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**FOR REFERENCE**

not to be taken from this room

REPORT -- LOAD TESTS  
PROPOSED WAREHOUSE  
WAI'AU FISH POND  
WAIMALU, OAHU, STATE OF HAWAII

for

F. T. OPPERMAN, INCORPORATED

MEYERS, DETWEILER & ASSOC.  
Architect

J. BRIAN HUGHES & ASSOC.  
Structural Engineers

Project No. H-69  
July 31, 1970

MAURSETH, HOWE, LOCKWOOD & ASSOCIATES  
Consulting Foundation Engineers & Geologists

MUNICIPAL REFERENCE & RECORDS CENTER  
City & County of Honolulu  
City Hall Annex, 558 S. King Street  
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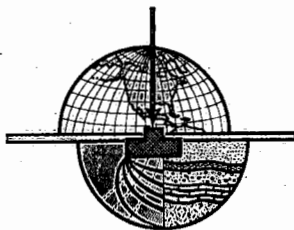
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CHARLES S. HOWE JR., C.E.  
R. BRUCE LOCKWOOD, GEOL.-P.E.

Honolulu, Hawaii

July 31, 1970

Project No. H-69

F. T. Opperman, Incorporated  
General Engineering Contractors  
98-021 Kamehameha Highway  
Aiea, Hawaii 96701

Attention: Mr. F. T. Opperman

Gentlemen:

Presented herewith is the results of two load tests performed on the site of the proposed warehouse to be located adjacent to Waimalu Stream, Oahu, State of Hawaii.

PREVIOUS INVESTIGATION

The subsurface conditions of the site were inspected and reported on May 19, 1970. Based on the recommendations of this report, two load tests were performed to determine the settlement characteristics of the foundation soils under different sizes and types of loads.

BRANCH OFFICE MANAGERS

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## TESTING PROCEDURES

About one week prior to these tests, approximately four feet of compacted fill was placed over the proposed building area. The new fill was placed to raise the site grade.

The general layout of the settlement markers, relative to the proposed building location, is shown on Plate A, Plot Plan. Elevation readings were obtained in the following observation areas:

### Footing Test

A pad of large concrete blocks, covering an area of approximately 45 square feet, was loaded with a roller weighing approximately 45 tons. Prior to loading the test pad, elevation readings were taken on the four corners. Settlement records were maintained at various time intervals over a period of 18 days.

The results of the footing load test is presented on Plate 1.

### Surcharge Fill Test

In the center of the building site, a loose fill was placed within a circle having a radius of 60 feet. Prior to the placement of the surcharge fill, six settlement markers were placed around the circumference of the circle, and one in the center.

After three days of filling, the height of fill was an average of 3.3 feet. On the seventh day, the height of fill was increased to an average of 5.0 feet. The results of the settlement readings, over a period of 18 days, are presented on Plates 2 and 3.

### General Records

As a check on the zone of influence of the surcharge fill, and a check on the settlement caused by the permanent fill, settlement markers were established on the Diamond Head and Ewa building lines. Presented on Plate 4 are the settlement

records of the stations located nearest to the surcharge fill.

Plate 5 shows the settlement records of the stations apparently located outside the influence of the surcharge fill, but show settlement caused by the permanent fill.

### RESULTS

To make a general analysis of the site settlement based on the records obtained would be misleading. Each station has a different loading history.

#### Footing Test

The general settlement of the footing over a period of 18 days averaged approximately 1/2-inch. Half of this settlement took place within 5 days.

In order to evaluate the settlement caused by the load of the roller only, the settlement caused by the permanent fill must be omitted from the records shown on Plate 1. It can be seen, by subtracting the settlements shown on Plate 5 from those on Plate 1, the settlement caused by the roller was approximately .01 feet. This amount of settlement can be classified as negligible.

#### Surcharge Fill Test

The settlement under 5 feet of surcharge fill was approximately 5 inches on the circumference and 10 inches in the center after 18 days. It appears that this settlement was slowing down and, as indicated from the permanent fill settlement records, it is anticipated that the settlement rate after another few weeks would become relatively slow.

### CONCLUSIONS AND RECOMMENDATIONS

The site can be developed at the present time provided that the warehouse is a light, metal frame, one-story structure, with

asphalt floors. It is anticipated that the storage loads may cause settlement over the building area, but the settlements would not affect the structure. Footings founded on the compacted fill can be designed for an allowable bearing capacity of 2,000 pounds per square foot.

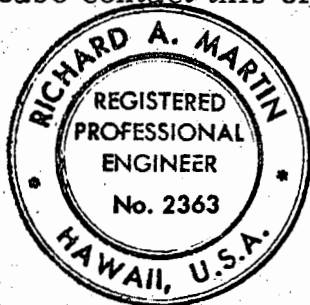
To construct a two story structure with reinforced concrete floors a surcharge fill placed over the site is recommended. The fill would induce settlement of the underlying soils prior to building construction. As the existing settlement records have not been maintained for a long enough period to provide definite recommendations on the amount of time required to induce the major amounts of settlement, it is presently estimated that the fill would have to remain over the building area at least three months prior to building construction.

Flexible pipe connections are recommended to allow for the differential settlements between the inside and outside building areas.

The finished floor of the building should be elevated above the adjacent grades to allow for drainage after the anticipated settlements have occurred.

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Should you have any questions concerning this report, please contact this office.



