GEOLABS-HAWAII, Inc.
Geology, Soils and Foundation Engineering
1553 Colburn Street, Suite 203 • Honolulu, Hawaii 96817 • (808) 841-5064

June 27, 1974
W. O. 526-00

Park Engineering, Inc.
1149 Bethel Street
Suite 710
Honolulu, Hawaii 96813

Attention: Mr. Clarence K. Tanonaka

Subject: Soil and Foundation Investigation
Proposed Kaneohe Villa Cluster Condominium
Kaneohe, Oahu, Hawaii
Tax Map Key: 4-4-13: 33, 34

Gentlemen:

Herewith submitted is our report "Soil and Foundation Investigation, Proposed Kaneohe Villa Cluster Condominium, Kaneohe, Oahu, Hawaii".

Our work was done in accordance with the scope outlined in our first proposal dated April 8, 1974 and subsequent request for additional borings in the upper areas in our letter dated May 6, 1974. Prior to our field boring work for this investigation, a geologic reconnaissance study had been performed and its preliminary findings submitted on April 19, 1974.

The site is suitable for the proposed development provided our recommendations are followed. A summary of our recommendations is presented at the beginning of the report. Detailed discussion and recommendations are contained in the body of the report.

If there is any point which is not clear in this report, please feel free to contact us to discuss it further.

Very truly yours,

GEOLABS-HAWAII, INC.

Bob Y. K. Wong

Bob Y. K. Wong
Vice President

BYKW:fsd

OFFICES: VAN NUYS, CALIFORNIA • SANTA ANA, CALIFORNIA • LAS VEGAS, NEVADA • BELLEVUE, WASHINGTON • TACOMA, WASHINGTON • HONOLULU, HAWAII

W. O. 526-00
June 27, 1974

SOIL AND FOUNDATION INVESTIGATION
PROPOSED KANEOHE VILLA CLUSTER CONDOMINIUM
KANEOHE, OAHU, HAWAII
TAX MAP KEY: 4-4-13: 33, 34

SUMMARY OF RECOMMENDATIONS

The site is suitable for the proposed development. Foundations bearing upon natural soil may be designed for maximum contact bearing pressures of 3000 psf. Foundations bearing upon structural fill should be designed for a bearing pressure of 2000 psf.

The existing recent landslide should be completely undercut and removed to obtain a stable slope.

INTRODUCTION

This report presents the results of a soil and foundation investigation of the proposed 20 acre development located in

Kaneohe, Oahu, Hawaii. The scope of this study includes an investigation of geologic and subsurface soil conditions; an evaluation of the stability of the existing slopes, including two existing landslide areas; the formulation of recommendations for proposed cut and fill slopes, and for the design of foundations; and recommendations pertinent to site development.

PROJECT CONSIDERATIONS

It is presently planned to construct 22 duplex units in the lower portion of the subject project. It is anticipated that the site grading will entail maximum cuts not to exceed 20 feet in depth, and maximum fills on the order of 15 feet.

SITE CONDITIONS

Geology

The island of Oahu was formed by two major volcanoes, the Waianae and Koolau shield volcanoes. Puu Papaa Peak and the associated ridge line on which the site is located is the caldera of the old Koolau shield volcano. Dikes are numerous throughout the area as are breccia associated with caldera collapse. The dikes and breccia are generally more resistant to erosion than the thin lava flows. This erosion resistance ridge line remains after extensive weathering of the less resistance surrounding lava flows. The warm climate and high rainfall has chemically weathered the basalt rock leaving residual soil derived from the in-place decomposition of the bedrock. Some exposed bedrock was noted in the upper end of the steep gully.

Surface

The site, consisting basically of two associated ridge lines and gully, is heavily vegetated with trees and brush. The upper portion of the site has slopes of 50 to 60 percent which decreases to approximately 20 percent in the lower slopes. The area between the toe of the slopes and Mokapu Saddle Road is fairly level.

A recent landslide was found in the northern portion of the property. A possible ancient landslide was also observed on the slope near the southern property line above the planned residential development. The ancient landslide appeared on aerial photographs, approximately five years old. However, the recent slide on the northern section of the property was not observed in these photos, and therefore, should be less than five years old.

During the investigation a third area of potentially unstable soil was discovered between the above two slides. This area appeared to be a talus slope. The extent of the three potentially unstable areas are outlined on the Site Plan and Boring Locations, Plate 1.

Suburface

One test pit was excavated and twelve borings were drilled at the locations shown on Plate 1. Soil samples, both disturbed and undisturbed, obtained from the test borings were visually classified in the field by our geologist and then returned to our laboratory for additional classification and measurement of physical properties. A detailed description of the field investigations and laboratory testing is contained in the appendix. A log of each boring and the results of the laboratory tests are also appended.

The subsurface explorations revealed that the site is generally blanketed by clayey silt or silt extending to the limits of our explorations. This clayey silt is predominantly stiff to hard in consistency and contains numerous basalt fragments and layers of rock. Boring 7 and Test Pit 1 encountered weathered basalt from the surface to a depth of 10 feet, the bottom of the boring.

Groundwater was not encountered in any of the borings during the period of our subsurface explorations. This does not preclude the existence of localized groundwater.

DISCUSSIONS AND RECOMMENDATIONS

General

It is our understanding that the proposed structures will utilize post and beam construction with spread foundations and slab-on-grade only in carport areas. The soils encountered in the subsurface explorations, with consistences varying from very stiff to hard, will provde adequate support for the proposed foundations. Slope stabilization measures will be required in the area of the recent landslide.

Foundations

Spread foundations bearing on natural soil a minimum of 12 inches below final adjacent grade can be designed for contact bearing pressures of 3000 psf for combined dead and live loads. This value may be increased by one-third for wind and seismic loadings. A minimum horizontal set-back distance of four feet should be maintained between the outer edge of the foundations and the slope face. Higher bearing values up to 8000 psf can be utilized in cut areas where the upper, more weathered soils are removed and the foundations will be bearing on the underlying residual soil or decomposed rock. When the final grades have been established, the cut areas can be evaluated on an individual basis to delineate where the higher bearing pressures can be utilized for retaining wall or building foundations.

Foundations bearing upon structural fill can be designed for maximum contact bearing pressures of 2000 psf for combined dead and live loadings provided the fill placement is properly monitored to assure adequate compaction. These foundation loads may also be increased by one-third when considering wind and seismic loads.

To minimize differential settlements the building pad bearing elevations should be varied where possible so that the foundations are resting upon similar materials, either entirely on fill or entirely on cut. Where this is not feasible and the foundations will be bearing on cut and fill, the foundation bearing upon cut should be over-excavated to twelve inches below the foundation subgrade and backfilled with compacted soil. We do not anticipate detrimental settlements for foundations seated in natural ground or upon properly compacted fill. The estimated maximum settlements are ½ inch total and ¼ inch differential. Slab-on-grade construction can be utilized providing the floor slabs are divorced from load bearing members.

Retaining Walls

Retaining walls should be designed to resist active lateral loads equivalent to a fluid pressure of 40 psf. The backfill immediately adjacent to the retaining walls should be open-graded compacted granular material. Weepholes or a subsurface drainage system should be provided to prevent the build-up of excessive hydrostatic pressures behind the walls. A friction value of 0.5 can be utilized for the determination of the sliding resistance of the retaining wall foundations.

As previously discussed, bearing values in excess of 3000 psf can be utilized in cut areas where the upper soils are removed. These areas should be evaluated on an individual basis to establish the maximum allowable contact bearing pressure.

SLOPES

General

The subsurface investigations provided additional information on the potentially unstable slide areas mentioned in our previous report of April 29, 1974.* The northerly slide area is still active and will require special grading to obtain a stable slope. The suspected ancient landslide located near the southern boundary and the talus slope delineated during the investigation appear

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* Geologic Reconnaissance, Proposed Kaneohe Villa, Kaneohe, Oahu, Hawaii. Tax Map Key: 4-4-13: 33, 34, Geolabs-Hawaii, Inc., April 29, 1974, W. O. 526-00.

sufficiently stable and will not require stabilization providing that the proposed extent of the grading operations is not expanded.

It is recommended that the proposed cut slopes be constructed no steeper than one and one-half horizontal to one vertical (1½:1). The proposed fill slopes should not exceed two horizontal to one vertical (2:1). All cut slopes should be inspected during the grading operations to determine if undisclosed geologic planes of weakness or extensive seepage exist.

Recent Landslide

The estimated extent of the recent landslide is outlined on the Site Plan, Plate 1. The upper extent of the slide is defined by the tension crack and high wall shown on the site plan. The lower limits were estimated from irregularities in the ground surface contours.

Three test borings were drilled within the estimated slide area to determine the depth of the soil mantle included in the movement. Boring 2 encountered approximately three feet of medium stiff clayey silt underlain by stiff to very stiff soil. It appears that the upper medium stiff soil was part of the unstable mass. The lower soils appear to be competent residual soil.

Borings 11 and 12 encountered four feet of stiff clayey silt with standard penetration blow counts below 20. This material is part of the landslide. It is underlain by stable decomposed rock to the limits of the explorations.

It therefore appears that the recent landslide is a shallow movement with a maximum depth of approximately four feet. It will therefore be necessary to completely undercut the earth mass movement and construct a new cut slope at no steeper than 1½ to 1. The estimated extent of the undercutting of the unstable soil is shown on the enclosed Section A-A, Plate 2. This section illustrates the remedial measures in the proposed cut areas up-slope of the residential units. Based upon the estimated plan extent of the earth mass movement shown on Plate 1, the unstable soil also underlies the lower units in this area. Where the undercutting removes the soil below the proposed final grade, the area should be backfilled in accordance with the site preparation and the earthwork recommendations.

It should be noted that the limits given on Plate 1 are estimates only and that the actual extent of the unstable mass must be established during construction by proper field inspection.

Ancient Landslide

Also shown on Plate 1 is the extent of the ancient landslide as determined from irregularities in the ground surface contours, geologic reconnaissance, and interpretations of the air photographs. This area appears as a shallow bowl-shaped depression in the natural slope. Boring 7 and one test pit were made within the lower portion of this ancient movement. These borings encountered weathered bedrock essentially at the existing surface. It therefore appears that the area outlined on Plate 1 as the "limit of the ancient landslide" in an area remaining after the unstable soil mass was removed by erosion at the toe. This area now has a thin soil cover and weathered rock can be expected close to the surface. It is not anticipated that any stability problems will be associated with this area.

Talus Slope

Boring 5 was drilled in the upper area of a possible talus slope to investigate the nature of the materials. The limits of the talus slope is again based upon interpretations of the irregularities in the ground surface contours. An obvious bulging can be delineated within this zone. Boring 5 encountered 16 feet of hard fine silt residual soil. This material appears to be stable with no subsurface evidence in Boring 5 of creep movements. Since several major cuts are planned in this area, it is recommended that the cuts be inspected during construction operations to determine if undisclosed planes of weakness exist within the residual soils. Providing the weak planes are not present, the cuts should be constructed at slopes not exceeding 1½ horizontal to 1 vertical.

Site Preparation and Earthwork

Within the grading limits the site should be cleared of all deleterious and organic matter which should be removed from the site. In areas to receive fill, the ground surface should be scarified to a minimum depth of six inches. The scarified surface shall then be brought to near optimum water content and compacted to a minimum density of 90% of the maximum dry density determined by ASTM D-1557-72. The fill shall then be placed in six inch maximum horizontal lifts and compacted to a minimum of 90% of the above density. Subsurface drains should be incorporated into the earthwork if seepage zones are encountered to prevent the build up of excessive hydrostatic pressures.

It is anticipated that the on-site excavated soils can be utilized as fill provided that rocks larger than six inches are removed. They have a low expansion potential, and it is estimated that the shrinkage factor between cut and fill will not exceed ten percent.

Where the natural ground surface is steeper than five horizontal to one vertical (5:1), the fill should be benched into competent underlying soil. The keying is a critical operation which should be performed under the direct monitoring of a soils engineer to assure the proper construction of the proposed fills on the relatively steep sloping ground.

Construction Monitoring

Due to the possibility of encountering geologic planes of weakness or localized soft areas, and to assure that proper foundation bearing levels and fill compaction are obtained, it is recommended that the cut slopes, fill placement and foundation excavations be inspected by an engineer from our firm to verify that conditions are consistent with those encountered in the subsurface explorations. The recommendations given in this report are contingent upon such inspections.

If you have any questions on the contents of this report, please feel free to contact us.

Respectfully submitted,

GEOLABS-HAWAII, INC.

