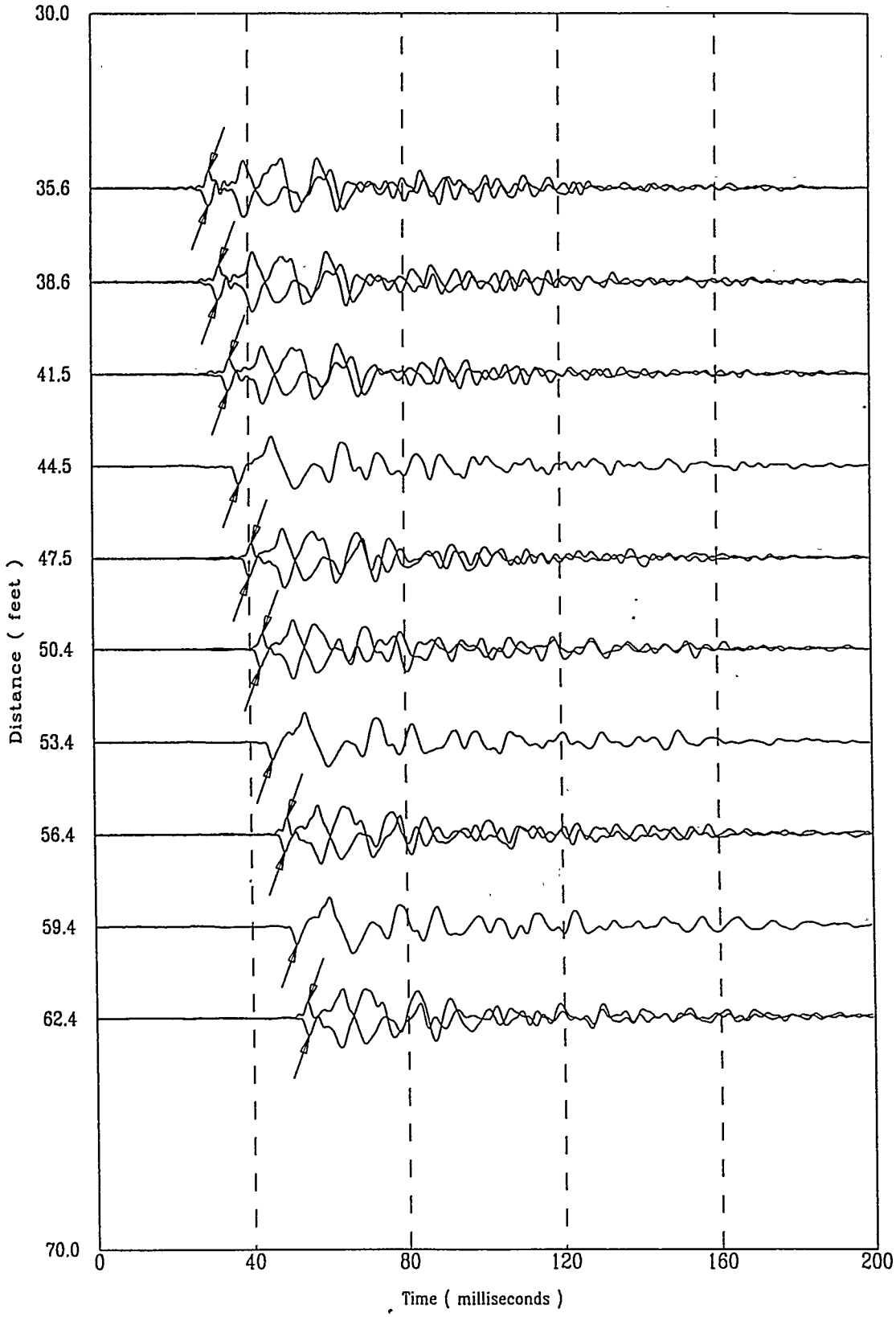
Applied Research Associates
SDFBC4

S Wave
04/26/99



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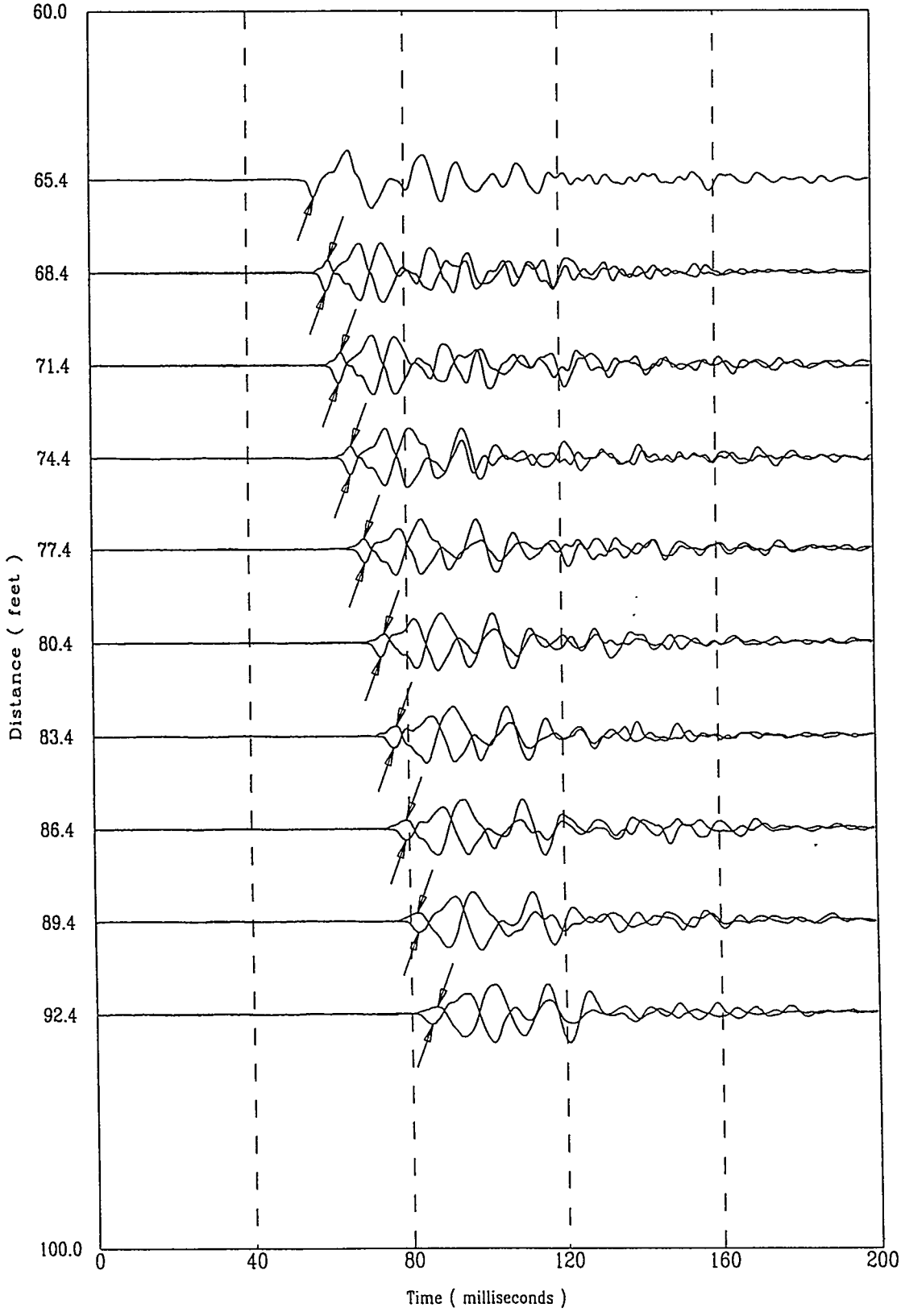

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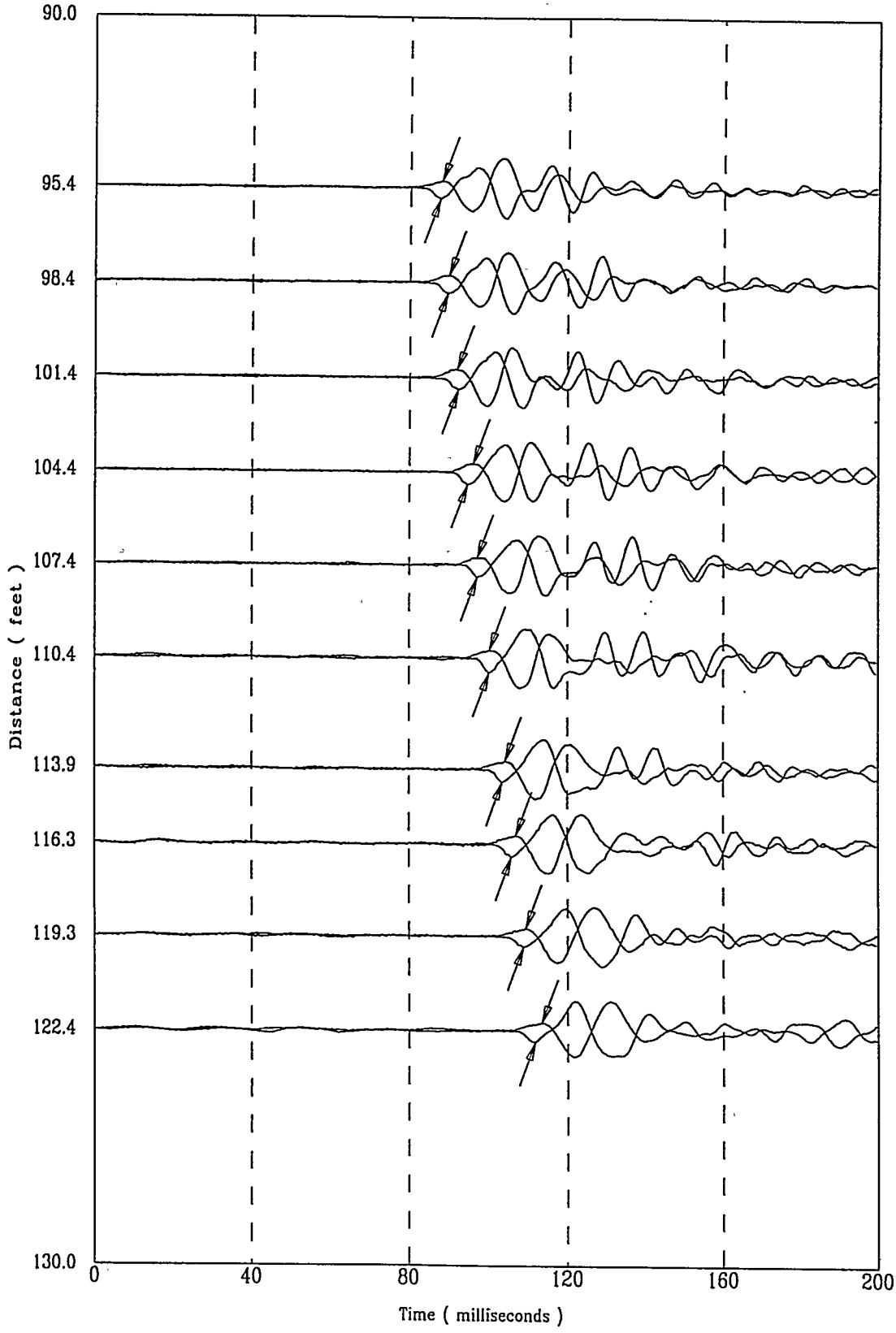

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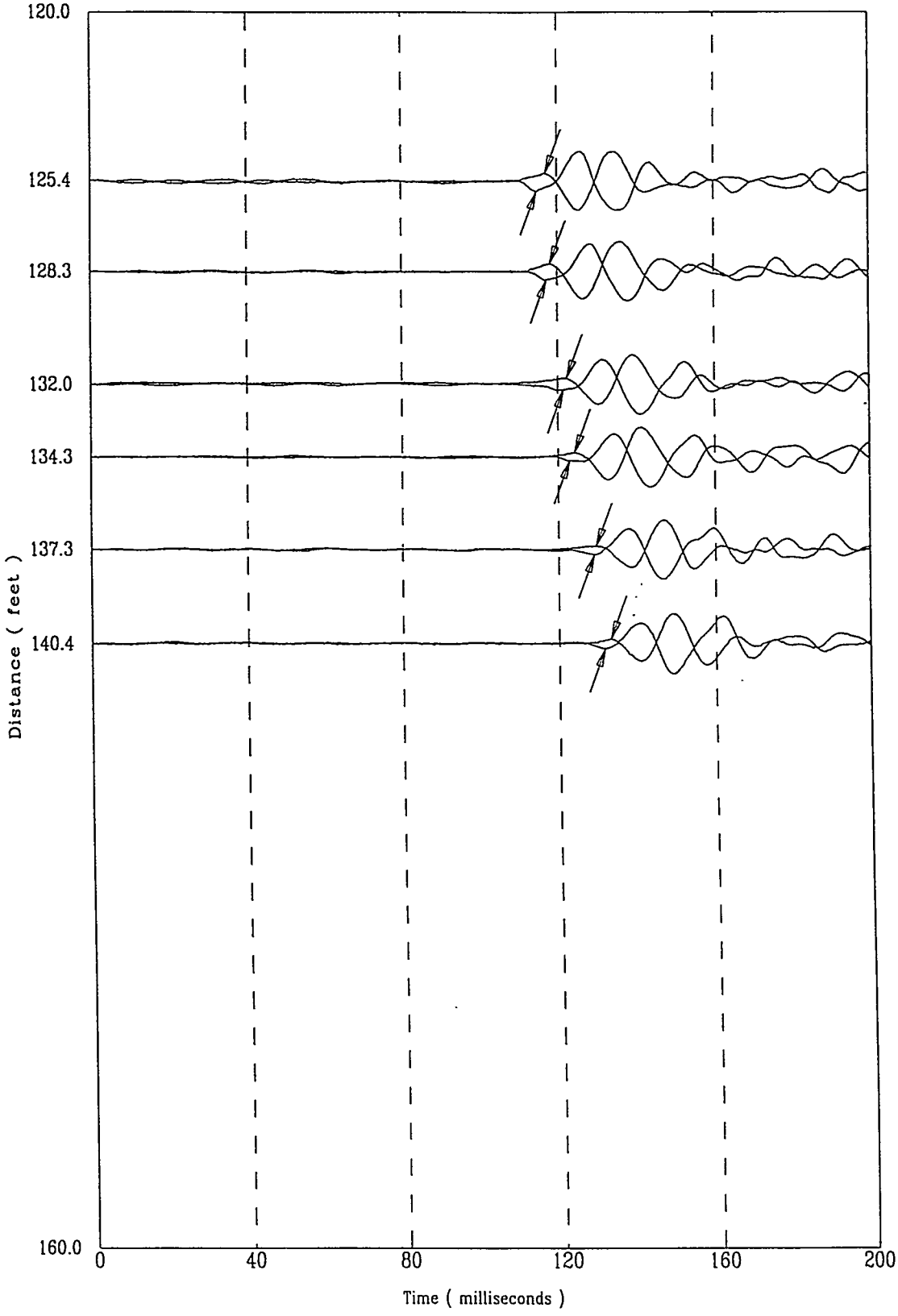

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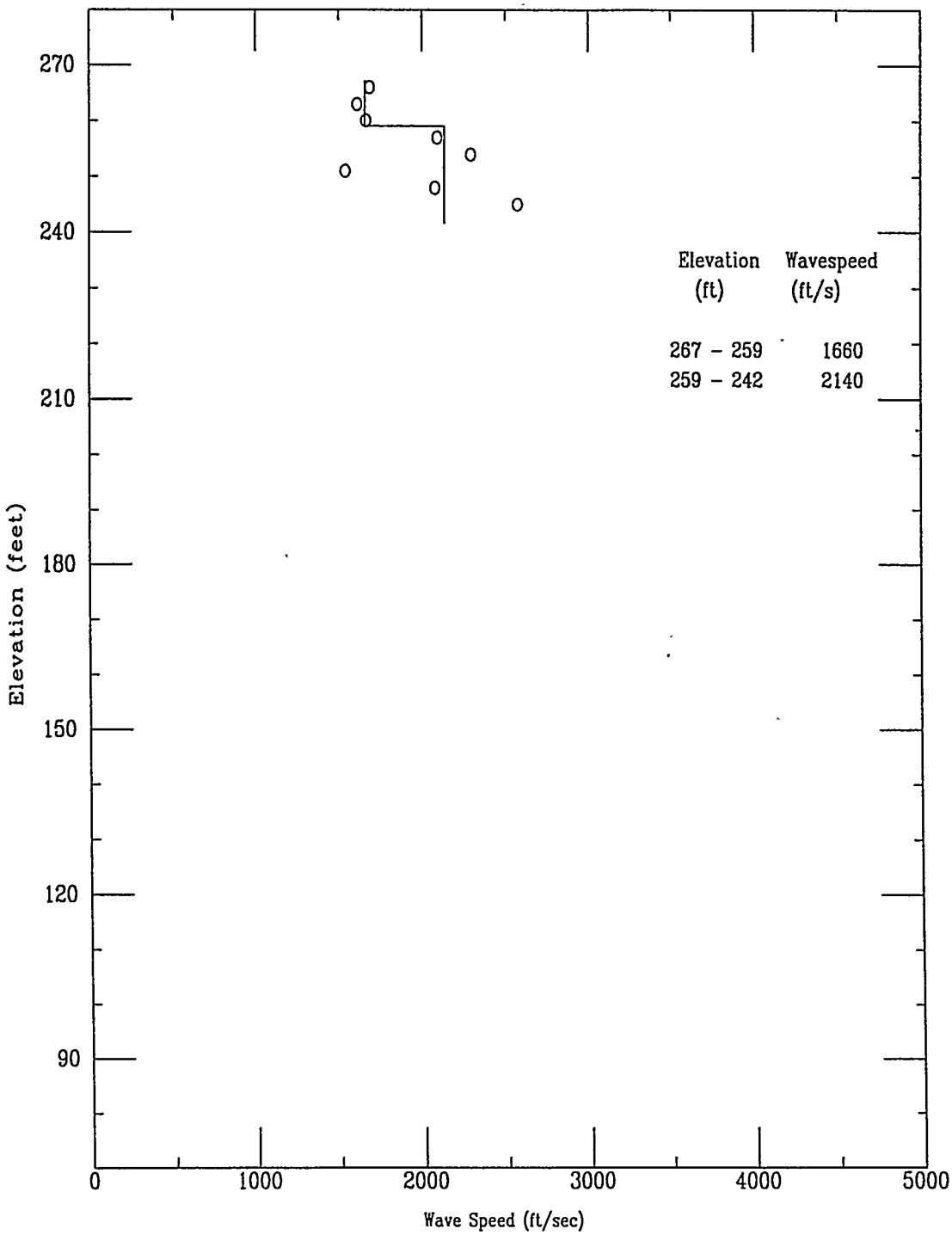

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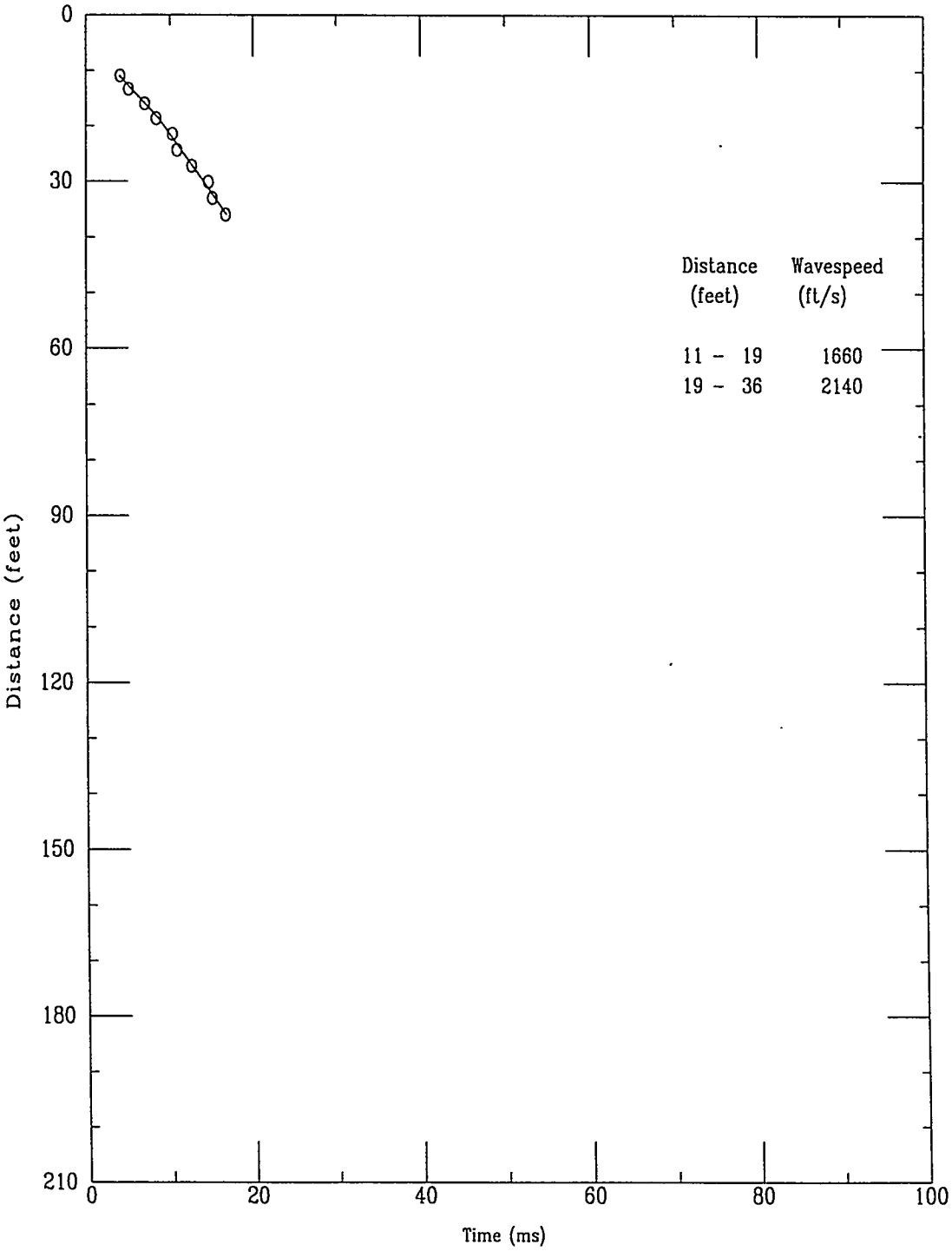

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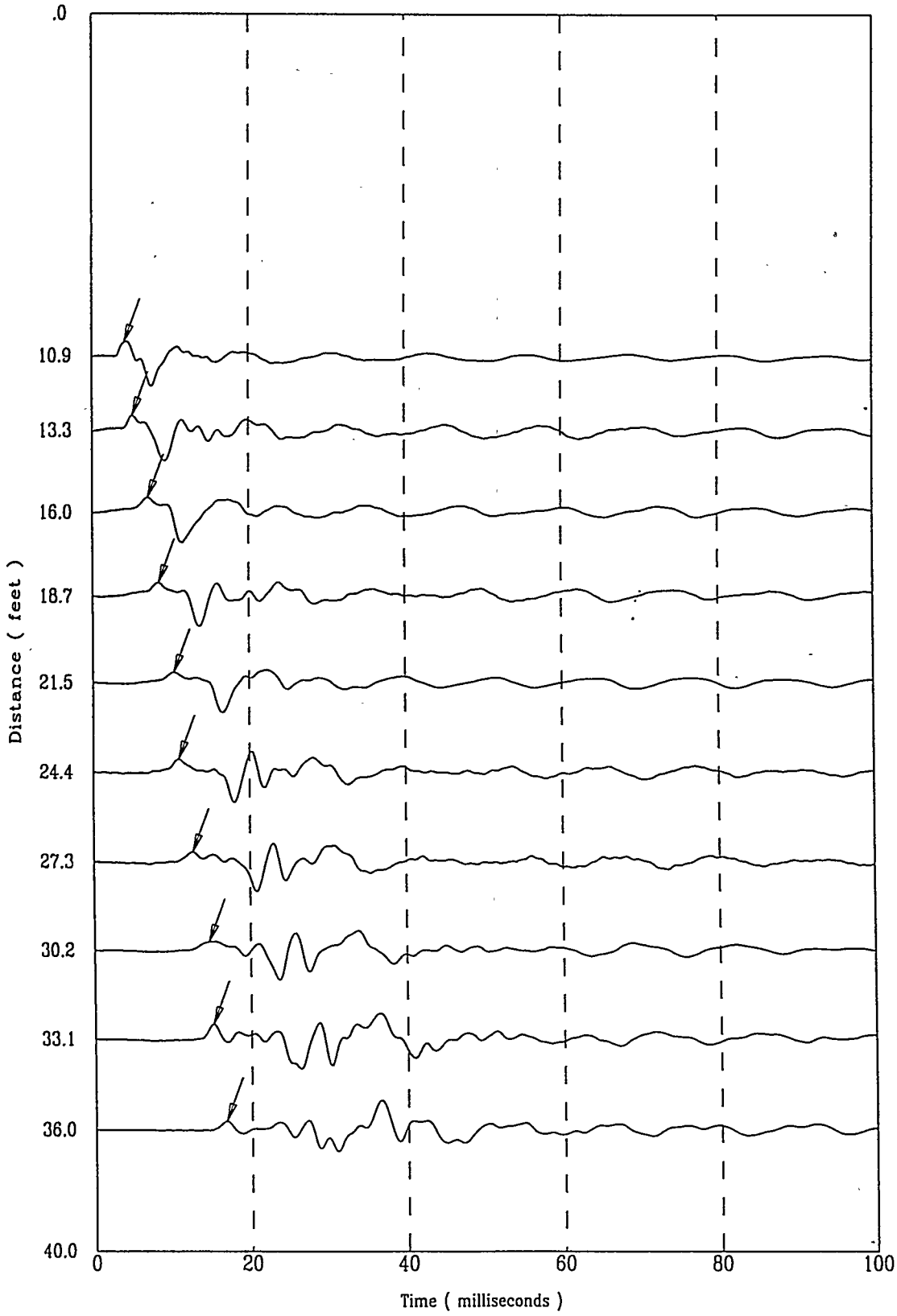
Applied Research Associates
SDFBC4

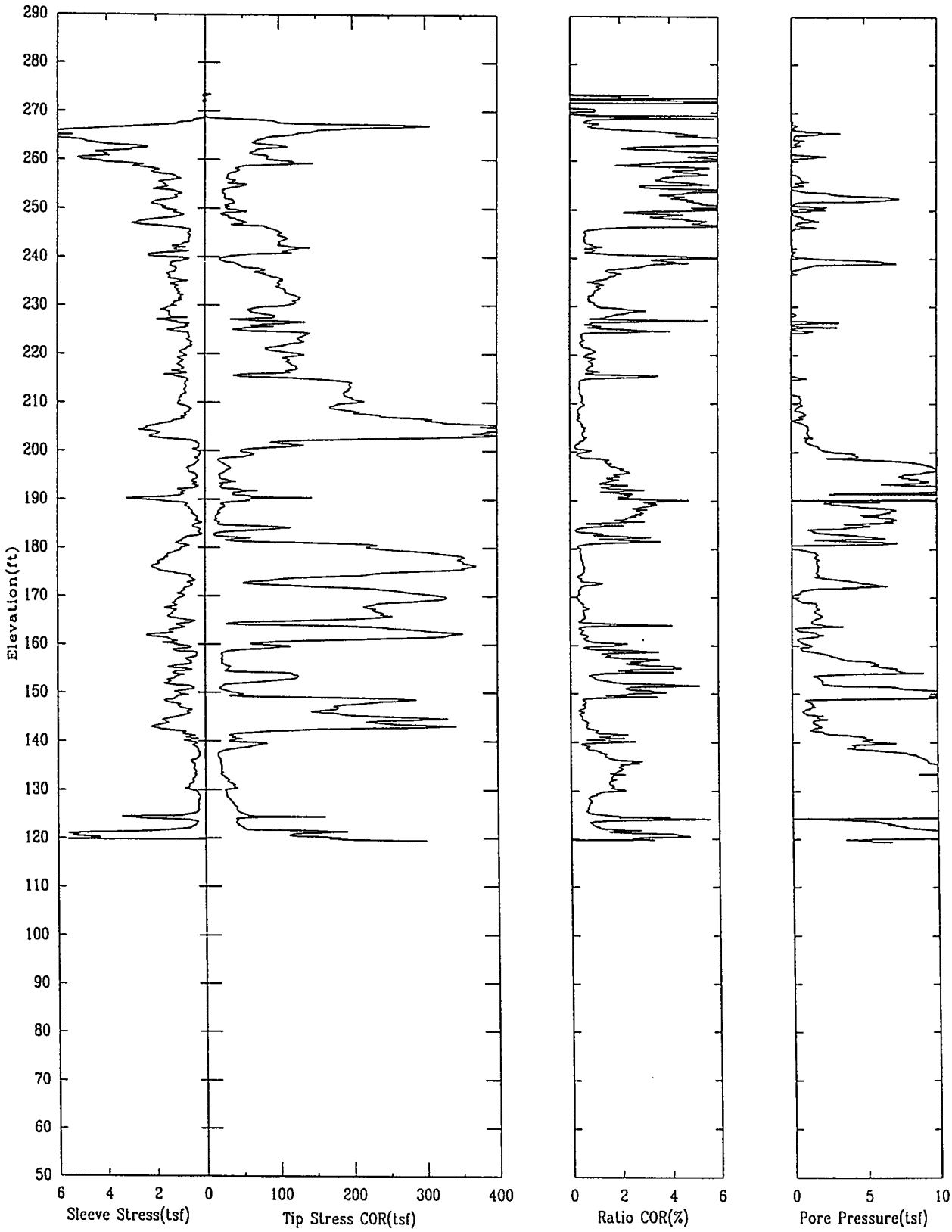
P Wave
04/26/99



File 326a901S

SDFBC7 APPLIED RESEARCH ASSOCIATES, INC. 04/27/99

North 72703.0 East 65393.4 Elevation 274.0



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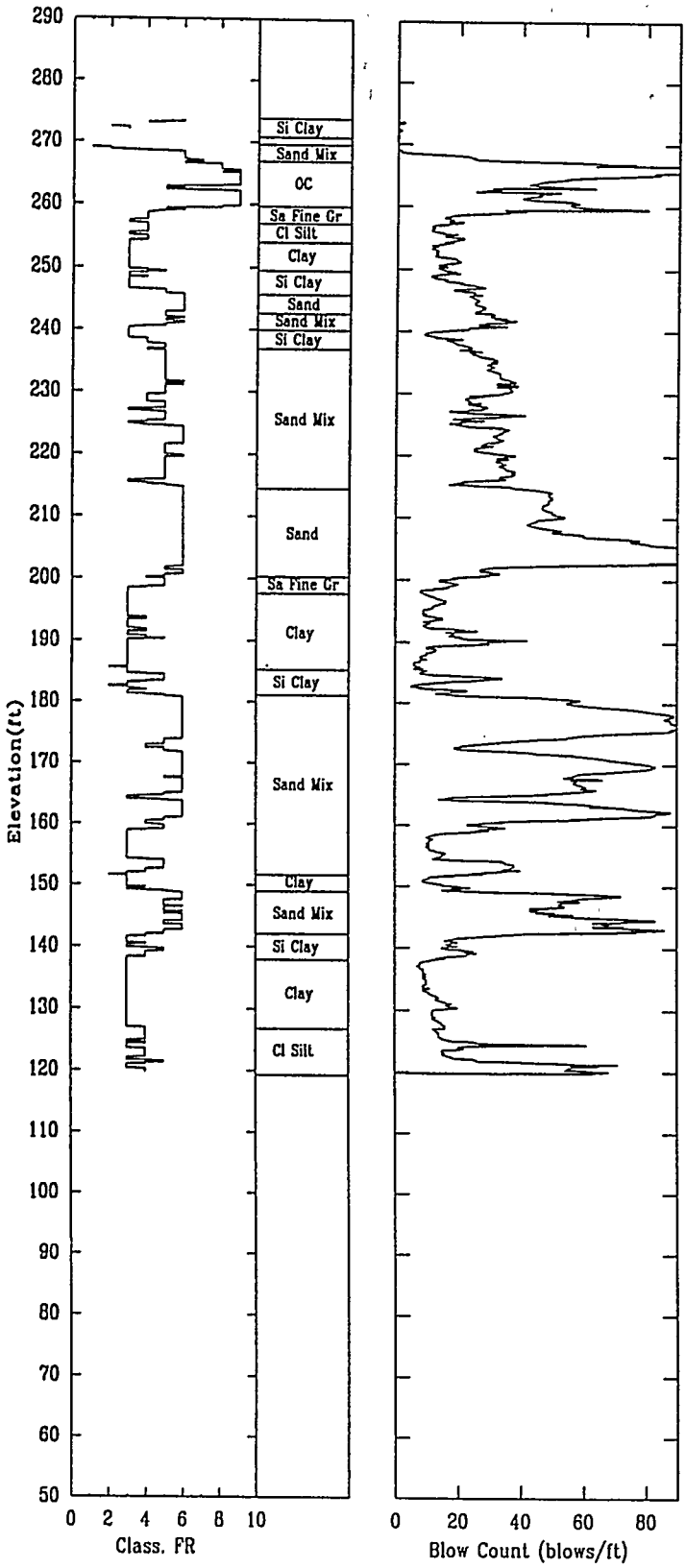
SDFBC7 APPLIED RESEARCH ASSOCIATES, INC. 04/27/99

North 72703.0 East 65393.4 Elevation 274.0



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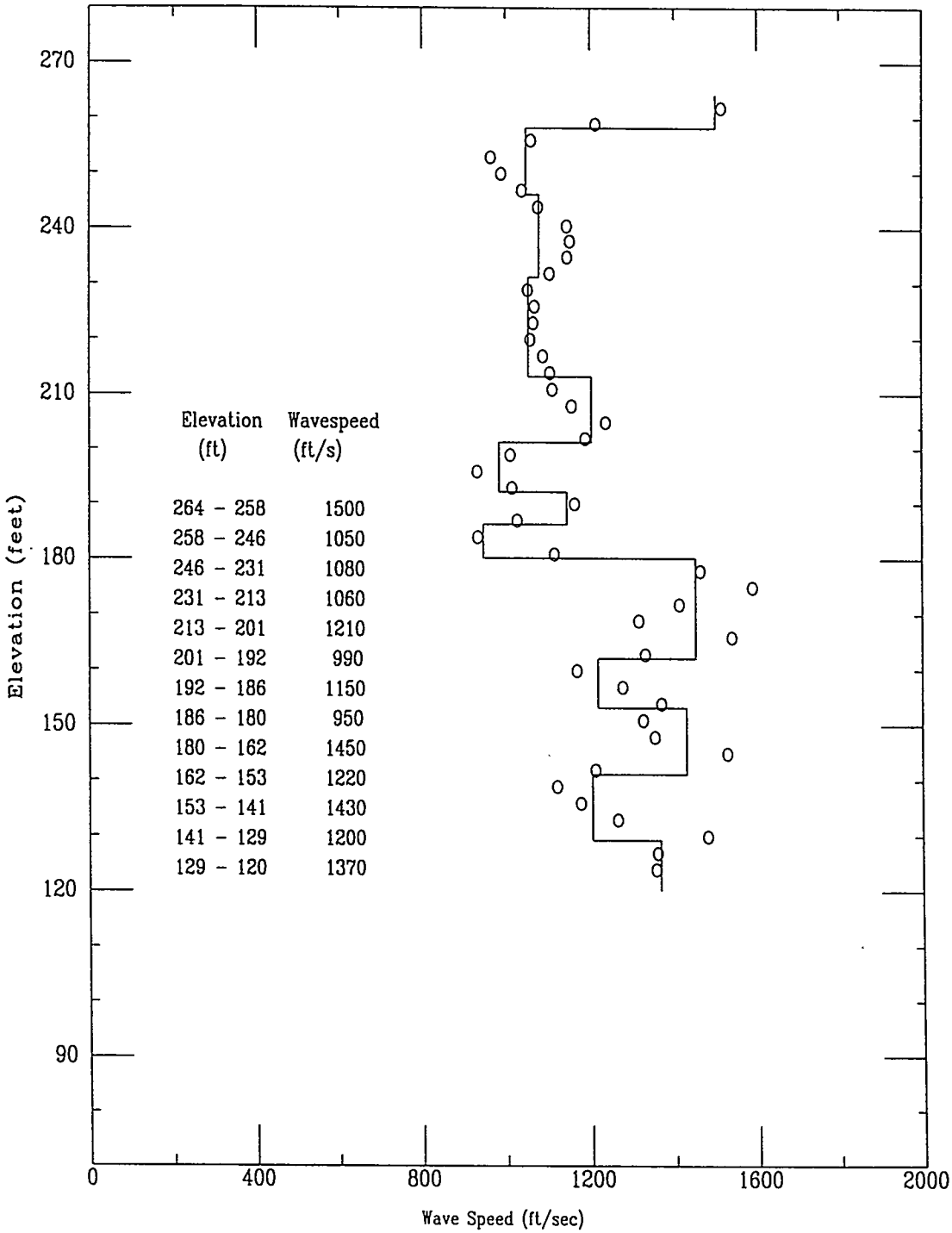
SDFBC7 APPLIED RESEARCH ASSOCIATES, INC. 04/27/99

Shear Wave Speeds

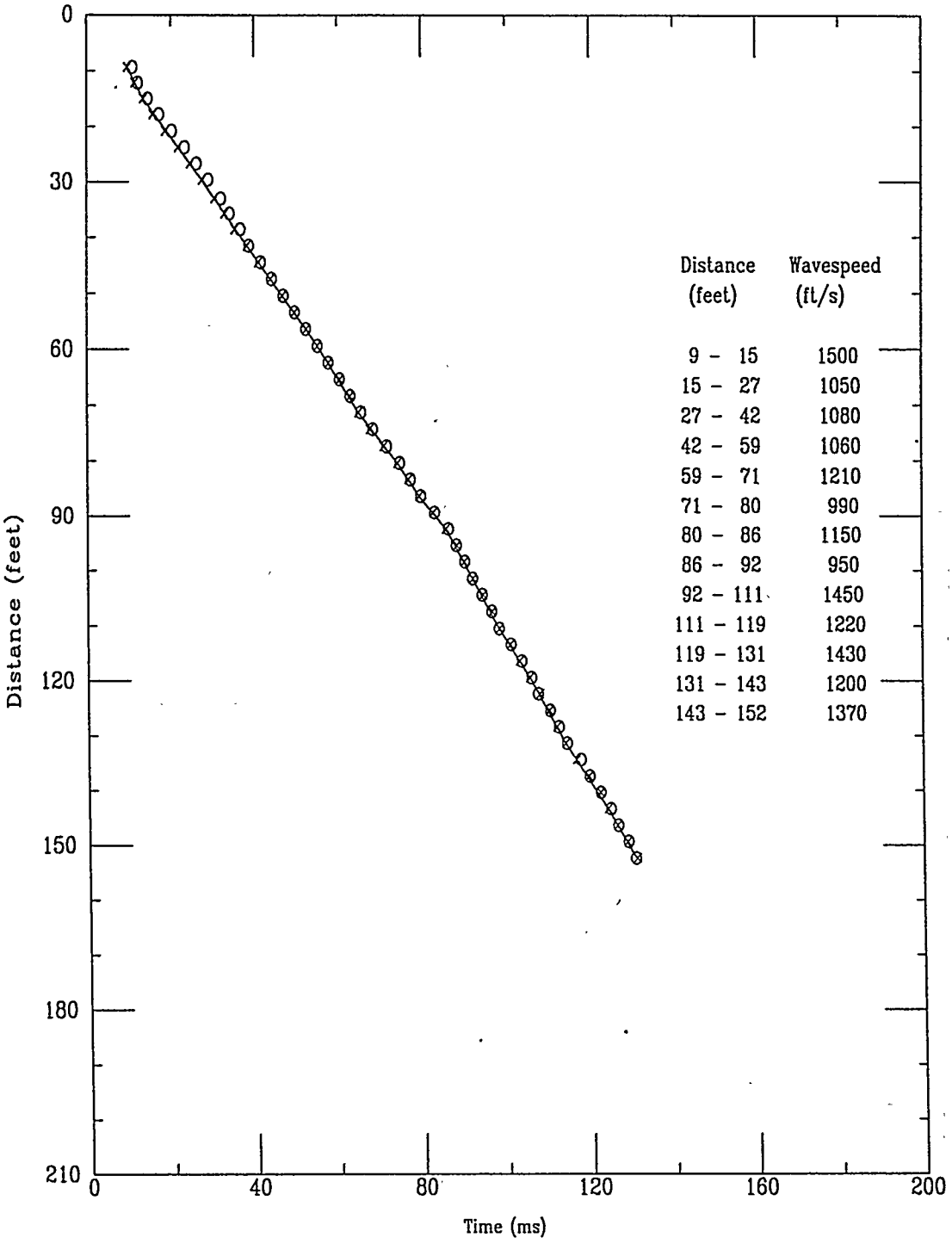


Elevation (ft)	Wavespeed (ft/s)
264 - 258	1500
258 - 246	1050
246 - 231	1080
231 - 213	1060
213 - 201	1210
201 - 192	990
192 - 186	1150
186 - 180	950
180 - 162	1450
162 - 153	1220
153 - 141	1430
141 - 129	1200
129 - 120	1370

File 327A901S

SDFBC7 APPLIED RESEARCH ASSOCIATES, INC. 04/27/99

Shear Wave Time of Peak

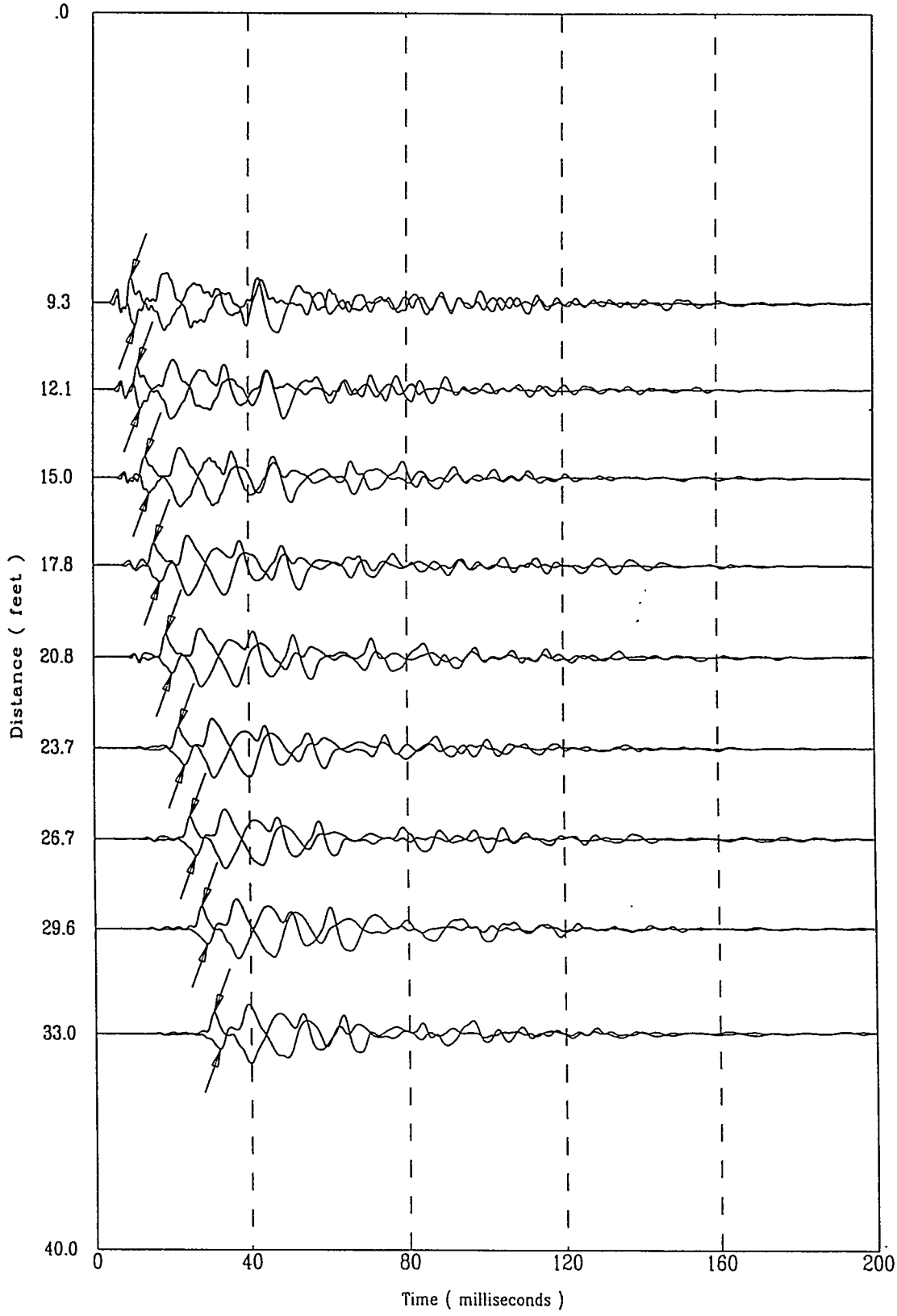


Distance (feet)	Wavespeed (ft/s)
9 - 15	1500
15 - 27	1050
27 - 42	1080
42 - 59	1060
59 - 71	1210
71 - 80	990
80 - 86	1150
86 - 92	950
92 - 111	1450
111 - 119	1220
119 - 131	1430
131 - 143	1200
143 - 152	1370

File 327A901S

Applied Research Associates
SDFBC7

S Wave
04/27/99



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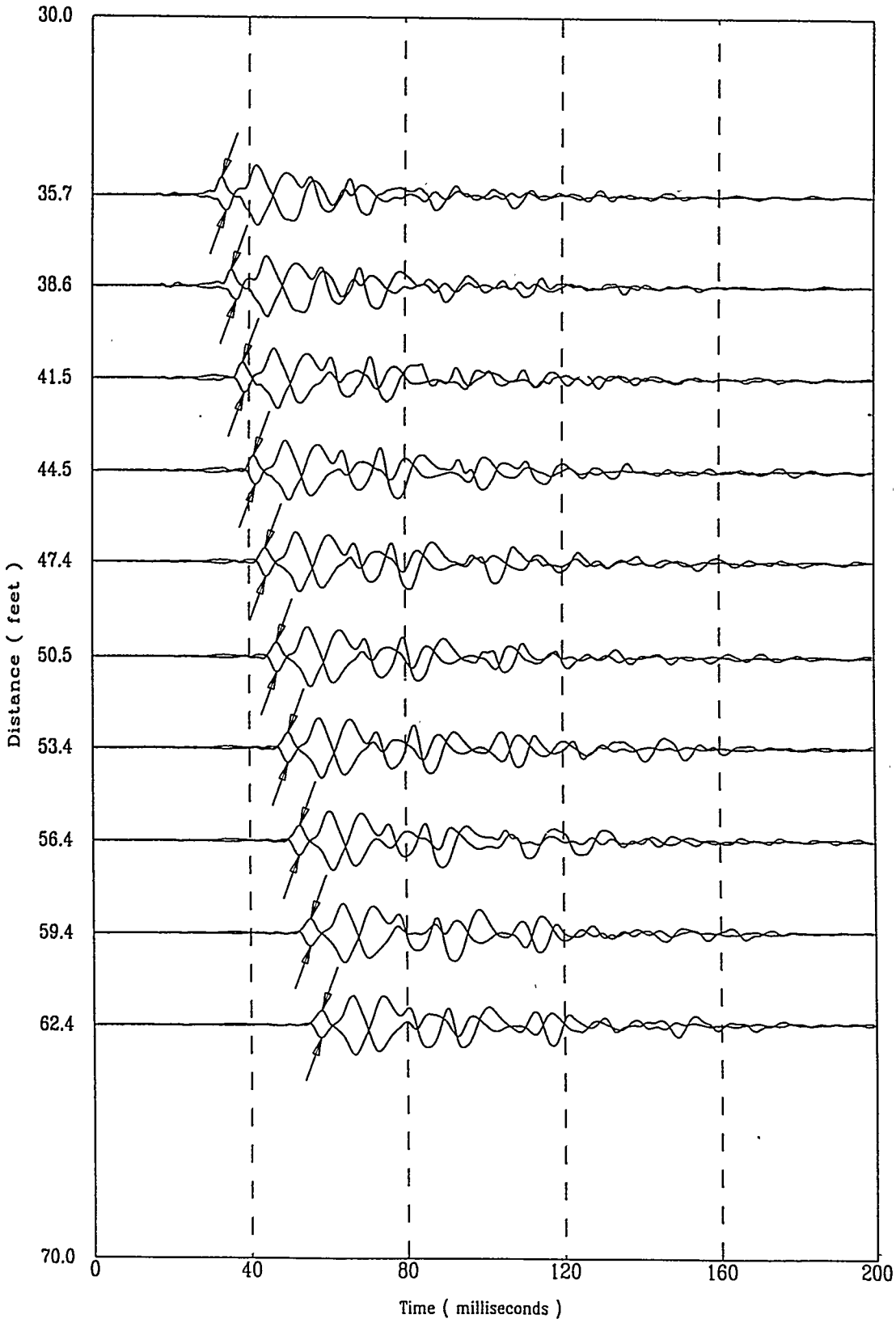
Applied Research Associates
SDFBC7