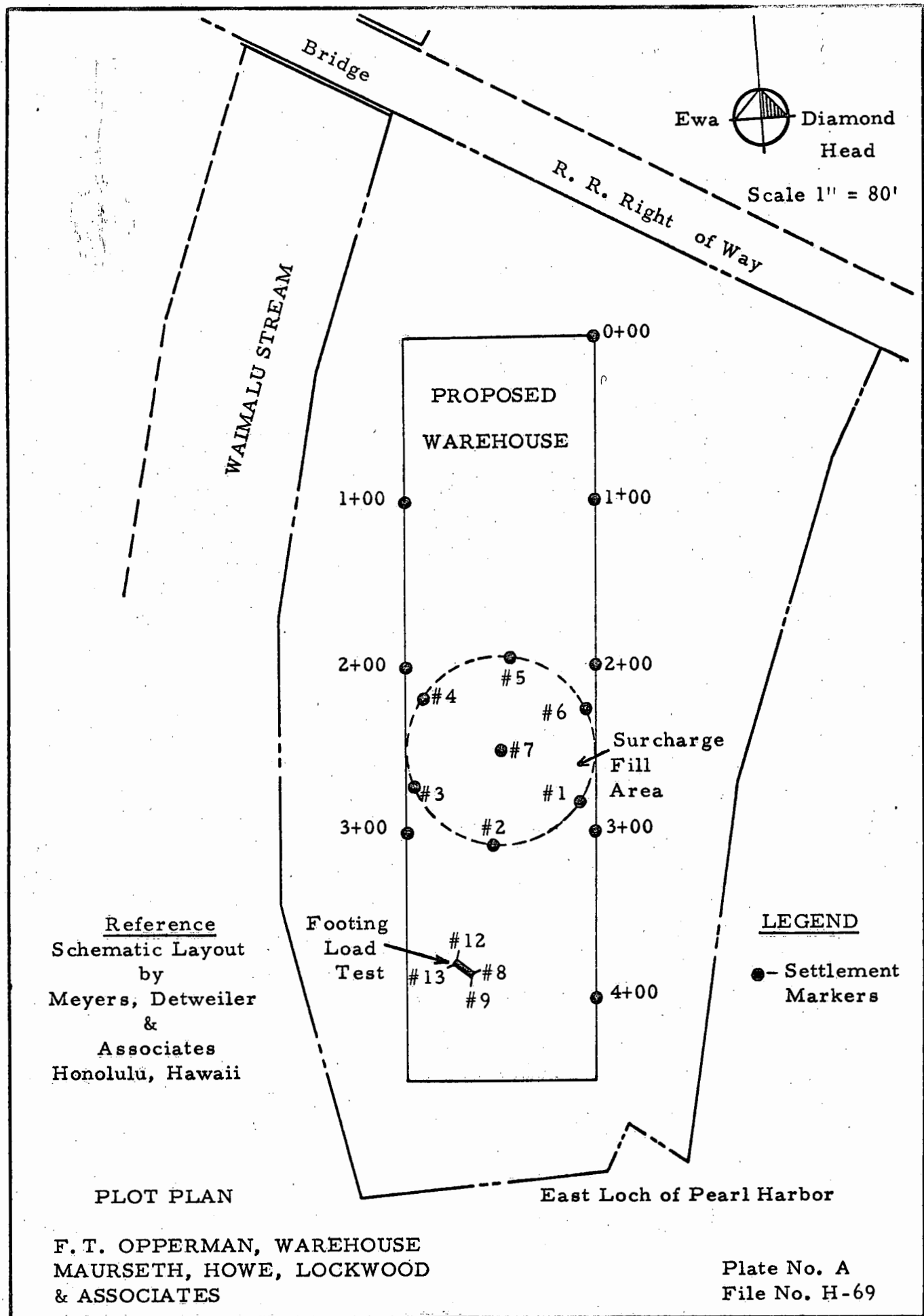
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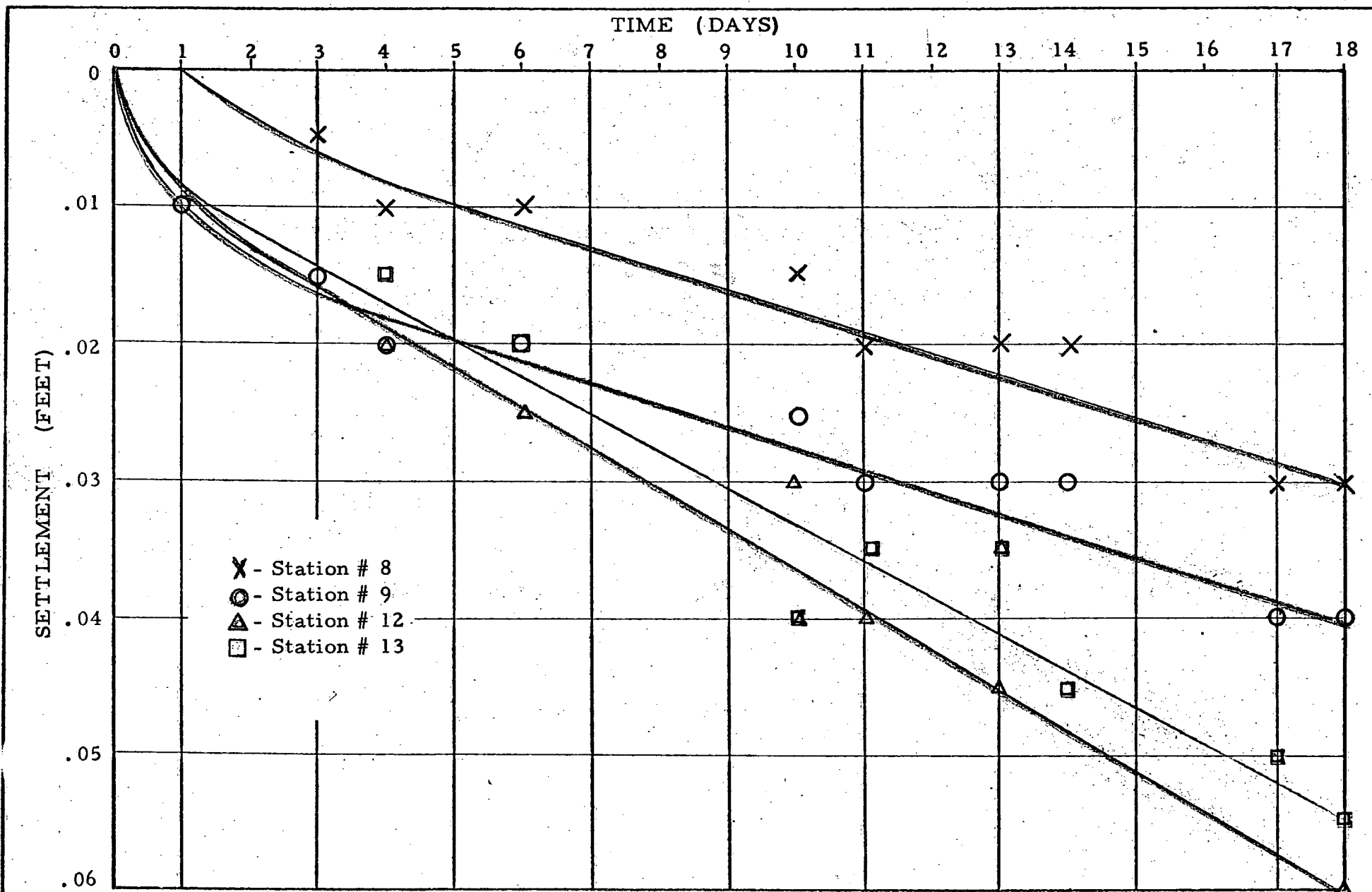
Attachments: (6)

