REPORT
FOUNDATION INVESTIGATION
PROPOSED PEARL RIDGE
SHOPPING CENTER

#356

Grading Permit NO. 4834

KAONOHI RIDGE, OAHU,
STATE OF HAWAII

for

ROBERT B. LILES, INCORPORATED
Architects and Engineers

April 30, 1970
Project Number H-58

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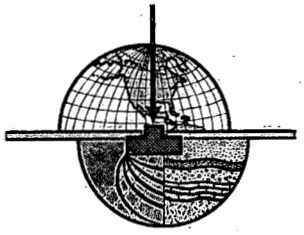

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Honolulu, Hawaii
April 30, 1970

Project No. H-58

Robert B. Liles, Incorporated
Architects and Engineers
840 Battery Street
San Francisco, California 94111

Attention: Mr. Robert B. Liles

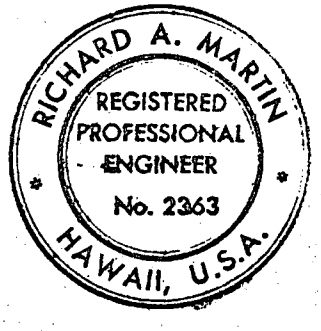
Gentlemen:

The attached report represents the data, conclusions and recommendations of an investigation of Soil and Foundation conditions at the site of the proposed Pearl Ridge Shopping Center, Kaonohi Ridge, Oahu, State of Hawaii.

The scope of services provided in this investigation was planned in collaboration with the Architect. During the course of the investigation, preliminary data was transmitted to the Architect for review.

In general, except for the low areas near the southwest corner of the site and along the existing drainage channel, soil conditions are favorable for the development of the site using shallow spread footings. In those areas of poor soil conditions driven piles may be used or certain measures may be taken during grading such as preloading, to improve conditions to the point where bearing loads can be supported by spread footings.

This investigation was made in accordance with generally accepted engineering procedures and included such field and laboratory tests considered necessary in the circumstances. In the opinion of the undersigned, the accompanying report has been substantiated by mathematical data in conformity with generally accepted engineering principles and presents fairly the design information requested by your organization.



Very truly yours

MAURSETH, HOWE, LOCKWOOD
& ASSOCIATES

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RAM/rg

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INTRODUCTION

This investigation was made for the purpose of obtaining information on the subsurface soils on which to base recommendations for a suitable foundation design for the proposed Pearl Ridge Shopping Center. The development will be located between Pearl City and Aiea on the island of Oahu, State of Hawaii. The location of the site, relative to existing streets and landmarks, is shown on the Vicinity Map, Plate 1, attached to this report.

SCOPE OF WORK

The scope of services provided was outlined in a "Proposal", dated January 14, 1970. Essentially, the following information is provided for the use of design engineers:

1. General soil condition of the site.
2. The physical characteristics of the soils encountered.
3. Recommended allowable bearing pressures and recommended foundation depths for spread footings or pile foundations.
4. Estimated settlements of foundations subjected to design pressures.

5. Opinions on possible construction problems.

PREVIOUS REPORTS

Previous investigations on the site have been made by others. These were reviewed as a part of this investigation and the data and information therein was taken into account in the conclusions and recommendations of this report.

PLANNED CONSTRUCTION

The proposed shopping center will cover approximately 29 acres overlooking Pearl Harbor. The major structure will consist of a two story mall bounded on the west by Liberty House, and on the east by J. C. Penney's. The structure, to be of reinforced concrete construction, will cover approximately 285,000 square feet. Typical bays will be 24 by 28 feet in plan dimensions.

The planned elevation for the lower, upper and roof levels are 44, 63 and 82 feet respectively. The northwest corner of the site is at elevation 96 feet. To lower the elevation two retaining walls will be necessary. One will be placed five feet from the adjacent streets, with a maximum height of 33 feet.

The second wall will retain approximately 20 feet of soil and rock and will form the outer wall of the main structure.

An Additional Penney's building will be located east of the main structure. This single story structure, with a basement under the majority of the area, will have the main floor at elevation 58.5 feet and the basement at elevation 45.5 feet; this latter elevation lies above the present surface in some parts of the site.

A single story complex of structures, including a bank, service shops, market and restaurant, will be located near the intersection of Kaonohi Street and Kamehameha Highway. The area covered by these structures will be approximatley 50,000 square feet.

A concrete lined drainage channel has recently been constructed near the east end of the property. It is planned to utilize the area adjacent to the channel for parking on the east, and a traffic ramp with two levels of parking on the west side of the channel. A pedestrian and automotive bridge is planned at the intersection of the southern property line and the channel.

Along the entire southern boundary, a retaining wall of variable height will be constructed between the parking areas and

the adjacent Sumida Watercress Farm.

SITE CONDITIONS

SURFACE

The site is presently open and undeveloped except for old Moanalua Road, which presently cuts through the site but will later be removed. Structures on the site are the concrete lined drainage channel, and a few single story, wood frame structures.

The site elevations range from +96 feet at the northwest corner to +2 feet in the southern corner. General drainage of the site is to the south.

A sparse growth of brush and weeds cover the majority of the area, with a few large trees along the southern property line. Large boulders, up to five feet in diameter, have been wasted in the northern portion of the site.

The effects of erosion on the silty surface soils is evident in the form of numerous rivulet channels, one foot wide and three inches deep, crossing the surface of most of the flat area.

SUBSURFACE

The near surface soils over most of the site consists of a reddish brown to brown clayey silt with numerous gravels, cobbles and boulders. This sedimentary deposit is underlain by weathered volcanic basalt found at various depths. A hard, massive basalt is found below the weathered zone.

Two areas of the site, one along the concrete lined drainage channel and the other in the southern corner of the site between the watercress farm and Kaonohi Street, contain soils of a softer characteristic. These areas are noted on the Plot Plan, Plate 1, as Area A and Area B.

Along Kamehameha Highway, in the southern corner of the site (Area A), recent fill was encountered in the upper 7 to 8 feet in borings 11, 12, and 31. It is understood that at one time, this area was part of the existing watercress farm. Below this fill, approximately 10 feet of soft silt was encountered.

The existing drainage channel was built over an old stream bed. The subsurface soils in this vicinity are variable in quality and physical characteristics, depending on the time of deposition. All borings close to the channel (Area B) disclosed

layers of soft silts and loose sands. Borings numbered 20 to 25 encountered loose and soft, saturated soils to depths ranging from 21 to 40 feet. Various amounts of highly organic (peat) deposits and soft, marine sands were also encountered in the borings at lower elevations along the drainage channel. Water was found in all borings drilled in this area at depths ranging from 9 to 19 feet below the surface.

Additional existing fill soils was found at the surface in borings 3, 9, 10, 15, 17, 18, 24 and 25 to depths ranging from 2 to 7 feet.

Details of the subsurface investigation and the soils encountered are presented in Appendix A, Field Exploration. The depths where groundwater was encountered are shown on the Logs of Borings, included in Appendix A.

DISCUSSIONS AND RECOMMENDATIONS

GENERAL

It is concluded that the majority of structures can be supported on shallow spread footings resting on natural soils or on compacted fills. The type of foundation and general construction methods depend primarily on their location on the

site and the elevation of the lowest floor. Provisions should be made to protect the foundation soils from moisture infiltration. It is recommended that exterior grading provide for adequate surface drainage away from structures.

As disclosed by borings in the areas where soft soils underlie proposed structures, driven piles would offer positive stable support. However, consideration should be given to surcharging these areas with a temporary fill to reduce settlements due to the imposed building loads founded on spread footings. The choice will depend upon the relative costs of the two methods of support and tolerable settlement. These matters are discussed in detail later in this report.

SITE PREPARATION AND GRADING

The following specifications are recommended for grading of the site:

1. All trees, grass, weeds, vegetation, debris and other deleterious material shall be cleared from the site.
2. Where buildings are supported on shallow foundations, all existing fills under building areas shall be

removed. The surface of all areas to receive new fill shall be scarified to a depth of six (6) inches, moistened or aerated where necessary, and compacted to a minimum of 90% of the maximum density as determined by ASTM-1557.

3. Under areas to be paved, all existing fills shall be removed and/or recompacted to a minimum depth of two feet (possibly more, depending upon conditions disclosed during grading). The degree of compaction shall be at least 90% of the aforementioned standard.

4. All fill intended to support interior or exterior concrete slabs or paving shall be compacted to at least 90%.

5. All fill intended to support structural loads shall be compacted to at least 95%. In general, such compaction shall extend beyond the edges of footings supported on fill a distance equal to the depth of compacted soil beneath the footings or 3 feet, whichever is greater.

6. All other fills and backfills shall be compacted to at least 90%.
7. Where fill is to be placed on slopes steeper then 5 to 1, the slope shall be benched into firm, natural soil or rock before placing fill.
8. Subdrains shall be provided under fills where seepage or subsurface water is encountered or expected. Such drains shall consist of a minimum of 3 square feet of No. 3 rock, and where large flow is expected, supplemented with a 4 inch perforated drain pipe.
9. All new fill shall be non-expansive soil, free of large rock (over 4"), vegetation and all other debris.

Remarks

When placing fills adjacent to walls, caution should be exercised in operating heavy equipment so as not to damage walls.

Although present plans show no major unretained slopes, the following is recommended for any future planned cut or fill

slopes:

Height	Slope Angle (Horizontal to Vertical)
0 - 10 feet	1-1/2 to 1
10 - 20 feet	2 to 1

Further studies should be made for permanent slopes over 10 feet high in areas of soft underlying soils.

STRUCTURES

Mall

Based on the results of the field and laboratory investigations, the firm natural soils are capable of supporting spread footings, founded at a depth of two (2) feet below the lowest adjacent grade. A maximum allowable bearing value of 7,000 pounds per square foot is recommended for design purposes. It is important that the footings be founded either on the firm natural clayey silt or on basalt. Care should be taken when excavating not to disturb large boulders below the footings. It is recommended that the last foot be excavated by hand.

Some of the footings will be founded in weathered basalt which grades stronger with depth. The weathered basalt caused

little difficulty in the drilling of the test borings and it is anticipated that it can be excavated with conventional earth moving equipment.

It is estimated that the total settlement of the structure founded on the natural soils and/or weathered basalt will be less than one (1) inch. Differential settlements between adjacent columns are estimated at less than one-half (1/2) inch.

For general comments on footing design, refer to the section entitled FOOTINGS, presented later in this report.

J.C. Penney's Additional Building

General

This building will be located partly on natural soils and partly over fill. The portion of the fill lying adjacent to and east of the proposed structure, will vary in thickness from approximately 15 to 20 feet. As the fill extends farther to the east, it will be underlain by a soft, compressible sand and silt layer associated with the old drainage course. The fill placed will effect the settlement and deflection of the eastern side of the structure.

It is anticipated that the fill will cause a settlement of the natural soils adjacent to and under the proposed building on the order of two (2) inches. The maximum settlement of the natural soils, caused by compression of the soft underlying soils, is estimated at eight (8) inches near the center of the filled area.

The two inch settlement mentioned above will occur only on one side of the building area. If this settlement is tolerable, spread footings, either on compacted fill or natural, firm clayey silts, can support the structure. A bearing value of 3,000 pounds per square foot is recommended for footings founded at least two feet below the lowest adjacent grade. Settlement of footings, under structural loads only, will be negligible.

To reduce residual settlement along the eastern side of the building after construction, the area could be surcharged with on-site soil. A 20 foot high fill, extending at least two feet outside the building line in the eastern direction, would reduce the residual settlement to an estimated one-half (1/2) inch. The fill should remain for at least four months before building construction. Settlement markers should be placed in the fill area in order to

determine rates of settlement and thus to be able to predict when the majority of the settlement has taken place.

In considering the possibility of surcharging this area, comments presented later in this report (SECTION - Drainage Channel Retaining Wall) should be reviewed.

Pile Support

If the expected differential settlement is unacceptable, and the area is not surcharged, the eastern, and single story portion of the structure may be supported by driven piles. The piles would extend approximately 30 feet below the existing grade. It is anticipated that either a 12-inch round wooden pile, or a 6-inch steel pipe pile driven to this depth can support a load of 20 tons and 10 tons respectively.

All piles should be driven in accordance with the recommendations given in the "Pile Driving" section of this report.

The basement walls of the building will also act as retaining walls. An active lateral pressure, not including possible exterior live loads, i.e., truck traffic, but with adequate provision made for drainage, of 30 pounds per cubic foot equivalent pressure is recommended.

Single Story Structures

General

The subsurface soil conditions in the southwestern portion of the site can be isolated into two general areas. The area noted as "Area A" on the Plot Plan, and the area to the north of Area A. The soils found in Area A consist of 7 to 8 feet of fill, underlain by approximately 10 feet of soft silt. Along the property line bounded by the watercress farm the soft silt was encountered in the upper 10 feet. In the area to the North of Area A, only firm, natural clayey silts were encountered.

Area A

It is recommended that as much of the existing fill as is practical be removed from under and 10 feet outside the building area. The excavation will probably be limited by the high water level found in this area. The excavation can then be refilled with compacted fill (see SITE PREPARATION AND GRADING). Following the placement of the permanent fill, a temporary surcharge fill should be placed and allowed to remain for approximately 3 months, or more, depending upon the results

of settlement reading of the area.

The single story building could be supported by spread footings resting on the firm compacted fill. A design bearing value of 3,000 pounds per square foot is recommended. Settlement of footings due to the building loads should not exceed 1/2-inch, provided the area has been surcharged.

Another method of structural support would be driven piles. Piles driven 10 feet below the soft soil zone could give adequate support for the anticipated loads. Either an 12-inch round wooden pile or 6-inch steel pipe pile could be used to support allowable loads of 10 - tons and 5 - tons, respectively.

All piles should be driven in accordance with recommendations given in the "Pile Driving" section of this report.

Northern Area

The portion of the single story shops north of Area A can be supported by spread footings located two feet below the lowest adjacent grade. A maximum bearing value of 4,000 pounds per square foot is recommended. For footings up to four feet wide founded on the firm, natural soil, under the

fully applied design load, settlement of less than one-half (1/2) inch is anticipated.

