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REPORT
SOILS INVESTIGATION
PROPOSED OAHU STADIUM,
KAM HWY. IMPROVEMENT
CONNECTIONS, INCREMENT I,
(INBOUND LANE TO SALT LAKE BLVD.)

HALAWA, OAHU,
STATE OF HAWAII

564

for

THE STATE OF HAWAII
Department of Accounting And General Services

WILSON, OKAMOTO & ASSOCIATES
Architects

September 26, 1973
Project No. 117-026-11

MAURSETH HOWE ASSOCIATES
Consulting Foundation Engineers & Geologists

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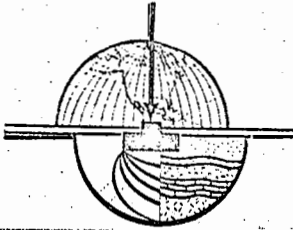
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MAURSETH HOWE ASSOCIATES

A CORPORATION

Consulting Foundation Engineers and Geologists

Honolulu, Hawaii
September 26, 1973

Job No. 117-026-11

State of Hawaii
Department of Accounting And
General Services
P. O. Box 119
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Attention: Mr. Rikio Nishioka,
State Public Works Engineer

Gentlemen:

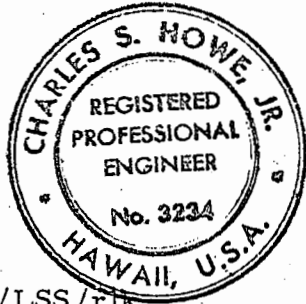
The attached report represents the data, conclusions and recommendations of an investigation of the subsurface conditions at the site of the Proposed Oahu Stadium, Kam Highway Improvement Connections, Increment I, (Inbound Lane to Salt Lake Boulevard), adjacent to Halawa Valley Estates, Halawa, Oahu, State of Hawaii.

The details and scope of this investigation were discussed with Mr. Ken Nagai of Wilson, Okamoto & Associates, on June 7, 1973.

Based on the findings of this investigation, the proposed Inbound Lane to Salt Lake Boulevard is feasible as planned. The recommendations for pavement design is based on the subgrade soil conditions along the existing roadway.

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 principles and presents fairly the design information requested by The State of Hawaii.

This investigation was performed under the supervision of the undersigned. Should you have any questions or require any further information, please do not hesitate to contact us.



CSH/LSS/rik

Very truly yours,

MAURSETH HOWE ASSOCIATES

Charles S. Howe, Jr.

DISTRIBUTION:

State of Hawaii, DAGS (4)
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INTRODUCTION

This investigation was made for the purpose of obtaining information on the subsurface soils on which to base pavement design recommendations for the proposed Inbound Lane to Salt Lake Boulevard. The specific limits of the project are shown on the Plot Plan, Plate 2 attached to this report.

SCOPE OF WORK

The investigation was discussed with Mr. Ken Nagai of Wilson, Okamoto & Associates, outlined in a Proposal dated July 30, 1973, and accepted by Purchase Order Number 072442. The investigation consisted of excavating seven test pits to determine the subgrade soil conditions. Soil samples were taken from these excavations and taken to the laboratory for testing. From these tests, recommendations for the pavement design along the proposed road alignment were made.

PROPOSED DEVELOPMENT

It is presently proposed to construct an inbound lane from Kamehameha Highway which will provide access to the south parking lot of Oahu Stadium and to Salt Lake Boulevard. The proposed roadway will extend from Station 1 + 00 at Kamehameha Highway to Station 16 + 37.59 at the proposed Salt Lake Boulevard Widening Project.

A north access ramp, included in this project, will start at Station 8 + 51.62 and will branch off from the inbound lane at Station 9 + 95.94 and will continue in the mauka direction to Station 11 + 12.04, which is the equivalent of Station 6 + 25.97 of Salt Lake Boulevard.

The profile of the road will require cuts as deep as 14.5 feet and fills of up to three feet from existing ground.

SITE CONDITIONS

Surface

From Station 1 + 00 to Station 4 + 45 the proposed roadway will be aligned through a vacant lot adjacent to the Makalapa Manor Housing Development, and from Station 4 + 45 to the end of the project, the roadway will be aligned along the existing inbound lane to Salt Lake Boulevard. Along the the Diamond Head side of the existing inbound lane, there is a slope which drops a maximum of 32 feet at an approximate inclination of 1.5 horizontal to 1 vertical. Along the Ewa side of the existing inbound lane there is a vacant lot covered with brush, weeds and rubbish.