Very truly yours

MAURSETH, HOWE, LOCKWOOD  
& ASSOCIATES

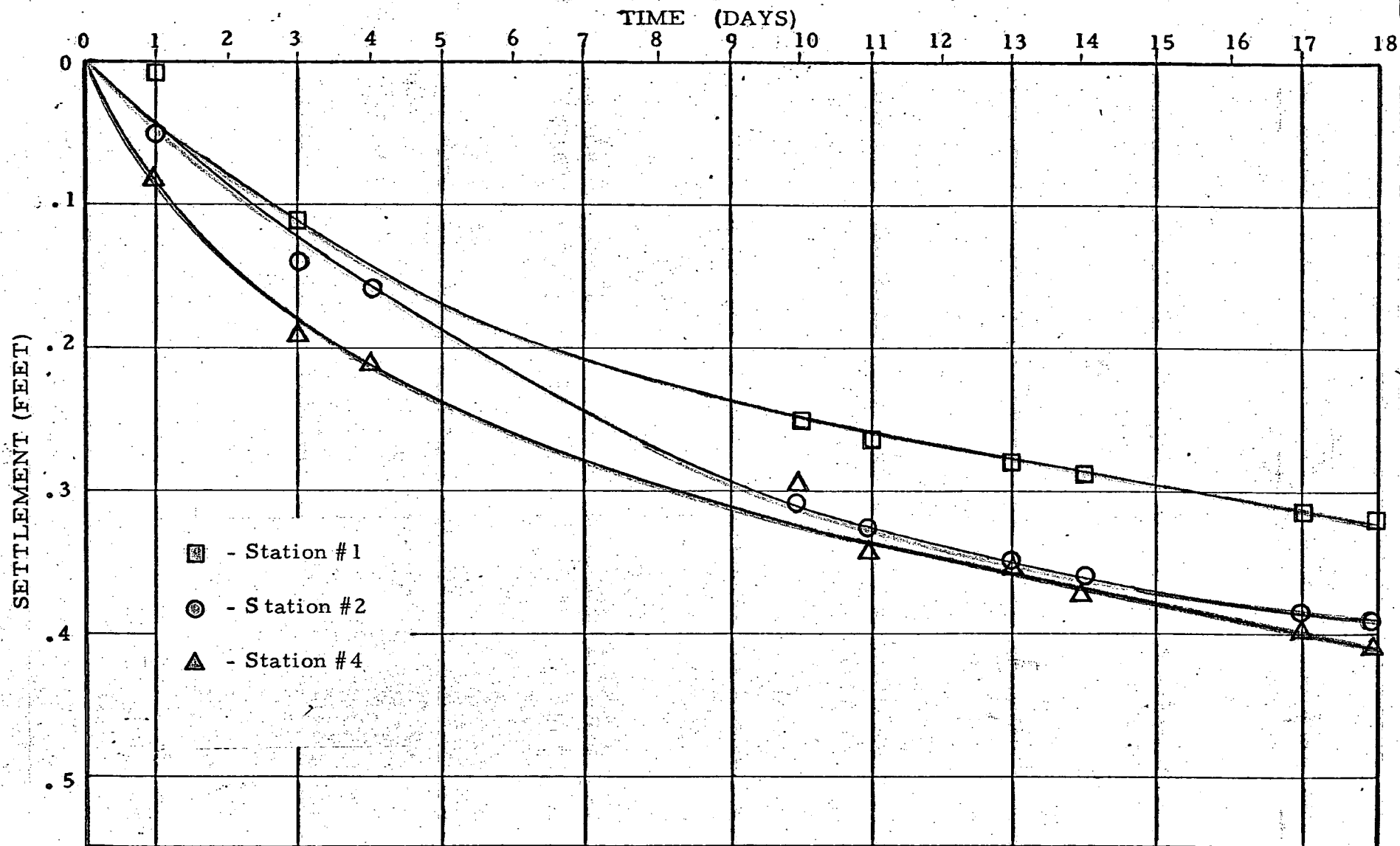
Richard A. Martin





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MAURSETH, HOWE, LOCKWOOD & ASSOC.