S Wave
04/27/99



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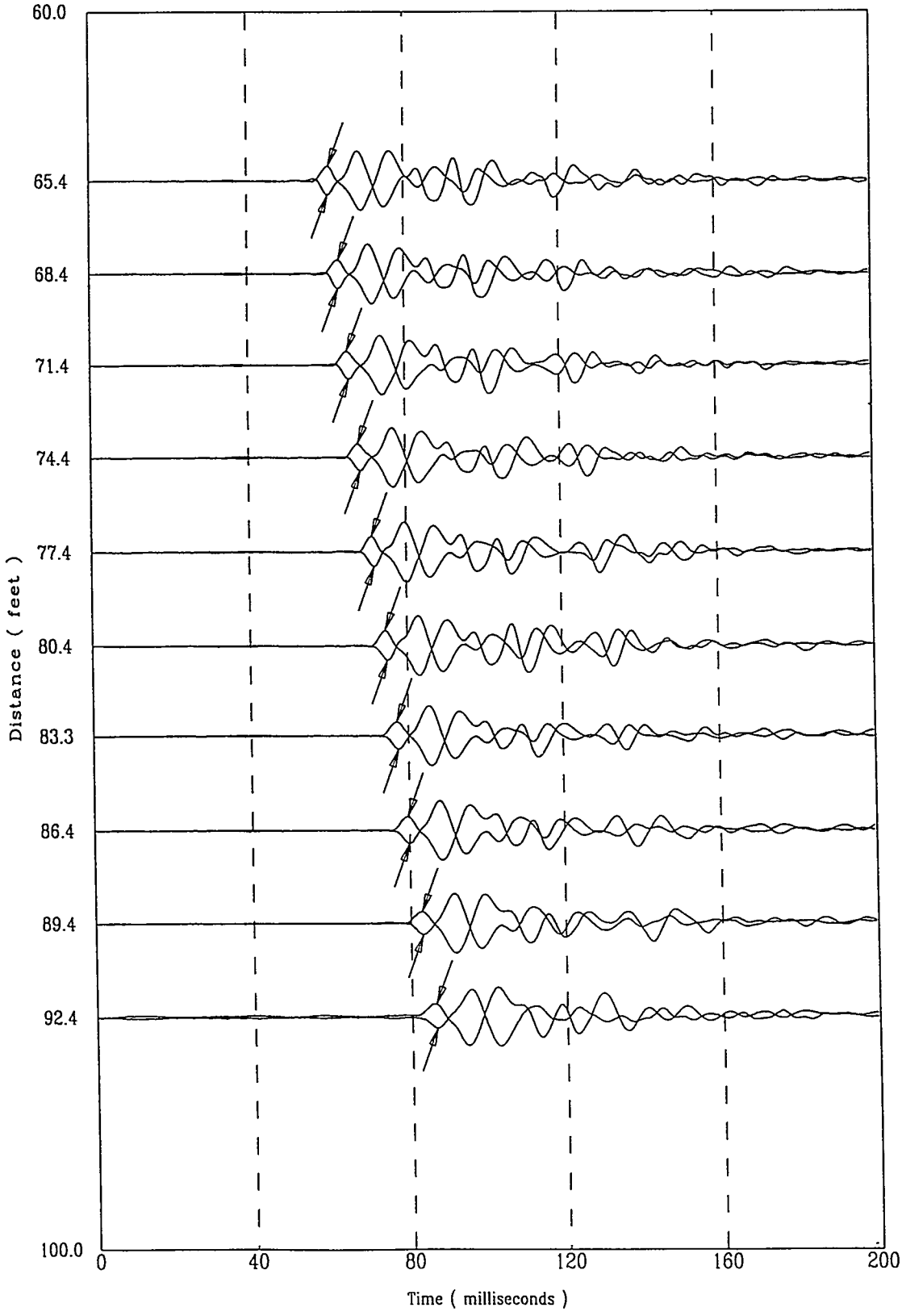
Applied Research Associates
SDFBC7

S Wave
04/27/99



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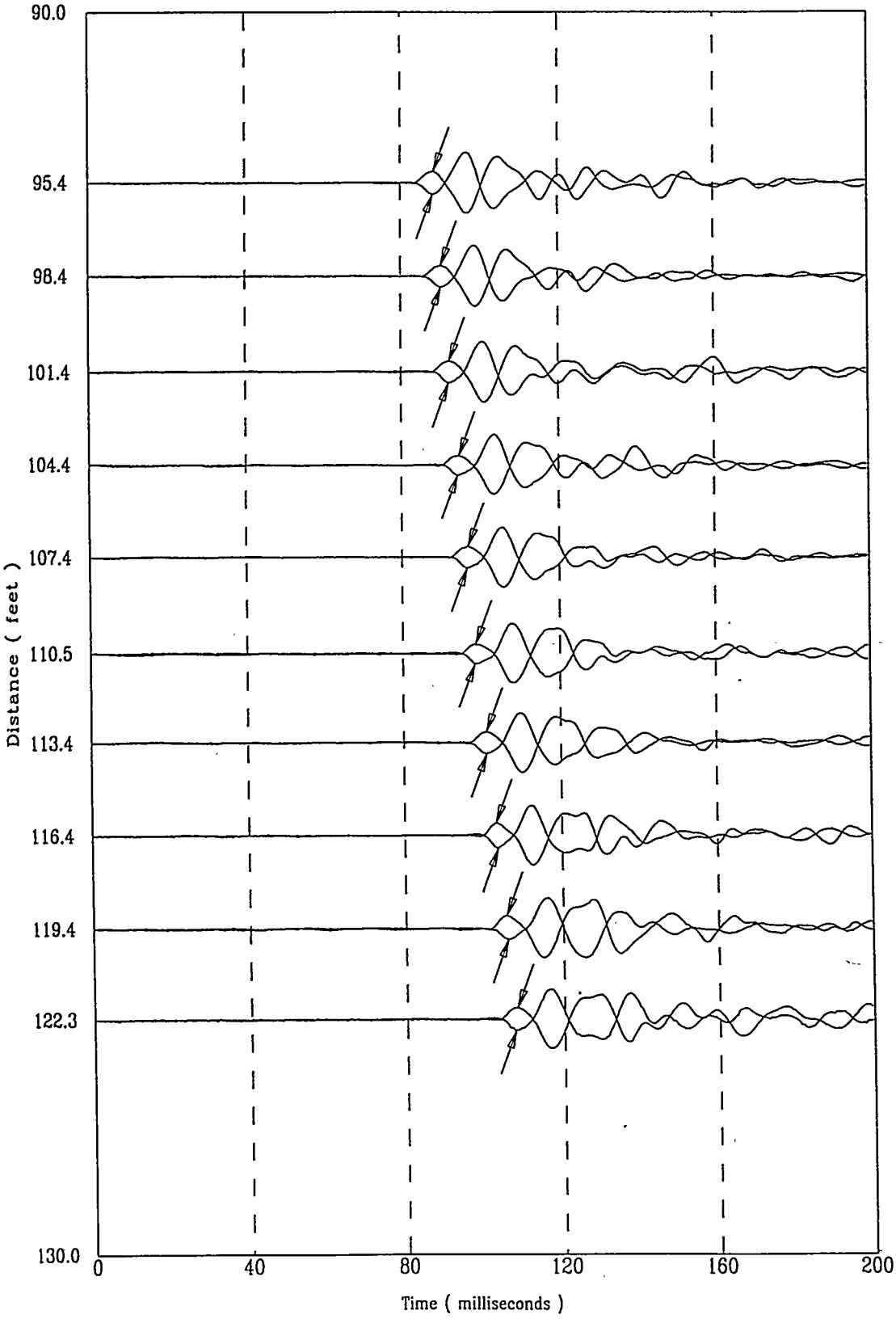
Applied Research Associates
SDFBC7

S Wave
04/27/99



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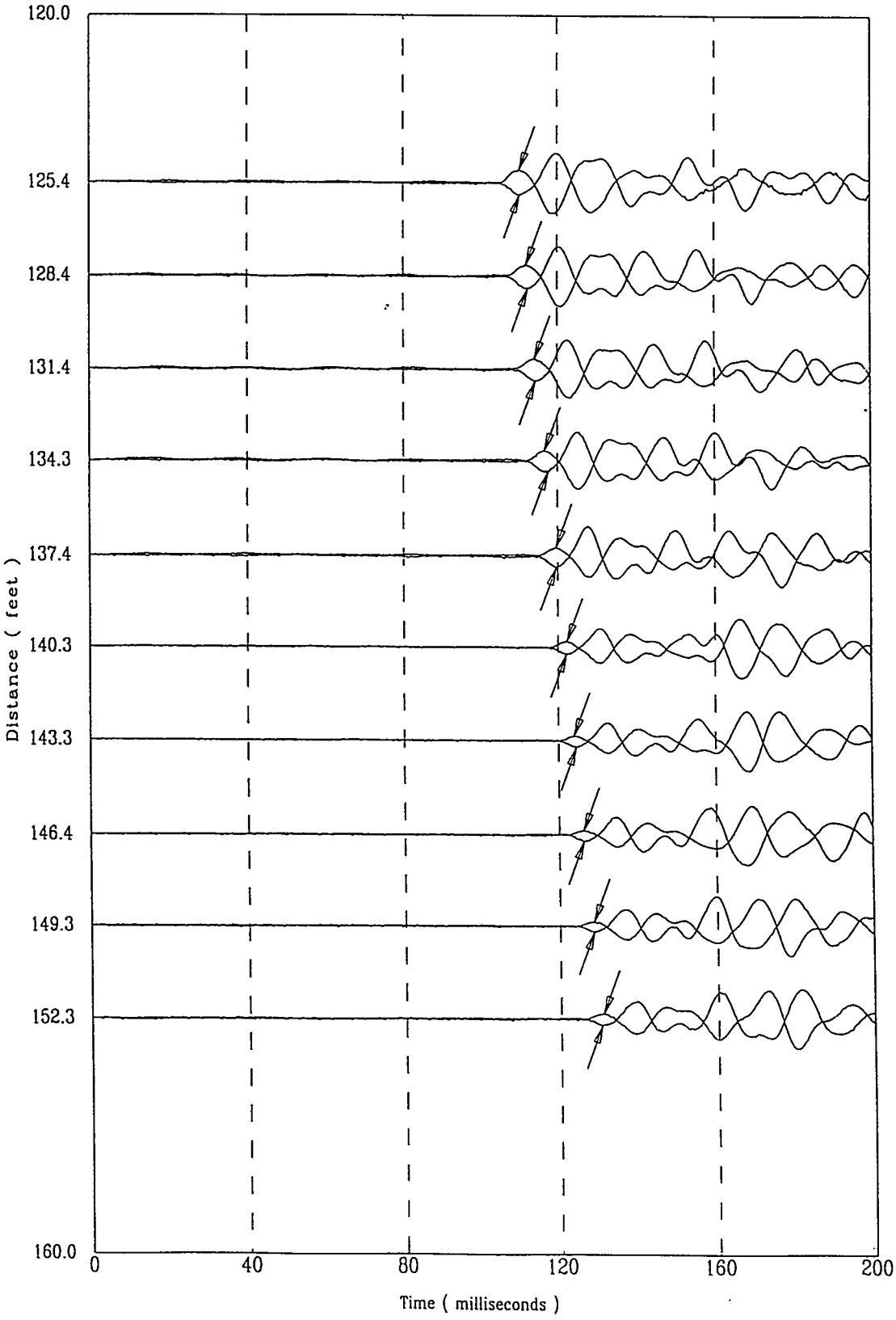
Applied Research Associates
SDFBC7

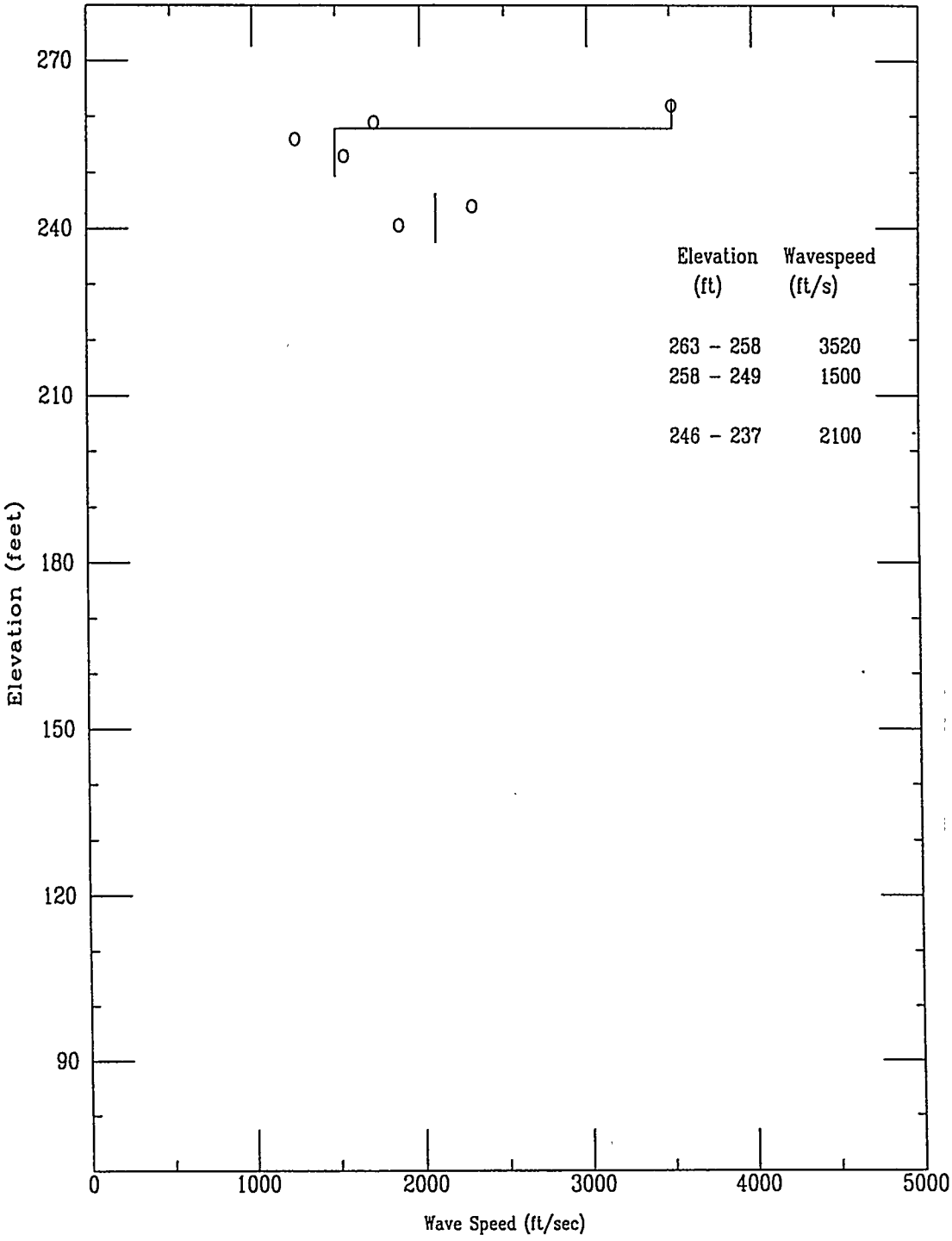
S Wave
04/27/99



File 327A901S

SDFBC7 APPLIED RESEARCH ASSOCIATES, INC. 04/27/99

Compression Wave Speeds



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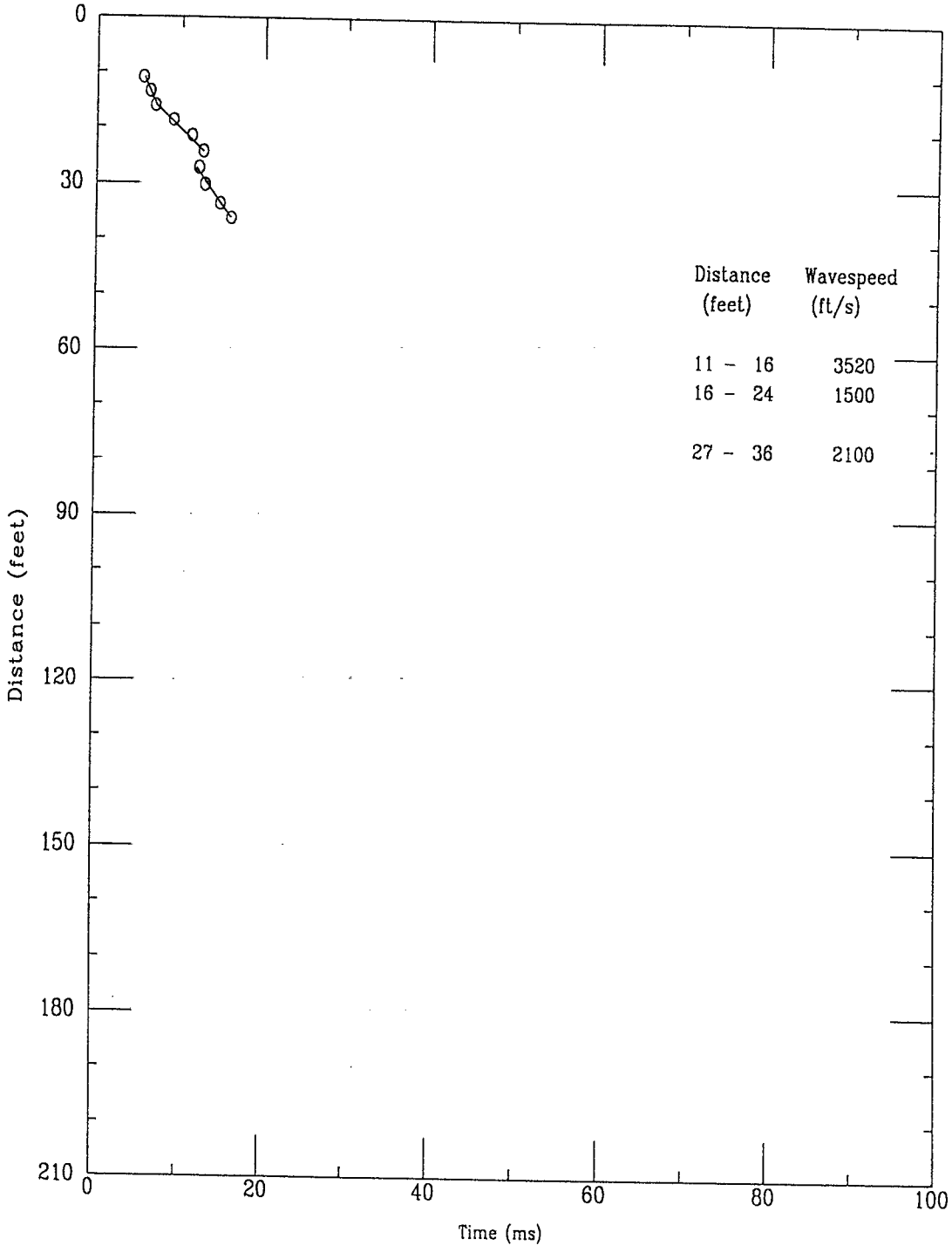
SDFBC7 APPLIED RESEARCH ASSOCIATES, INC. 04/27/99

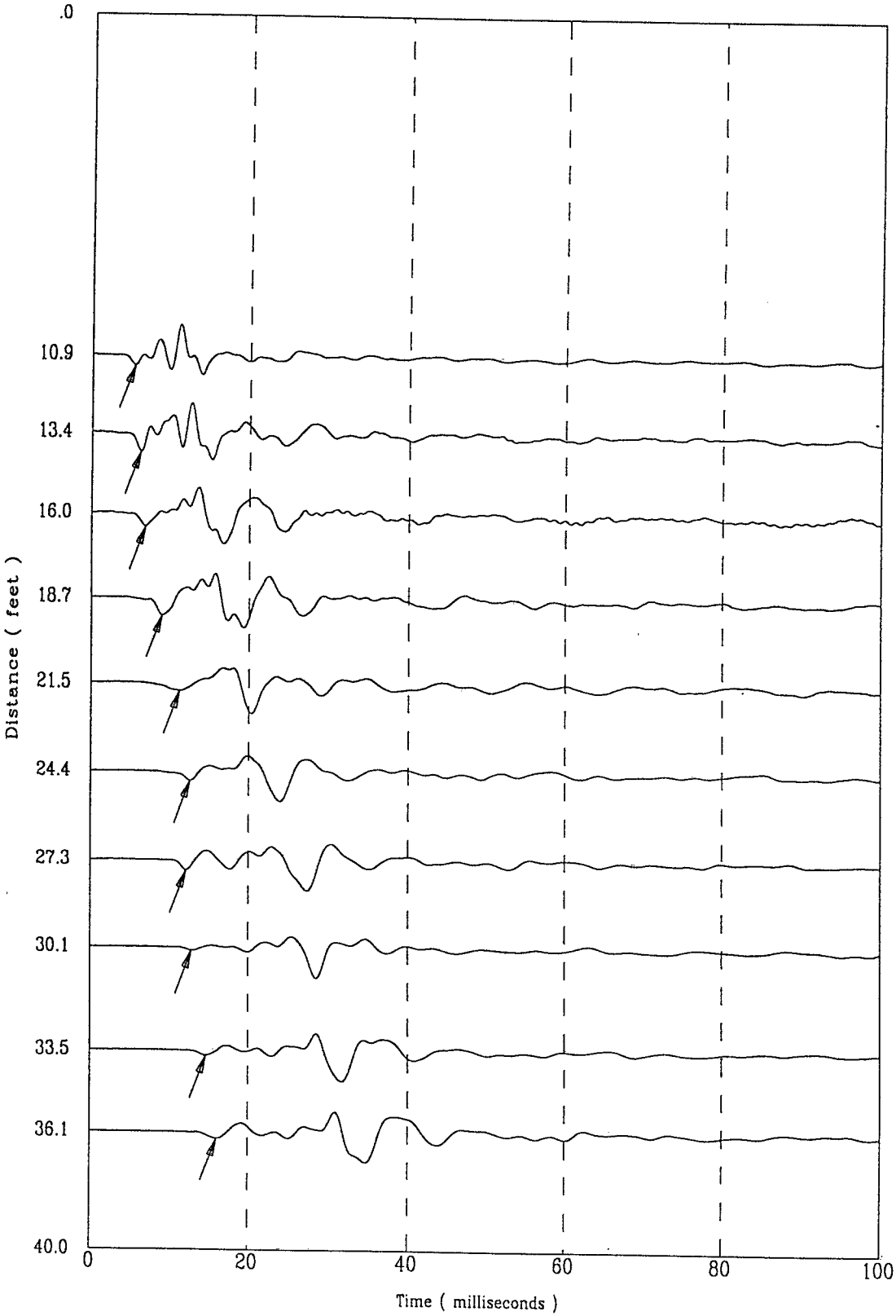
Compression Wave Time of Peak



File 327a901S

Applied Research Associates
SDFBC7

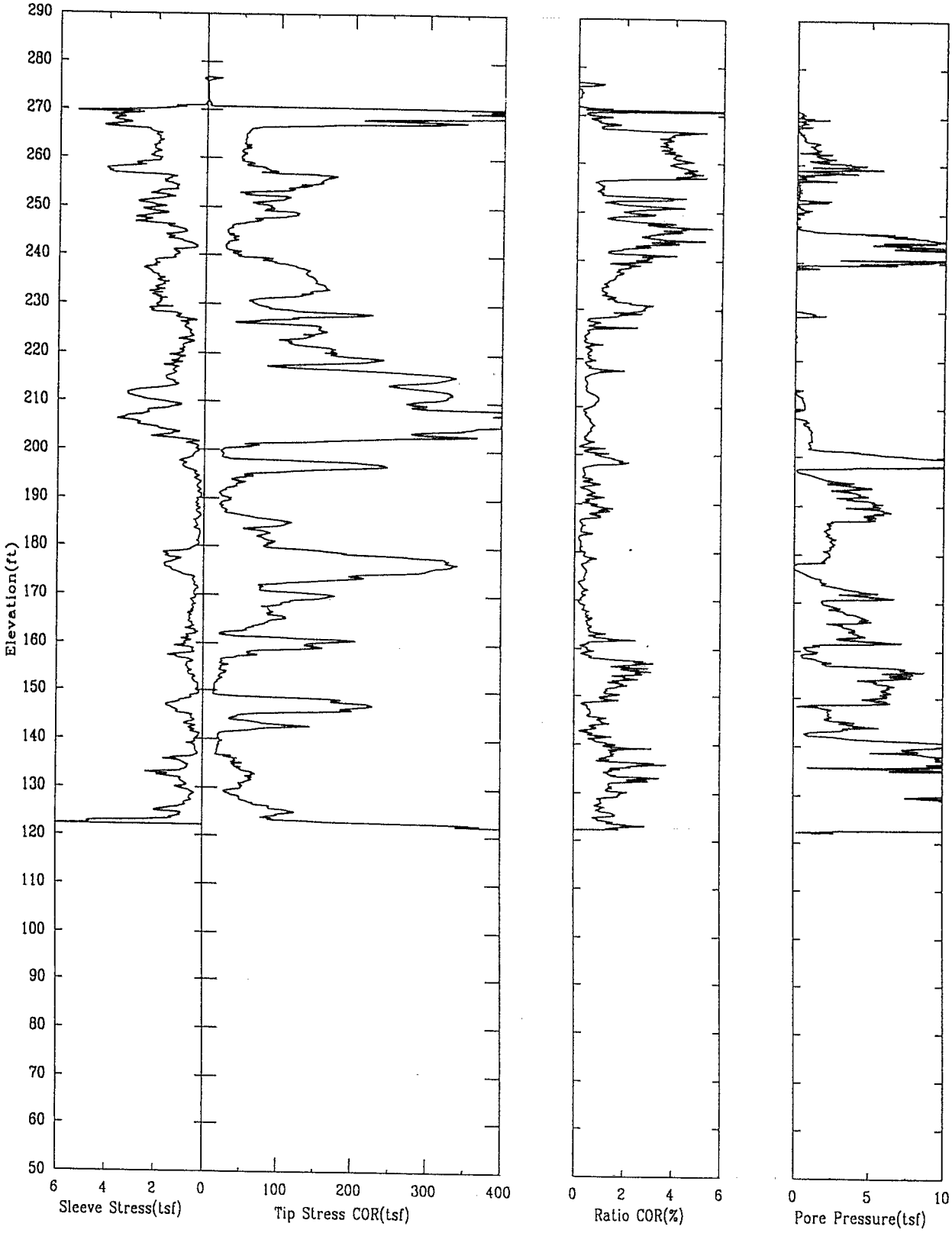
P Wave
04/27/99



File 327a901S

SDFBC10 APPLIED RESEARCH ASSOCIATES, INC. 05/06/99

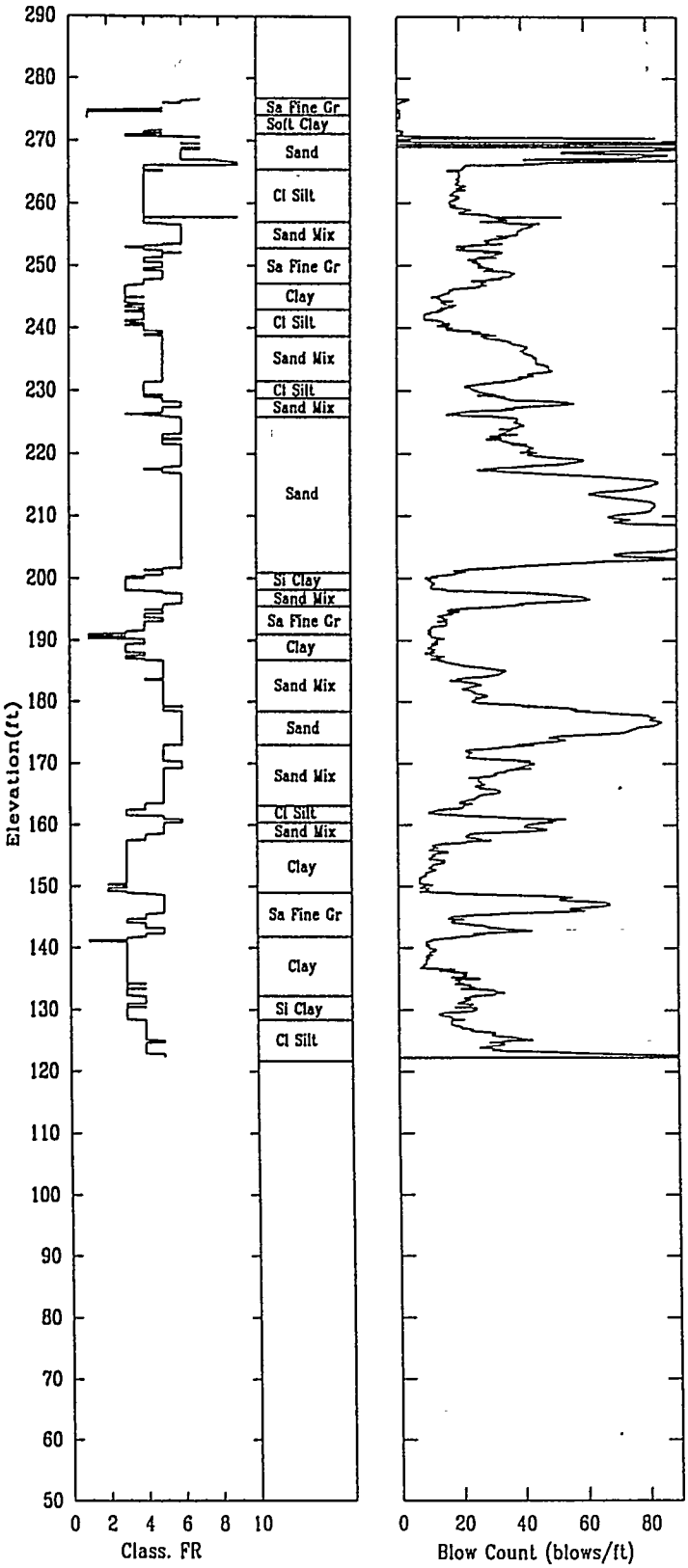
North 72751.5 East 65251.9 Elevation 277.0



File 306y902.ECP

SDFBC10 APPLIED RESEARCH ASSOCIATES, INC. 05/06/99

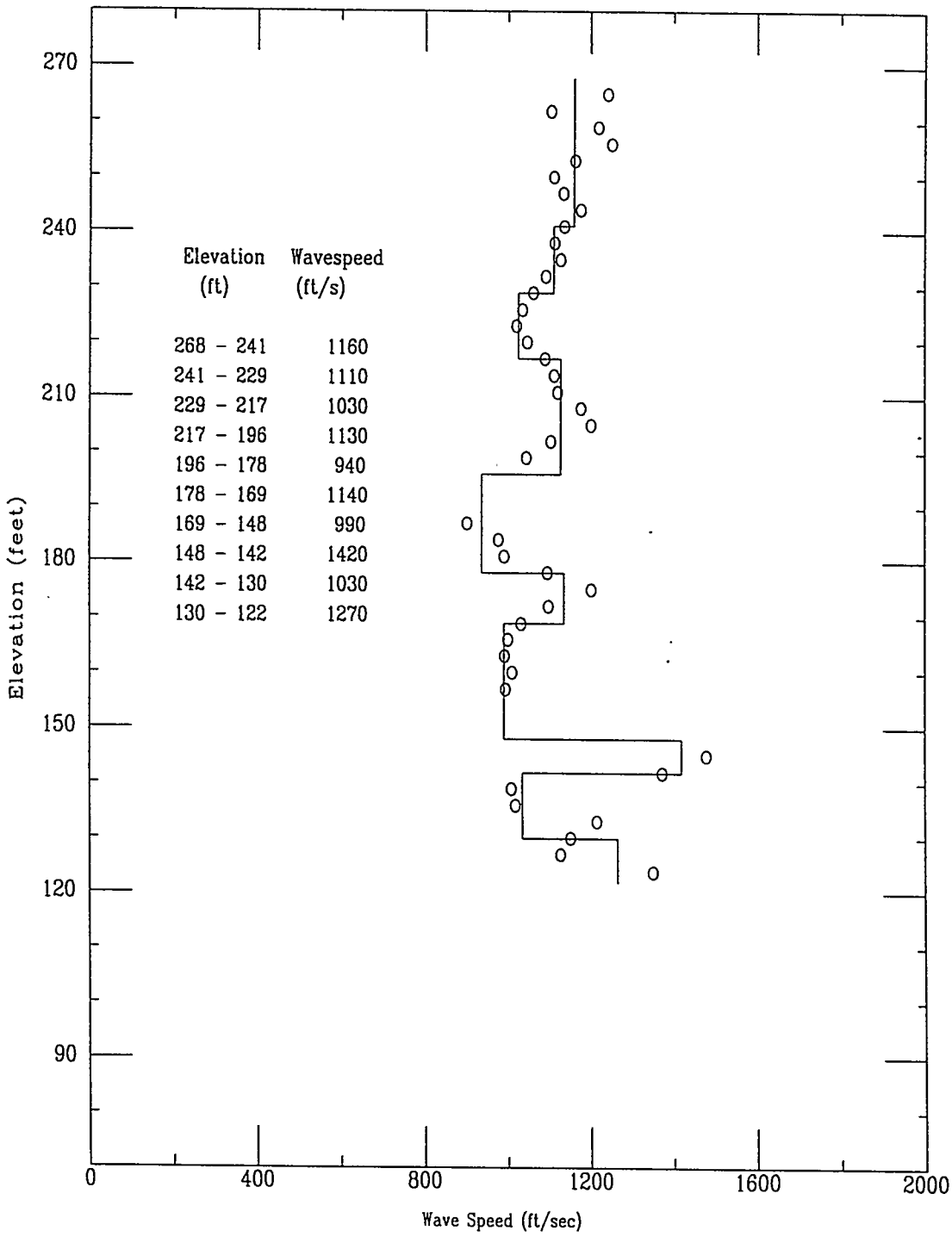
North 72751.5 East 65251.9 Elevation 277.0



File 306y902.ECP

SDFBC10 APPLIED RESEARCH ASSOCIATES, INC. 05/06/99

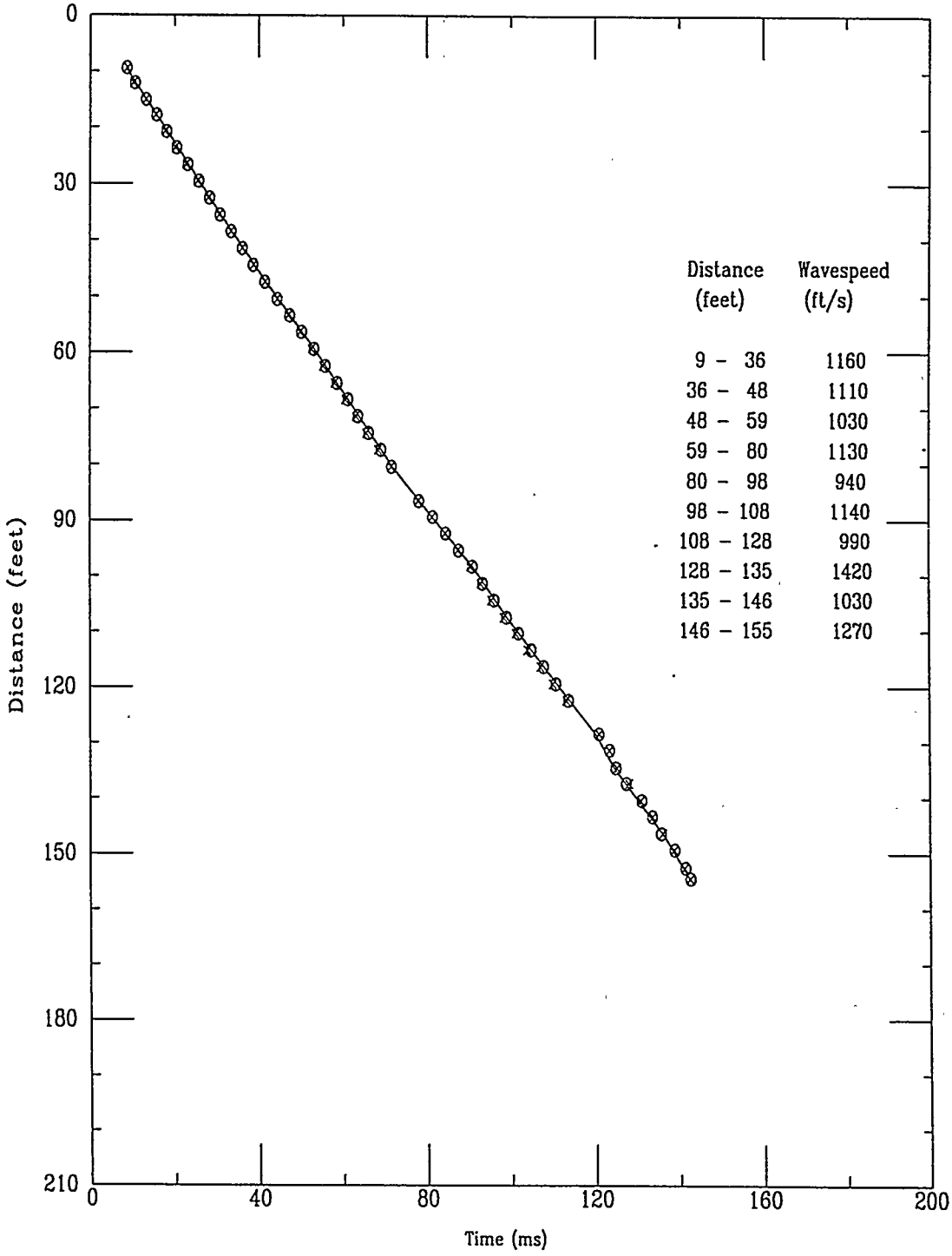
Shear Wave Speeds



File 306Y902S

SDFBC10 APPLIED RESEARCH ASSOCIATES, INC. 05/06/99

Shear Wave Time of Peak

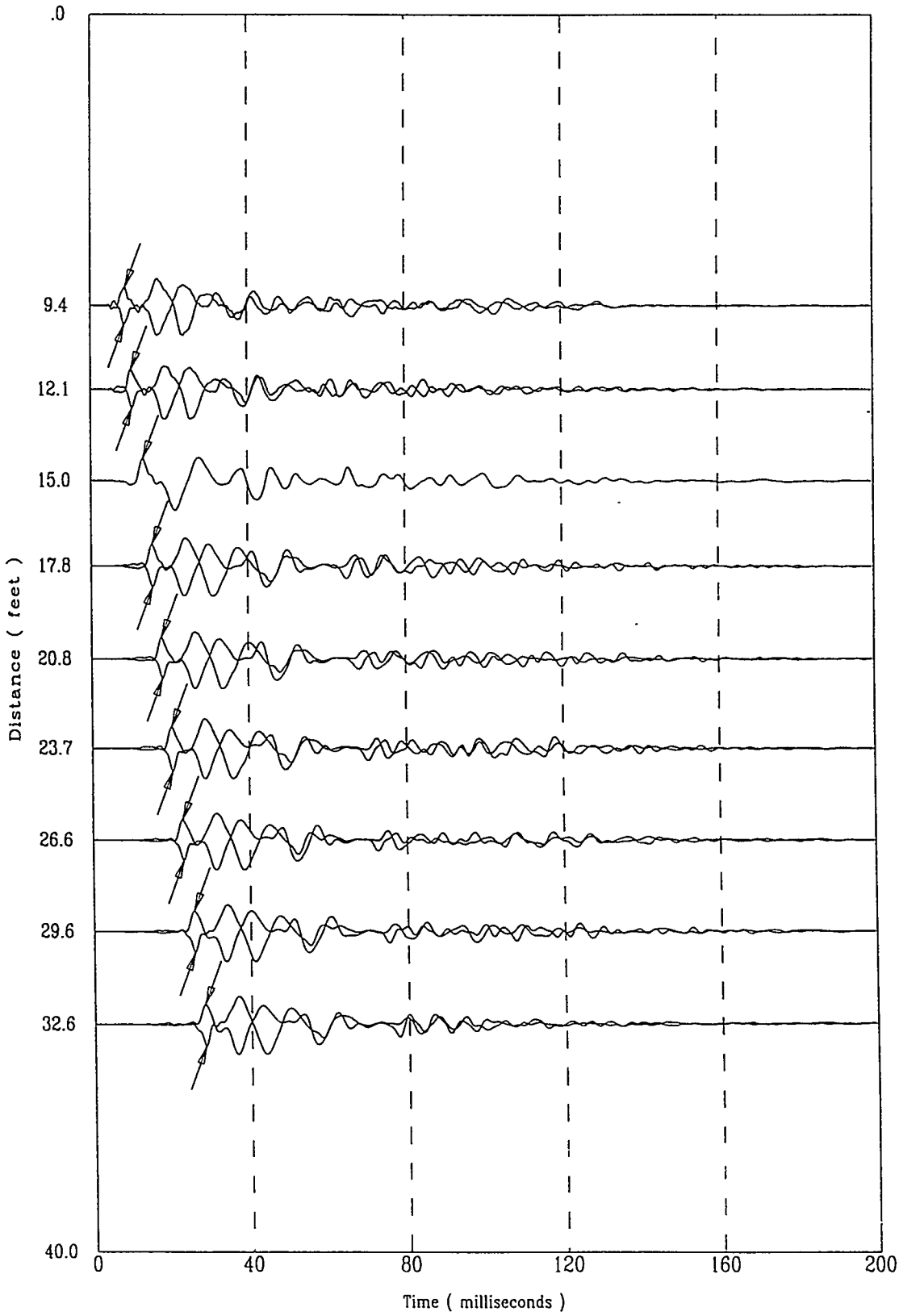


Distance (feet)	Wavespeed (ft/s)
9 - 36	1160
36 - 48	1110
48 - 59	1030
59 - 80	1130
80 - 98	940
98 - 108	1140
108 - 128	990
128 - 135	1420
135 - 146	1030
146 - 155	1270

