# NATIONAL BUREAU OF STANDARDS REPORT

10 479

## OUTDOOR PERFORMANCE OF PLASTICS
## VIII. FIRST UPDATE OF WEATHERING DATA

Sponsored
by
Manufacturing Chemists' Association


U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

# NATIONAL BUREAU OF STANDARDS

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The Bureau comprises the Institute for Basic Standards, the Institute for Materials Research, the Institute for Applied Technology, the Center for Radiation Research, the Center for Computer Sciences and Technology, and the Office for Information Programs.

**THE INSTITUTE FOR BASIC STANDARDS** provides the central basis within the United States of a complete and consistent system of physical measurement; coordinates that system with measurement systems of other nations; and furnishes essential services leading to accurate and uniform physical measurements throughout the Nation's scientific community, industry, and commerce. The Institute consists of an Office of Measurement Services and the following technical divisions:

Applied Mathematics—Electricity—Metrology—Mechanics—Heat—Atomic and Molecular Physics—Radio Physics [2]—Radio Engineering [2]—Time and Frequency [2]—Astrophysics [2]—Cryogenics.[2]

**THE INSTITUTE FOR MATERIALS RESEARCH** conducts materials research leading to improved methods of measurement standards, and data on the properties of well-characterized materials needed by industry, commerce, educational institutions, and Government; develops, produces, and distributes standard reference materials; relates the physical and chemical properties of materials to their behavior and their interaction with their environments; and provides advisory and research services to other Government agencies. The Institute consists of an Office of Standard Reference Materials and the following divisions:

Analytical Chemistry—Polymers—Metallurgy—Inorganic Materials—Physical Chemistry.

**THE INSTITUTE FOR APPLIED TECHNOLOGY** provides technical services to promote the use of available technology and to facilitate technological innovation in industry and Government; cooperates with public and private organizations in the development of technological standards, and test methodologies; and provides advisory and research services for Federal, state, and local government agencies. The Institute consists of the following technical divisions and offices:

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Information Processing Standards—Computer Information — Computer Services — Systems Development—Information Processing Technology.

**THE OFFICE FOR INFORMATION PROGRAMS** promotes optimum dissemination and accessibility of scientific information generated within NBS and other agencies of the Federal government; promotes the development of the National Standard Reference Data System and a system of information analysis centers dealing with the broader aspects of the National Measurement System, and provides appropriate services to ensure that the NBS staff has optimum accessibility to the scientific information of the world. The Office consists of the following organizational units:

Office of Standard Reference Data—Clearinghouse for Federal Scientific and Technical Information [3]—Office of Technical Information and Publications—Library—Office of Public Information—Office of International Relations.

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[1] Headquarters and Laboratories at Gaithersburg, Maryland, unless otherwise noted; mailing address Washington, D.C. 20234.
[2] Located at Boulder, Colorado 80302.
[3] Located at 5285 Port Royal Road, Springfield, Virginia 22151.

# NATIONAL BUREAU OF STANDARDS REPORT

| NBS PROJECT | | NBS REPORT |
|---|---|---|
| 4216362 | September 3, 1971 | 10 479 |

## OUTDOOR PERFORMANCE OF PLASTICS
## VIII. FIRST UPDATE OF WEATHERING DATA

by
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Sponsored
by
Manufacturing Chemists Association




U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

This report updates previous reports of the Manufacturing Chemists' Association's (MCA) project that was initiated in 1966. Since that time, 20 plastic samples (Table I) have been exposed outdoors at three different exposure sites (Table II) which represent varying climatic weather conditions encountered in the United States. The MCA project and its preliminary results have been described in a series of National Bureau of Standards Reports. These reports (1-7), all entitled Outdoor Performance of Plastics have the following subtitles:

I. Introduction and Color-Change (1).

II. Tensile and Flexural Properties (2).

III. Statistical Model for Predicting Weatherability (3).

IV. Significance of Climate (4).

V. Surface Roughness (5).

VI. Electrical Properties (6).

VII. Haze and Gloss (7).

Changes in the properties listed in the above subtitles were used as the means for measuring the outdoor performance of the 20 plastic samples. Computers were used for data storage and retrieval. Graphs of property vs. outdoor exposure time were generated by the computer and these graphs were reproduced in the various reports as the method of reporting property changes.

From the preliminary results, it was decided that color, tensile, flexure, haze, and gloss would be the significant properties to follow

for the remainder of the project. Samples have now been exposed outdoors for 48 months and these five properties have been measured for each plastic. The physical testing was again performed by MCA member companies (Table III). Although the five properties were originally reported in 3 separate NBS reports, the data through 48 months for the 5 properties is presented in this single report.

Experimental details are not presented here; such details can be found in the original reports. Again, the data is presented as reproductions of the computer-generated graphs (Figures I - 81B). These graphs differ from the earlier ones in the X-axis (time in months) has been expanded to 60 months to accommodate the 48 month data. Thus, the data points are compressed when compared to those of the original graphs.

Some plastics have failed in the field and obviously there are no additional data for these. However, the original graphs have still been reproduced in this report with the expanded time axis.

The color data presented in the first report was erroneous. This data has now been corrected. No comparisons can be made between the graphs for color-change in the first report and this one.

This report is intended only as an update of the previous reports. No discussion of the accumulated data is presented. Another update will be issued after 60 months exposure time.

## References


(1) "Outdoor Performance of Plastics. I. Introduction and Color-Change", J. E. Clark, N. E. Green, and P. Giesecke, NBS Report #9912, Sept. 1968.

(2) "Outdoor Performance of Plastics. II. Tensile and Flexural Properties", J. E. Clark, G. E. Fulmer, R. C. Neuman, and J. A. Slater, NBS Report #10014, March 1969.

(3) "Outdoor Performance of Plastics. III. Statistical Model for Predicting Weatherability", J. E. Clark, and J. A. Slater, NBS Report #10116, Oct. 1969.

(4) Outdoor Performance of Plastics. IV. Significance of Climate", J. E. Clark, and C. Bal Krishna, NBS Report #10156, Jan. 1970.

(5) "Outdoor Performance of Plastics. V. Surface Roughness", J. E. Clark, C. Bal Krishna, H. C. Gunst, and J. R. Dagon, NBS Report #10179, March 1970.

(6) "Outdoor Performance of Plastics. VI. Electrical Properties", J. E. Clark, J. A. Slater, and V. L. Bergeron, NBS Report #10185, March 1970.

(7) "Outdoor Performance of Plastics. VII. Haze and Gloss", J. E. Clark, C. Bal Krishna, G. C. Claver, and F. H. McTigue, NBS Report #10188, March 1970.

## Acknowledgment

The authors acknowledge and appreciate the grateful assistance that Max Tryon presented in reproducing the computer graphs.

Table I

List of Twenty Plastics

| Base Polymer | Plastic |
|---|---|
| Polyethylene | Translucent - 1 mil<br>- 60 mil |
| Poly (methyl methacrylate) | Clear - 60 mil |
| Poly (vinyl fluoride) | Clear - 1 mil |
| Poly (ethylene terephthalate) | Clear - 5 mil |
| Polyester/x-linked | Clear - 60 mil |
| Poly (vinyl chloride) | Clear - 4 mil<br>- 10 mil<br>- 60 mil<br>Ba-Cd |
| | Clear - 4 mil<br>- 10 mil<br>- 60 mil<br>Sn |
| | Clear - 60 mil |
| | White - 4 mil<br>- 10 mil<br>- 60 mil<br>Ba-Cd |
| | White - 4 mil<br>- 10 mil<br>- 60 mil<br>Sn |
| | White - 60 mil |

TABLE III

Plastics Evaluation

| Property | Company & Location |
|---|---|
| Color | American Cyanamid Company<br>Stamford, Connecticut |
| Tensile<br>Flexure | W. R. Grace & Company<br>Clarksville, Maryland |
| Haze | Monsanto Company<br>Indian Orchard, Massachusetts |
| Gloss | Hercules Incorporated<br>Wilmington, Delaware |

## List of Figures

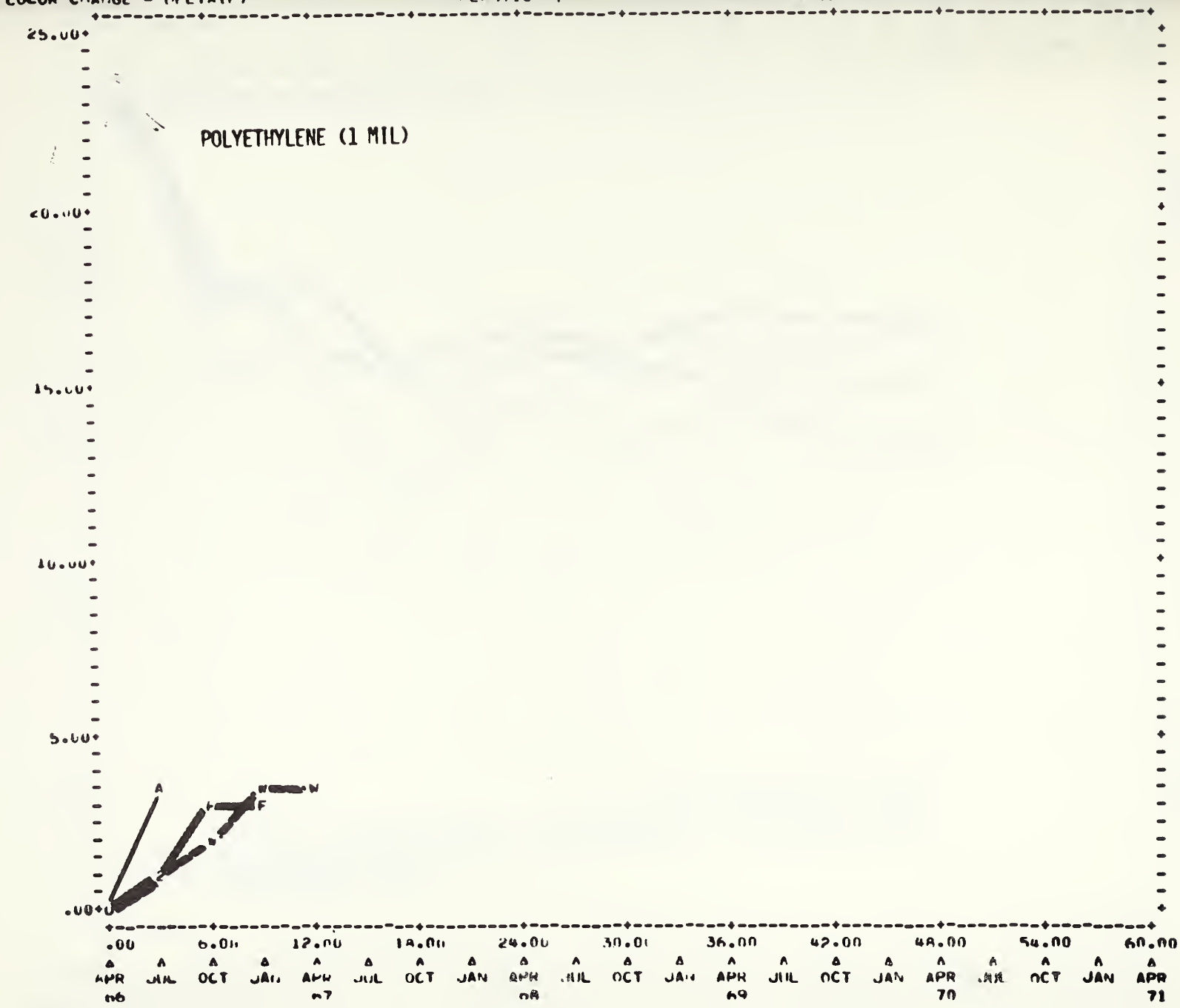

COLOR CHANGE - DELTA(E)
PLASTIC 1
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYETHYLENE (1 MIL)
25.00
20.00
15.00
10.00
5.00
.00
A
F
W
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 1

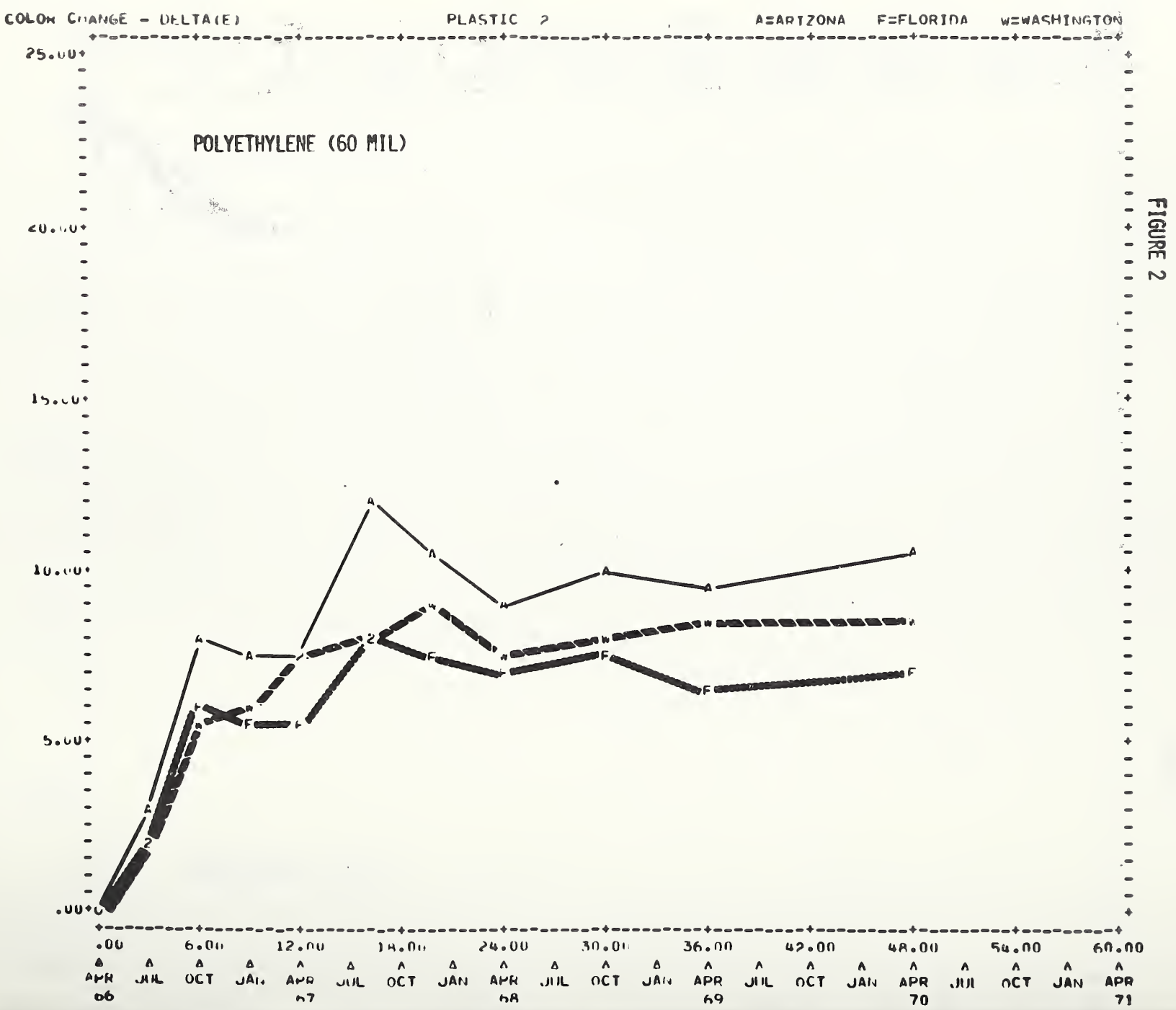

COLOR CHANGE - DELTA(E)
PLASTIC 2
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYETHYLENE (60 MIL)
25.00
20.00
15.00
10.00
5.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 2

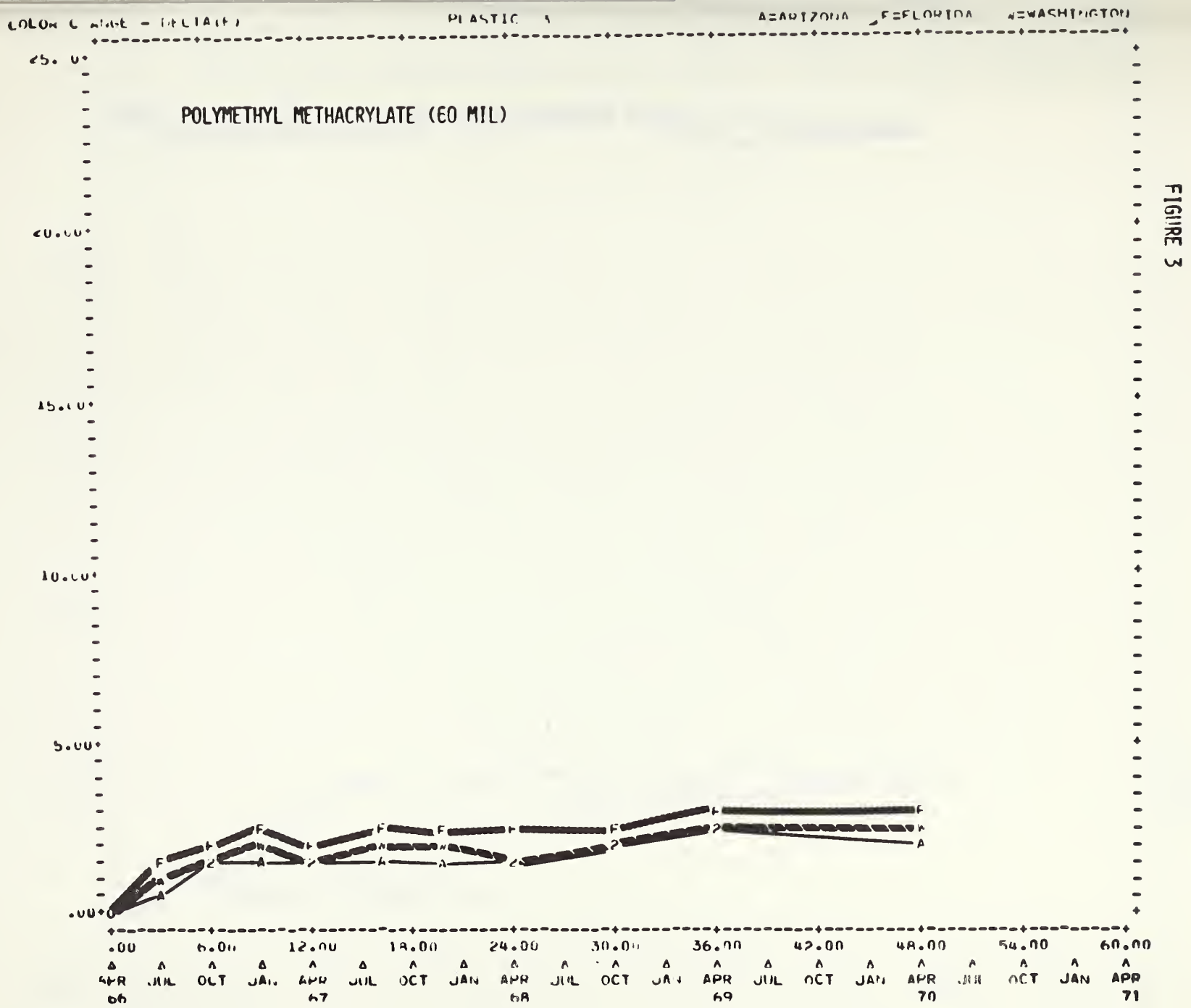

COLOR CHANGE - DELTA(E)
PLASTIC 1
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYMETHYL METHACRYLATE (60 MIL)
25.00
20.00
15.00
10.00
5.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 3

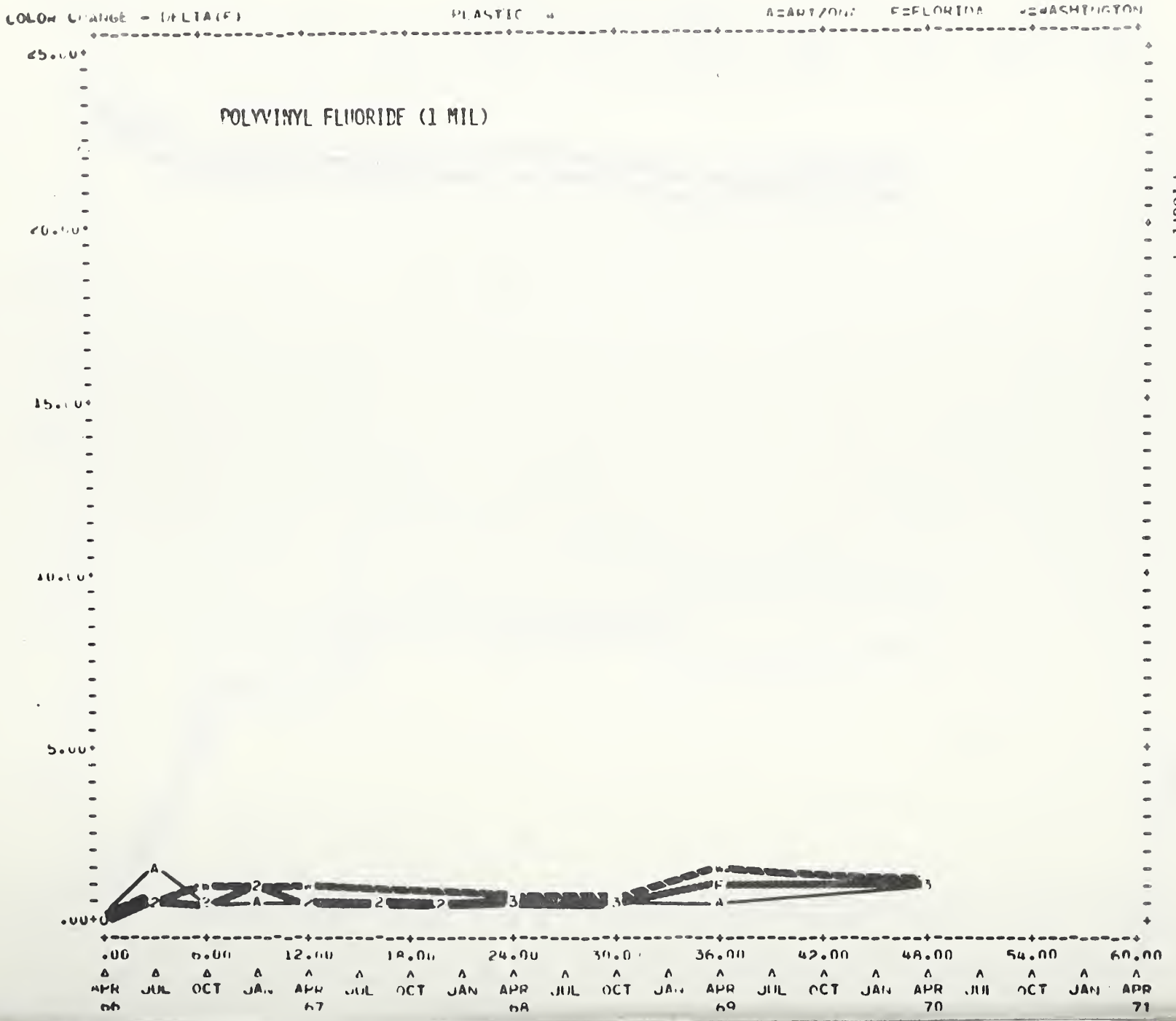

COLOR CHANGE - DELTA(E)
PLASTIC
A=ARIZONA
F=FLORIDA
W=WASHINGTON
POLYVINYL FLUORIDE (1 MIL)
25.00
20.00
15.00
10.00
5.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 4