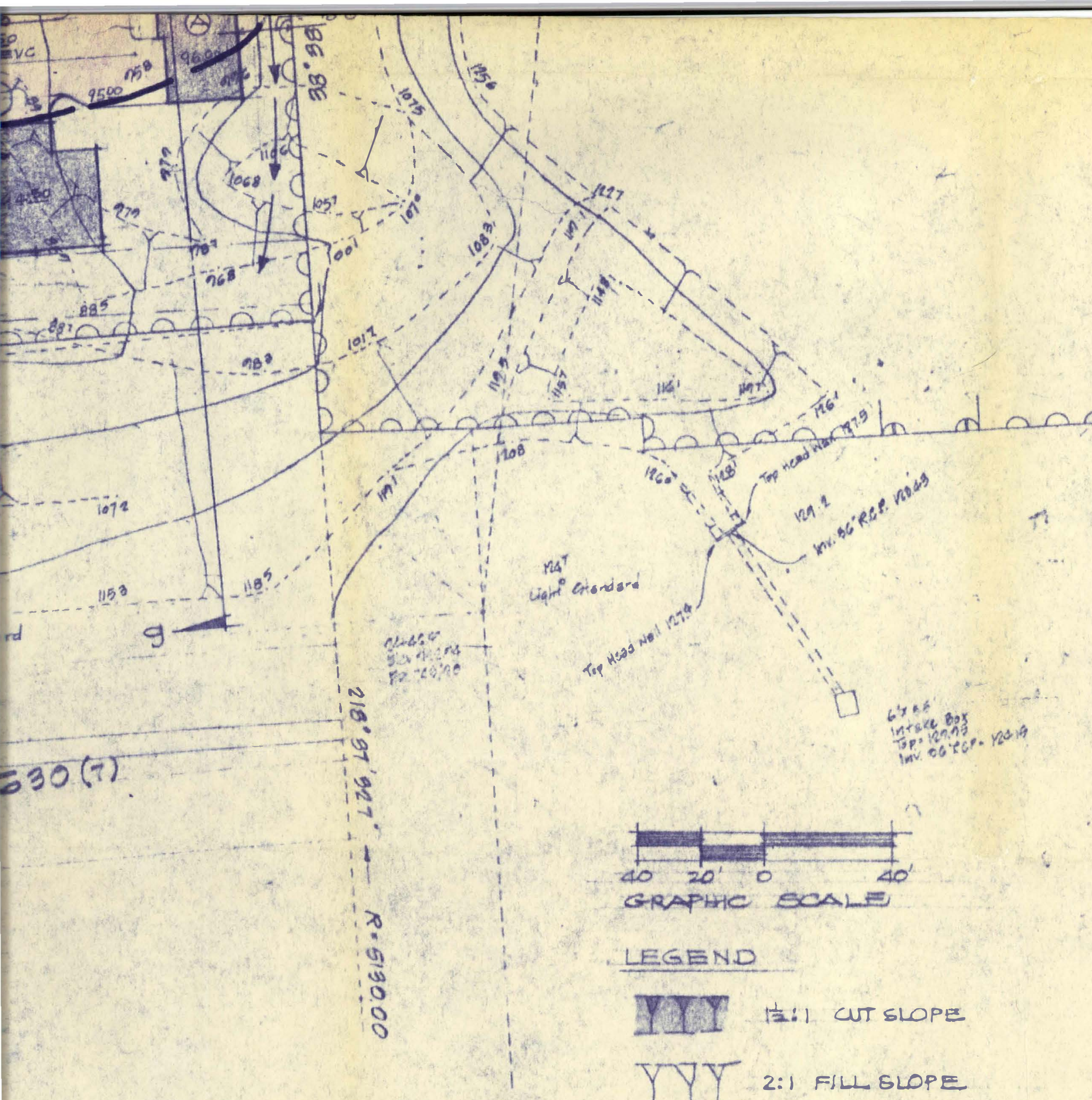
No. 3611

Richard B. Fewell

Robert S. Levinson
Regional Manager

Richard B. Fewell
Chief Engineer

RSL:RBF:fsd



▬ ▬ ESTIMATED EXTENT OF SLIDE

◕ BORING LOCATIONS

⬣ TEST PIT LOCATION

REFERENCE: KANEOHE VILLA
ROBERT M. MATSUSHITA & ASSOC.
5/17/74

SITE PLAN & BORING LOCATIONS

PLATE I

GEOLABS-HAWAII, INC. Foundation & Soil Engineering · Geology	
DATE MAY 1974	DRAWN BY C C
SCALE 1" = 50'	W.O. 526-00

40 20' 0 40'
GRAPHIC SCALE

LEGEND

▨ 1½:1 CUT SLOPE

YYY 2:1 FILL SLOPE

⌒⌒⌒ NO ACCESS PERMITTED

MOKAPU SADDLE ROAD
KANEOHE ~ SAKODA
T.M.K. 4-4-13: 4, 32, 88 & 89

FIELD BOOK 743 & 857
MARCH 14, 1973

NOTES

1. 44 FT. ROAD (IKEANANI PLACE) TO BE DEDICATED TO THE CITY & COUNTY OF HONOLULU
2. WATER SERVICE FROM B.W.S. MAIN ON IKEANANI PLACE.
3. SEWER DISPOSAL WILL BE BY SEWER SYSTEM CONNECTED TO EXISTING SEWER LINE ON IKEANANI PLACE.
4. AVERAGE ANNUAL RAINFALL = 40 INCHES.
5. Ⓐ INDICATES MODEL UNIT DESIGNATION.
6. ZONING:
   a. THE FOLLOWING PARCELS ARE ZONED R-4: PARCELS 4, 30, 31, 32, 47, 53, 72, 75, 79, 80, 81, 82, & 89.
   b. THE FOLLOWING PARCELS ARE ZONED R-4 & P-1: PARCELS 48, 87, & 88.
   c. PARCEL 84 IS ZONED P-1.