File 306Y902S

Applied Research Associates
SDFBC10

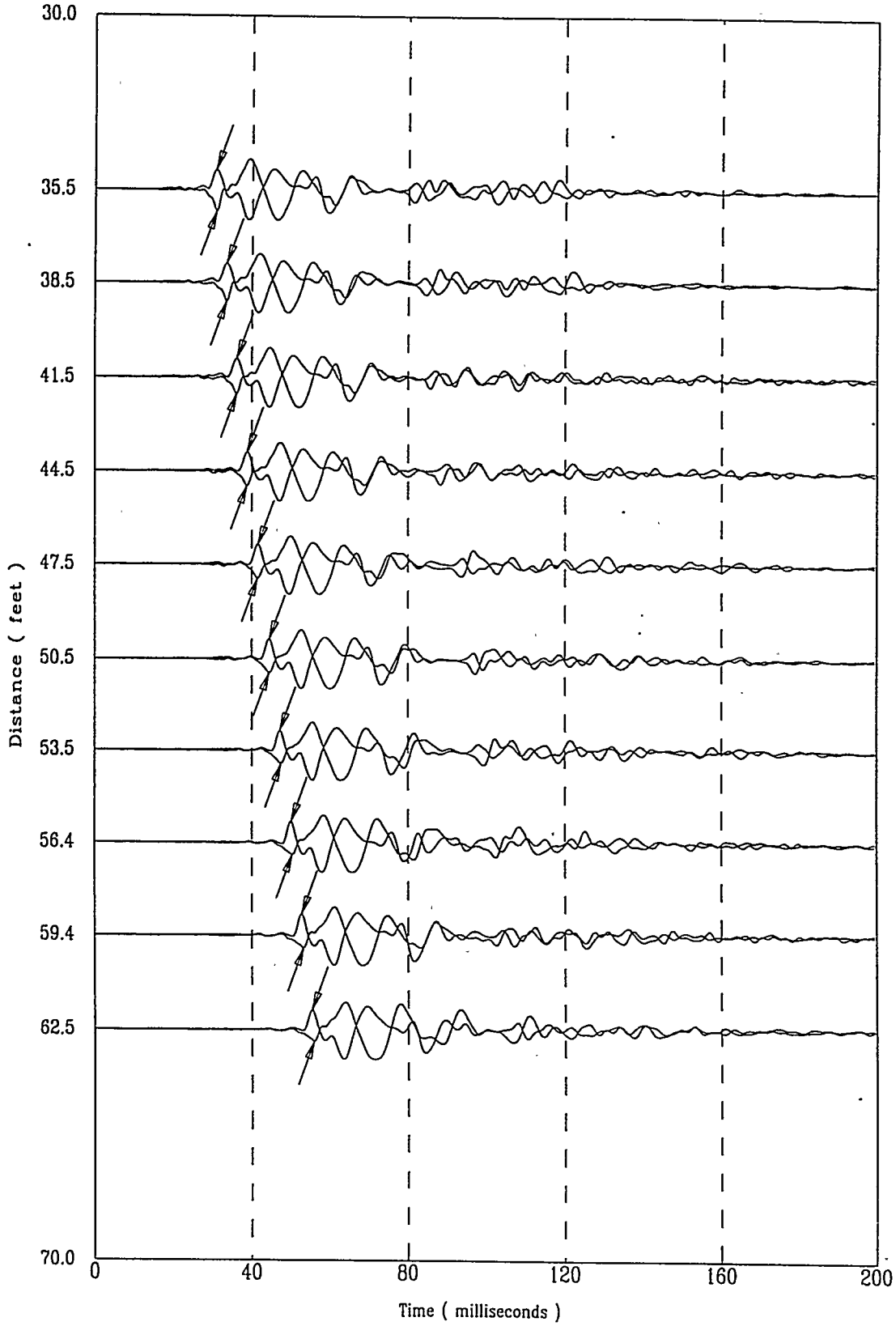
S Wave
05/06/99



File 306y902S

Applied Research Associates
SDFBC10

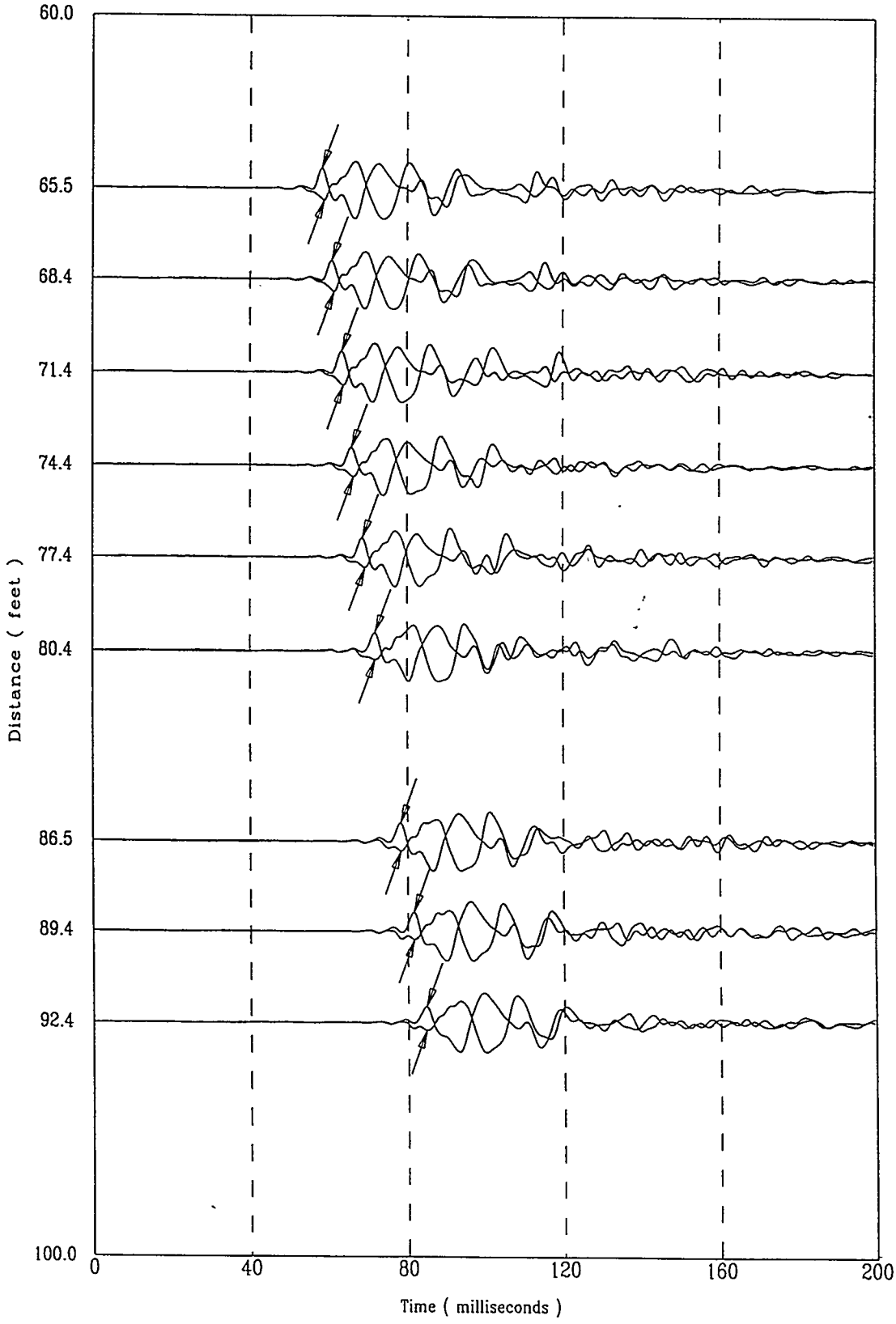
S Wave
05/06/99



File 306y902S

Applied Research Associates
SDFBC10

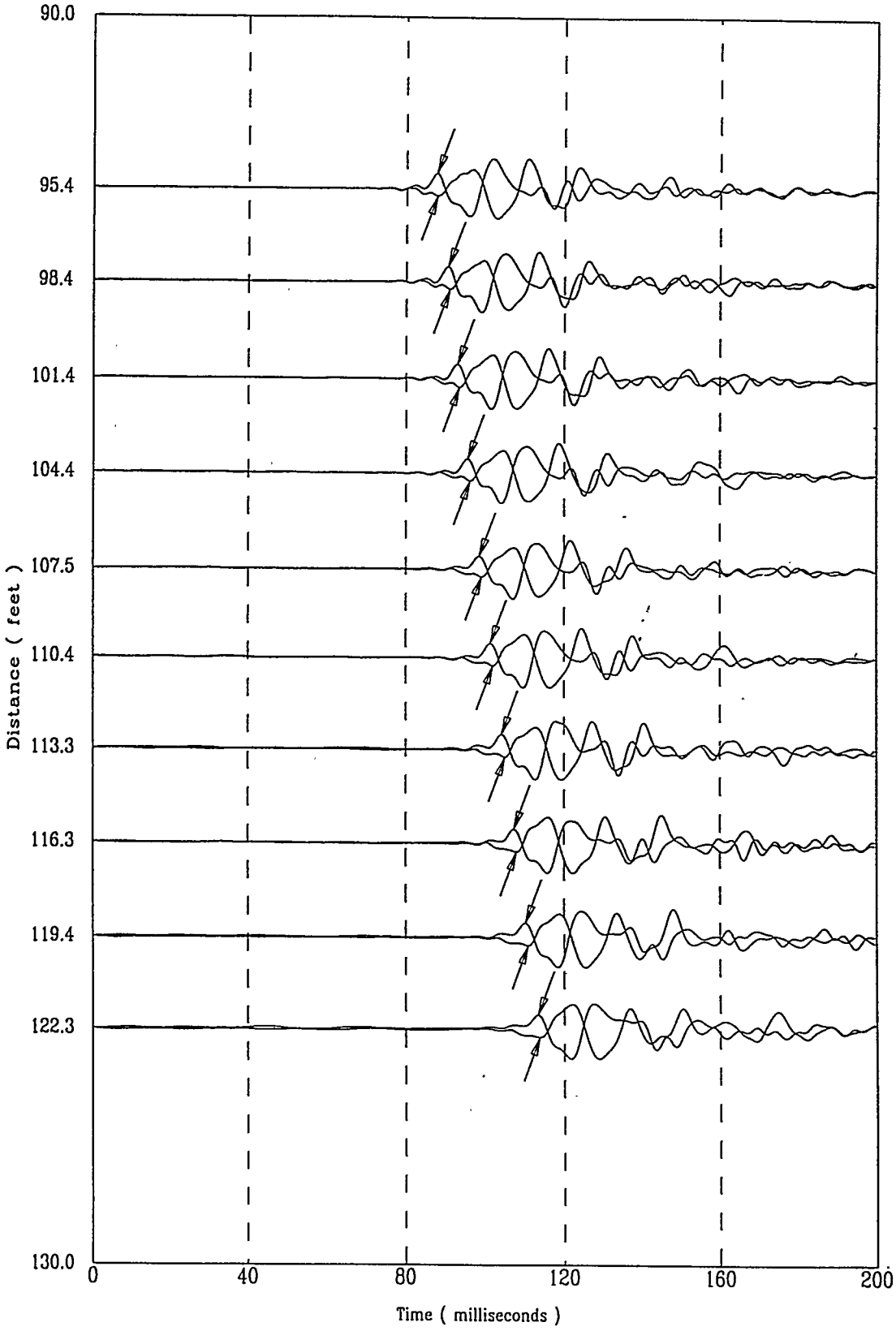
S Wave
05/06/99



File 306y902S

Applied Research Associates
SDFBC10

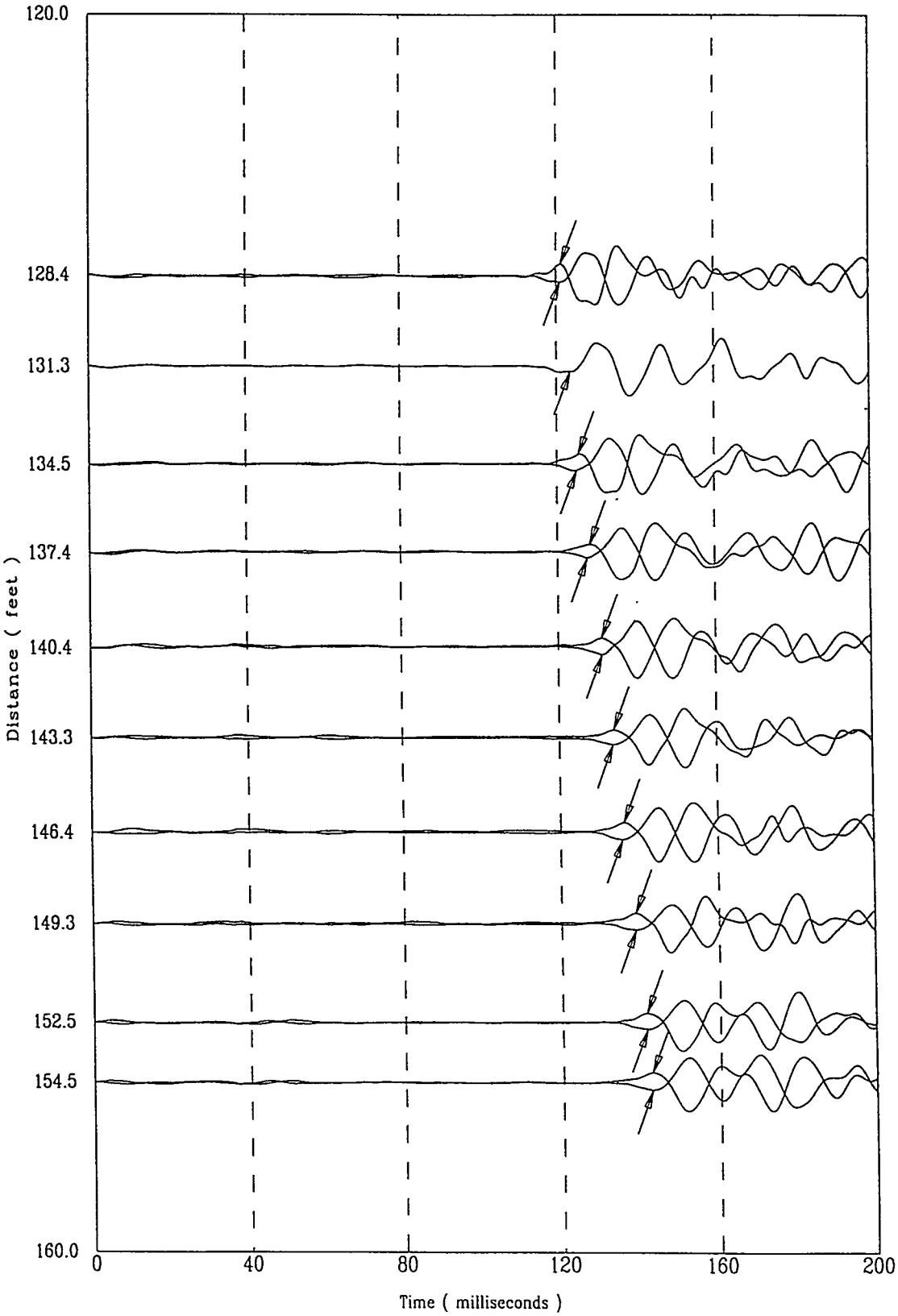
S Wave
05/06/99



File 306y902S

Applied Research Associates
SDFBC10

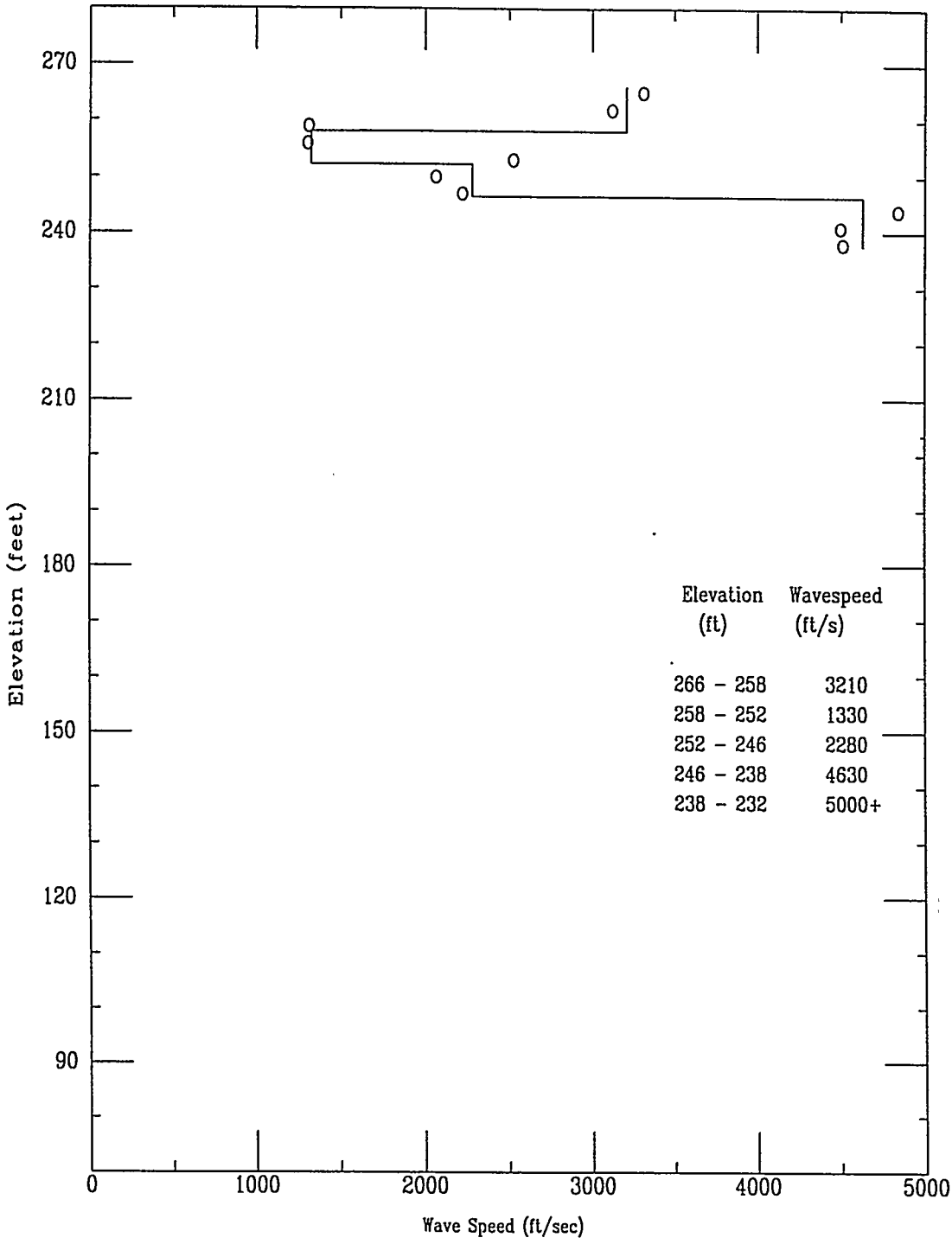
S Wave
05/06/99



File 306Y902S

SDFBC10 APPLIED RESEARCH ASSOCIATES, INC. 05/06/99

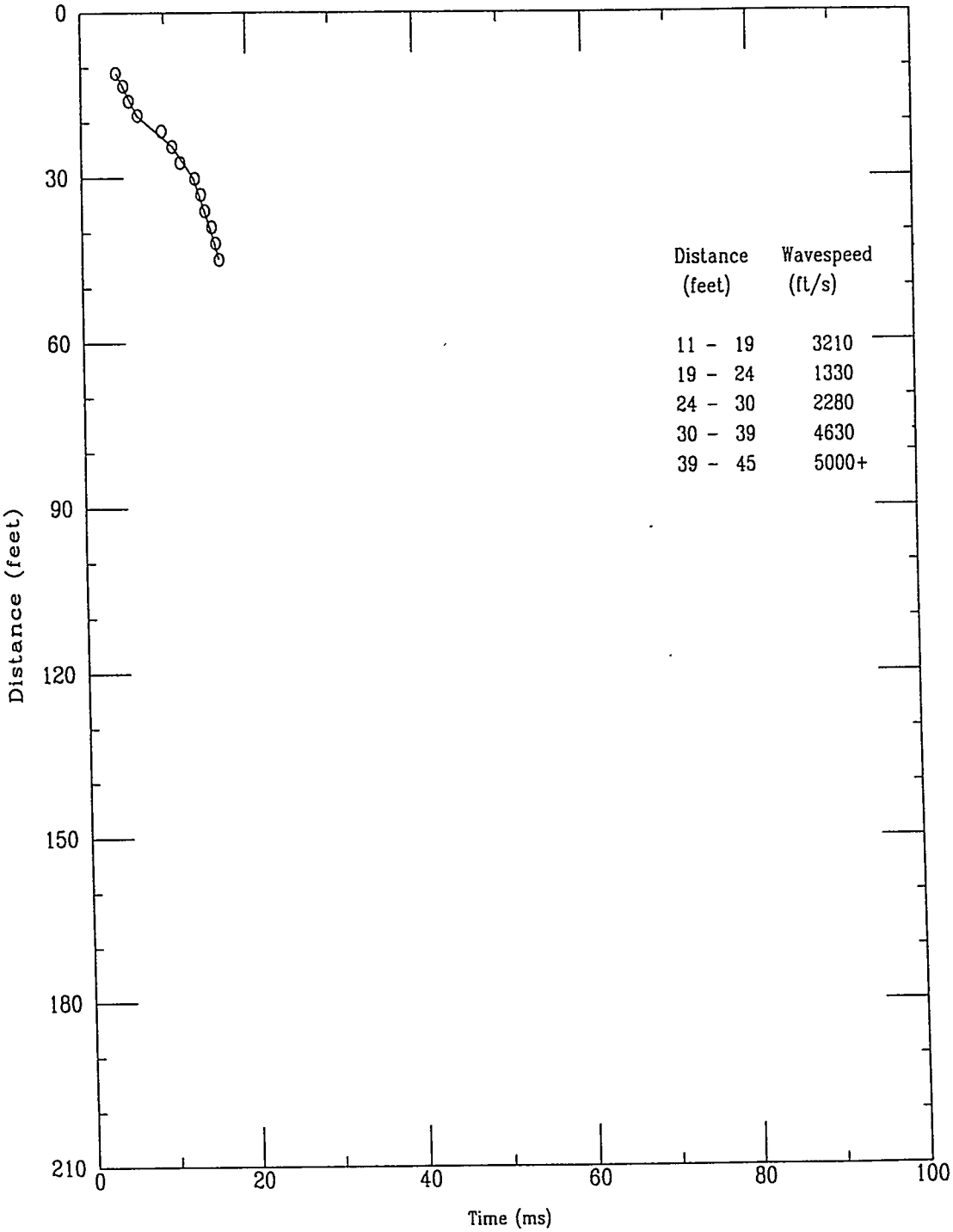
Compression Wave Speeds



File 306Y902S

SDFBC10 APPLIED RESEARCH ASSOCIATES, INC. 05/06/99

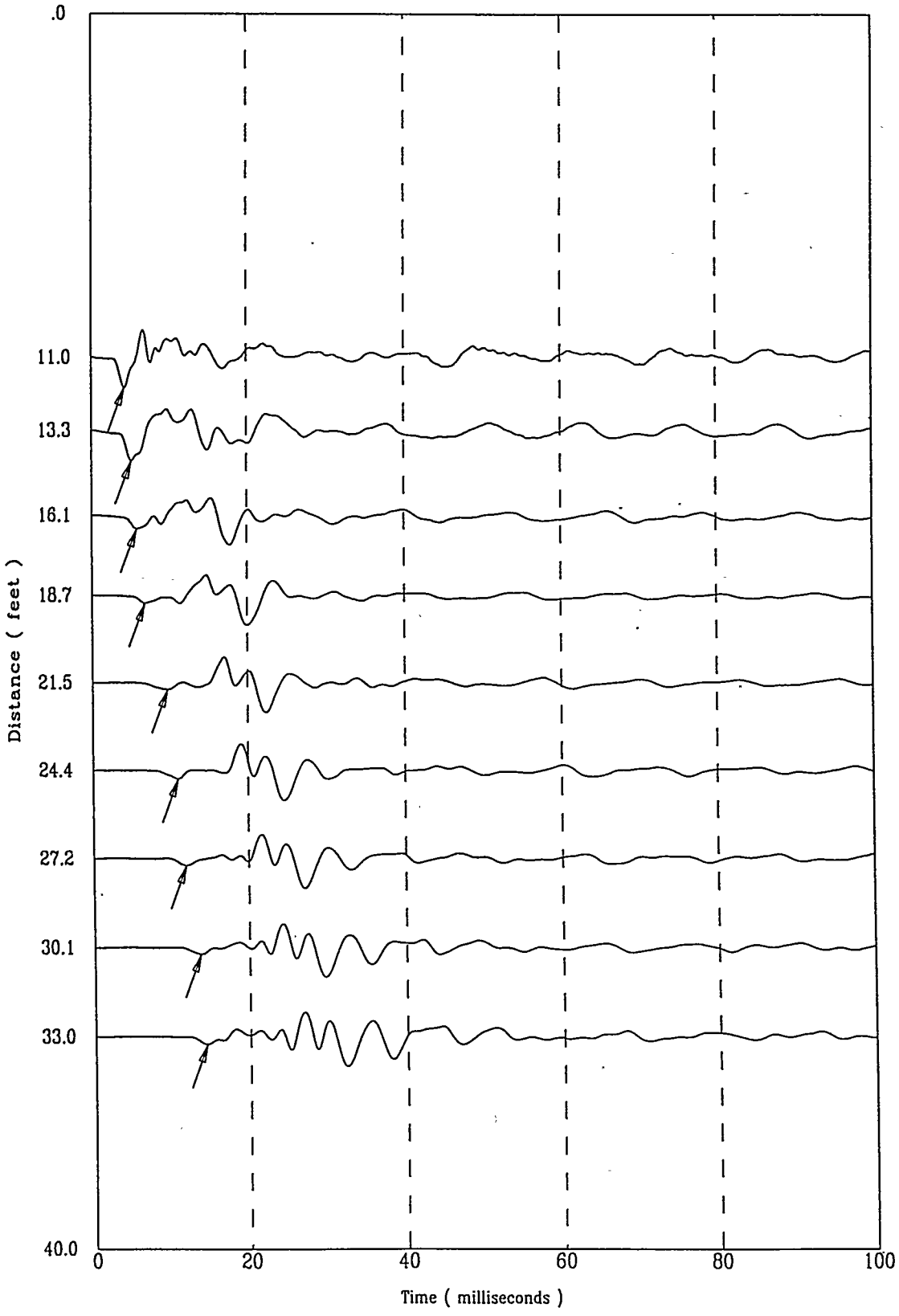
Compression Wave Time of Peak



File 306Y902S

Applied Research Associates
SDFBC10

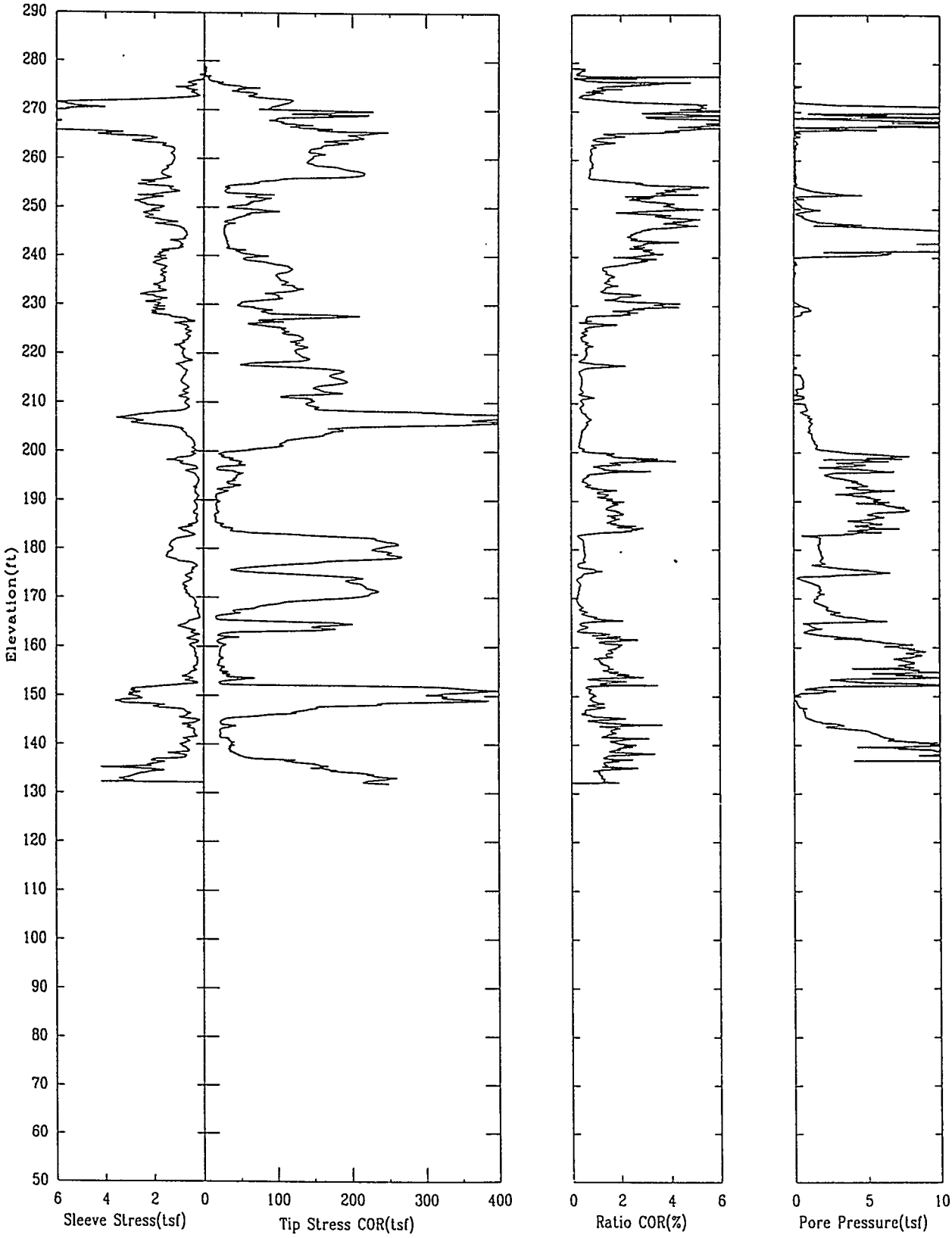
P Wave
05/06/99



File 306y902S

SCDFB14 APPLIED RESEARCH ASSOCIATES, INC. 05/10/99

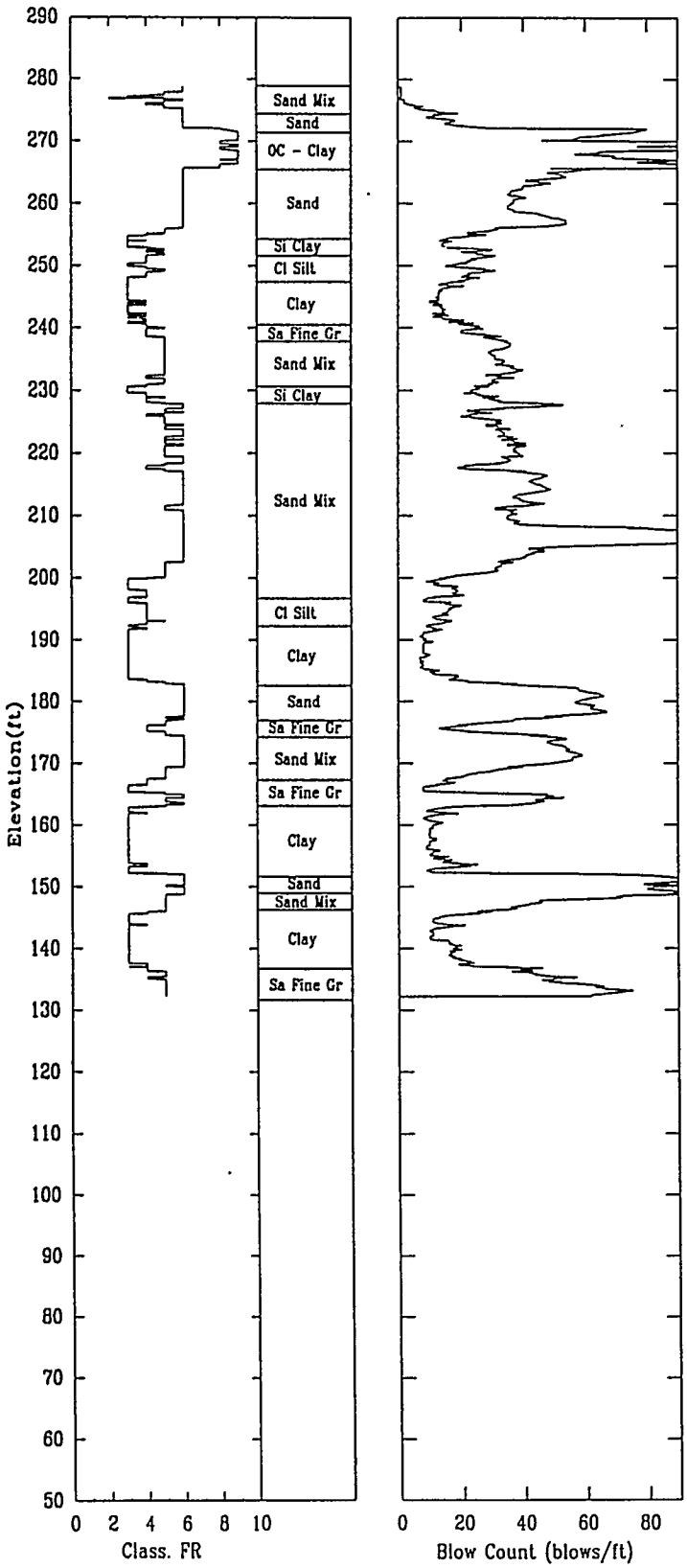
North 72764.3 East 65025.3 Elevation 279.1



File 310y901.ECP

SCDFB14 APPLIED RESEARCH ASSOCIATES, INC. 05/10/99

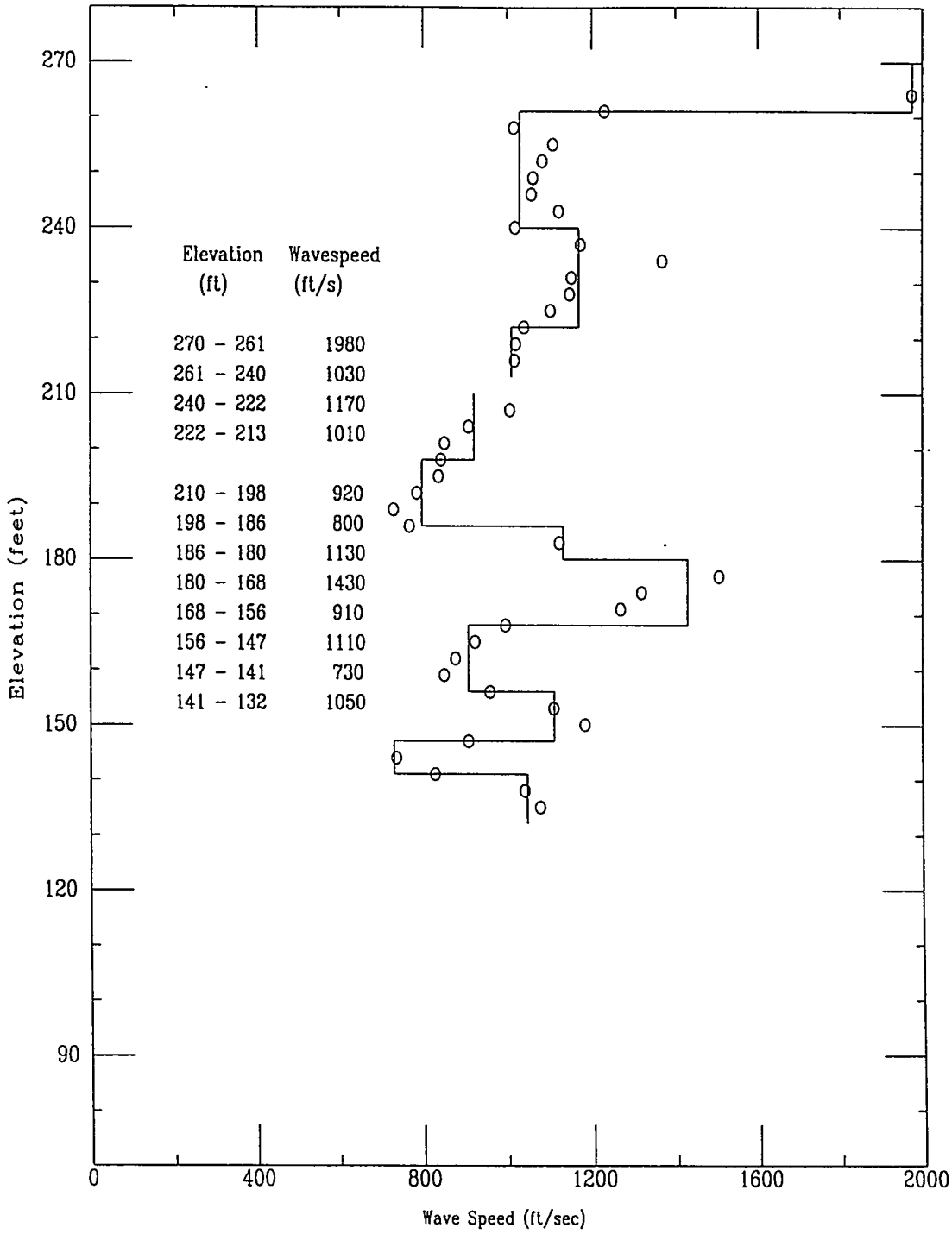
North 72764.3 East 65025.3 Elevation 279.1



File 310y901.ECP

SDFBC14 APPLIED RESEARCH ASSOCIATES, INC. 05/10/99

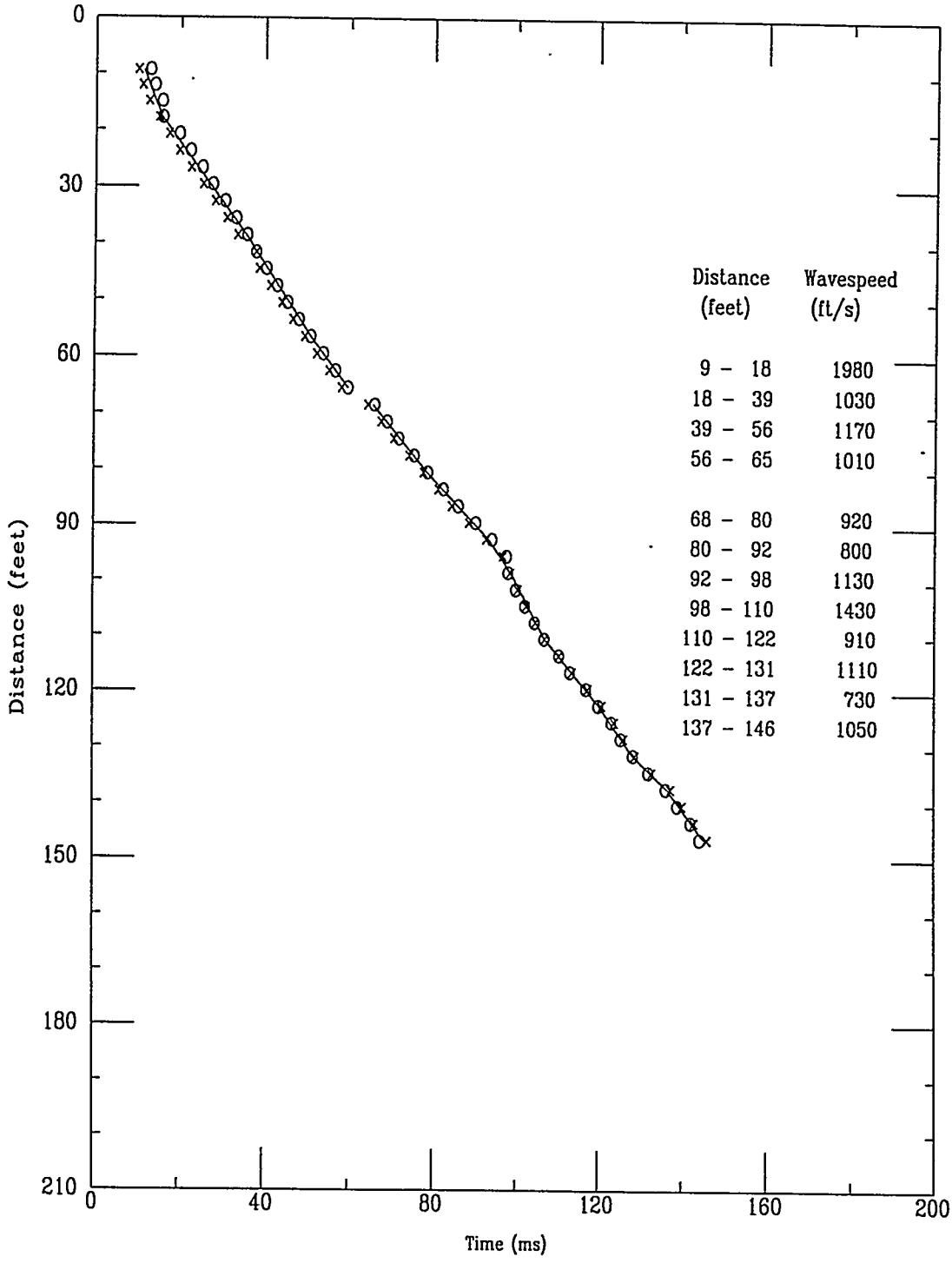
Shear Wave Speeds



File 310y901S

SDFBC14 APPLIED RESEARCH ASSOCIATES, INC. 05/10/99

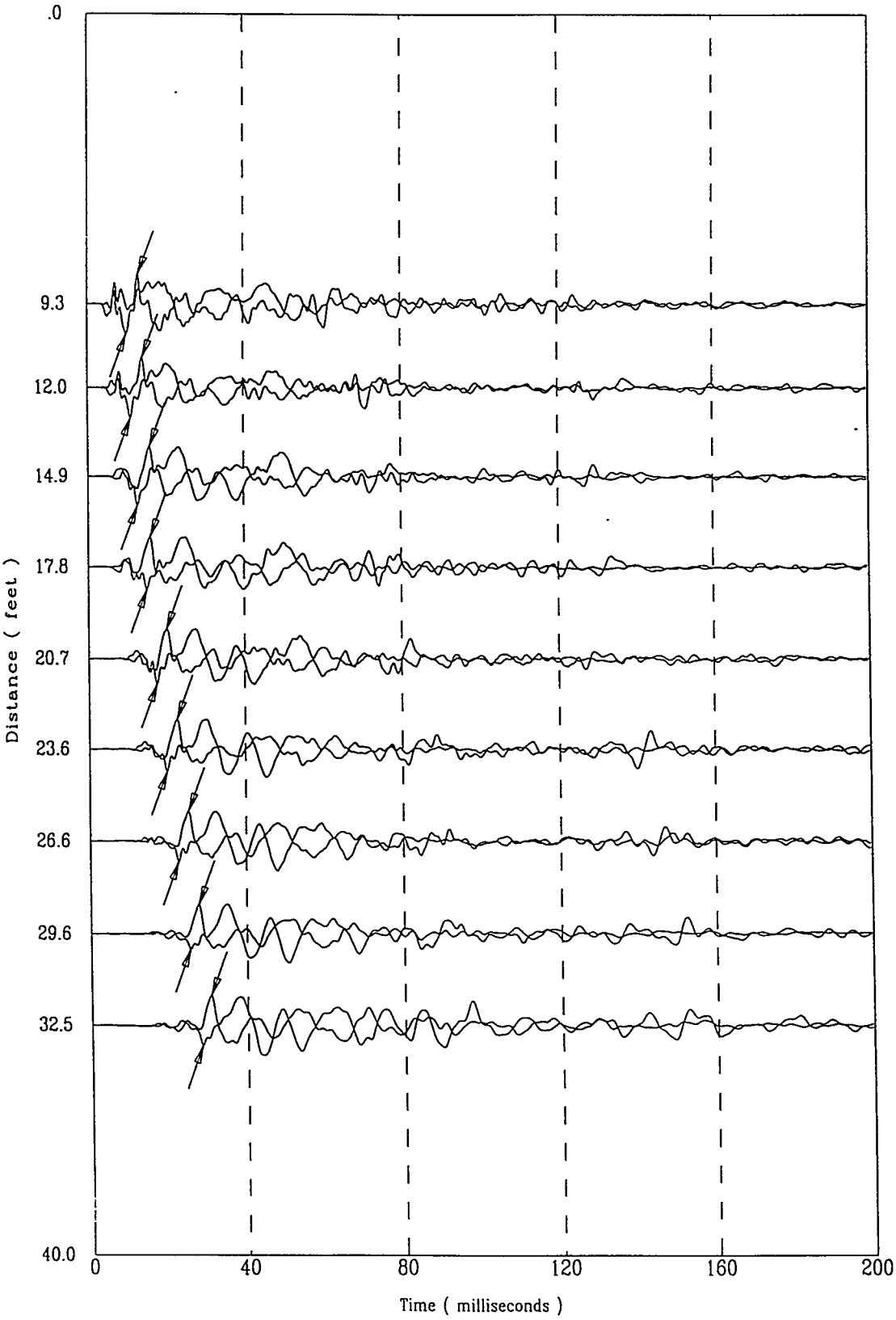
Shear Wave Time of Peak



File 310y901S

Applied Research Associates
SDFBC14

S Wave
05/10/99



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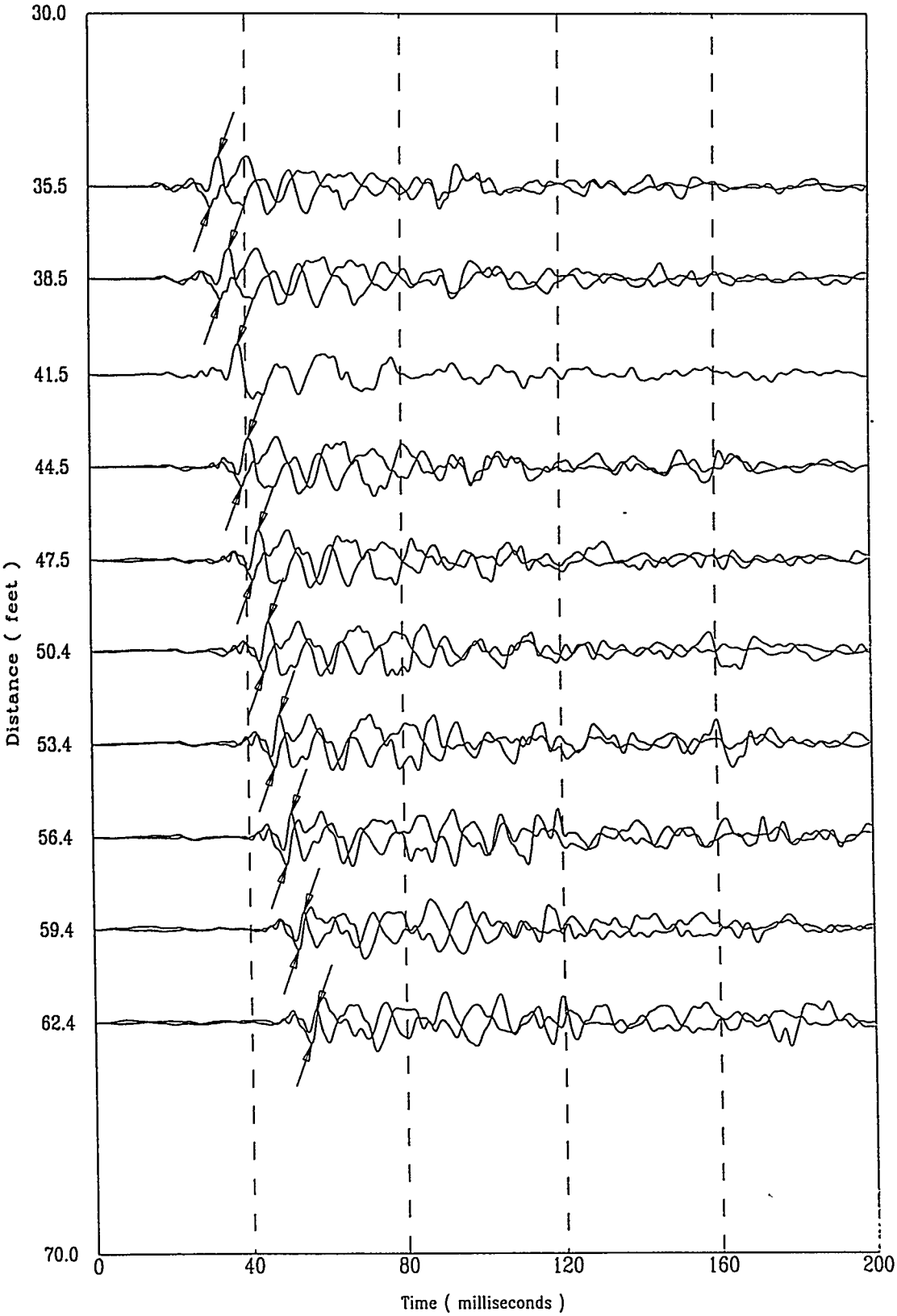
Applied Research Associates
SDFBC14

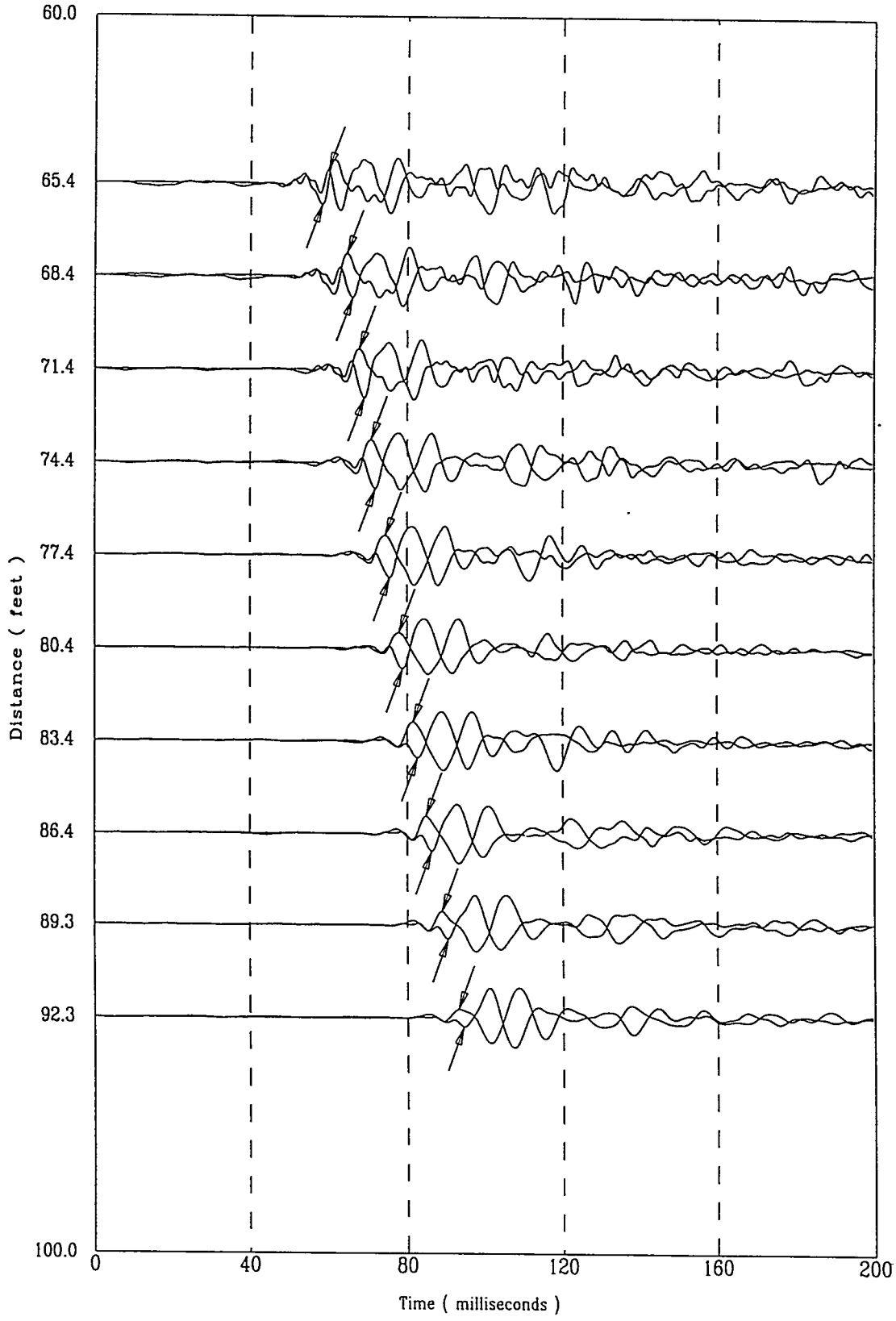
S Wave
05/10/99



File 310y901S

Applied Research Associates
SDFBC14

S Wave
05/10/99



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Applied Research Associates
SDFBC14