Along the eastern property line, footings should be located so that the horizontal distance between the edge of the footings and the slope face is at least 5 feet. These recommendations are based on the assumption that no new fill would be placed under the building.

General recommendations on footing design are presented in the section entitiled Footings.

Automobile and Pedestrian Bridge

A bridge to span the drainage channel near the old Moanalua Road is planned.

Footings for bridge supports placed at two feet below the final adjacent ground surface resting on firm natural soil or on compacted fill, may be designed for a maximum bearing value of 2,000 pounds per square foot, provided the resulting settlements are tolerable. The following settlements have been estimated under the fully applied recommended load:

Width of Footing in Feet	Estimated Settlement in Inches	
	Square	Continuous
2		1/10
3	1/4	3/8
5	1/2	5/8
8	1	

Variations in these values by as much as 25% may be expected due to differences in soil conditions from one area of the site to another. Settlement will be approximately proportional to the actual applied load.

The above recommendations are based on the requirement that all fill and existing soft soil (see Logs of Boring 24 and 25.) within five (5) feet of the bottom of footings be removed and replaced with adequately compacted fill. (See Site Preparation and Grading). Due care should be paid to excavating and compacting close to channel walls.

Driven piles may also be used to support the structure. Piles should be driven at least 10 feet below the soft zones. Allowable bearing values for precast, prestressed concrete piles

have been estimated as follows:

Penetration of pile below "soft" zone - in feet	Allowable Load - Tons 12" sq.	16" oct.
10'	22	26
15'	33	39
20*	44	52

* Piles driven deeper than 15 feet are likely to encounter hard basalt. In this case, and if so verified by the Soils Engineer during driving, piles could be designed for end bearing, with allowable bearing values of 75 and 120 Tons per pile for 12" and 16" concrete piles respectively.

OTHER CONSTRUCTION

Northwestern Retaining Wall

Parallel to Kaonohi Street and to Moanalua Road, a retaining wall of variable height will be constructed. An equivalent fluid pressure of 30 pounds per cubic foot should be assumed for design of the wall. This value does not include hydrostatic pressures. It is assumed that adequate drainage will be provided.

Temporary cuts should be limited to the following slope angles:

Height (in ft)	Slope
0 - 5	vertical
5 - 10	1/2 : 1 (horizontal to vertical)
10 - 20	1 : 1
over 20	1 - 1/2 : 1

As this retaining wall will make up a portion of the mall building, seepage pressures may be relieved by placing a coarse grained, drainage blanket along the outside of the wall. The drainage blanket could be connected to a longitudinal drain pipe located above the footing.

Retaining wall footings may be designed at the same values as given for the Mall buildings.

Southern Retaining Wall

Adjacent to the existing watercress farm, it is planned to raise the site grade by constructing a retaining wall and filling to grade. With the exception of Area A, the soil and rock found in this investigation along the proposed retaining wall

is firm. Based on these findings, it is concluded that a cantilever-type retaining wall can be constructed on the natural soil.

For footings founded at least three feet below the lowest adjacent grade on firm natural soil, a bearing value of 4,000 pounds per square foot may be used. Lateral pressures against the wall of 30 pounds per cubic foot equivalent fluid pressure may be assumed, with adequate drainage.

Drainage Channel Retaining Wall

General

Parallel to the existing concrete lined drainage channel, and 15 feet from its edge, a 20 foot high retaining wall is planned. The wall will retain a compacted fill which will be used to support an automotive ramp and the upper parking level.

The fill to be placed behind the wall will be underlain by a layer of soft, compressible soil. If the fill were placed in the conventional manner, the rapid loading of the soft layer could cause an unstable condition, which may extend to the drainage channel, and possibly cause an upward heaving of the lining.

Fill Placement

To reduce the possibility of a slippage towards the channel, two possible construction methods have been considered.

Sheet Piles

The first method would be to drive sheet piles along the toe of the proposed retaining wall to a depth of 10 feet below the soft strata. The wall could be constructed and the fill placed with the sheet pile wall restraining the lateral movement of the soft layer. After the filling is completed and sufficient time has been allowed for consolidation of the soft strata, the sheet piles could be remove.

Incremental Filling

Another possible construction method would be to place the fill in increments and allow a period of time for settlement to take place. By loading in stages, the soft soils would consolidate and gain strength prior to the next loading increment. It is believed that the fill could be placed in four increments of five feet each. It has been estimated that the majority

of settlement should take place in one month per increment. The settlement rate should be varified by settlement markers placed below the fill. A temporary surcharge fill outside the retaining wall will aid in maintaining stability during this period.

Retaining Wall Support

The wall may be supported by either spread footings or driven piles.

Footings or piles may be designed on the same basis as given for the Automobile and Pedestrian Bridge. In either case, subsidence of the area will occur due to the consolidation of the soft soils. For this reason, consideration should be given to placing the fill before constructing the wall. If the wall is constructed first, and on spread footings, some subsidence of the wall should be expected, possibly on the order of 2 to 4 inches, depending upon the depth of fill. Temporary cuts for construction of the wall will have to be sloped at angles to be determined depending upon the fill soils used and the height of the cut. However, it is possible that a temporary vertical, or near vertical cut could be realized.

All piles should be driven in accordance with recommendations given in the "Pile Driving" section of this report.

Pavement Design

For parking areas, where only light automobile traffic is anticipated, 2-inches of AC over a 4-inch base course is recommended. For heavy truck traffic anticipated in entrance and loading areas, a 3-inch AC over a 6-inch base course is recommended. In each case, the subgrade to a depth of 6-inches should be compacted to at least 90%. This assumes that the subgrade soils are fine natural or compacted fills. Where soft or loose soils exist, special consideration should be made in the design of the pavement section or the preparation of the subgrade.

FOOTINGS

The bearing values presented in this report are net bearing values. The weight of the supporting concrete footing or piles can be ignored in considering the applied loads. The bearing values may be increased by 33% for momentary loads due to wind or seismic forces. If any foundation is eccentrically loaded,

the maximum edge pressure should not exceed the total allowable bearing values including momentary loads.

Lateral loads may be resisted by the passive pressure against the footings. For design purposes, such resistance for the existing soils and any subsequent compacted fill may be assumed to be equal to an equivalent fluid pressure of 300 pounds per cubic foot. Lateral forces may be resisted by friction between the floor slab and the underlying soils, and may be assumed as 0.3 times the dead load.

PILE DRIVING

The soil below and/or above areas where soft layers were encountered contain gravel, cobbles, and boulders as noted on the Log of Borings. Attempts at driving Wooden piles through the rock will subject the piles to cracking, or "brooming". Even concrete or steel piles could either deflect or become damaged in driving through the rock filled deposit.

It is recommended that a few test piles be driven prior to the production driving in any area to establish probable required lengths. Some piles may not reach the estimated required depth of penetration. Modifications should be made in the field by the

Soils Engineer so that the required support capacity will be obtained.

To prevent overdriving of the wooden piles, if used, the hammer should be small, with a rated energy of less than 15,000 foot-pounds. The blow counts and pile alignment should be carefully observed by the Soils Engineer. Driving should be halted when either the blows per inch become excessive or the pile becomes unacceptably out of plumb. A steel shoe is also recommended.

Lateral loads may be resisted by the bending strength of the pile and the passive resistance of the soil. The following values are recommended for fixed end piles driven on the order of 20 feet below the lowest adjacent grade:

Pile Type	Allowable Lateral Load (In Pounds)
12" Round Wood	3,000
6" Steel Pipe	3,000
12" Square Reinforced Concrete	6,000
16" Octagonal Reinforced Concrete	10,000

These loads should cause a horizontal deflection of not more than 1/4 inch.

Lateral loads may be resisted also by the uplift capacity of the driven piles coupled with other piles in a group or cluster. The amount of pullout resistance of each pile depends on the depth of penetration. It has been estimated that one-half the downward capacity of a pile would be available for uplift resistance.

INSPECTION

During the process of construction, so as to achieve the desired results, it is recommended that the Soils Engineer be present to inspect the following operations:

1. Surcharge settlement recordings.
2. Site preparation; clearing and grubbing.
3. Placement of fill and backfill. (Tests and control of compaction).
4. Pile Driving.
5. Footing Excavations.

REMARKS

Areas between and beyond borings are assumed to be consistant with those sampled and tested. While no major changes in strata depths or thicknesses are anticipated, it should be realized that depths to the various soil and/or rock layers will vary over the site, as indicated by the findings.

This report has been compiled for the exclusive use of Robert B. Liles, Incorporated, who represents the developer. It shall not be transferred to or used by a third party, or to another project without consent and/or thorough review by this facility.

Should the project be delayed beyond the period of one year after the date of this report, the report shall be reviewed to consider possible changed conditions.

Samples obtained in this investigation will deteriorate with time and will be unsuitable for further laboratory testing within three months from the date of this report. Unless otherwise advised, the samples will be discarded at that time.

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The following plates and appendices are attached and complete this report:

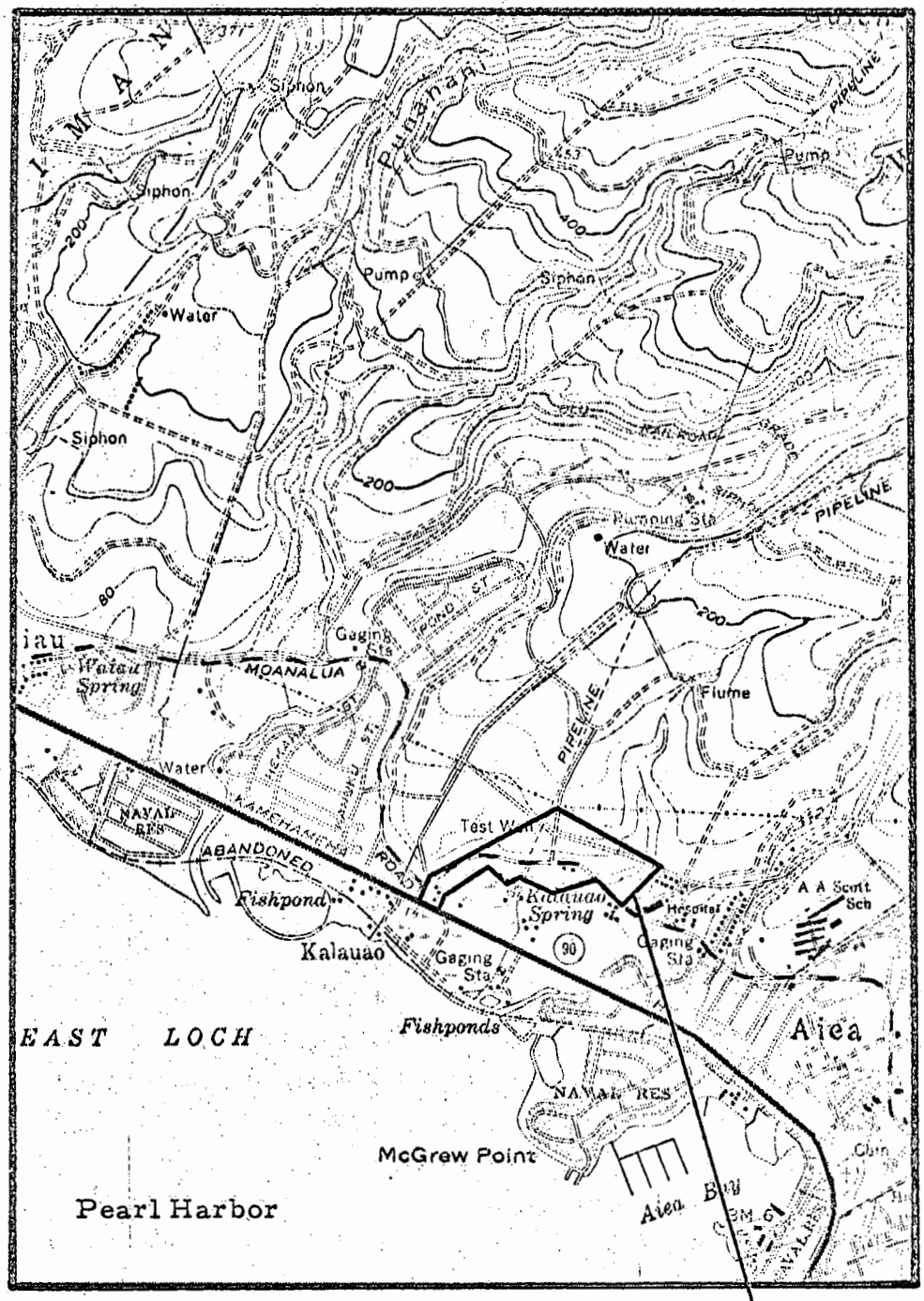
Plate 1 - Vicinity Map

Plate 2 - Plot Plan

Appendix A - Field Exploration

Appendix B - Laboratory Testing

VICINITY MAP



Scale
1" = 2,000'

General Site Location

REFERENCE

USGS Topographic Map
Waipahu, Hawaii Quadrangle
Dated 1959

PEARL RIDGE SHOPPING CENTER
MAURSETH, HOWE, LOCKWOOD & ASSOC.

Plate 1
File No. H-58

APPENDIX A

FIELD EXPLORATION

Subsurface conditions at the site of the proposed shopping center development were explored by drilling a total of 32 borings. The borings were four inches in diameter and were drilled to depths ranging from 5-1/2 to 56-1/2 feet. The borings were drilled with truck-mounted rotary augers. The locations of these borings are shown on the Plot Plan, Plate 2.

Undisturbed samples were obtained by driving a sampling tube into undisturbed soil at various intervals below the surface by means of a heavy driving weight dropping on sampler rods. The sampling tube consists of a steel barrel, 2.50-inches in diameter, with an interior lining of one-inch long, thin brass rings. The sampling tube is driven approximately 18-inches into the soil and a section of the central portion of the sample is taken to the laboratory in a closely fitted, water-proof container in order to retain the field moisture until completion of the tests. The

driving energy required to drive the sampler one foot into the undisturbed soil, as noted in the Log of Borings in Blows per Foot, is 140 pounds dropping 30 inches.