OCIATES

ULU, HAWAII

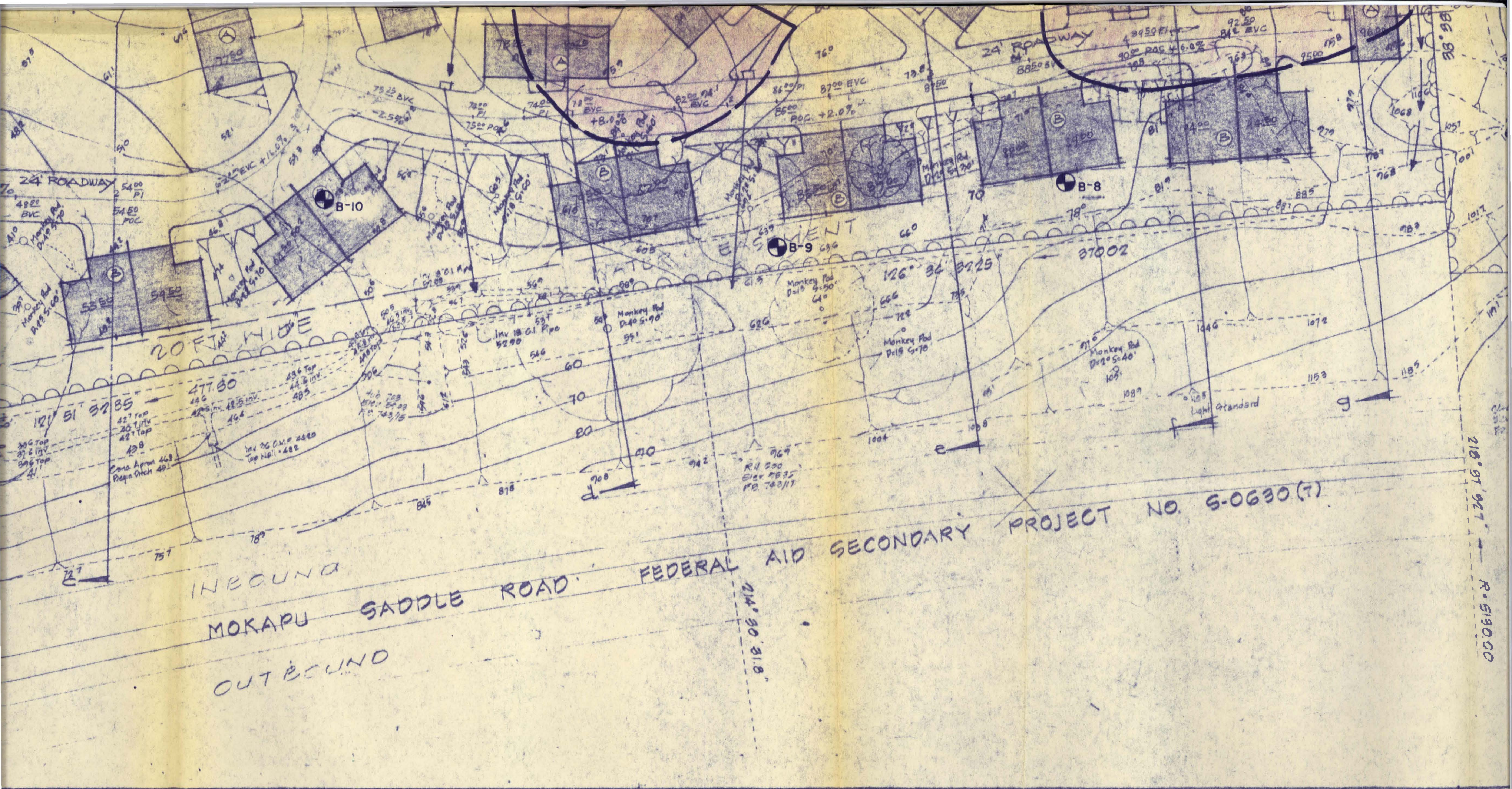
KANEOHE VILLA · CLUSTER CONDOMINIUM
KANEOHE HAWAII 22 DUPLEX UNITS

SITE & GRADING PLAN SCHEME 10

JOB NO
#73-16

DRAWN	DATE
T.F.	5-17-74

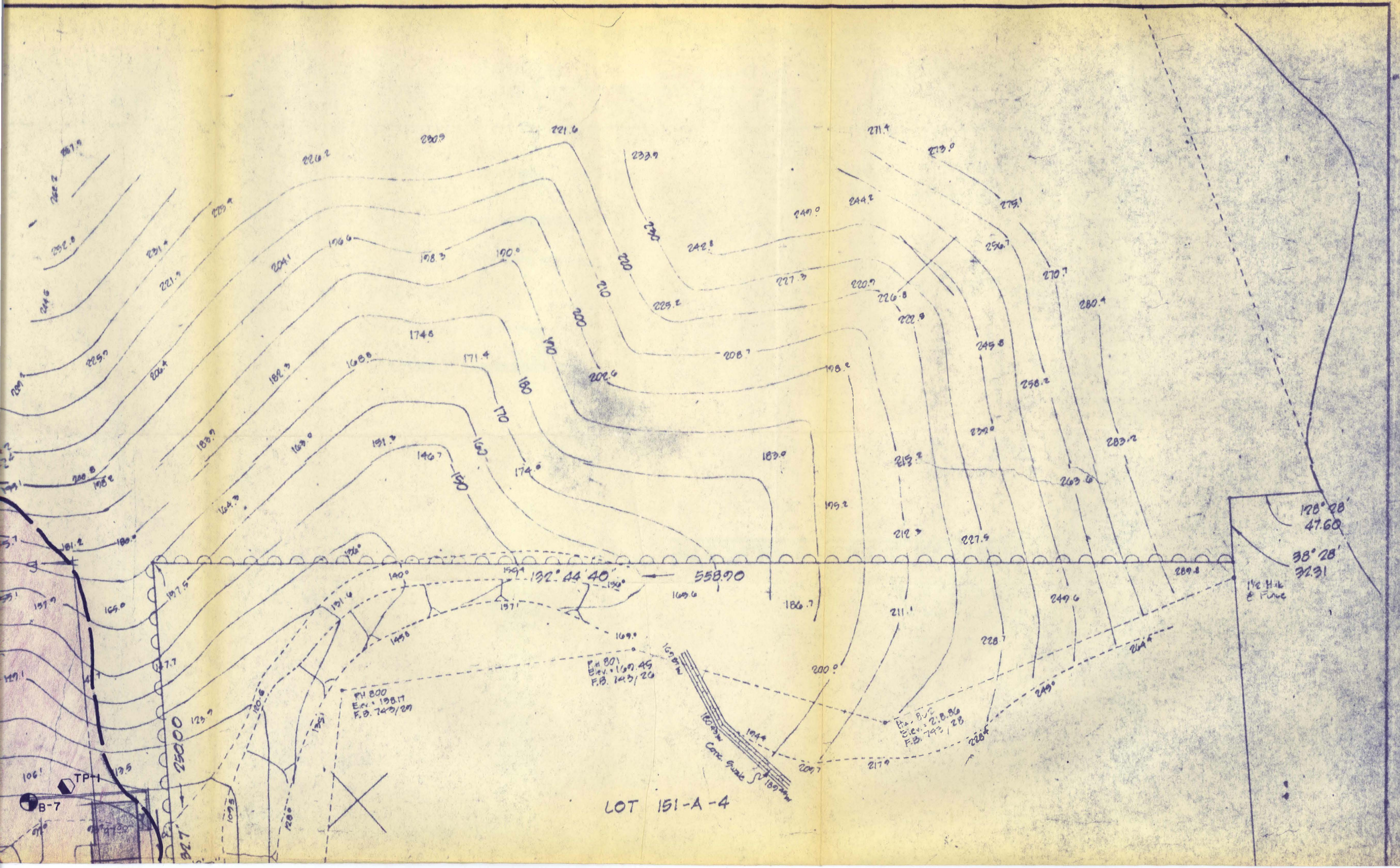
2 OF 8 SHTS

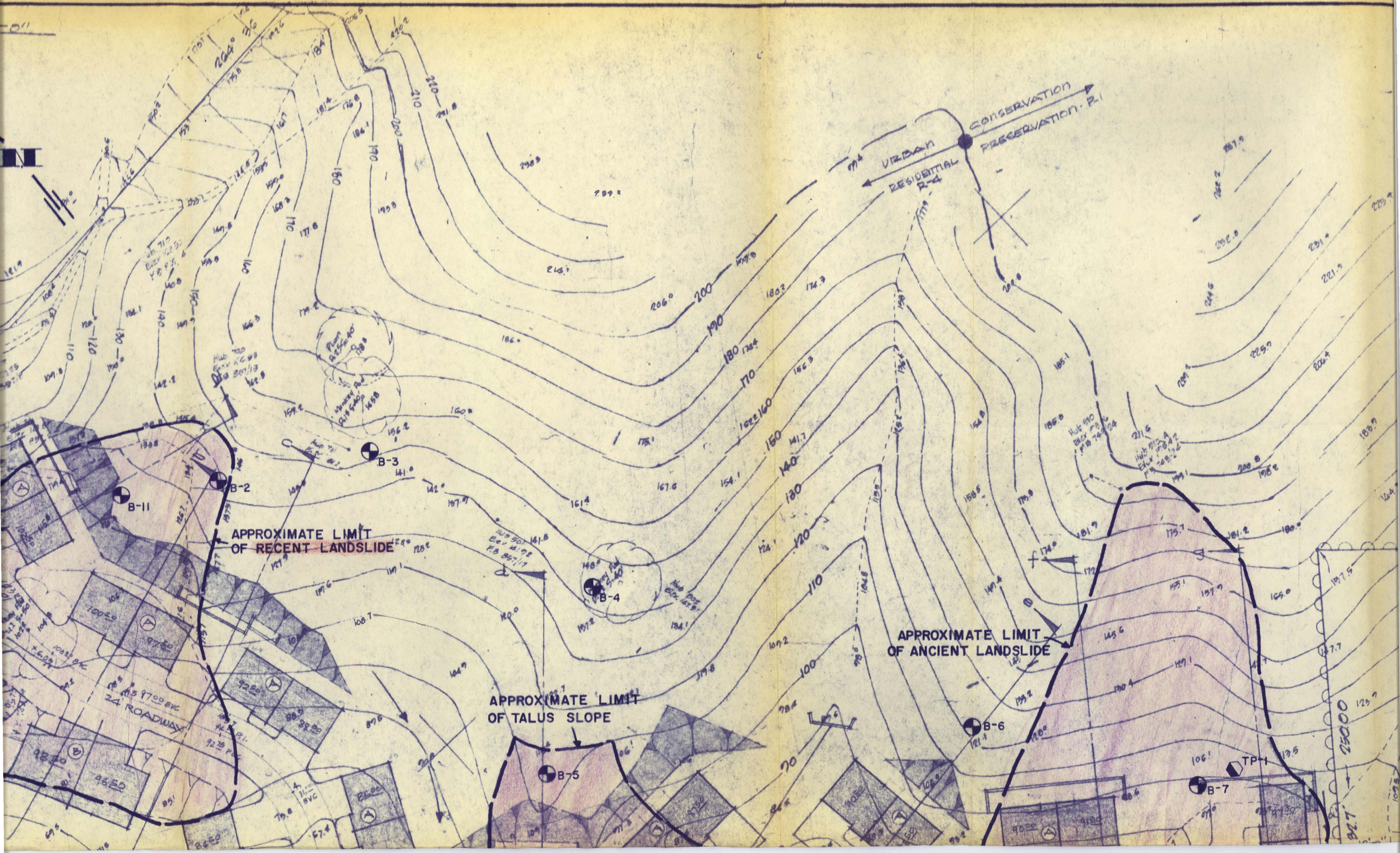


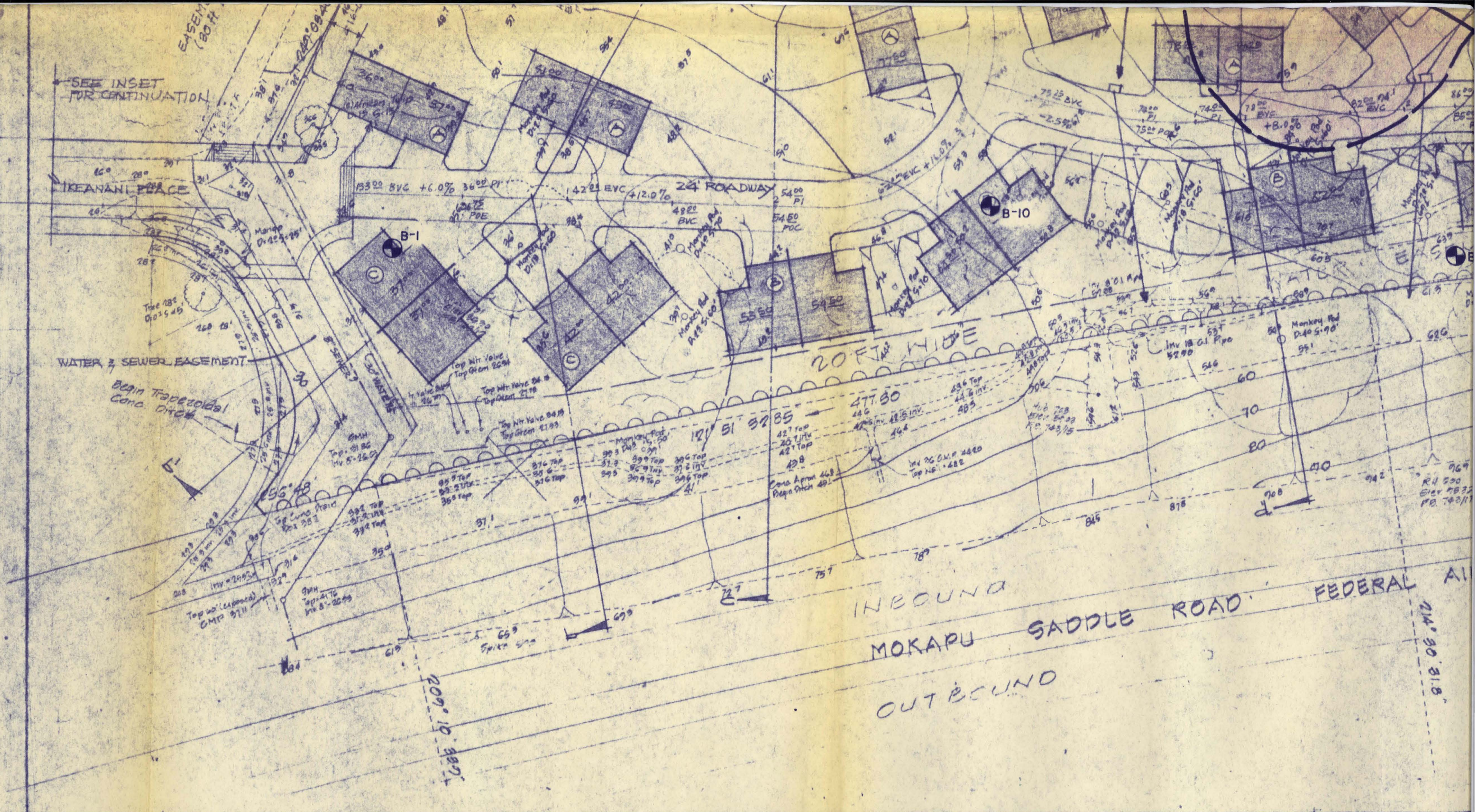
ROBERT M. MATSUSHITA & ASSOCIATES

ARCHITECTS

610 WARD AVENUE
HONOLULU, HAWAII


LOT 151-A-4
132° 44' 40"
558.70
250.00
178° 28'
47.60
38° 28'
32.31
1½ Hub
& Fence
F.H. 800
Elev. = 138.17
F.B. 743/27
F.H. 801
Elev. = 167.45
F.B. 743/26
F.H. 802
Elev. = 218.86
F.B. 743/28
Conc. Swale
TP-1
B-7
150
160
170
180
190
200
210
220
230
221.6
230.9
226.2
233.9
271.4
273.9
275.1
244.2
247.0
242.8
256.7
270.7
227.3
220.7
226.8
225.2
222.8
280.4
208.7
245.8
258.2
208.2
202.6
174.8
171.4
168.8
182.3
206.4
225.7
229.4
231.4
221.7
232.8
204.1
196.6
198.3
190.0
183.7
165.0
151.3
146.7
174.0
183.0
232.0
215.8
283.2
263.6
175.2
212.3
227.5
289.8
164.3
180.0
181.2
198.2
200.8
165.0
157.5
140.0
159.4
156.0
169.6
186.7
211.1
249.6
151.6
157.1
145.8
169.0
228.7
264.5
200.0
249.0
228.4
217.0
209.7
194.4
180.43 inv.
189.44 inv.
167.7
123.7
113.5
106.1

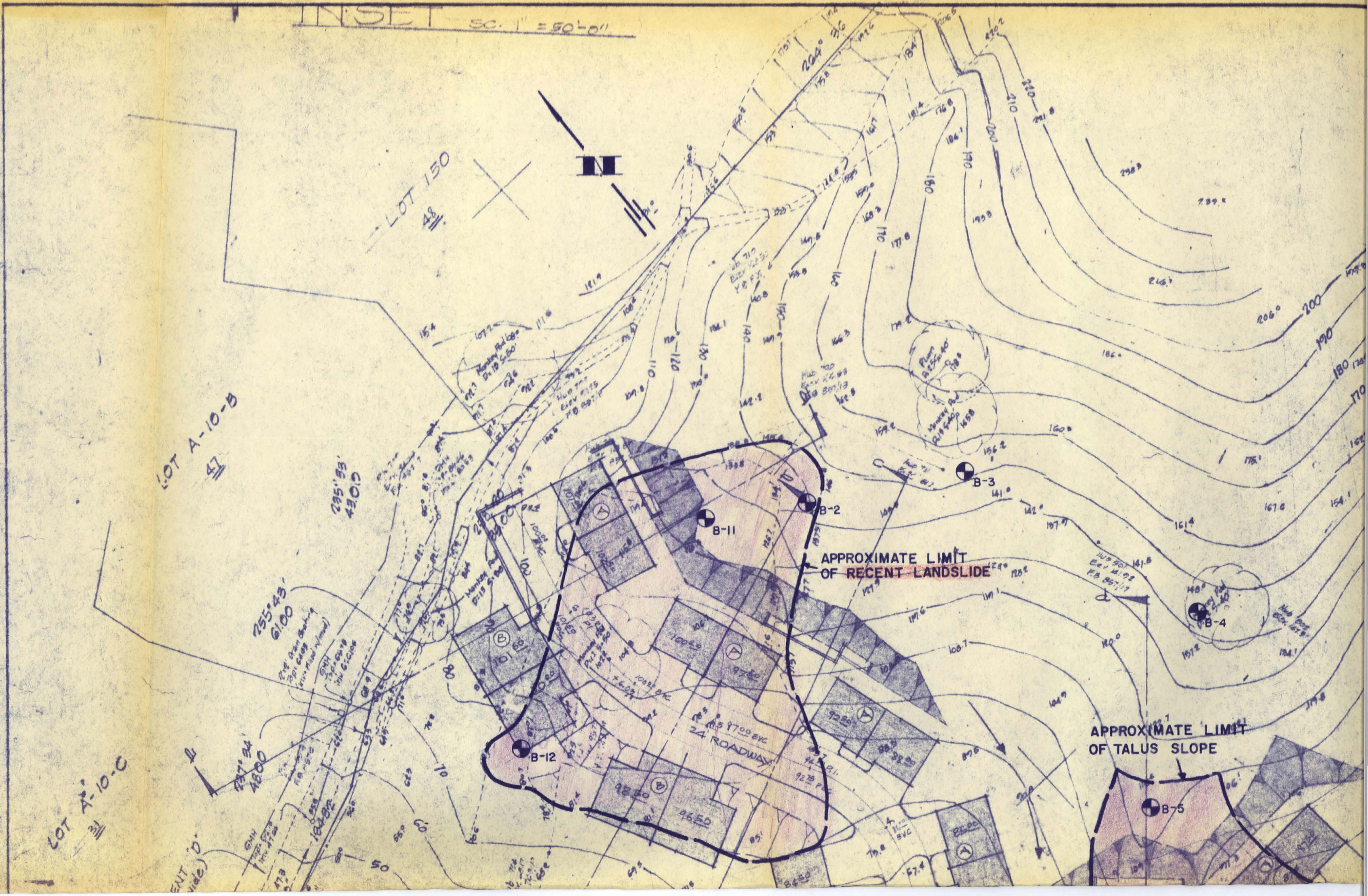

APPROXIMATE LIMIT OF RECENT LANDSLIDE
APPROXIMATE LIMIT OF TALUS SLOPE
APPROXIMATE LIMIT OF ANCIENT LANDSLIDE
URBAN RESIDENTIAL R-4
CONSERVATION PRESERVATION P-1
24' ROADWAY
B-2
B-3
B-4
B-5
B-6
B-7
B-11
TP-1
220
210
200
190
180
170
160
150
140
130
120
110
100
70
25000



ROBERT M. MATSUSHITA
REGISTERED ARCHITECT
No. 911
HAWAII, U.S.A.