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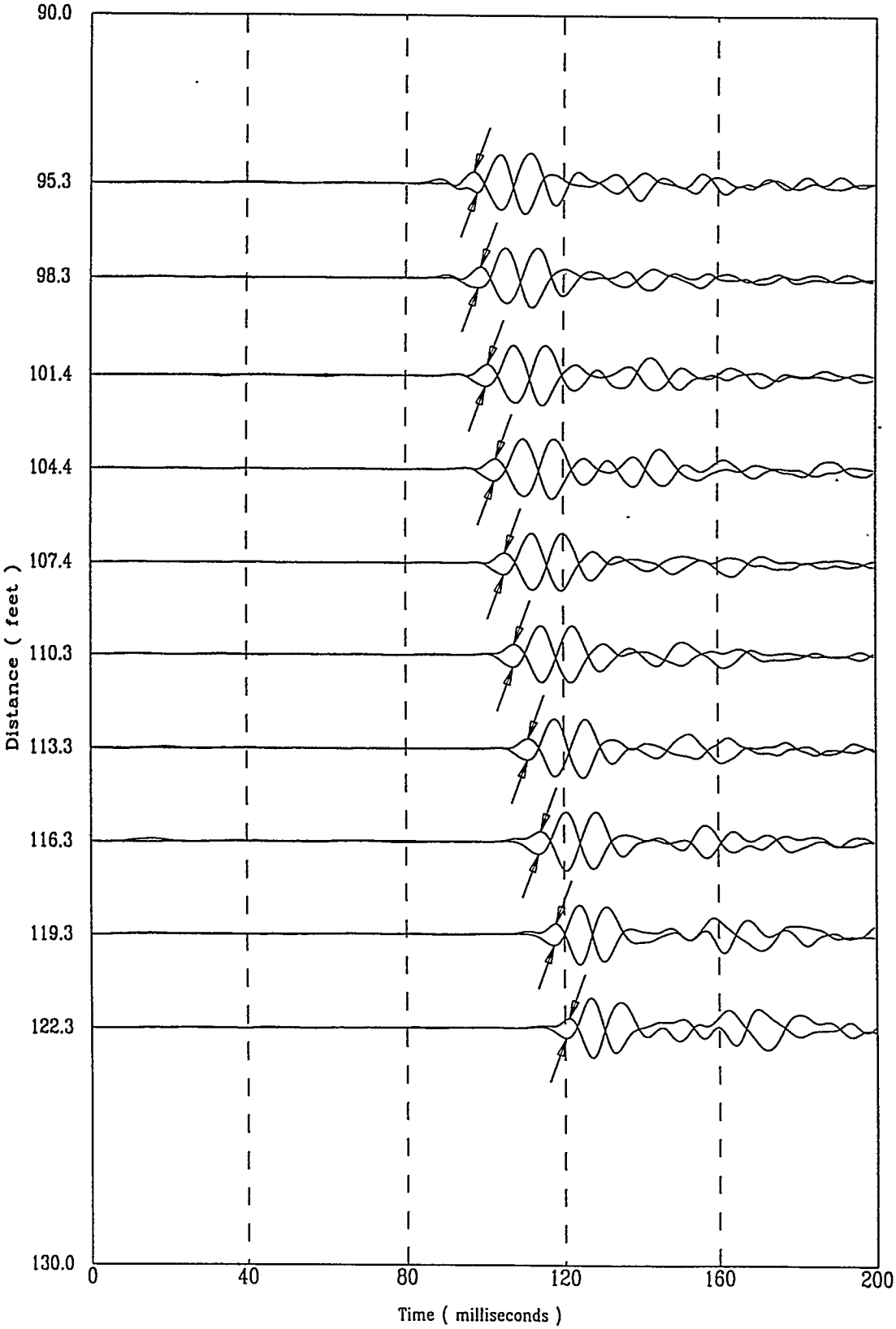
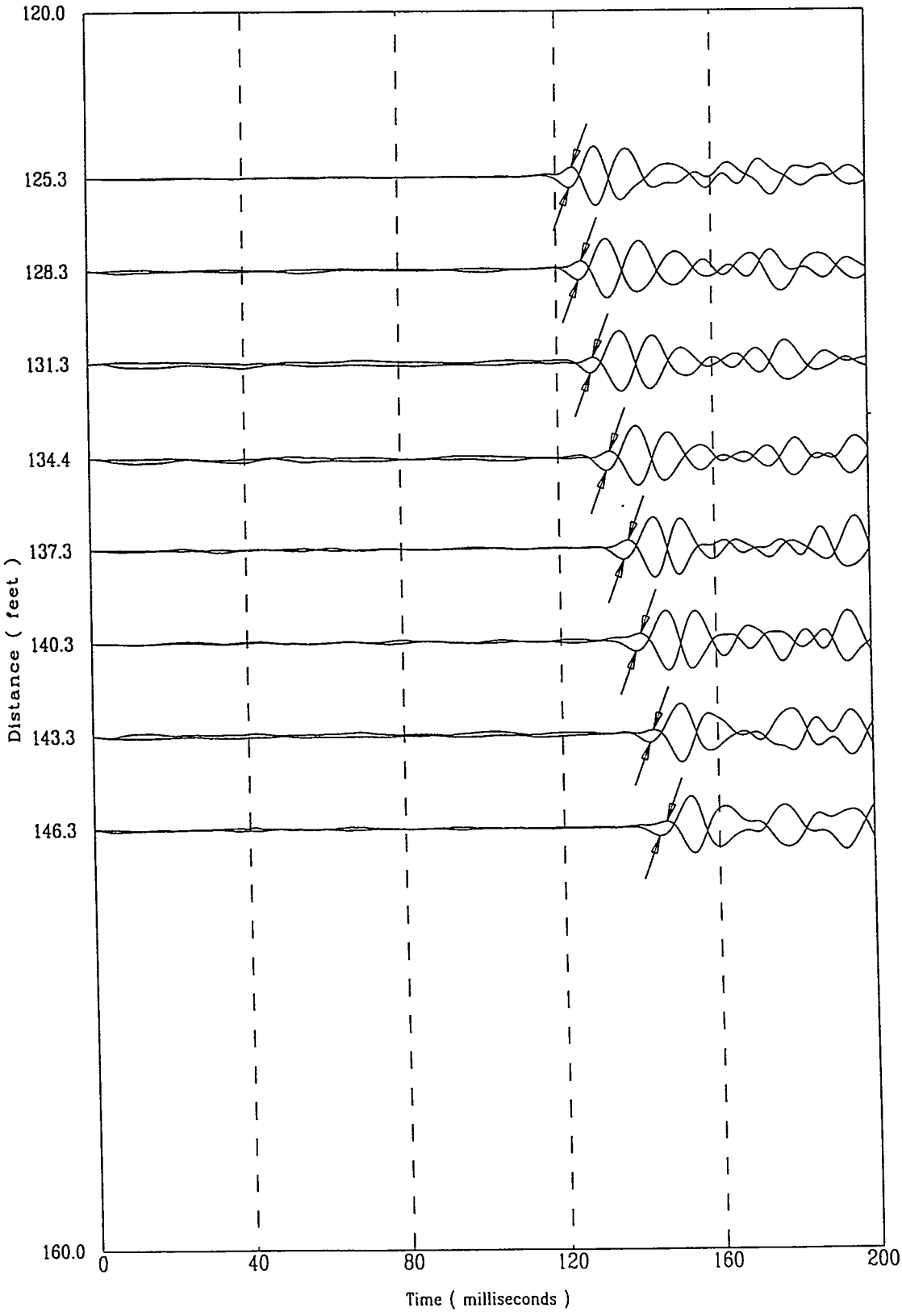
05/10/99



File 310y901S

Applied Research Associates
SDFBC14

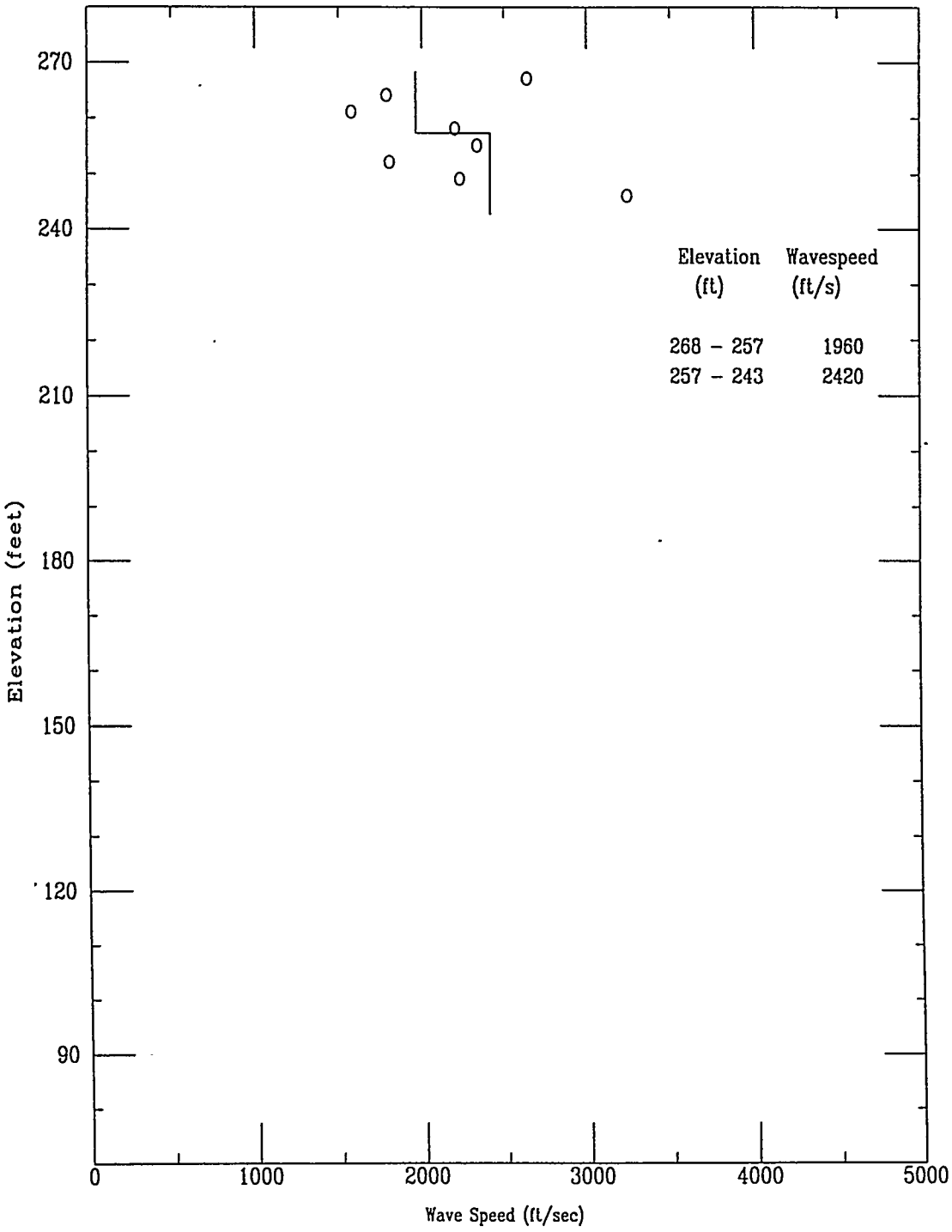
S Wave
05/10/99



File 310y901S

SDFBC14 APPLIED RESEARCH ASSOCIATES, INC. 05/10/99

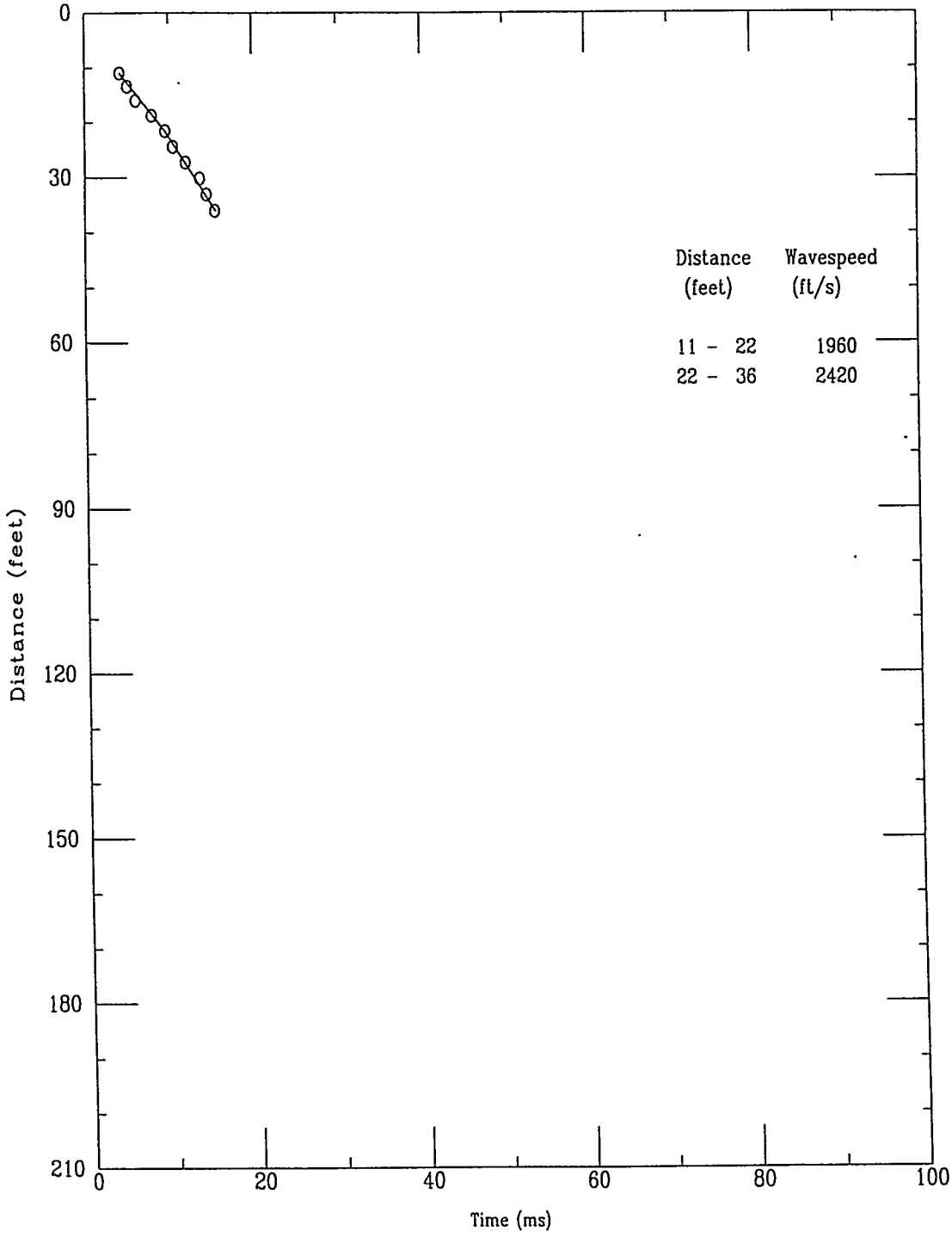
Compression Wave Speeds



File 310Y901S

SDFBC14 APPLIED RESEARCH ASSOCIATES, INC. 05/10/99

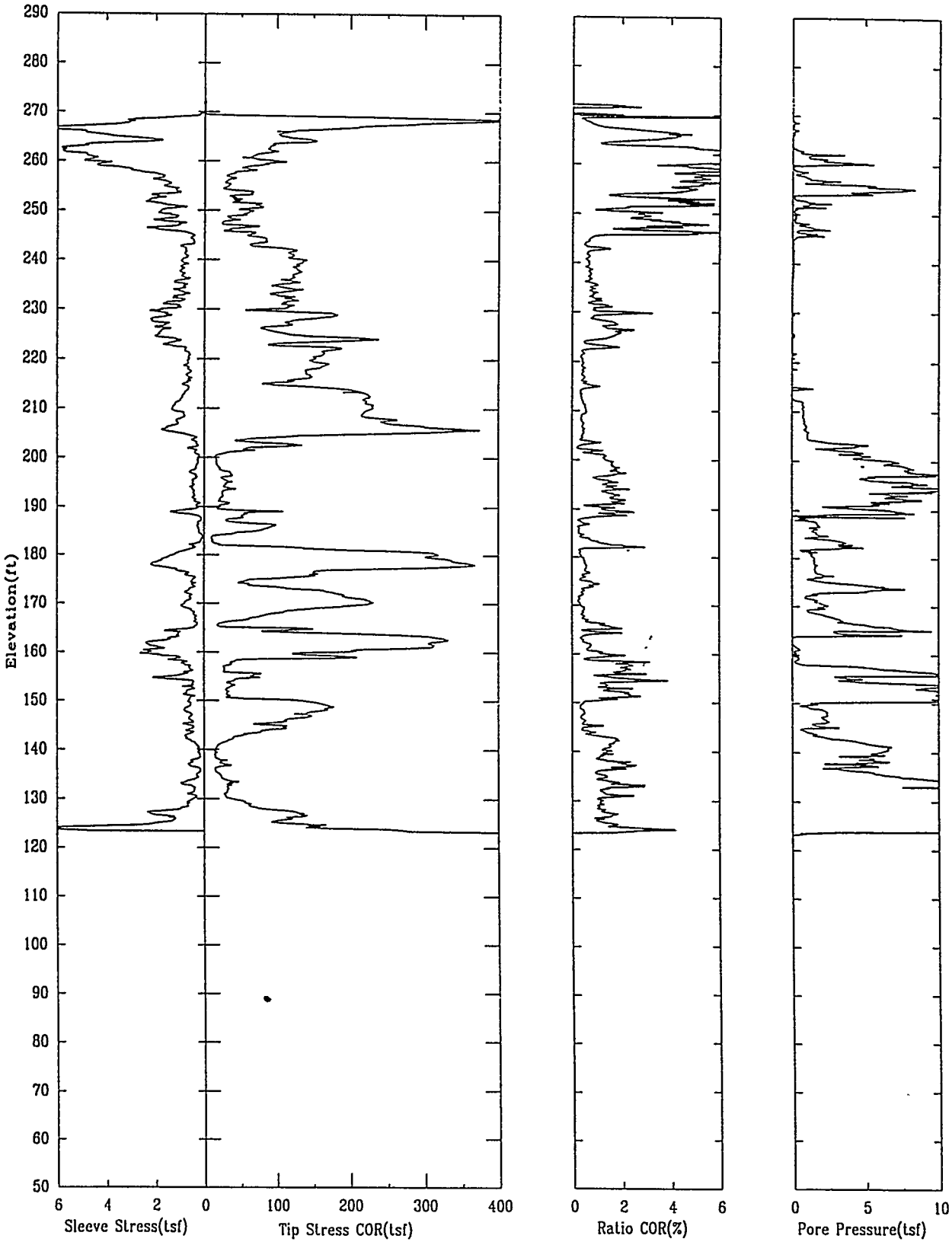
Compression Wave Time of Peak



File 310Y901S

SDFBC15 APPLIED RESEARCH ASSOCIATES, INC. 05/07/99

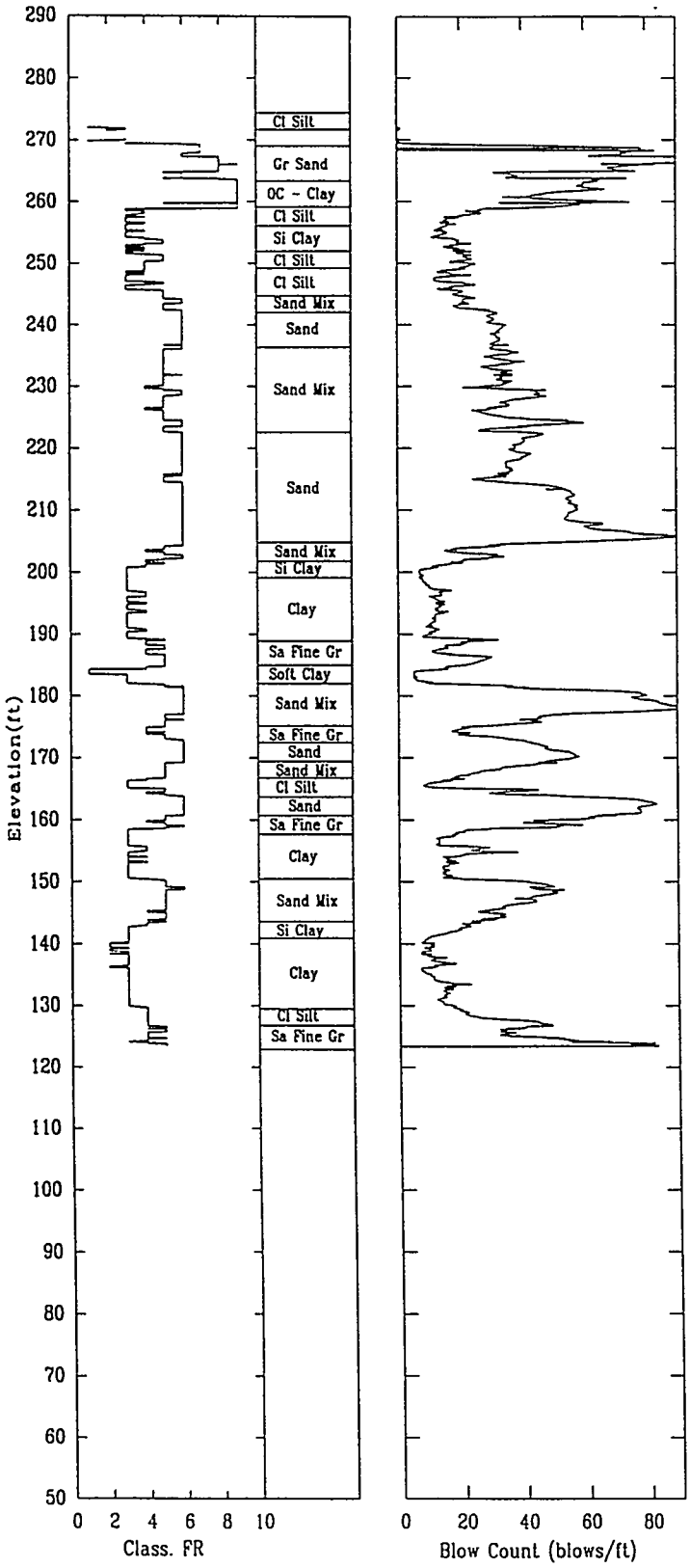
North 72768.8 East 65444.7 Elevation 275.0



File 307y901.ECP

SDFBC15 APPLIED RESEARCH ASSOCIATES, INC. 05/07/99

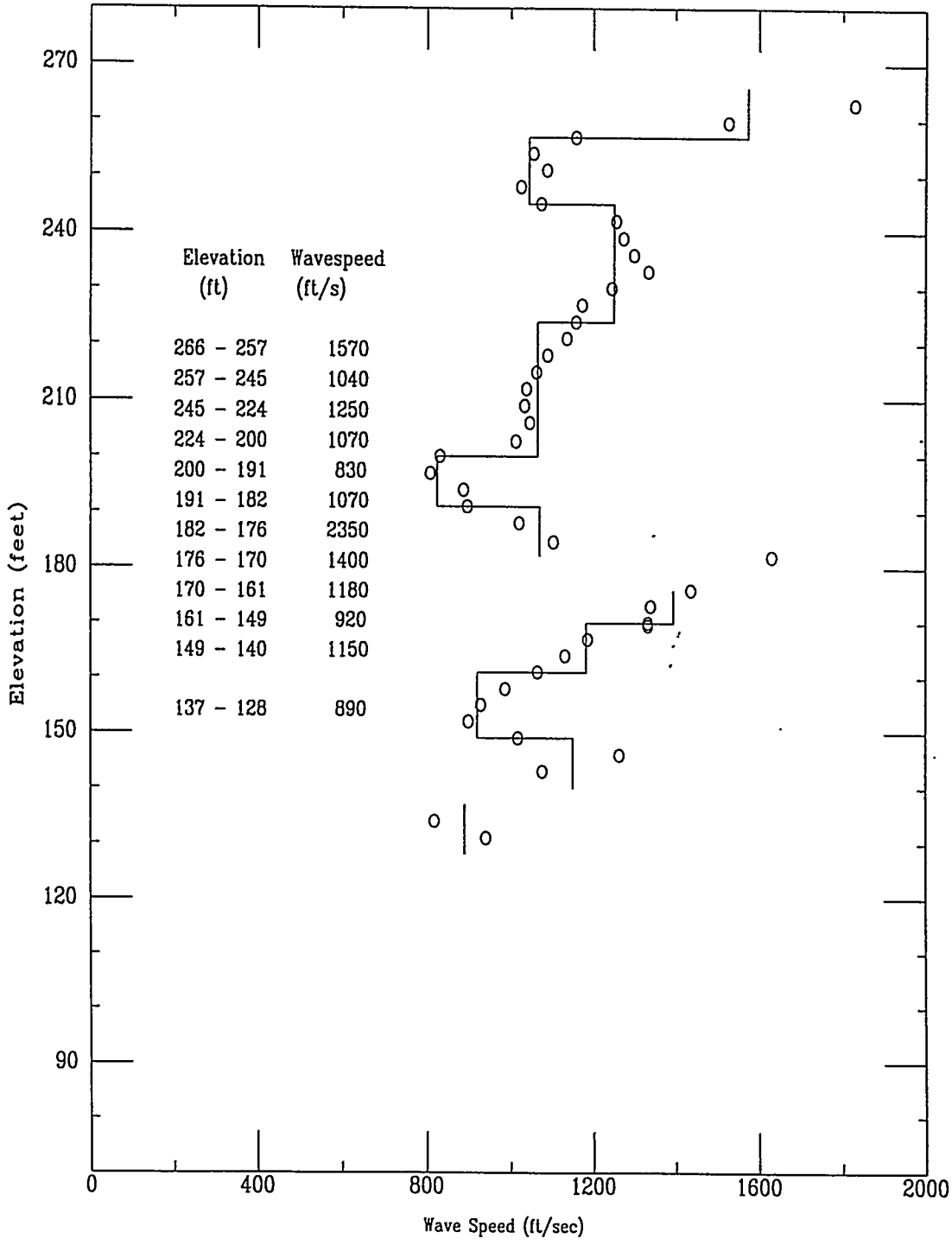
North 72768.8 East 65444.7 Elevation 275.0



File 307y901.ECP

SDFBC15 APPLIED RESEARCH ASSOCIATES, INC. 05/07/99

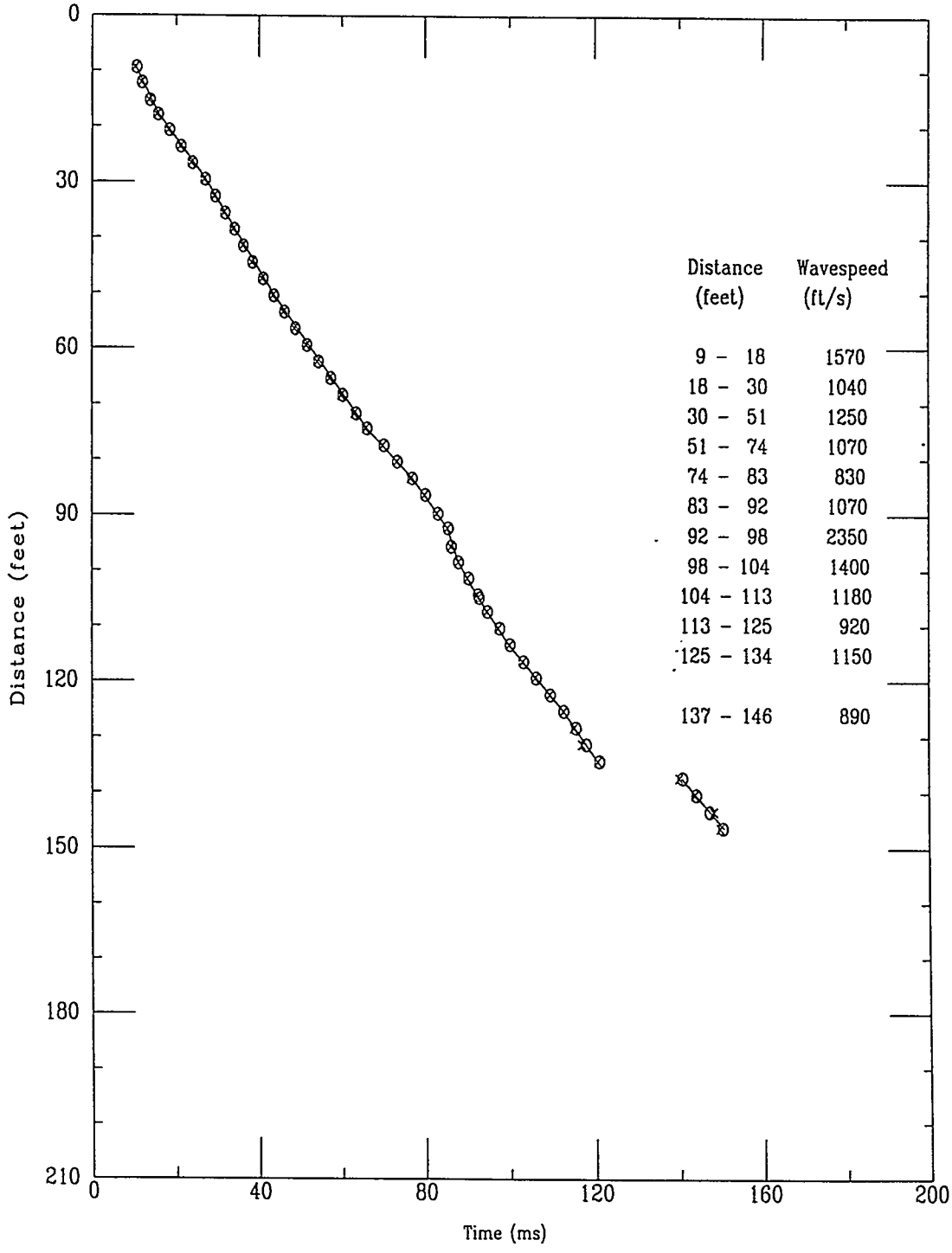
Shear Wave Speeds



File 307Y901S

SDFBC15 APPLIED RESEARCH ASSOCIATES, INC. 05/07/99

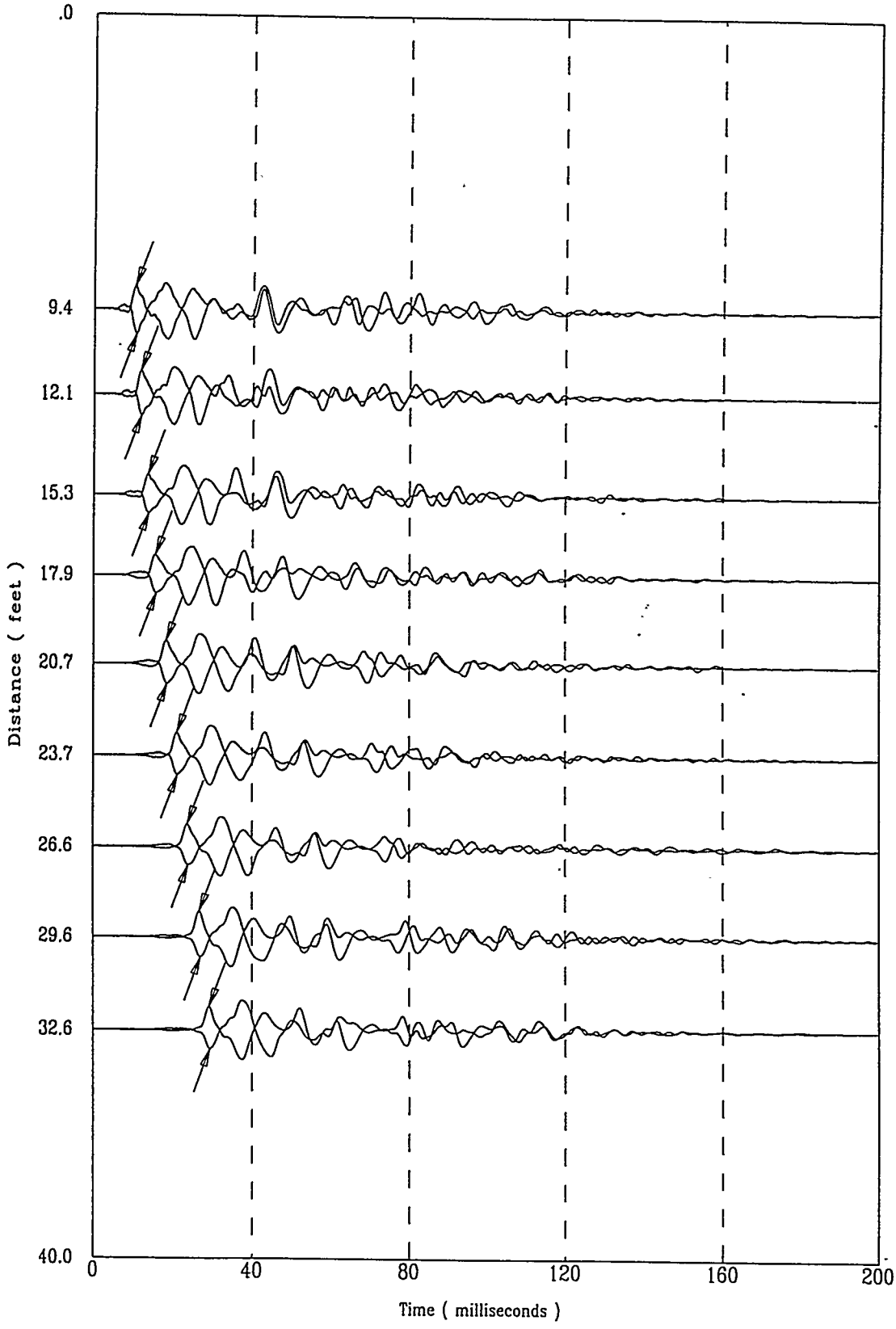
Shear Wave Time of Peak



File 307Y901S

Applied Research Associates
SDFBC15

S Wave
05/07/99



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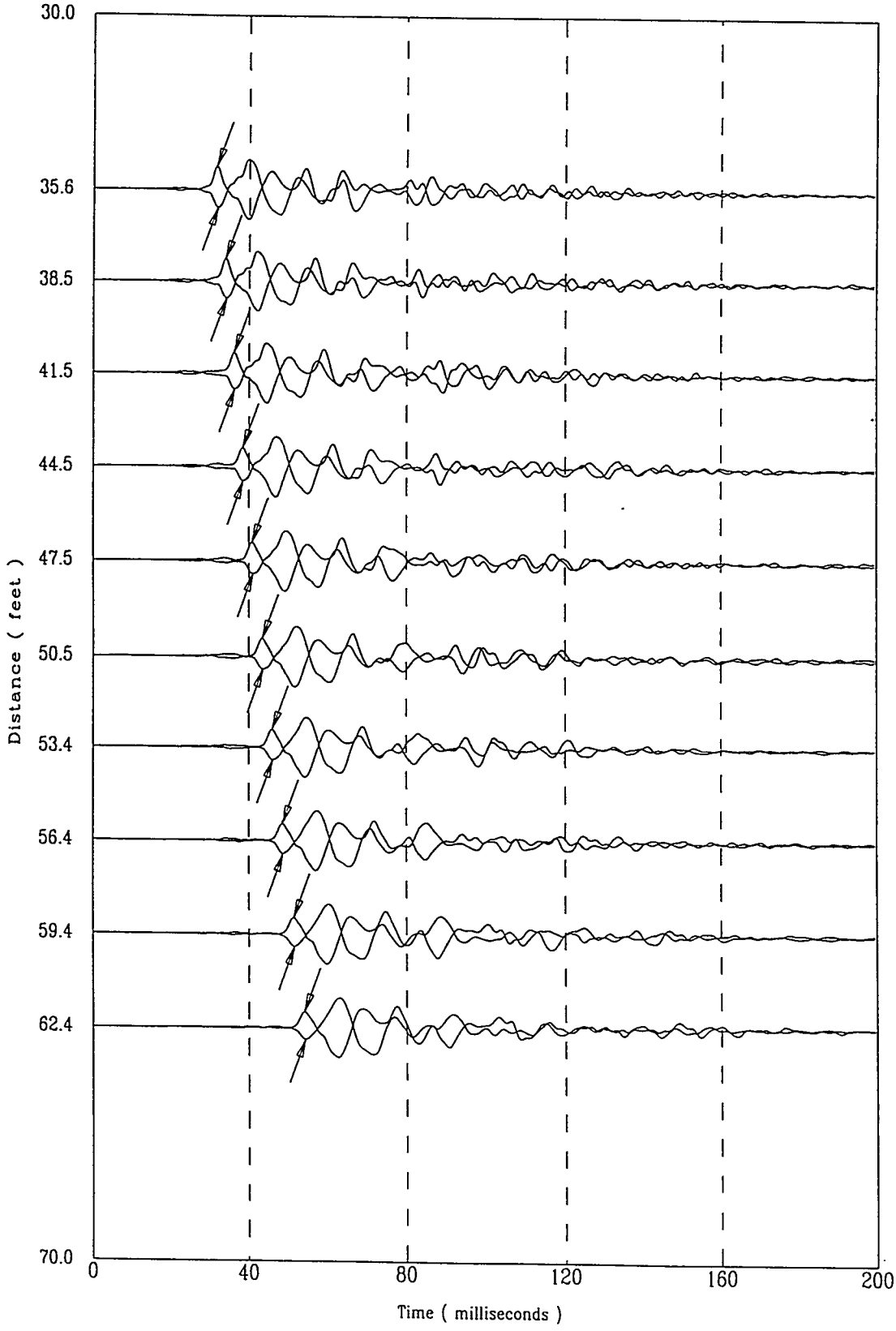
Applied Research Associates
SDFBC15

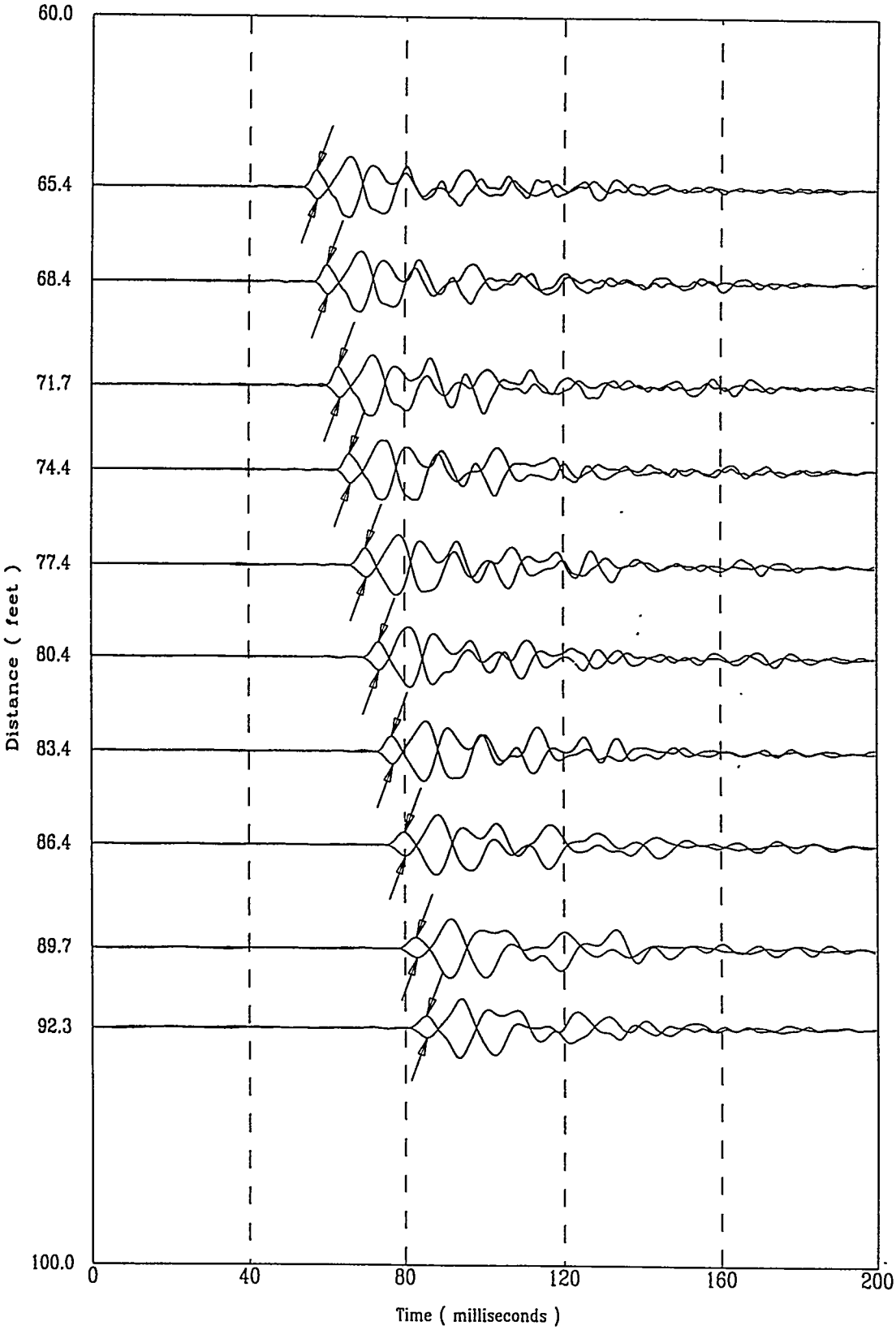
S Wave
05/07/99



File 307y901S

Applied Research Associates
SDFBC15

S Wave
05/07/99



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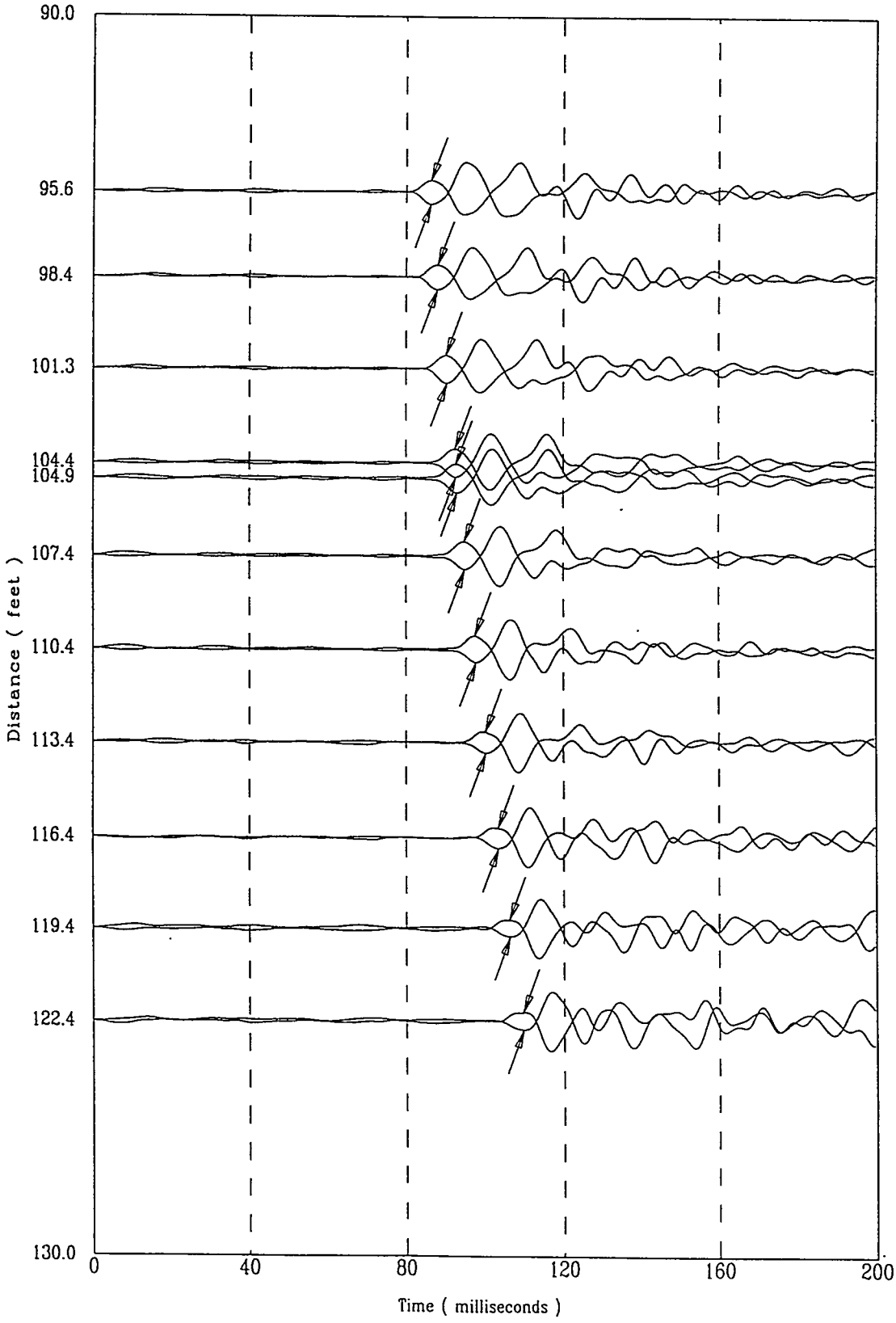
Applied Research Associates
SDFBC15