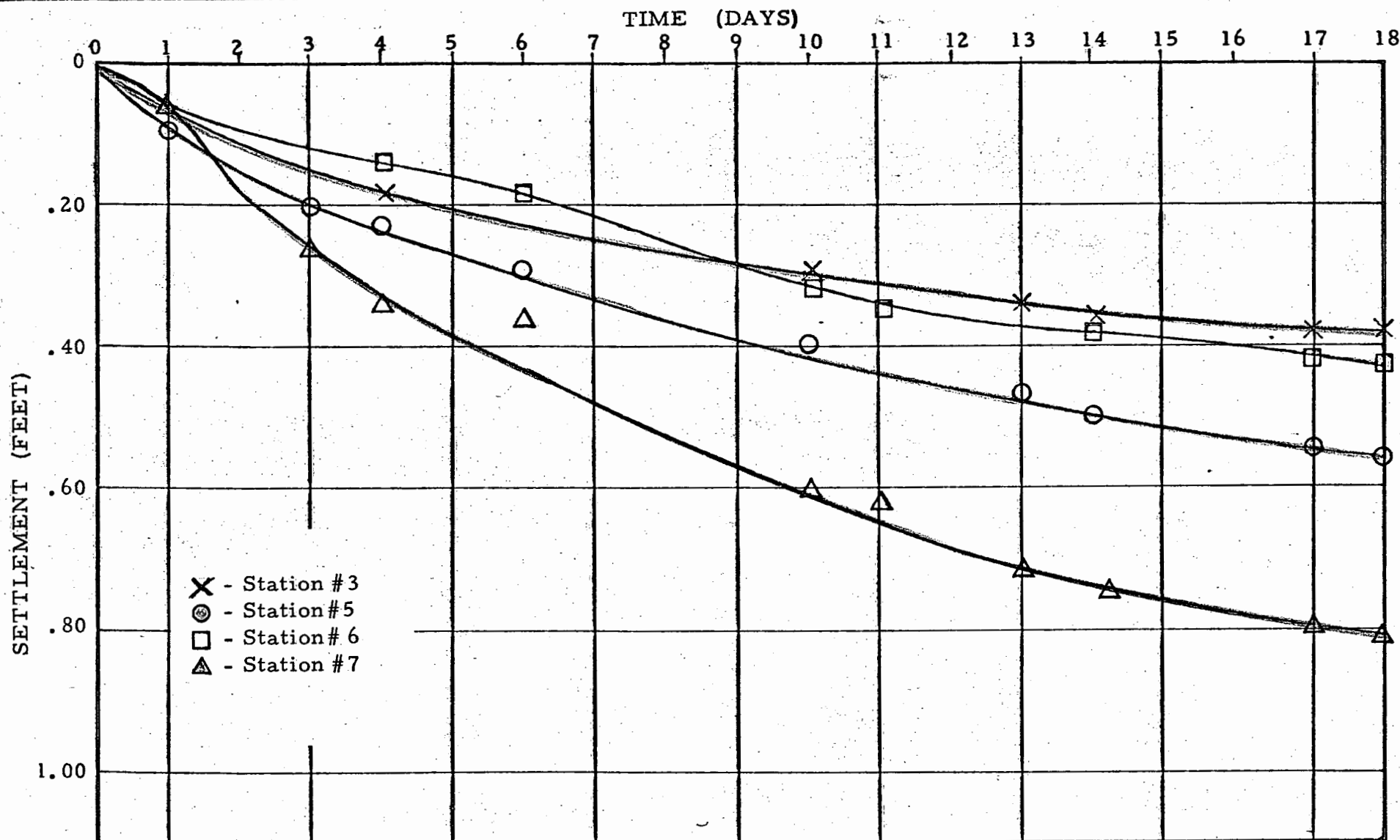
Plate No. 1  
File No. H-69



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MAURSETH, HOWE, LOCKWOOD  
& ASSOCIATES