ROBE

610 WA


INSET SC. 1" = 50'-0"
N
LOT 150
48
LOT A-10-B
47
LOT A-10-C
31
255°43'
61.00
235°33'
43.00
237°34'
48.00
APPROXIMATE LIMIT
OF RECENT LANDSLIDE
APPROXIMATE LIMIT
OF TALUS SLOPE
B-2
B-3
B-4
B-5
B-11
B-12
24' ROADWAY
A
B
100.20
97.50
92.50
88.50
98.50
96.50
101.50
86.50
220
210
200
190
180
170
160
150
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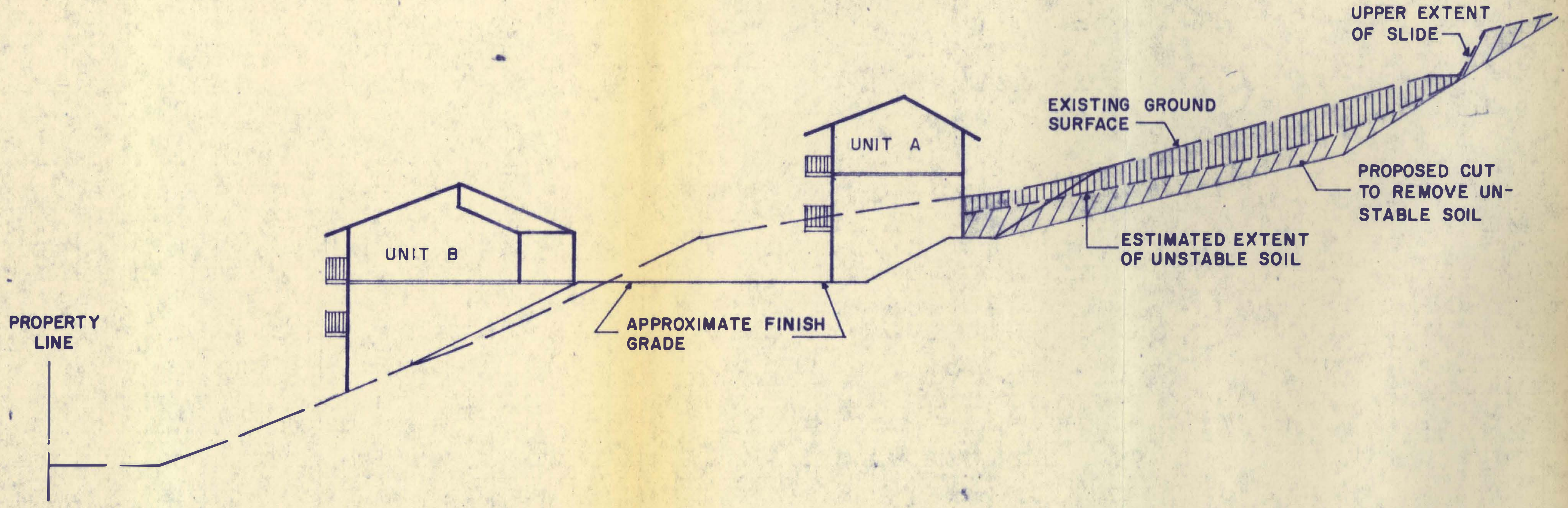
120
110
100
90
80
70
60
50



SECTION A

REFERENCE: KANEOHE VILLA
ROBERT M. MATSUSHITA & ASSOC.
MAY 1974

GEOLABS-HAWAII, INC.
Foundation & Soil Engineering · Geology

DATE JUNE 1974
DRAWN BY CC
SCALE 1"=20'
W.O 526-00

PLATE 2

APPENDIX

FIELD EXPLORATION

AND

LABORATORY TESTING

W. O. 526-00
June 19, 1974

APPENDIX

FIELD EXPLORATION

The subsurface conditions at the site were explored by drilling 12 borings utilizing truck-mounted equipment for 10 borings and portable rotary-auger equipment for Borings 11 and 12. The depths of the borings ranged from 9 to 20 feet below the existing ground surface. The locations of the borings are shown on the Site Plan included in the text of this report. The soils were classified by visual and textural examinations in the field by our geologist who continuously supervised the drilling operations. The classifications were verified by visual inspection and testing in the laboratory. All soils were classified in accordance with the Unified Soil Classification System. A graphical representation of the soils encountered is presented on the Boring Logs, Plates A-1 thru A-12. Soil samples were obtained by driving either a 2.4 inch I.D. diameter or a standard penetration sampler with a 140 pound hammer free falling a distance of 30 inches. The blow counts to drive the sampler the last 12 inches are shown on the Log of Borings at the appropriate sample depths.

LABORATORY TESTING

To provide data for evaluating the strength characteristics of the encountered soils, a Direct Shear Test was performed on a selected sample from Boring 2. The test results are shown on Plate A-13.

Moisture and density determinations and Atterberg Limits were made on selected samples to aid in the classification of the soils. The results of these test are presented on the Log of Borings at the appropriate sample location.

A consolidation test was performed on a sample from Boring 9 to measure the soil response under various vertical loadings. The consolidation test results are graphically presented on Plate A-14.

The following Plates are attached and complete this appendix.

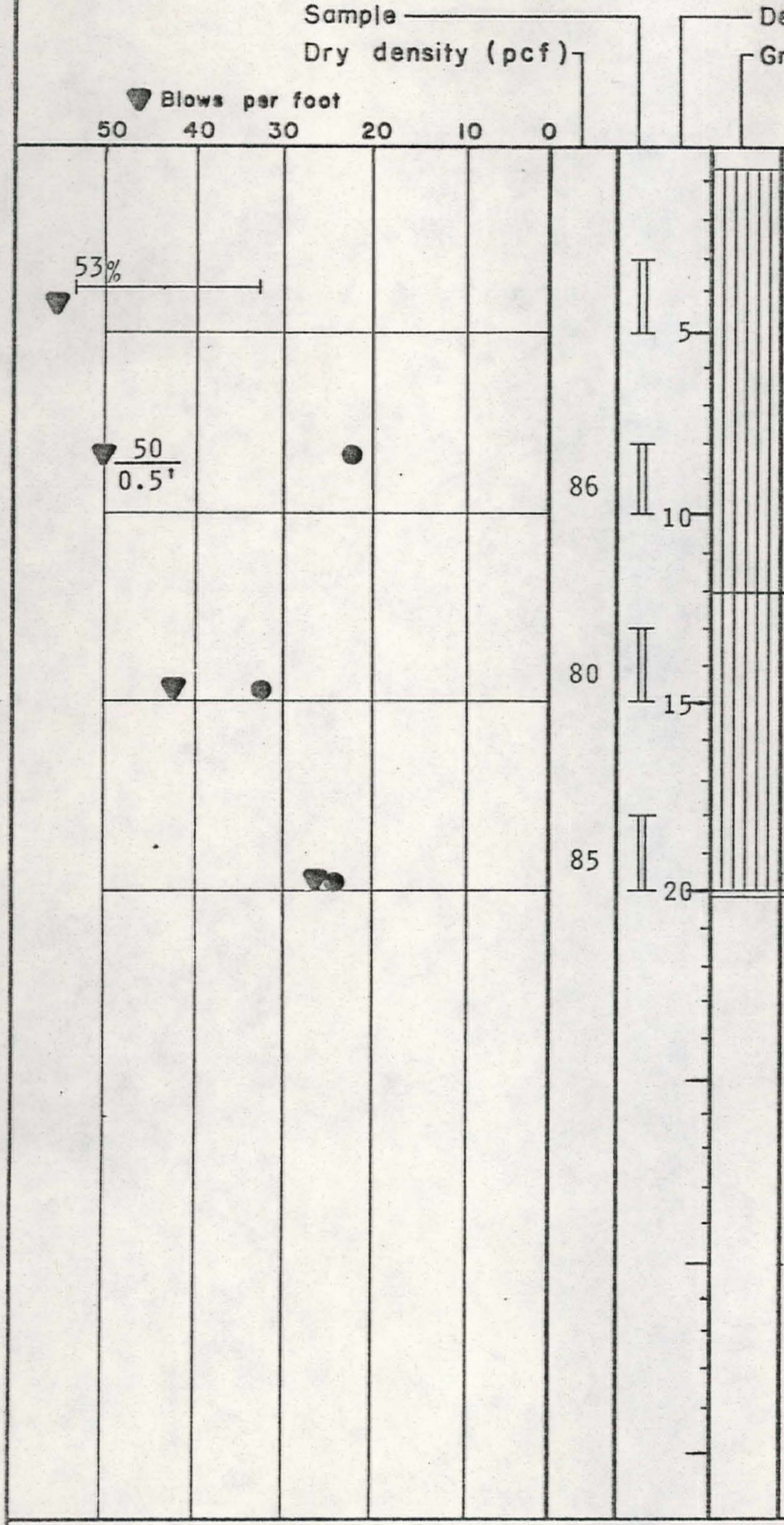
Plate A-1 - Log of Boring 1
Plate A-2 - Log of Boring 2
Plate A-3 - Log of Boring 3
Plate A-4 - Log of Boring 4
Plate A-5 - Log of Boring 5
Plate A-6 - Log of Boring 6

Appendix - 3
W. O. 526-00
June 19, 1974

BORING 1

SHEET 1 OF 1

Surface elevation 34 ±



SOIL DESCRIPTION	USC
TOP SOIL	
MEDIUM STIFF	
REDDISH BROWN CLAYEY SILT WITH ROCK FRAGMENTS - VERY STIFF TO HARD	MH
RED AND BROWN SILTY CLAY WITH DECOMPOSED SMALL ROCK FRAGMENTS VERY STIFF	MH
BORING TERMINATED AT 20.0 FEET ON 5-10-74	

LEGEND

● Moisture content

I 2.0" O.D. split-spoon sample

II Undisturbed ring sample

Disturbed ring sample

Core sample

P Sampler pushed

Plastic limit

Liquid limit

Natural water content

Driving energy 140 lb.wt. 30" drop

ANEOHE VILLA

LOG OF BORING

PARK ENGINEERING, INC.

GEOLABS-HAWAII, INC.
Foundation Engineering • Soil Engineering • Geology

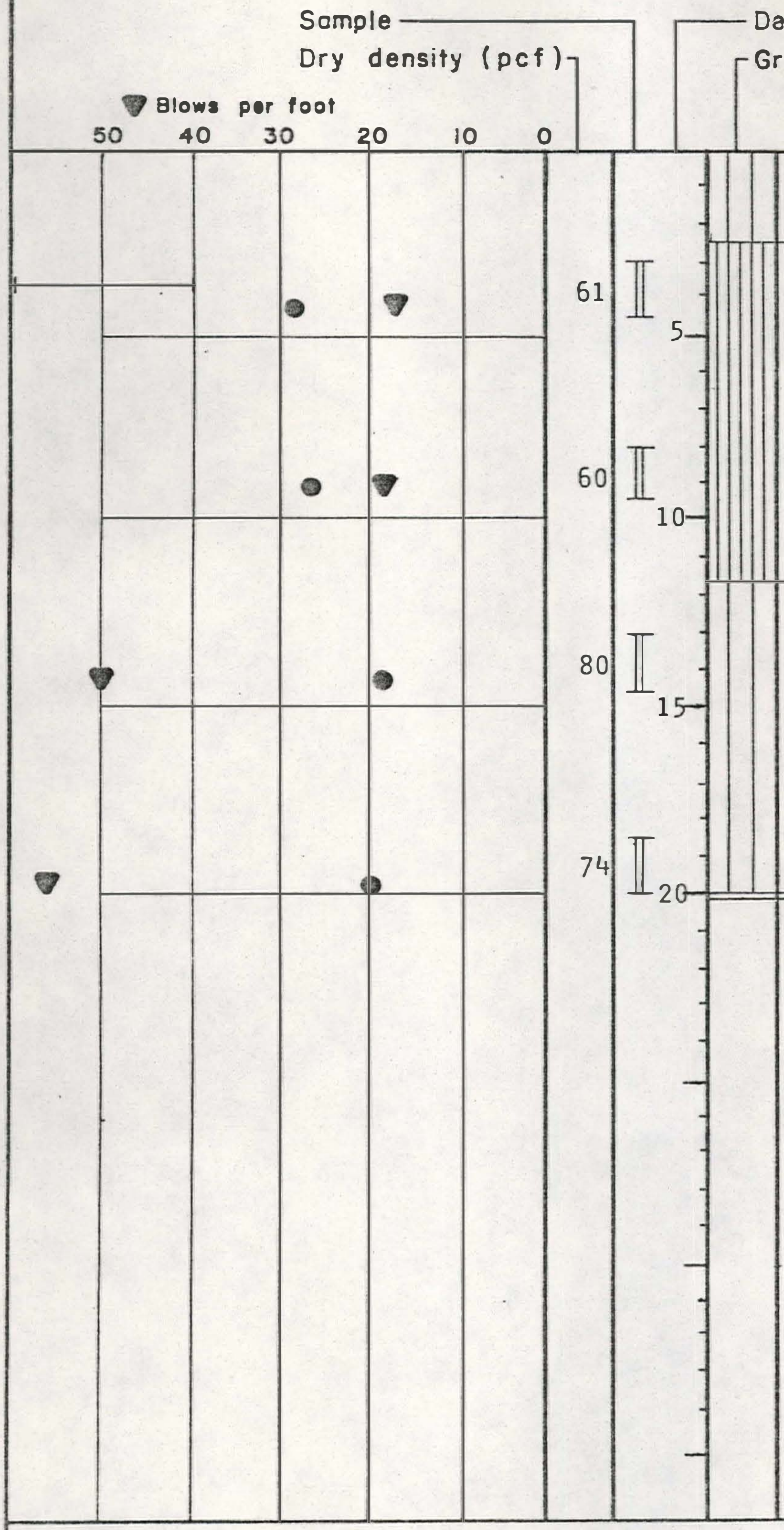
W. O. 526-00 MAY 1974

PLATE A-1

BORING 2

SHEET 1 OF 1

Surface elevation 130 ±



SOIL DESCRIPTION	USC
YELLOW AND RED CLAYEY SILT - MEDIUM STIFF	ML
YELLOW AND RED SILT WITH BLACK STREAKS, TRACE OF CLAY - STIFF TO VERY STIFF	MH
LIGHT GREEN SILT WITH BLACK AND LIGHT TAN STREAKS - DENSE TO VERY DENSE	ML
BORING TERMINATED AT 20.0 FEET ON 5-13-74	

LEGEND

● Moisture content

I 2.0" O.D. split-spoon sample

II Undisturbed ring sample

Disturbed ring sample

Core sample

P Sampler pushed

Plastic limit

Liquid limit

Natural water content

Driving energy: 140 lb.wt. 30" drop

KANEOHE VILLA

LOG OF BORING

PARK ENGINEERING, INC.