Boring elevations and locations were established by the drilling contractor, Nat Whiton & Company.

Logs of all borings are shown on the attached plates, 3 through 34.

LOG OF BORING NO 1

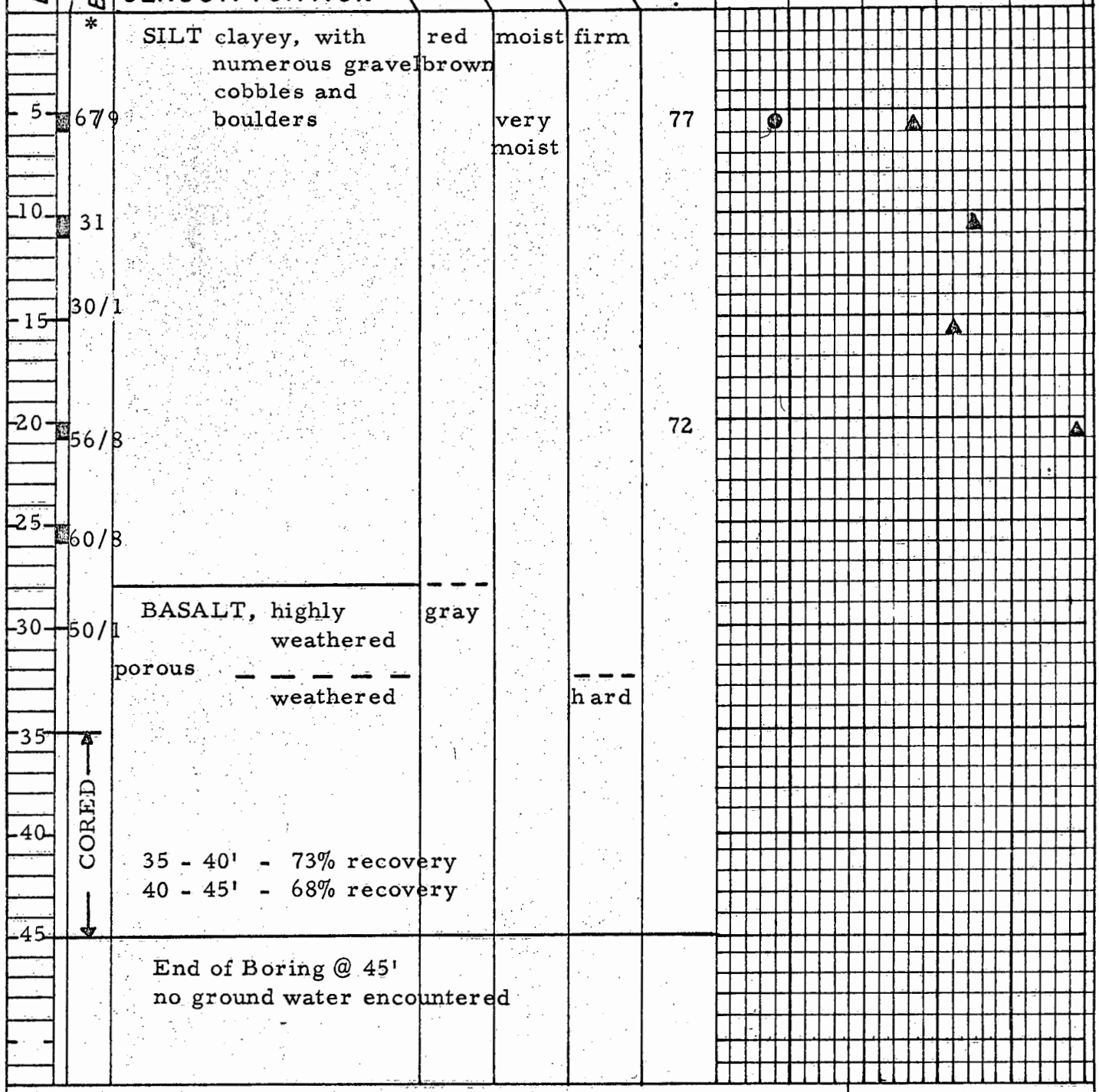
DATE DRILLED: February 27, 1970

EQUIPMENT USED: Truck Mounted Auger

ELEV. OF SURFACE: 79.4

Depth in Feet	Samples	Blows Per Foot	DESCRIPTION OF SOILS — CLASSIFICATION	Color	Moisture	Consistency	Dry Unit Weight lb. per cu. ft.
5		* 6/7/9	SILT clayey, with numerous gravel cobbles and boulders	red brown	moist	firm	
					very moist		77
10		31					
15		30/1					
20		56/8					72
25		60/8					
30		50/1	BASALT, highly weathered porous	gray			
			weathered			hard	
35	CORED		35 - 40' - 73% recovery				
40			40 - 45' - 68% recovery				
45			End of Boring @ 45' no ground water encountered				

COHESION ○ OR SHEAR RES. ●
KIPS PER SQUARE FOOT
1 2 3 4 5
MOISTURE - PERCENT DRY/WT.
▲ 10 20 30 40 50



* 140 lb. Hammer falling 30 inches

PEARL RIDGE SHOPPING CENTER

MAURSETH HOWE LOCKWOOD & ASSOC.

PLATE NO. 3

FILE NO. H-58

LOG OF BORING NO 2

DATE DRILLED: February 26, 1970

EQUIPMENT USED: Truck Mounted Auger

ELEV. OF SURFACE: 66.6

Depth in Feet	Samples	Blows Per Foot	DESCRIPTION OF SOILS — CLASSIFICATION	Color	Moisture	Consistency	Dry Unit Weight lb. per cu. ft.
0			SILT, clayey, with numerous gravels, cobbles & boulders.	red brown	Moist	firm	
5							
10		53			very moist		81
15							
20		37/6					
25			BASALT, weathered	gray		hard	
30		22/2				firm	102
35		80/2					
40		40/1					
45			End of Boring @ 45' No ground water encountered				

COHESION ○ OR SHEAR RES. ●
KIPS PER SQUARE FOOT
1 2 3 4 5
MOISTURE - PERCENT DRY/WT.
▲ 10 20 30 40 50

PEARL RIDGE SHOPPING CENTER

MAURSETH HOWE LOCKWOOD & ASSOC.

PLATE NO. 4

FILE NO. H-58

LOG OF BORING NO 3

DATE DRILLED: March 3, 1970
EQUIPMENT USED: Truck Mounted Auger
ELEV. OF SURFACE: 84.4

Depth in Feet	Samples	Blows Per Foot	DESCRIPTION OF SOILS — CLASSIFICATION	Color	Moisture	Consistency	Dry Unit Weight lb. per cu. ft.
			FILL SILT, clayey w/ gravels, boulders	brown	moist	firm	
5			SILT, clayey, with numerous gravels, cobbles, boulders	red brown			
10		49		gray brown			
15							
20		45/4	sandy with numerous gravels and cobble size basalt				
25							
30		94					
35							
40		50/5	BASALT, weathered, porous	gray			
45		49/8					
50			(Con't)				

COHESION ○ OR SHEAR RES. ●
KIPS PER SQUARE FOOT
1 2 3 4 5
MOISTURE PERCENT DRY/WT.
▲ 10 20 30 40 50

PEARL RIDGE SHOPPING CENTER
PLATE NO. 5
MAURSETH HOWE LOCKWOOD & ASSOC.
FILE NO. H-58

LOG OF BORING NO 3 (Con't)

DATE DRILLED:

EQUIPMENT USED:

ELEV. OF SURFACE:

Depth in Feet	Samples	Blows Per Foot	DESCRIPTION OF SOILS — CLASSIFICATION	Color	Moisture	Consistency	Dry Unit Weight lb. per cu. ft.
55	Cored		BASALT, weathered, porous	gray	moist	hard	
			50' to 55' - 78% recovery 55' to 60' - 90% recovery				
60			End of Boring @ 60' no ground water encountered				

COHESION ○ OR SHEAR RES. ●
KIPS PER SQUARE FOOT
1 2 3 4 5
MOISTURE PERCENT DRY/WT.
▲ 10 20 30 40 50

PEARL RIDGE SHOPPING CENTER

MAURSETH HOWE LOCKWOOD & ASSOC.

PLATE NO. 5 (con't)

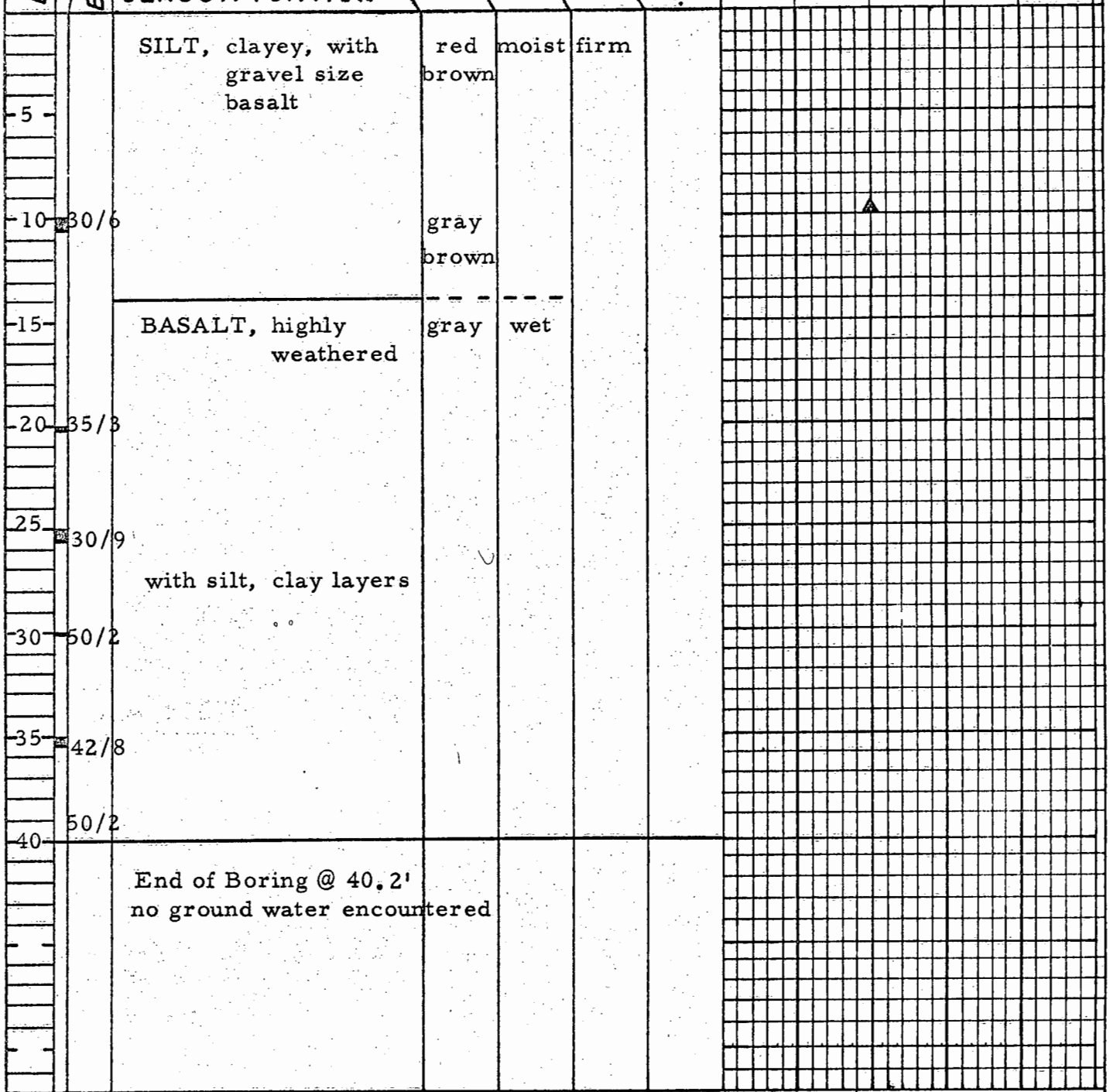
FILE NO. H-58

LOG OF BORING NO 4

DATE DRILLED: February 26, 1970
EQUIPMENT USED: Truck Mounted Auger
ELEV. OF SURFACE: 58.2

Depth in Feet	Samples	Blows Per Foot	DESCRIPTION OF SOILS — CLASSIFICATION	Color	Moisture	Consistency	Dry Unit Weight lb. per cu. ft.
5			SILT, clayey, with gravel size basalt	red brown	moist	firm	
10		30/6		gray brown			
15			BASALT, highly weathered	gray	wet		
20		35/3					
25		30/9	with silt, clay layers				
30		50/2					
35		42/8					
40		50/2					
			End of Boring @ 40.2' no ground water encountered				

COHESION ○ OR SHEAR RES. ●
KIPS PER SQUARE FOOT
1 2 3 4 5
MOISTURE - PERCENT DRY WT.
▲ 10 20 30 40 50



PEARL RIDGE SHOPPING CENTER
MAURSETH HOWE LOCKWOOD & ASSOC.

PLATE NO. 6
FILE NO. H-58

LOG OF BORING NO 5

DATE DRILLED: March 5, 1970

EQUIPMENT USED: Truck Mounted Auger

ELEV. OF SURFACE: 67.2

Depth in Feet	Samples	Blows Per Foot	DESCRIPTION OF SOILS — CLASSIFICATION	Color	Moisture	Consistency	Unit Dry Weight lb. per cu. ft.	COHESION ○ OR SHEAR RES. ● KIPS PER SQUARE FOOT (1 2 3 4 5) MOISTURE PERCENT DRY/WT. (▲ 10 20 30 40 50)
5			SILT, sandy	brown	moist	firm		
			clay	red brown				
10		80	with basalt fragments				73	
15								
20		67					72	
25	CORED		BASALT, weathered	gray		hard		
			porous					
30			with silt, clay streaks					
35			25-1/2' to 30-1/2' - 80% recovery 30-1/2' to 35-1/2' - 92% recovery 35-1/2' to 40-1/2' - 93% recovery					
40			End of Boring @ 40.7' no ground water encountered					

PEARL RIDGE SHOPPING CENTER

MAURSETH HOWE LOCKWOOD & ASSOC.