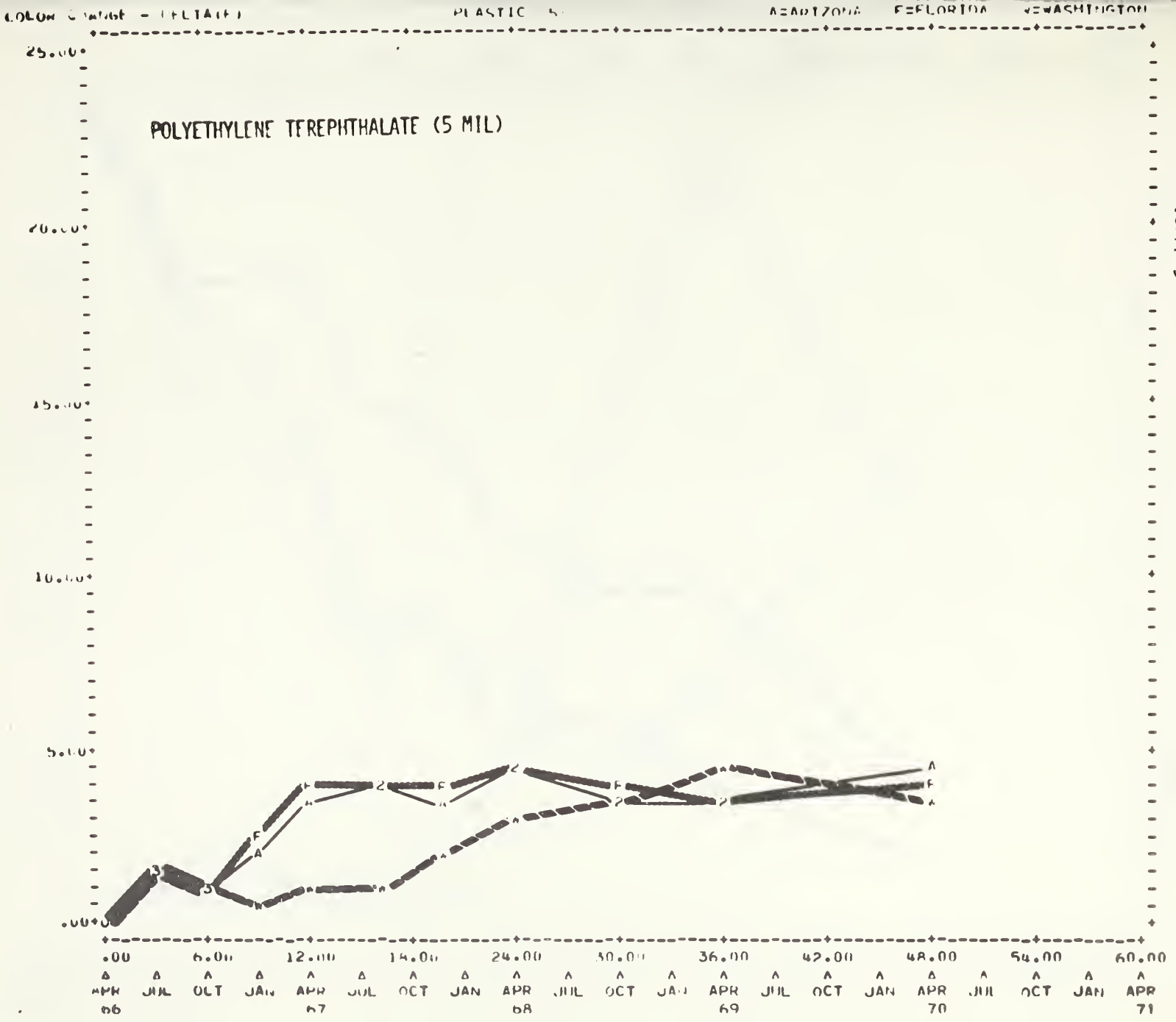

POLYETHYLENE TEREPHTHALATE (5 MIL)
25.00
20.00
15.00
10.00
5.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 5

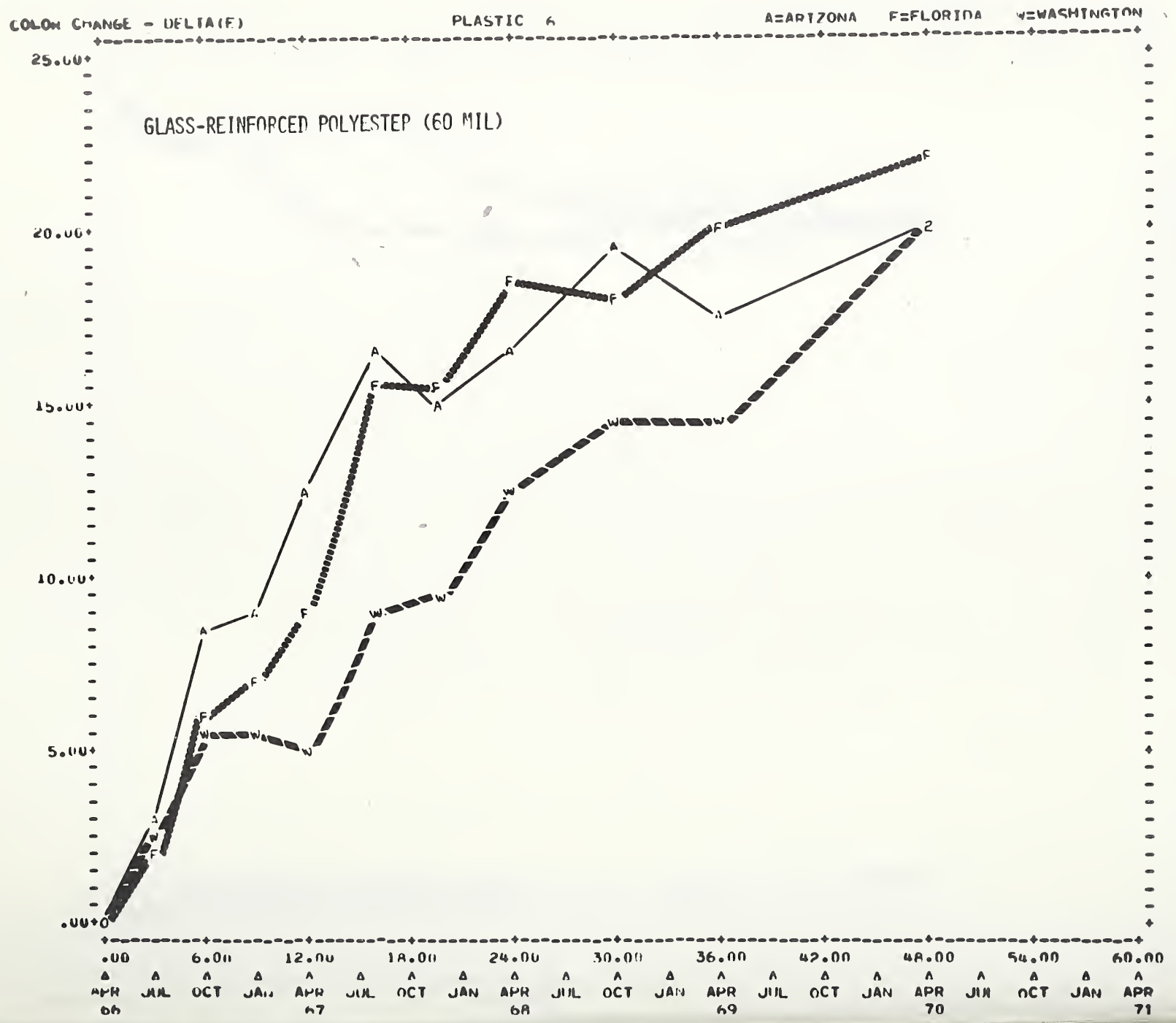

COLOR CHANGE - DELTA(E)
PLASTIC 6
A=ARIZONA F=FLORIDA W=WASHINGTON
GLASS-REINFORCED POLYESTER (60 MIL)
25.00
20.00
15.00
10.00
5.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 6

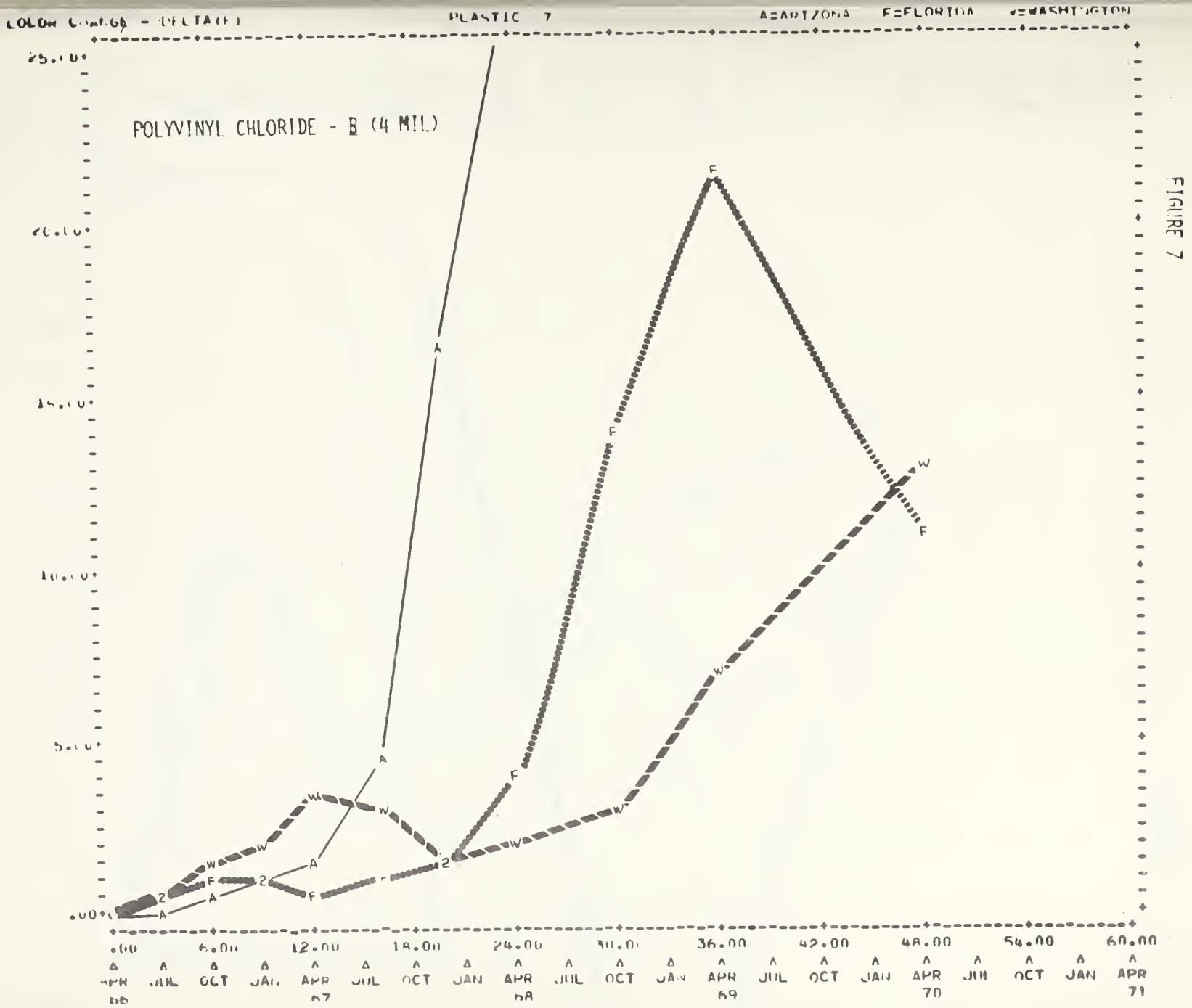



FIGURE 7

**NOTE. 2 POINTS FELL OUTSIDE THE SPECIFIED LIMITS AND WERE OMITTED.

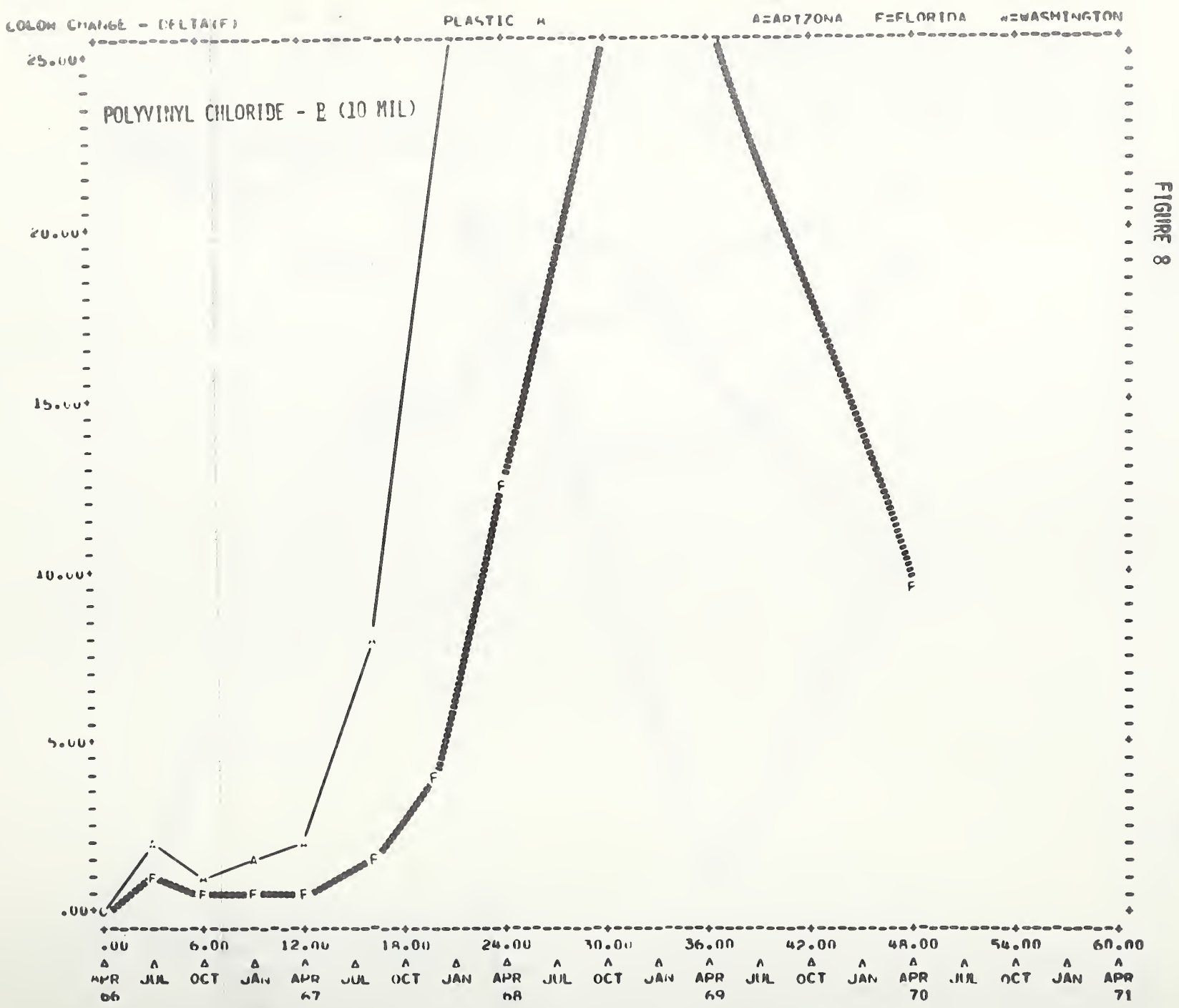



FIGURE 8

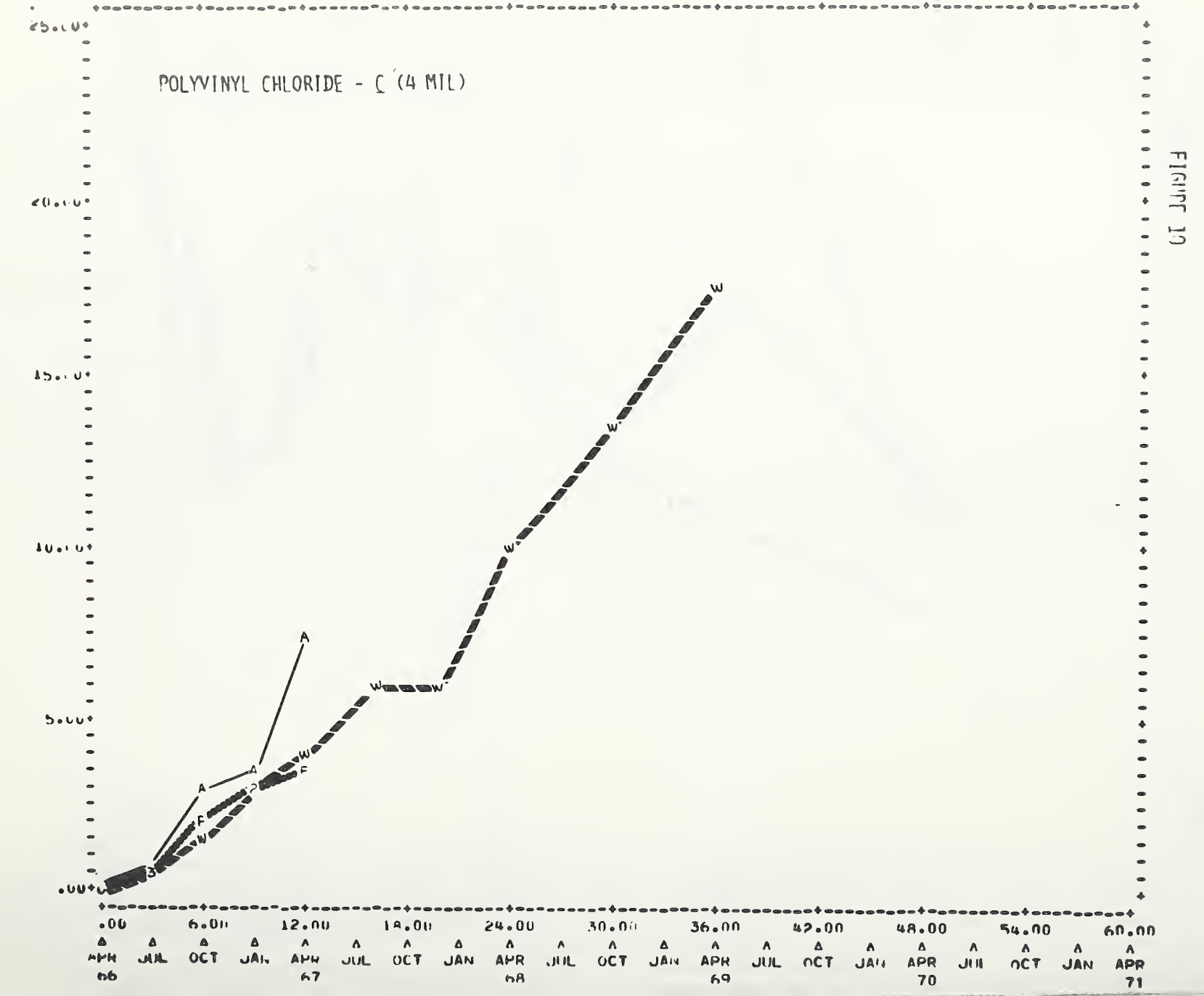
**NOTE. 6 POINTS FELL OUTSIDE THE SPECIFIED LIMITS AND WERE OMITTED.