Subsurface

Subsurface soil conditions near the beginning of the project as disclosed by Test Pit No. s 1 and 2, consist of clayey sand at the subgrade elevation. Volcanic tuff was encountered in Test Pit No. s 3 through 6 at a depth of from 2.9 to 5.0 feet below existing ground surface. Due to the hardness of this material, penetration to the subgrade elevation could not be accomplished with a backhoe. However, it is reasonably believed that the tuff extends to and below the proposed subgrade elevation. In the area of Test Pit No. 7, a silty sand was found at subgrade elevation.

No ground water was encountered in any of the test pits.

CONCLUSIONS AND RECOMMENDATIONS

The recommended pavement design for the proposed subgrade is based on the Asphalt Institute Thickness Design Manual, Series No. 1 (MS - 1), dated August, 1970. The Initial Daily Traffic (IDT) of 11,000 vehicles, taken by the City and County of Honolulu, at Salt Lake Boulevard on April 4, 1973, and the following assumed values, were used in the pavement design:

- a. Five percent of IDT are 30,000 pounds average, gross weight trucks.
- b. Fifty percent of the trucks will use the Design Lane (heaviest travel lane).
- c. The legal single-axle load limit is 24,000 pounds.
- d. The traffic growth rate is four percent annually.
- e. The design period is twenty years.
- f. Traffic designation : Heavy (DTN = 450).

The following is a summary of test results and recommended pavement sections at the various test locations:

Test Pit No.	1 & 2	3 - 6	7
Soil Description	Sand, clayey (SC) light brown	Volcanic Tuff blue-grey	Sand, silty (SM) brown
CBR @ 0.1" penetration	3.5	67.4	12.6

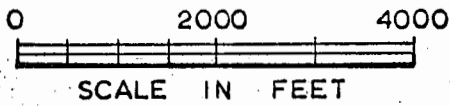
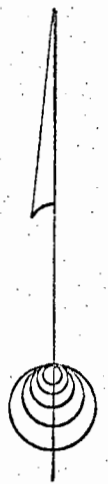
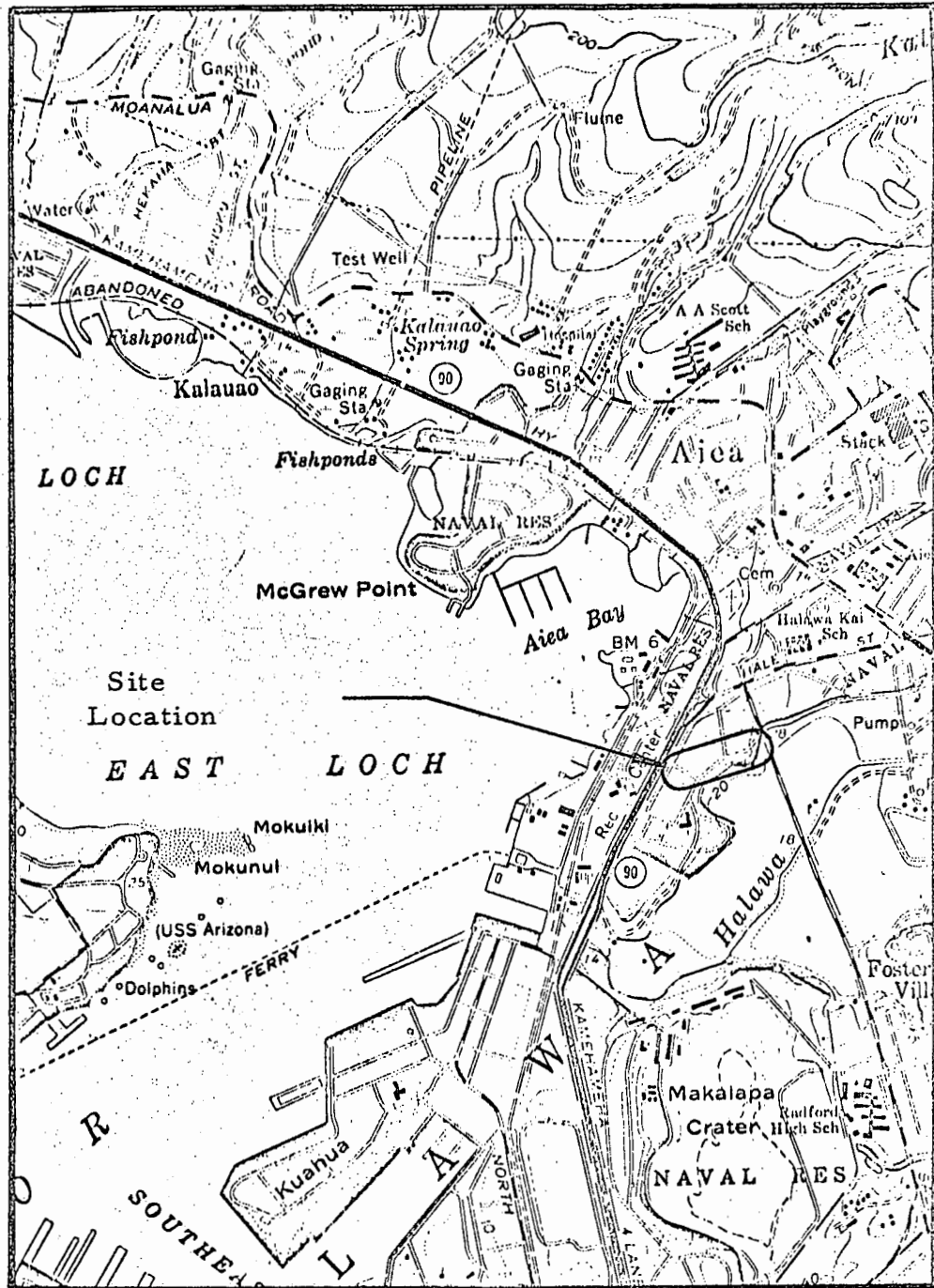
Recommendations