PLATE NO. 7

FILE NO. H-58

LOG OF BORING NO 6

DATE DRILLED: March 12, 1970

EQUIPMENT USED: Truck Mounted Auger

ELEV. OF SURFACE: 48.2

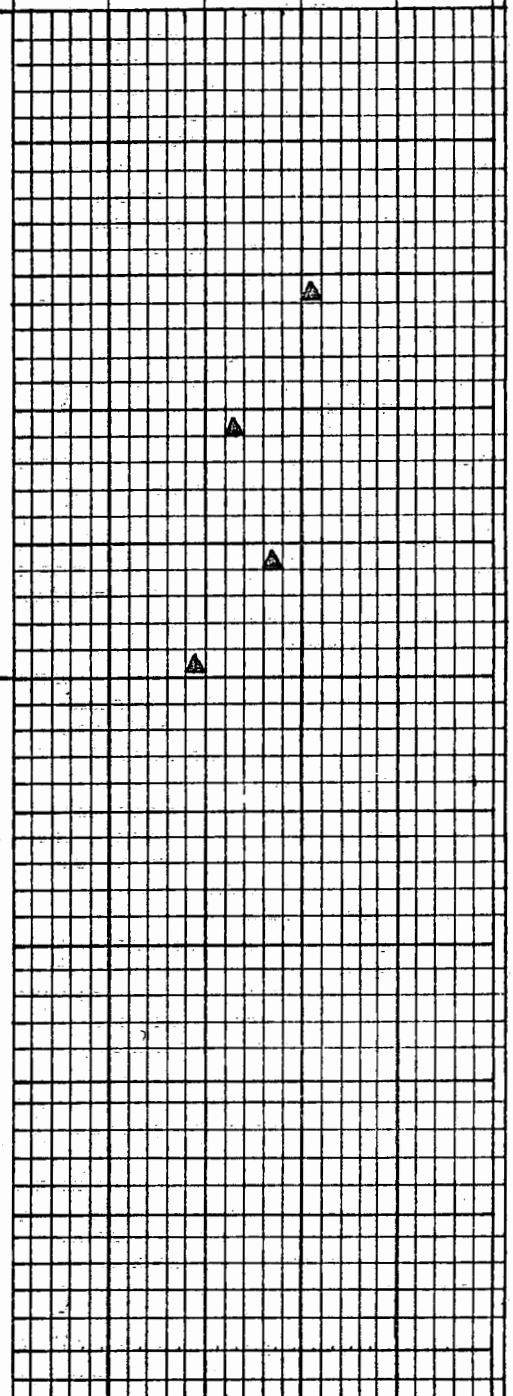
Depth in Feet	Samples	Blows Per Foot	DESCRIPTION OF SOILS — CLASSIFICATION	Color	Moisture	Consistency	Unit Dry Weight lb. per cu. ft.
5		10/1	SILT, sandy	red brown	sl moist	firm	
10		111	DECOMPOSED BASALT	gray	moist		74
			porous	red brown			
15		87			moist		79
20		71/8		gray			82
25		72/7	End of Boring @ 25.6' no ground water encountered				

COHESION ○ OR SHEAR RES. ● KIPS PER SQUARE FOOT

1 2 3 4 5

MOISTURE - PERCENT DRY/WT.

▲ 10 20 30 40 50



PEARL RIDGE SHOPPING CENTER

MAURSETH HOWE LOCKWOOD & ASSOC.

PLATE NO. 8

FILE NO. H-58

LOG OF BORING NO 7

DATE DRILLED: March 12, 1970
EQUIPMENT USED: Truck Mounted Auger
ELEV. OF SURFACE: 61.5

Depth in Feet	Samples	Blows Per Foot	DESCRIPTION OF SOILS — CLASSIFICATION	Color	Moisture	Consistency	Dry Unit Weight lb. per cu. ft.
5			SILT, clayey with gravel & boulder size basalt	red brown	moist	firm	
10		20/1		gray & brown			
		53/14					65
15			clayey	gray brown	wet		
20		35/4	BASALT, weathered, porous				
25		20/1					
30		39/9					
35		45/4				very hard	
40			End of Boring @ 40' no ground water encountered				

COHESION ○ OR SHEAR RES. ◉ KIPS PER SQUARE FOOT
1 2 3 4 5
MOISTURE - PERCENT DRY/WT.
▲ 10 20 30 40 50

PEARL RIDGE SHOPPING CENTER
MAURSETH HOWE LOCKWOOD & ASSOC.

PLATE NO. 9
FILE NO. H-58

LOG OF BORING NO 8

DATE DRILLED: March 5, 1970

EQUIPMENT USED: Truck Mounted Auger

ELEV. OF SURFACE: 59.0

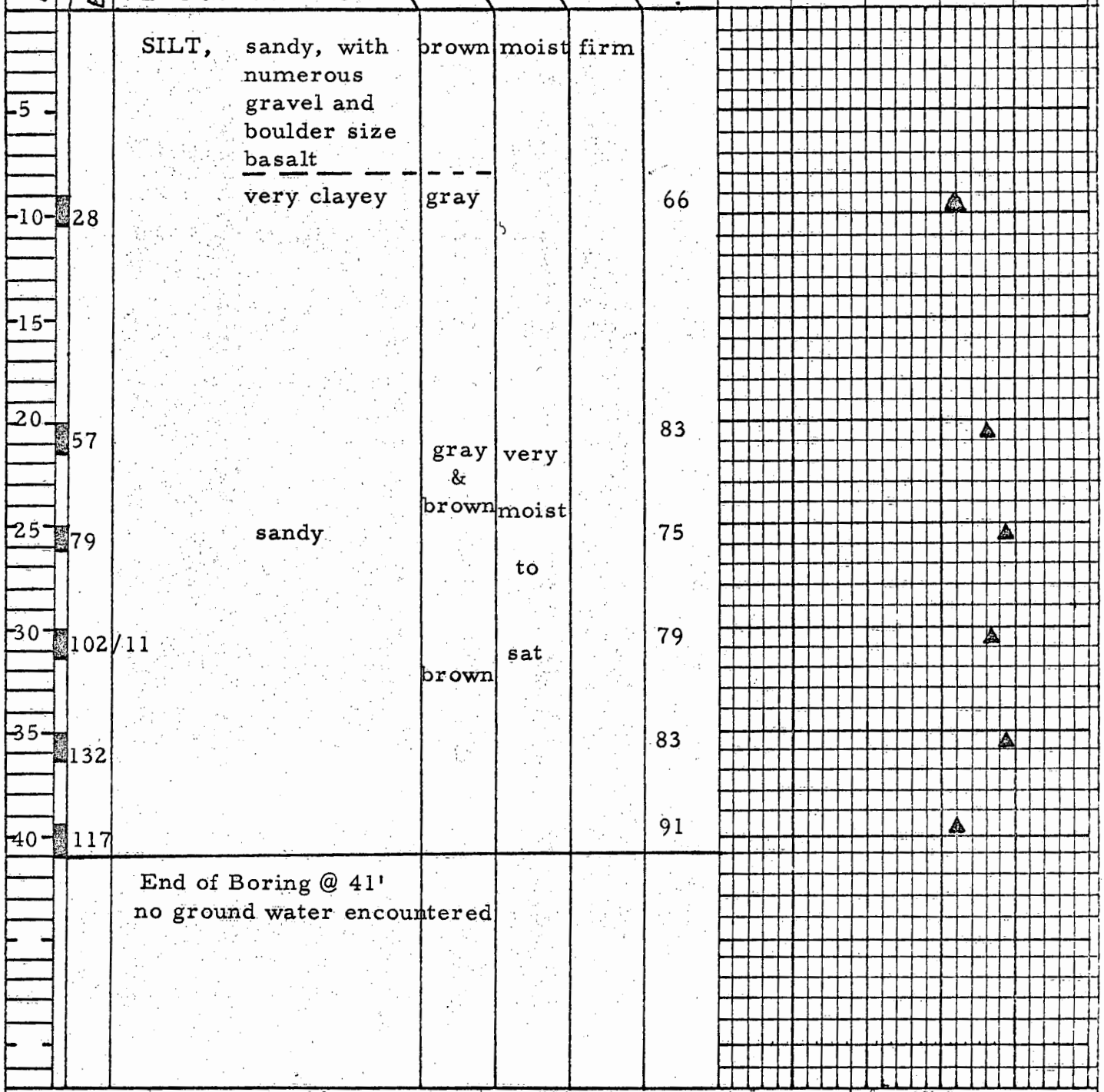
Depth in Feet	Samples	Blows Per Foot	DESCRIPTION OF SOILS — CLASSIFICATION	Color	Moisture	Consistency	Dry Unit Weight lb. per cu. ft.
5			SILT, sandy, with numerous gravel and boulder size basalt	brown	moist	firm	
10		28	very clayey	gray			66
15							
20		57		gray & brown	very moist to sat		83
25		79	sandy				75
30		102/11		brown			79
35		132					83
40		117					91
			End of Boring @ 41' no ground water encountered				

COHESION ○ OR SHEAR RES. ◎ KIPS PER SQUARE FOOT

1 2 3 4 5

MOISTURE - PERCENT DRY/WT.

▲ 10 20 30 40 50



PEARL RIDGE SHOPPING CENTER

MAURSETH HOWE LOCKWOOD & ASSOC.

PLATE NO. 10

FILE NO. H-58

LOG OF BORING NO 9

DATE DRILLED: March 6, 1970

EQUIPMENT USED: Truck Mounted Auger

ELEV. OF SURFACE: 58.5

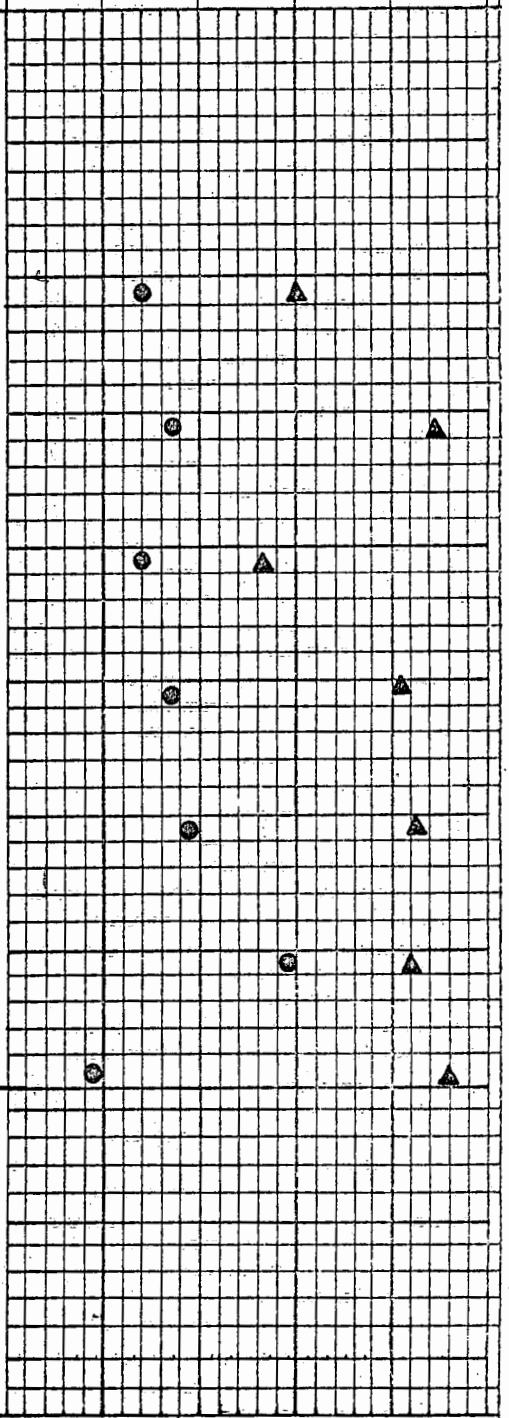
Depth in Feet	Samples	Blows Per Foot	DESCRIPTION OF SOILS — CLASSIFICATION	Color	Moisture	Consistency	Dry Unit Weight lb. per cu. ft.
			FILL SILT, clayey	red brown & brown	sl moist	mod soft	
5			SILT, clayey			firm	
10		35	occasional basalt frags.		very moist		92
15		25					70
20		59		brown & gray			86
25		64					75
30		51					75
35		78/8					88
		55					72
40			End of Boring @ 41' no ground water encountered				

COHESION ○ OR SHEAR RES. ◎ KIPS PER SQUARE FOOT

1 2 3 4 5

MOISTURE - PERCENT DRY/WT.

▲ 10 20 30 40 50



PEARL RIDGE SHOPPING CENTER

PLATE NO. 11

MAURSETH HOWE LOCKWOOD & ASSOC.