FIGURE 9

**NOTE. 4 POINTS FELL OUTSIDE THE SPECIFIED LIMITS AND WERE OMITTED.

COLOR CHANGE - DELTA(E)  PLASTIC A  A=ARIZONA F=FLORIDA W=WASHINGTON

COLOR CHANGE - DELTA(E)  PLASTIC 10  A=ARIZONA F=FLORIDA W=WASHINGTON



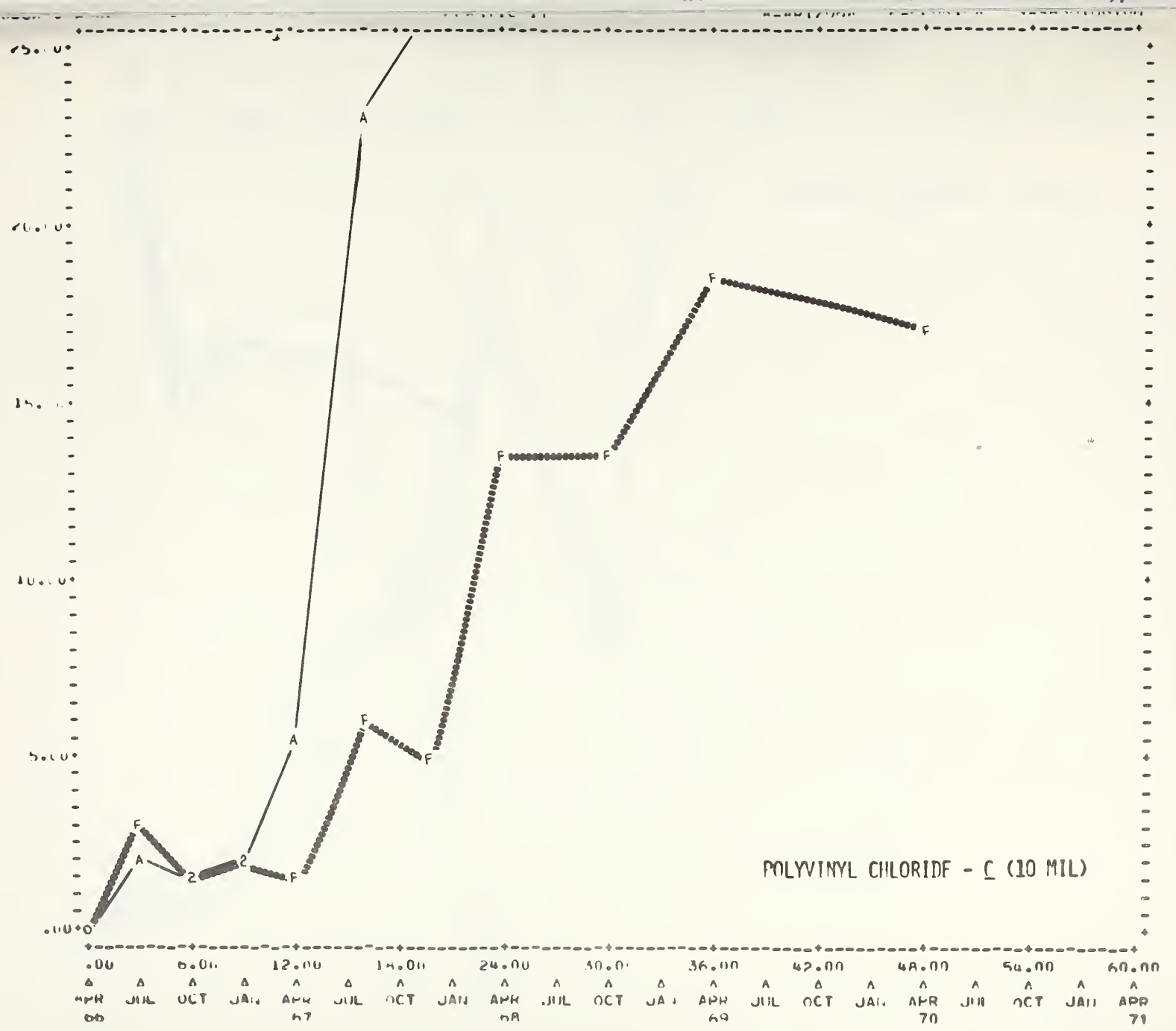



FIGURE 11

**NOTE. 4 POINTS FELL OUTSIDE THE SPECIFIED LIMITS AND WERE OMITTED.

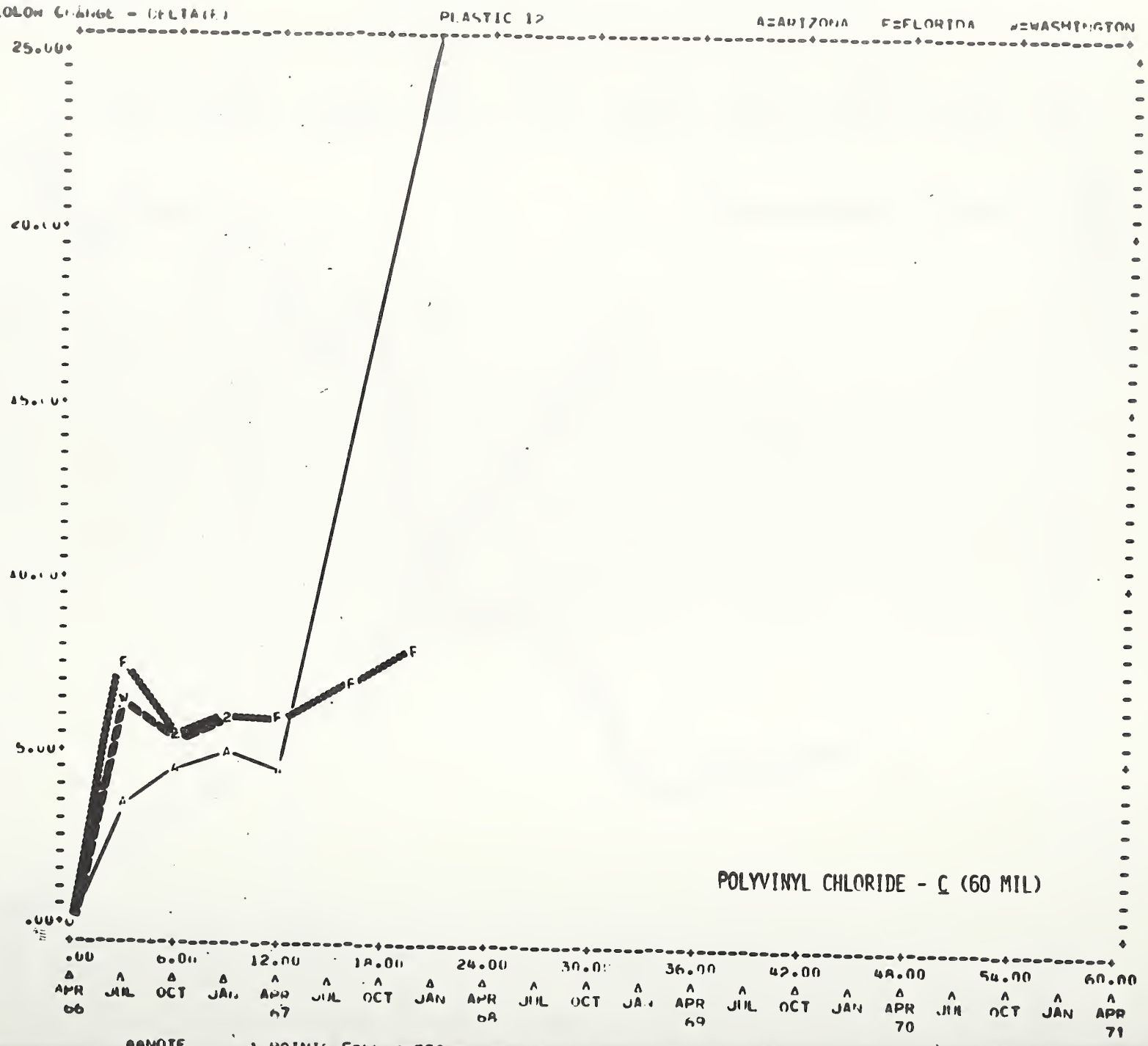

COLOR CHANGE - DELTA(E)
PLASTIC 12
ARIZONA
FLORIDA
WASHINGTON
25.00
20.00
15.00
10.00
5.00
.00
POLYVINYL CHLORIDE - C (60 MIL)
.00 APR 66
6.00 OCT
12.00 APR 67
18.00 OCT
24.00 APR 68
30.00 OCT
36.00 APR 69
42.00 OCT
48.00 APR 70
54.00 OCT
60.00 APR 71
JUL
JAN
JUL
JAN
JUL
JAN
JUL
JAN
JUL
JAN
**NOTE. 1 POINTS FELL OUTSIDE THE SPECIFIED LIMITS AND WERE OMITTED

FIGURE 12

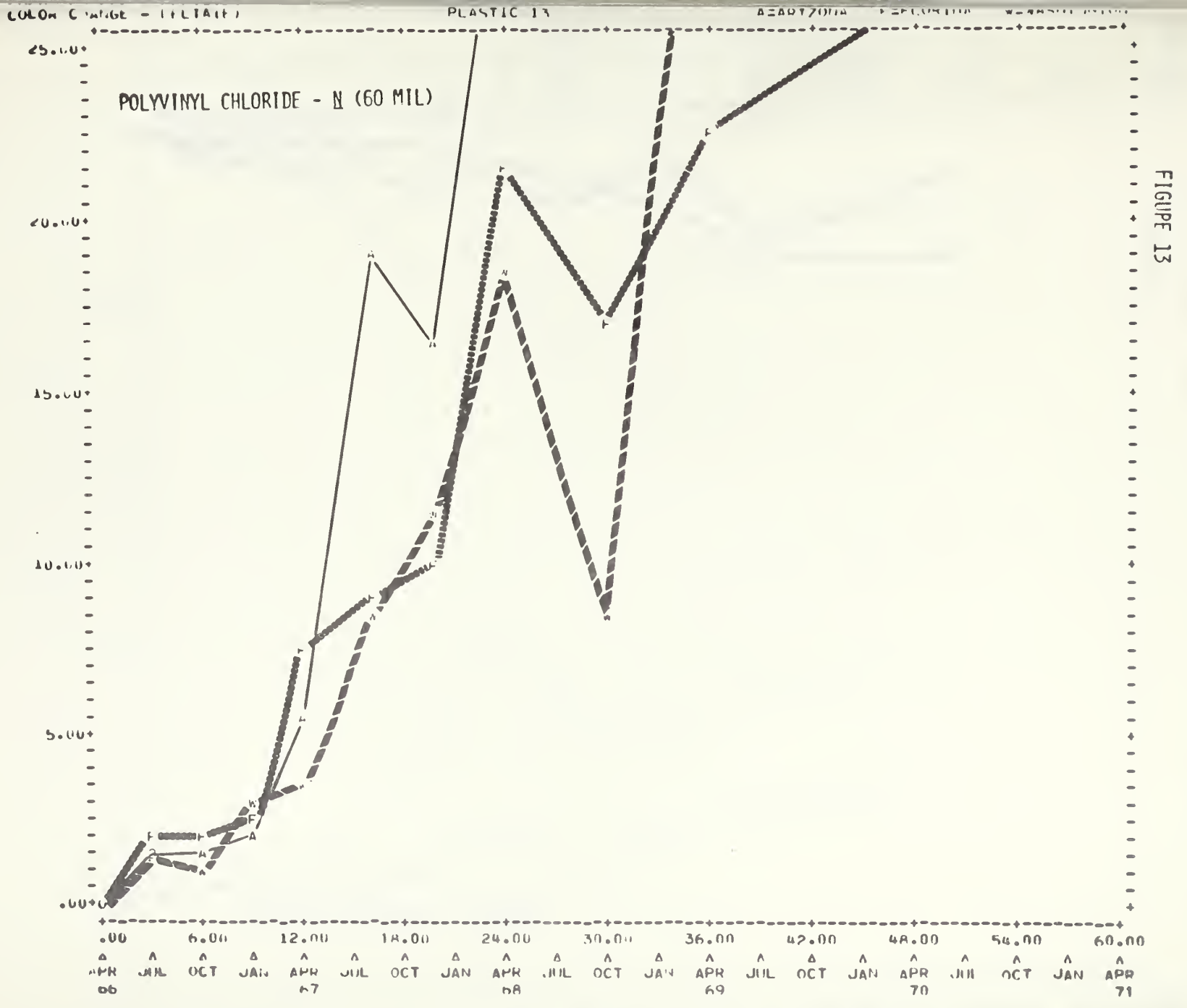



FIGURE 13

**NOTE. 6 POINTS FELL OUTSIDE THE SPECIFIED LIMITS AND WERE OMITTED.

COLOR CHANGE - (DELTA(E)  PLASTIC 14  A=ARIZONA  F=FLORIDA  W=WASHINGTON

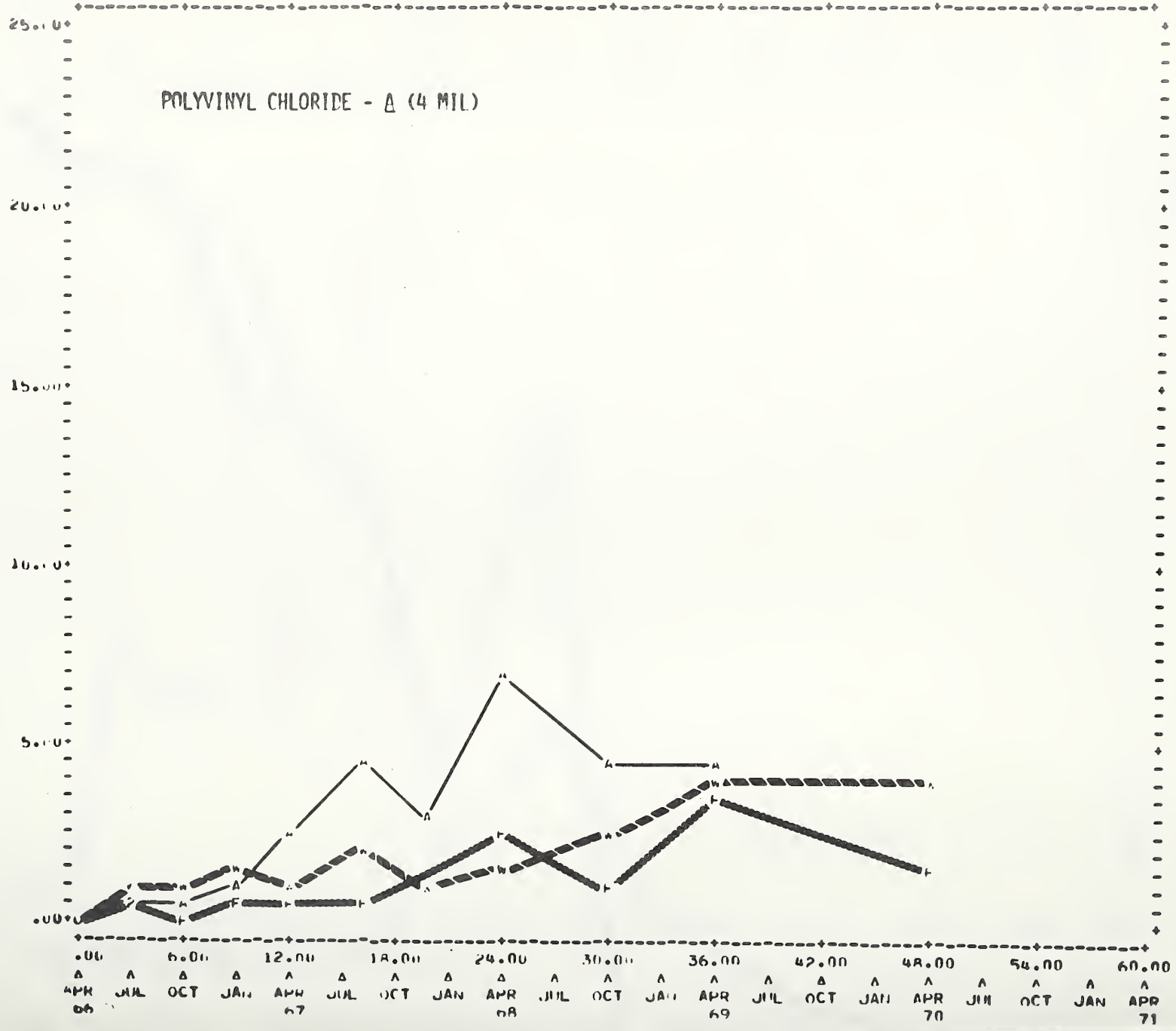



FIGURE 14

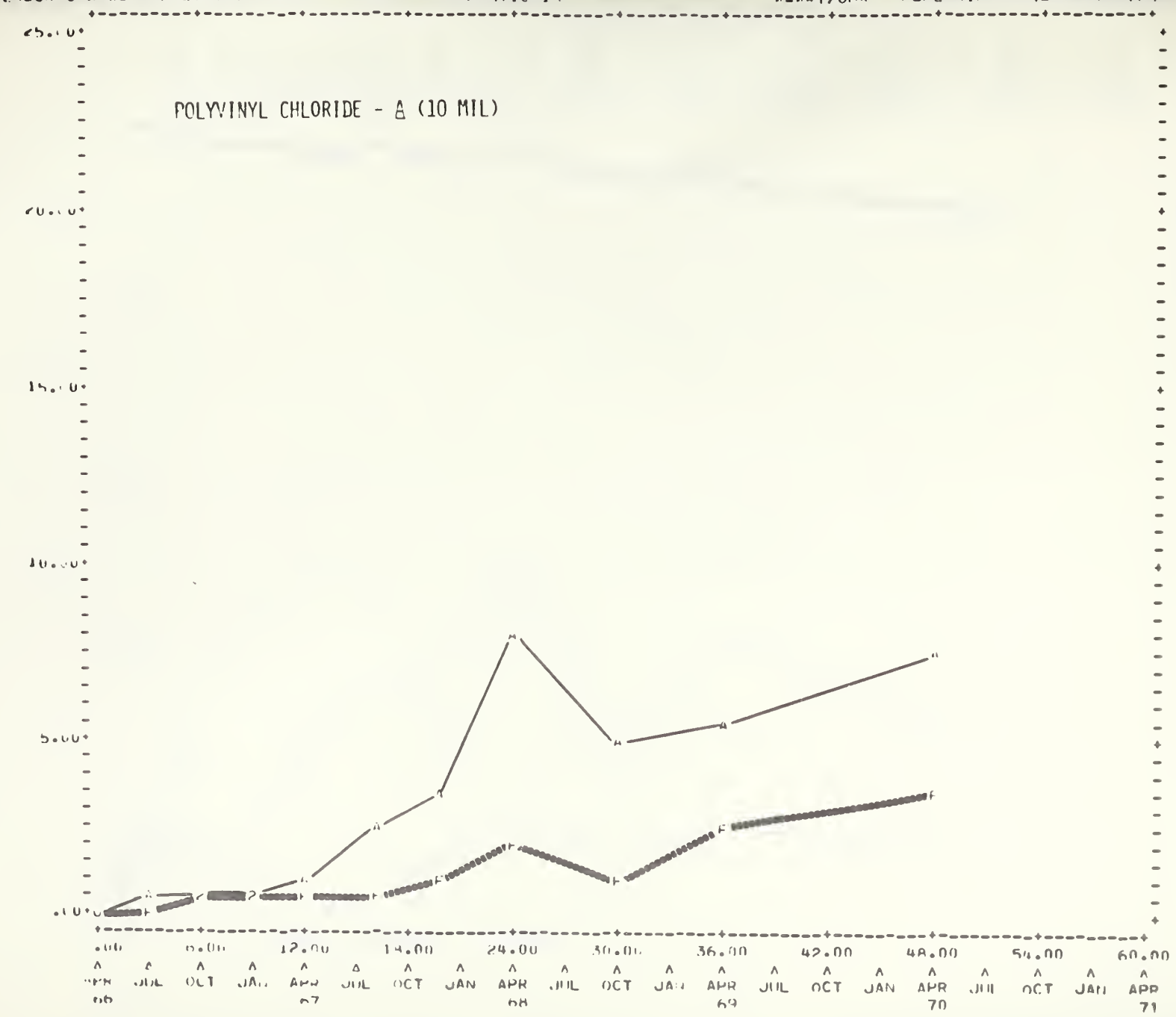

POLYVINYL CHLORIDE - A (10 MIL)
PLASTIC 15
ARIZONA
FLORIDA
WASHINGTON
25.00
20.00
15.00
10.00
5.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 15

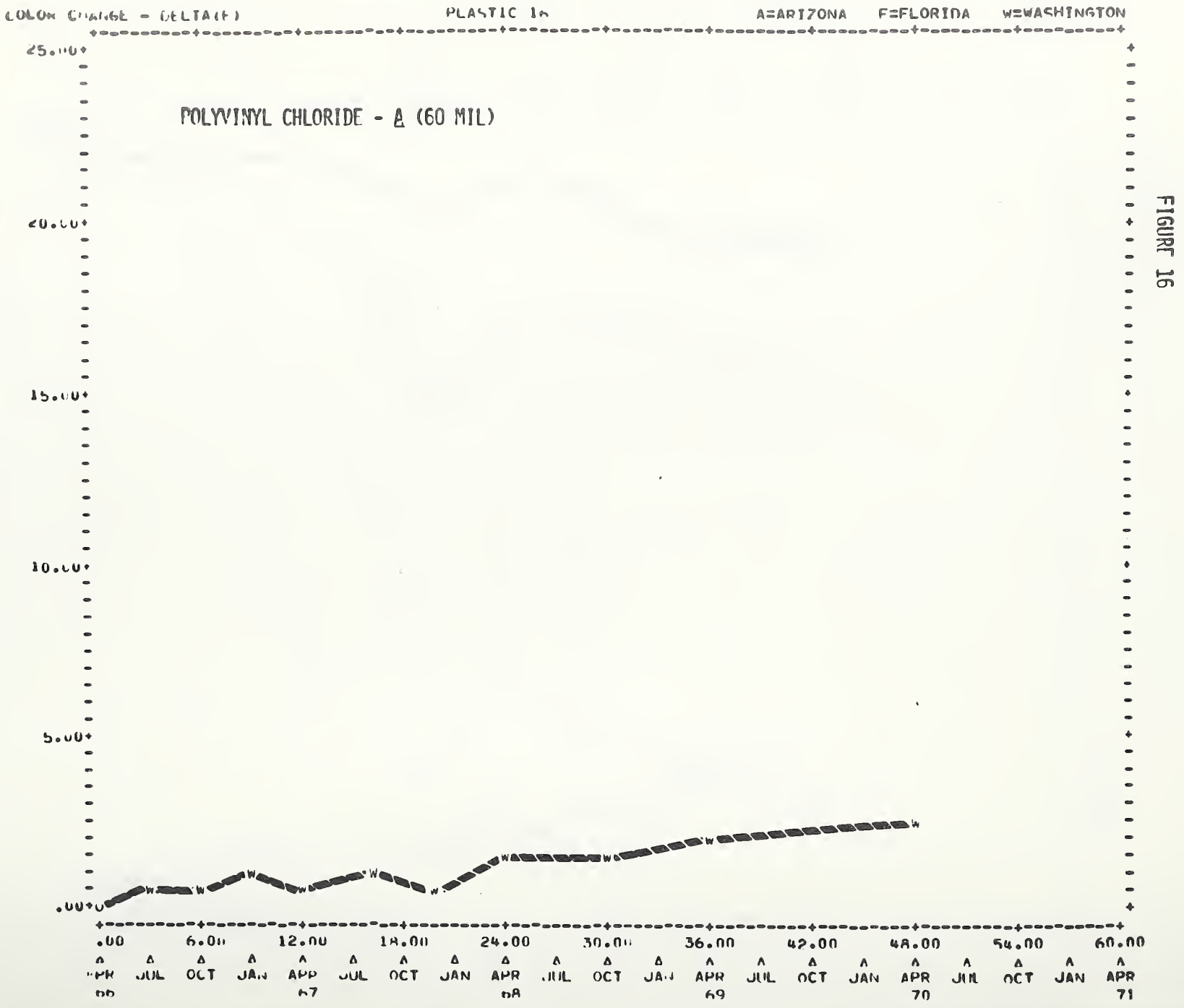

COLOR CHANGE - DELTA(E)
PLASTIC 1A
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL CHLORIDE - A (60 MIL)
25.00
20.00
15.00
10.00
5.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 16

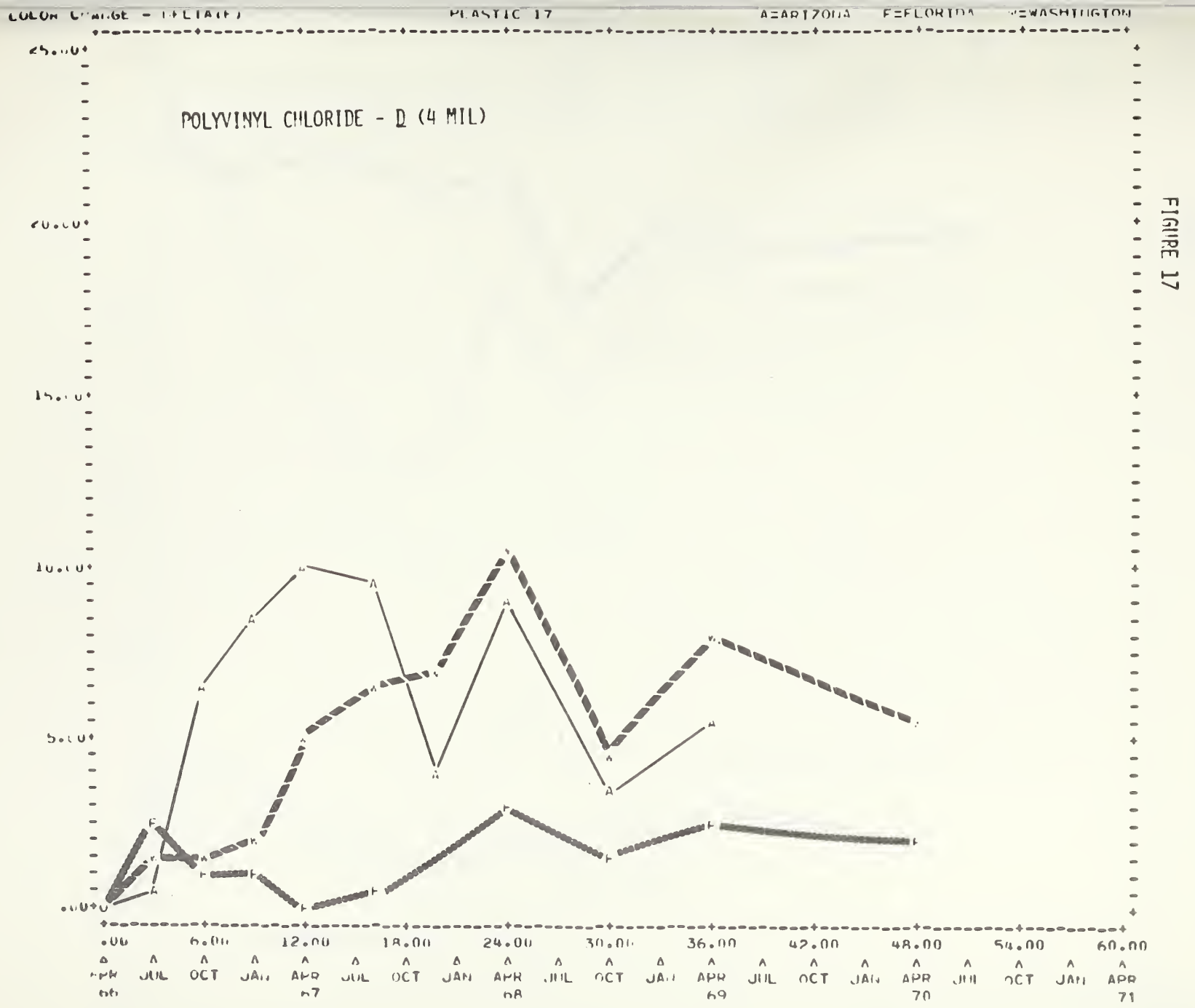

COLOR CHANGE - DELTA(E)
PLASTIC 17
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL CHLORIDE - D (4 MIL)
25.00
20.00
15.00
10.00
5.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 17