A. C.	3"	3"	3"
Base	8"	6"	6"
Select Borrow	14"	0"	4"

Should soils other than those indicated be found during grading, the above pavement thicknesses will be subject to modifications. All materials used and work done shall conform to the City and County of Honolulu "Standard Specifications for Public Works", dated November, 1968.

Tabulation of the test results are presented in the Appendix to this report.

VICINITY MAP



REFERENCE

Waipahu & Puuloa Quadrangle
USGS Topographic Survey
Dated 1959

INBOUND LANE, SALT LAKE BOULEVARD
MAURSETH HOWE ASSOCIATES

PLATE NO 1
FILE NO 117-026-11

APPENDIX

FIELD INVESTIGATION AND

LABORATORY TESTING

Field Investigation

Seven (7) test pits were excavated with a backhoe. Bulk samples of the soil encountered were taken from each test pit for laboratory testing.

The locations of these test pits are shown on the Plot Plan, Plate 2.

Detailed logs of the soils encountered are presented on Plates 3 through 10, Log of Test Pits.

Laboratory Testing

Samples of the subgrade soils were tested to determine grain size distribution by means of sieves, Atterberg limit tests to determine liquid and plastic limits, and the California Bearing Ratios. The results of these tests are as follows:

Test Pit No.	1 & 2	3 - 6	7
Soil Description	Sand, clayey light brown (SC)	Volcanic Tuff blue-grey	Sand, silty brown (SM)
CBR @ 0.1" penetration	3.5	67.4	12.6
Expansion, %	4.8	0.3	2.1
Moisture Content, %	22.0	26.0	30.5
Dry Density	105.0	96.0	92.0
Liquid Limit	44.3	-	49.2
Plasticity Index	18.4	-	0

Sieve Analysis

Test Pit No.	1 & 2	3 - 6	7
Percent Passing			
Sieve Number			
3"	100.0	74.2	100.0
1.5"	100.0	53.6	99.4
3/4"	99.4	44.8	97.2
3/8"	98.9	41.3	91.9
#4	98.0	36.6	86.6
#10	96.5	31.1	74.8
#40	77.6	23.0	53.8
#60	64.4	20.9	45.5
#100	54.4	17.3	36.9
#200	48.0	15.7	29.5

LOG OF TEST PIT NO 1

DATE August 18, 1973

EQUIPMENT USED Backhoe

ELEV OF SURFACE 48.0'*

DESCRIPTION OF SOILS

CONFINING PRESSURE kips / sq ft	SHEAR STRENGTH kips / sq ft	DRY DENSITY lbs per cu ft	PERCENT MOISTURE	BLOWS PER FOOT	SAMPLE DEPTH IN FEET	CLASSIFICATION	COLOR	MOISTURE	CONSISTENCY
					1	FILL: CLAY, sand, gravelly (CL)	black	sl. moist	firm
					2	SAND, very clayey, gravelly (SC)	brown		
					3	End of Test Pit @ 3.0' No Water Encountered			

Ref. Elev from Preliminary Plan by DAGS Division of Public Works, Undated

INBOUND LANE, SALT LAKE BOULEVARD

PLATE NO 3

MAURSETH HOWE ASSOCIATES

FILE NO 117-026-11

LOG OF TEST PIT NO 2

DATE August 18, 1973

EQUIPMENT USED Backhoe

ELEV OF SURFACE 48.0'

DESCRIPTION OF SOILS

CONFINING PRESSURE kips / sq ft	SHEAR STRENGTH kips / sq ft	DRY DENSITY lbs per cu ft	PERCENT MOISTURE	BLOWS PER FOOT	SAMPLE DEPTH IN FEET	CLASSIFICATION	COLOR	MOISTURE	CONSISTENCY
					1	SAND, very clayey, gravelly (SC)	brown	sl. moist	dense
					2				
					3				
					4				
					5				
						End of Test Pit @ 5.0' No Water Encountered			