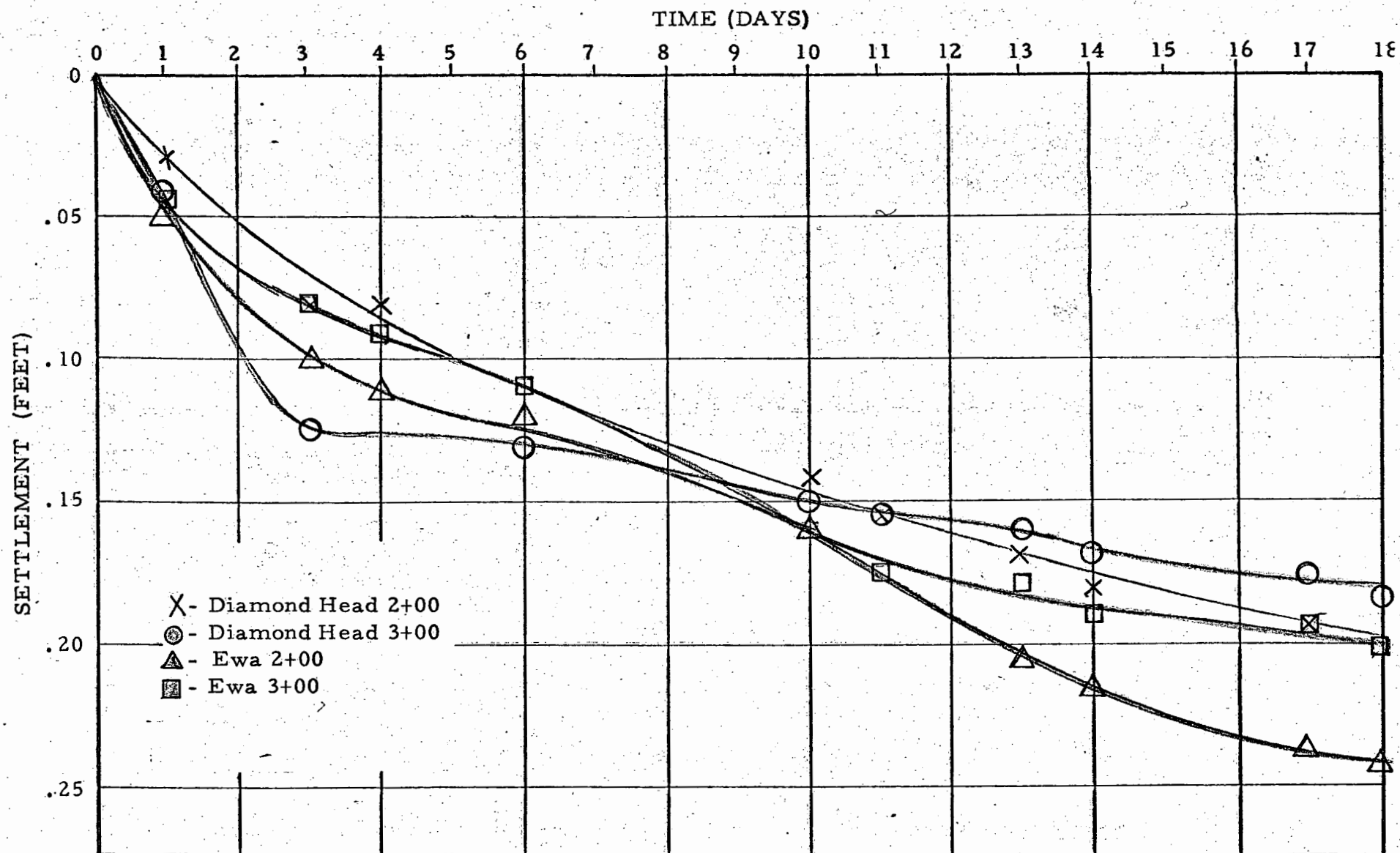
Plate No. 2  
File No. H-69





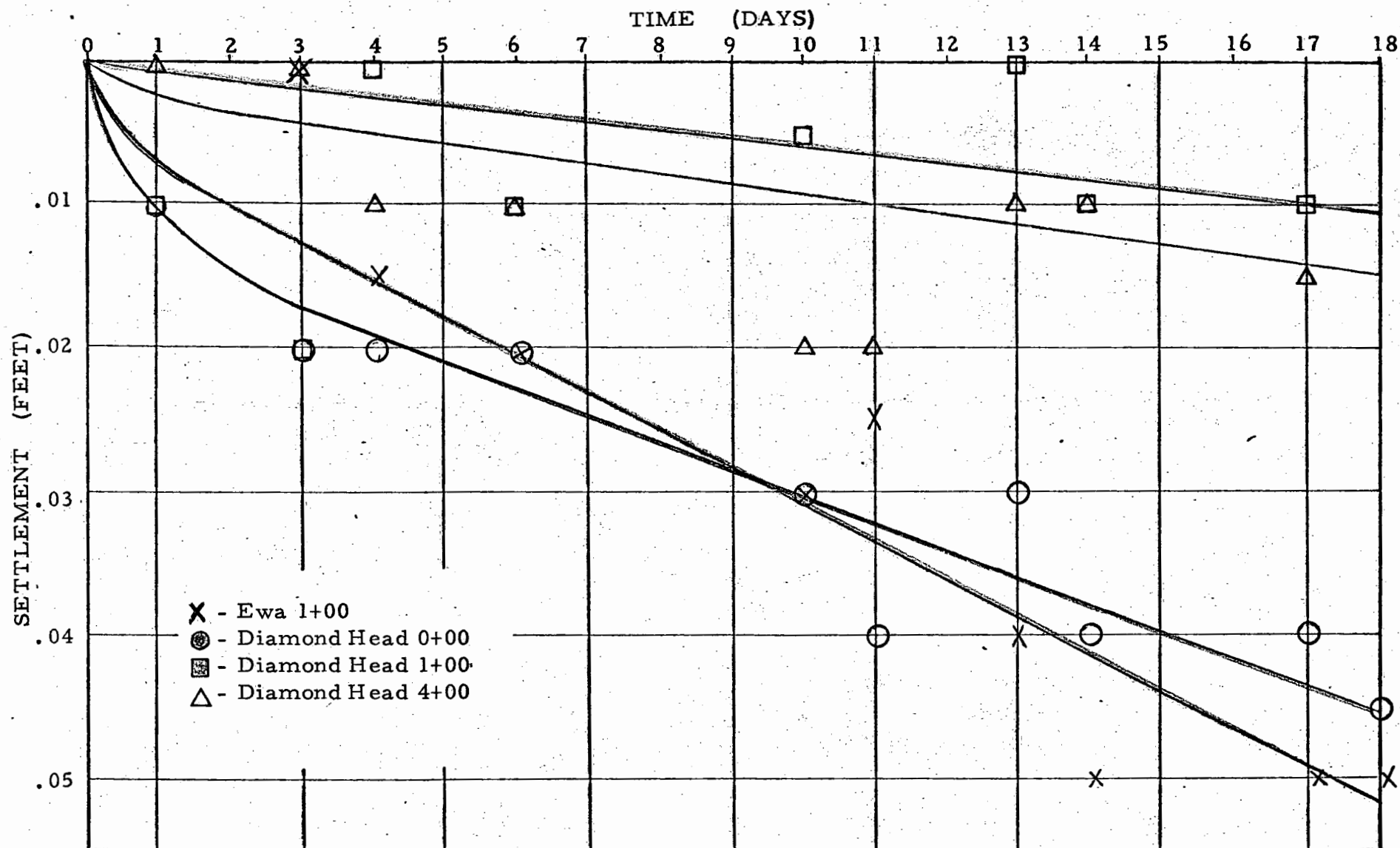
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Plate No. 3  
File No. H-69



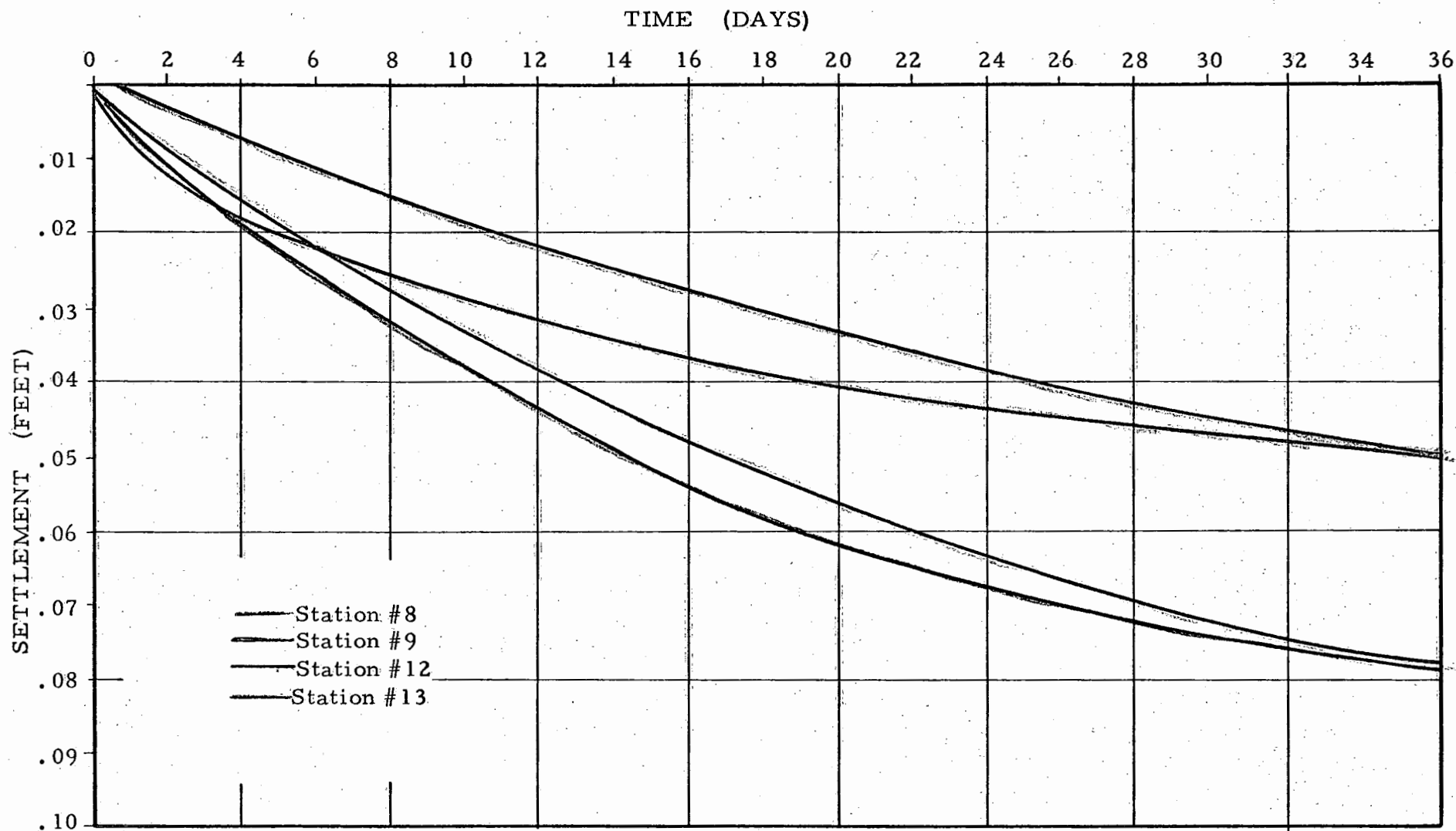
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Plate No. 4  
File No. H-69