COLOR CHANGE - DELTA(E) PLASTIC 1A A=ARIZONA F=FLORIDA W=WASHINGTON

COLOR CHANGE - DELTA(E) PLASTIC 1A A=ARIZONA F=FLORIDA W=WASHINGTON

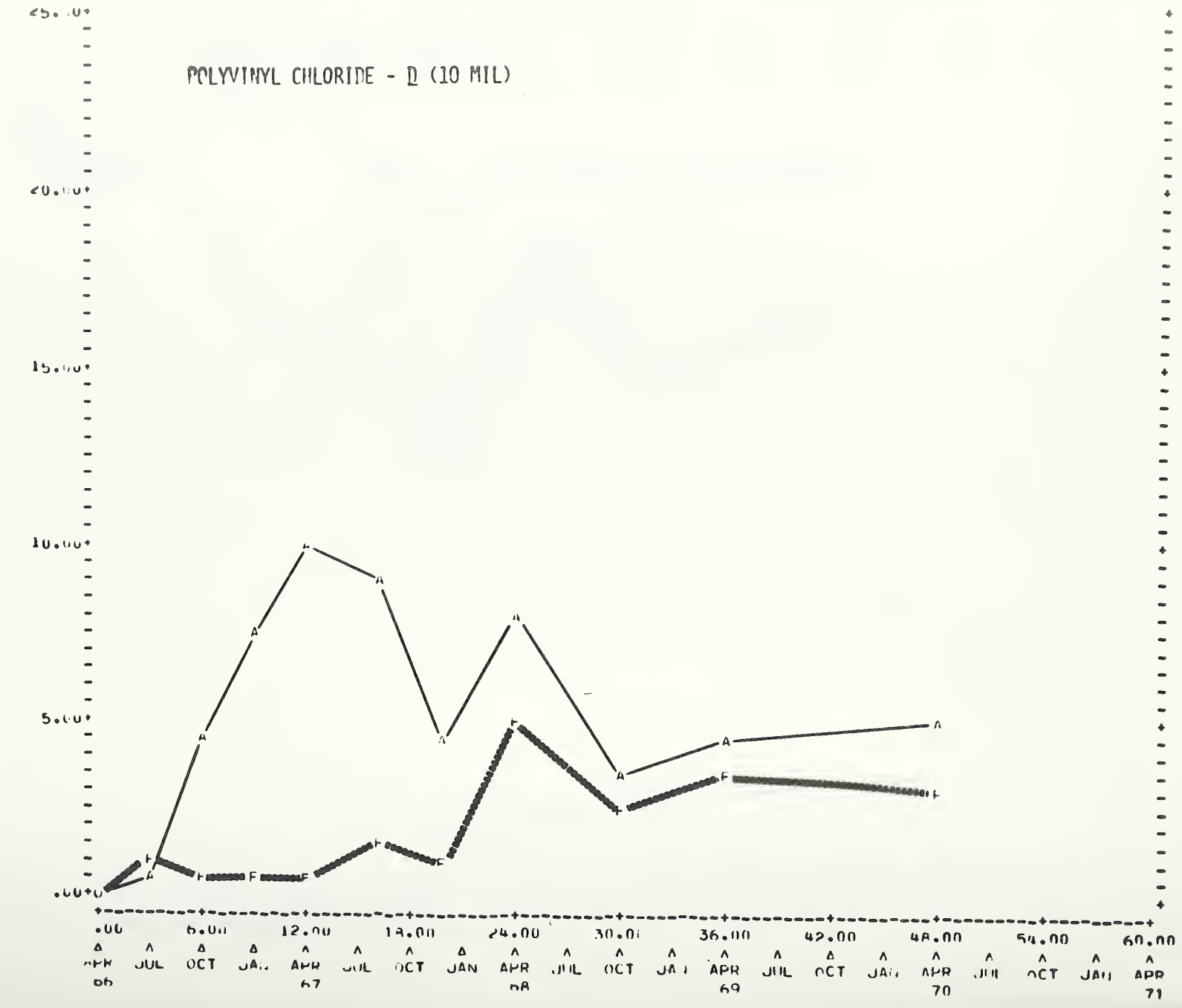



FIGURE 18

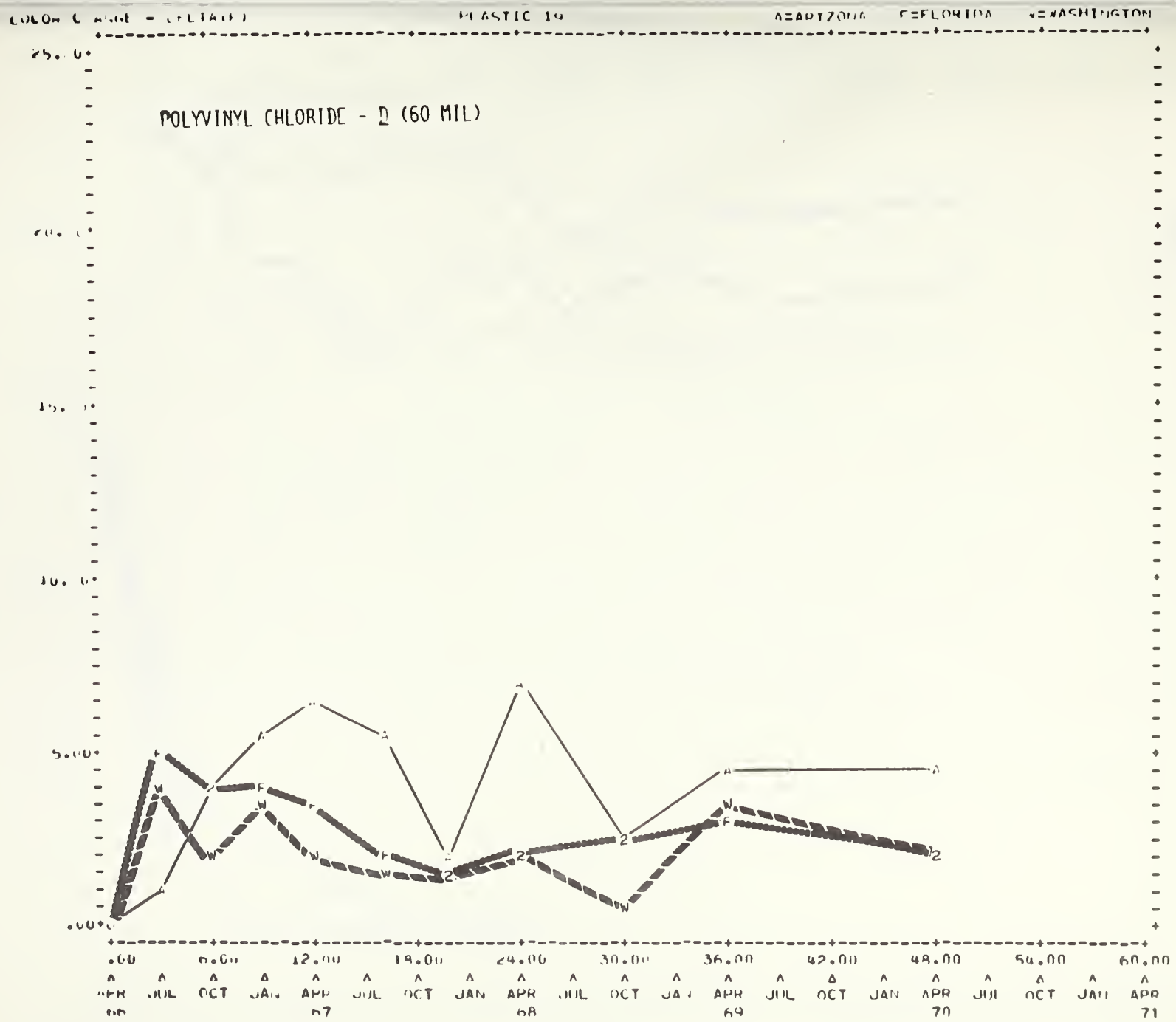

COLOR CHART = (RELATIVE)
PLASTIC 19
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL CHLORIDE - D (60 MIL)
25.0°
20.0°
15.0°
10.0°
5.00°
.00°C
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 19

COLOR CHANGE - DELTA(E)  PLASTIC 1A

COLOR CHANGE - DELTA(E)  PLASTIC 2D  A=ARIZONA  F=FLORIDA  W=WASHINGTON

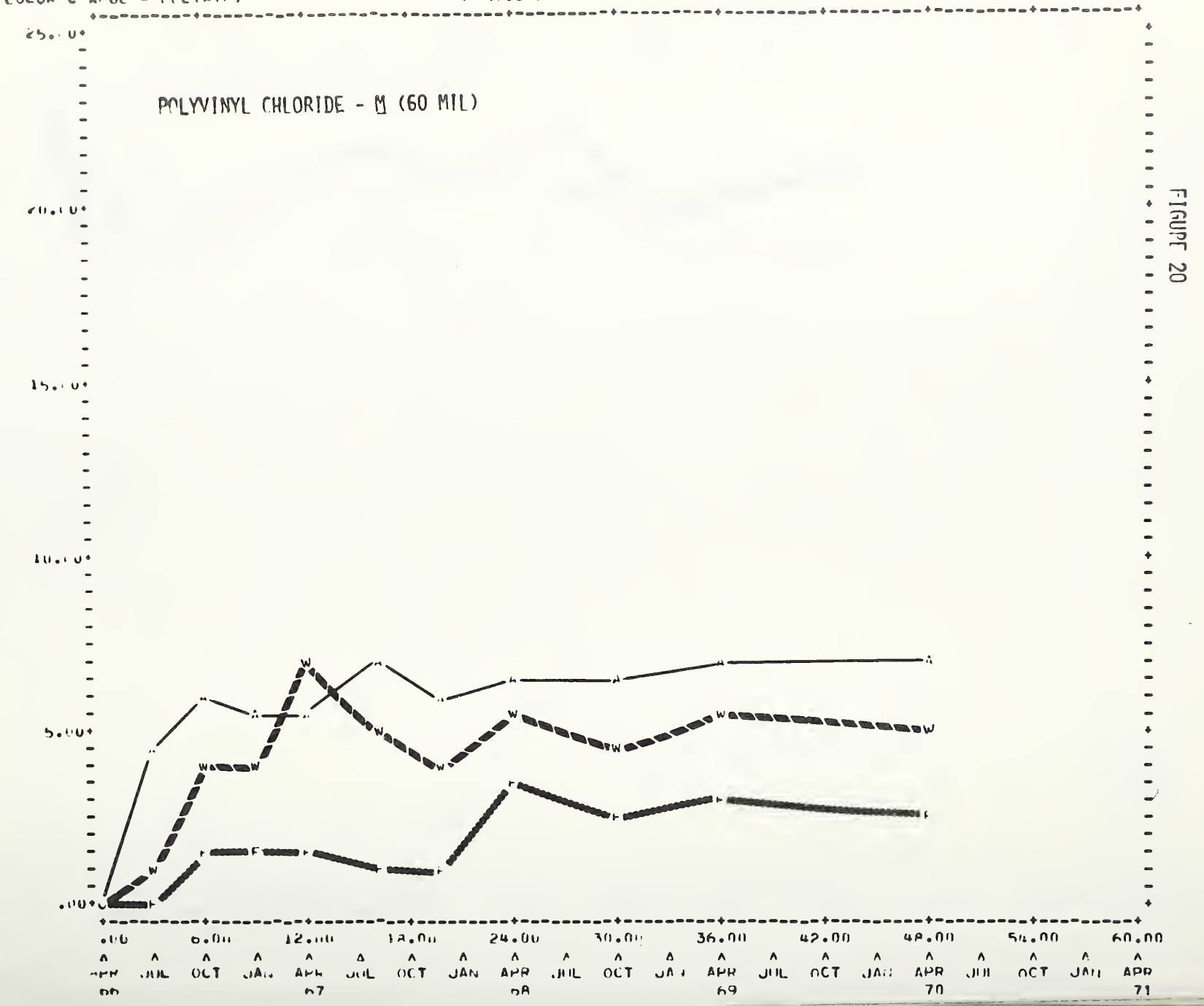



FIGURE 20

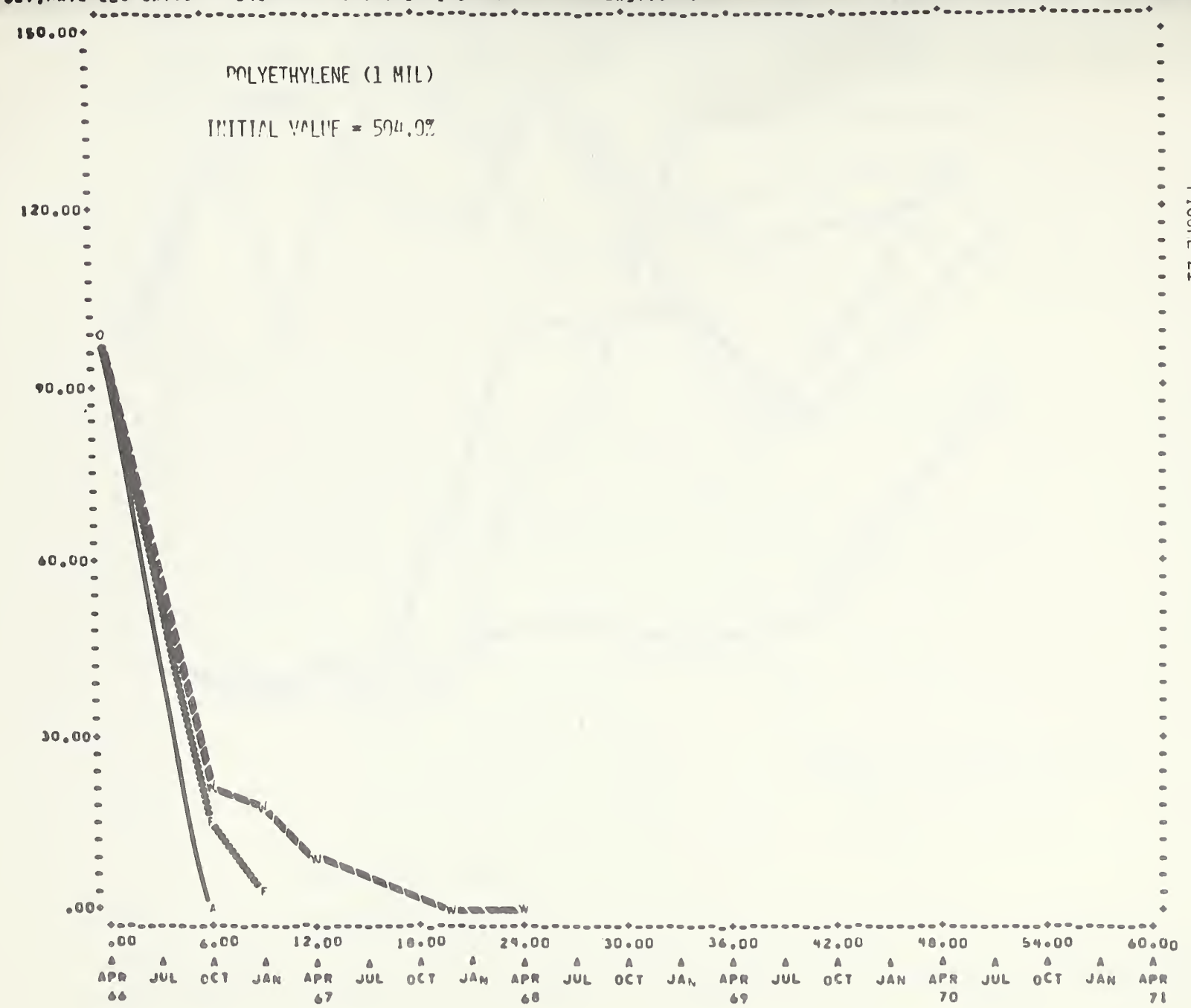

ULTIMATE ELONGATION (PERCENT OF INITIAL VALUE)
PLASTIC 1
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYETHYLENE (1 MIL)
INITIAL VALUE = 504.0%
150.00
120.00
90.00
60.00
30.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 21

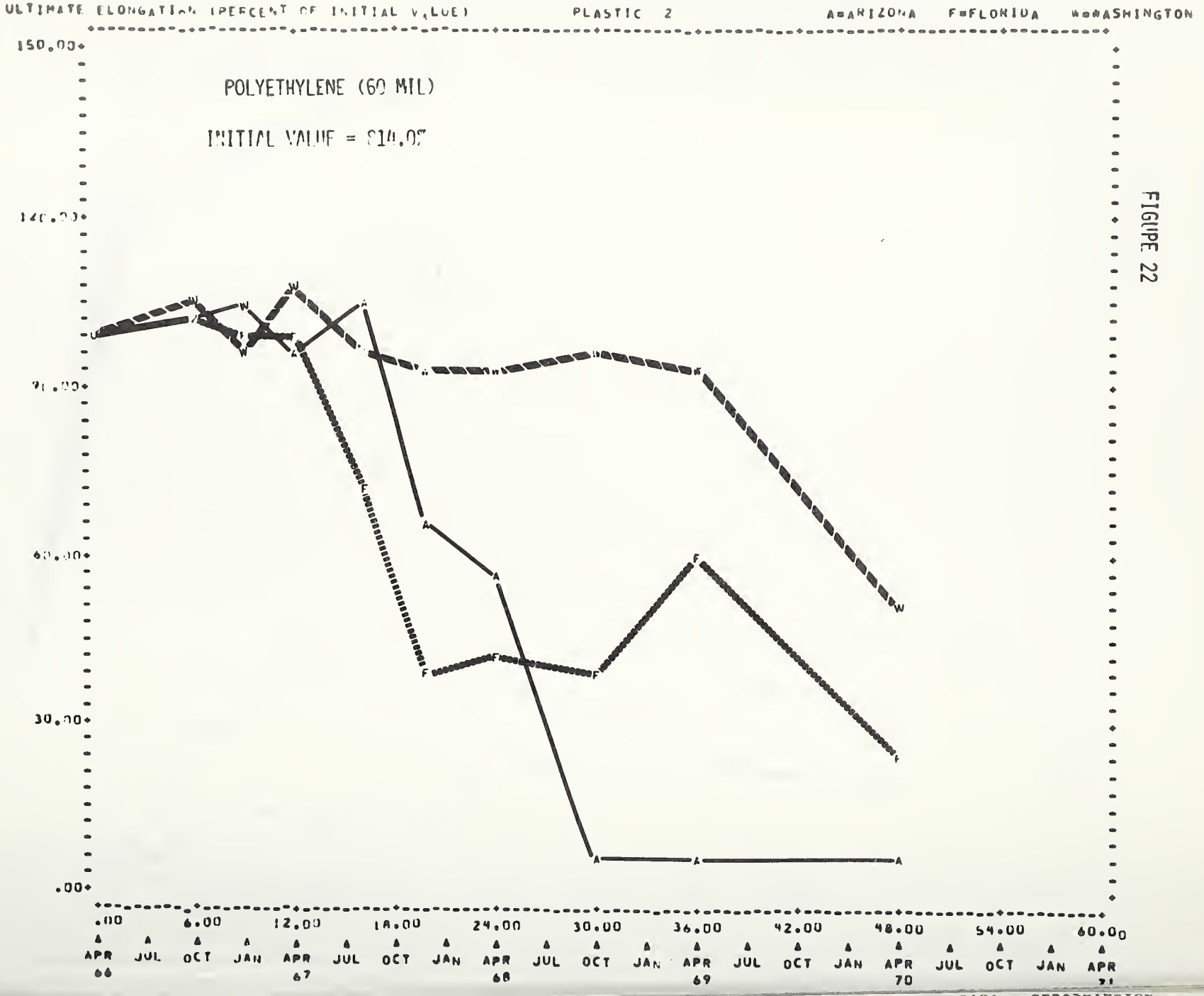

ULTIMATE ELONGATION (PERCENT OF INITIAL VALUE)
PLASTIC 2
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYETHYLENE (60 MIL)
INITIAL VALUE = 814.0%
150.00
120.00
90.00
60.00
30.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 22


ULTIMATE ELONGATION (PERCENT OF INITIAL VALUE)
PLASTIC J
A=ARIZONA F=FLORIDA W=WASHINGTON
150.00
120.00
90.00
60.00
30.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71
POLYMETHYL METHACRYLATE (60 MIL)
INITIAL VALUE = 6.5%

FIGURE 23

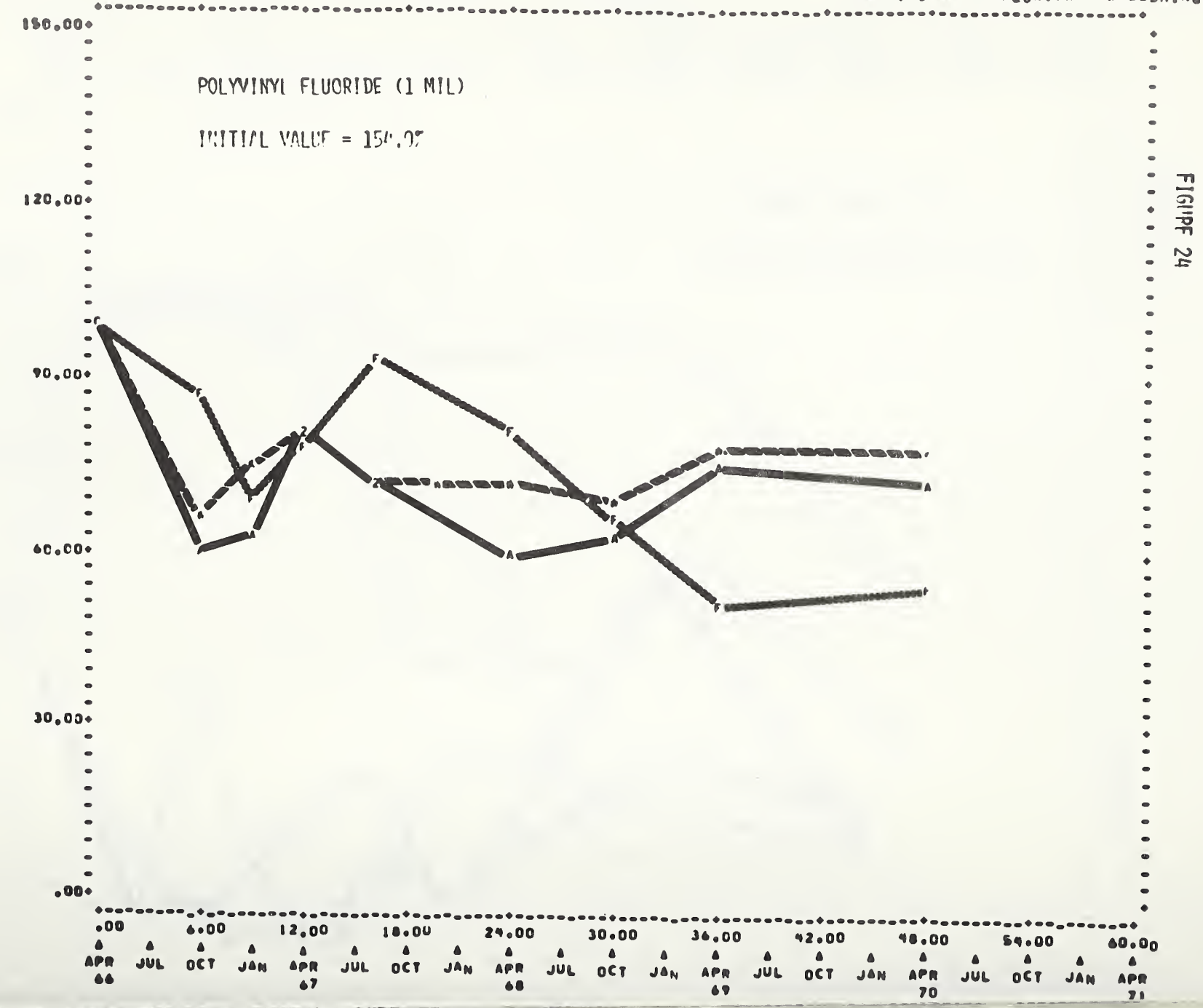

ULTIMATE ELONGATION (PERCENT OF INITIAL VALUE)
PLASTIC 4
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL FLUORIDE (1 MIL)
INITIAL VALUE = 150.0%
150.00
120.00
90.00
60.00
30.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 24