FILE NO. H-58

LOG OF BORING NO 10

DATE DRILLED: March 6, 1970

EQUIPMENT USED: Truck Mounted Auger

ELEV. OF SURFACE: 41.3

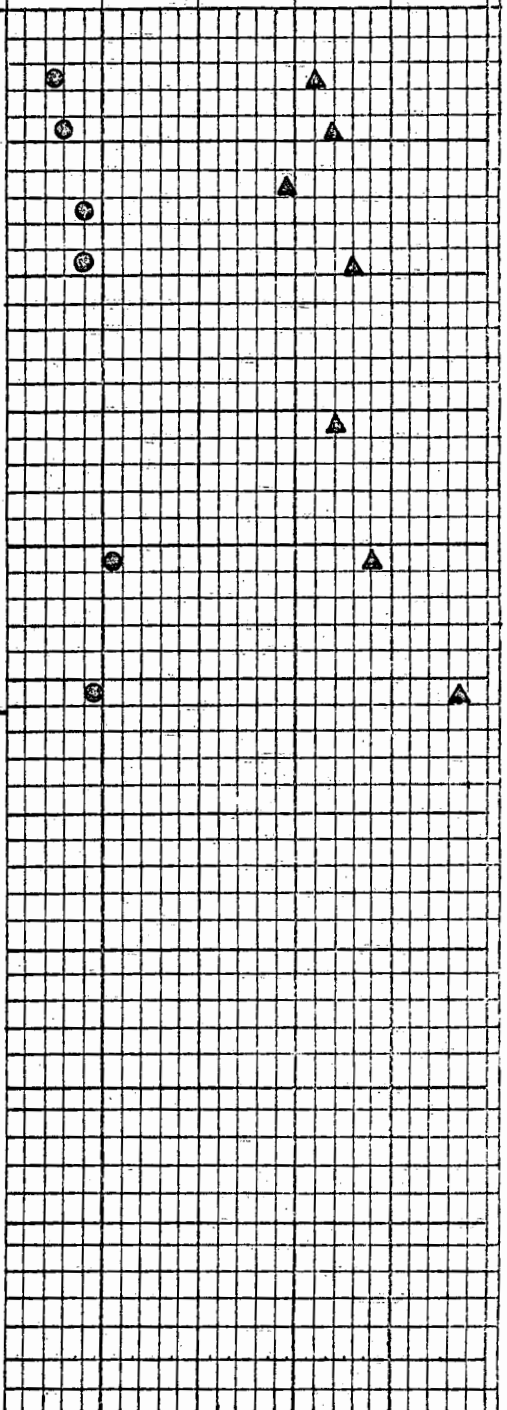
Depth in Feet	Samples	Blows Per Foot	DESCRIPTION OF SOILS — CLASSIFICATION	Color	Moisture	Consistency	Dry Unit Weight lb. per cu. ft.
		21	FILL SILT, clayey organic matter	red brown & brown	very moist to sat	mod firm	83
		21					81
5		31	SILT clayey	brown		firm	90
							85
10		26					
15		23					84
20		35					84
					▽		
25		20					73
			End of Boring @ 26.5' Water level at 24' on 3/6/70				

COHESION ○ OR SHEAR RES. ◎ KIPS PER SQUARE FOOT

1 2 3 4 5

MOISTURE - PERCENT DRY WT.

▲ 10 20 30 40 50



PEARL RIDGE SHOPPING CENTER

PLATE NO. 12

MAURSETH HOWE LOCKWOOD & ASSOC.

FILE NO. H-58

LOG OF BORING NO 11

DATE DRILLED: February 25, 1970
EQUIPMENT USED: Truck Mounted Auger
ELEV. OF SURFACE: 20.0'

Depth in Feet	Samples	Blows Per Foot	DESCRIPTION OF SOILS — CLASSIFICATION	Color	Moisture	Consistency	Dry Unit Weight lb. per cu. ft.
			FILL, SILT, clayey with gravels	red brown	moist	firm	
5		15		brown	sat	mod firm	
			SILT, sandy	gray brown		soft	
10		3					
15		2					
20		10	sandy, clayey	brown		mod firm	85.2
			End of Boring @ 21.5' water level @ 7.8' on 3/2/70				

COHESION ○ OR SHEAR RES. ● KIPS PER SQUARE FOOT
1 2 3 4 5
MOISTURE - PERCENT DRY/WT.
▲ 10 20 30 40 50

PEARL RIDGE SHOPPING CENTER
MAURSETH HOWE LOCKWOOD & ASSOC.

PLATE NO. 13
FILE NO. H-58

LOG OF BORING NO 12

DATE DRILLED: February 25, 1970

EQUIPMENT USED: Truck Mounted Auger

ELEV. OF SURFACE: 17.0'

Depth in Feet	Samples	Blows Per Foot	DESCRIPTION OF SOILS — CLASSIFICATION	Color	Moisture	Consistency	Unit Dry Weight lb. per cu. ft.
5		14	FILL, SILT, clayey, with gravels, & bits of glass, wood & concrete	brown & gray	moist	firm / mod firm	78
10		4	SILT, clayey	gray		soft	56
15		4					74
20		21	with silt nodules	yellow brown		firm	
			End of Boring @ 21.0' water level @ 3.8' on 3/20/70				

COHESION ○ OR SHEAR RES. ●
KIPS PER SQUARE FOOT

1 2 3 4 5

MOISTURE - PERCENT DRY/WT.

▲ 10 20 30 40 50

66▲

PEARL RIDGE SHOPPING CENTER

MAURSETH HOWE LOCKWOOD & ASSOC.

PLATE NO. 14

FILE NO. H-58

LOG OF BORING NO 13

DATE DRILLED: February 25, 1970

EQUIPMENT USED: Truck Mounted Auger

ELEV. OF SURFACE: 20.9'

Depth in Feet	Samples	Blows Per Foot	DESCRIPTION OF SOILS — CLASSIFICATION	Color	Moisture	Consistency	Dry Unit Weight lb. per cu. ft.
5		48	SILT, clayey, with gravels	gray & brown	moist	firm	72
				brown			88
10		45					
			sandy				69
15		26					
				red brown			86
20		25					
			End of Boring @21.0' water level @ 8.0' 3/2/70				

COHESION ○ OR SHEAR RES. ◎ KIPS PER SQUARE FOOT

1 2 3 4 5

MOISTURE - PERCENT DRY/WT.

▲ 10 20 30 40 50

53▲

PEARL RIDGE SHOPPING CENTER

MAURSETH HOWE LOCKWOOD & ASSOC.

PLATE NO. 15

FILE NO. H-58

LOG OF BORING NO 14

DATE DRILLED: March 4, 1970

EQUIPMENT USED: Truck Mounted Auger

ELEV. OF SURFACE: 6.4'

Depth in Feet	Samples	Blows Per Foot	DESCRIPTION OF SOILS — CLASSIFICATION	Color	Moisture	Consistency	Dry Unit Weight lb. per cu. ft.
			FILL, silt, clayey	brown	moist	soft	
			SILT, sandy, clayey	gray		soft	
5		3					66
10		32	clayey	brown & gray		firm	80
15		38		red			85
20		39					92
25		42					89
30		47	DECOMPOSED BASALT				86
			End of Boring @ 31.5' water flowing freely from top of boring (Artesian)				

COHESION ○ OR SHEAR RES. ◉ KIPS PER SQUARE FOOT

1 2 3 4 5

MOISTURE PERCENT DRY/WT.

▲ 10 20 30 40 50

60

40

PEAL RIDGE SHOPPING CENTER

PLATE NO. 16

MAURSETH HOWE LOCKWOOD & ASSOC.

FILE NO. H-58

LOG OF BORING NO 15

DATE DRILLED: February 26, 1970

EQUIPMENT USED: Truck Mounted Auger

ELEV. OF SURFACE: 15.3'

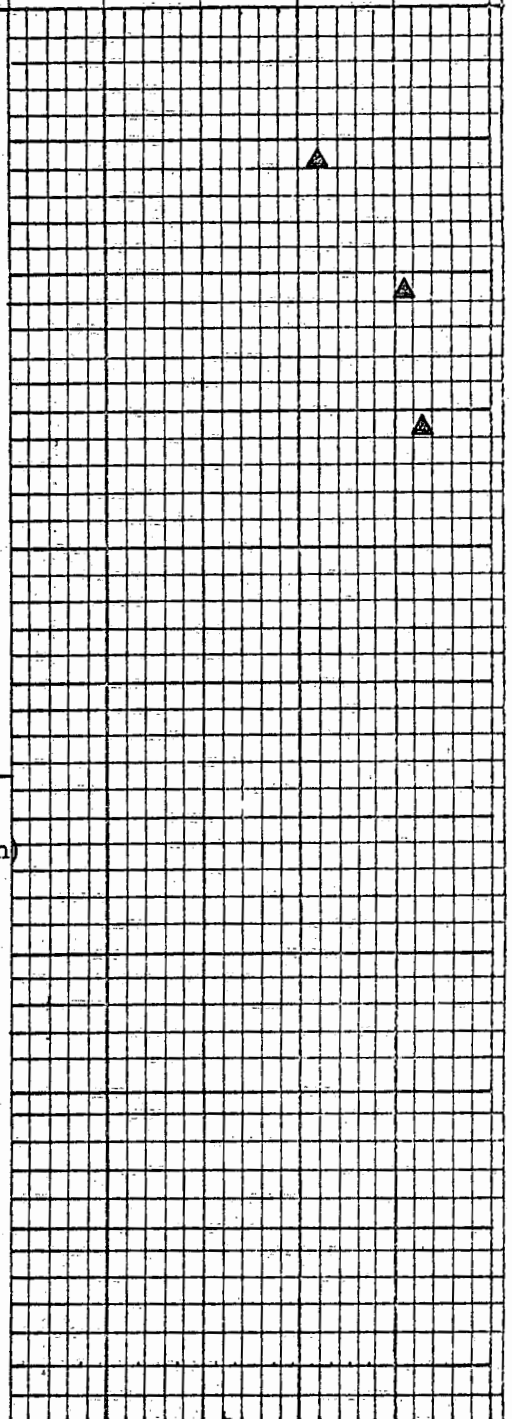
Depth in Feet	Samples	Blows Per Foot	DESCRIPTION OF SOILS — CLASSIFICATION	Color	Moisture	Consistency	Dry Unit Weight lb. per cu. ft.
5		33	FILL, clayey with gravel	brown	very moist to sat	firm	90
				red brown			
10		21					70
				gray & brown			
15		41					75
20		43	increasing gravel				
25		51/8	BASALT, highly weathered	green & gray		mod hard hard	
30			End of boring @ 28.8' Water flowing freely from top of hole (artesian)				

COHESION ○ OR SHEAR RES. ◎ KIPS PER SQUARE FOOT

1 2 3 4 5

MOISTURE PERCENT DRY/WT.

▲ 10 20 30 40 50



PEARL RIDGE SHOPPING CENTER

PLATE NO. 17

MAURSETH HOWE LOCKWOOD & ASSOC.

FILE NO. H-58

LOG OF BORING NO 16

DATE DRILLED: March 3, 1970

EQUIPMENT USED: Truck Mounted Auger

ELEV. OF SURFACE: 16.0

Depth in Feet	Samples	Blows Per Foot	DESCRIPTION OF SOILS — CLASSIFICATION	Color	Moisture	Consistency	Dry Unit Weight lb. per cu. ft.
5		47	SILT, clayey with gravel	red brown	moist	firm	
				gray			
10		50/4					
15		45/2					
20	CORED		BASALT, highly weathered, porous	gray		mod hard	
25			20' to 25' - 55% recovery 25' to 30' - 40% recovery				
30			End of Boring @ 30.0' water level @ 3.8' on 3/20/70				

COHESION ○ OR SHEAR RES. ⊙ KIPS PER SQUARE FOOT

1 2 3 4 5

MOISTURE PERCENT DRY/WT.

▲ 10 20 30 40 50

PEARL RIDGE SHOPPING CENTER

PLATE NO. 18

MAURSETH HOWE LOCKWOOD & ASSOC.

FILE NO. H-58

LOG OF BORING NO 17

DATE DRILLED: March 6, 1970

EQUIPMENT USED: Truck Mounted Auger

ELEV. OF SURFACE: 14.4

Depth in Feet	Samples	Blows Per Foot	DESCRIPTION OF SOILS — CLASSIFICATION	Color	Moisture	Consistency	Dry Unit Weight lb. per cu.ft.	COHESION ○ OR SHEAR RES. ⊕ KIPS PER SQUARE FOOT (1 2 3 4 5) / MOISTURE PERCENT DRY/WT. (▲ 10 20 30 40 50)
		19	FILL, SILT, clayey sandy, with roots	brown mott.	moist	firm	75	
		22					74	
5								
		22	SILT, clayey	brown & gray	sat		70	
		49					84	
10			BASALT, highly weathered	gray		hard		
15			End of Boring @ 13.3 Water level @ 8' on 3/9/70					

PEARL RIDGE SHOPPING CENTER

MAURSETH HOWE LOCKWOOD & ASSOC.

PLATE NO. 19

FILE NO. H-58

LOG OF BORING NO 18

DATE DRILLED: March 9, 1970

EQUIPMENT USED: Truck Mounted Auger

ELEV. OF SURFACE: 16.6

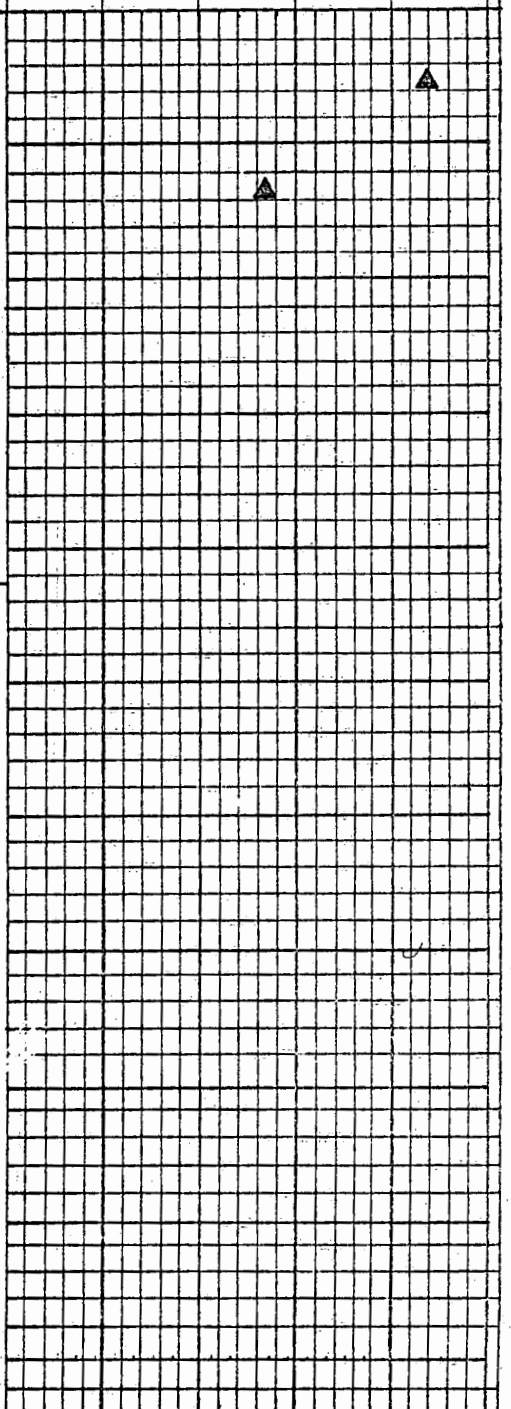
Depth in Feet	Samples	Blows Per Foot	DESCRIPTION OF SOILS — CLASSIFICATION	Color	Moisture	Consistency	Dry Unit Weight lb. per cu. ft.
			FILL, SILT, clayey	brown	moist	mod firm	
		18	SILT, clayey	red brown	sat	firm	83
5							
		39					83
			with numerous gravels & boulders, to 10" vis.		▽	very firm	
10							
	CORED		7.5 - 12.5 - no recovery				
			12.5 - 16.5 - 25% recovery				
15			16.5 - 21.5 - 28% recovery				
			BASALT, highly weathered	gray		hard	
20							
			End of Boring @ 21.5' water level @ 8.8' on 3/20/70				

COHESION ○ OR SHEAR RES. ◎ KIPS PER SQUARE FOOT

1 2 3 4 5

MOISTURE PERCENT DRY/WT.