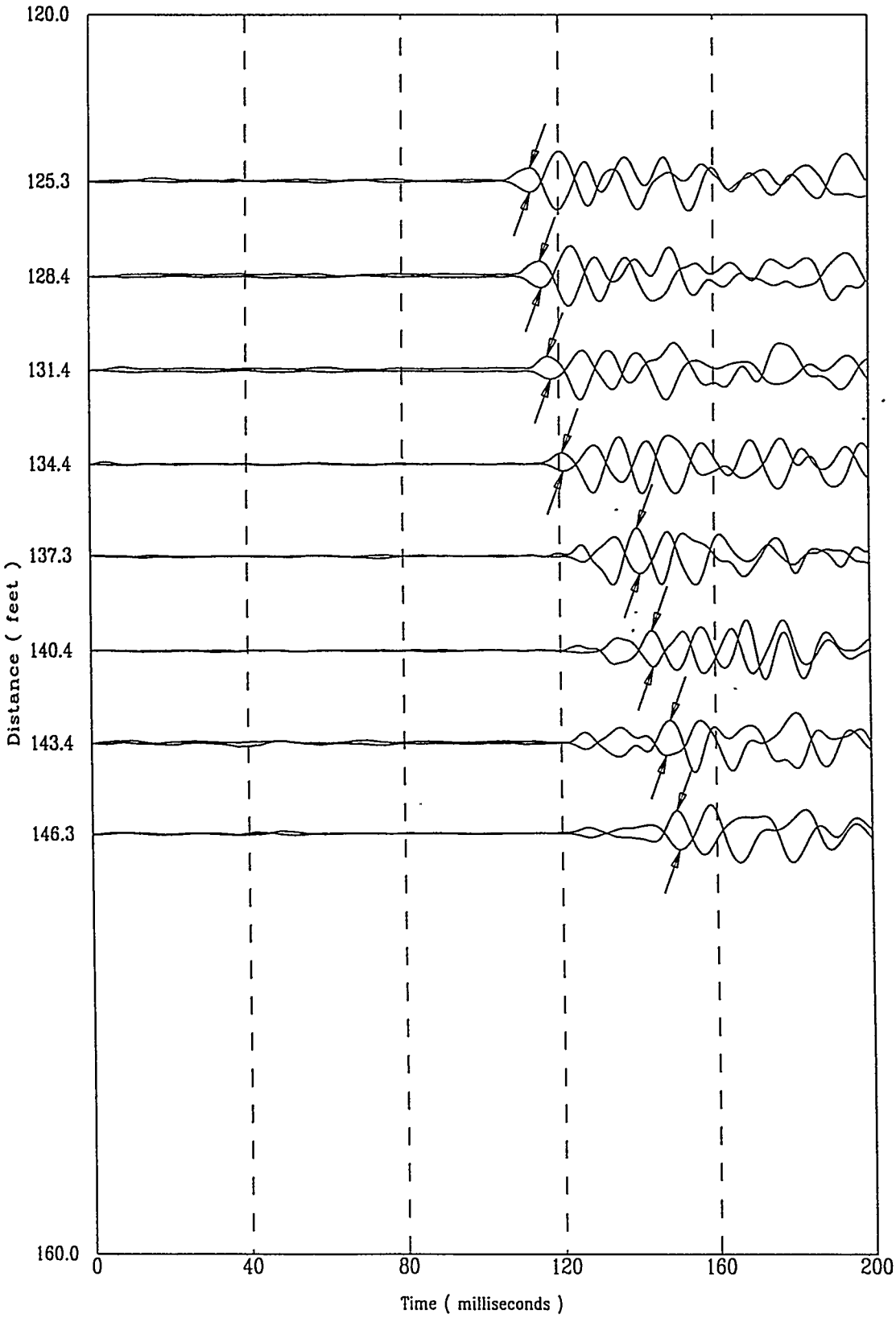
S Wave
05/07/99



File 307Y901S

Applied Research Associates
SDFBC15

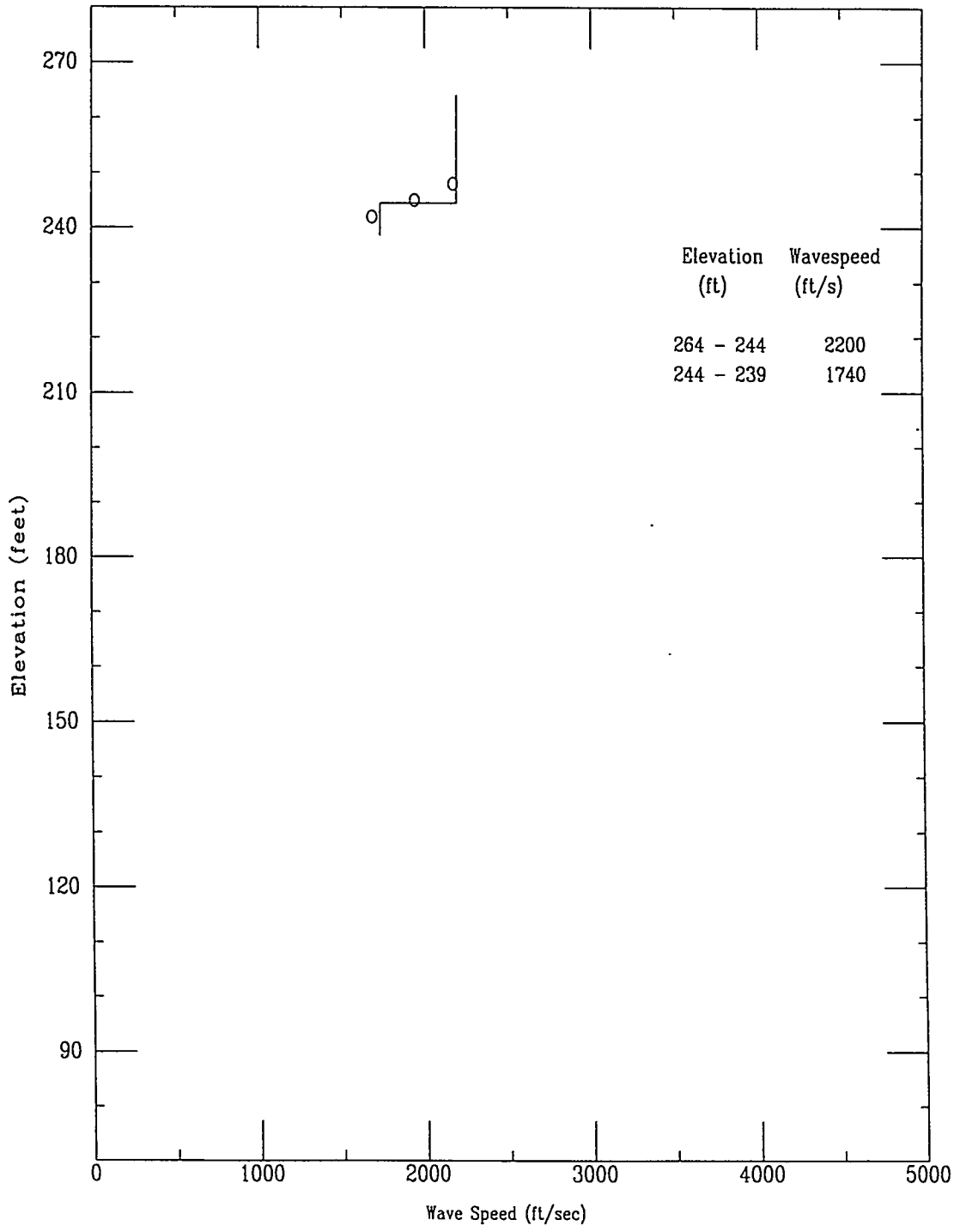
S Wave
05/07/99



File 307Y901S

SDFBC15 APPLIED RESEARCH ASSOCIATES, INC. 05/07/99

Compression Wave Speeds



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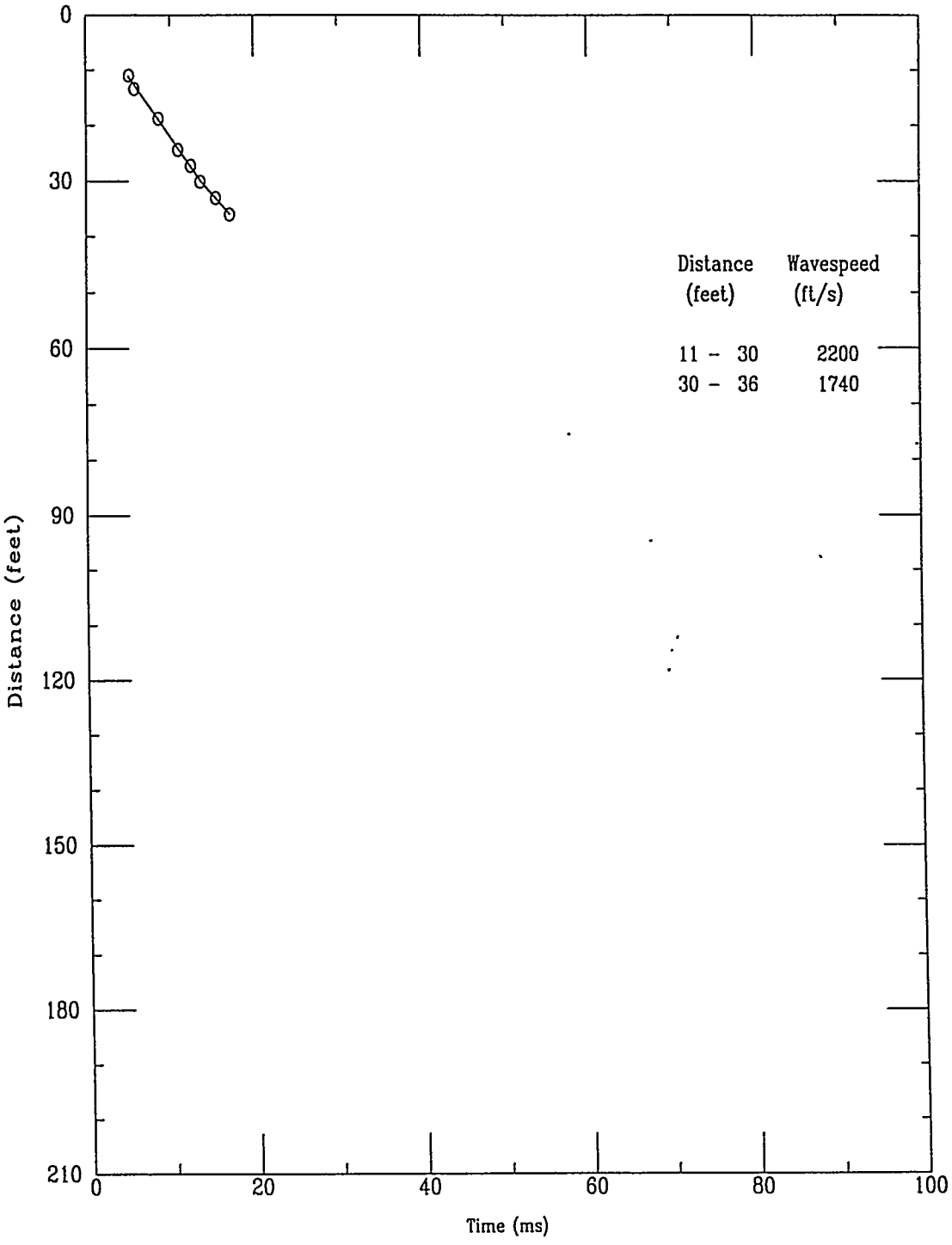
SDFBC15 APPLIED RESEARCH ASSOCIATES, INC. 05/07/99

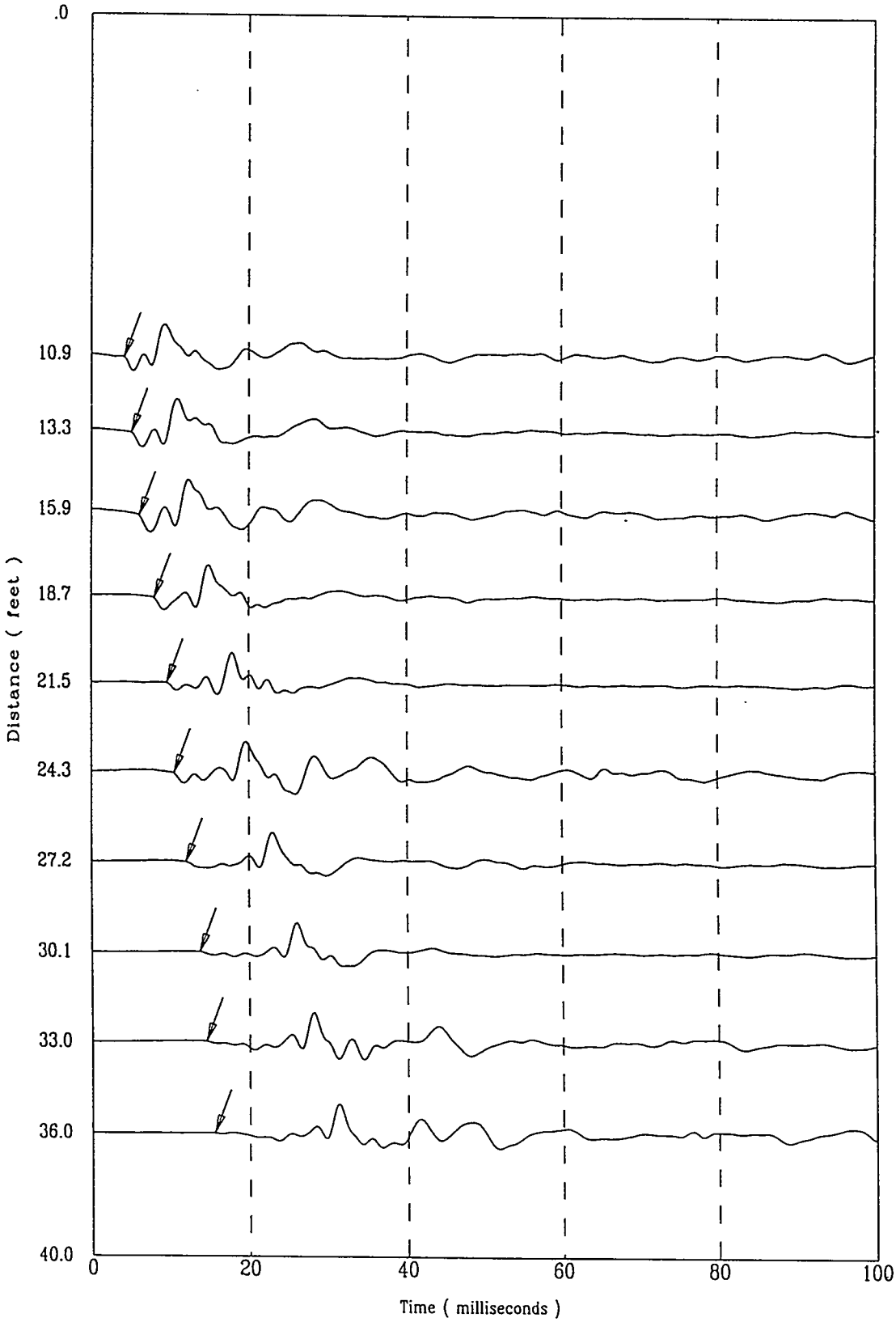
Compression Wave Time of Peak



File 307Y901S

Applied Research Associates
SDFBC14

P Wave
05/10/99



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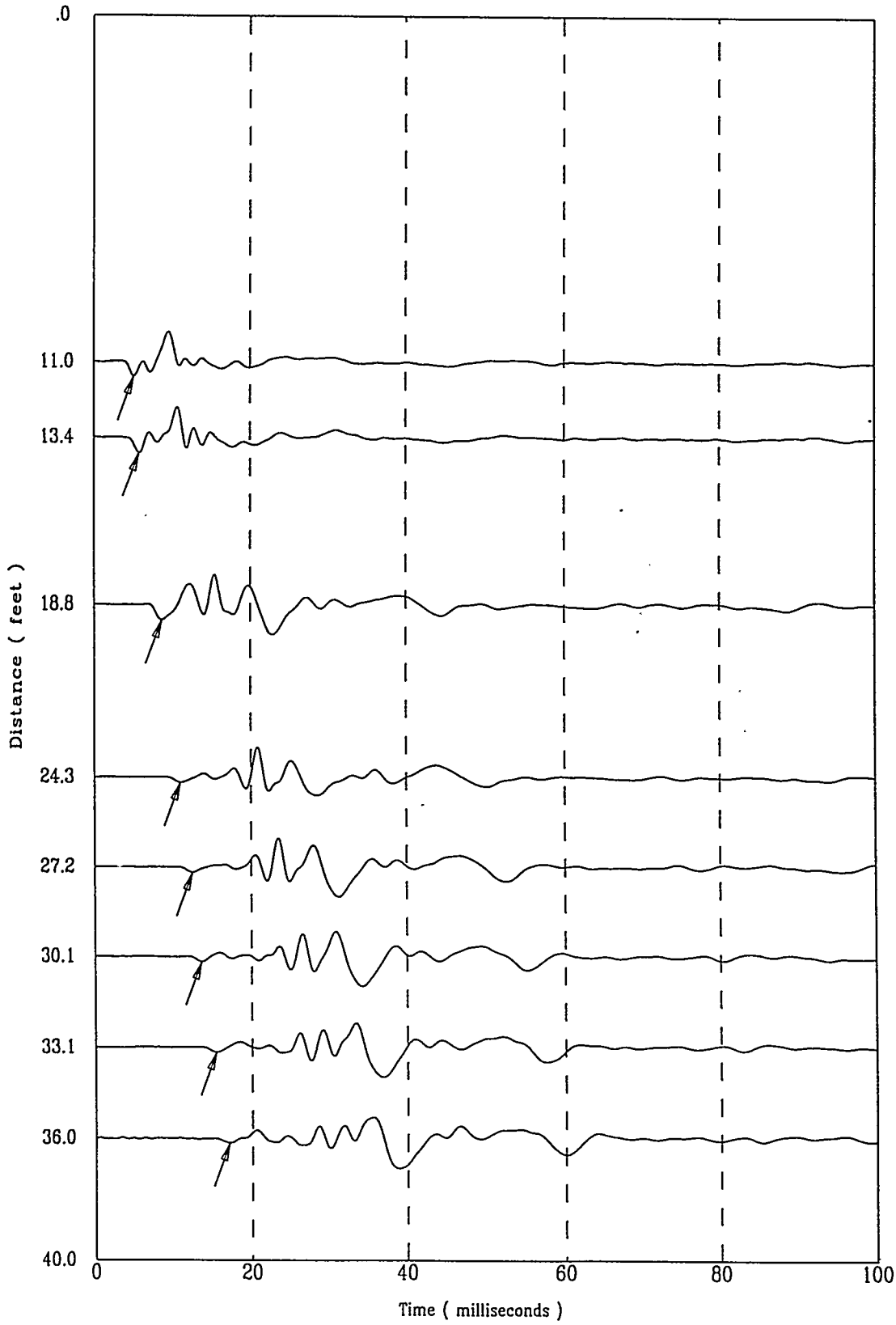
Applied Research Associates
SDFBC15
P Wave
05/07/99
.0
11.0
13.4
18.8
24.3
27.2
30.1
33.1
36.0
40.0
Distance (feet)
0
20
40
60
80
100
Time (milliseconds)
File 307y901S

Appendix C
Resistivity Cone Penetrometer Data

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APPLIED RESEARCH ASSOCIATES, INC.
Engineering and Applied Science

June 30, 1999

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 10 test locations conducted at the DWPF area of the Savannah River Site, performed under WSRC subcontract AA82276N, task 35. A single water sample was also collected. The cone penetrometer tests conducted and the water sample collected under this task are summarized in Table 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. Four of the tests contain soil resistivity data and the remaining six test include seismic data. The computer disks provide the ECP and VEL files that contain the plotted data in ASCII format.

The 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. The 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_35_ltr_rpt1.doc

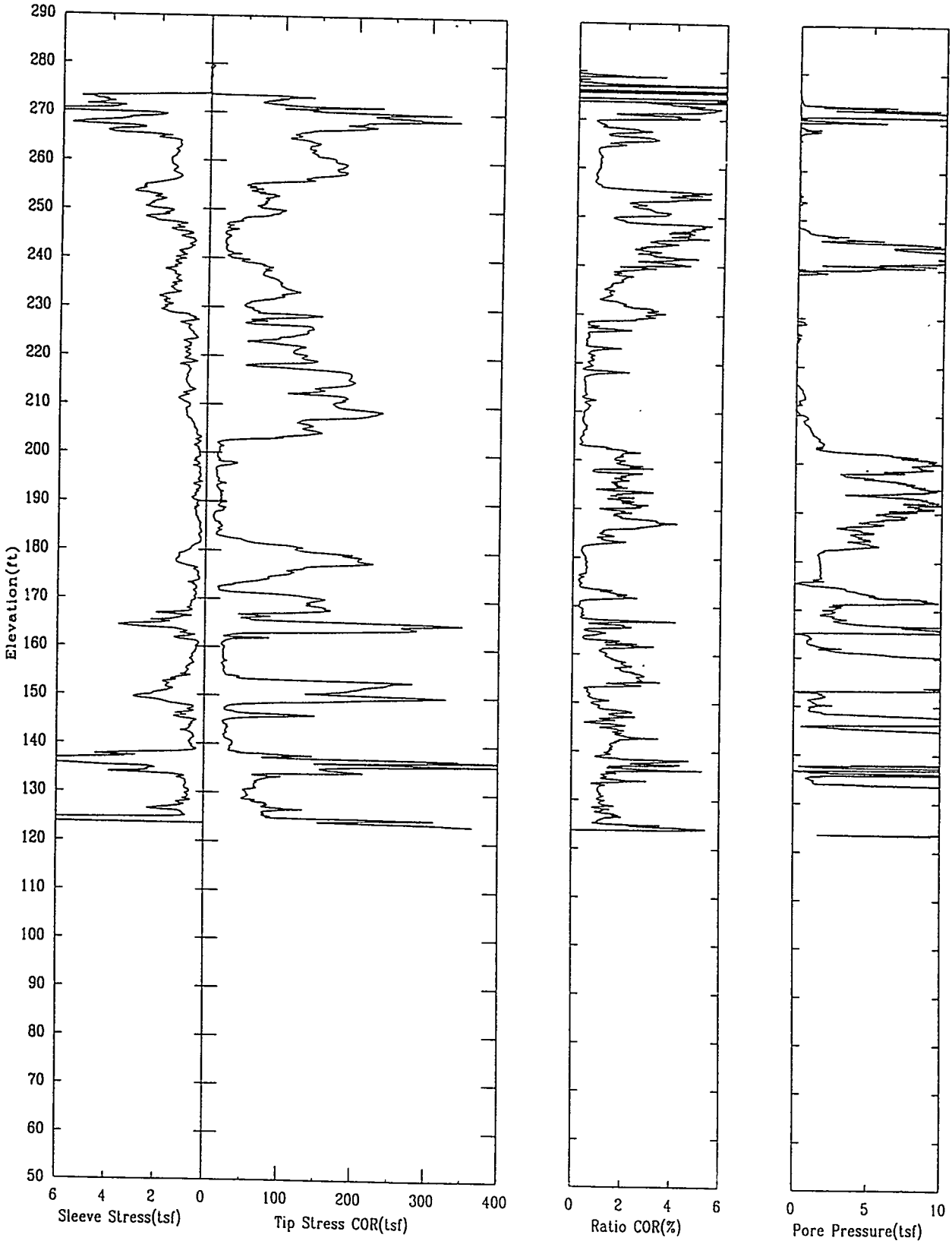
415 WATERMAN ROAD ■ SOUTH ROYALTON, VT 05068
(802) 763-8348 ■ FAX (802) 763-8283

Table 1 Summary of cone penetrometer tests and water samples at the DWPF area, Task 35

Test ID	Filename	Type of Test	Date of Test	Maximum Depth (ft)	Northing (ft)	Easting (ft)	Elevation (ft)	G.W.T. Depth (ft)
SDFBC4	326a901	S/P-CPT	4/26/99	142.0	72846.7	65251.9	278.0	37
SDFBC7	327a901	S/P-CPT	4/27/99	154.6	72703.0	65393.4	274.0	37
SDFBC2	327a904	S/P-CPT	4/27/99	130.1	72703.0	65104.3	277.0	37
SDFBC10	306y902	S/P-CPT	5/6/99	154.0	72751.5	65251.9	277.0	47
SDFBC15	307y901	S/P-CPT	5/7/99	152.0	72768.8	65444.7	275.0	38
SDFBC14	310y901	S/P-CPT	5/10/99	147.4	72764.3	65025.3	279.1	38
SDFBC5	303y902	R/P-CPT	5/3/99	151.8	72703.0	65251.0	276.0	43
SDFBC3	303y904	R/P-CPT	5/3/99	151.5	72751.3	65326.4	276.0	38
SDFBC6	303y906	R/P-CPT	5/3/99	149.0	72846.7	65393.4	277.0	38
SDFBC1	304y901	R/P-CPT	5/4/99	156.7	72846.0	65094.0	280.0	46
SDFBB1		WS	5/10/99	45.0				

SDFBC1 APPLIED RESEARCH ASSOCIATES, INC. 05/04/99

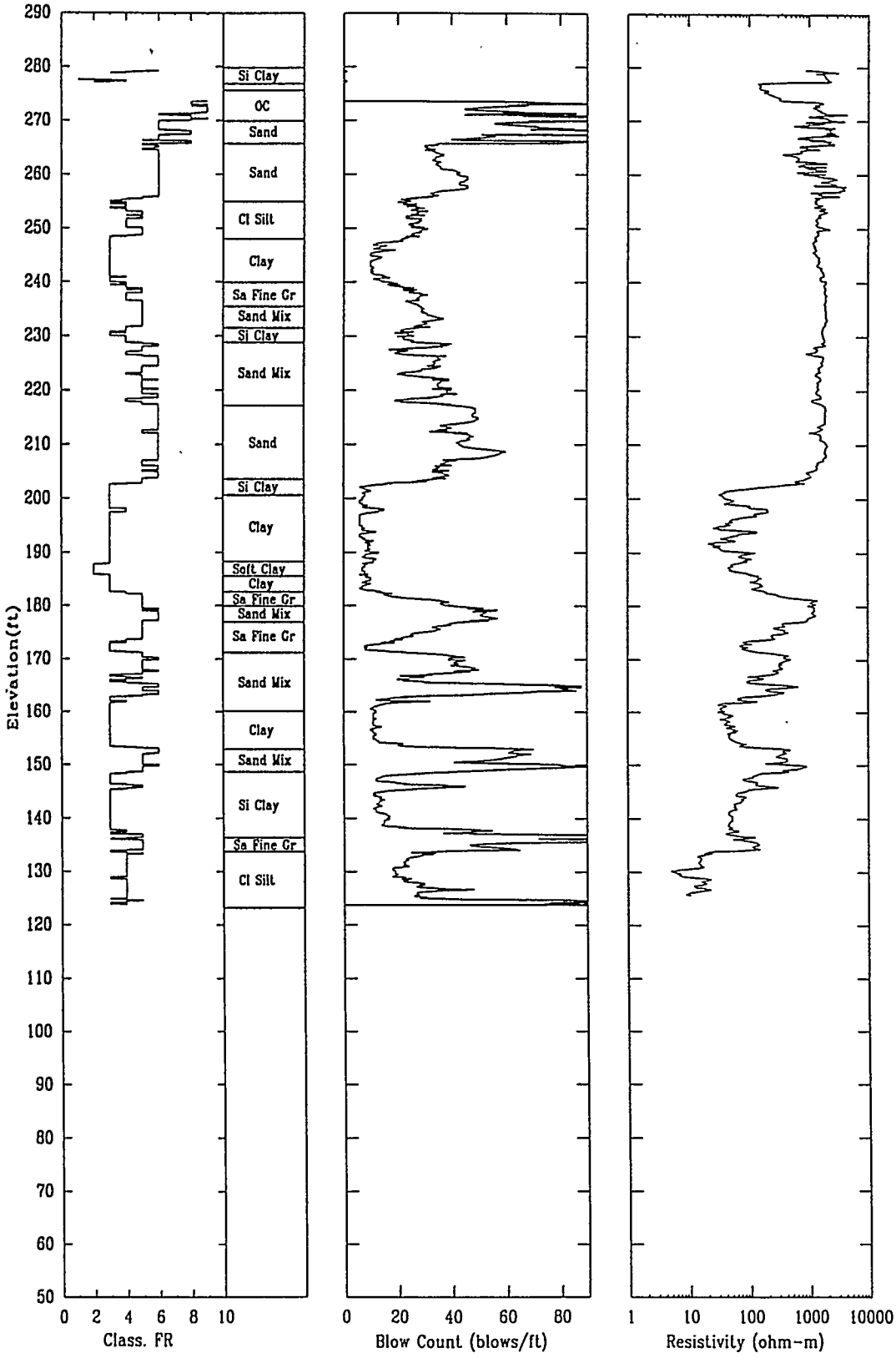
North 72846.0 East 65094.0 Elevation 280.0



File 304y901.ECP

SDFBC1 APPLIED RESEARCH ASSOCIATES, INC. 05/04/99

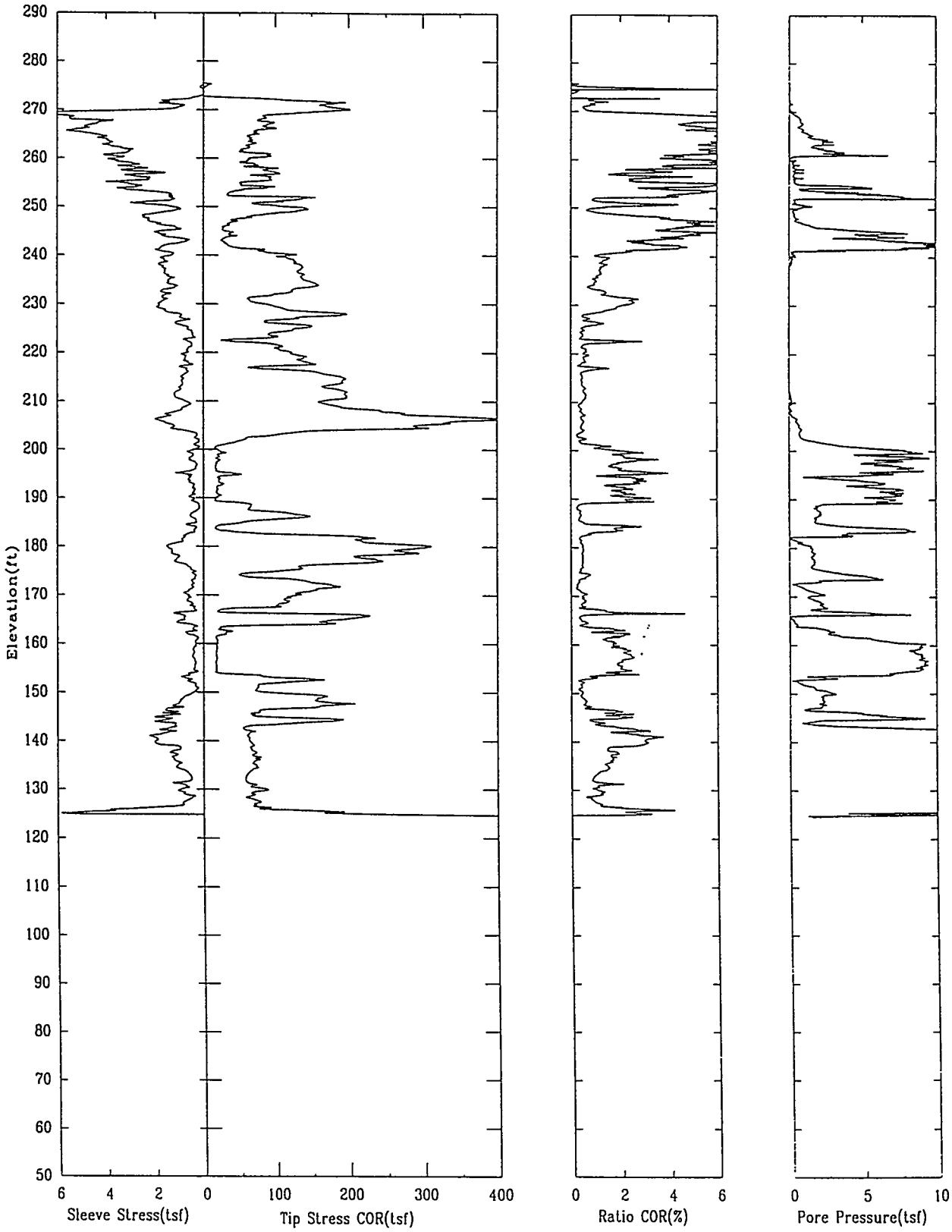
North 72846.0 East 65094.0 Elevation 280.0



File 304y901.ECP

SDFBC3 APPLIED RESEARCH ASSOCIATES, INC. 05/03/99

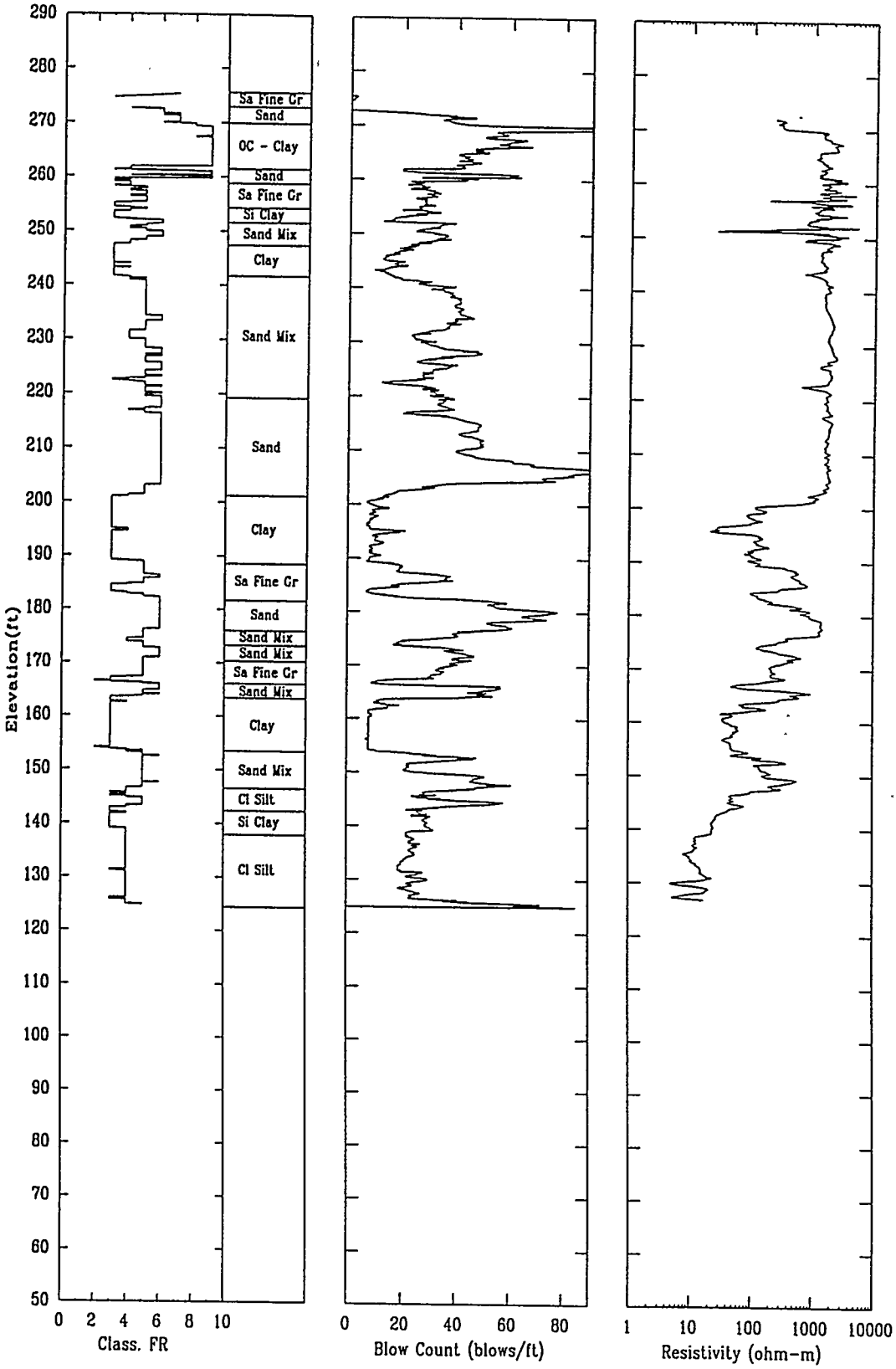
North 72751.3 East 65326.4 Elevation 276.0



File 303y904.ECP

SDFBC3 APPLIED RESEARCH ASSOCIATES, INC. 05/03/99

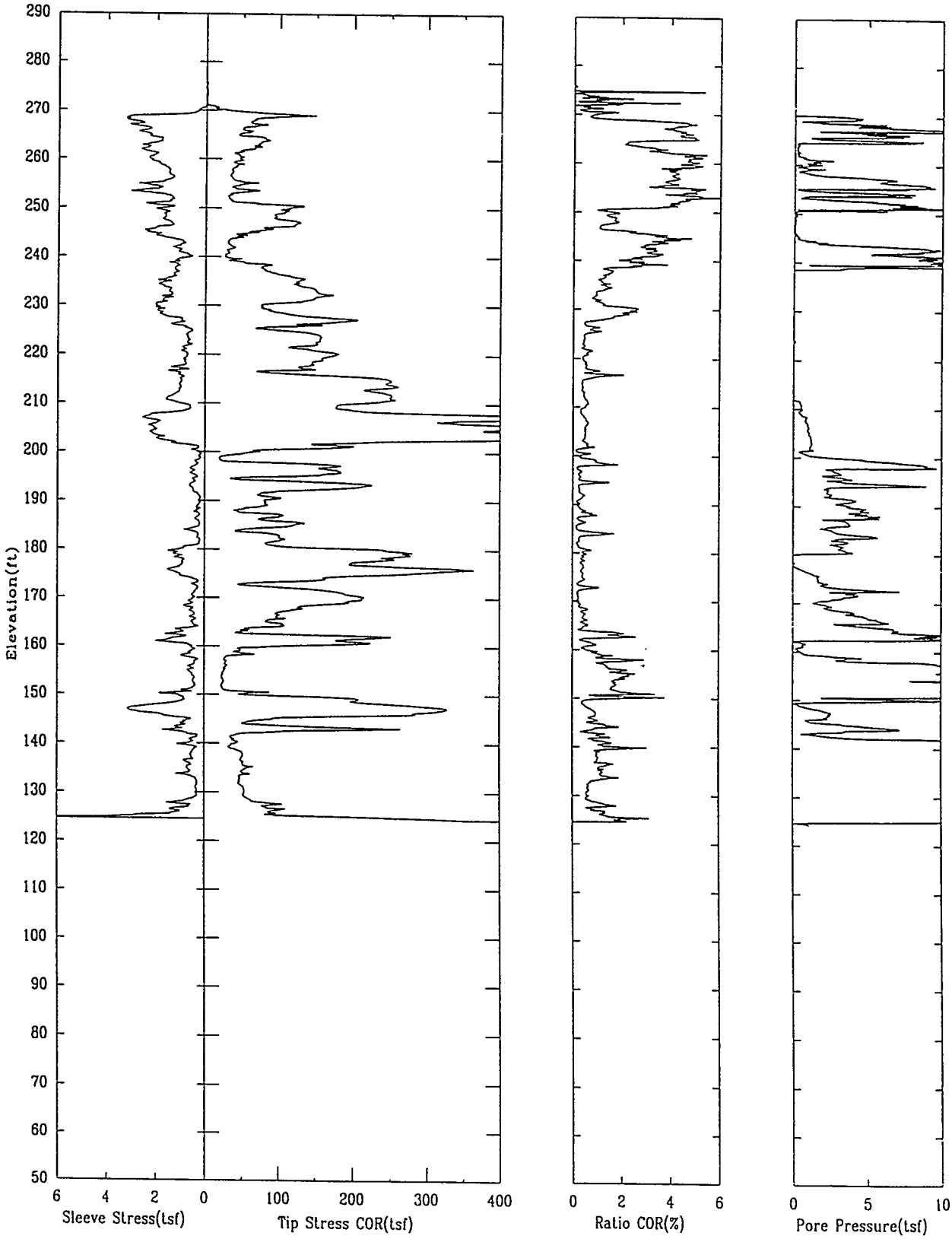
North 72751.3 East 65326.4 Elevation 276.0



File 303y904.ECP

SDFBC5 APPLIED RESEARCH ASSOCIATES, INC. 05/03/99

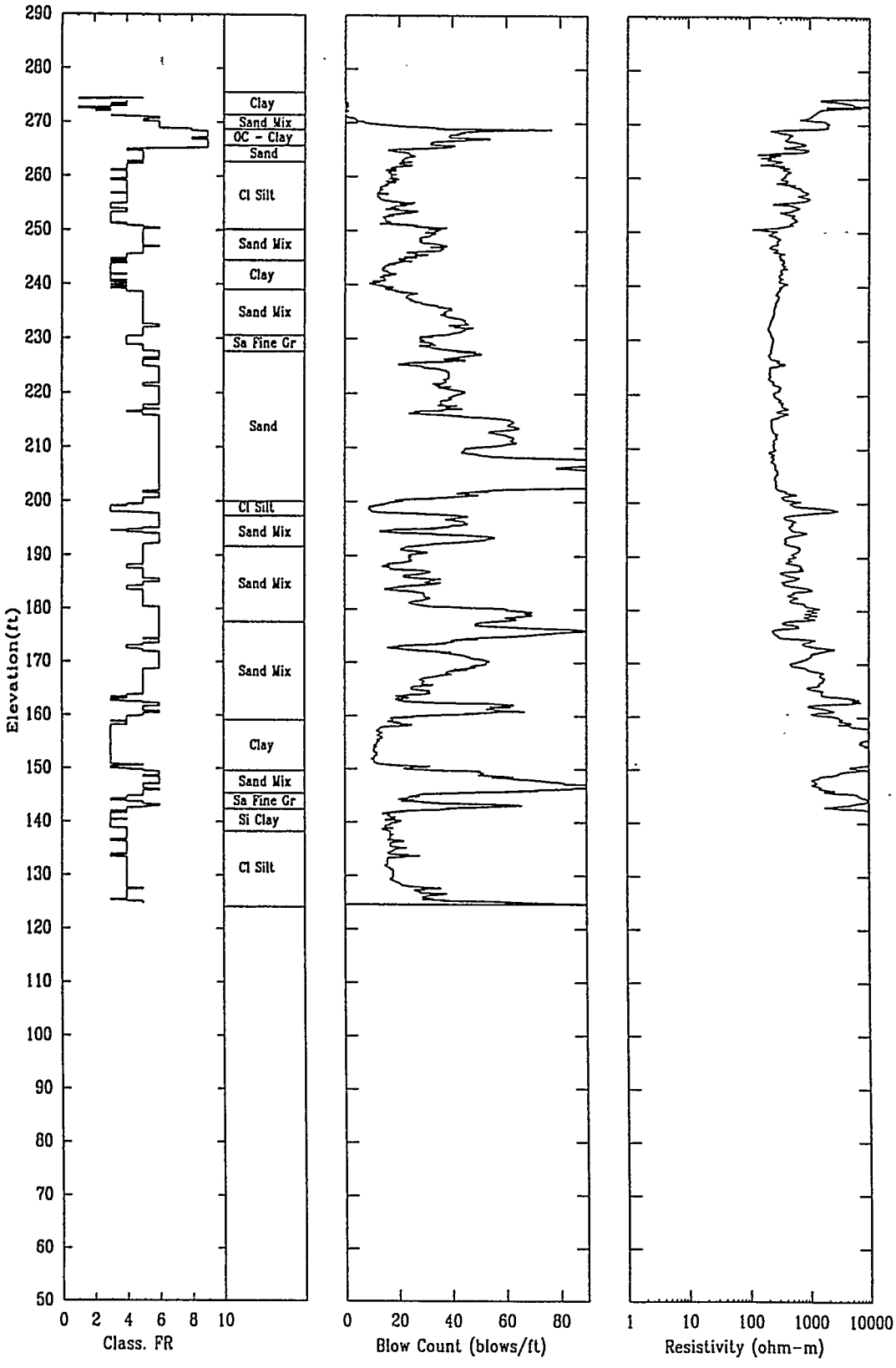
North 72703.0 East 65251.0 Elevation 276.0



File 303y902.ECP

SDFBC5 APPLIED RESEARCH ASSOCIATES, INC. 05/03/99

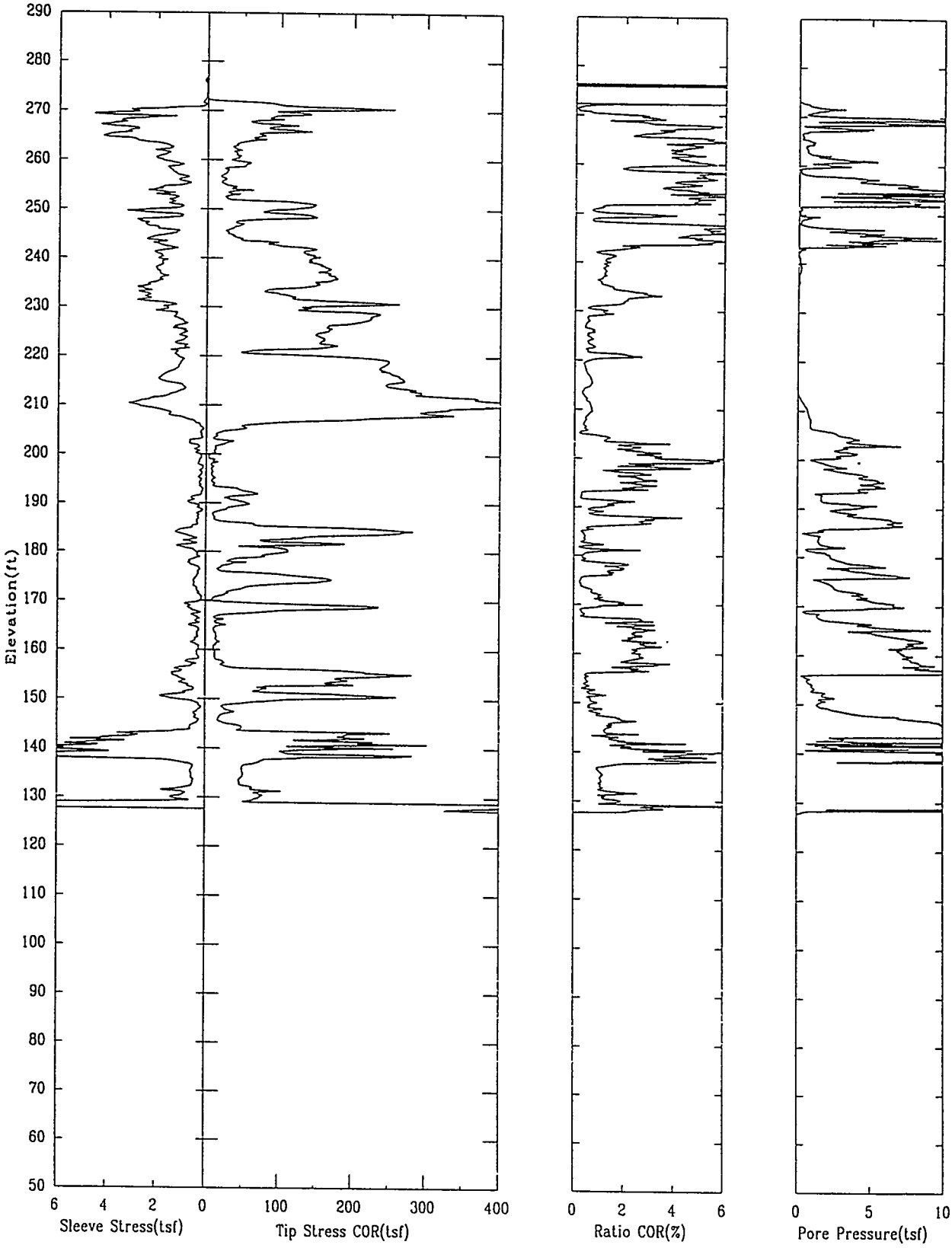
North 72703.0 East 65251.0 Elevation 276.0



File 303y902.ECP

SDFBC6 APPLIED RESEARCH ASSOCIATES, INC. 05/03/99

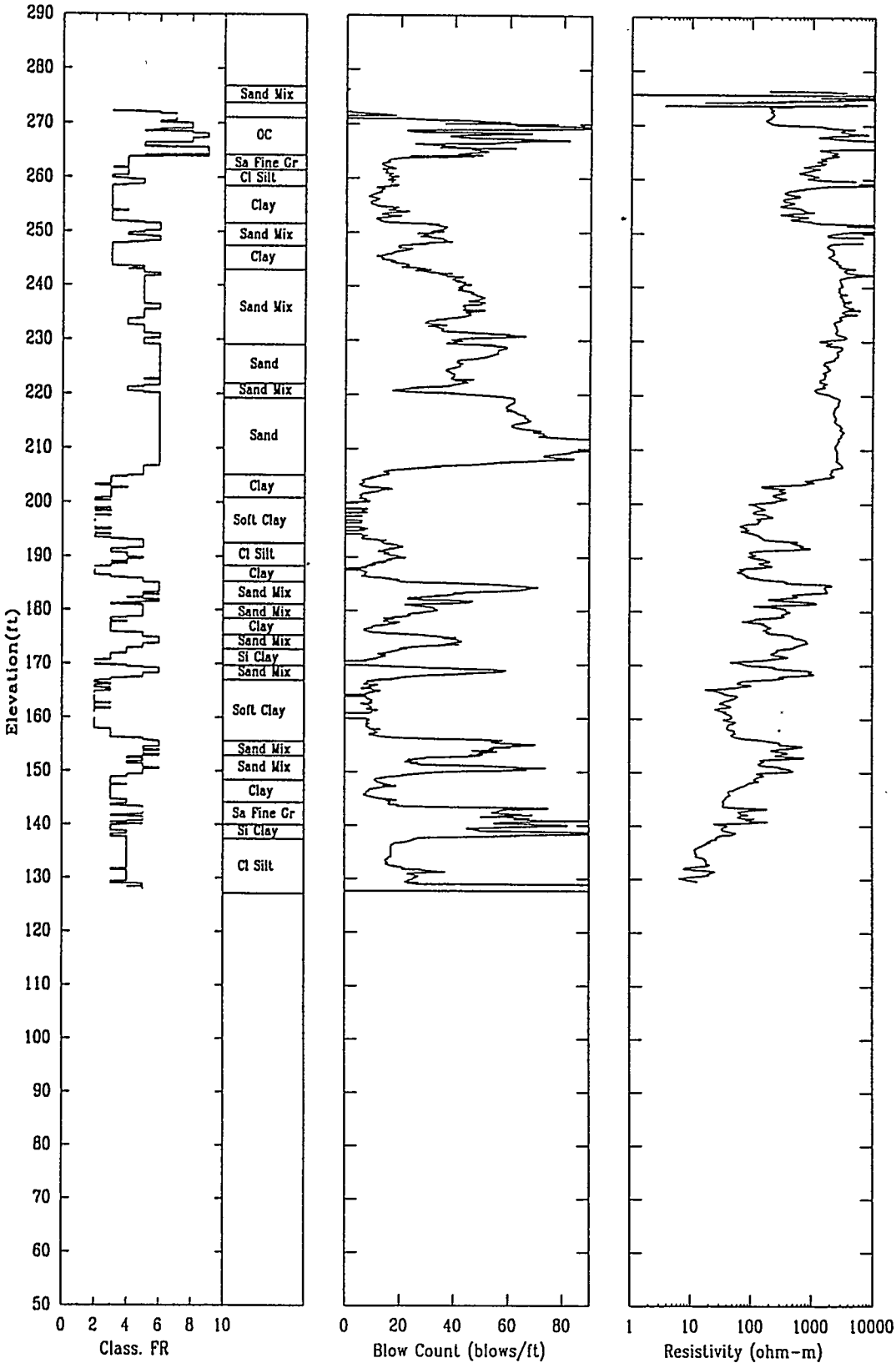
North 72846.7 East 65393.4 Elevation 277.0



File 303y906.ECP

SDFBC6 APPLIED RESEARCH ASSOCIATES, INC. 05/03/99

North 72846.7 East 65393.4 Elevation 277.0



File 303y906.ECP

Appendix D
Sediment Laboratory Results

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LAW

LAWGIBB Group Member

June 16, 1999

Westinghouse Savannah River Company
P.O. Box 616
Aiken, South Carolina 29808

Attention: Mr. Bruce Triplett
Building 730-2B, Room 1086
Subcontract No. AB80111N

Subject: **Transmittal of Test Results: Salt Disposition Facility Investigation**
Geotechnical Testing Services
WSRC Site Wide - Task Release No.40
Law Engineering Project No. 50161-7-0108 (Phase 40)

Dear Mr. Triplett:

Law Engineering and Environmental Services, Inc. has completed the assigned laboratory tests for Task Release No. 40 of our 3-year site-wide geotechnical testing contract. We are transmitting to you the tabular and/or graphical summary for each of the specimens tested. A copy of the Laboratory Assignment Sheet is enclosed with the samples tested These are the final results, thus, we have enclosed two copies of the following test results for your distribution:

Atterberg Limits (ASTM D4318)
Grain Size without Hydrometer (ASTM D422)
Moisture Content (ASTM D2216)
Grain Size with Hydrometer (ASTM D422)

If you have any questions pertaining to these test results or require additional information, please do not hesitate to call us.