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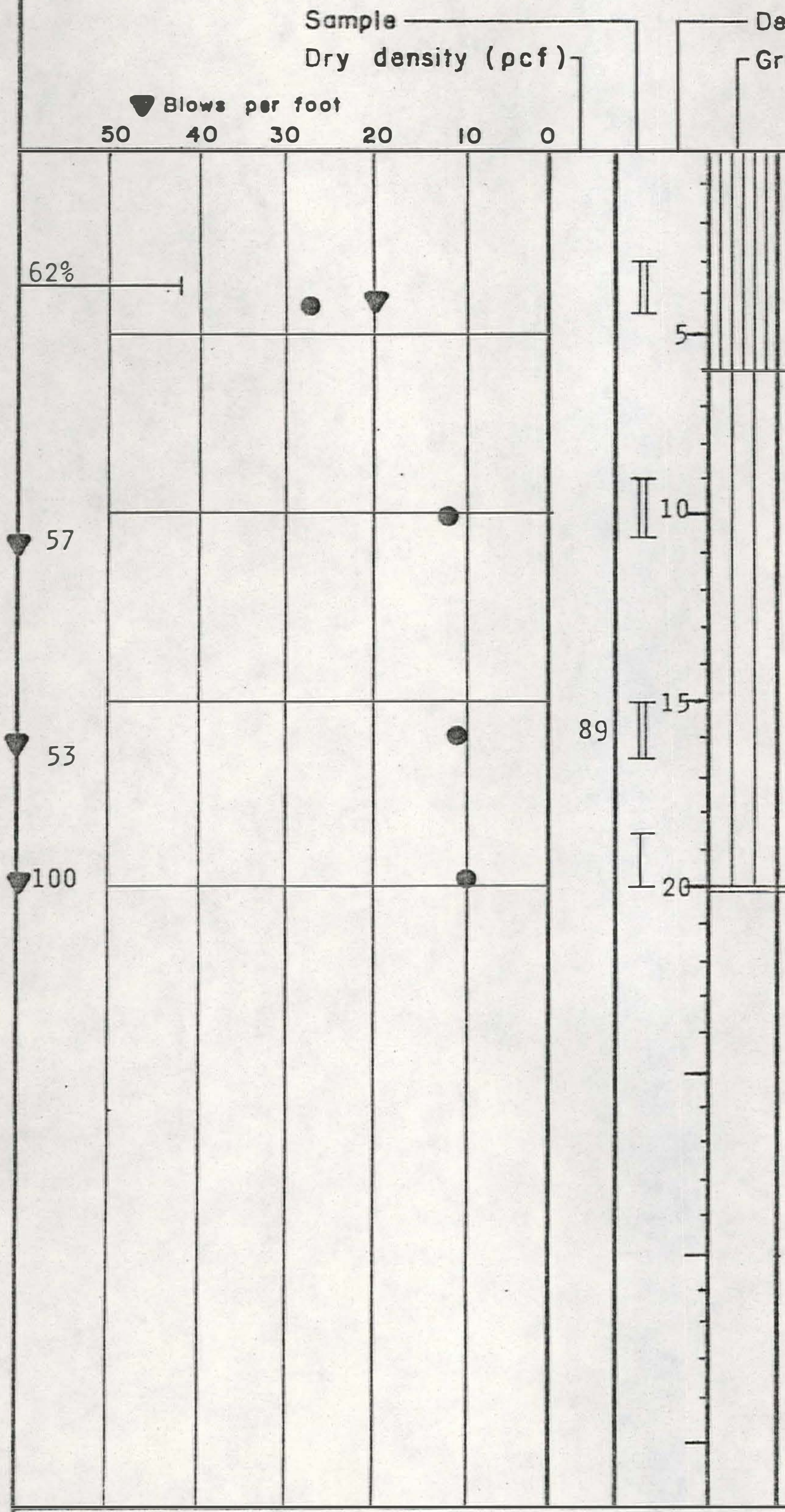
W. O. 526-00 MAY 1974

PLATE A-2

BORING 3

SHEET 1 OF 1

Surface elevation 135 ±



SOIL DESCRIPTION	USC
YELLOW AND RED SILT TRACE OF CLAY - VERY STIFF	MH
LIGHT BROWN SILT, TRACE OF BLACK ROCK FRAGMENTS WITH OCCASIONAL BASALT SEAM - VERY DENSE	ML

BORING TERMINATED AT 20.0 FEET
ON 5-13-74

LEGEND

● Moisture content

I 2.0" O.D. split-spoon sample

II Undisturbed ring sample

Disturbed ring sample

Core sample

P Sampler pushed

Plastic limit

Liquid limit

Natural water content

Driving energy: 140 lb.wt. 30" drop

KANEOHE VILLA

LOG OF BORING

PARK ENGINEERING, INC.

GEOLABS-HAWAII, INC.
Foundation Engineering • Soil Engineering • Geology

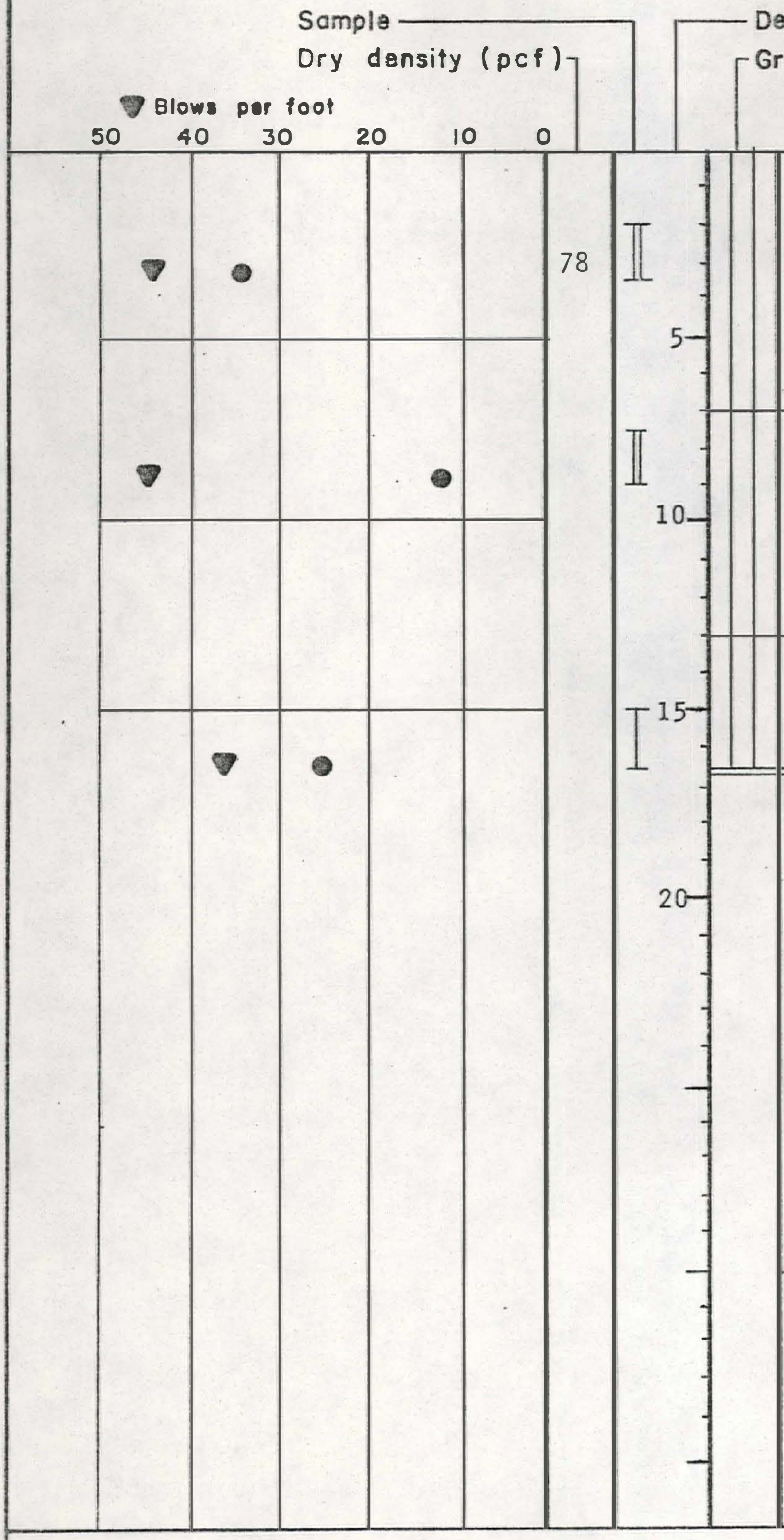
W. O. 526-00 MAY 1974

PLATE A-3

BORING 4

SHEET 1 OF 1

Surface elevation 135 ±



SOIL DESCRIPTION	USC
LIGHT TAN CLAYEY SILT WITH RED STREAKS ALONG VERTICAL PLANES - HARD	ML
LIGHT TAN SILT WITH ROCK FRAGMENTS - VERY STIFF	ML
YELLOW TO TAN SILT - DENSE	ML
BORING TERMINATED AT 16.5 FEET ON 5-13-74	

LEGEND

● Moisture content

I 2.0" O.D. split-spoon sample

II Undisturbed ring sample

Ⅱ Disturbed ring sample

I Core sample

P Sampler pushed

Plastic limit

Liquid limit

Natural water content

Driving energy: 140 lb. wt. 30" drop

KANEOHE VILLA

LOG OF BORING

PARK ENGINEERING, INC.

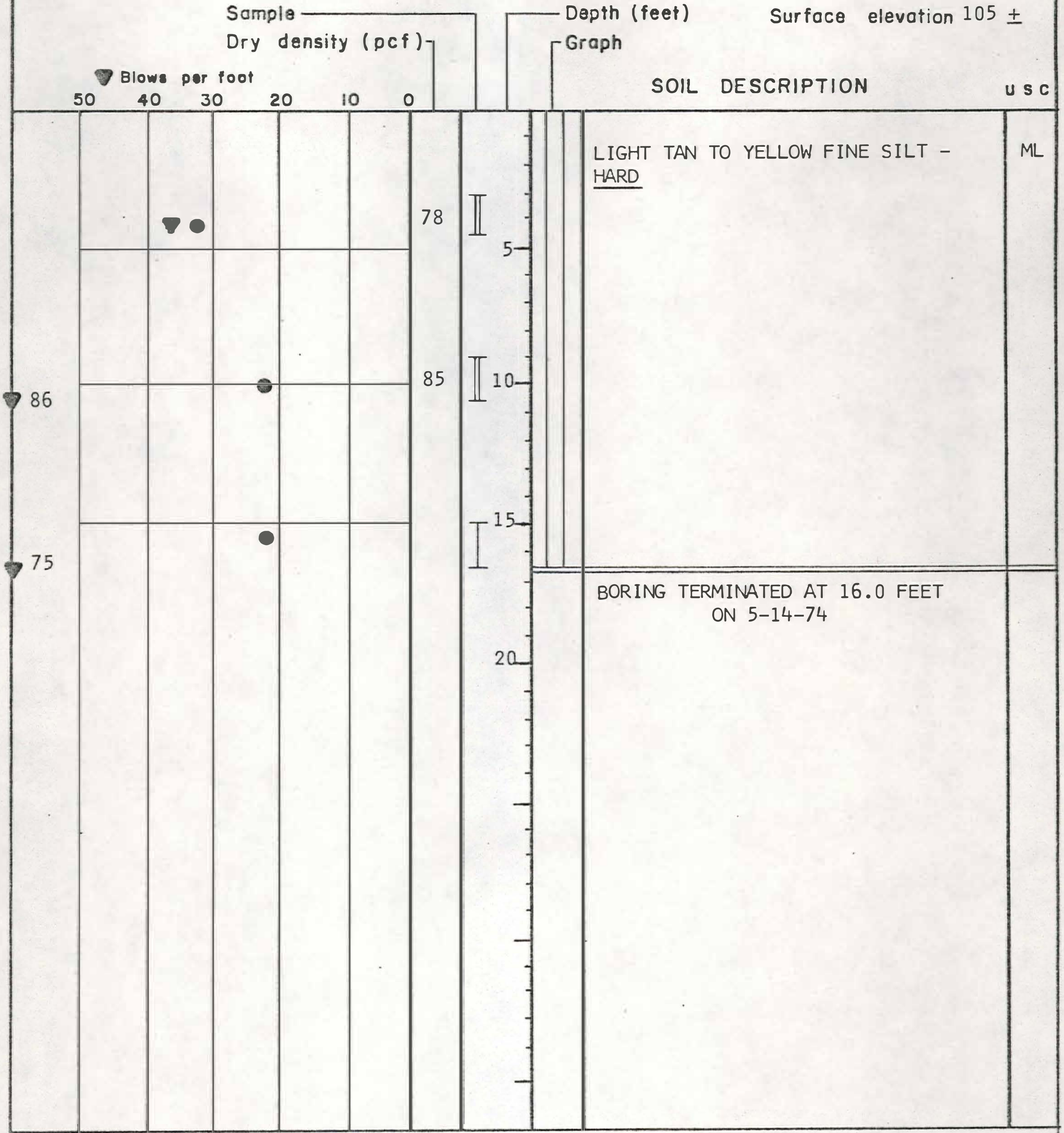
GEOLABS-HAWAII, INC.
Foundation Engineering • Soil Engineering • Geology