▲ 10 20 30 40 50



PEARL RIDGE SHOPPING CENTER

MAURSETH HOWE LOCKWOOD & ASSOC.

PLATE NO. 20

FILE NO. H-58

LOG OF BORING NO 19

DATE DRILLED: March 12, 1970
EQUIPMENT USED: Truck Mounted Auger
ELEV. OF SURFACE: 18.8

Depth in Feet	Samples / Blows Per Foot	DESCRIPTION OF SOILS — CLASSIFICATION	Color	Moisture	Consistency	Dry Unit Weight lb. per cu.ft.
		SILT, clayey	brown	moist	mod soft	
5	22	DECOMPOSED BASALT, porous	gray		firm	73
10	33/7"					71
15	CORED	13.0 - 15.0, 60% recovery 15.0 - 19.0, 75% recovery			mod hard	
20		End of Boring @ 19.0' water level @ 4.4' on 3-20-70				

COHESION ○ OR SHEAR RES. ●
KIPS PER SQUARE FOOT
1 2 3 4 5
MOISTURE PERCENT DRY/WT.
▲ 10 20 30 40 50

PEARL RIDGE SHOPPING CENTER
PLATE NO. 21
MAURSETH HOWE LOCKWOOD & ASSOC.
FILE NO. H-58

LOG OF BORING NO 20

DATE DRILLED: March 9, 1970

EQUIPMENT USED: Truck Mounted Auger

ELEV. OF SURFACE: 36.5

Depth in Feet	Samples	Blows Per Foot	DESCRIPTION OF SOILS CLASSIFICATION	Color	Moisture	Consistency	Dry Unit Weight lb. per cu. ft.
0			SILT, clayey with gravels	brown	sat	firm	85
5		23					
		14				mod firm	77
10		16	very sandy			soft	80
15		9					79
20		5	very clayey			firm	76
25		25					85
30		19					79
			End of Boring @ 31.5' water level @ 18.4' on - 3/20/70				

COHESION ○ OR SHEAR RES. ◉ KIPS PER SQUARE FOOT

1 2 3 4 5

MOISTURE-PERCENT DRY/WT.

▲ 10 20 30 40 50

PEARL RIDGE SHOPPING CENTER

PLATE NO. 22

MAURSETH HOWE LOCKWOOD & ASSOC.

FILE NO. H-58

LOG OF BORING NO 21

DATE DRILLED: March 11, 1970

EQUIPMENT USED: Truck Mounted Auger

ELEV. OF SURFACE: 34.7'

Depth in Feet	Samples	Blows Per Foot	DESCRIPTION OF SOILS — CLASSIFICATION	Color	Moisture	Consistency	Dry Unit Weight lb. per cu. ft.
5		33	SILT, clayey with gravels	brown	moist to very moist	firm	92
10		23					82
				dark brown to brown		mod firm	
15		17	very clayey			mod soft	86
20		8					73
						mod firm	
25		18					85
30		19					87
35		17					79
			DECOMPOSED BASALT			firm	
40		40					97
45			End of Boring @ 41.5' Water level @ 17.6' on 3/20/70				

COHESION ○ OR SHEAR RES. ● KIPS PER SQUARE FOOT

1 2 3 4 5

MOISTURE PERCENT DRY/WT.

▲ 10 20 30 40 50

52▲

PEARL RIDGE SHOPPING CENTER

MAURSETH HOWE LOCKWOOD & ASSOC.

PLATE NO. 23

FILE NO. H-58

LOG OF BORING NO 22

DATE DRILLED: March 9, 1970
EQUIPMENT USED: Truck Mounted Auger
ELEV. OF SURFACE: 33.4'

Depth in Feet	Samples	Blows Per Foot	DESCRIPTION OF SOILS CLASSIFICATION	Color	Moisture	Consistency	Dry Unit Weight lb. per cu.ft.
5		58	SILT, clayey, with gravels	brown	moist	firm	87
10		17				mod firm	74
15		7	sandy	dark brown		soft	71
20		18					74
25		15	DECOMPOSED BASALT - highly weathered	dark gray green		firm	66
30		60	weathered	dark brown		hard	77
35			End of Boring @ 31.5' Water level @ 16.2' on 3/9/70				

COHESION ○ OR SHEAR RES. ●
KIPS PER SQUARE FOOT
1 2 3 4 5
MOISTURE PERCENT DRY/WT.
▲ 10 20 30 40 50

51▲
59▲

PEARL RIDGE SHOPPING CENTER
MAURSETH HOWE LOCKWOOD & ASSOC.

PLATE NO. 24
FILE NO. H-58

LOG OF BORING NO 23

DATE DRILLED: March 11, 1970
EQUIPMENT USED: Truck Mounted Auger
ELEV. OF SURFACE: 27.6'

Depth in Feet	Samples	Blows Per Foot	DESCRIPTION OF SOILS — CLASSIFICATION	Color	Moisture	Consistency	Dry Unit Weight lb. per cu. ft.	MOISTURE PERCENT DRY/WT.
								COHESION ○ OR SHEAR RES. ⊗ KIPS PER SQUARE FOOT 1 2 3 4 5 ▲ 10 20 30 40 50
			SILT, clayey, sandy with gravels	brown	moist	firm		
5		29					75	
				red brown				
10		23					86	
					▽			
15		11	sandy clayey	brown		mod soft soft	76	
20		6					61	
			PEAT, silty	black			31	135
25		6	SILT, clayey	dark gray				
			SAND, fine to coarse silty coarse, silty	to gray		loose	53	73
30		8						
35		8					61	65
			SILT, clayey with gravels	gray & brown		mod firm firm	81	
40		13						
45		18					73	
			DECOMPOSED BASALT			hard		
50		46					72	51

End of Boring @ 52' Water level @ 14.2' on 3/20/70

PEARL RIDGE SHOPPING CENTER

MAURSETH HOWE LOCKWOOD & ASSOC.

PLATE NO. 25

FILE NO. H-58

LOG OF BORING NO 24

DATE DRILLED: March 9, 1970

EQUIPMENT USED: Truck Mounted Auger

ELEV. OF SURFACE: 22.1'

Depth in Feet	Samples	Blows Per Foot	DESCRIPTION OF SOILS — CLASSIFICATION	Color	Moisture	Consistency	Dry Unit Weight lb. per cu. ft.	
5		30/10	FILL — SILT, clayey sandy with gravels	brown	moist	mod loose to firm	82	
10		10	SILT, clayey	red brown		mod firm	78	
			sandy	brown		soft		
15		3	CLAY, very silty with peat	dark gray			31	132
20		5	SAND, very fine, very silty, with organic matter	gray			55	81
25		4	SILT, sandy with shells				68	54
30		14	clayey, with gravels			mod firm	70	51
			DECOMPOSED BASALT	gray brown		firm		
35		30/3						
40		32/6					77	
45		44					70	
			End of Boring @ 45.5'					
50			Water level @ 9.3' on 3/10/70					

COHESION ○ OR SHEAR RES. ●
KIPS PER SQUARE FOOT
1 2 3 4 5
MOISTURE PERCENT DRY/WT.
▲ 10 20 30 40 50

PEARL RIDGE SHOPPING CENTER

MAURSETH HOWE LOCKWOOD & ASSOC.

PLATE NO. 26

FILE NO. H-58

LOG OF BORING NO 25

DATE DRILLED: March 10, 1970

EQUIPMENT USED: Truck Mounted Auger

ELEV. OF SURFACE: 19.5'

Depth in Feet	Samples	Blows Per Foot	DESCRIPTION OF SOILS — CLASSIFICATION	Color	Moisture	Consistency	Dry Unit Weight lb. per cu. ft.
			FILL — SILT, sandy, clayey	brown	moist	mod firm	
5		11	SILT, sandy clayey	dark gray brown	very moist	mod soft	72
10		18					83
15		4	PEAT, silty	black		soft	26
20		6	SAND, very fine to fine, very silty	dark gray		loose	78
25		7					56
			SILT, sandy			soft	
30		4	SAND, very fine to fine with shells and peat lenses			loose	69
35		15	SILT, very clayey			mod soft	75
40		23	with numerous gravels	dark gray brown		firm	84
45		43					93
50		29					75

COHESION ○ OR SHEAR RES. ● KIPS PER SQUARE FOOT

1 2 3 4 5

MOISTURE - PERCENT DRY WT.

▲ 10 20 30 40 50

146▲

65▲

51▲

(Con't).

PEARL RIDGE SHOPPING CENTER

MAURSETH HOWE LOCKWOOD & ASSOC.

PLATE NO. 27

FILE NO. H-58

LOG OF BORING NO 25 (Con't)

DATE DRILLED:
EQUIPMENT USED:

ELEV. OF SURFACE:

Depth in Feet	Samples	Blows Per Foot	DESCRIPTION OF SOILS — CLASSIFICATION	Color	Moisture	Consistency	Dry Unit Weight lb. per cu. ft.	COHESION ○ OR SHEAR RES. ● KIPS PER SQUARE FOOT (1 2 3 4 5) MOISTURE PERCENT DRY/WT. (▲ 10 20 30 40 50)
55		69	DECOMPOSED BASALT	yellow brown & brown		firm	73	▲
60			End of Boring @ 56.6' Water level @ 10.5' on 3/10/70					

PEARL RIDGE SHOPPING CENTER

MAURSETH HOWE LOCKWOOD & ASSOC.

PLATE NO. 27 (con't)

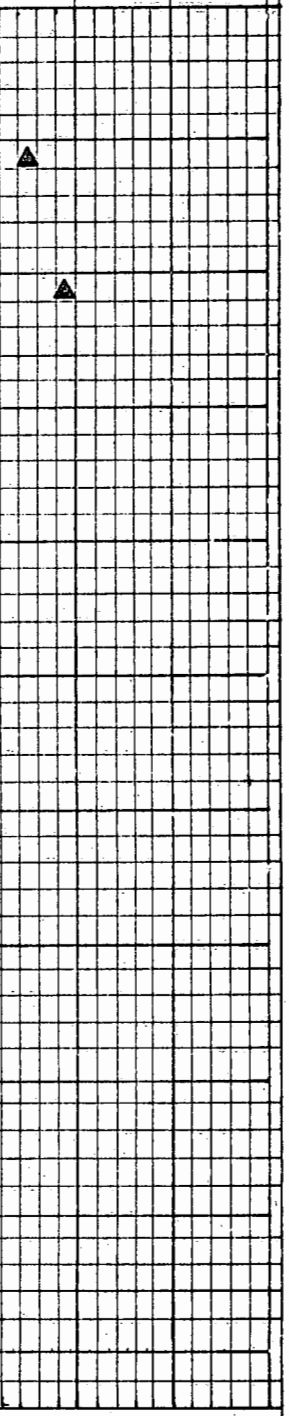
FILE NO. H-58

LOG OF BORING NO 26

DATE DRILLED: March 10, 1970
EQUIPMENT USED: Truck Mounted Auger
ELEV. OF SURFACE: 46.5'

Depth in Feet	Samples	Blows Per Foot	DESCRIPTION OF SOILS — CLASSIFICATION	Color	Moisture	Consistency	Dry Unit Weight lb. per cu. ft.
5		36	SILT, clayey with gravels	brown	moist	firm	
		41		red brown	to sat		96
10		29					93
			End of Boring @ 11.5' No water encountered				
15							

COHESION ○ OR SHEAR RES. ●
KIPS PER SQUARE FOOT
1 2 3 4 5
MOISTURE PERCENT DRY/WT.
▲ 10 20 30 40 50



PEARL RIDGE SHOPPING CENTER
MAURSETH HOWE LOCKWOOD & ASSOC.