Sincerely,
LAW ENGINEERING and ENVIRONMENTAL SERVICES, INC.

Harry E. Johnson.
Principal Technician

LAW Engineering and Environmental Services, Inc.
396 Plasters Avenue • Atlanta, GA 30324
404-873-4761 • Fax 404-881-0508

SAVANNAH RIVER SITE

SOILS LABORATORY ASSIGNMENT

Subcontractor: Law Engineering Contract No: AB80111N

Date: 5/27/99 Project: Salt Disposition Facility Investigation Boring No: SDFBB1 Task No: 40 Sheet No: 1 of 2

SAMPLE		PHYSICAL PROPERTIES				GRAIN SIZE			STRENGTH TESTS							CONSOL	COMPACTION		MISCELLANEOUS								
Number (as shown on tube/bag)	Depth (ft)	Tube Logging LAW Procedure TP-6	Moisture Content ASTM D-2216	Atterberg Limits ASTM D-4318	Specific Gravity ASTM D-854	Sieve Analysis ASTM D-421/422	No. 200 Sieve Wash ASTM D-1140	Hydrometer (w/Sieve) ASTM D-2217	Unconfined Compression ASTM D-2166	Direct Shear (3 points) ASTM D-3080	Triaxial Shear (UU) ASTM D-2850	Triaxial Shear (CU) ASTM D-4767	Triaxial Shear (CU) w/Back/Pore Water Pressure ASTM D-4767	Triaxial Shear (CD) w/volume change EM-1110-2-1906	Indicate Confining Pressures, KSF	ASTM D-2435 Indicate Load in ksf and Reload Cycle if any	Standard Proctor ASTM D-698	Remold Samples @ +2% of Optimum	Falling Head Permeability ASTM D-5084 - Vertical	Falling Head Permeability ASTM D-5084 - Horizontal	Bulk Density ASTM D-4531	Total Organic Content US EPA 9060	Capillary-Moisture Relationships ASTM D2325	Cation Exchange Capacity US EPA 9080 / 9081	Porosity EM1110-2-1906	pH Determination ASTM D4972
SS-3			X	X				X																			
SS-6						X																					
SS-9						X																					
SS-12			X	X				X																			
SS-14			X	X		X																					
SS-16						X																					
SS-17						X																					
SS-19						X																					
SS-22						X																					
SS-25						X																					
SS-28						X																					
SS-31						X																					
SS-34						X																					
SS-36						X																					
SS-38			X	X		X																					
SS-40								X																			
SS-42			X	X		X																					
SS-47						X																					
SS-49						X																					
SS-52						X																					
TOTAL																											

SS - Split Spoon S - Save

ST - Shelby Tube D - Discard

CPT/ST = 1.44" Tube

Remarks: ~~Discard Archive Sample~~ CALL F SYMS BEFRE DISCARDING

Tests Assigned By: Bruce Triplett

SAVANNAH RIVER SITE

SOILS LABORATORY ASSIGNMENT

Subcontractor: Law Engineering Contract No: AB80111N

Date: 5/27/99 Project: Salt Disposition Facility Investigation Boring No: SDFBB1 Task No: 40 Sheet No: 1 of 1

SAMPLE		PHYSICAL PROPERTIES				GRAIN SIZE			STRENGTH TESTS							CONSOL	COMPACTION		MISCELLANEOUS								
Number (as shown on tube/bag)	Depth (ft)	Tube Logging - LAW Procedure TP-6,	Moisture Content ASTM D-2216	Atterberg Limits ASTM D-4318	Specific Gravity ASTM D-854	Sieve Analysis ASTM D-421/422	No. 200 Sieve Wash ASTM D-1140	Hydrometer (w/Sieve) ASTM D-2217	Unconfined Compression ASTM D-2166	Direct Shear (3 points) ASTM D-3080	Triaxial Shear (UU) ASTM D-2850	Triaxial Shear (CU) ASTM D-4767	Triaxial Shear (CU) w/Back/Pore Water Pressure ASTM D-4767	Triaxial Shear (CD) w/volume change EM-1110-2-1906	Indicate Confining Pressures, KSF	ASTM D-2435 Indicate Load in ksf and Reload Cycle if any	Standard Proctor ASTM D-698	Remold Samples @ +2% of Optimum	Falling Head Permeability ASTM D-5084 - Vertical	Falling Head Permeability ASTM D-5084 - Horizontal	Bulk Density ASTM D-4531	Total Organic Content US EPA 9060	Capillary-Moisture Relationships ASTM D2325	Cation Exchange Capacity US EPA 9080 / 9081	Porosity EM1110-2-1906	pH Determination ASTM D4972
SS-56						X																				
SS-58						X																				
SS-59			X	X				X																		
SS-60						X																				
SS-63			X	X				X																		
SS-64						X																				
SS-65			X	X				X																		
SS-67			X	X				X																		
SS-69			X	X				X																		
SS-71			X	X				X																		
TOTAL																										

SS - Split Spoon S - Save

ST - Shelby Tube D - Discard

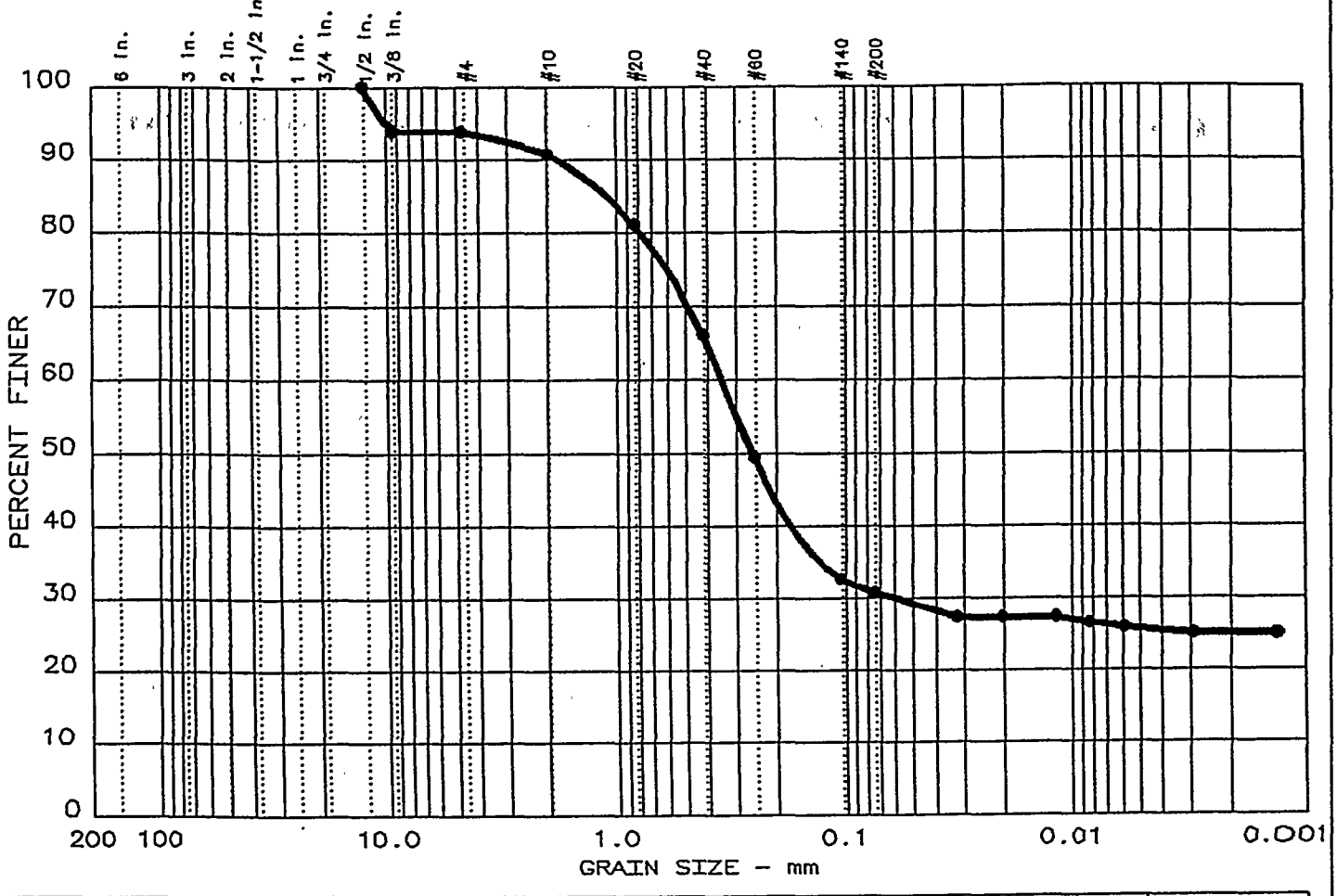
CPT/ST = 1.44" Tube

Remarks: ~~Discard residual sample~~

CALL F. SYMS BEFORE DISCARDING

Tests Assigned By: Bruce Triplett

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	4	0.0	6.2	63.0	5.2	25.6

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	52	33	1.12	0.35	0.25	0.059				

MATERIAL DESCRIPTION	USCS	AASHTO
● Tan Brown Gray Clayey Sand	SC	A-2-7(3.7)

Project No.: 50161-7-0108 Task 40
Project: Salt Disposition Facility Investigation
● Location: SDFBB1 SS-3 @ 10-12 Ft.

Date: June 15, 1999

GRAIN SIZE DISTRIBUTION TEST REPORT

LAW ENGINEERING, INC.

Remarks:

Tested by: SC

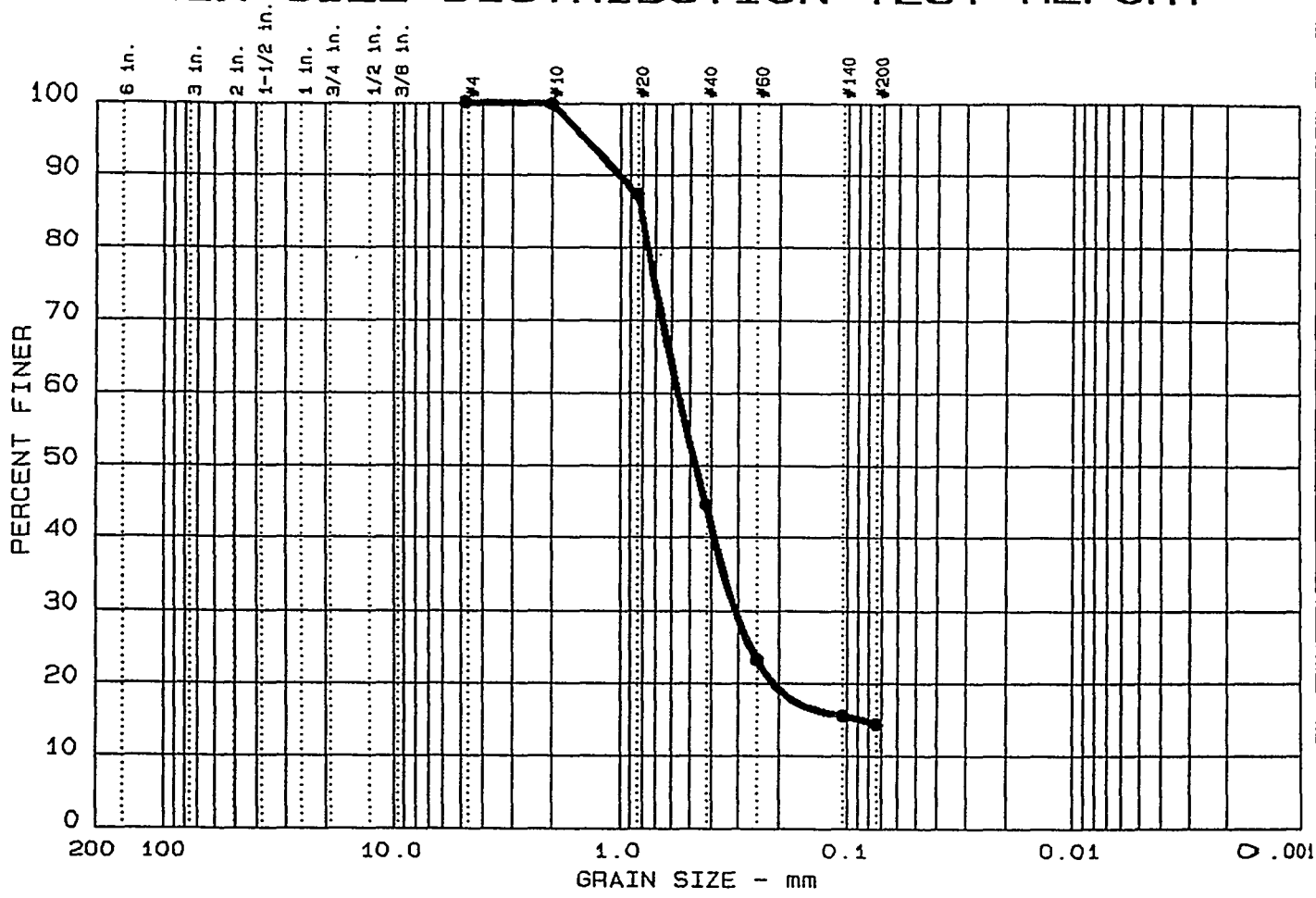
Reviewed by: [illegible]

Moisture Content = 16.8%

ASTM D422, D4318 & D2216

Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	6	0.0	0.0	85.6	14.4	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.81	0.56	0.47	0.310	0.0834			

MATERIAL DESCRIPTION	USCS	AASHTO
● White-Tan Silty Sand		

Project No.: 50161-7-0108.40
Project: Salt Disposition Facility Investigation
● Location: SDFBB1, SS-6 @ 16-19.0 Ft.

Date: June 8, 1999

GRAIN SIZE DISTRIBUTION TEST REPORT

LAW ENGINEERING, INC.

Remarks:

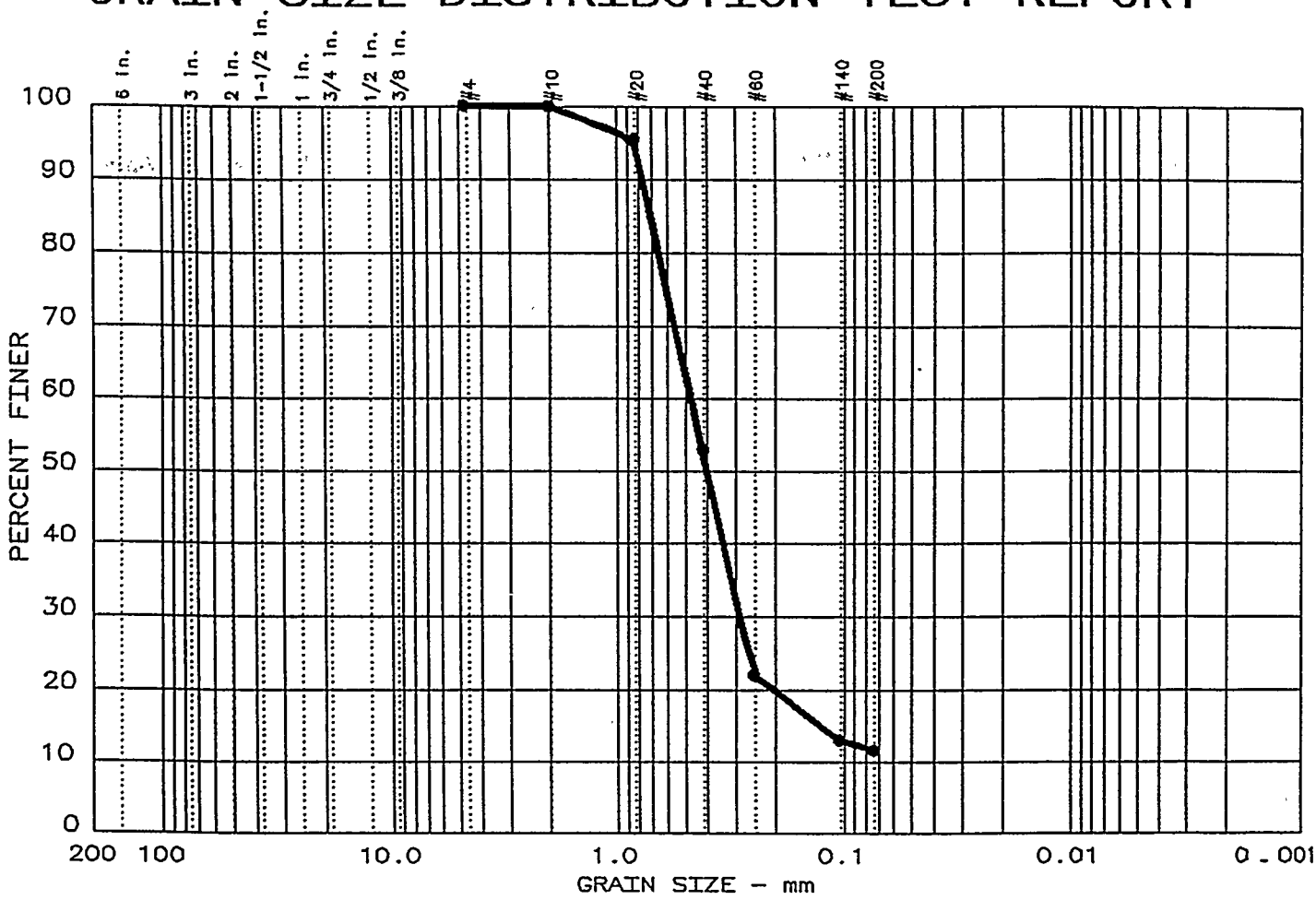
Tested by: SC

Reviewed by: HJ

Moisture Content: 17.9%

Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	4	0.0	0.0	88.3	11.7	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.71	0.47	0.40	0.285	0.1246			

MATERIAL DESCRIPTION	USCS	AASHTO
● Purple Silty Sand		

Project No.: 50161-7-0108 Task 40
Project: Salt Disposition Facility Investigation
● Location: SDFBB1 SS-9 @ 22-24 Ft.

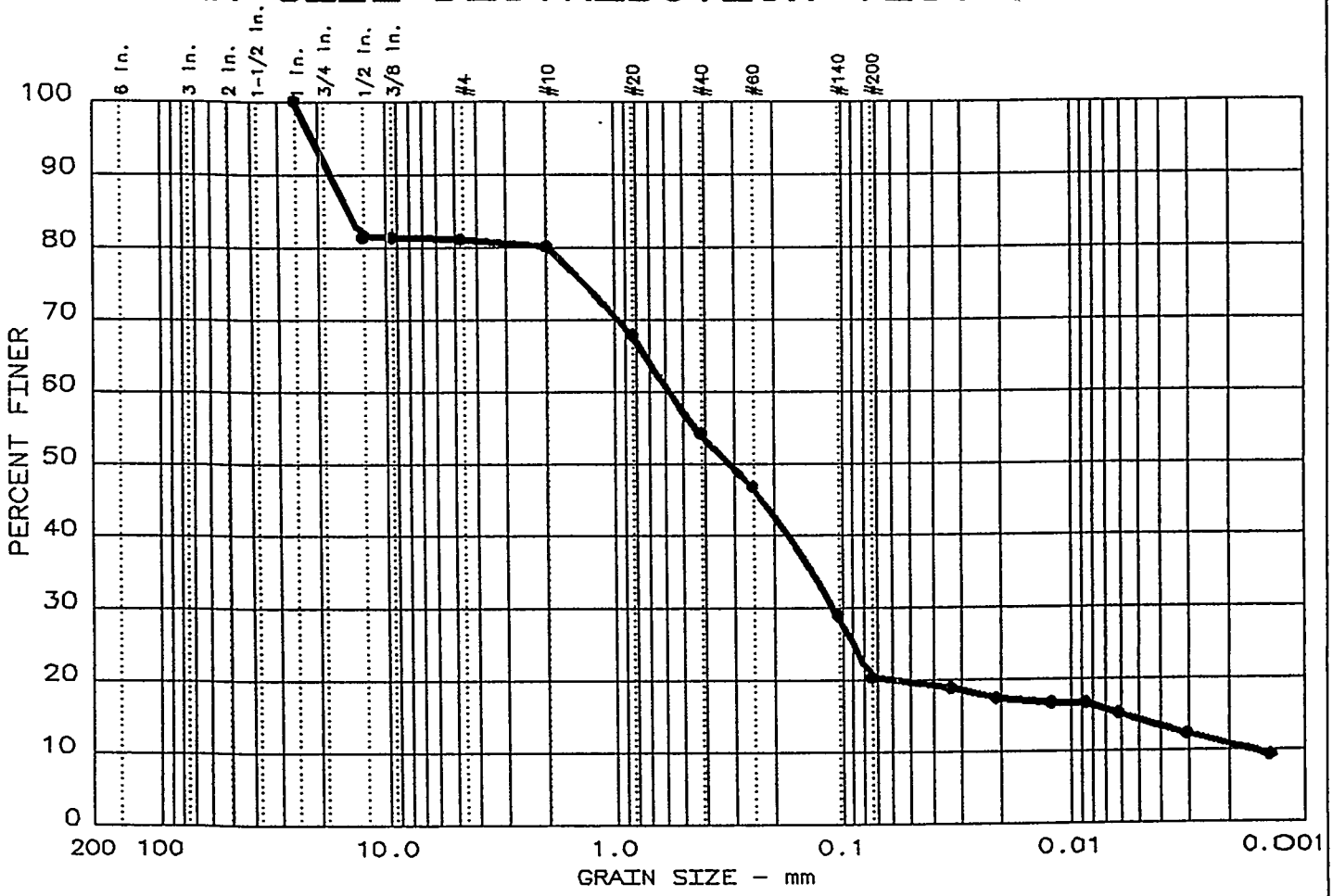
Date: June 8,1999

GRAIN SIZE DISTRIBUTION TEST REPORT
LAW ENGINEERING, INC.

Remarks:
Tested by: SC
Reviewed by: HB
Moisture Content = 11.1%
ASTM D422 & D2216

Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	5	0.0	18.9	60.8	6.2	14.1

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	46	24	14.45	0.57	0.31	0.109	0.0059	0.0015	13.65	375.8

MATERIAL DESCRIPTION	USCS	AASHTO
● Red Brown & Gray Clayey Sand with Gravel	SC	A-2-7(0.7)

Project No.: 50161-7-0108 Task 40
Project: Salt Disposition Facility Investigation
● Location: SDFBB1 SS-12 @ 28-30 Ft.

Date: June 15, 1999

GRAIN SIZE DISTRIBUTION TEST REPORT

LAW ENGINEERING, INC.

Remarks:

Tested by: SC

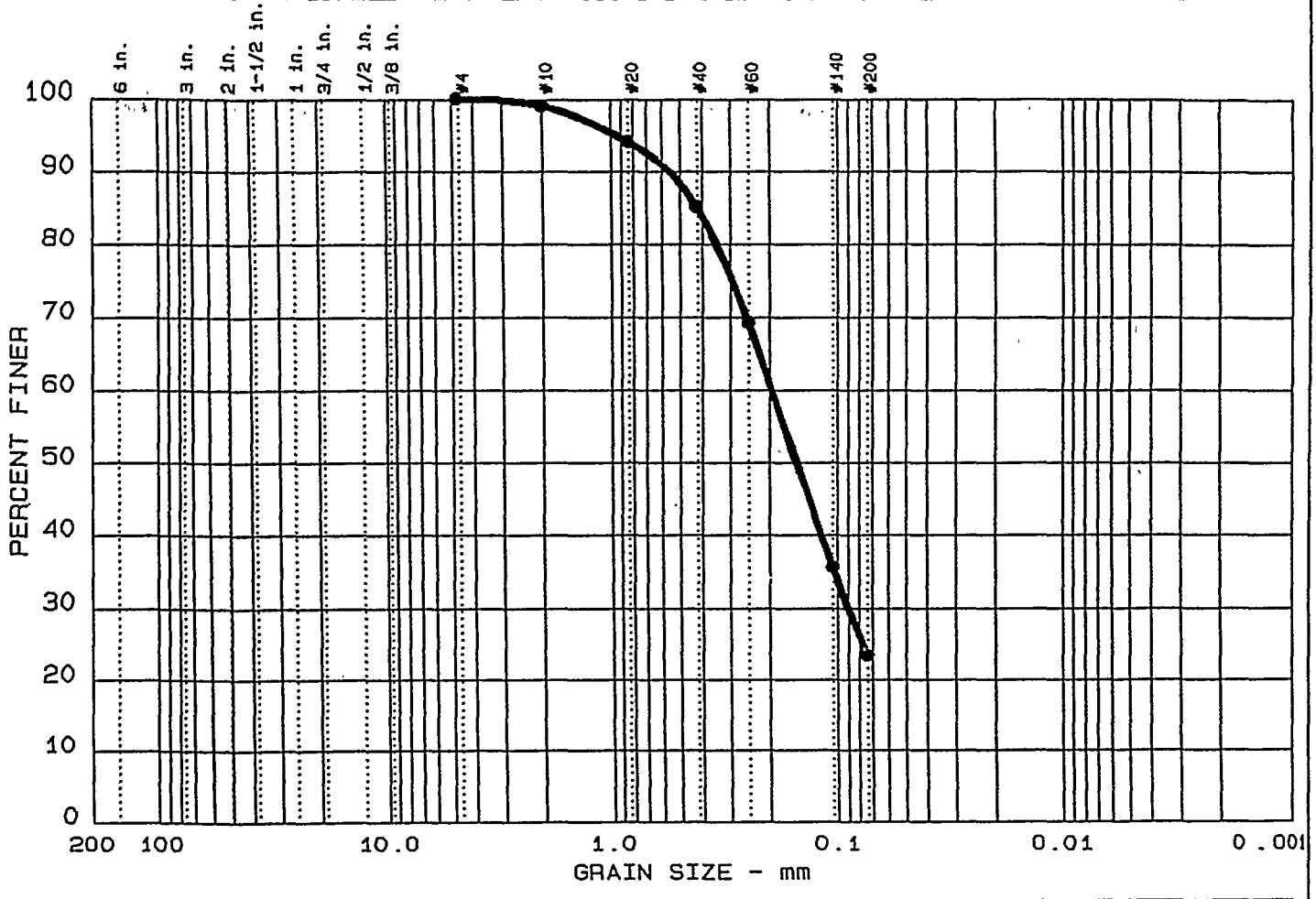
Reviewed by: LB

Moisture Content = 17.0%

ASTM D422, D4318 & D2216

Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	2	0.0	0.0	76.6	23.4	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	33	12	0.41	0.20	0.15	0.090				

MATERIAL DESCRIPTION	USCS	AASHTO
● Red-Gray Clayey Sand	SC	A-2-6(0.2)

Project No.: 50161-7-0108.40
Project: Salt Disposition Facility Investigation
◆ Location: SDFBB1, SS-14 @ 32-34.0 Ft.

Date: June 8, 1999

GRAIN SIZE DISTRIBUTION TEST REPORT

LAW ENGINEERING, INC.

Remarks:

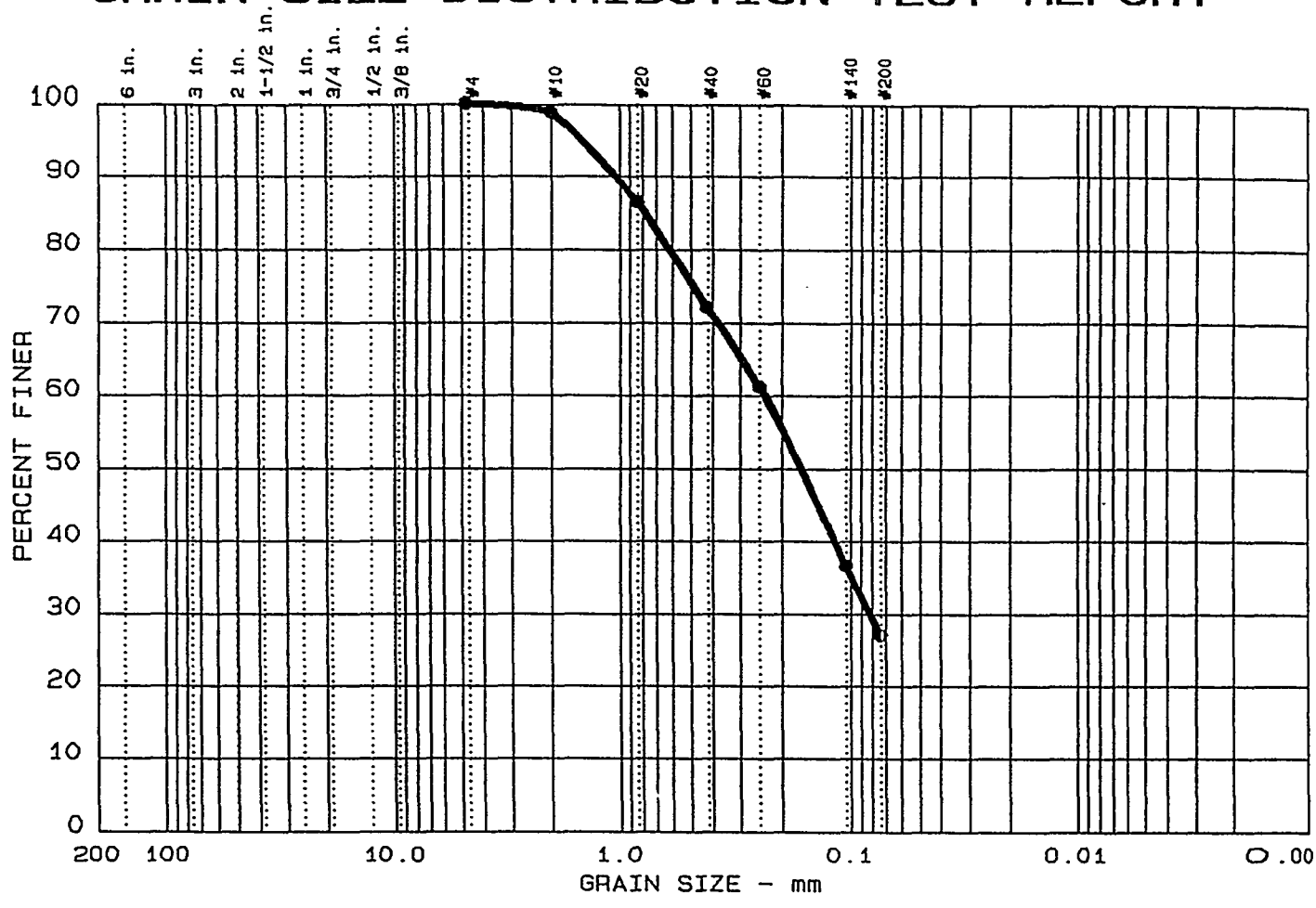
Tested by:

Reviewed by:

Moisture Content: 17.9%

Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	18	0.0	0.0	72.9	27.1	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.78	0.24	0.17	0.083				

MATERIAL DESCRIPTION	USCS	AASHTO
● Purple Silty Sand		

Project No.: 50161-7-0108.40
Project: Salt Disposition Facility Investigation
● Location: SDFBB1, SS-16 @ 36-38.0 Ft.

Date: June 8, 1999

GRAIN SIZE DISTRIBUTION TEST REPORT

LAW ENGINEERING, INC.

Remarks:

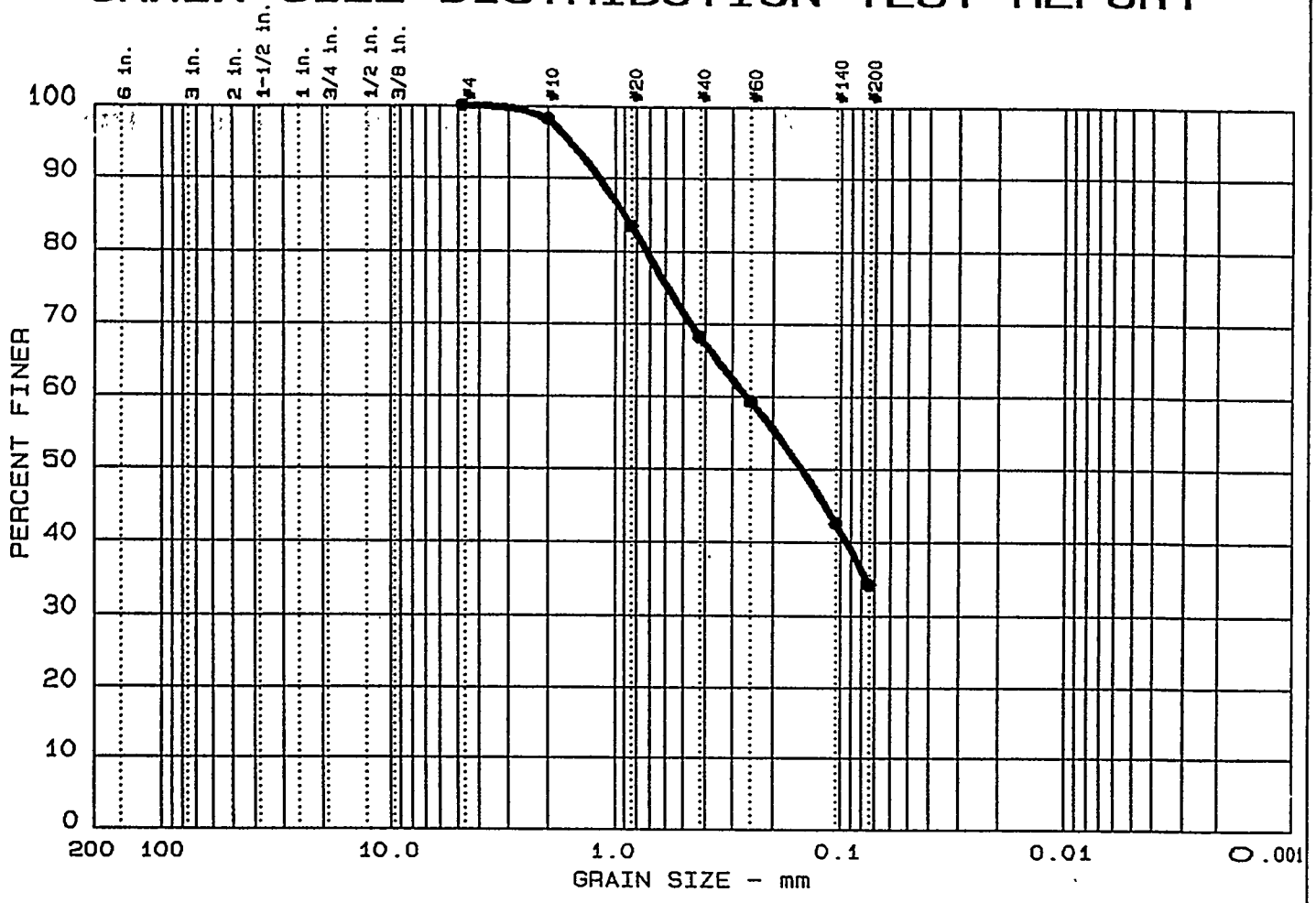
Tested by: SC

Reviewed by: CB

Moisture Content: 19.2%

Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	17	0.0	0.0	65.9	34.1	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.90	0.26	0.15					

MATERIAL DESCRIPTION	USCS	AASHTO
● Purple-Tan Silty Sand		

Project No.: 50161-7-0108.40
Project: Salt Disposition Facility Investigation
◆ Location: SDFBB1, SS-17 @ 38-40.0 Ft.

Date: June 8, 1999

GRAIN SIZE DISTRIBUTION TEST REPORT

LAW ENGINEERING, INC.

Remarks:

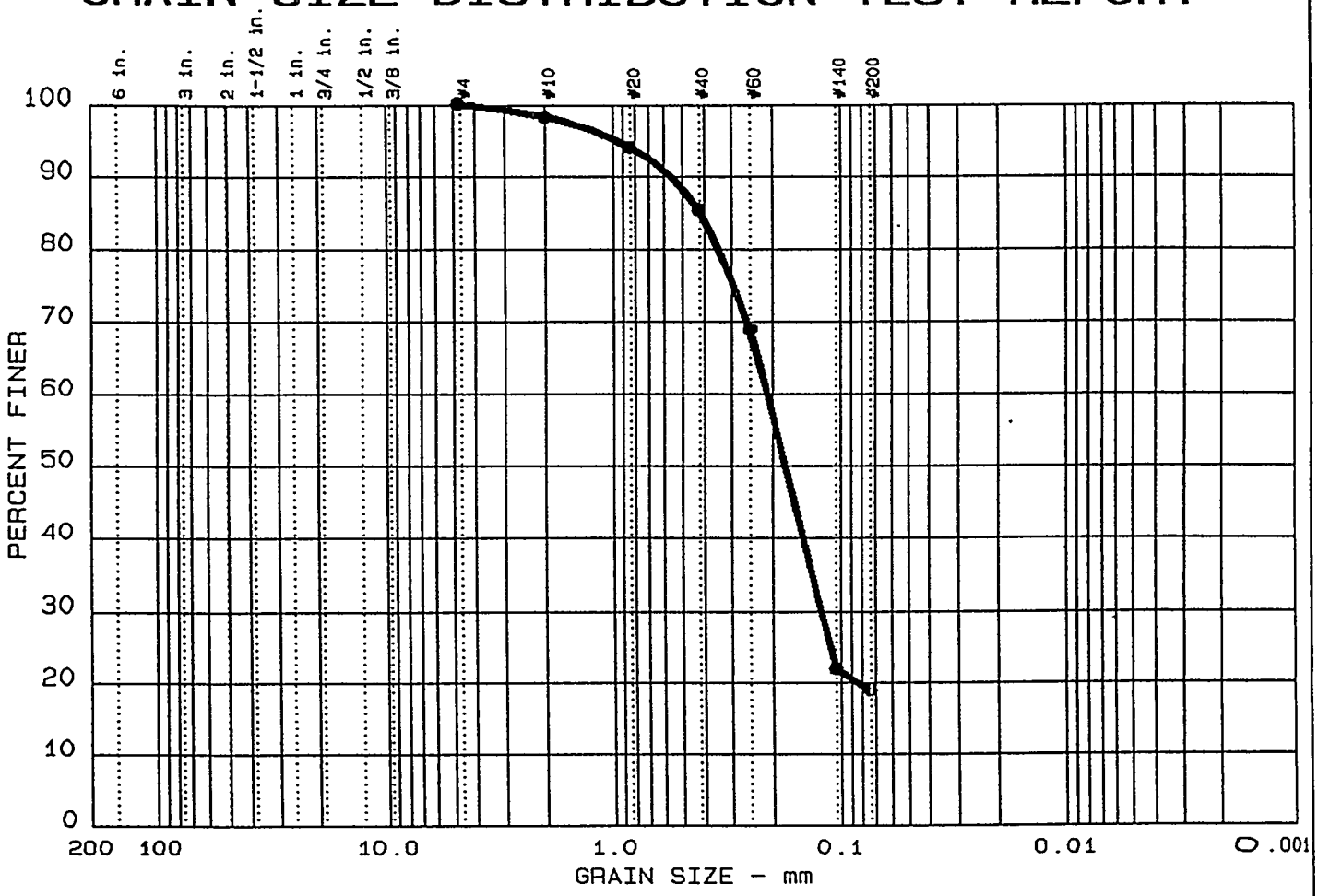
Tested by: SC

Reviewed by: HJ

Moisture Content: 21.6%

Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	16	0.0	0.0	81.0	19.0	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_C	C_U
●			0.41	0.21	0.18	0.122				

MATERIAL DESCRIPTION	USCS	AASHTO
● Tan Silty Sand		

Project No.: 50161-7-0108.40
Project: Salt Disposition Facility Investigation
● Location: SDF8B1, SS-19 @ 42-44.0 Ft.

Date: June 8, 1999

GRAIN SIZE DISTRIBUTION TEST REPORT

LAW ENGINEERING, INC.

Remarks:

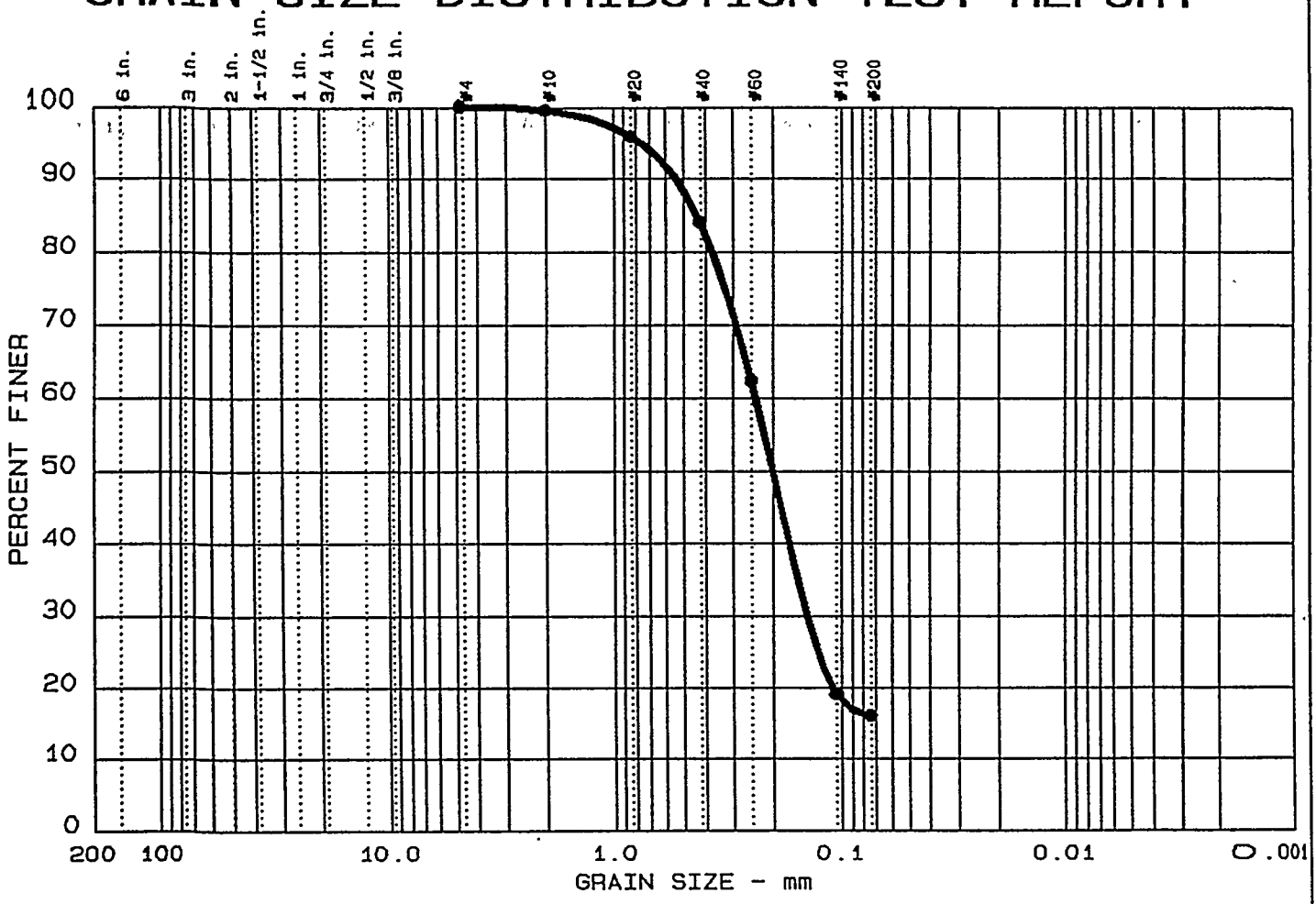
Tested by: SC

Reviewed by: HB

Moisture Content: 23.9%

Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	10	0.0	0.0	83.9	16.1	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.43	0.24	0.20	0.141				

MATERIAL DESCRIPTION	USCS	AASHTO
● Tan Silty Sand		

Project No.: 50161-7-0108.40
Project: Salt Disposition Facility Investigation
● Location: SDFBB1, SS-22 @ 48-50.0 Ft.