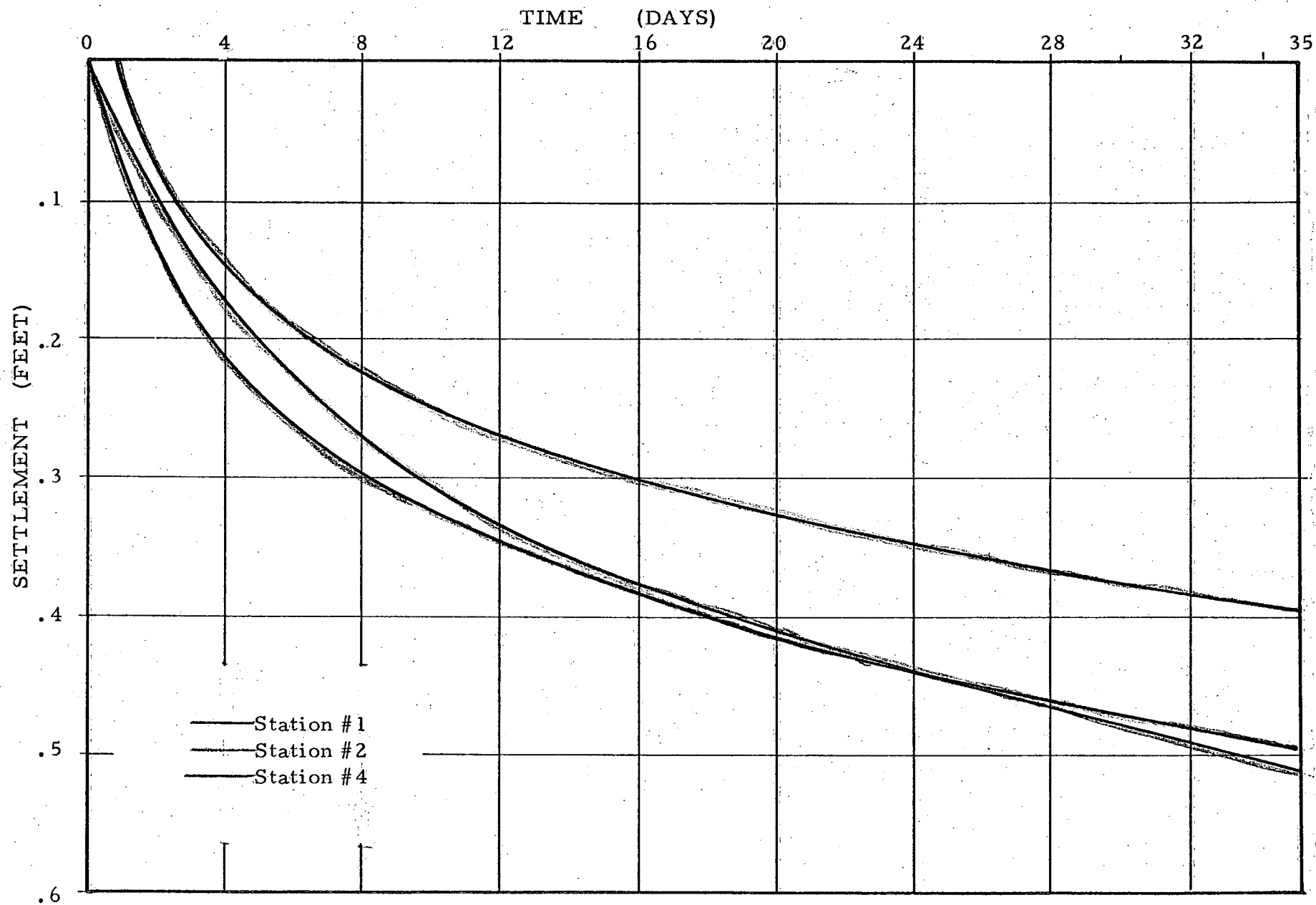
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Plate No. 5  
 File No. H-69