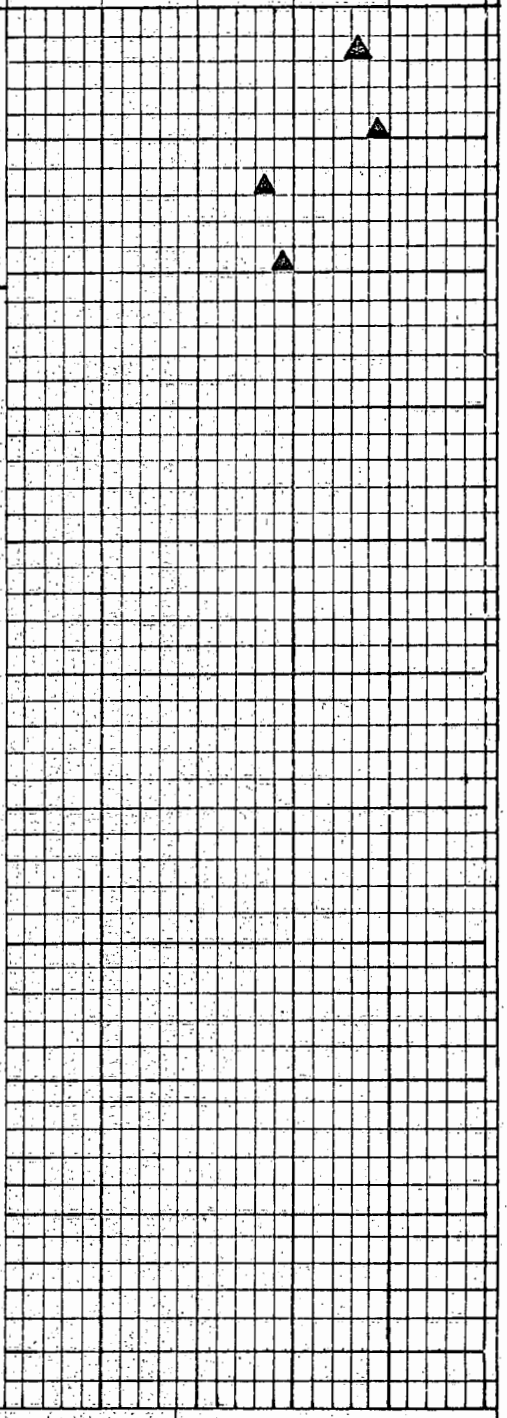
PLATE NO. 28
FILE NO. H-58

LOG OF BORING NO 27

DATE DRILLED: March 6, 1970
EQUIPMENT USED: Truck Mounted Auger
ELEV. OF SURFACE: 59.9'

Depth in Feet	Samples	Blows Per Foot	DESCRIPTION OF SOILS — CLASSIFICATION	Color	Moisture	Consistency	Dry Unit Weight lb. per cu. ft.
		15	SILT, sandy	brown &	very moist	firm	75
		26					73
5			very clayey				
		19					90
10		21					88
			End of Boring @ 10.5' No water encountered				
15							

COHESION ○ OR SHEAR RES. ●
KIPS PER SQUARE FOOT
1 2 3 4 5
MOISTURE PERCENT DRY/WT.
▲ 10 20 30 40 50



PEARL RIDGE SHOPPING CENTER
MAURSETH HOWE LOCKWOOD & ASSOC.

PLATE NO. 29
FILE NO. H-58

LOG OF BORING NO 28

DATE DRILLED: February 25, 1970

EQUIPMENT USED: Truck Mounted Auger

ELEV. OF SURFACE: 35.3'

Depth in Feet	Samples	Blows Per Foot	DESCRIPTION OF SOILS — CLASSIFICATION	Color	Moisture	Consistency	Dry Unit Weight lb. per cu. ft.
5		30/3	SILT, clayey with gravel	brown	moist	firm	
			End of Boring @ 5-1/2' No water encountered				

COHESION ○ OR SHEAR RES. ◎ KIPS PER SQUARE FOOT

1 2 3 4 5

MOISTURE PERCENT DRY/WT.

▲ 10 20 30 40 50

PEARL RIDGE SHOPPING CENTER

MAURSETH HOWE LOCKWOOD & ASSOC.

PLATE NO. 30

FILE NO. H-58

LOG OF BORING NO 29

DATE DRILLED: February 25, 1970
EQUIPMENT USED: Truck Mounted Auger
ELEV. OF SURFACE: 39.9'

Depth in Feet	Samples	Blows Per Foot	DESCRIPTION OF SOILS — CLASSIFICATION	Color	Moisture	Consistency	Dry Unit Weight lb. per cu. ft.
5		15/3"	SILT, clayey with gravels	red brown	moist	firm	
		32					75.0
10			End of Boring @ 7.0' No water encountered				

COHESION ○ OR SHEAR RES. ⊗ KIPS PER SQUARE FOOT
1 2 3 4 5
MOISTURE - PERCENT DRY/WT.
▲ 10 20 30 40 50

PEARL RIDGE SHOPPING CENTER
MAURSETH HOWE LOCKWOOD & ASSOC.

PLATE NO. 31
FILE NO. H-58

LOG OF BORING NO 30

DATE DRILLED: February 25, 1970

EQUIPMENT USED: Truck Mounted Auger

ELEV. OF SURFACE: 28.9'

Depth in Feet	Samples	Blows Per Foot	DESCRIPTION OF SOILS — CLASSIFICATION	Color	Moisture	Consistency	Dry Unit Weight lb. per cu. ft.
5		22	SILT, clayey with gravels	brown	moist	firm	
				gray & brown	sat		67
10		37/9					78
			End of Boring @ 11.0' No water encountered				
15							

COHESION ○ OR SHEAR RES. ⊙ KIPS PER SQUARE FOOT

1 2 3 4 5

MOISTURE - PERCENT DRY WT.

▲ 10 20 30 40 50

61▲

PEARL RIDGE SHOPPING CENTER

MAURSETH HOWE LOCKWOOD & ASSOC.

PLATE NO. 32

FILE NO. H-58

LOG OF BORING NO 31

DATE DRILLED: March 12, 1970
EQUIPMENT USED: Truck Mounted Auger
ELEV. OF SURFACE: 21.1

Depth in Feet	Samples	Blows Per Foot	DESCRIPTION OF SOILS — CLASSIFICATION	Color	Moisture	Consistency	Dry Unit Weight lb. per cu. ft.
0			FILL SILT, clayey	brown	moist	firm	
		14					
5		22	SAND f to c			Dense	
		7	SILT, clayey, with organic matter	black & brown		soft	82
10							
		4					58
15			clayey, with gravels	brown & gray		firm	
		31					82
20							
				red brown			
25		21					84
			End of Boring @ 27'				
30			Water level @ 6.4' on 3/20/70				

COHESION ○ OR SHEAR RES. ◎
KIPS PER SQUARE FOOT
1 2 3 4 5
MOISTURE - PERCENT DRY WT.
▲ 10 20 30 40 50

54▲

PEARL RIDGE SHOPPING CENTER
MAURSETH HOWE LOCKWOOD & ASSOC.

PLATE NO. 33
FILE NO. H-58

LOG OF BORING NO 32

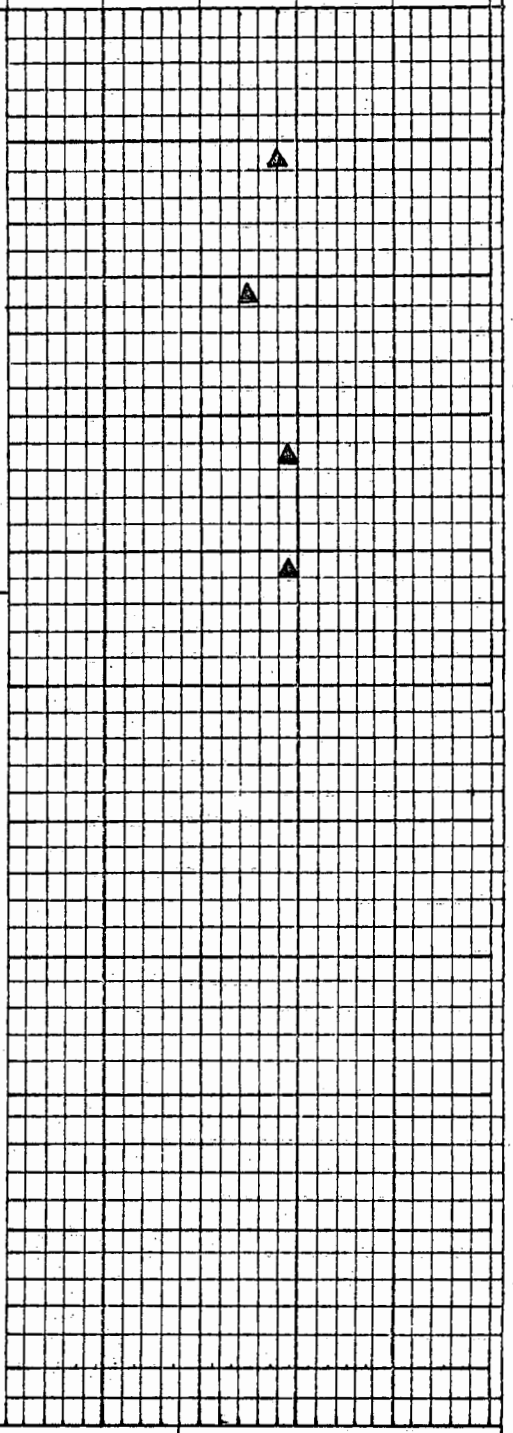
DATE DRILLED: March 13, 1970

EQUIPMENT USED: Truck Mounted Auger

ELEV. OF SURFACE: 23.8

Depth in Feet	Samples	Blows Per Foot	DESCRIPTION OF SOILS — CLASSIFICATION	Color	Moisture	Consistency	Dry Unit Weight lb. per cu. ft.
5		57	SILT, clayey with gravel	red	moist	firm	93
10		17	CLAY, silty	gray brown		stiff	87
15		64	SILT, sandy, clayey	brown	▽	firm	81
20		31					76
25			End of Boring @ 21.5' Water level @ 15.3' on 3/20/70				

COHESION ○ OR SHEAR RES. ●
KIPS PER SQUARE FOOT
1 2 3 4 5
MOISTURE PERCENT DRY WT.
▲ 10 20 30 40 50



PEARL RIDGE SHOPPING CENTER

MAURSETH HOWE LOCKWOOD & ASSOC.

PLATE NO. 34

FILE NO. H-58

APPENDIX B

LABORATORY TESTING

General

The undisturbed samples extracted from the borings were subjected to various laboratory tests following a review of the field investigation. Tests performed included moisture and density determinations, direct shear tests, consolidation tests, swell tests, Atterberg Limit tests and a compaction test.

Field Moisture and Dry Density

The field moisture content and density tests of samples obtained were made to correlate between similar samples. One or more one-inch long sections of the sample are cut, trimmed, weighed, oven dried and reweighed. From these measurements, the unit weight of the solids in pounds per cubic foot and the percent of moisture are calculated.

The test results are plotted on the Log of Borings, Plates 3 thru 34.

Direct Shear Tests

To determine the strength characteristics of the soils

encountered, directed shear tests were performed. Each sample is sheared under a normal load approximately equivalent to the expected overburden. In addition, some tests were performed at decreased or increased surcharge pressures to simulate the effects of reduced loads due to excavations, or the increased loads due to the weight of fill or a proposed structure.

The shear test results are plotted on the Log of Borings, Plates 3 thru 34.

Consolidation Tests

Consolidation tests were performed on representative samples of various soil strata's to determine the consolidation characteristics of the soils. Each sample was run under a saturated condition. The results of these tests appear on Plates 35 thru 37, Consolidation Tests.

Swell Tests

The effects of moisture on in-place soils, were tested to determine if the soils had a tendency to swell. Soils which swell can cause damage to lightly loaded areas, i.e., floor slabs and paved areas. A surcharge pressure of

200 pounds per square foot was applied to one-inch high, two and one - half inch diameter samples. Water was added to the samples, under field moisture conditions, and the change in height was measured.

The results of the swell tests are as follows:

Boring Number	Sample Number	Depth in Feet	Percent Swell
2	1	10.5	1.84
5	1	11.0	-0.18
30	2	10.5	0.00
32	1	5.5	-0.04

Atterberg Limits

For classification of the fine grain portions of the soils encountered, Atterberg Limit tests were performed. The results are as follow:

Boring Number	Depth	Liquid Limit	Plastic Limit	Plastic Index
17	6.0	47	33	14
31	2.5	47	31	16
31	8.5	65	41	24

Compaction Test

A bulk sample of the predominant surface soils was tested to determine its compaction characteristics. The test was performed in accordance with ASTM D - 1557-66T. The test results are plotted on Plate 38.

The following are attached and complete this Appendix:

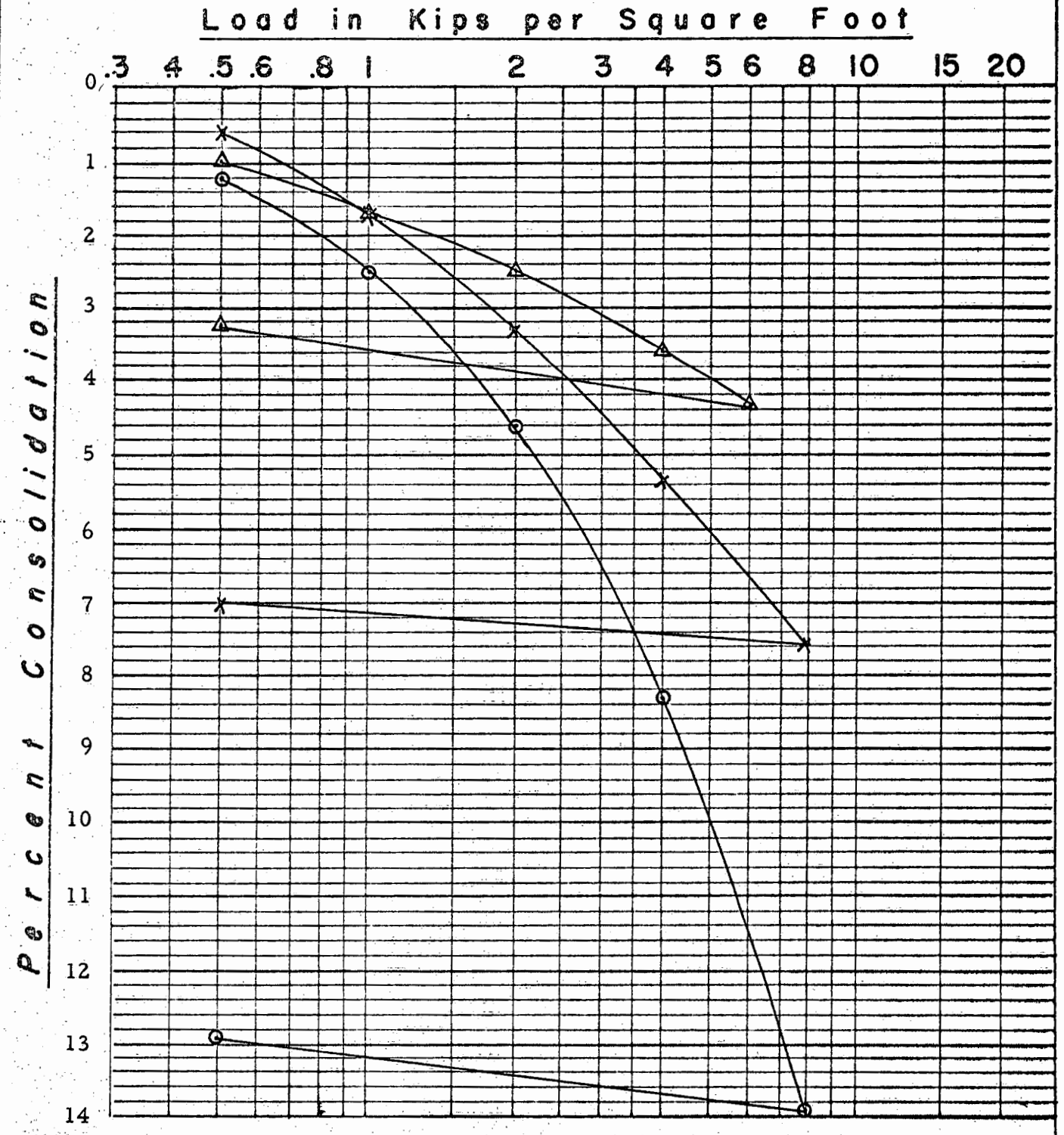
Plate 35 - Consolidation Tests

Plate 36 - Consolidation Tests

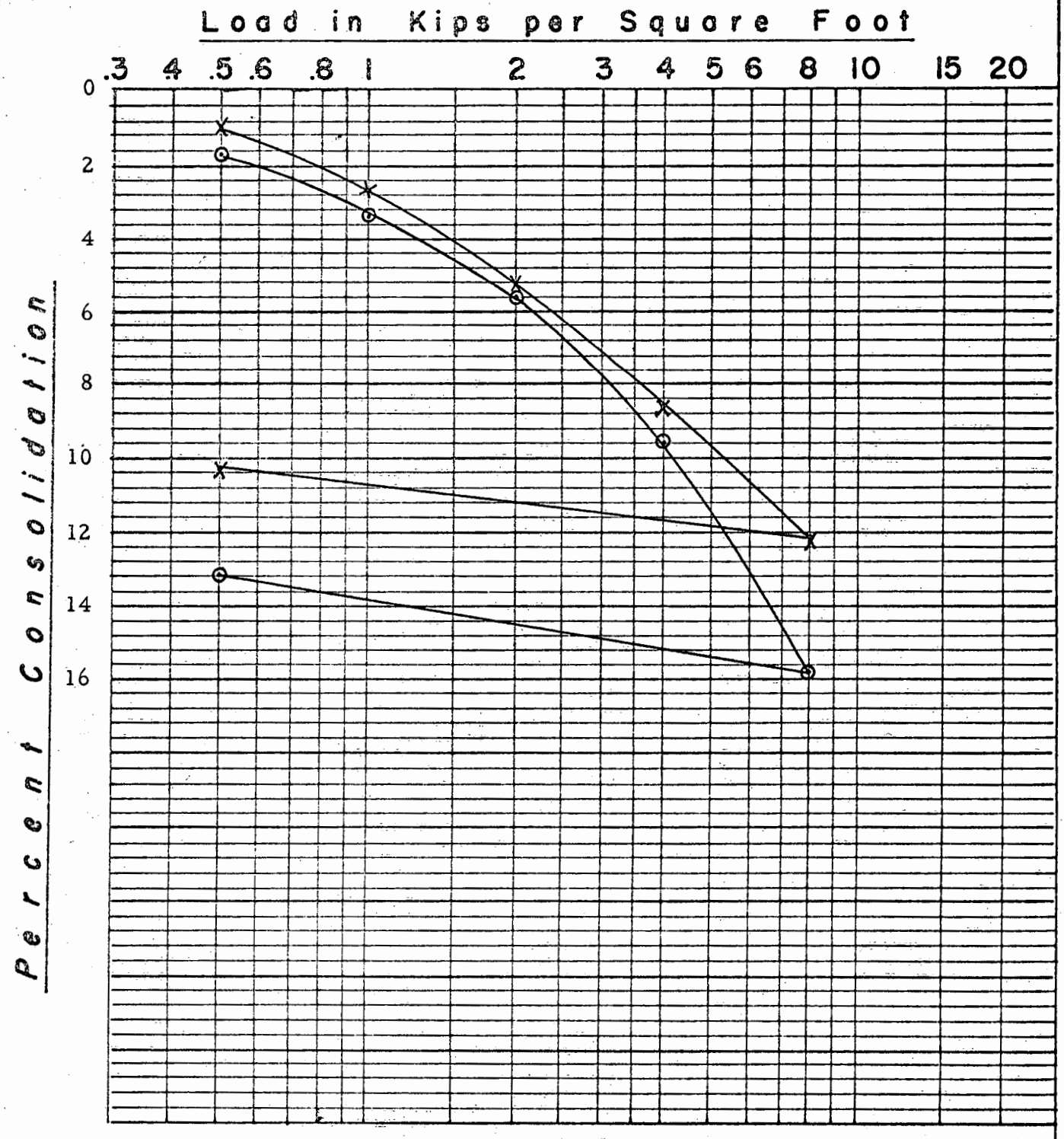
Plate 37 - Consolidation Tests

Plate 38 - Compaction Test

CONSOLIDATION TESTS



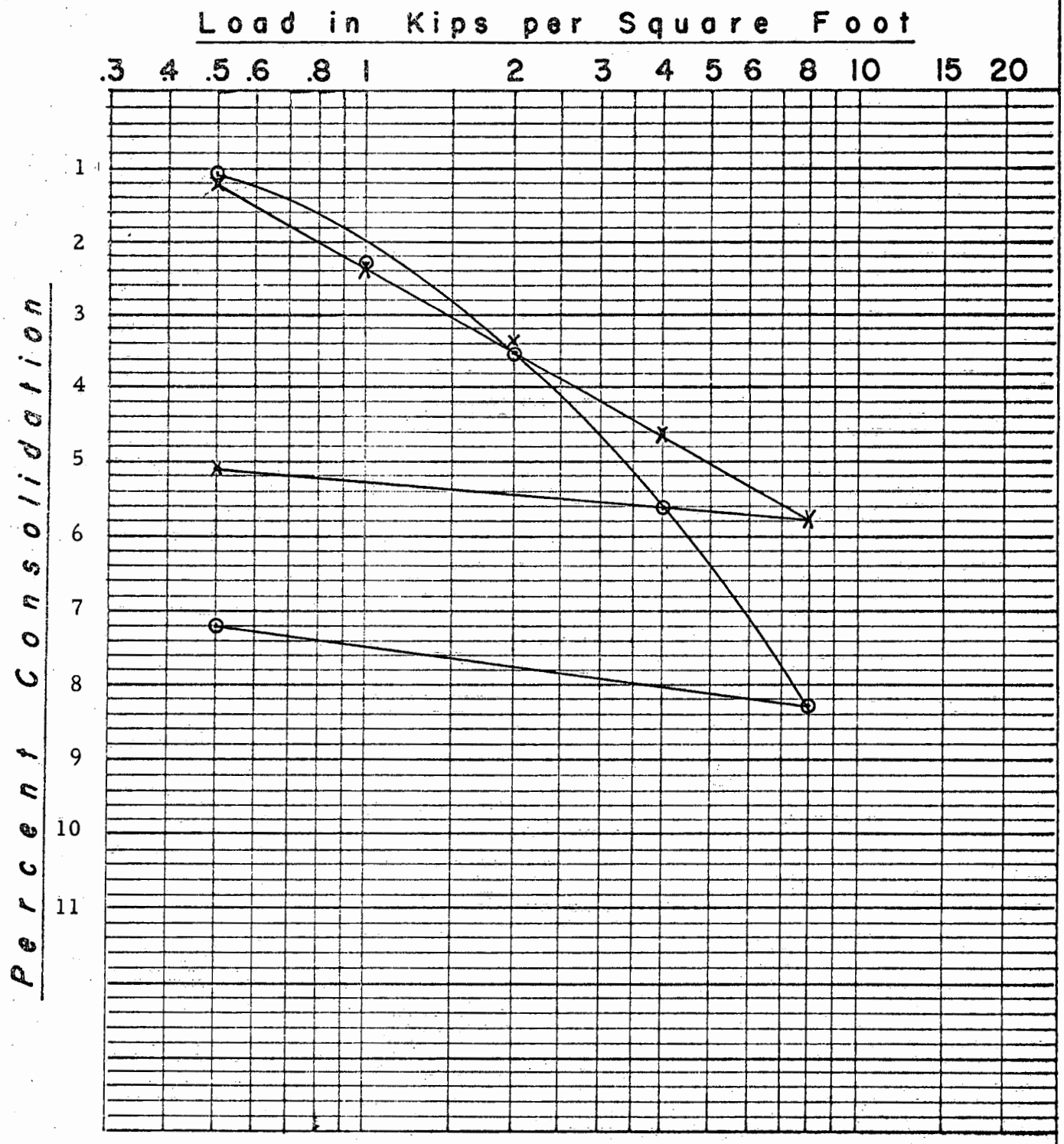
PEARL RIDGE SHOPPING CENTER	File No. H-58
MAURSETH HOWE LOCKWOOD & ASSOC	Plate No. 35



X - B - 22, S-3 @ 16'
⊙ - B - 23, S-4 @ 20'

PEARL RIDGE SHOPPING CENTER	File No. H-58
MAURSETH HOWE LOCKWOOD & ASSOC	Plate No. 36

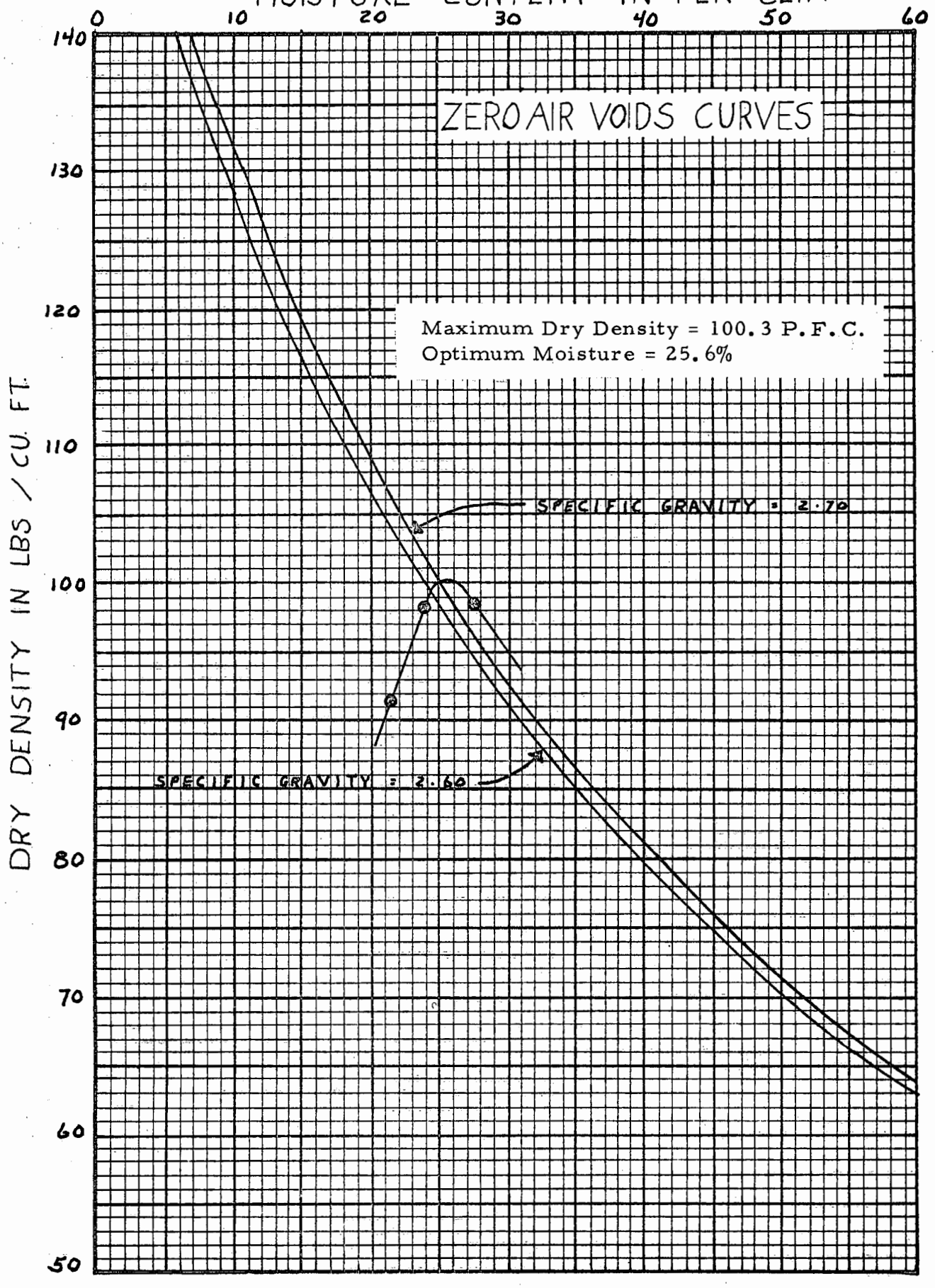
CONSOLIDATION TESTS



X - B - 20, S-2 @ 5.0'

⊙ - B - 20, S-4 @ 15.5'

PEARL RIDGE SHOPPING CENTER	File No. H-58
MAURSETH HOWE LOCKWOOD & ASSOC	Plate No. 37



PEARL RIDGE SHOPPING CENTER

Plate No. 38

MAURSETH, HOWE, LOCKWOOD & ASSOCIATES

File No. H-58