Date: June 8, 1999

Remarks:

Tested by: SC

Reviewed by: HS

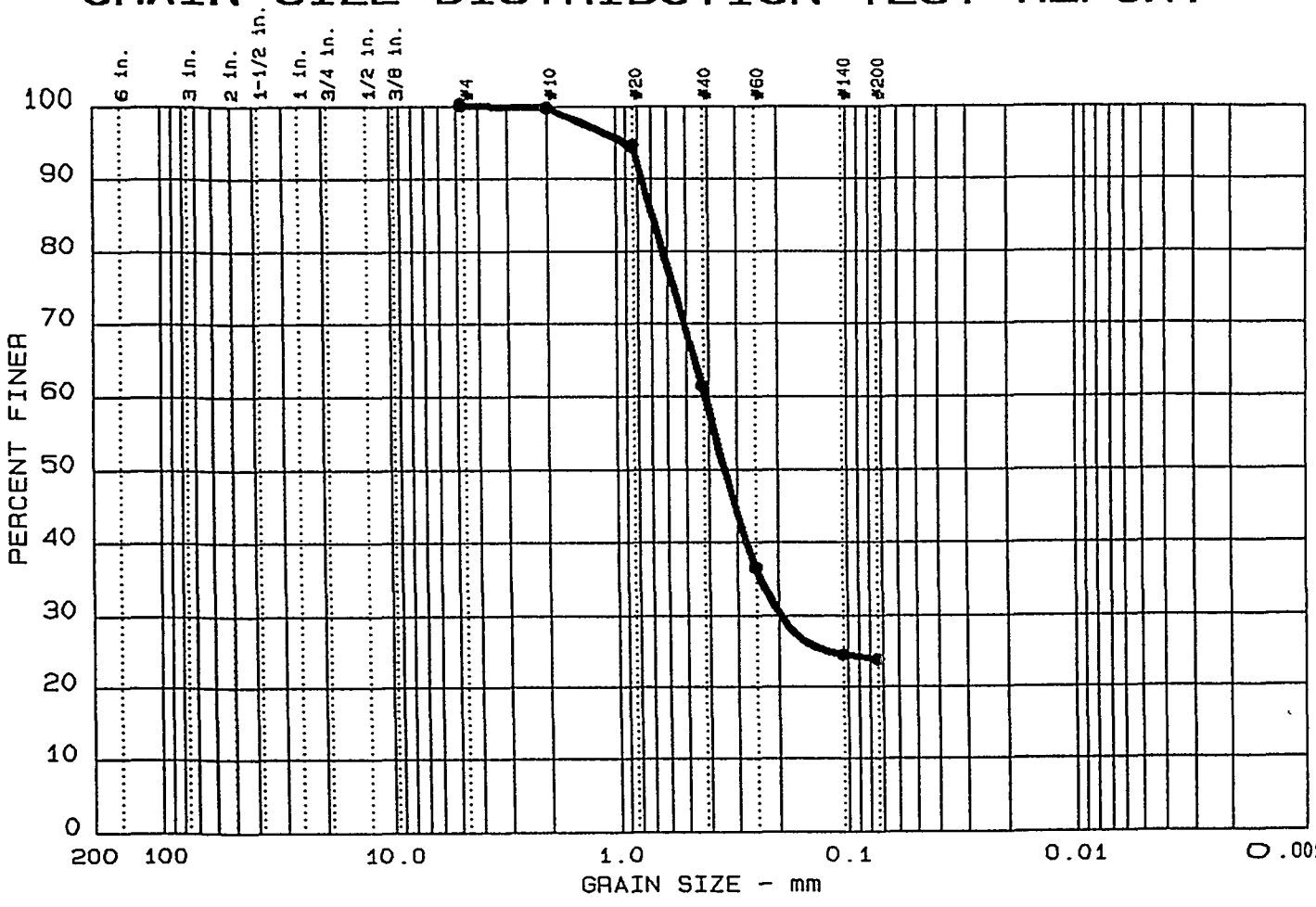
Moisture Content: 26.0%

GRAIN SIZE DISTRIBUTION TEST REPORT

LAW ENGINEERING, INC.

Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	4	0.0	0.0	76.2	23.8	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_C	C_u
●			0.69	0.41	0.34	0.198				

MATERIAL DESCRIPTION	USCS	AASHTO
◐ Tan Silty Sand		

Project No.: 50161-7-0108.40
Project: Salt Disposition Facility Investigation
◐ Location: SDF881, SS-25 @ 54-56.0 Ft.

Date: June 8, 1999

GRAIN SIZE DISTRIBUTION TEST REPORT

LAW ENGINEERING, INC.

Remarks:

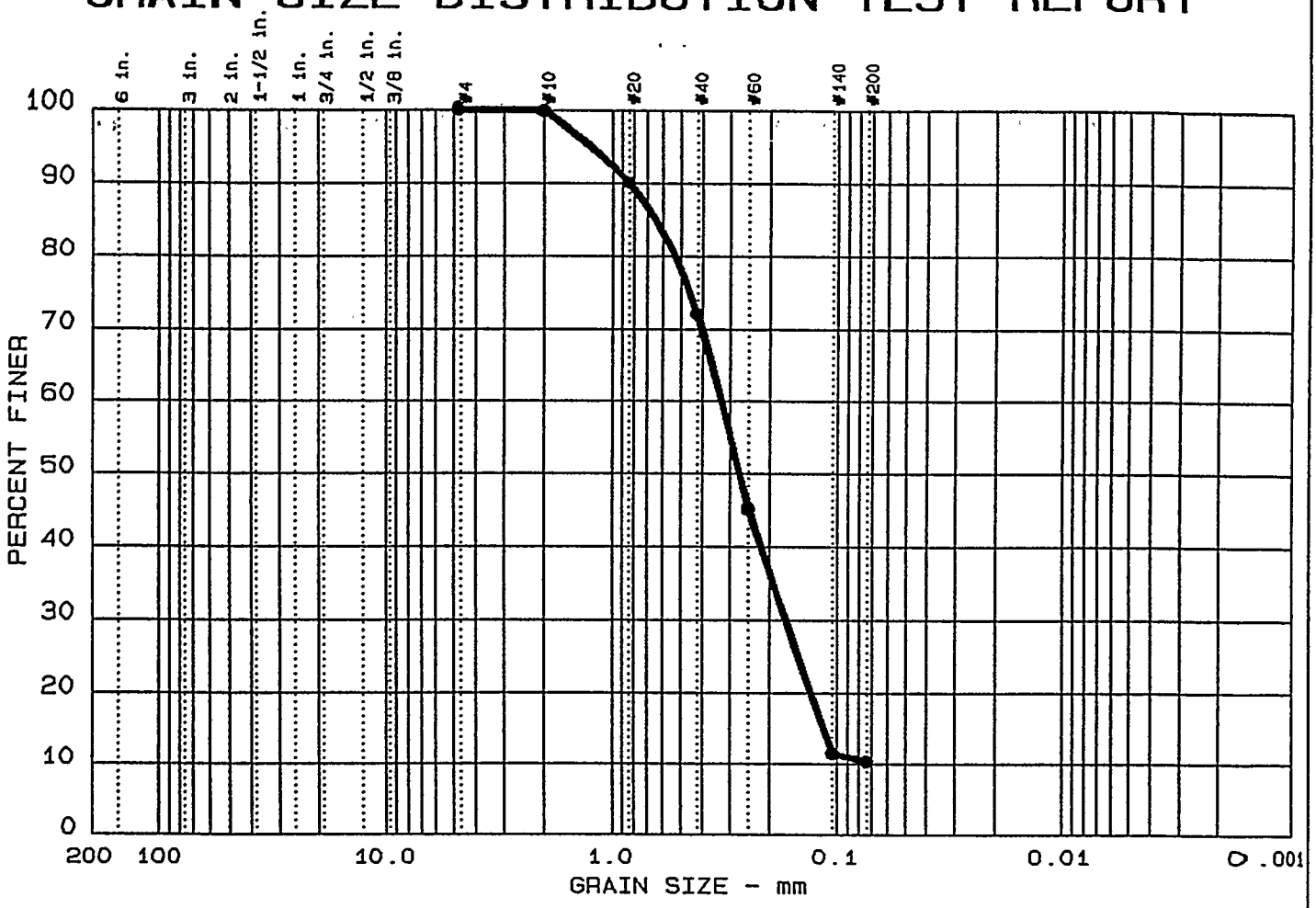
Tested by: SC

Reviewed by: [illegible]

Moisture Content: 26.5%

Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	12	0.0	0.0	89.7	10.3	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.64	0.33	0.27	0.169	0.1146			

MATERIAL DESCRIPTION	USCS	AASHTO
● Brown Poorly Graded Sand with Silt		

Project No.: 50161-7-0108.40
Project: Salt Disposition Facility Investigation
◆ Location: SDFBB1, SS-28 @ 60-62.0 Ft.

Date: June 8, 1999

GRAIN SIZE DISTRIBUTION TEST REPORT

LAW ENGINEERING, INC.

Remarks:

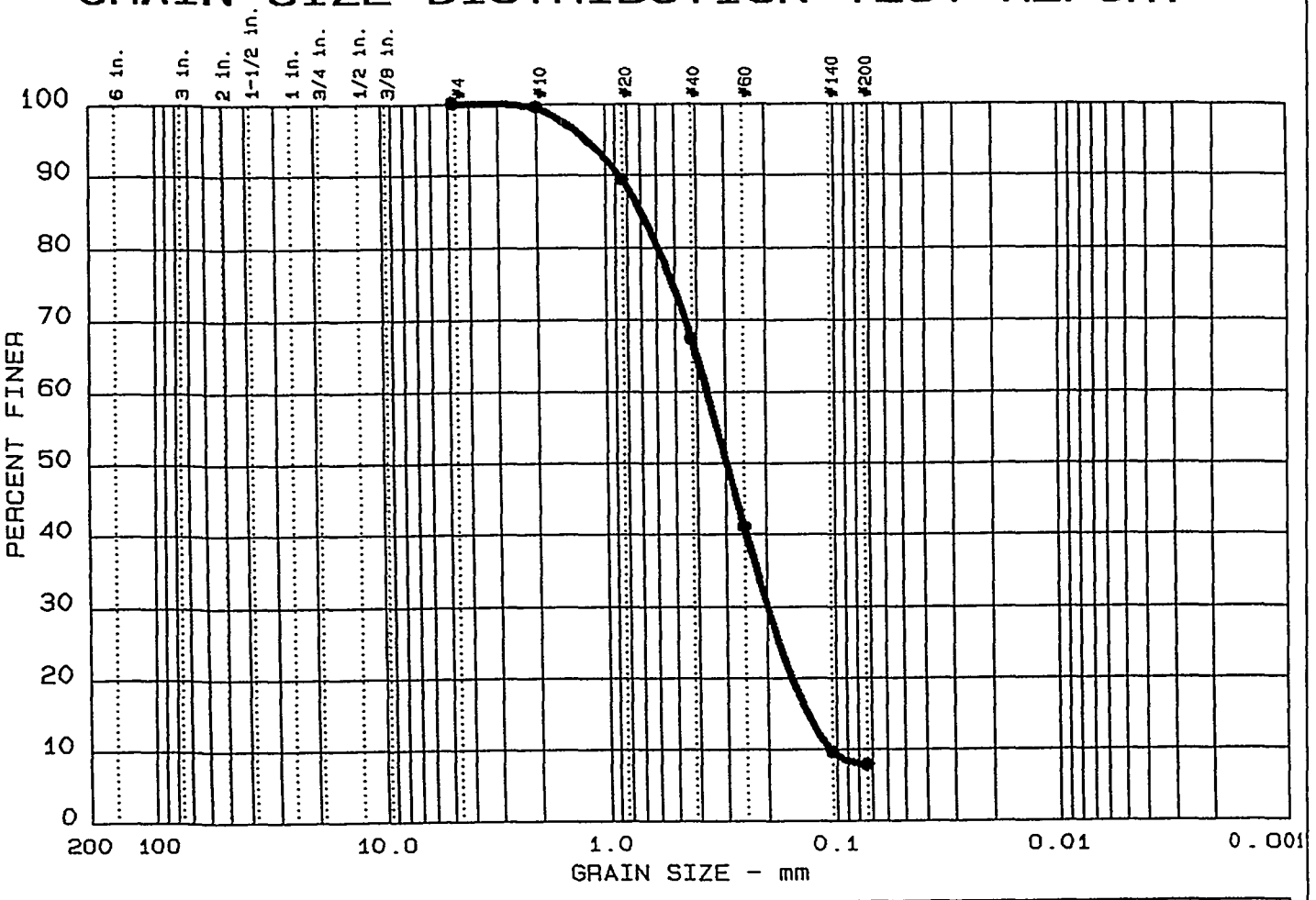
Tested by: SC

Reviewed by: HJ

Moisture Content: 23.7%

Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	1	0.0	0.0	92.1	7.9	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.69	0.36	0.30	0.200	0.1347	0.1070	1.04	3.4

MATERIAL DESCRIPTION	USCS	AASHTO
● Tan Poorly Graded Sand with Silt		

Project No.: 50161-7-0108.40
Project: Salt Disposition Facility Investigation
● Location: SDFB81, SS-31 @ 66-68.0 Ft.

Date: June 8, 1999

GRAIN SIZE DISTRIBUTION TEST REPORT

LAW ENGINEERING, INC.

Remarks:

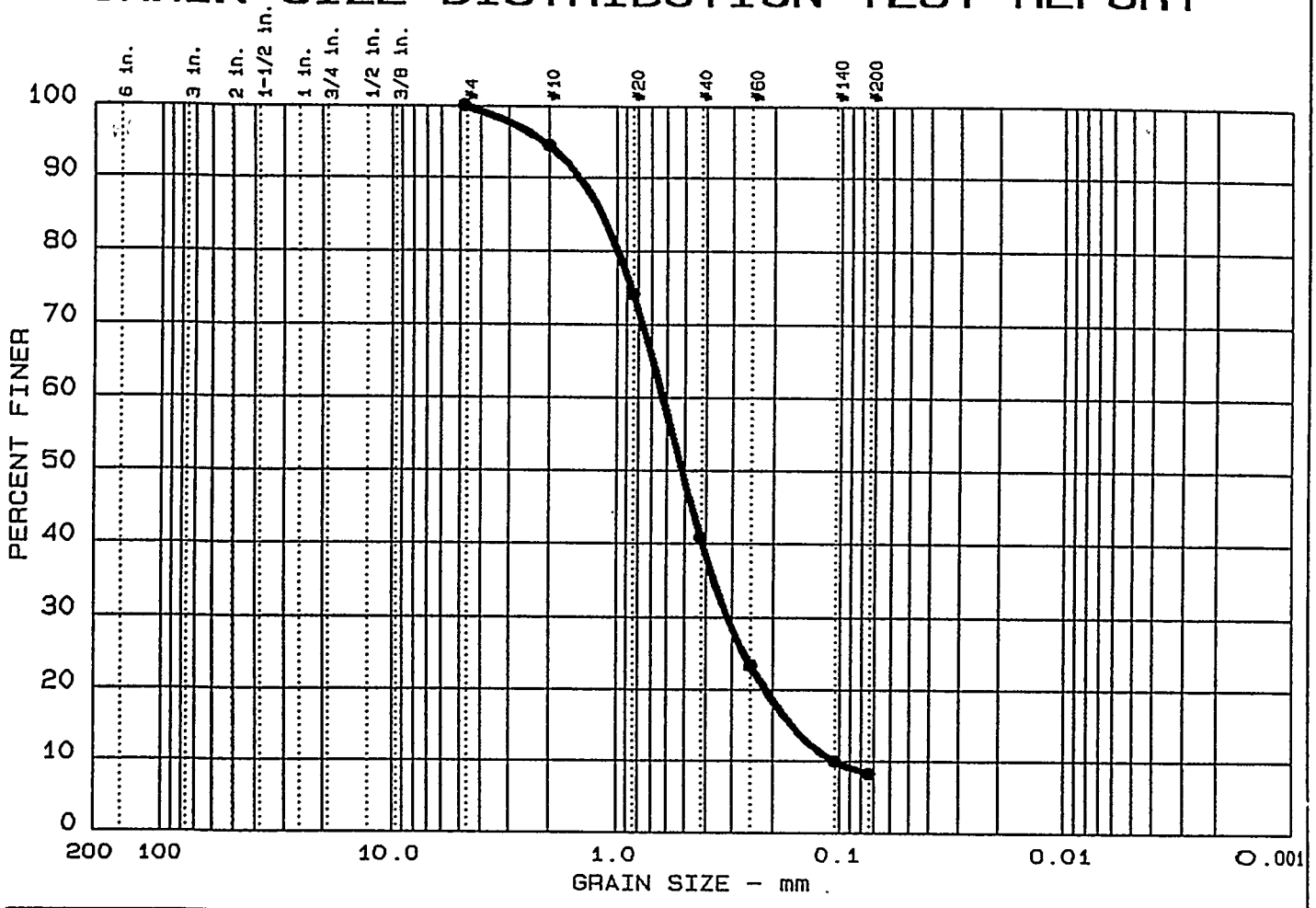
Tested by: SC

Reviewed by: HD

Moisture Content: 19.9%

Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	19	0.0	0.0	91.8	8.2	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			1.16	0.62	0.51	0.316	0.1637	0.1057	1.51	5.9

MATERIAL DESCRIPTION	USCS	AASHTO
● Tan Poorly Graded Sand with Silt		

Project No.: 50161-7-0108.40
Project: Salt Disposition Facility Investigation
● Location: SDFBB1, SS-34 @ 72-74.0 Ft.

Date: June 8, 1999

GRAIN SIZE DISTRIBUTION TEST REPORT

LAW ENGINEERING, INC.

Remarks:

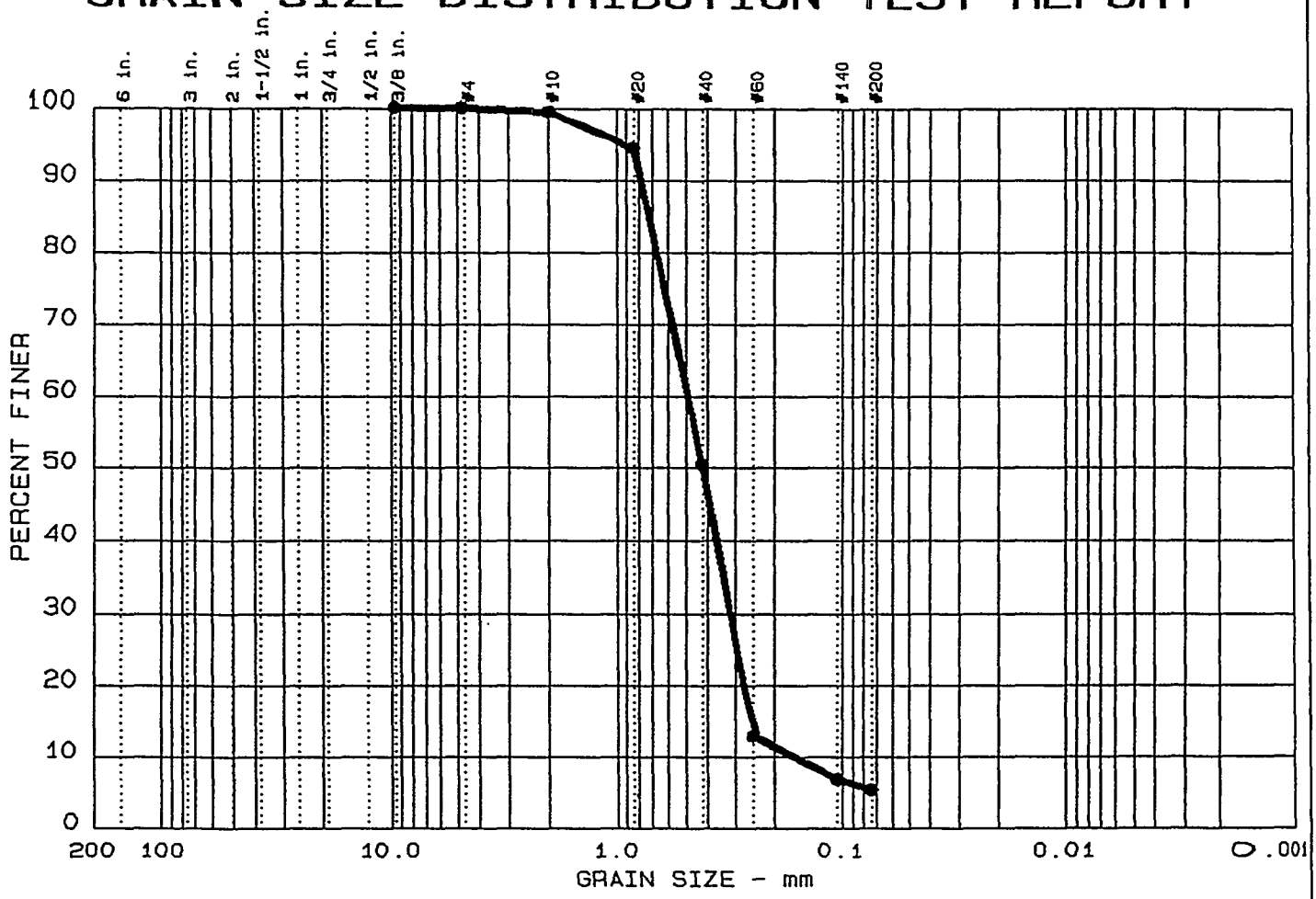
Tested by: SC

Reviewed by: HO

Moisture Content: 15.6%

Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	11	0.0	0.0	94.6	5.4	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.72	0.49	0.42	0.316	0.2570	0.1641	1.25	3.0

	MATERIAL DESCRIPTION	USCS	AASHTO
●	Brown-Tan Poorly Graded Sand with Silt		

Project No.: 50161-7-0108.40
Project: Salt Disposition Facility Investigation
● Location: SDFBB1, SS-36 @ 76-78.0 Ft.

Date: June 8, 1999

GRAIN SIZE DISTRIBUTION TEST REPORT

LAW ENGINEERING, INC.

Remarks:

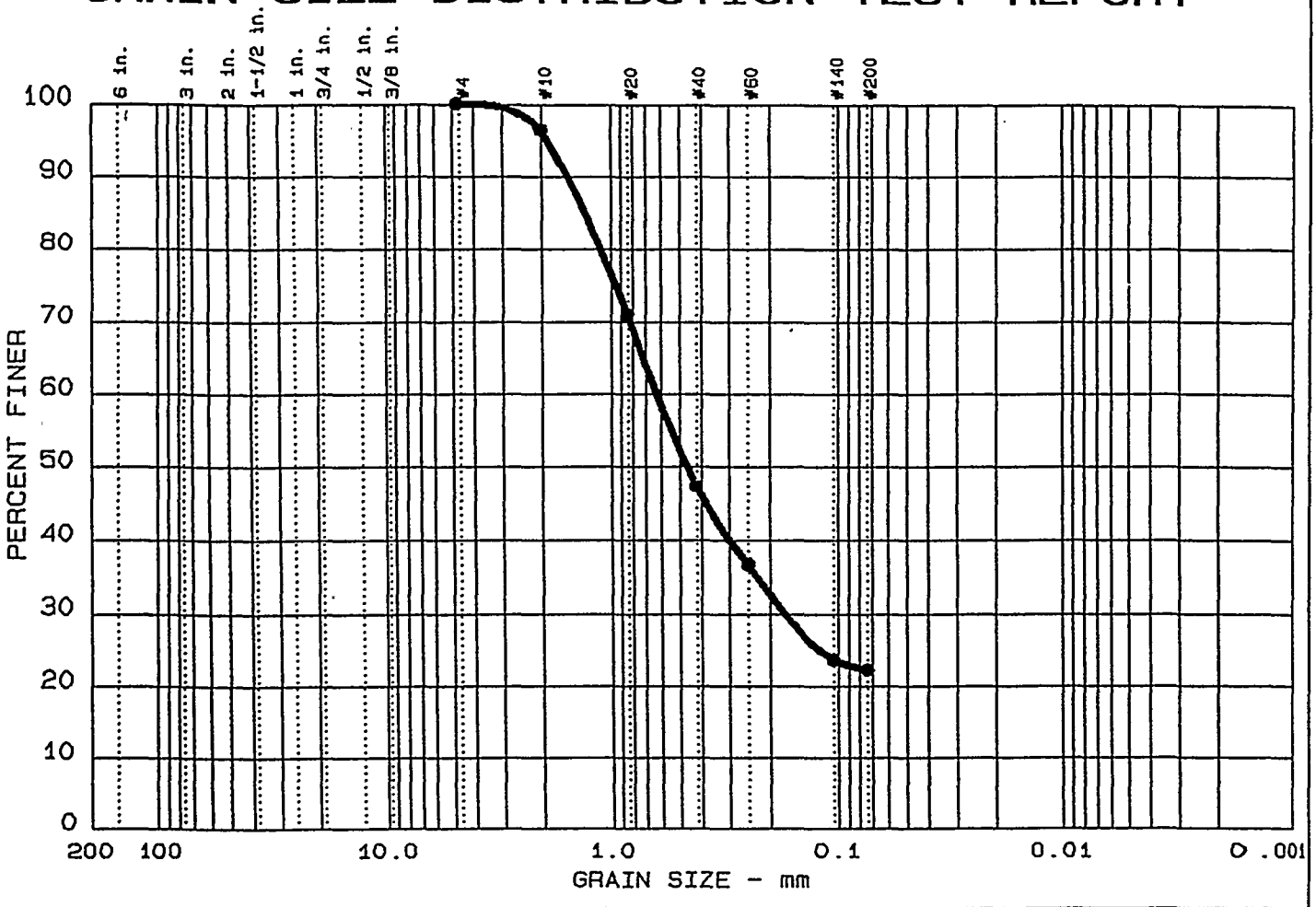
Tested by: SC

Reviewed by: HD

Moisture Content: 16.8%

Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	3	0.0	0.0	77.7	22.3	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	82	59	1.30	0.62	0.46	0.173				

MATERIAL DESCRIPTION	USCS	AASHTO
● Brown-Tan Clayey Sand	SC	A-2-7(3.4)

Project No.: 50161-7-0108.40
Project: Salt Disposition Facility Investigation
● Location: SDFBB1, SS-38 @ 80-82.0 Ft.

Date: June 8, 1999

Remarks:

Tested by: SC

Reviewed by: AB

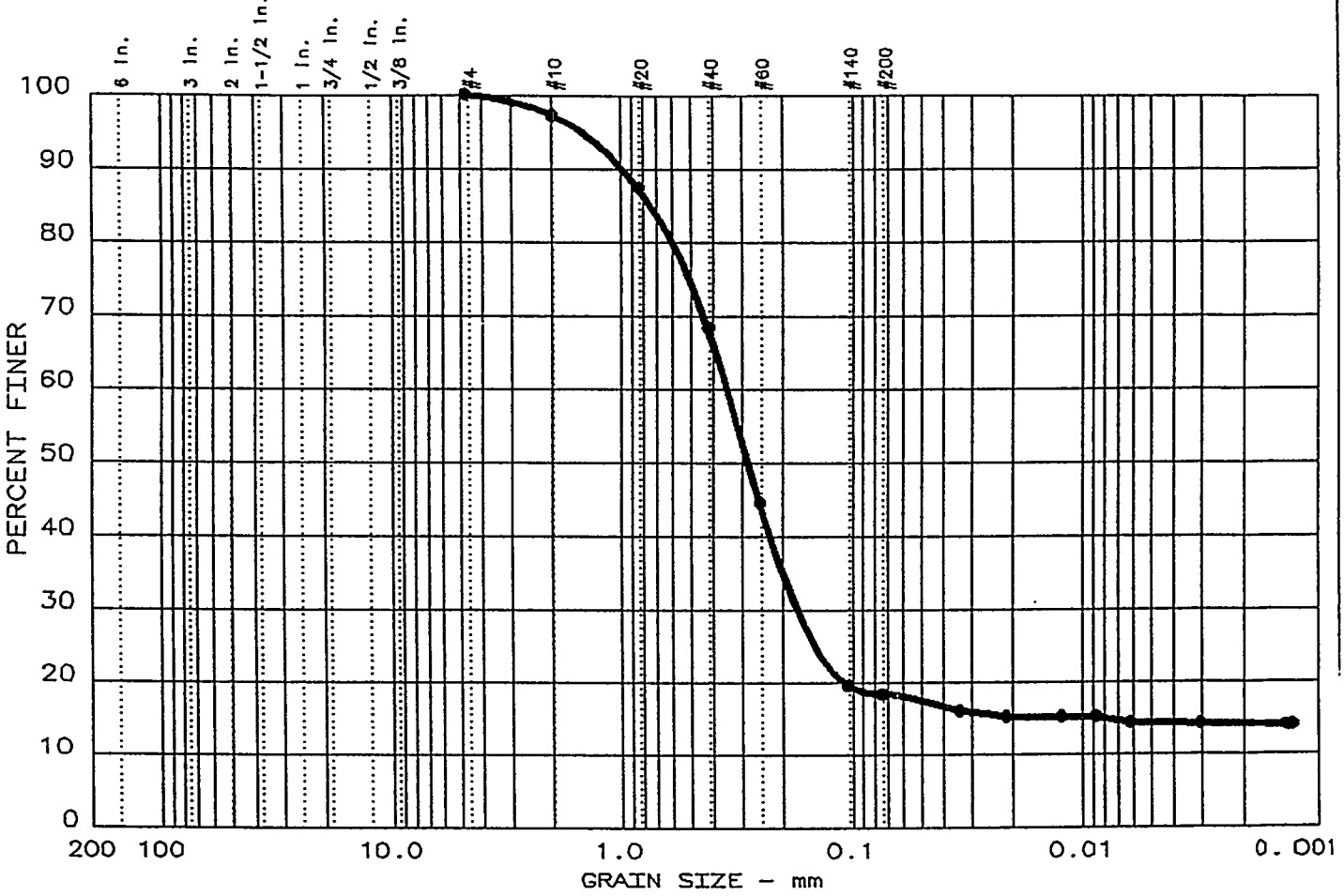
Moisture Content: 33.8%

GRAIN SIZE DISTRIBUTION TEST REPORT

LAW ENGINEERING, INC.

Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	9	0.0	0.0	81.6	4.1	14.3

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.74	0.35	0.28	0.171	0.0077			

MATERIAL DESCRIPTION	USCS	AASHTO
● Tan Brown Clayey Sand		

Project No.: 50161-7-0108 Task 40
Project: Salt Disposition Facility Investigation
● Location: SDFBB1 SS-40 @ 84-86 Ft.

Date: June 15, 1999

GRAIN SIZE DISTRIBUTION TEST REPORT

LAW ENGINEERING, INC.

Remarks:

Tested by: SC

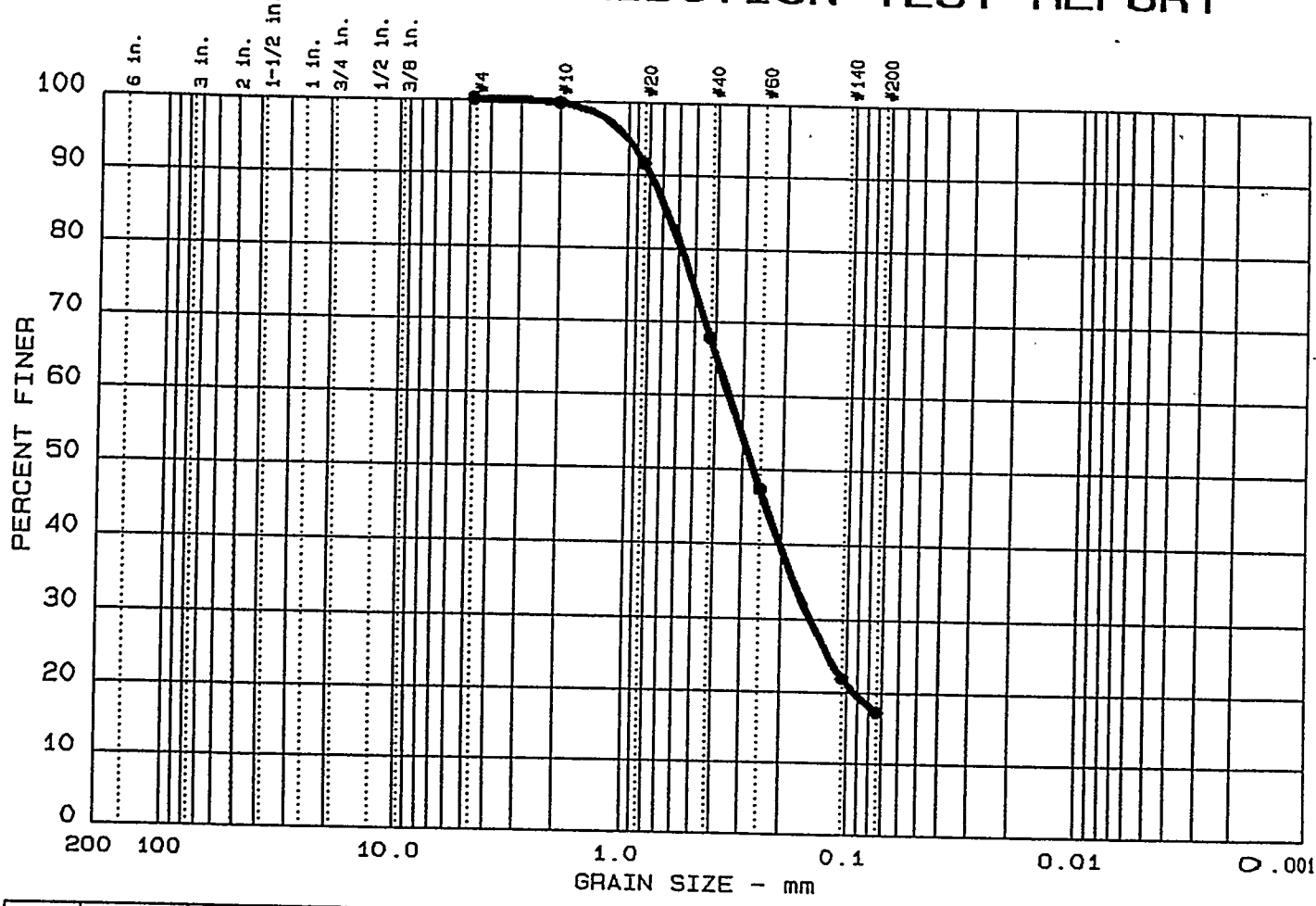
Reviewed by: KB

Moisture Content = 26.4%

ASTM D422, D4318 & D2216

Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	B	0.0	0.0	82.7	17.3	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	50	23	0.67	0.35	0.27	0.149				

MATERIAL DESCRIPTION	USCS	AASHTO
● Tan Clayey Sand	SC	A-2-7 (0.3)

Project No.: 50161-7-0108.40
Project: Salt Disposition Facility Investigation
● Location: SDFBB1, SS-42 @ 88-90.0 Ft.

Date: June 8, 1999

GRAIN SIZE DISTRIBUTION TEST REPORT

LAW ENGINEERING, INC.

Remarks:

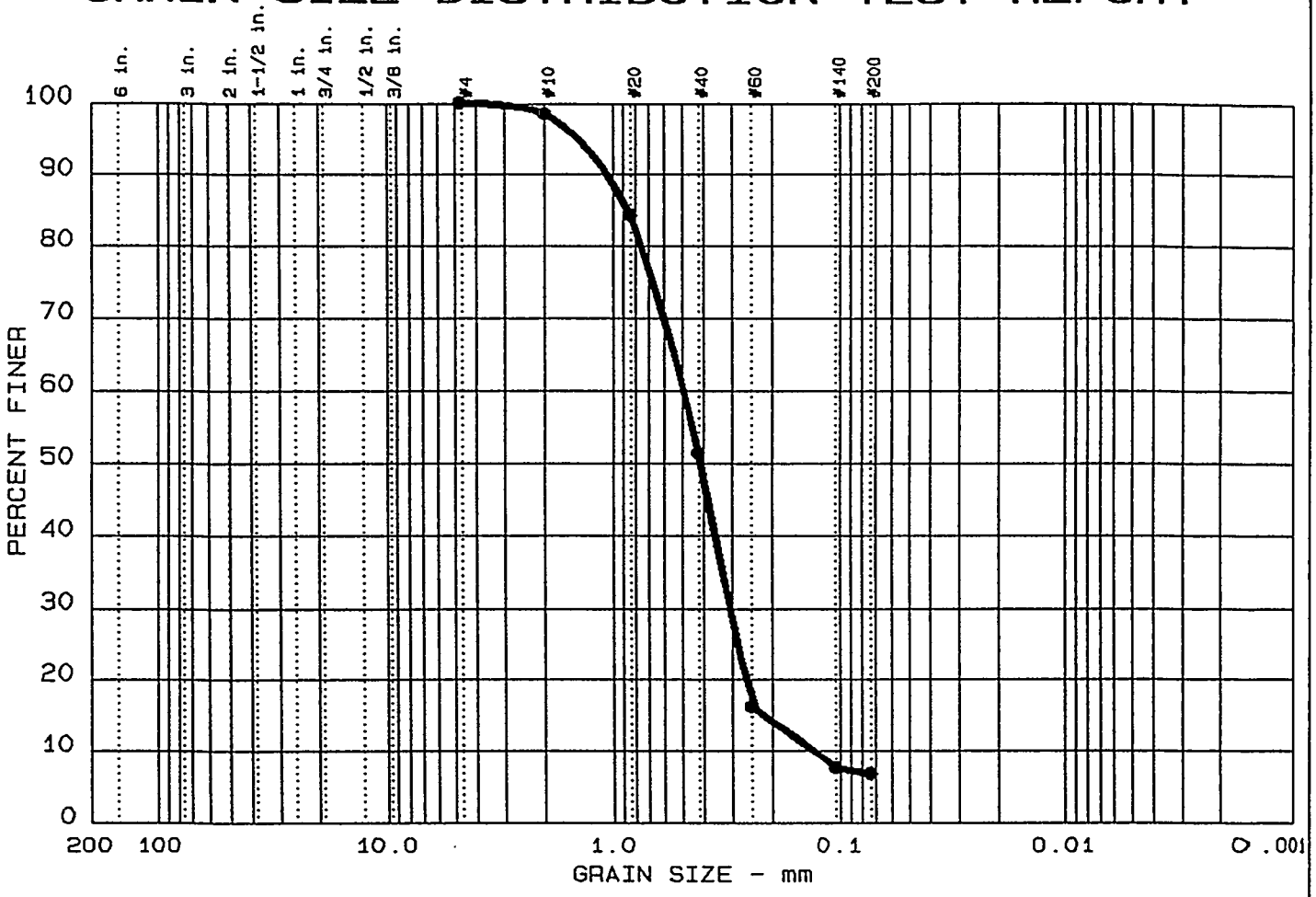
Tested by: SC

Reviewed by: HB

Moisture Content: 33.1%

Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	5	0.0	0.0	93.2	6.8	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.86	0.49	0.41	0.306	0.2193	0.1321	1.45	3.7

MATERIAL DESCRIPTION	USCS	AASHTO
● Brown-Tan Poorly Graded Sand with Silt		

Project No.: 50161-7-0108.40
Project: Salt Disposition Facility Investigation
● Location: SDFBB1, SS-47 @ 98-100 Ft.

Date: June 8, 1999

GRAIN SIZE DISTRIBUTION TEST REPORT

LAW ENGINEERING, INC.

Remarks:

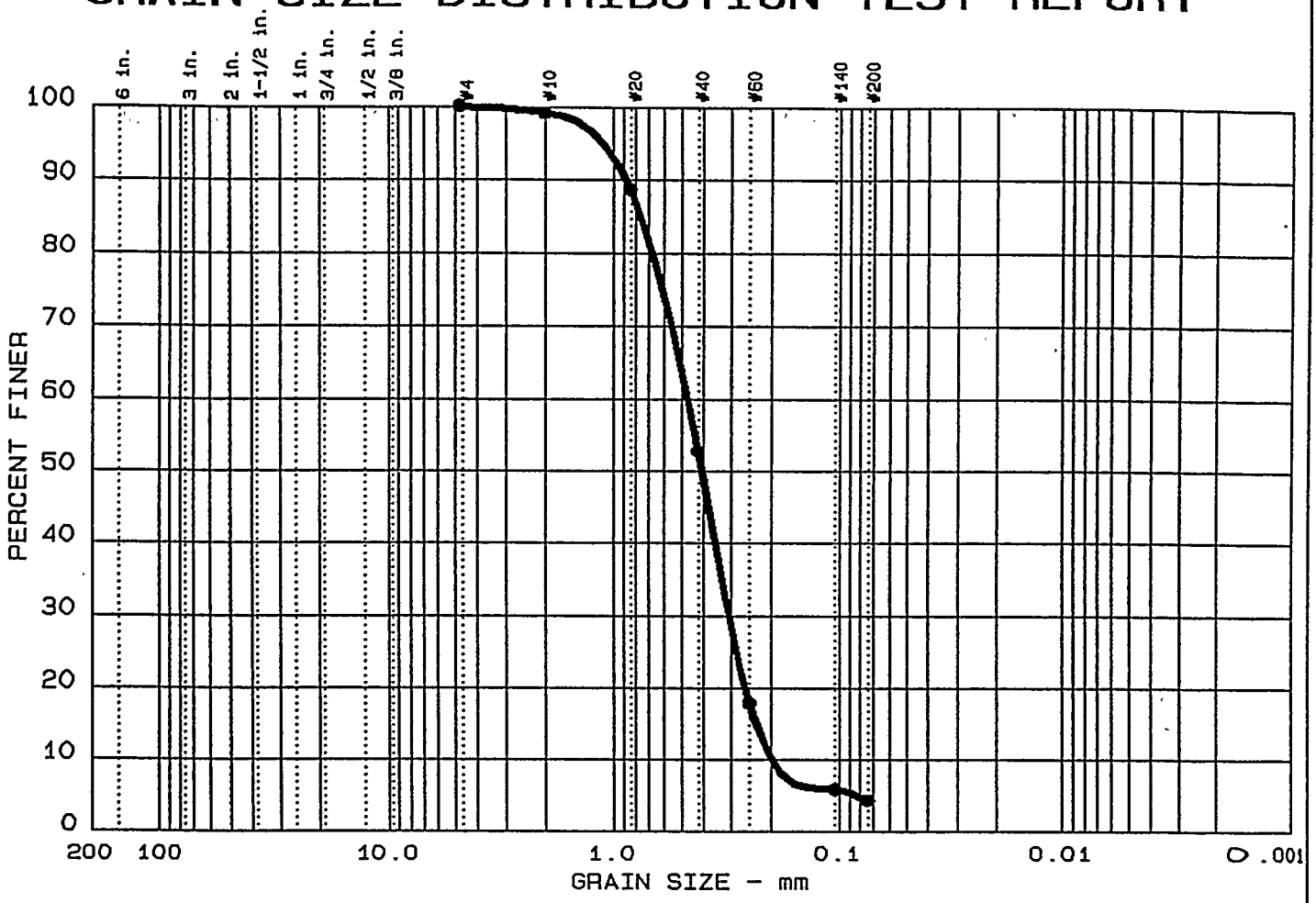
Tested by: SC

Reviewed by: HB

Moisture Content: 21.0%

Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	15	0.0	0.0	95.7	4.3	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.75	0.47	0.40	0.306	0.2342	0.1993	1.01	2.3

MATERIAL DESCRIPTION	USCS	AASHTO
● Brown Poorly Graded Sand		

Project No.: 50161-7-0108.40
Project: Salt Disposition Facility Investigation
● Location: SDFBB1, SS-49 @ 102-104.0 Ft.

Date: June 8, 1999

GRAIN SIZE DISTRIBUTION TEST REPORT

LAW ENGINEERING, INC.

Remarks:

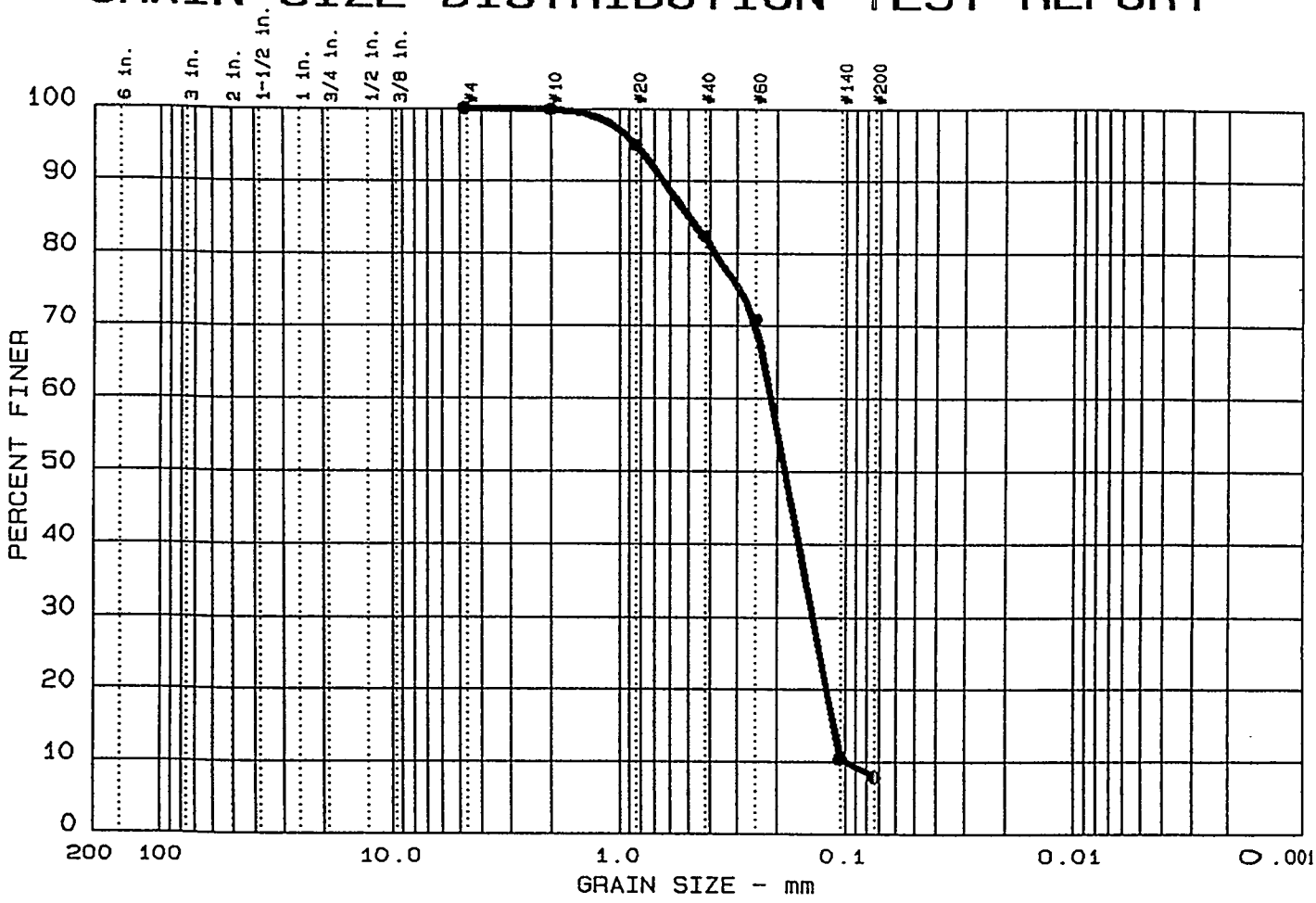
Tested by: SC

Reviewed by: HB

Moisture Content: 18.0%

Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
◐	14	0.0	0.0	92.2	7.8	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
◐			0.49	0.21	0.19	0.139	0.1122	0.0989	0.92	2.2

MATERIAL DESCRIPTION	USCS	AASHTO
◐ Brown Poorly Graded Sand with Silt		

Project No.: 50161-7-0108.40
Project: Salt Disposition Facility Investigation
◐ Location: SDF8B1, SS-52 @ 108-110 Ft.