W. O. 526-00 MAY 1974

BORING 5

SHEET 1 OF 1

Surface elevation 105 ±



LIGHT TAN TO YELLOW FINE SILT - HARD | ML

BORING TERMINATED AT 16.0 FEET
ON 5-14-74

LEGEND

● Moisture content

Ⅰ 2.0" O.D. split-spoon sample

Ⅱ Undisturbed ring sample

Ⅹ Disturbed ring sample

Ⅰ Core sample

P Sampler pushed

Plastic limit

Liquid limit

Natural water content

Driving energy: 140 lb. wt. 30" drop

KANEOHE VILLA

LOG OF BORING

PARK ENGINEERING, INC.

GEOLABS-HAWAII, INC.
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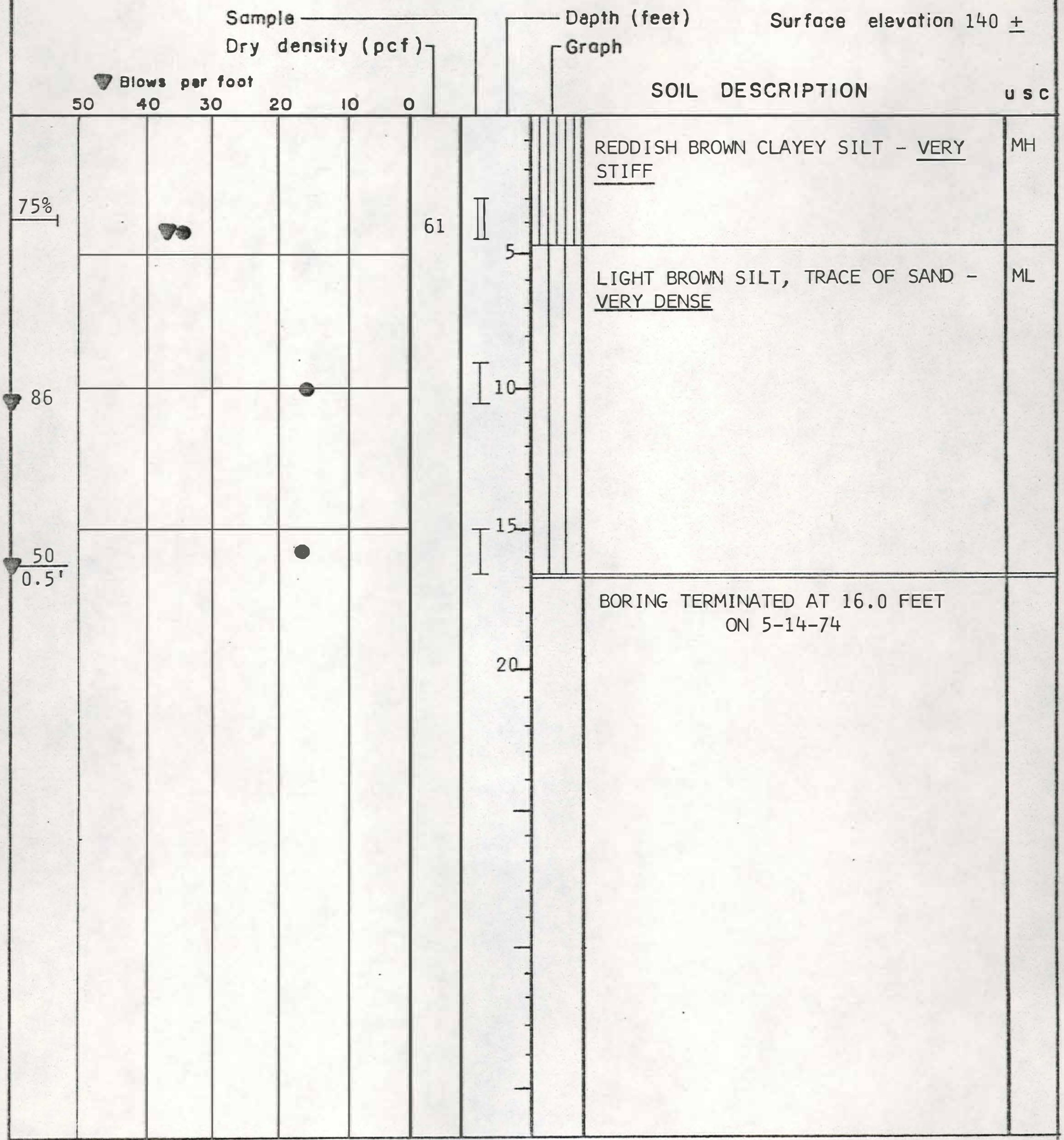
PLATE A-5

BORING 6

SHEET 1 OF 1

Surface elevation 140 ±



SOIL DESCRIPTION	USC
REDDISH BROWN CLAYEY SILT - VERY STIFF	MH
LIGHT BROWN SILT, TRACE OF SAND - VERY DENSE	ML
BORING TERMINATED AT 16.0 FEET ON 5-14-74	

LEGEND

● Moisture content

I 2.0"O.D. split-spoon sample

II Undisturbed ring sample

Disturbed ring sample

Core sample

P Sampler pushed

Plastic limit

Liquid limit

Natural water content

Driving energy: 140 lb.wt. 30" drop

KANEOHE VILLA

LOG OF BORING

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PLATE A-6

BORING 7

SHEET 1 OF 1

Sample

Dry density (pcf)

Depth (feet)

Graph

Surface elevation 110 ±

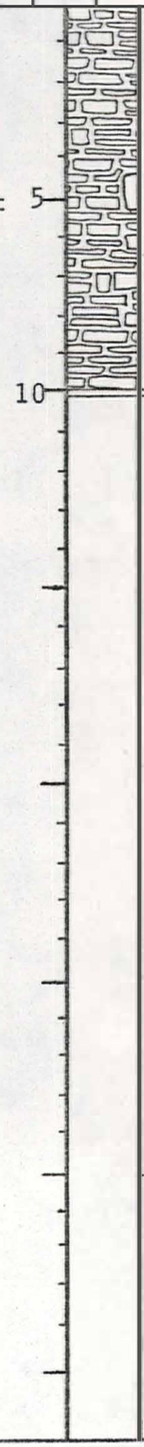
Blows per foot

50 40 30 20 10 0

SOIL DESCRIPTION

USC

REFUSAL



BROKEN BASALT WITH SOME LIGHT BROWN SILT - <u>HARD</u>

BORING TERMINATED AT 10.0 FEET ON 5-14-74

LEGEND

● Moisture content

I 2.0" O.D. split-spoon sample

II Undisturbed ring sample

Disturbed ring sample

Core sample

P Sampler pushed

Plastic limit

Liquid limit

Natural water content

Driving energy: 140 lb.wt. 30" drop

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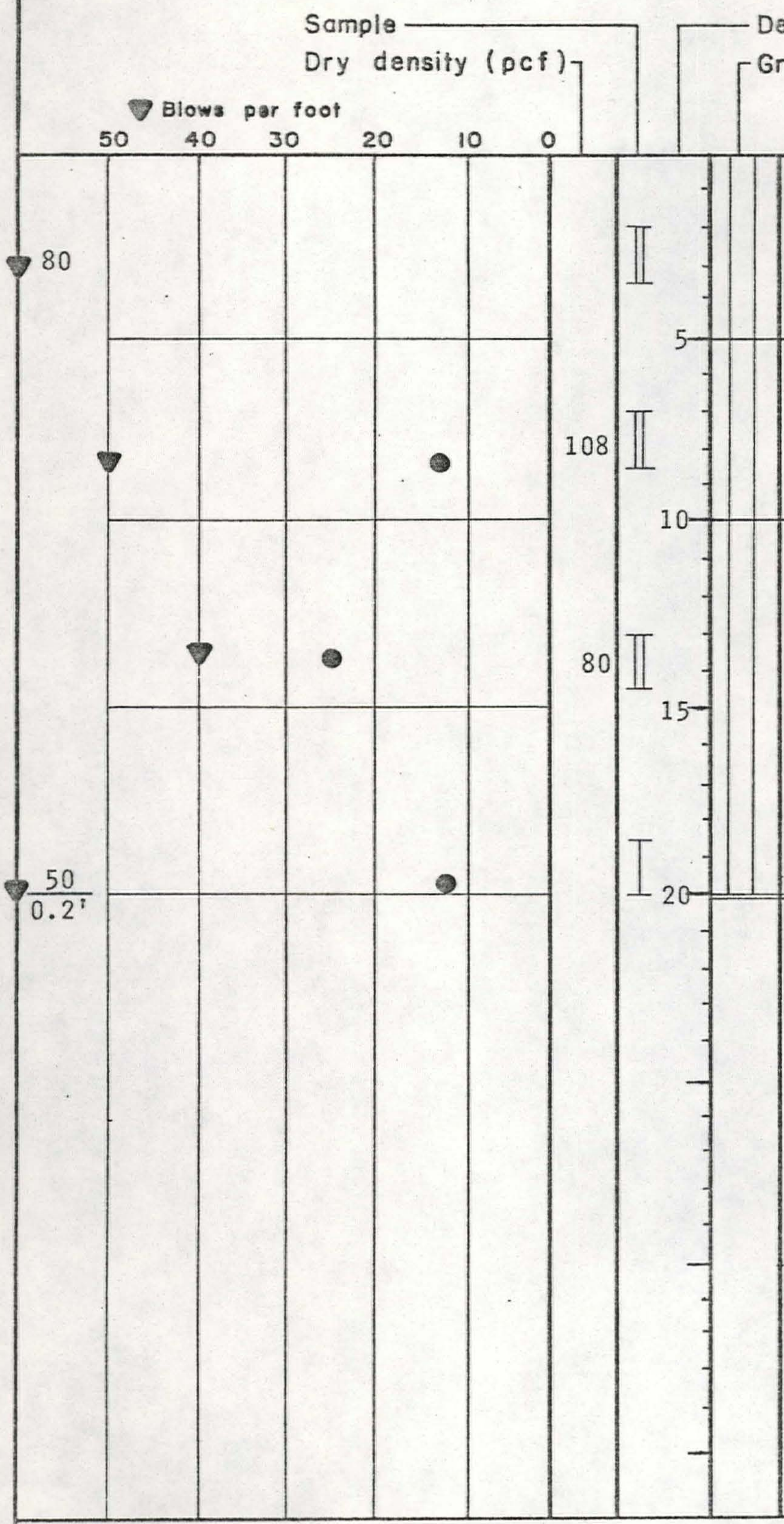
PLATE A-7

BORING 8

SHEET 1 OF 1

Surface elevation 70 ±



SOIL DESCRIPTION	usc
REDDISH BROWN AND GRAY MOTTLED CLAYEY SILT WITH DECOMPOSED ROCK FRAGMENTS - VERY STIFF	ML
DARK BROWN SANDY SILT - DENSE	ML
LIGHT TAN AND BROWN SILT WITH RED SILTY CLAY INCLUSIONS AND TRACE OF SAND - VERY STIFF	ML
BORING TERMINATED AT 20.0 FEET ON 5-14-74	