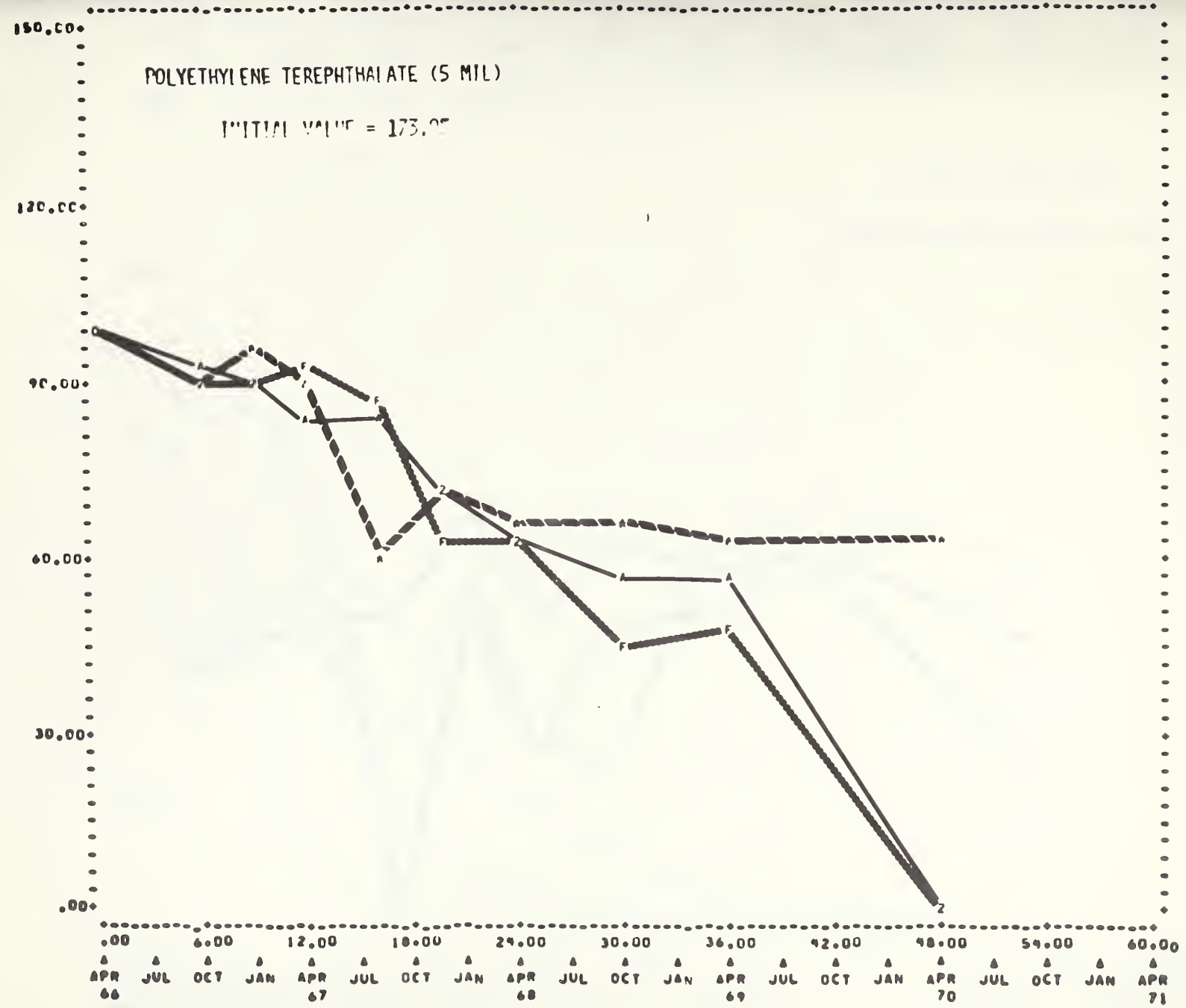

POLYETHYLENE TEREPHTHALATE (5 MIL)
INITIAL VALUE = 173.0
150.00
120.00
90.00
60.00
30.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 25

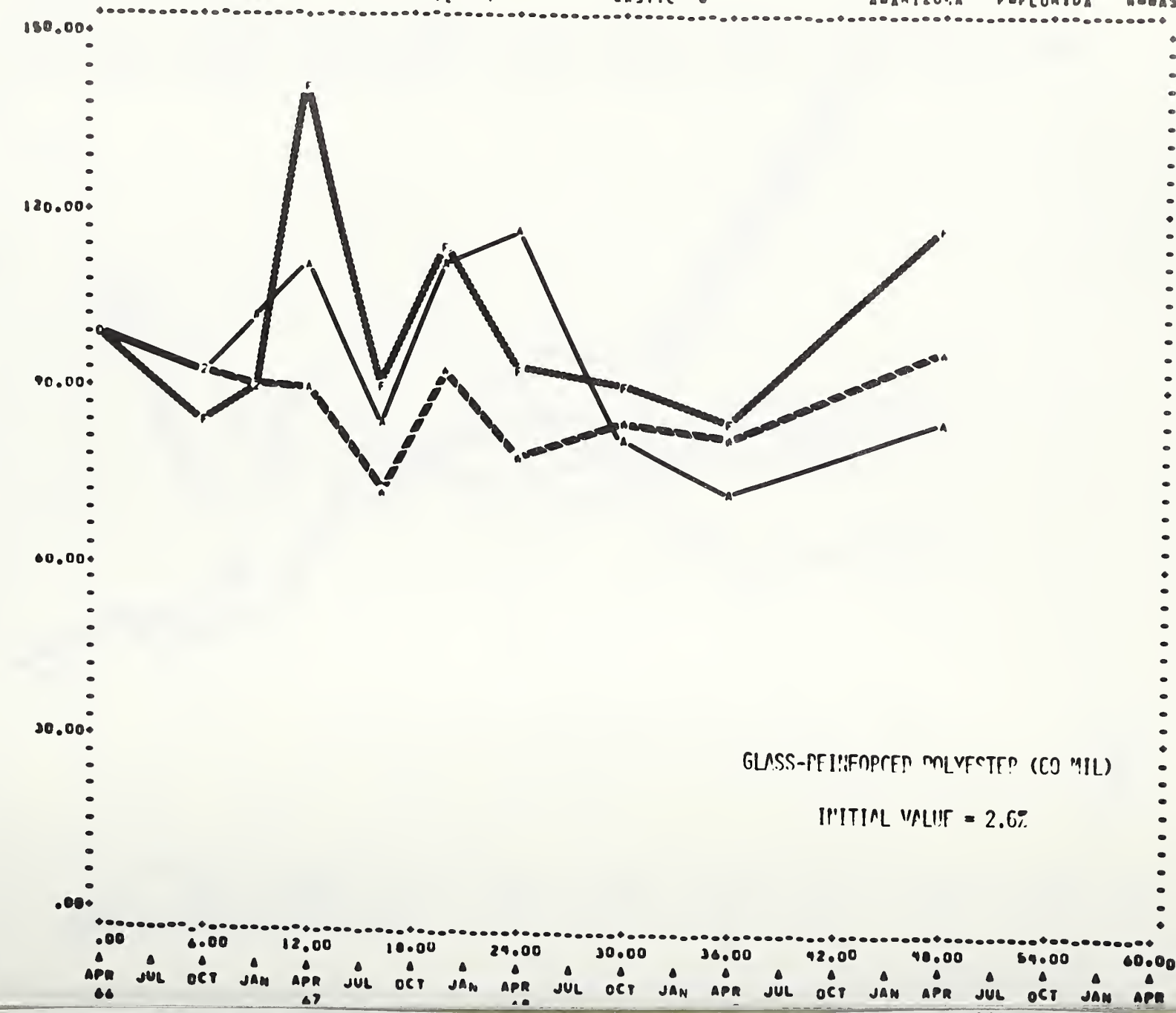

ULTIMATE ELONGATION (PERCENT OF INITIAL VALUE)
PLASTIC 6
ARIZONA
FLORIDA
WASHINGTON
150.00
120.00
90.00
60.00
30.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR
JUL
OCT
JAN
APR
JUL
OCT
JAN
APR
JUL
OCT
JAN
APR
GLASS-REINFORCED POLYESTER (60 MIL)
INITIAL VALUE = 2.6%

FIGURE 26

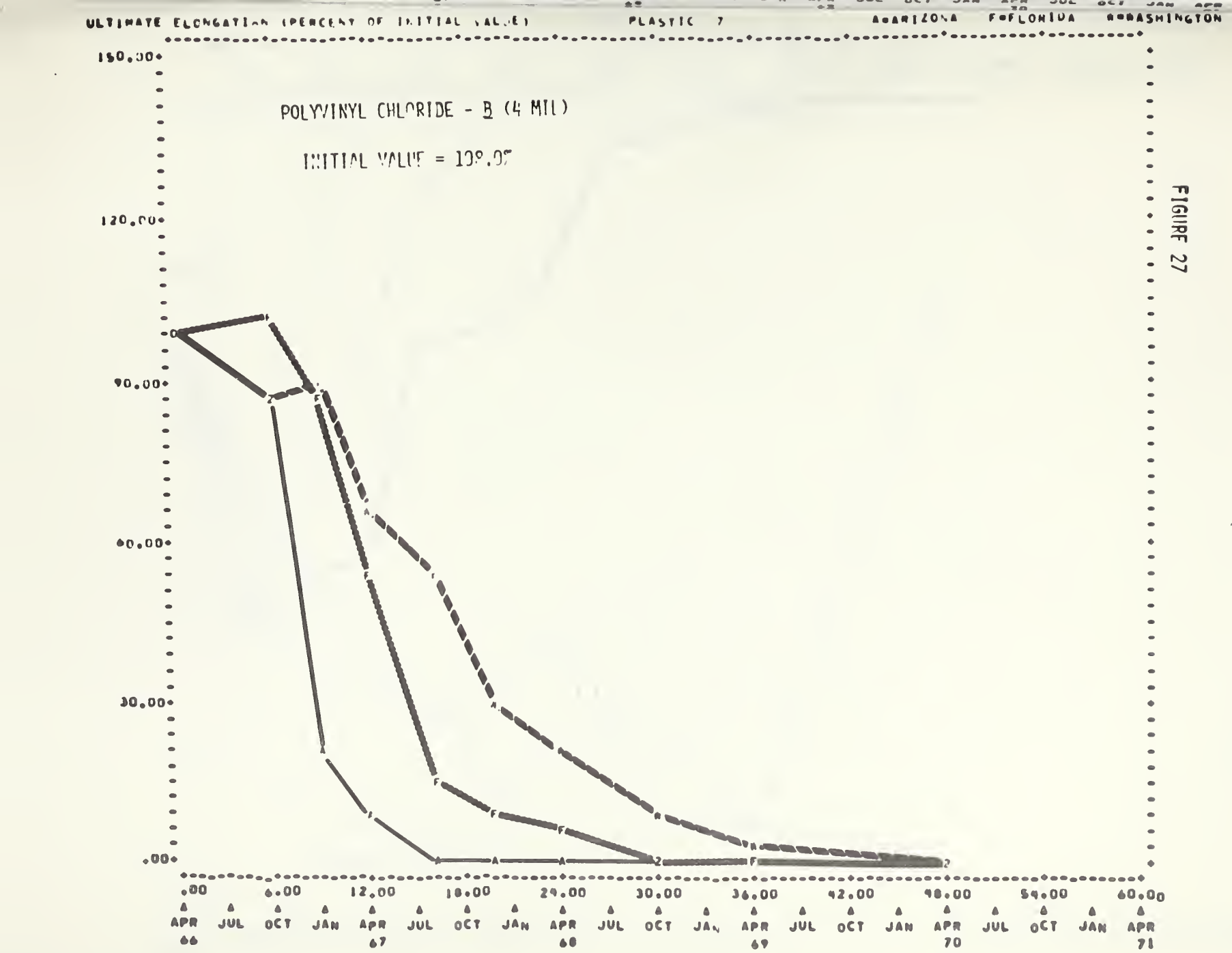

ULTIMATE ELONGATION (PERCENT OF INITIAL VALUE)
PLASTIC 7
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL CHLORIDE - B (4 MIL)
INITIAL VALUE = 109.07
150.00
120.00
90.00
60.00
30.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 27

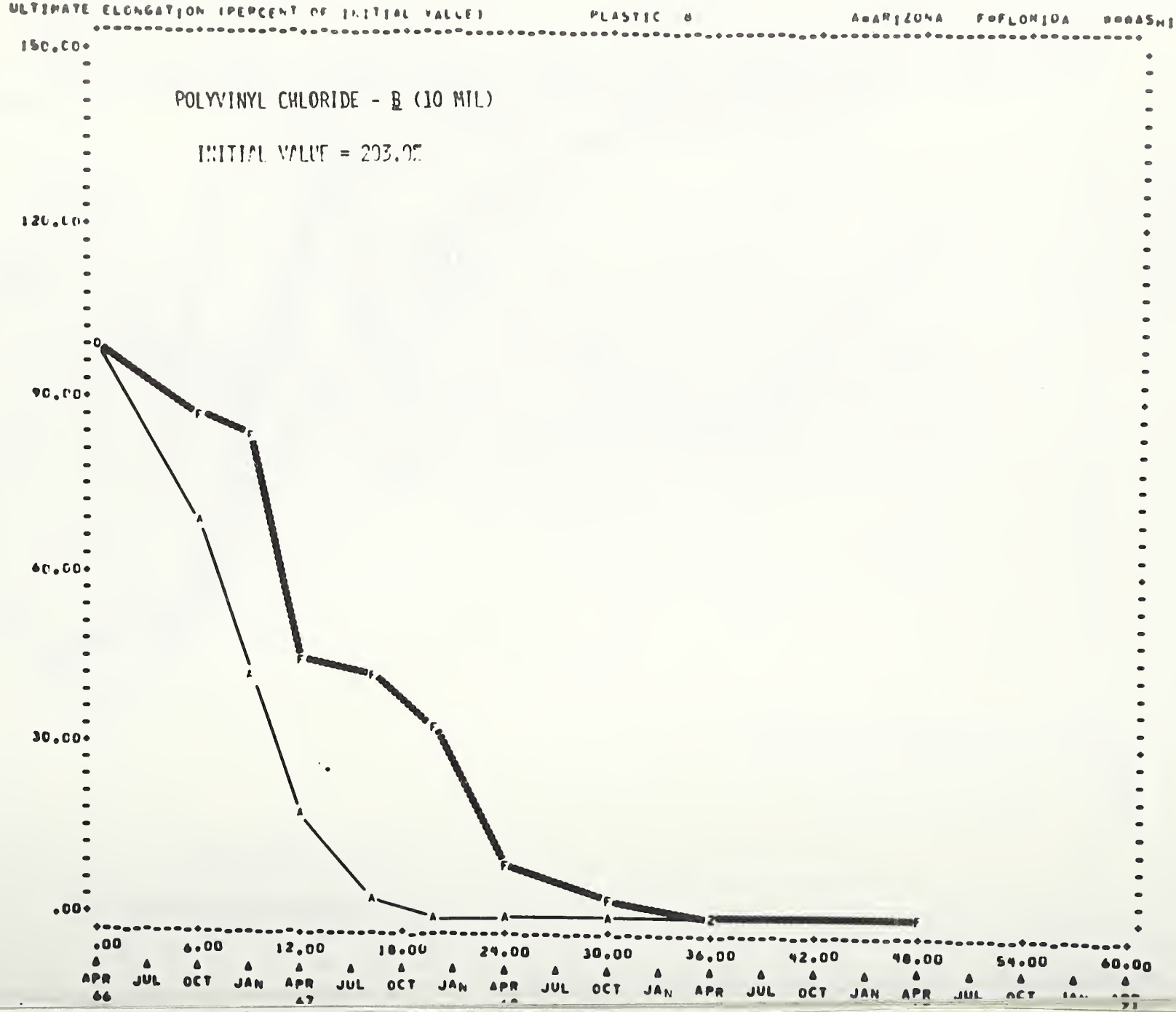

ULTIMATE ELONGATION (PERCENT OF INITIAL VALUE)
PLASTIC B
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL CHLORIDE - B (10 MIL)
INITIAL VALUE = 293.0%
150.00
120.00
90.00
60.00
30.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR
JUL
OCT
JAN
APR
JUL
OCT
JAN
APR
JUL
OCT
JAN
APR
JUL
OCT

FIGURE 28

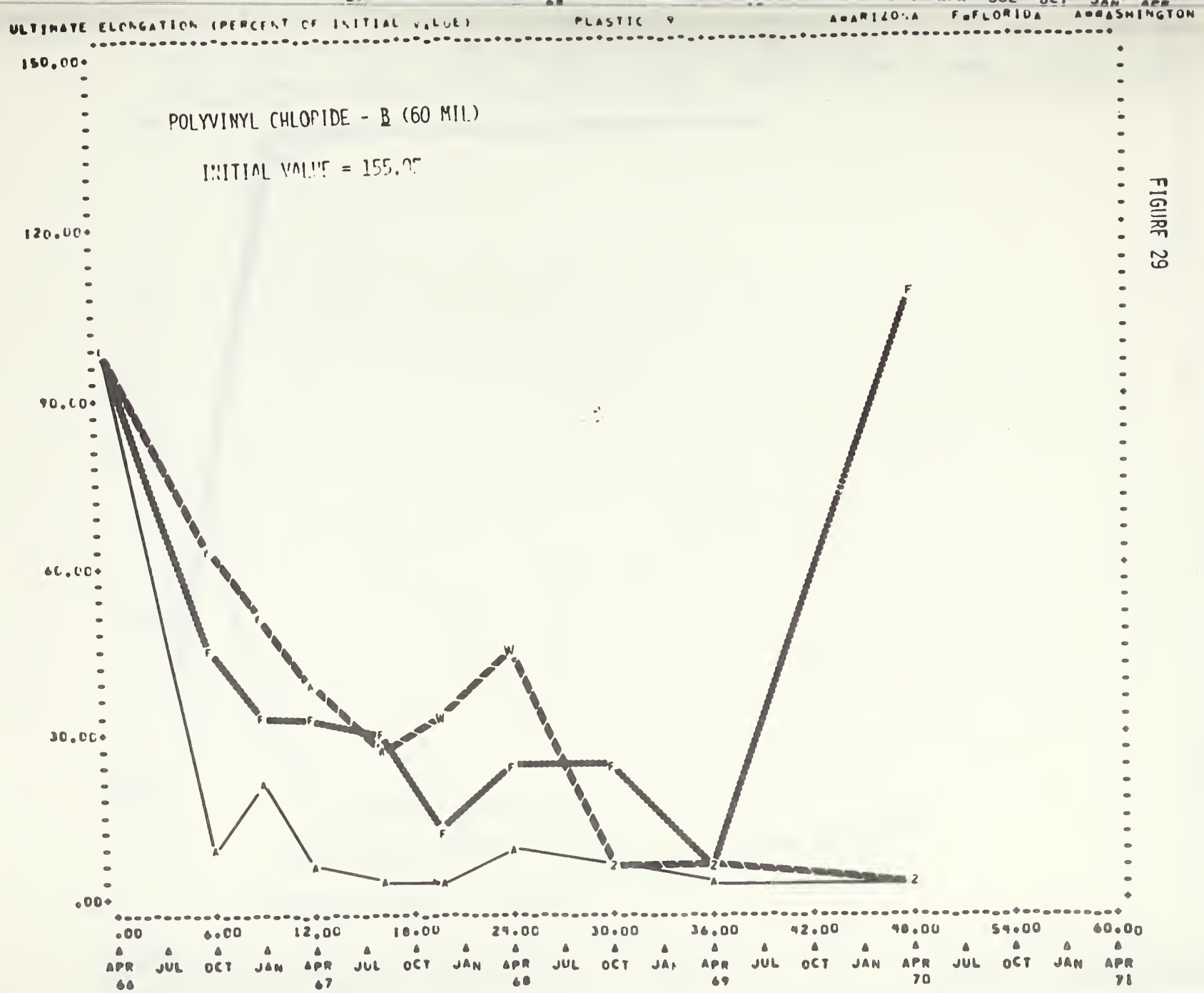

ULTIMATE ELONGATION (PERCENT OF INITIAL VALUE)
PLASTIC 9
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL CHLORIDE - B (60 MIL)
INITIAL VALUE = 155.0
150.00
120.00
90.00
60.00
30.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 29

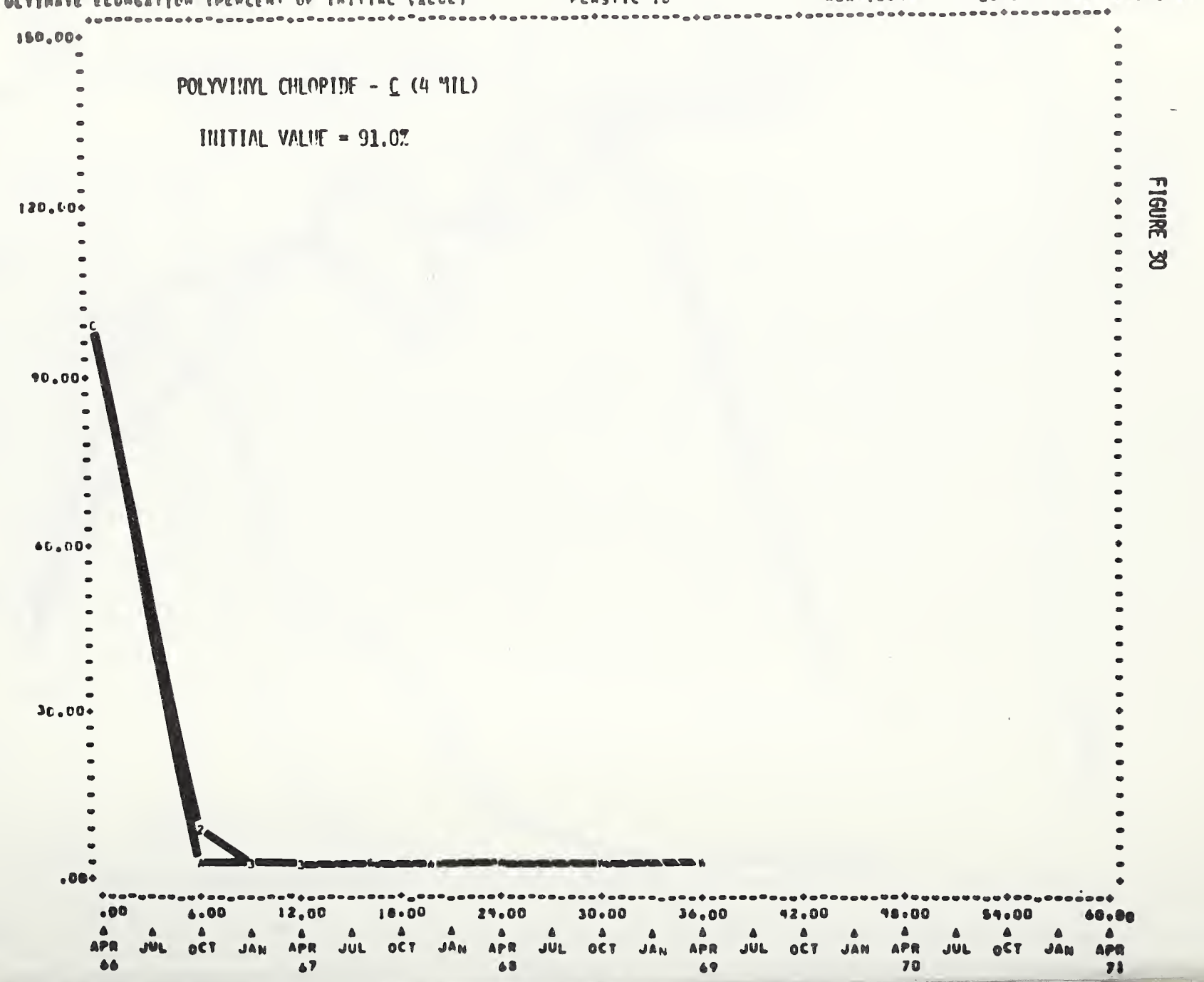

ULTIMATE ELONGATION (PERCENT OF INITIAL VALUE)
PLASTIC 10
A=ARIZONA F=FLORIDA B=WASHINGTON
POLYVINYL CHLORIDE - C (4 MIL)
INITIAL VALUE = 91.0%
150.00
120.00
90.00
60.00
30.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 30