INBOUND LANE, SALT LAKE BOULEVARD

PLATE NO 5

MAURSETH HOWE ASSOCIATES

FILE NO 117-026-11

LOG OF TEST PIT NO 3

DATE August 18, 1973

EQUIPMENT USED Backhoe

ELEV OF SURFACE 48.0'

DESCRIPTION OF SOILS

CONFINING PRESSURE kips / sq ft	SHEAR STRENGTH kips / sq ft	DRY DENSITY lbs per cu ft	PERCENT MOISTURE	BLOWS PER FOOT	SAMPLE DEPTH IN FEET	CLASSIFICATION	COLOR	MOISTURE	CONSISTENCY
					1	CLAY: some sand with gravels (CH)	brown	sl. moist	firm
					2				
					3				
					4	VOLCANIC TUFF; with sand seams	blue grey		hard
					5				
					6				
					7				
End of Test Pit @ 7.0'									
No Water Encountered									

INBOUND LANE, SALT LAKE BOULEVARD

PLATE NO 6

MAURSETH HOWE ASSOCIATES

FILE NO 117-026-11

LOG OF TEST PIT NO 4

DATE August 18, 19, 1973

EQUIPMENT USED Backhoe

ELEV OF SURFACE 49.5'

DESCRIPTION OF SOILS

CONFINING PRESSURE kips / sq ft	SHEAR STRENGTH kips / sq ft	DRY DENSITY lbs per cu ft	PERCENT MOISTURE	BLOWS PER FOOT	SAMPLE DEPTH IN FEET	CLASSIFICATION	COLOR	MOISTURE	CONSISTENCY
					1	CLAY; with gravels (CH)	brown	sl. moist	firm
					2				
					3				
					4				
					5	VOLCANIC TUFF	bl -gr		hard
						End of Test Pit @ 5.0' No Water Encountered			

INBOUND LANE, SALT LAKE BOULEVARD

PLATE NO 7

MAURSETH HOWE ASSOCIATES

FILE NO 117-026-11

LOG OF TEST PIT NO 5

DATE August 18, 1973
EQUIPMENT USED Bakchoe

ELEV. OF SURFACE 50.0'

DESCRIPTION OF SOILS

CONFINING PRESSURE kips / sq ft	SHEAR STRENGTH kips / sq ft	DRY DENSITY lbs per cu ft	PERCENT MOISTURE	BLOWS PER FOOT	SAMPLE DEPTH IN FEET	CLASSIFICATION	COLOR	MOISTURE	CONSISTENCY
					1	CLAY, silty (CH)	brown	sl. moist	firm
					2				
					3	VOLCANIC TUFF End of Test Pit @ 3.0' No Water Encountered	bl - gr		hard

INBOUND LANE, SALT LAKE BOULEVARD

PLATE NO 8

MAURSETH HOWE ASSOCIATES

FILE NO 117-026-11

LOG OF TEST PIT NO 6

DATE August 18, 1973
EQUIPMENT USED Backhoe

ELEV OF SURFACE 51.0'

DESCRIPTION OF SOILS

CONFINING PRESSURE kips / sq ft	SHEAR STRENGTH kips / sq ft	DRY DENSITY lbs per cu ft	PERCENT MOISTURE	BLOWS PER FOOT	SAMPLE DEPTH IN FEET	CLASSIFICATION	COLOR	MOISTURE	CONSISTENCY
					1	CLAY; with gravels (CH)	brown	sl. moist	firm
					2				
					3	VOLCANIC TUFF End of Test Pit @ 3.9' No Water Encountered	bl - gr.		hard

INBOUND LANE, SALT LAKE BOULEVARD

MAURSETH HOWE ASSOCIATES

PLATE NO 9

FILE NO 117-026-11

LOG OF TEST PIT NO 7

DATE August 18, 1973

EQUIPMENT USED Backhoe

ELEV OF SURFACE 31.0'

DESCRIPTION OF SOILS

CONFINING PRESSURE kips / sq ft	SHEAR STRENGTH kips / sq ft	DRY DENSITY lbs per cu ft	PERCENT MOISTURE	BLOWS PER FOOT	SAMPLE DEPTH IN FEET	CLASSIFICATION	COLOR	MOISTURE	CONSISTENCY
					1	FILL: CLAY; sandy, gravelly (CL)	brown	sl. moist	firm
					2	SAND, very silty (SM)			
					3	End of Test Pit @ 3.0' No Water Encountered			

INBOUND LANE, SALT LAKE BOULEVARD

PLATE NO 10

MAURSETH HOWE ASSOCIATES

FILE NO 117-026-11