LEGEND

● Moisture content

I 2.0" O.D. split-spoon sample

II Undisturbed ring sample

Disturbed ring sample

Core sample

P Sampler pushed

Plastic limit

Liquid limit

Natural water content

Driving energy 140 lb.wt., 30' drop

KANEOHE VILLA

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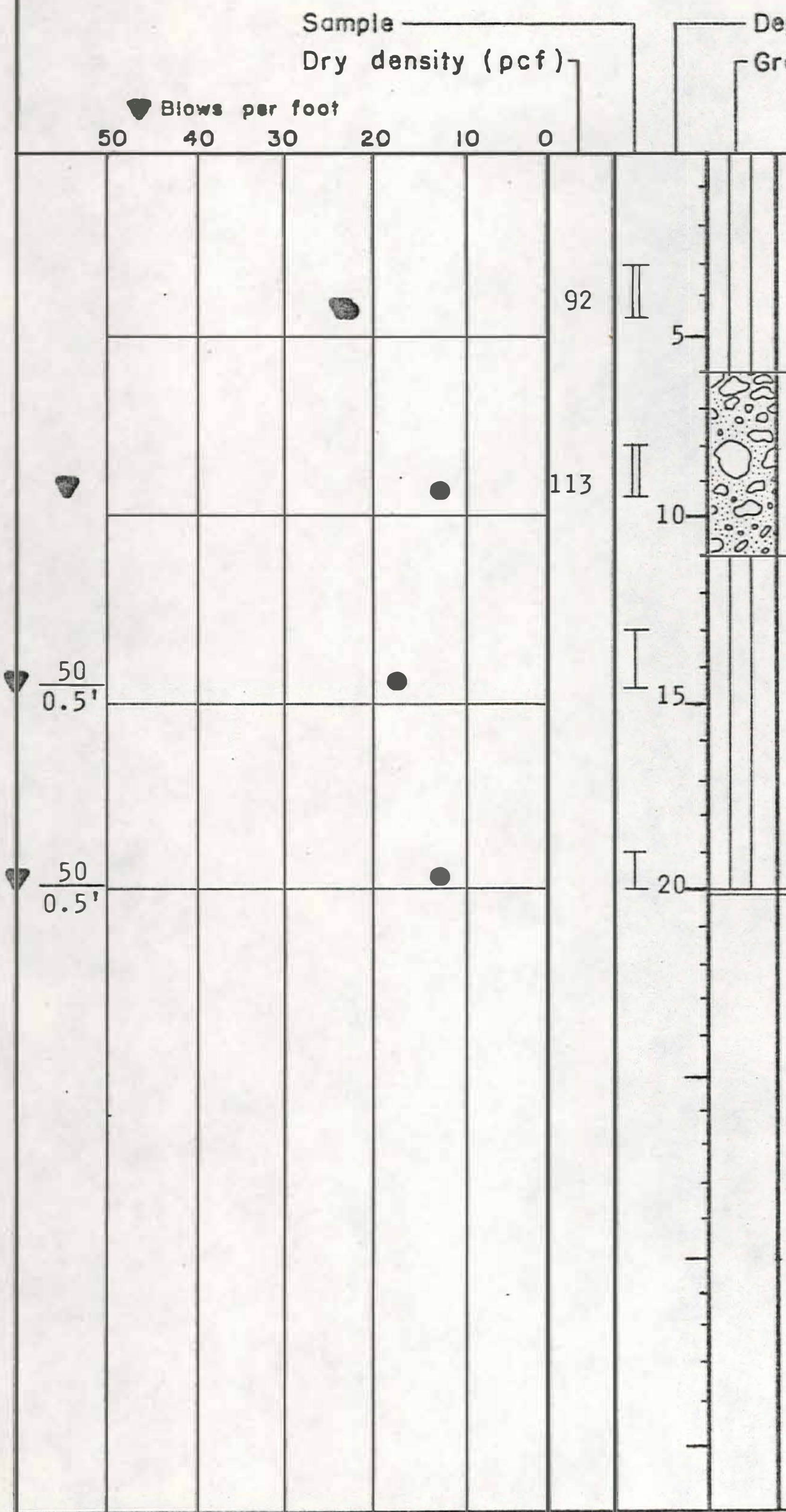
PLATE A-8

W.O.

BORING 9

SHEET 1 OF 1

Surface elevation 60' ±



SOIL DESCRIPTION	USC
GREEN-BROWN SILT WITH ROCK FRAGMENTS - <u>VERY STIFF</u>	ML
GRAY ROCK FRAGMENTS WITH SANDY SILT - <u>DENSE</u>	GM
BROWN-GREEN SANDY SILT WITH ROCK FRAGMENTS - <u>DENSE</u>	ML
BORING TERMINATED AT 20.0 FEET ON 5-15-74	

LEGEND

● Moisture content

I 2.0" O.D. split-spoon sample

II Undisturbed ring sample

Disturbed ring sample

Core sample

P Sampler pushed

Plastic limit

Liquid limit

Natural water content

Driving energy: 140 lb. wt., 30" drop

KANEOHE VILLA

LOG OF BORING

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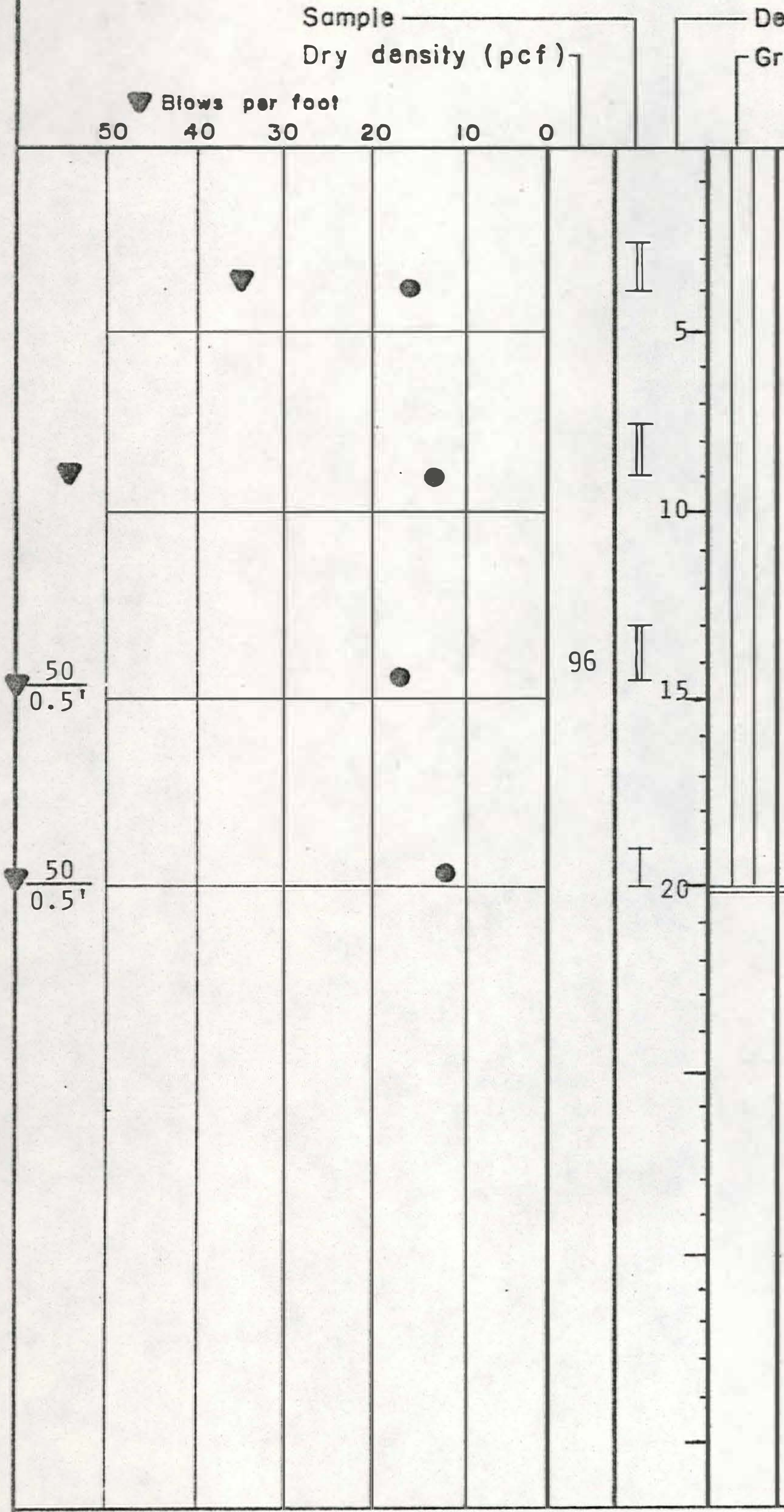
PLATE A-9

BORING 10

SHEET 1 OF 1

Surface elevation 50'±



SOIL DESCRIPTION	USC
GRAY AND BROWN SILT WITH TRACE OF SAND, OCCASIONAL LAYER OF BROKEN ROCK - STIFF TO HARD	ML
BORING TERMINATED AT 20.0 FEET ON 5-15-74	

LEGEND

● Moisture content

I 2.0" O.D. split-spoon sample

II Undisturbed ring sample

Disturbed ring sample

Core sample

P Sampler pushed

Plastic limit

Liquid limit

Natural water content

Driving energy 140 lb.wt., 30" drop

KANEOHE VILLA

LOG OF BORING

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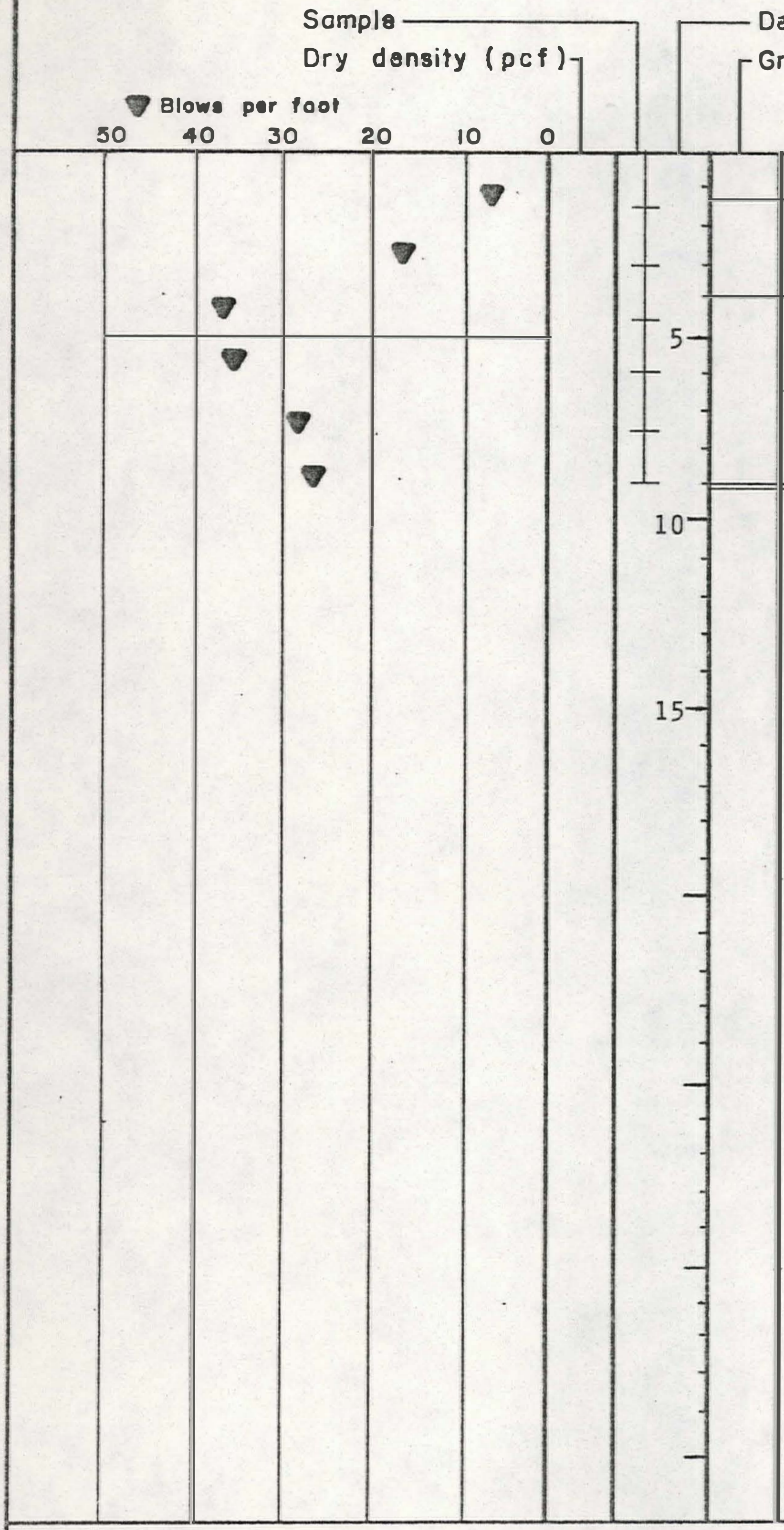
PLATE A-10

W.O.