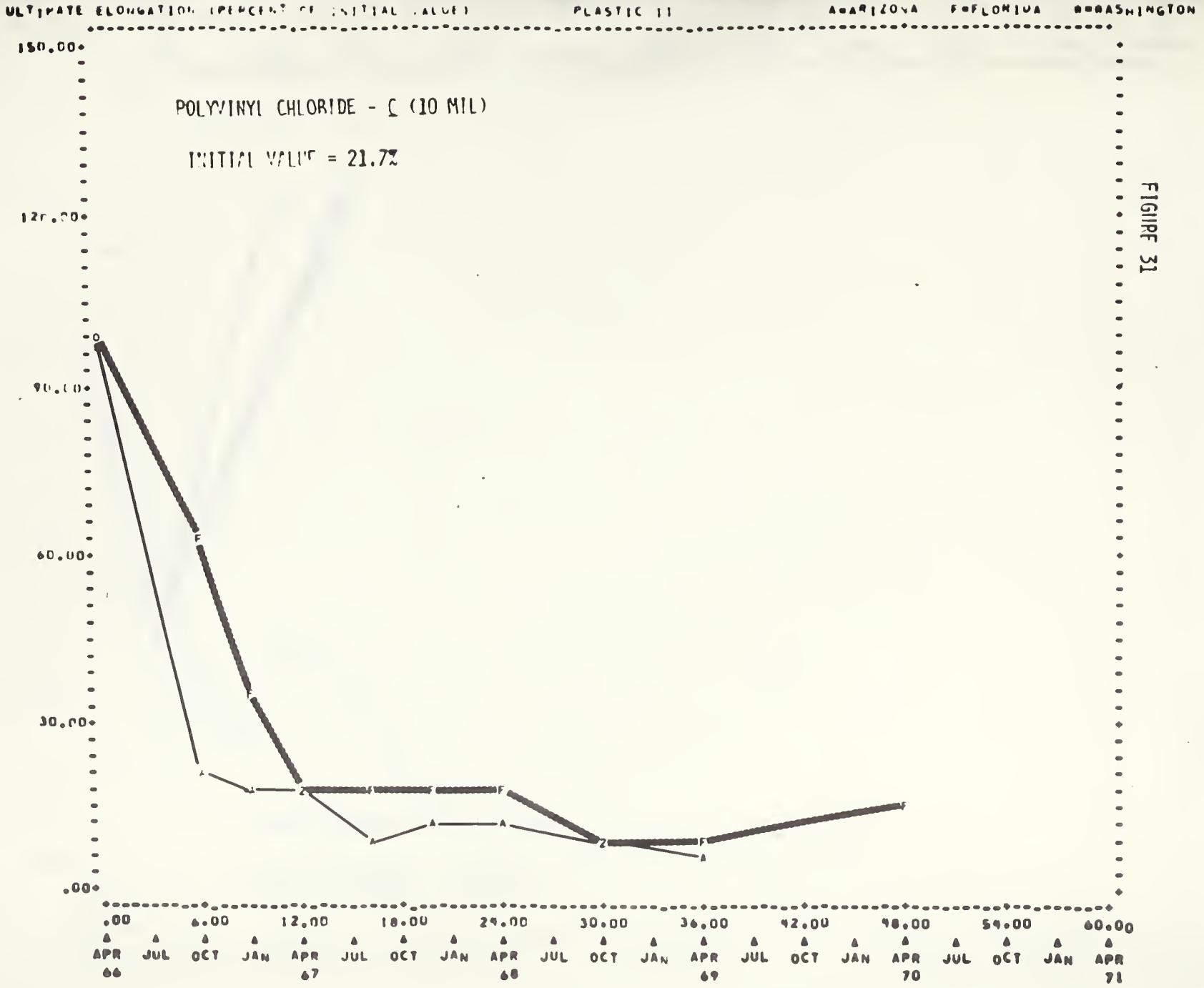

ULTIMATE ELONGATION (PERCENT OF INITIAL VALUE)
PLASTIC II
ARIZONA
FLORIDA
WASHINGTON
POLYVINYL CHLORIDE - C (10 MIL)
INITIAL VALUE = 21.7%
150.00
120.00
90.00
60.00
30.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 31

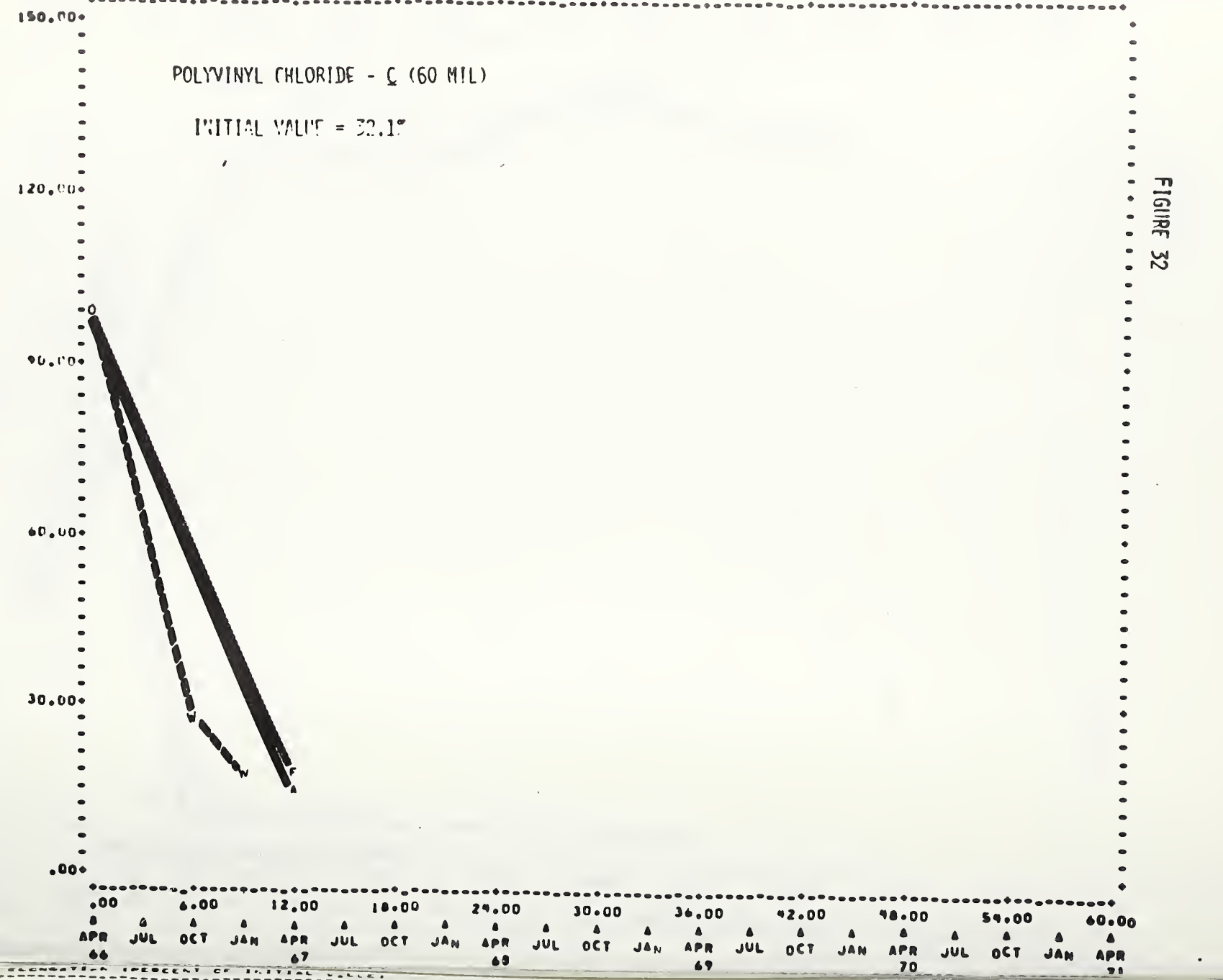

ULTIMATE ELONGATION (PERCENT OF INITIAL VALUE)
PLASTIC 12
AARIZONA FFLORIDA WWASHINGTON
POLYVINYL CHLORIDE - C (60 MIL)
INITIAL VALUE = 32.1%
150.00
120.00
90.00
60.00
30.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 32

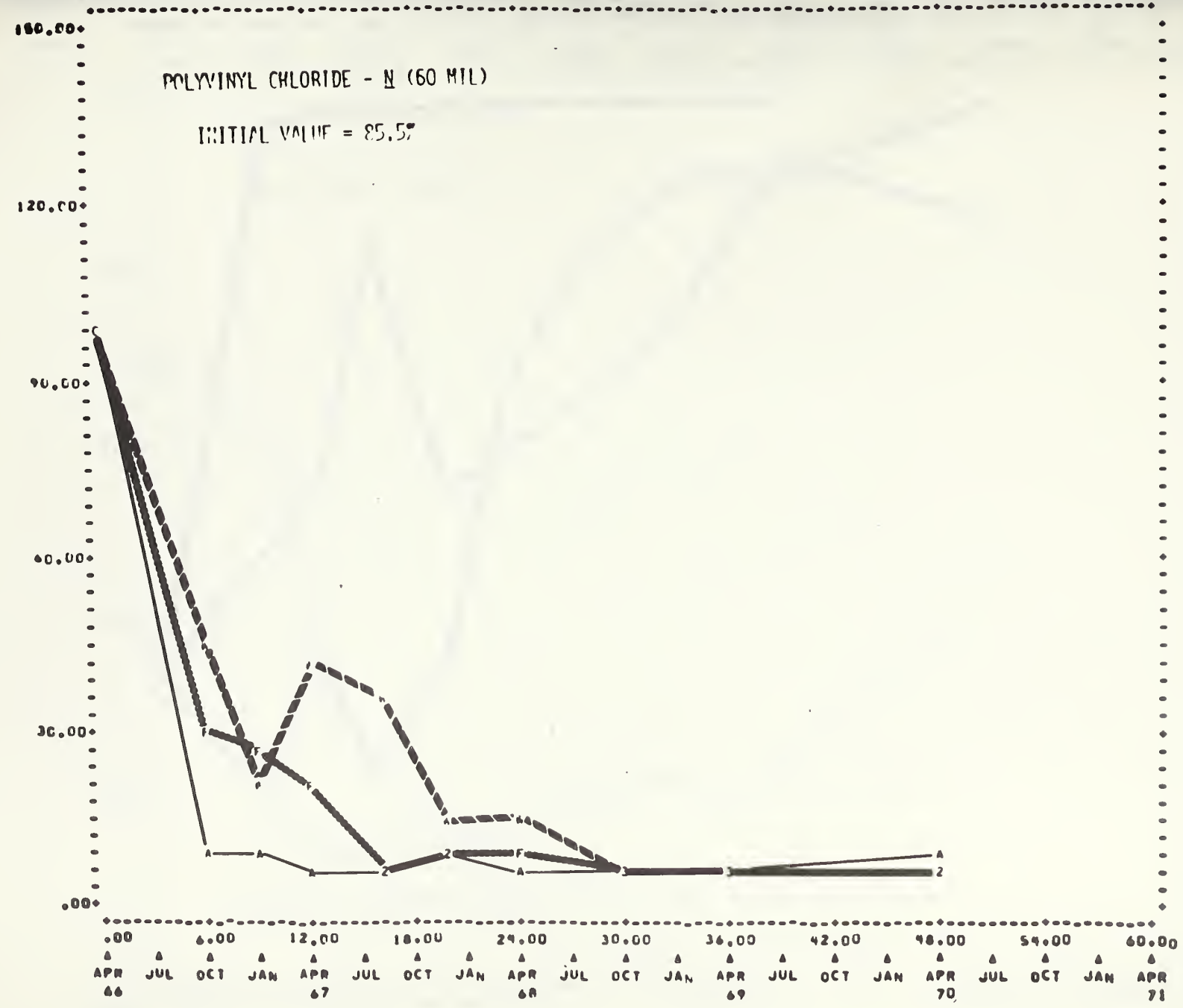

POLYVINYL CHLORIDE - N (60 MIL)
INITIAL VALUE = 85.5%
150.00
120.00
90.00
60.00
30.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 33

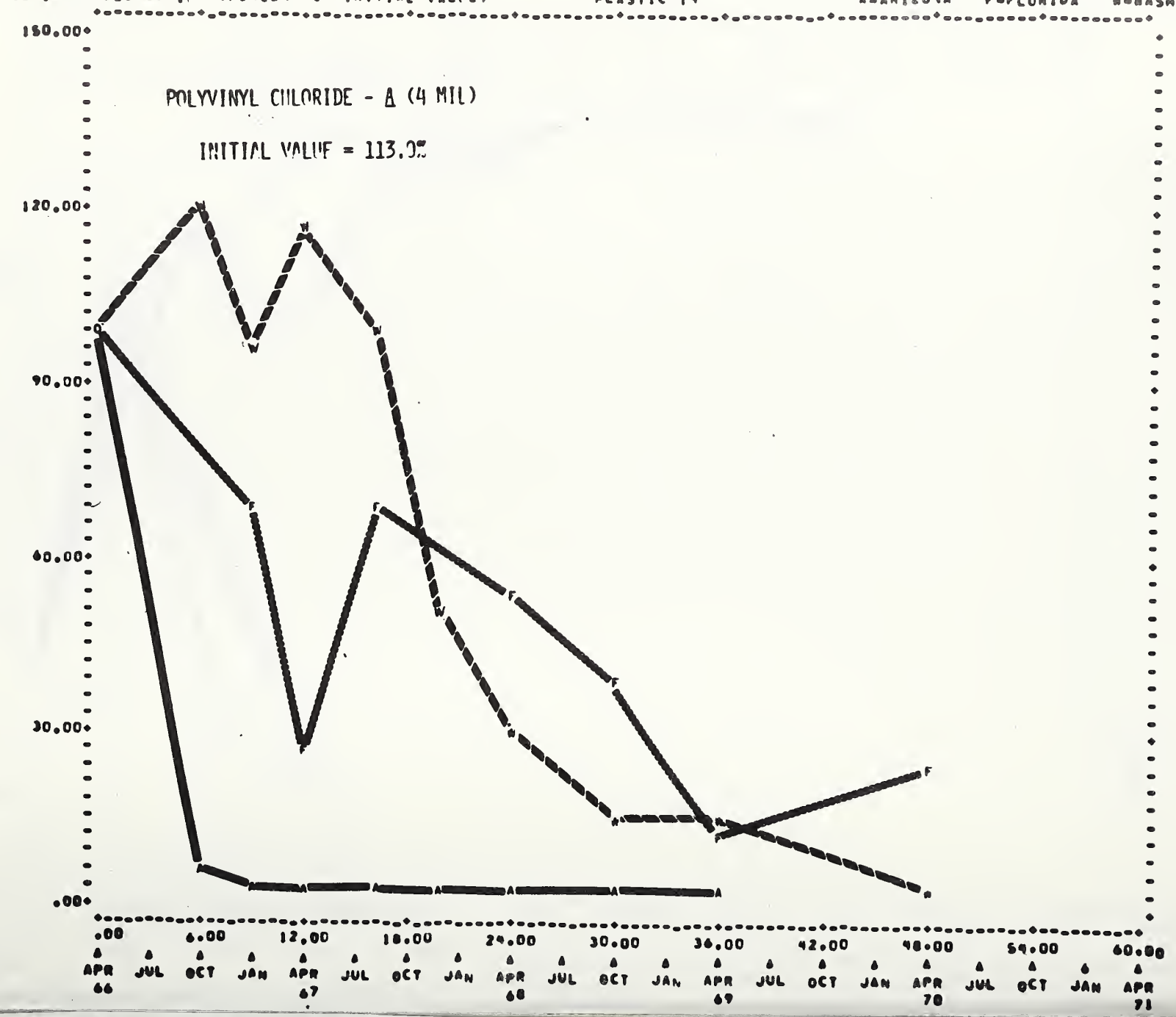

ULTIMATE ELONGATION (PERCENT OF INITIAL VALUE)
PLASTIC 14
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL CHLORIDE - A (4 MIL)
INITIAL VALUE = 113.0%
150.00
120.00
90.00
60.00
30.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 34

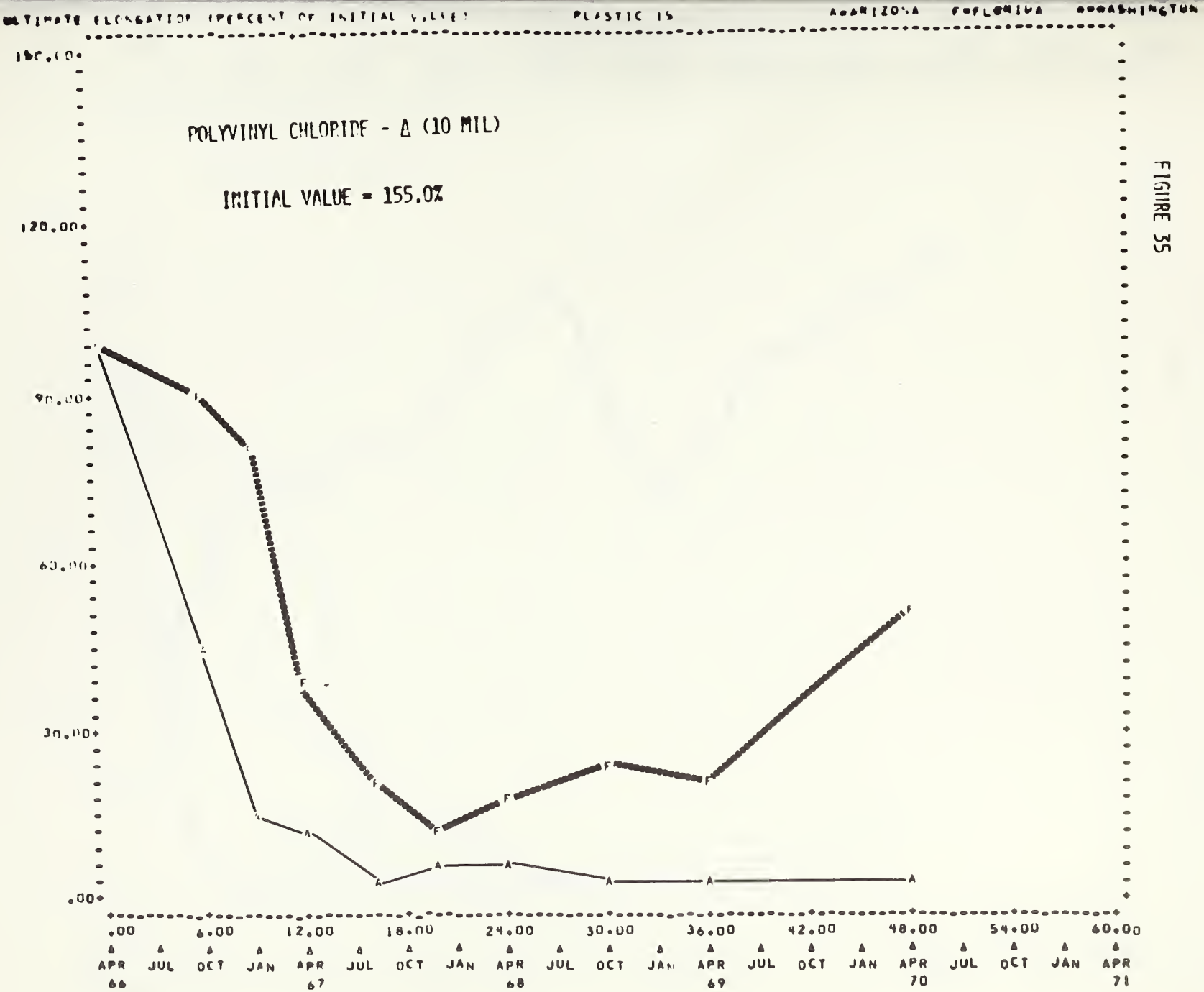
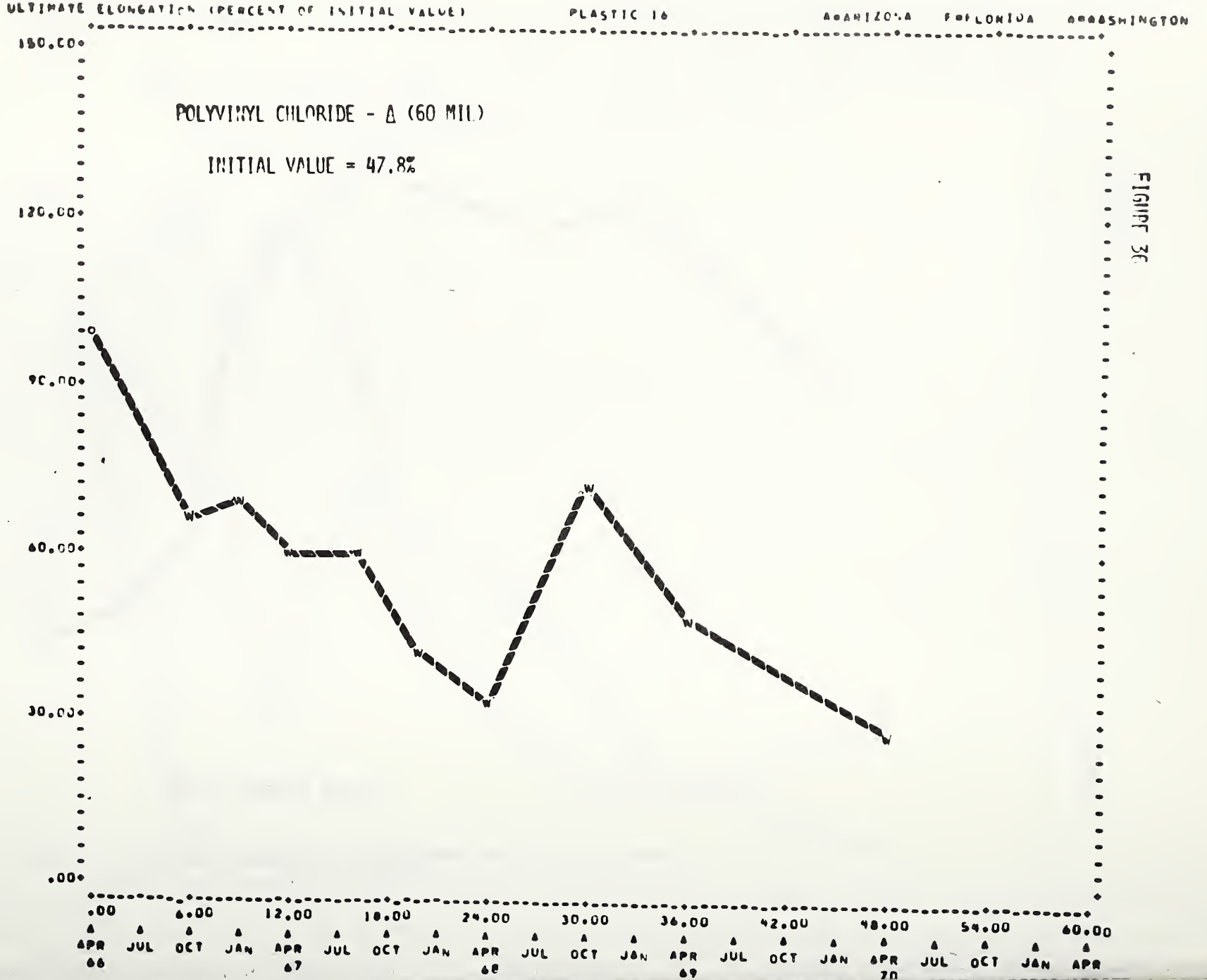

ULTIMATE ELONGATION (PERCENT OF INITIAL VALUE)
PLASTIC IS
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL CHLORIDE - A (10 MIL)
INITIAL VALUE = 155.0%
120.00
90.00
60.00
30.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 35


ULTIMATE ELONGATION (PERCENT OF INITIAL VALUE)
PLASTIC 16
ARIZONA
FLORIDA
WASHINGTON
POLYVINYL CHLORIDE - A (60 MIL)
INITIAL VALUE = 47.8%
150.00
120.00
90.00
60.00
30.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR

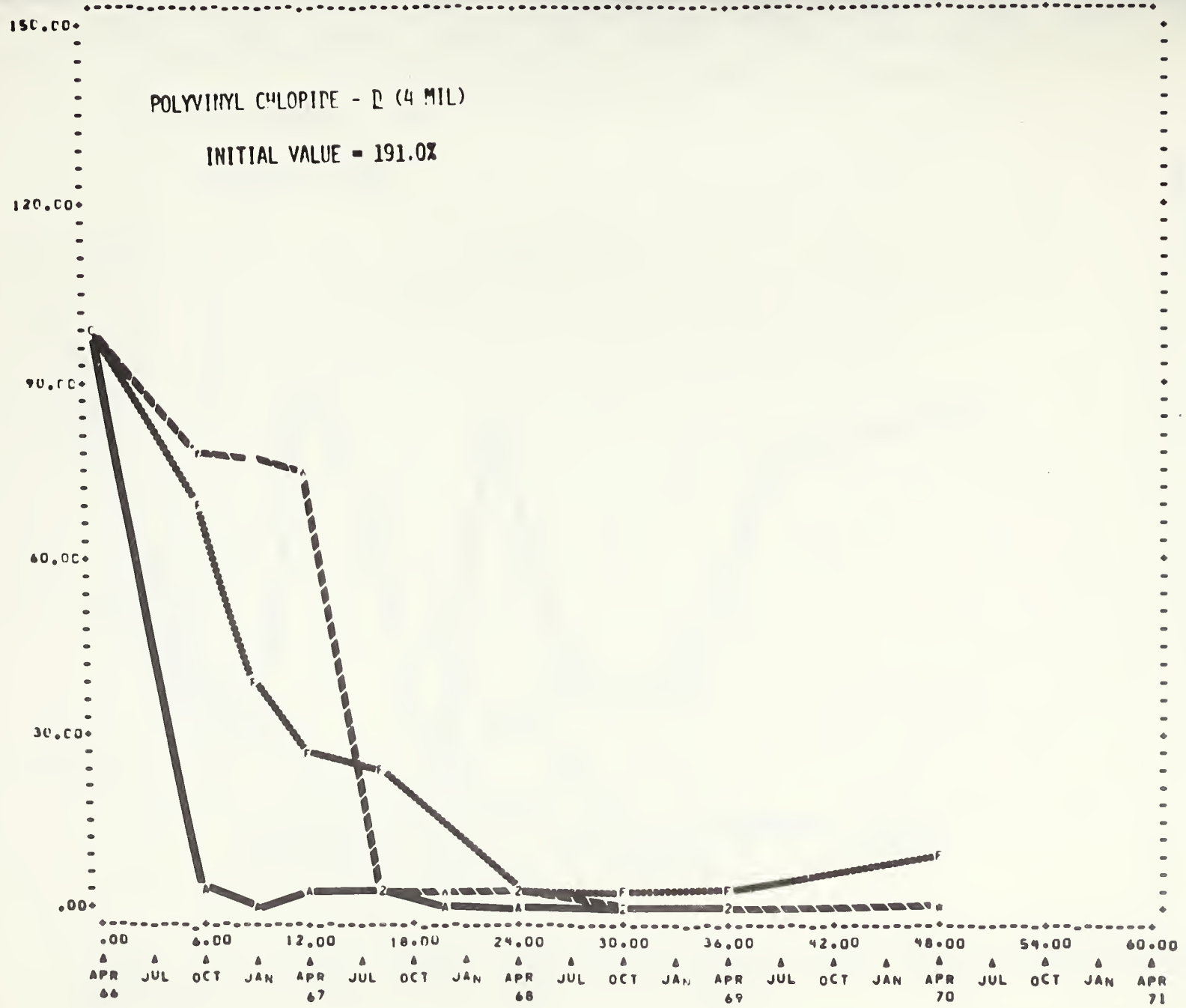

POLYVINYL CHLORIDE - D (4 MIL)
INITIAL VALUE = 191.0%
150.00
120.00
90.00
60.00
30.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 37

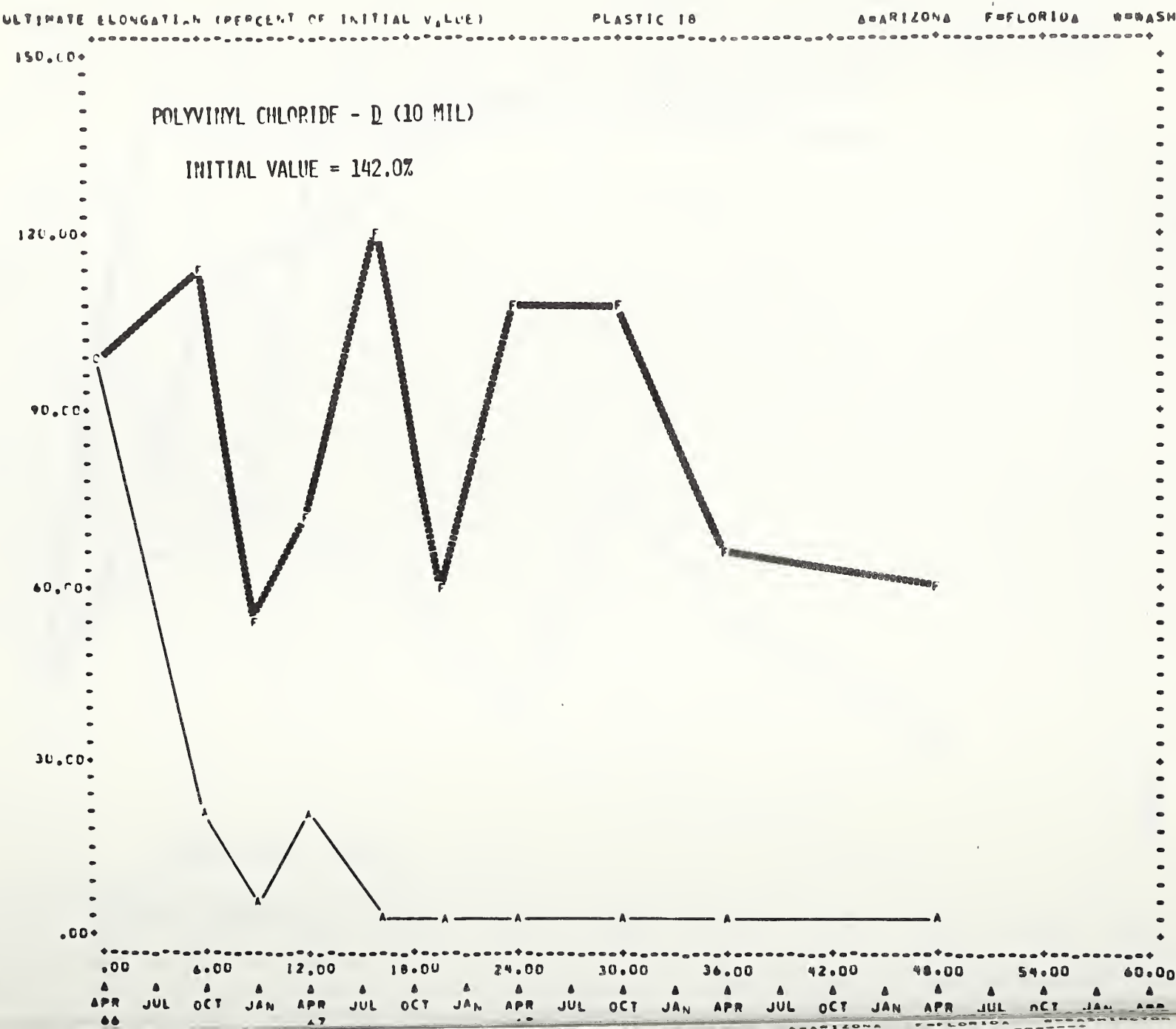

ULTIMATE ELONGATION (PERCENT OF INITIAL VALUE)
PLASTIC 18
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL CHLORIDE - D (10 MIL)
INITIAL VALUE = 142.0%
150.00
120.00
90.00
60.00
30.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR
JUL
OCT
JAN
APR
JUL
OCT
JAN
APR
JUL
OCT
JAN
APR
JUL
OCT
JAN
APR
JUL
OCT
JAN
APR
66
67

FIGURE 38

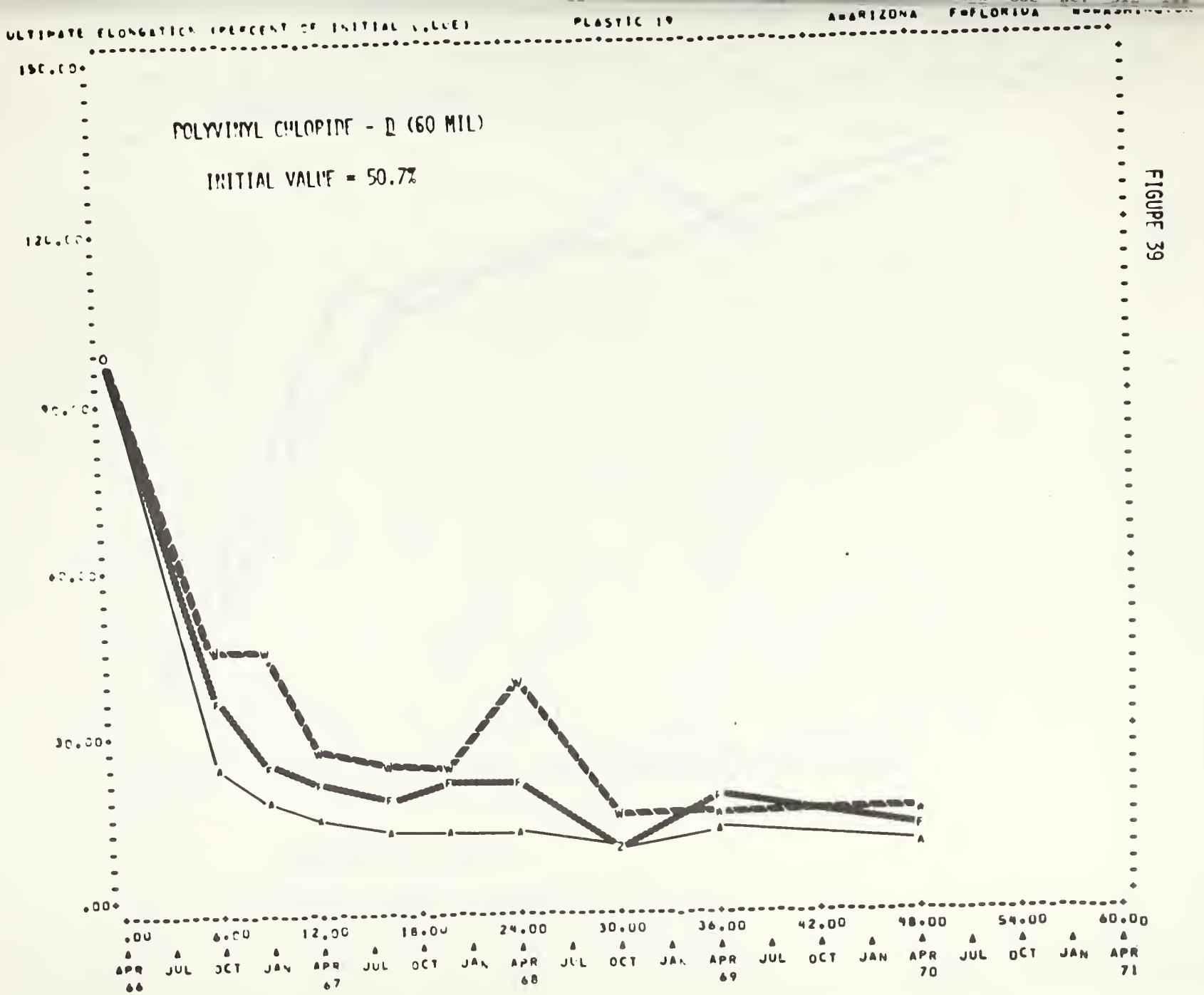

ULTIMATE ELONGATION (PERCENT OF INITIAL VALUE)
PLASTIC 19
ARIZONA
FLORIDA
POLYVINYL CHLORIDE - D (60 MIL)
INITIAL VALUE = 50.7%
150.00
120.00
90.00
60.00
30.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 39

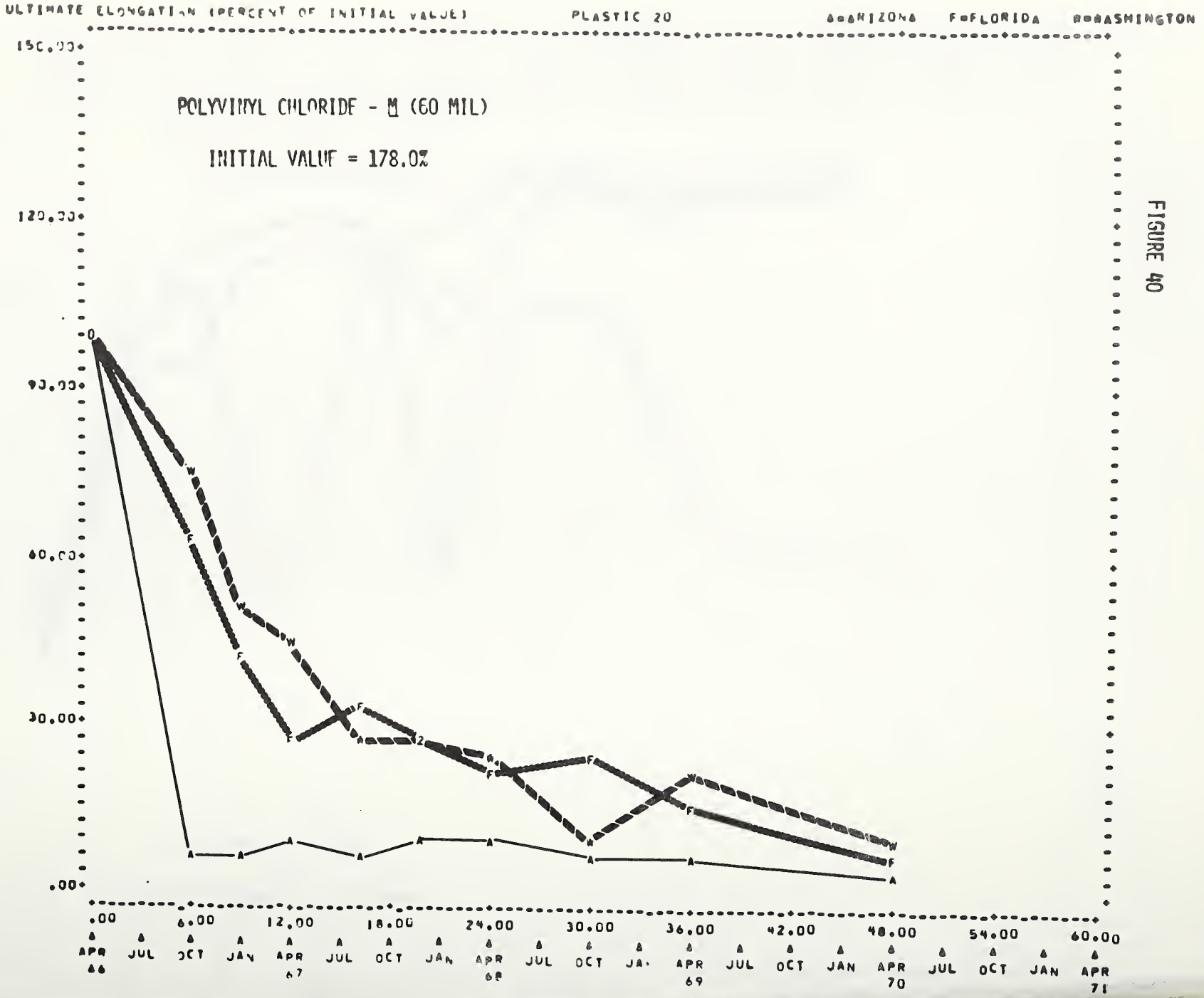

ULTIMATE ELONGATION (PERCENT OF INITIAL VALUE)
PLASTIC 20
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL CHLORIDE - M (60 MIL)
INITIAL VALUE = 178.0%
150.00
120.00
90.00
60.00
30.00
.00
.00 APR 66
6.00 JUL
12.00 OCT
18.00 JAN
24.00 APR 67
30.00 JUL
36.00 OCT
42.00 JAN
48.00 APR 68
54.00 JUL
60.00 OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 40

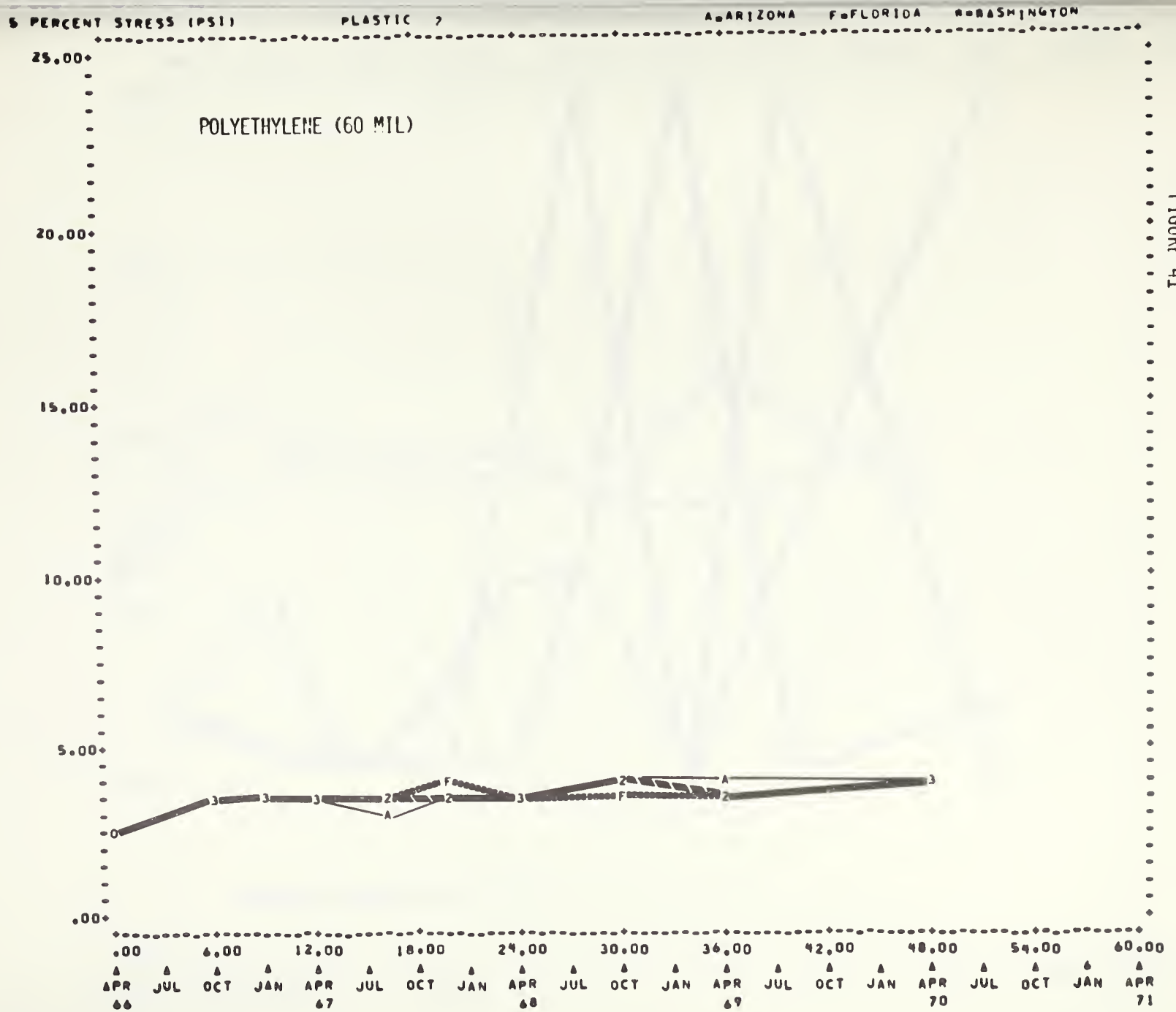

5 PERCENT STRESS (PSI)
PLASTIC 2
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYETHYLENE (60 MIL)
25.00
20.00
15.00
10.00
5.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 41

ULTIMATE ELONGATION (PERCENT OF ...