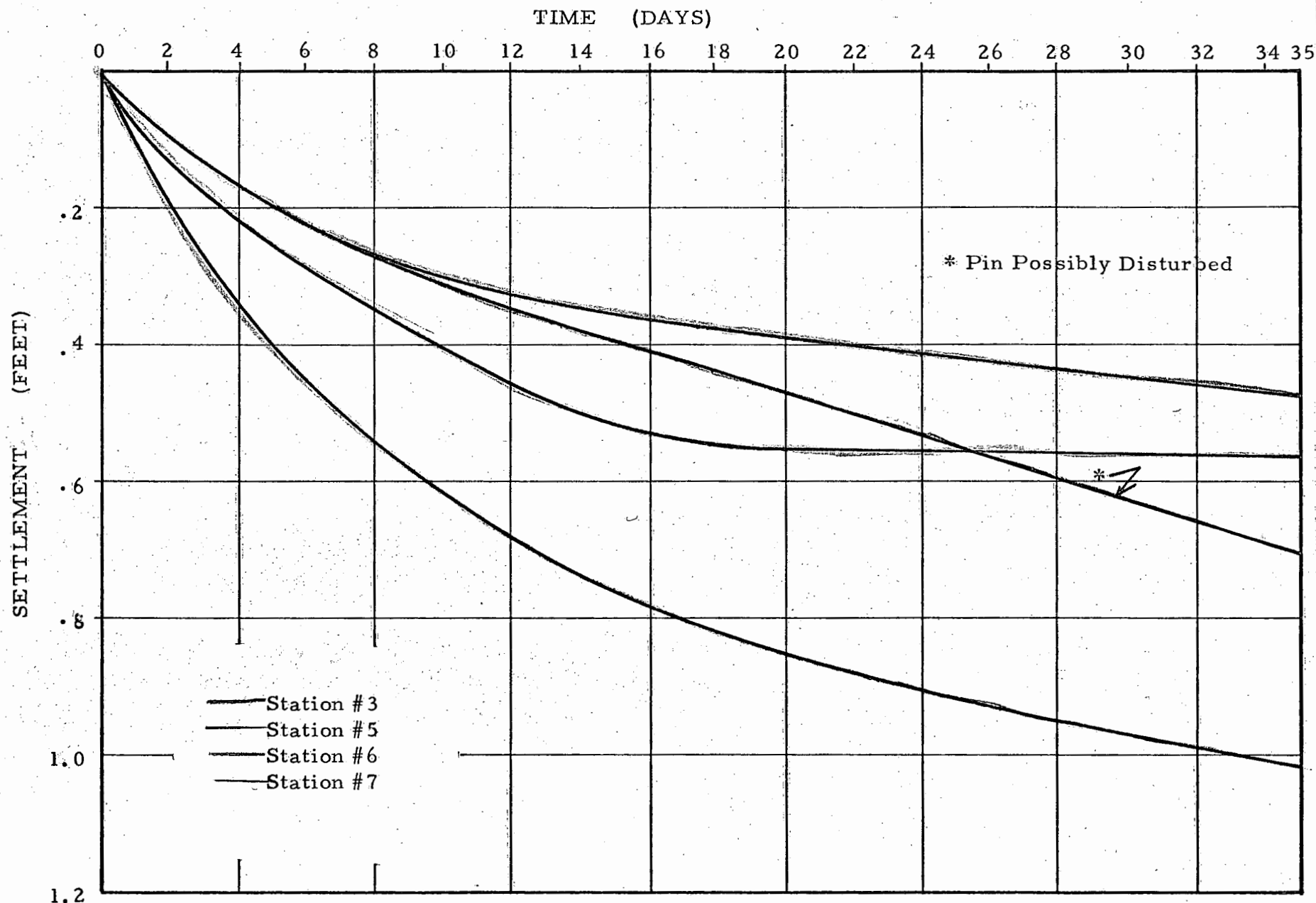
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& ASSOCIATES

Plate No. 1 - A  
File No. H-69



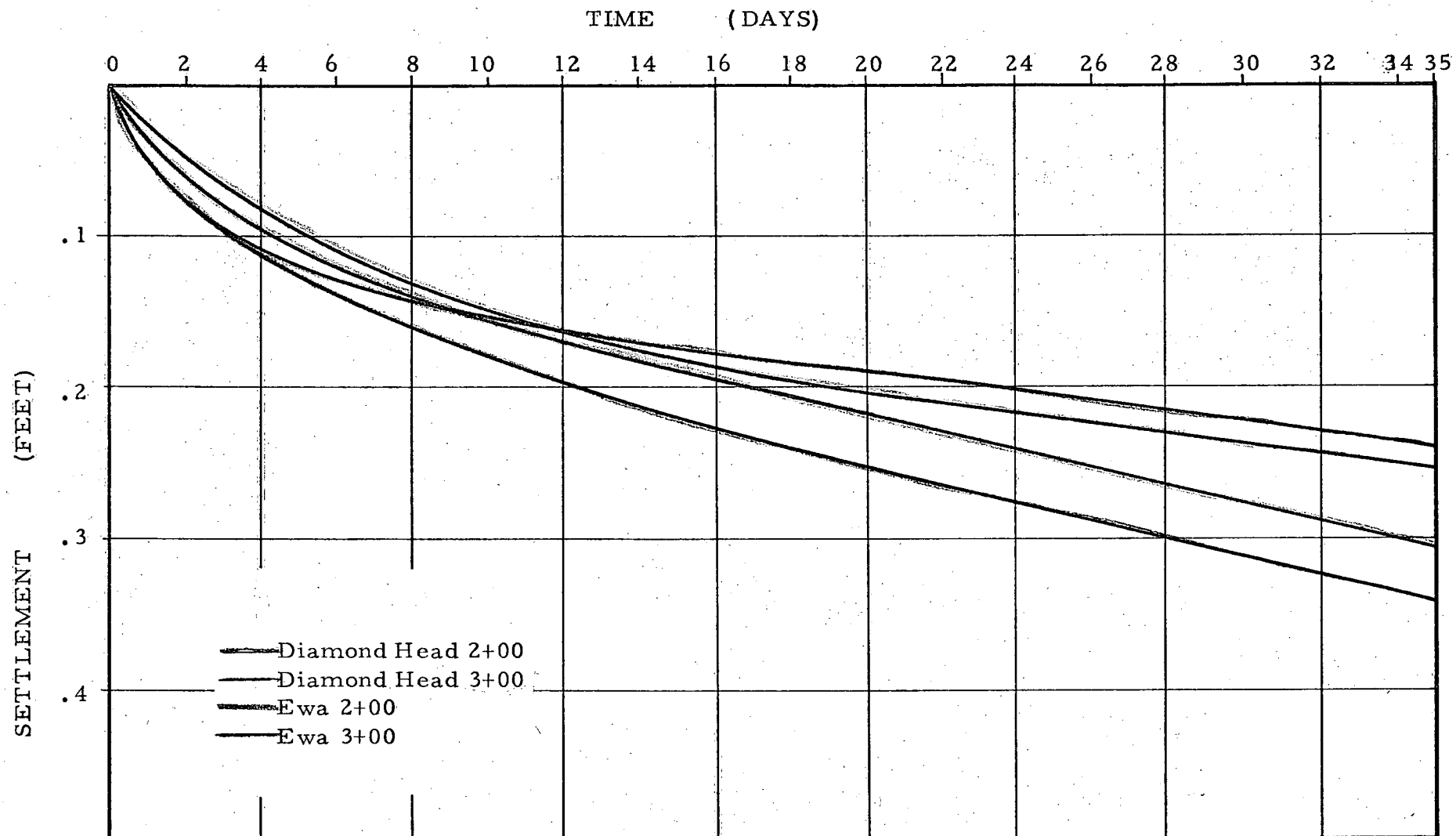
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Plate No. 2 - A  
File No. H-69