Date: June 8, 1999

GRAIN SIZE DISTRIBUTION TEST REPORT

LAW ENGINEERING, INC.

Remarks:

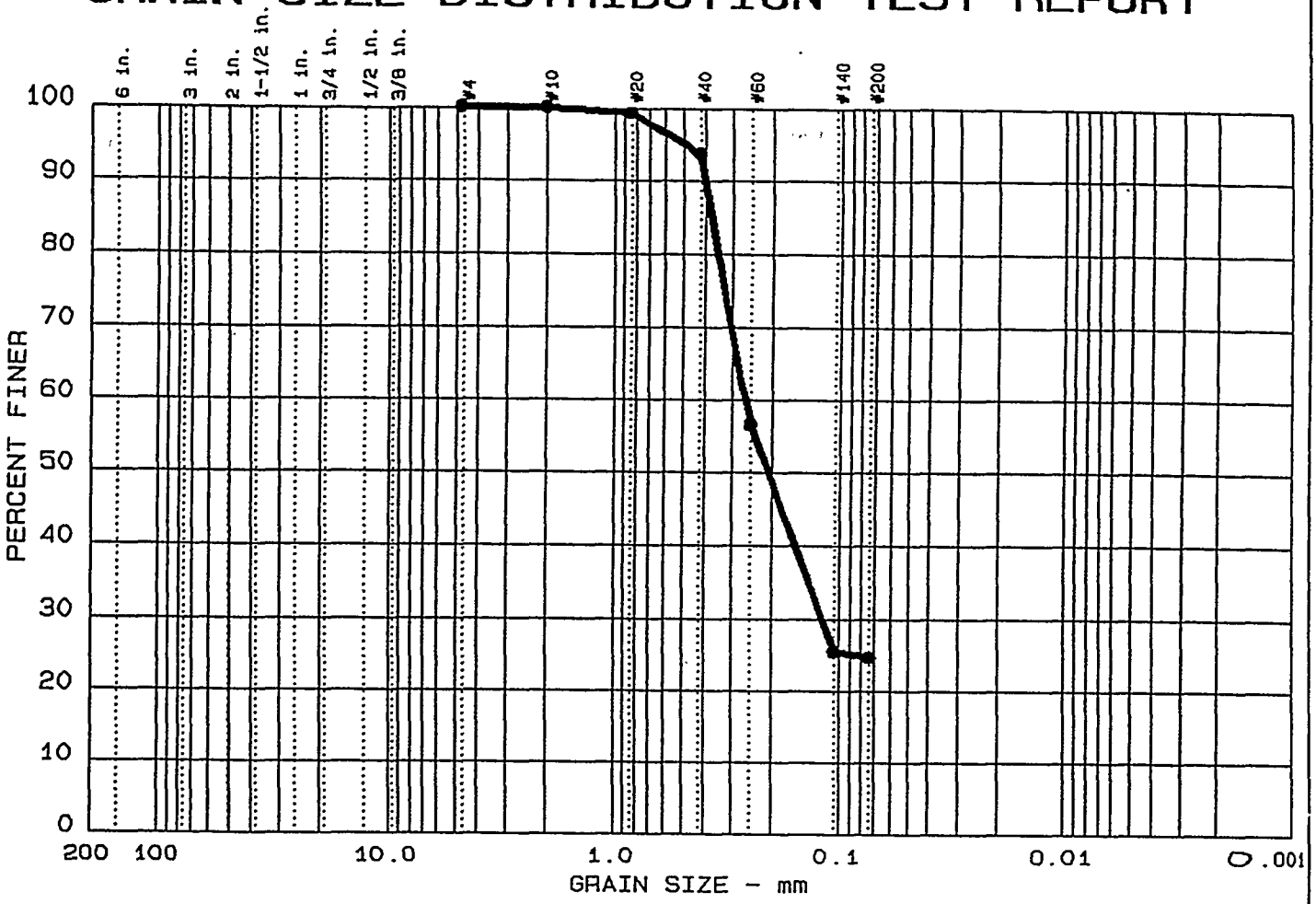
Tested by: SC

Reviewed by: HJ

Moisture Content: 26.5%

Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	7	0.0	0.0	75.3	24.7	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.37	0.26	0.21	0.119				

MATERIAL DESCRIPTION	USCS	AASHTO
● Brown-Tan Silty Sand		

Project No.: 50161-7-0108.40
Project: Salt Disposition Facility Investigation
● Location: SDFBB1, SS-56 @ 116-118 Ft.

Date: June 8, 1999

Remarks:

Tested by: SC

Reviewed by: HB

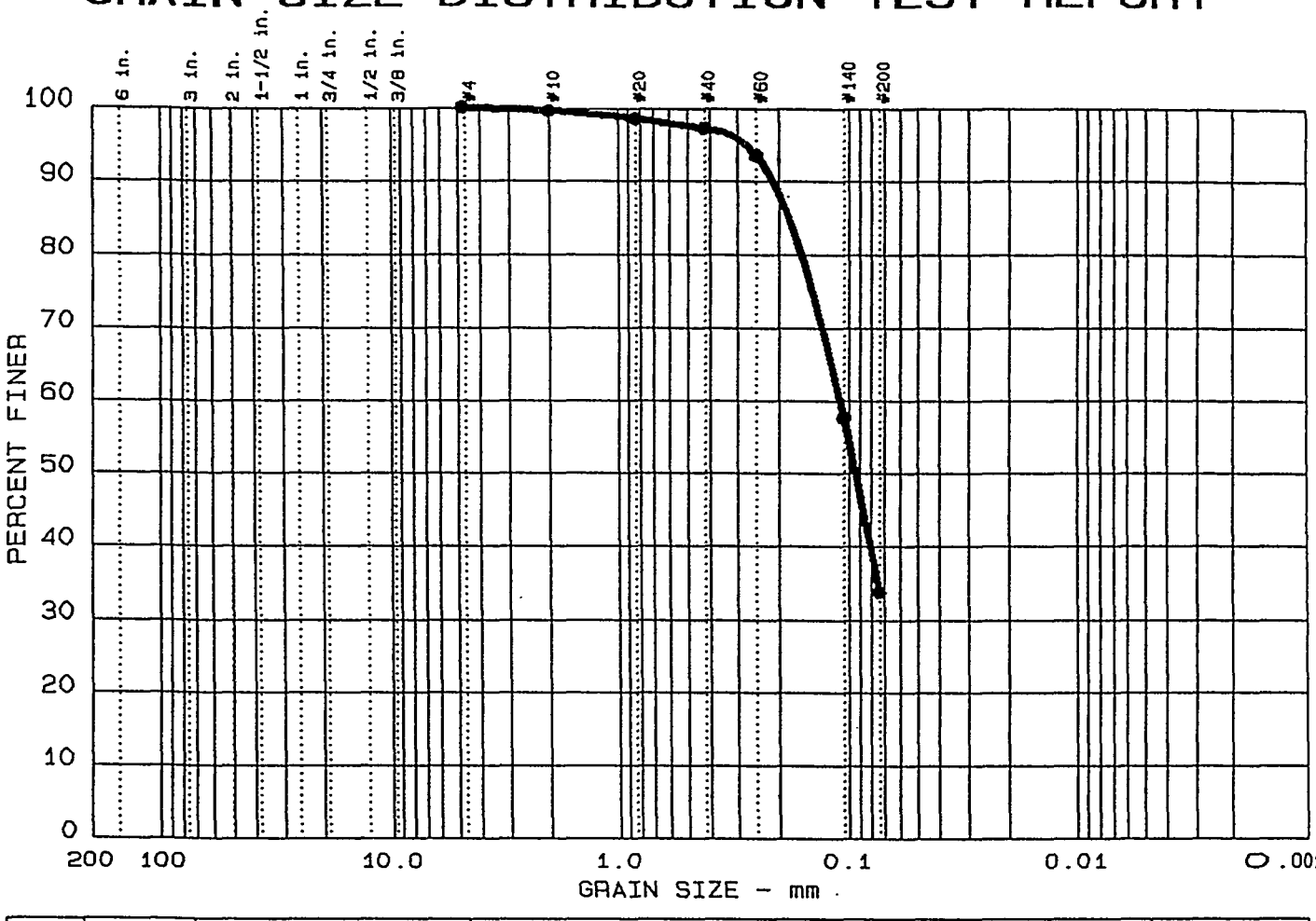
Moisture Content: 30.1%

GRAIN SIZE DISTRIBUTION TEST REPORT

LAW ENGINEERING, INC.

Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	20	0.0	0.0	66.2	33.8	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_C	C_U
●			0.18	0.11	0.09					

MATERIAL DESCRIPTION	USCS	AASHTO
● Gray Silty Sand		

Project No.: 50161-7-0108.40
Project: Salt Disposition Facility Investigation
● Location: SDFBB1, SS-58 @ 120-122.0 Ft.

Date: June 8, 1999

GRAIN SIZE DISTRIBUTION TEST REPORT

LAW ENGINEERING, INC.

Remarks:

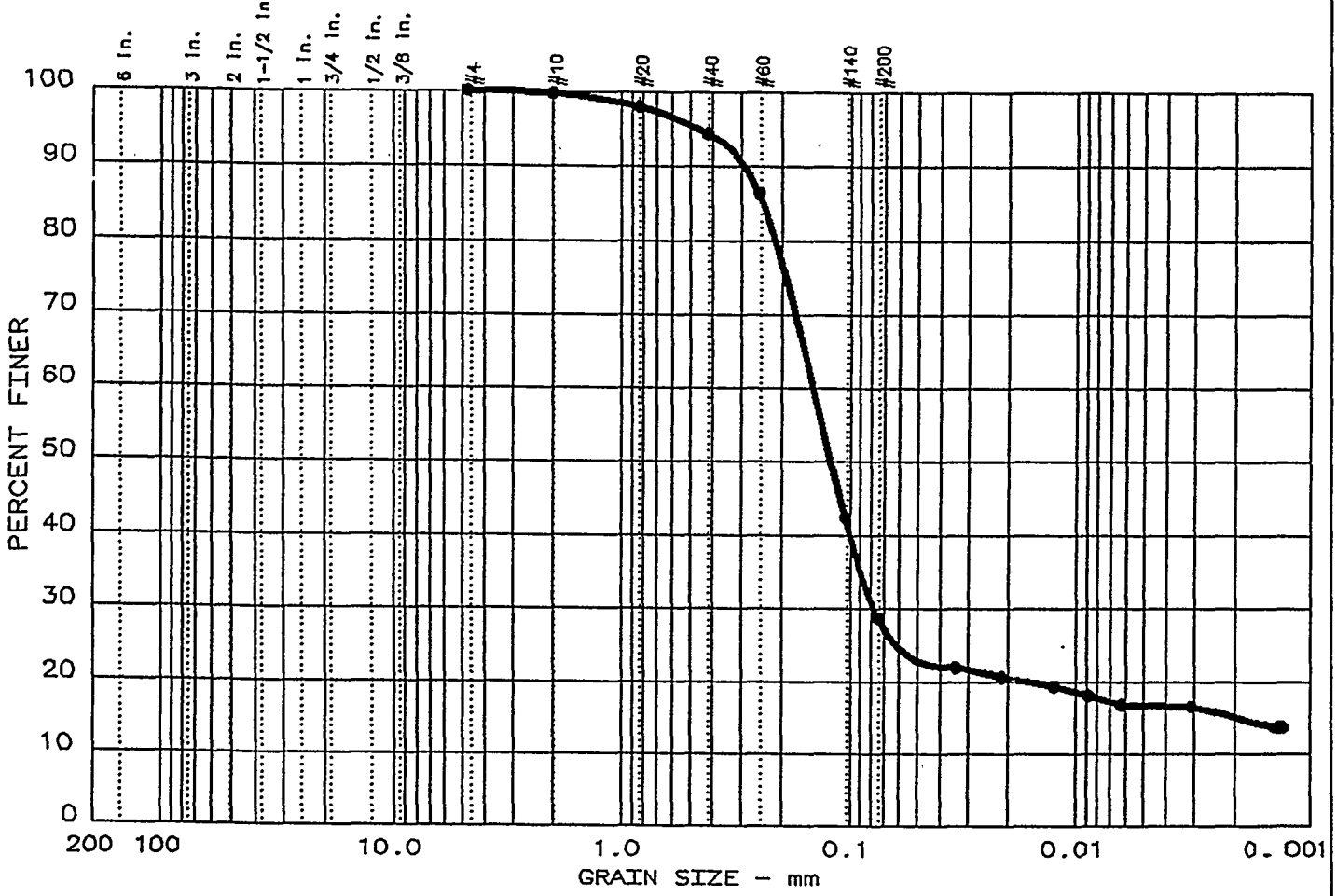
Tested by: SC

Reviewed by: JB

Moisture Content: 49.9%

Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	10	0.0	0.0	71.3	11.9	16.8

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	53	26	0.24	0.14	0.12	0.077	0.0019			

MATERIAL DESCRIPTION	USCS	AASHTO
● Tan & Gray Clayey Sand	SC	A-2-7(2.2)

Project No.: 50161-7-0108 Task 40
Project: Salt Disposition Facility Investigation
● Location: SDFBB1 SS-59 @ 122-124 Ft.

Date: June 15,1999

GRAIN SIZE DISTRIBUTION TEST REPORT

LAW ENGINEERING, INC.

Remarks:

Tested by: SC

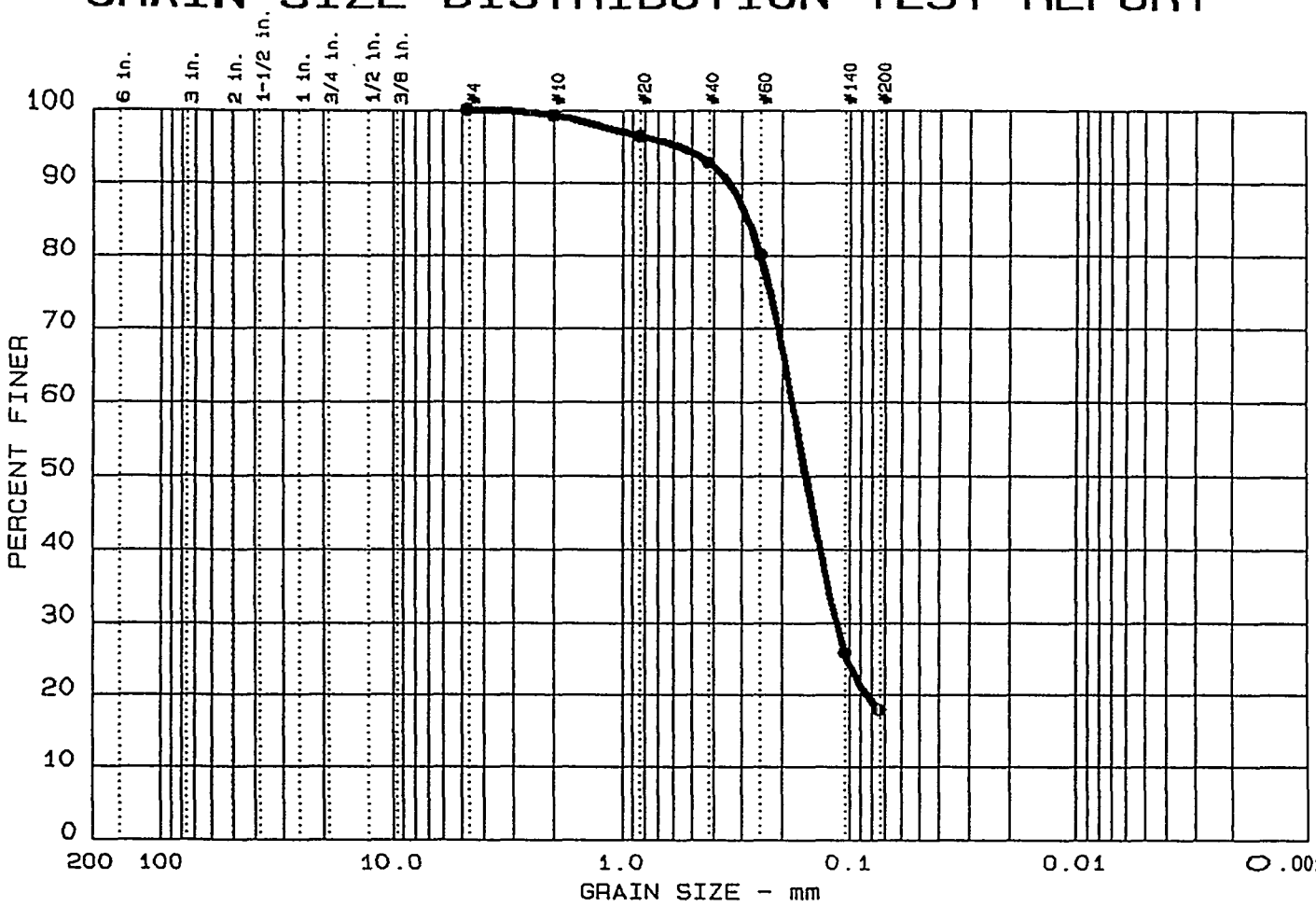
Reviewed by: [illegible]

Moisture Content = 38.9%

ASTM D422,D4318 & D2216

Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	13	0.0	0.0	82.1	17.9	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.28	0.18	0.16	0.115				

MATERIAL DESCRIPTION	USCS	AASHTO
● Tan-Brown Silty Sand		

Project No.: 50161-7-0108.40
Project: Salt Disposition Facility Investigation
● Location: SDFBB1, SS-60 @ 124-126 Ft.

Date: June 8, 1999

Remarks:

Tested by: SC

Reviewed by: lb

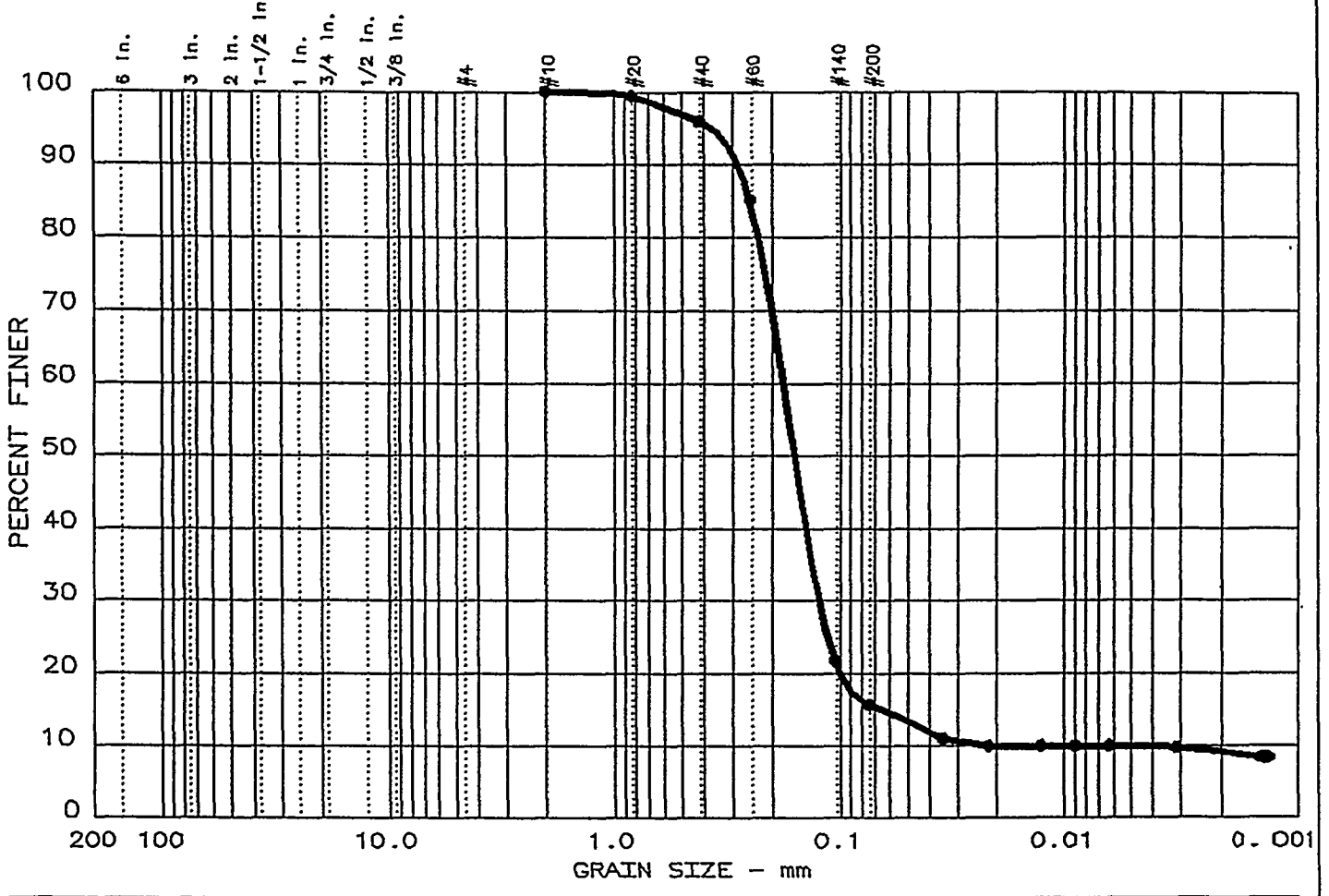
Moisture Content: 37.5%

GRAIN SIZE DISTRIBUTION TEST REPORT

LAW ENGINEERING, INC.

Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	8	0.0	0.0	84.2	5.8	10.0

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	33	5	0.25	0.18	0.16	0.122	0.0641	0.0225	3.75	7.9

MATERIAL DESCRIPTION	USCS	AASHTO
● Tan Brown Silty Sand	SM	A-2-4(0.0)

Project No.: 50161-7-0108 Task 40
Project: Salt Disposition Facility Investigation
● Location: SDFBB1 SS-63 @ 130-132 Ft.

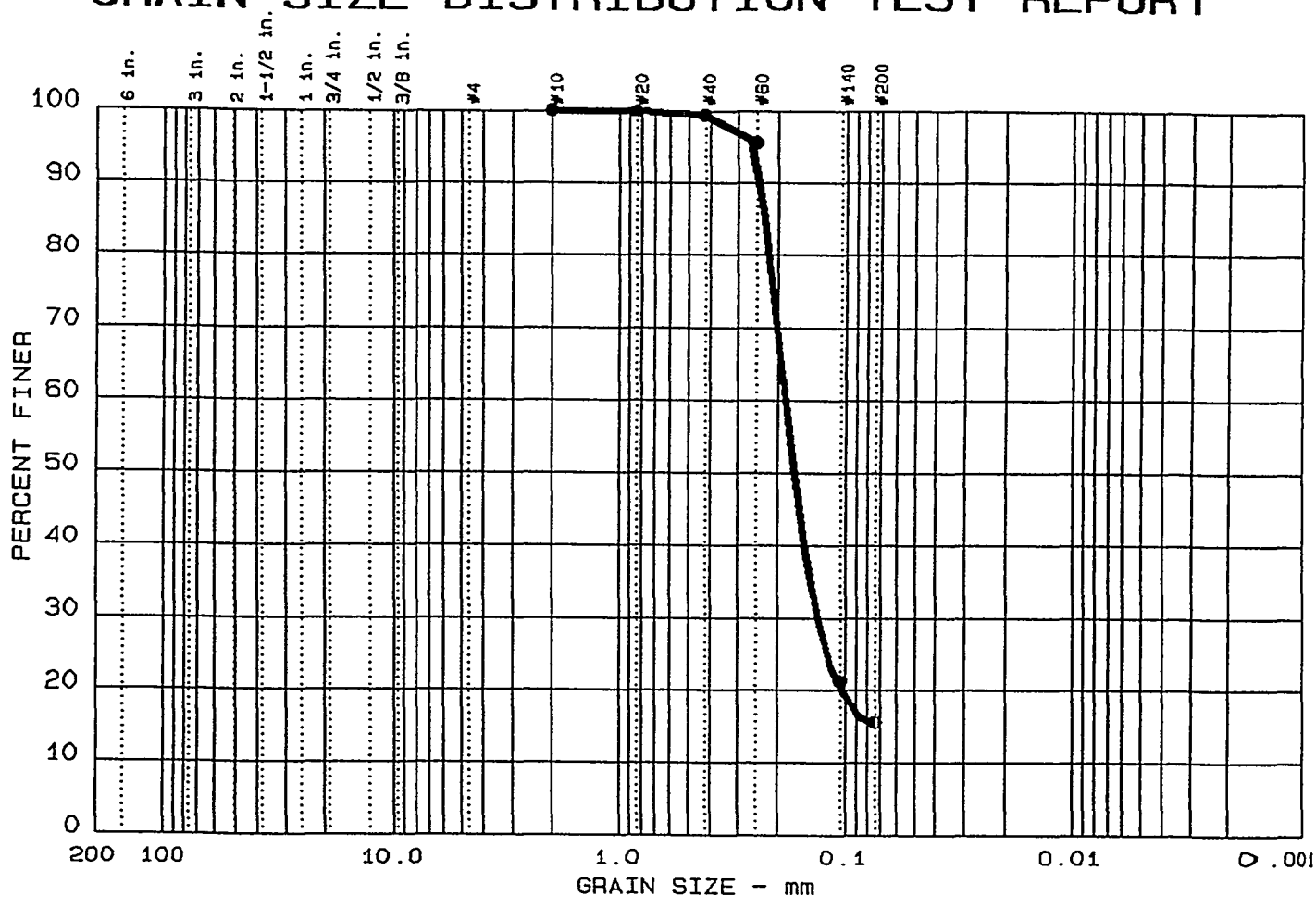
Date: June 15,1999

GRAIN SIZE DISTRIBUTION TEST REPORT
LAW ENGINEERING, INC.

Remarks:
Tested by: SC
Reviewed by: [illegible]
Moisture Content = 36.9%
ASTM D422,D4318 & D2216

Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	9	0.0	0.0	84.4	15.6	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.23	0.19	0.17	0.132				

MATERIAL DESCRIPTION	USCS	AASHTO
● Tan Silty Sand		

Project No.: 50161-7-0108.40
Project: Salt Disposition Facility Investigation
● Location: SDFBB1, SS-64 @ 132-134 Ft.

Date: June 8, 1999

Remarks:

Tested by: SC

Reviewed by: HB

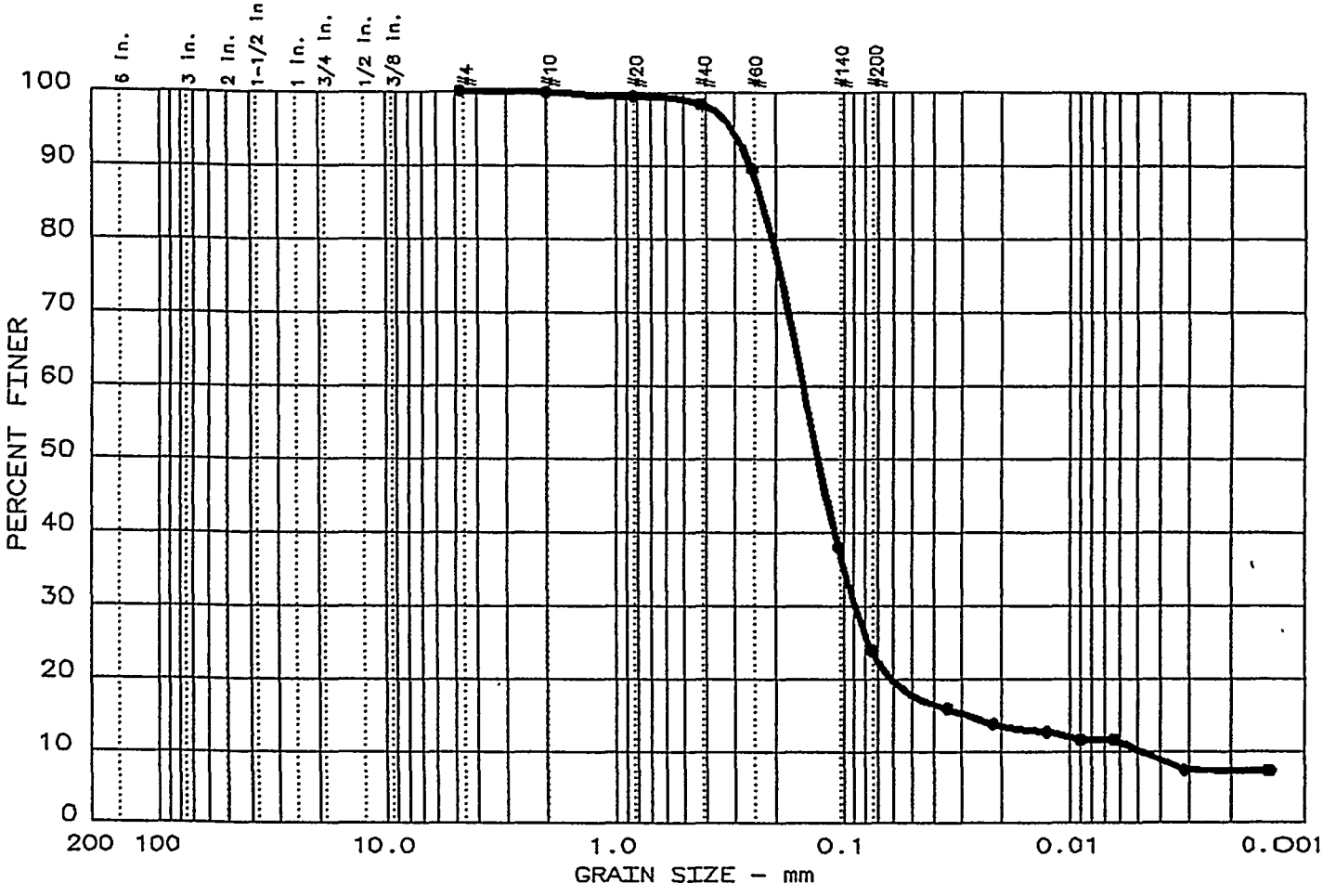
Moisture Content: 39.5%

GRAIN SIZE DISTRIBUTION TEST REPORT

LAW ENGINEERING, INC.

Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	6	0.0	0.0	76.1	13.7	10.2

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	31	6	0.23	0.15	0.13	0.089	0.0274	0.0048	10.93	31.0

MATERIAL DESCRIPTION	USCS	AASHTO
● Tan Brown Silty Sand	SM	A-2-4(0.0)

Project No.: 50161-7-0108 Task 40
Project: Salt Disposition Facility Investigation
● Location: SDFBB1 SS-65 @ 134-136 Ft.

Date: June 15,1999

GRAIN SIZE DISTRIBUTION TEST REPORT

LAW ENGINEERING, INC.

Remarks:

Tested by:

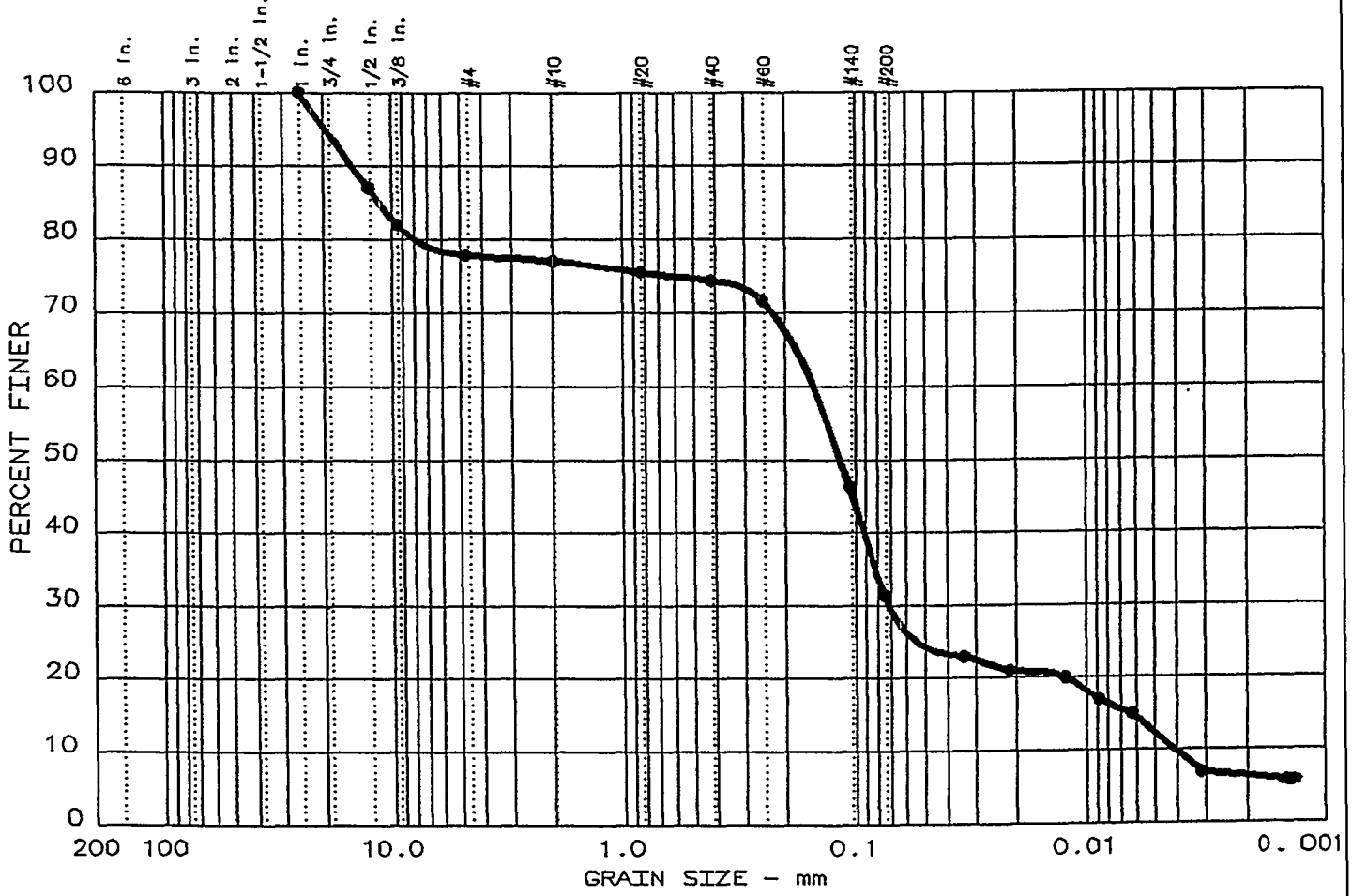
Reviewed by:

Moisture Content = 30.8%

ASTM D422,D4318 & D2216

Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	7	0.0	22.2	46.5	19.0	12.3

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	34	9	11.35	0.15	0.11	0.071	0.0063	0.0041	8.25	36.6

MATERIAL DESCRIPTION	USCS	AASHTO
● Brown Silty Sandy with Gravel	SM	A-2-4(0.0)

Project No.: 50161-7-0108 Task 40
Project: Salt Disposition Facility Investigation
● Location: SDFBB1 SS-67 @ 138-140 Ft.

Date: June 15, 1999

GRAIN SIZE DISTRIBUTION TEST REPORT

LAW ENGINEERING, INC.

Remarks:

Tested by: SC

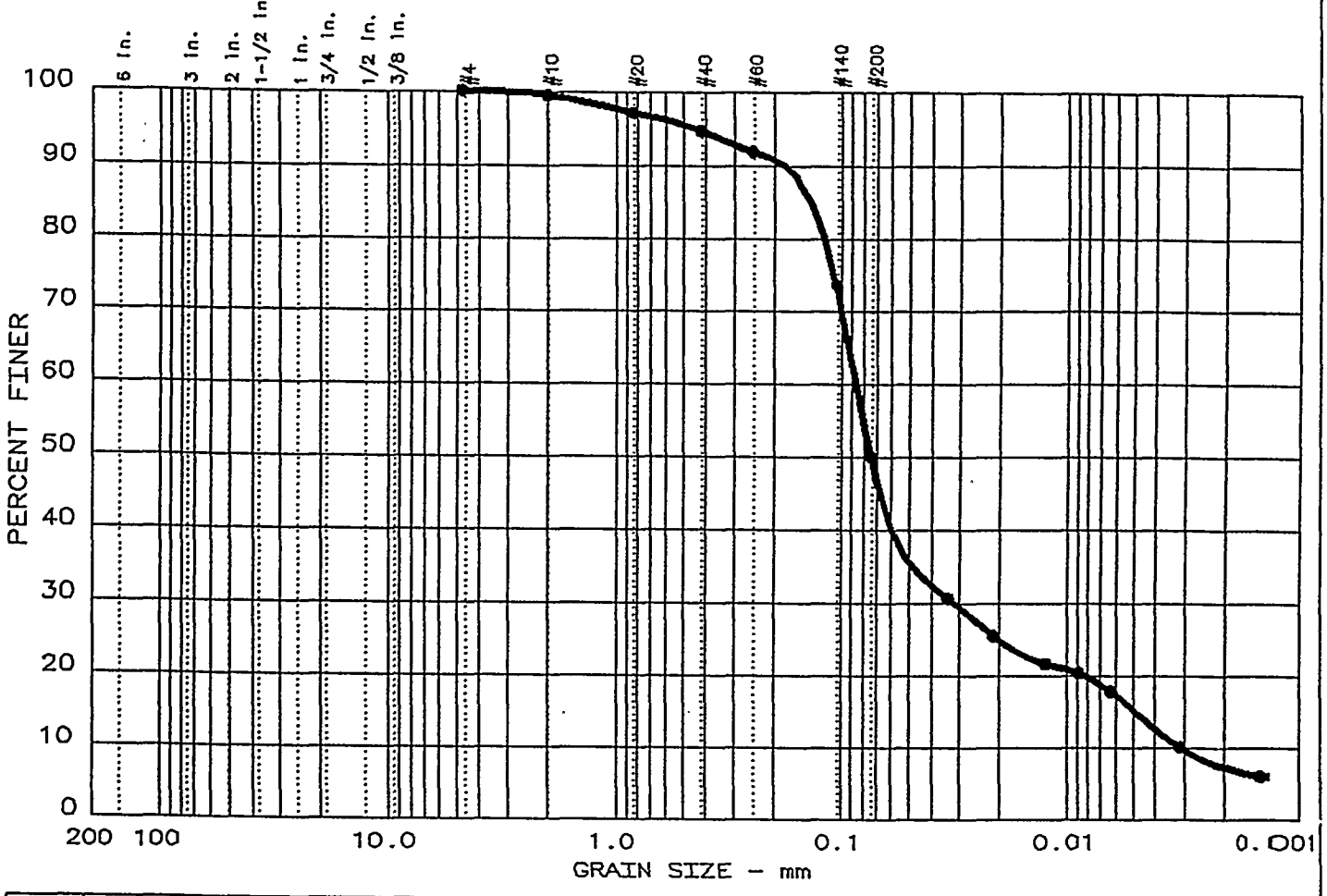
Reviewed by: [illegible]

Moisture Content = 22.7%

ASTM D422, D4318 & D2216

Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	20	0.0	0.0	50.1	34.7	15.2

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	41	10	0.14	0.09	0.07	0.031	0.0048	0.0031	3.67	27.9

MATERIAL DESCRIPTION	USCS	AASHTO
● Gray Brown Silty Sand	SM	A-5(3.1)

Project No.: 50161-7-0108 Task 40
Project: Salt Disposition Facility Investigation
● Location: SDFBB1 SS-69 @ 142-144 Ft.

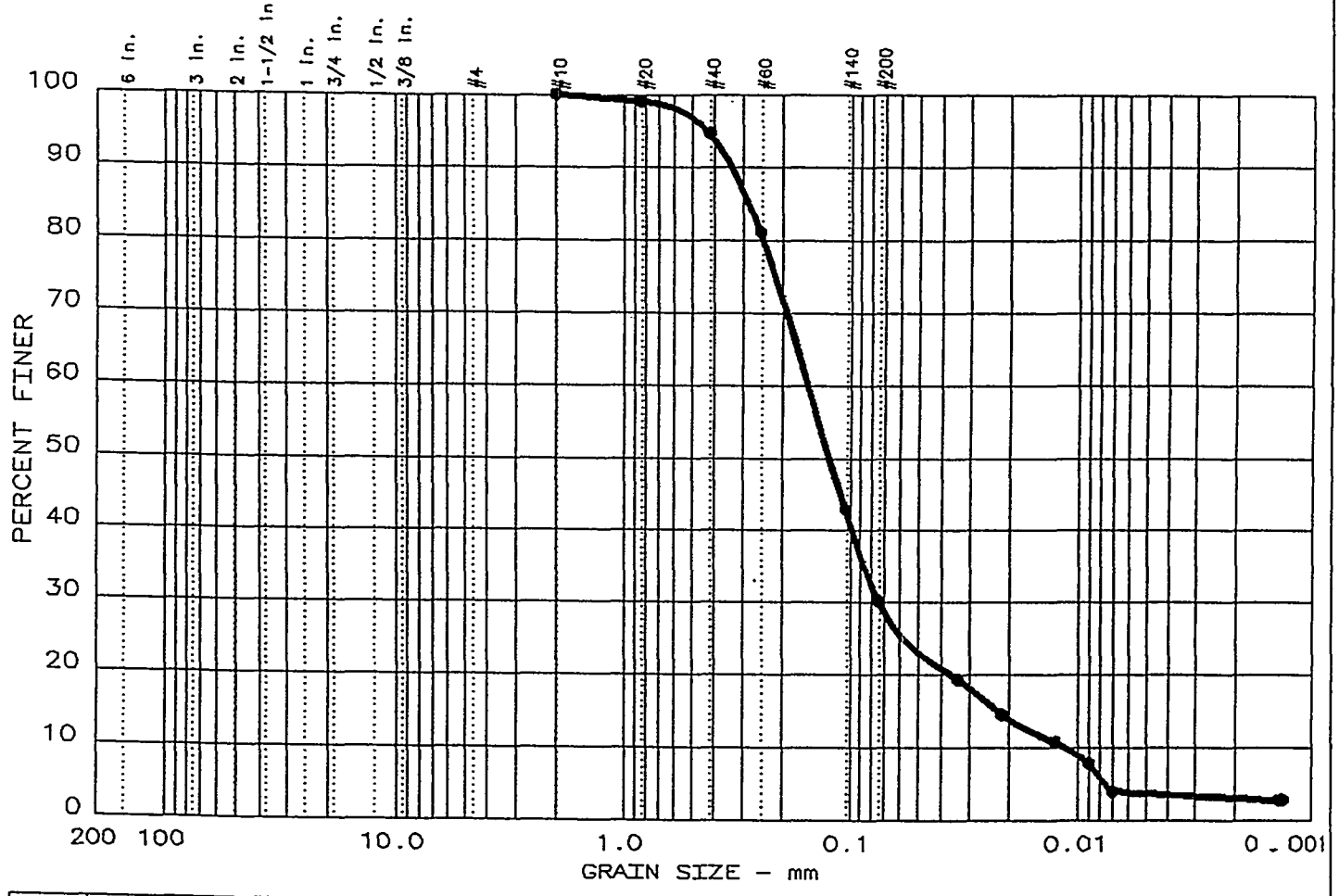
Date: June 16, 1999

GRAIN SIZE DISTRIBUTION TEST REPORT
LAW ENGINEERING, INC.

Remarks:
Tested By: SC
Reviewed by: [illegible]
Moisture Content = 34.7%
ASTM D422, D4318 & D2216

Figure No.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	19	0.0	0.0	69.9	26.5	3.6

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	37	10	0.28	0.15	0.12	0.073	0.0224	0.0112	3.14	13.6

MATERIAL DESCRIPTION	USCS	AASHTO
● Black & Brown Silty Sand	SM	A-2-4(0.0)

Project No.: 50161-7-0108 Task 40
Project: Salt Dispostion Facility Investigation
● Location: SDFB81 SS-71 @ 146-148 Ft.

Date: June 16, 1999

GRAIN SIZE DISTRIBUTION TEST REPORT

LAW ENGINEERING, INC.

Remarks:

Tested By: SC

Reviewed by: HB

Moisture Content = 31.1%

ASTM D422, D4318 & D2216

Figure No.

Appendix E
Groundwater Analysis Results

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Author: John02 Young at SRCCA14
Date: 6/23/99 4:12 PM
Normal
Receipt Requested
TO: Doug Wyatt at SRCCB10
Subject: Groundwater Survey - VOA Analysis Results
---------- Message Contents

for your files

---------- Forward Header ----------
Subject: Groundwater Survey - VOA Analysis Results
Author: John02 Young at SRCCA14
Date: 5/14/99 9:29 AM

SRT-ADS-99-0174

ADS has completed analysis of your 5/13 sample submission for Volatile Organic Analysis that was obtained during the site evaluation for the ITP Replacement Facility. The analyses were completed using a low-level method that was developed for the Inactive Process Sewer Line (IPSL) project. This compound specific selected ion monitoring GC/MS method was used with a performance based method tuned to optimally provide data at your prescribed action levels.

Full range calibration for trichlorofluoromethane (Freon-11) was established and an analytical reference standard was prepared at a concentration of 20µg/L. This standard was fortified with the action levels (5µg/L) of the other target compounds reported. This standard mix was used to establish calibration accuracy on a daily basis at the action levels for the target compounds.

In addition to the target compounds listed below, no other (non-target) compounds were detected in the data.

		target compound concentration, µg/l (ppb)				
ADS#	Cust ID	Benzene	Freon11	CCl4	TCE	PCE
3-127506	SDF-BB1-CP-45	<1	<1	<1	<1	<1
3-127506 duplicate	SDF-BB1-CP-45	<1	<1	<1	<1	<1

where:
Freon11 - trichlorofluoromethane
CCl4 - carbon tetrachloride
TCE - trichloroethene
PCE - tetrachloroethene

Samples reported with uncertainty values are calculated as the average of duplicate determinations, with the estimated uncertainty computed from the difference between the duplicates as described in Standard Methods, 17th edition, section 1-15. Samples with non-detected compounds are not reported with uncertainty values.

Startup qualifications for laboratory control blanks and calibration verification standards were within the acceptable ranges for each of the calibrated, reported compounds.

Please note that this laboratory is not certified by the South Carolina Dept of Health and Environmental Control for the purposes of generating data that is required to demonstrate compliance with a specific permit. The data is qualified for the purposes of establishing your knowledge of the process or facility. Any data from this laboratory that is available or submitted to DHEC must be qualified as originating from a non-certified lab.

H-3 Analysis Report by: THOMAS_J COUNT_RM 20-May-99 07:44 AM

batch description: SDF 990327
Batch_Count_Date: 19-MAY-1999
LS counter no.: 1

Background Analysis Option: BATCH BLANKS
batch average of 2 blank(s): 20.85 cpm.
(personal historical average: 21.91 +/- .08 cpm.
historical maximum: 24.8 minimum: 19.37 cpm.)

calculated spike activity: 2754.9 pCi.
Indirect Spike Eff: 33.57 %.
Direct Spike Eff: 33.57 %.
batch recovery: 100 %.
(personal historical average: 100 +/- 0 %, from 361 batches.
historical maximum: 100 minimum: 100 %.)

Sample ID	Sample Date	Days Dcy.	Aliq. (ml)	Recov. (%)	Activity (pCi/ml) Conc. +/- Uncert.	Eff. (%)
SDF BB1 CP	10-MAY-99	9.00	5.00	100.0	4.06 +/- .817	33.7
SDF BB1 CP REP	10-MAY-99	9.00	5.00	119.2	3.71 +/- .694	33.7

To: Doug Wyatt
From: J. Janssen