SHEET 1 OF 1

BORING 11

Surface elevation ± 87



SOIL DESCRIPTION	USC
REDDISH BROWN CLAYEY SILT	ML
LIGHT TAN CLAYEY SILT - <u>STIFF</u> (SLIDE MATERIAL)	ML
LIGHT TAN AND RED MOTTLED CLAYEY SILT - <u>VERY STIFF TO HARD</u> (DECOMPOSED ROCK)	ML
BORING TERMINATED AT 9.0 FEET ON 6-13-74	

LEGEND

● Moisture content

I 2.0" O.D. split-spoon sample

II Undisturbed ring sample

Ⅱ Disturbed ring sample

I Core sample

P Sampler pushed

Plastic limit

Liquid limit

Natural water content

Driving energy: 140 lb.wt., 30' drop

KANEOHE VILLA

LOG OF BORING

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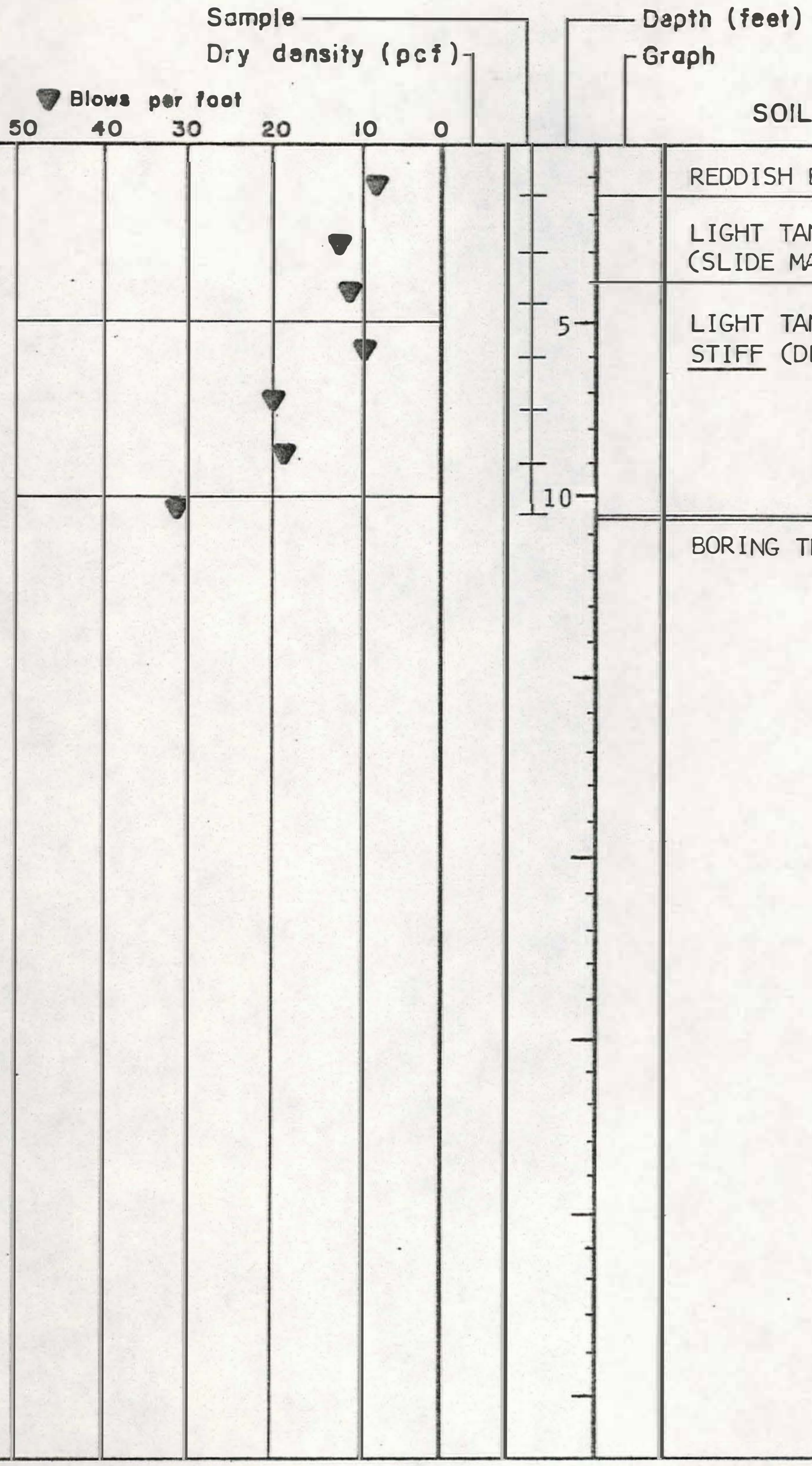
PLATE A-11

SHEET 1 OF 1

BORING 12

Surface elevation 116±



SOIL DESCRIPTION	USC
REDDISH BROWN CLAYEY SILT - STIFF	ML
LIGHT TAN CLAYEY SILT - STIFF (SLIDE MATERIAL)	ML
LIGHT TAN AND RED SILT - VERY STIFF (DECOMPOSED ROCK)	ML
BORING TERMINATED AT 10.5 FEET ON 6-14-74	

LEGEND

● Moisture content

I 2.0" O.D. split-spoon sample

II Undisturbed ring sample

Ⅱ Disturbed ring sample

I Core sample

P Sampler pushed

Plastic limit

Liquid limit

Natural water content

Driving energy 140 lb.wt., 30' drop

KANEOHE VILLA

LOG OF BORING

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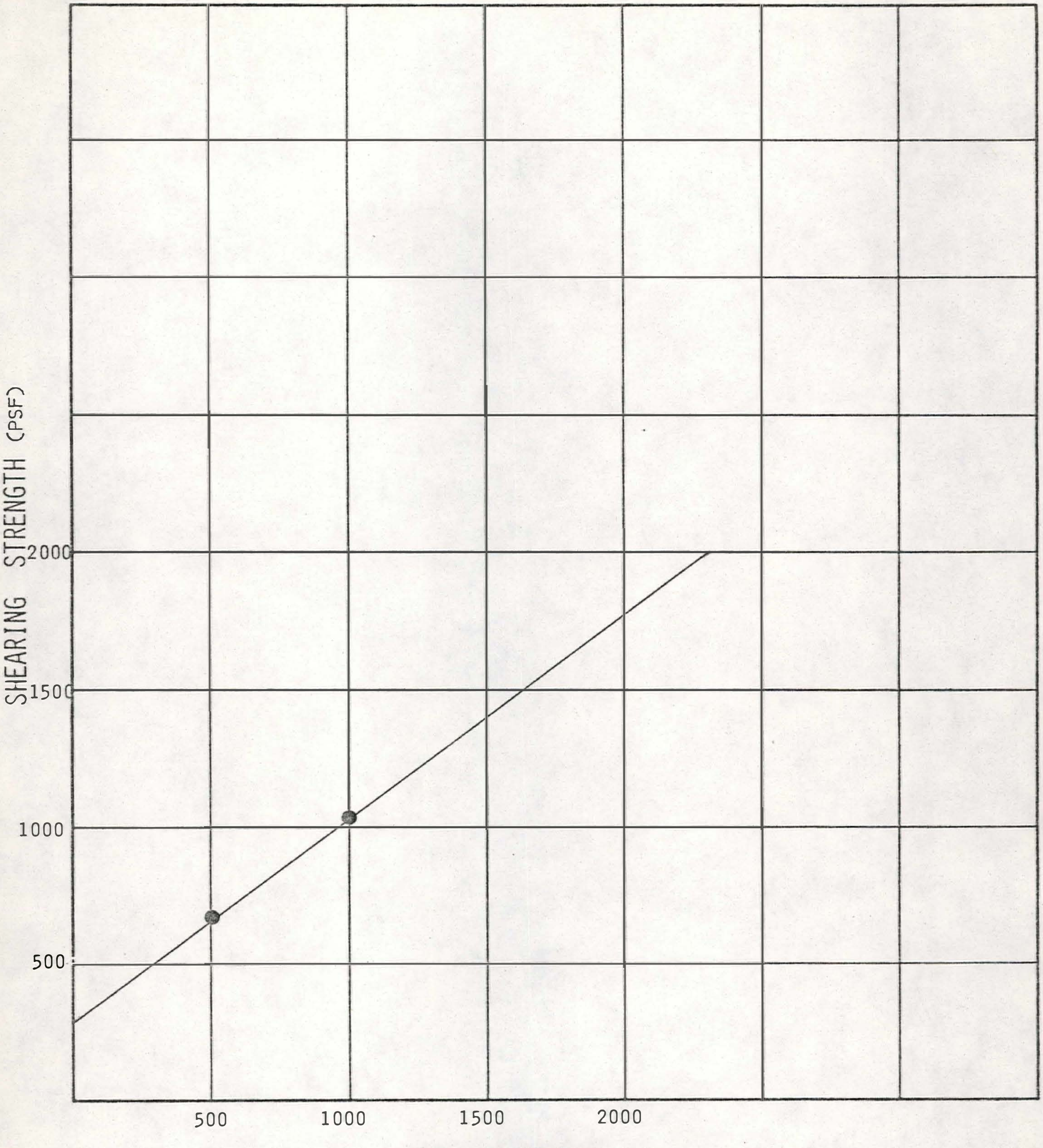
W.O. 526-00

PLATE A-12



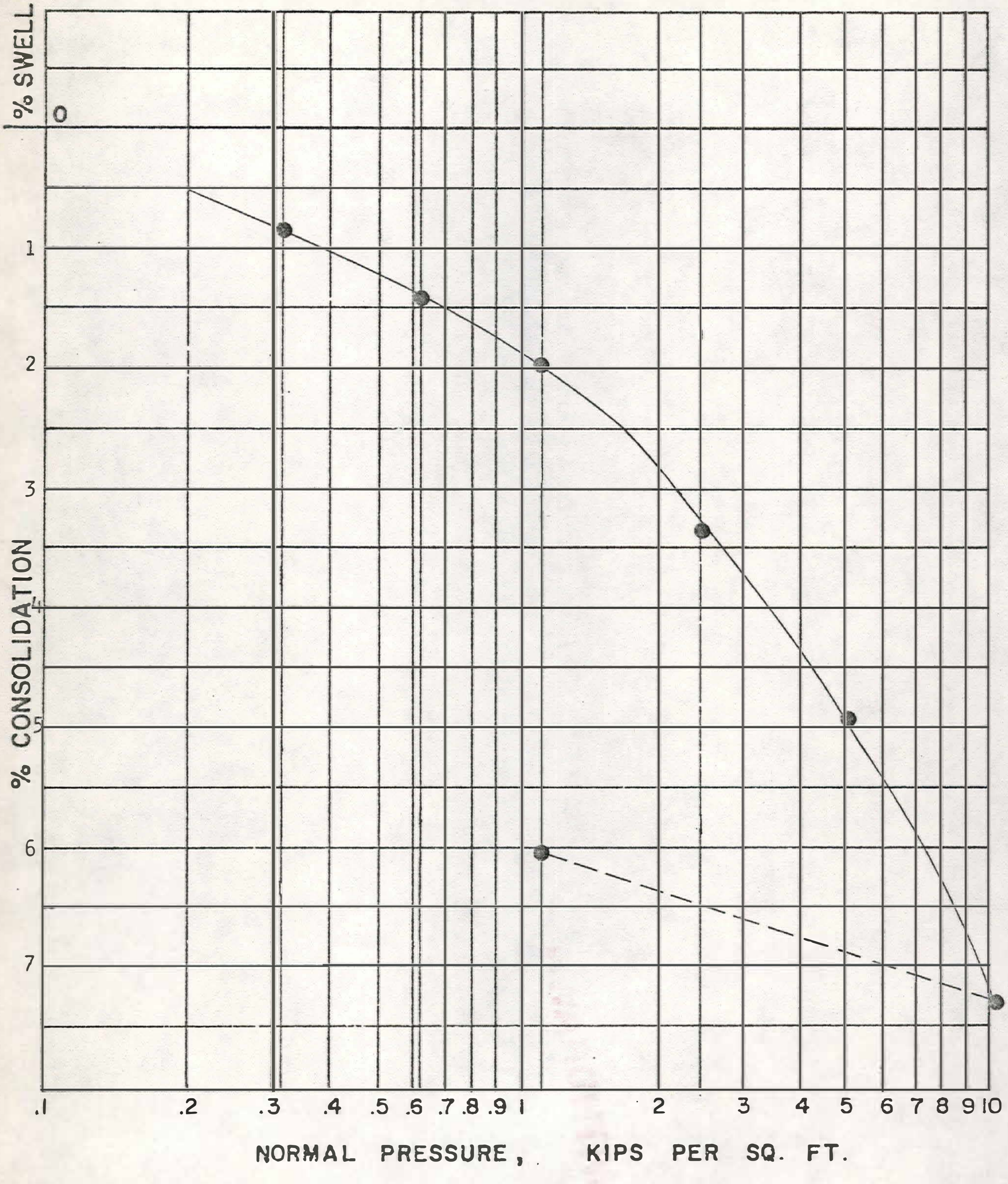
B - 2 @ 4.5'
C = 300 PSF
Ø = 37°

KANEOHE VILLA
PARK ENGINEERING, INC.

DIRECT SHEAR TEST	
GEOLABS-HAWAII, INC. Foundation & Soil Engineering · Geology	
DATE MAY 1974	W.O. 526-00

PLATE A-13

CONSOLIDATION-PRESSURE CURVE



SOIL TYPE GREEN BROWN SILT WITH ROCK FRAGMENTS

DRY DENSITY- PCF 92

MOISTURE 22 %

LIQUID LIMIT %

PLASTICITY INDEX %

BORING NO. 9

DEPTH: 4'

CONSOLIDATION TEST DATA

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