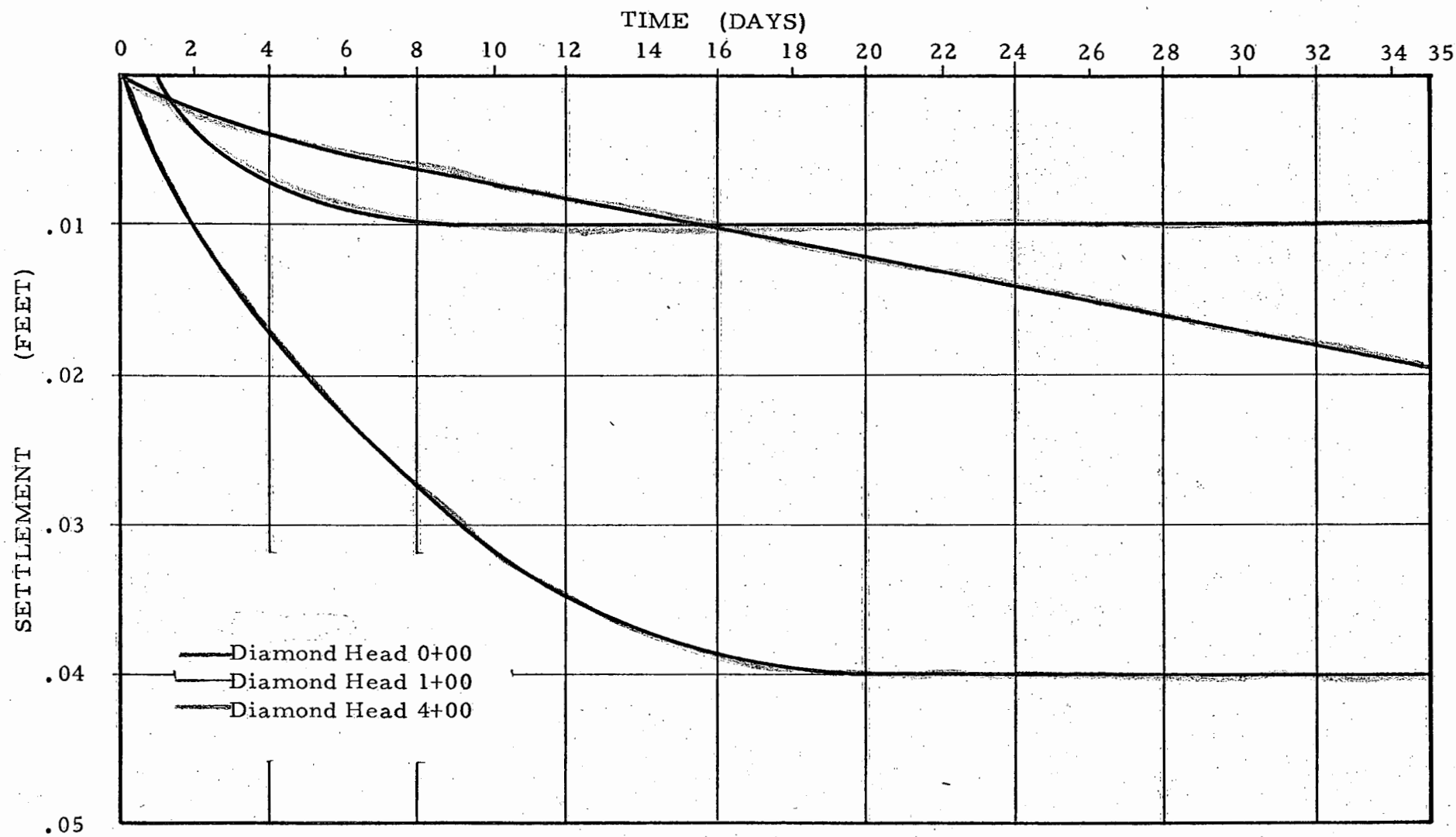
F. T. OPPERMAN WAREHOUSE

Plate No. 3 - A



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Plate No. 4 - A  
File No. H-69



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Plate No. 5 - A  
File No. H-69



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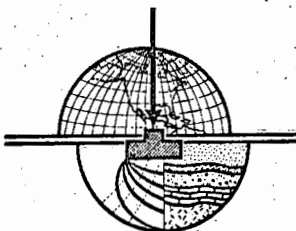
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Consulting Foundation Engineers and Geologists

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SEP 29 PM 2 29

Honolulu, Hawaii

September 29, 1970

Project No. H-69

RAY O. MAURSETH, C.E.  
JOHN B. HOWE, C.E.  
ROBERT D. COUSINEAU  
CHARLES S. HOWE JR., C.E.  
R. BRUCE LOCKWOOD, GEOL. P.E.

F. T. Opperman, Incorporated  
98-021 Kamehameha Highway  
Aiea, Hawaii 96701

Attention: Mr. F. T. Opperman

re: Proposed Warehouse  
Waimalu, Oahu

Gentlemen:

The design recommendations and settlement records have been reviewed on the subject project to determine if the surcharging program could cause an uplift adjacent to the fill area. The conclusions presented are based on the data collected on this site, plus experience gained on the adjacent property.

Some uplift, which is normal, has been observed adjacent to the fill. However, provided that the fill is not placed directly adjacent to an unretained slope, the uplift has been small and appears to stabilize within a few weeks after the initial loading.

To reduce the possibility of movement of adjacent areas, the surcharge filling program should start from the Pearl Harbor end of the site. The fill should not be placed all at one time (8 feet high), but should be placed in two lifts, or more. This would allow the underlying soft soils to consolidate and gain strength prior to the next loading increment.

BRANCH OFFICE MANAGERS

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- 2 -

By taking the precaution of incremental and selective loading, plus observing the records for abnormal time rates of settlement, it is believed that the fill can be placed without effecting the lower, adjacent properties.

- o o o -

If there are any questions concerning this letter, please do not hesitate to contact this office.

Very truly yours,

MAURSETH, HOWE, LOCKWOOD  
& ASSOCIATES

Richard A. Martin  
Richard A. Martin

RAM/rk

cc: J. Brian Hughes & Associates