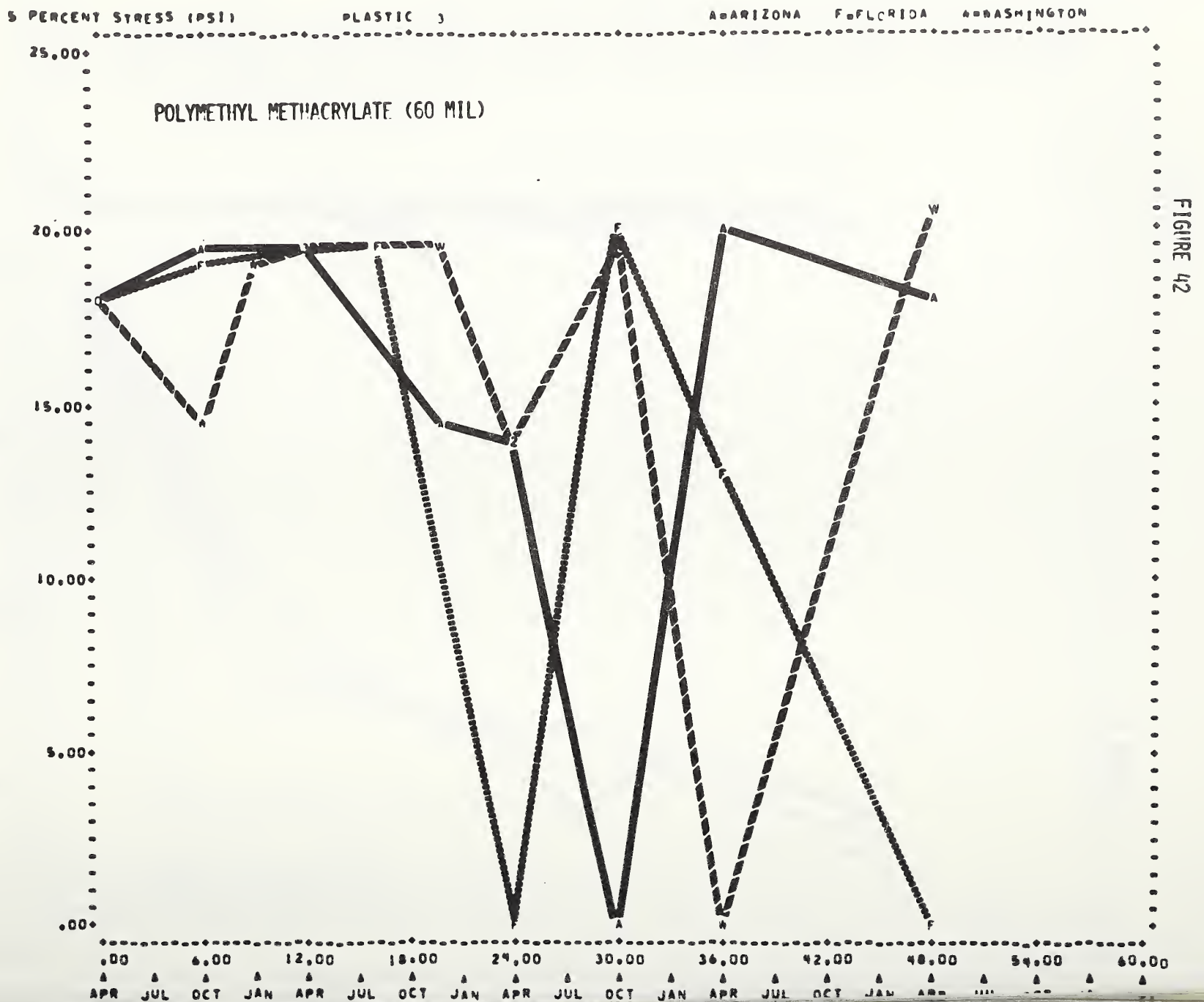



FIGURE 42

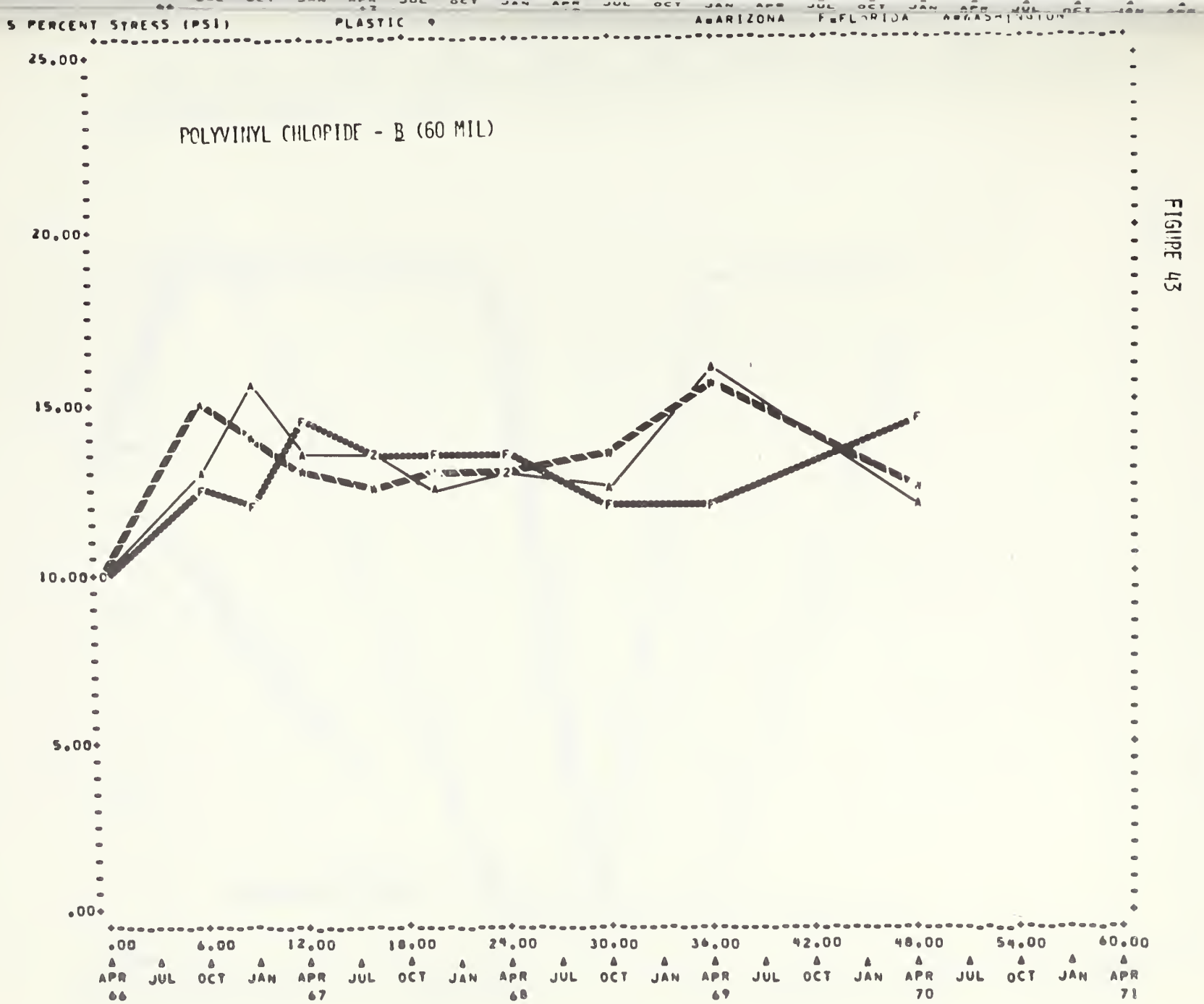

S PERCENT STRESS (PSI)
PLASTIC
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL CHLORIDE - B (60 MIL)
25.00
20.00
15.00
10.00
5.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 43

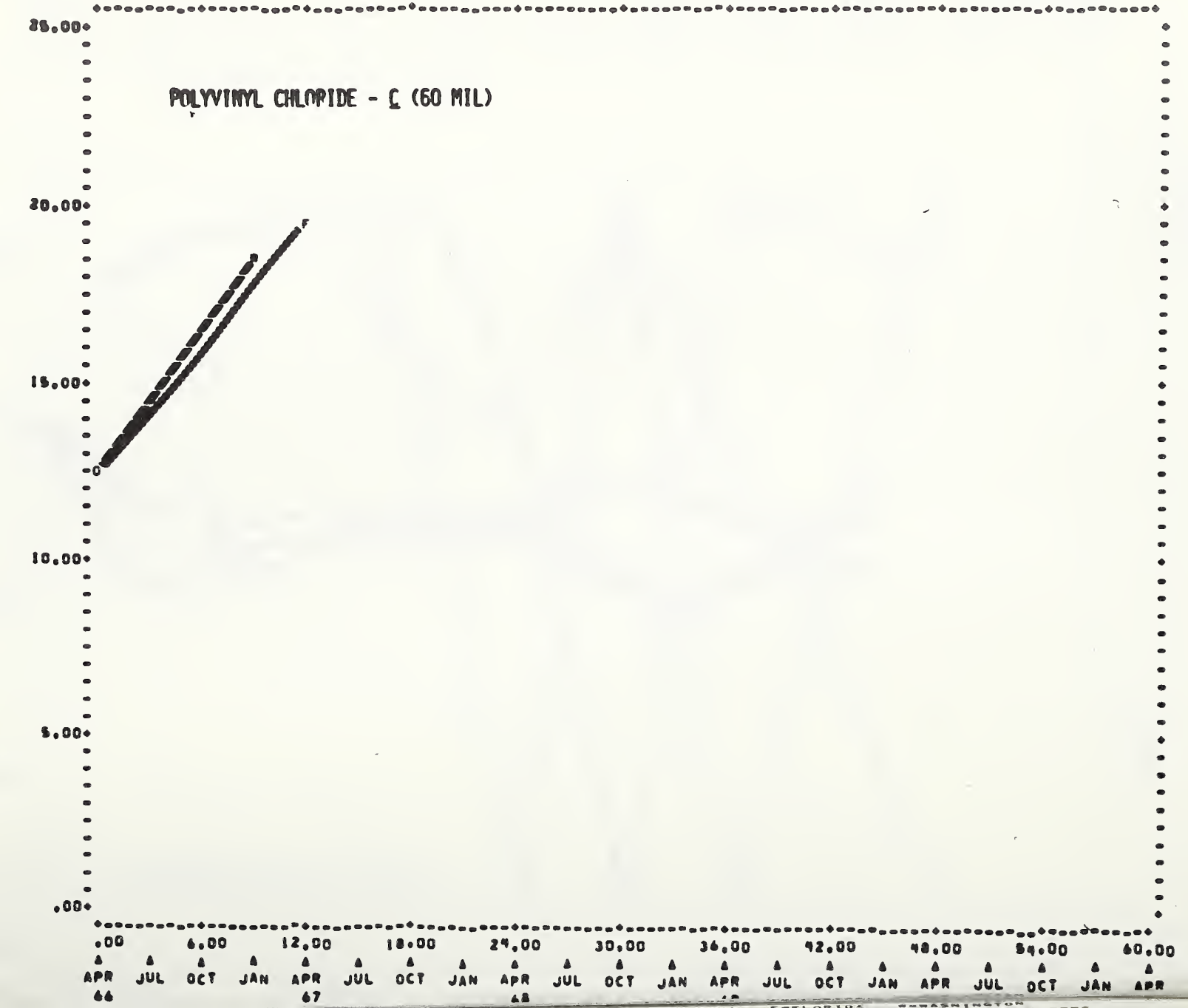

S PERCENT STRESS (PSI)
PLASTIC 17
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL CHLORIDE - C (60 MIL)
25.00
20.00
15.00
10.00
5.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR
JUL
OCT
JAN
APR
JUL
OCT
JAN
APR
JUL
OCT
JAN
APR

FIGURE 44

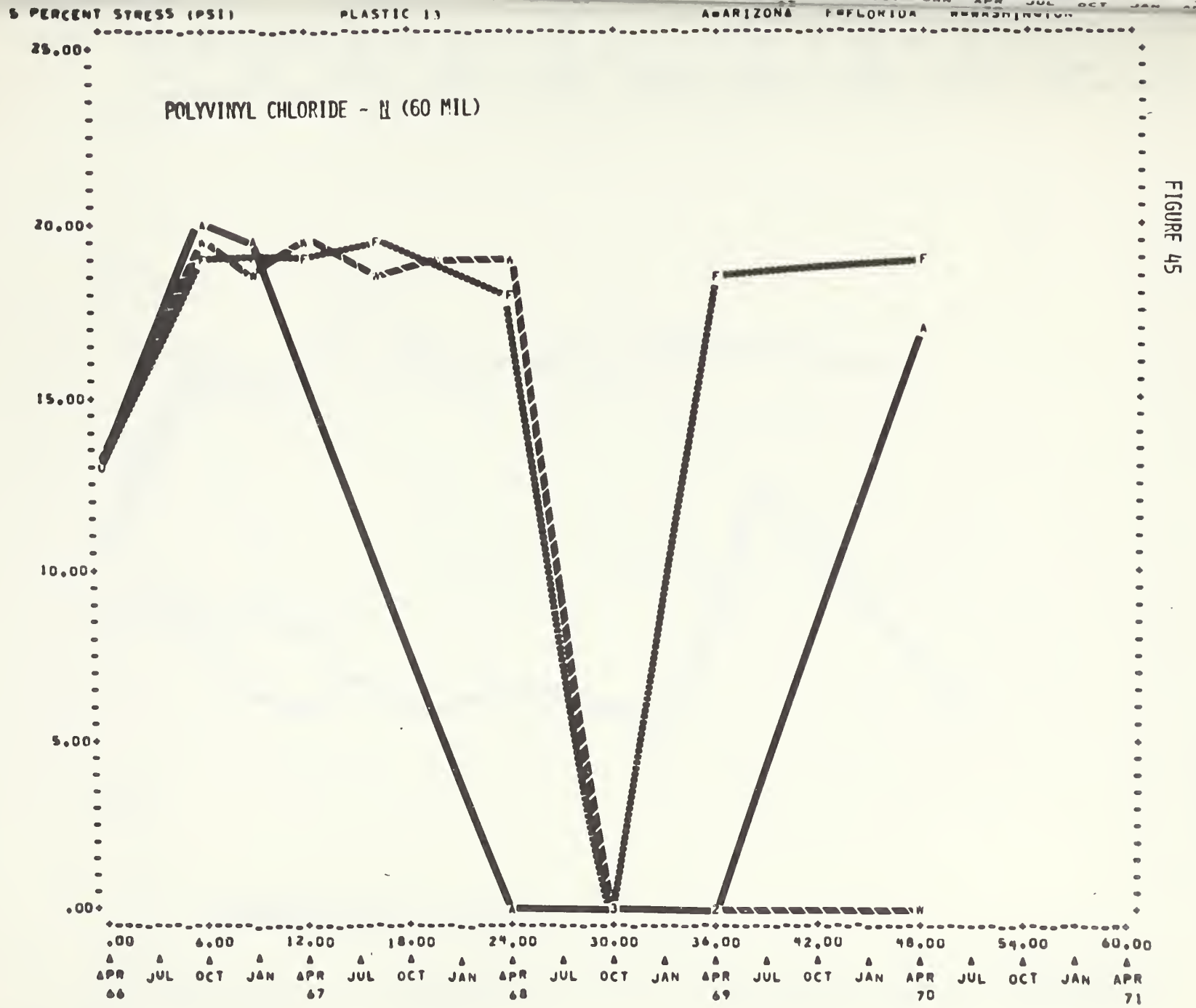

5 PERCENT STRESS (PSI)
PLASTIC 13
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL CHLORIDE - N (60 MIL)
25.00
20.00
15.00
10.00
5.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 45


5 PERCENT STRESS (PSI)
PLASTIC 1A
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL CHLORIDE - A (60 MIL)
25.00
20.00
15.00
10.00
5.00
.00
.00 APR 66
6.00 JUL
12.00 OCT
18.00 JAN 67
24.00 APR
30.00 JUL
36.00 OCT
42.00 JAN 68
48.00 APR 69
54.00 JUL
60.00 OCT
JAN 70
APR 71

FIGURE 46

5 PERCENT STRESS (PSI) PLASTIC 19 ARIZONA FLORIDA WASHINGTON

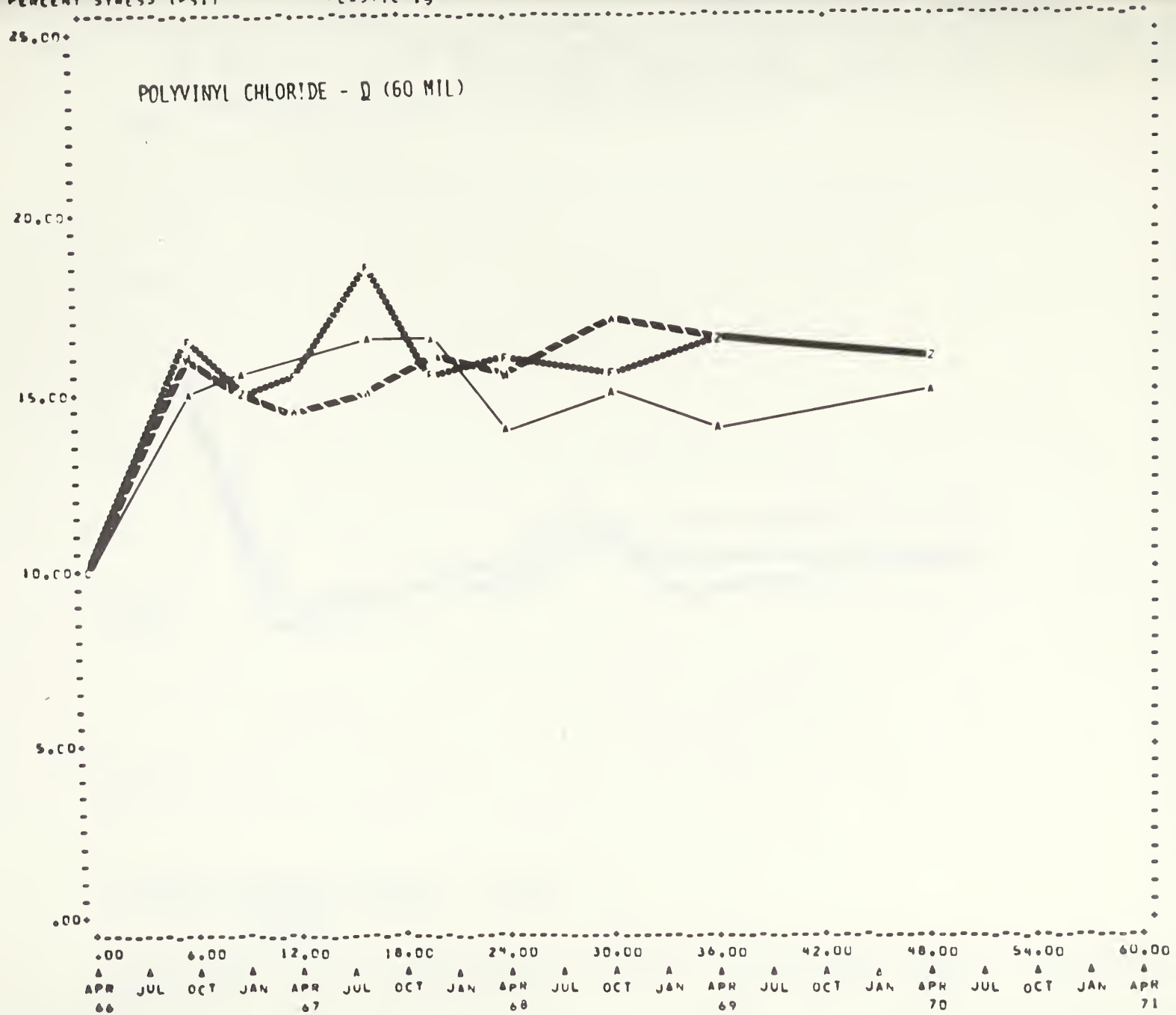



Figure 47

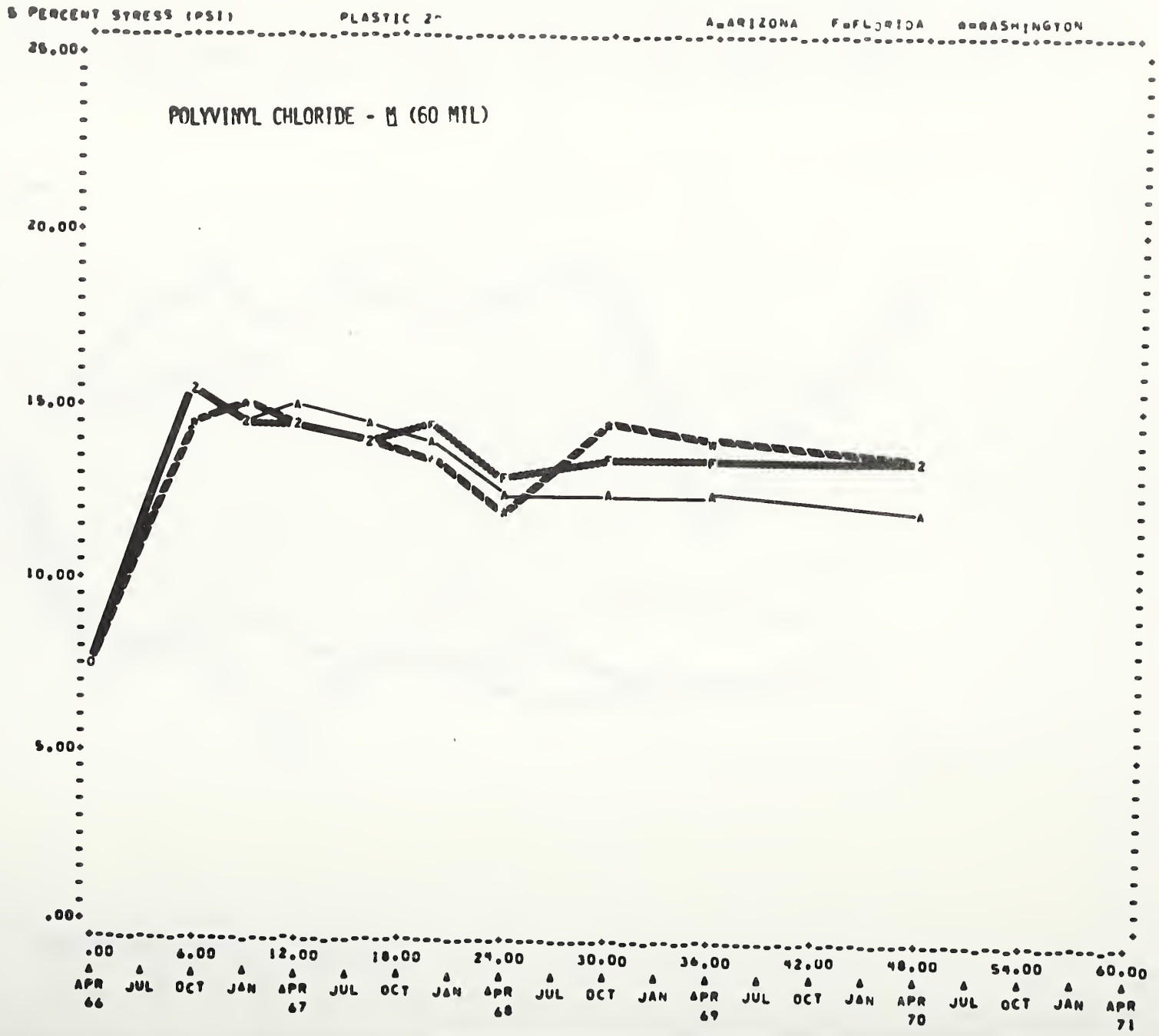

5 PERCENT STRESS (PSI)
PLASTIC 2
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL CHLORIDE - M (60 MIL)
25.00
20.00
15.00
10.00
5.00
.00
.00 APR 66
6.00 OCT
12.00 APR 67
18.00 OCT
24.00 APR 68
30.00 OCT
36.00 APR 69
42.00 OCT
48.00 APR 70
54.00 OCT
60.00 APR 71
JUL
JAN

FIGURE 48

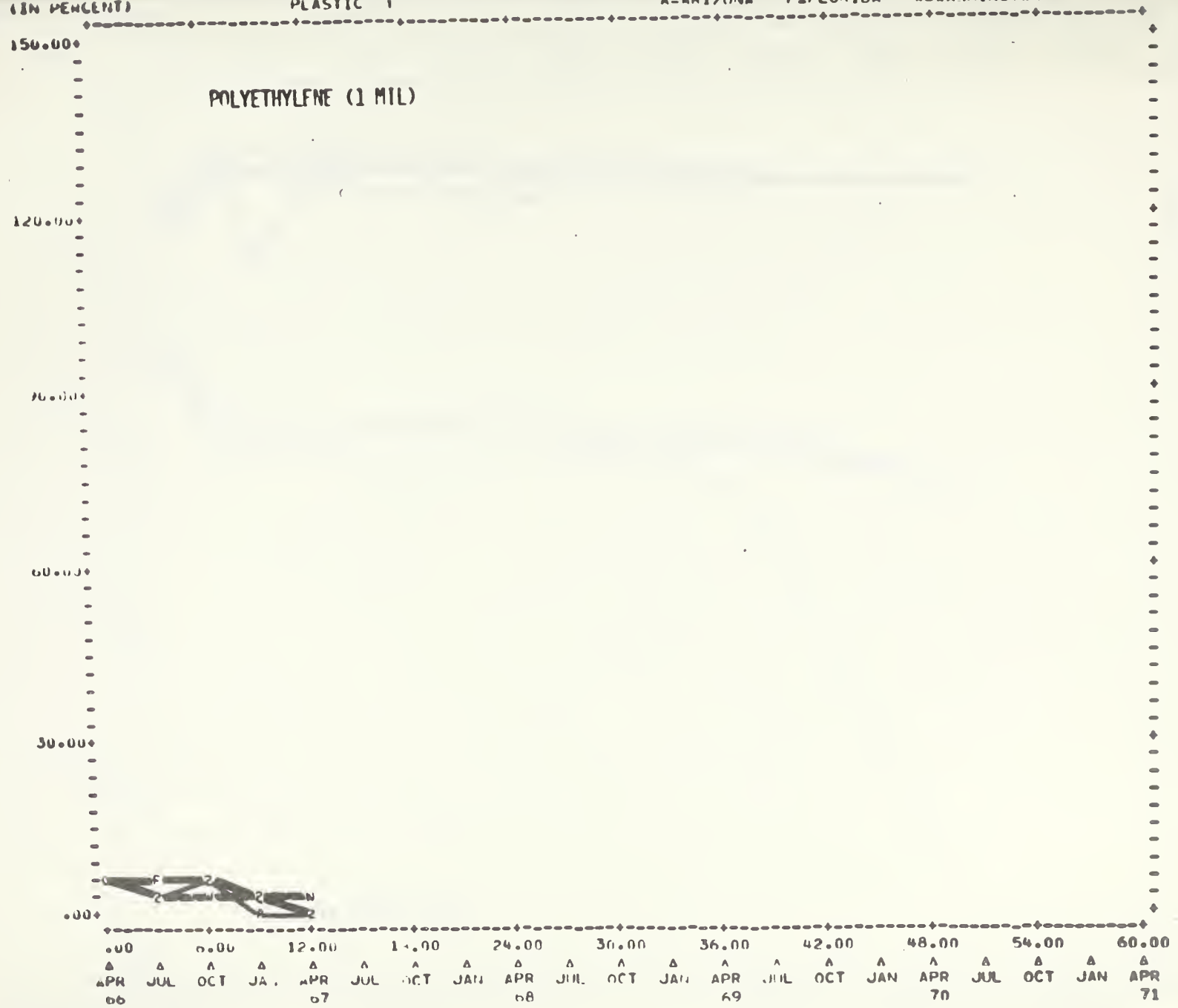

GLOSS (IN PERCENT)
PLASTIC 1
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYETHYLENE (1 MIL)
150.00
120.00
90.00
60.00
30.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JA.
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 49

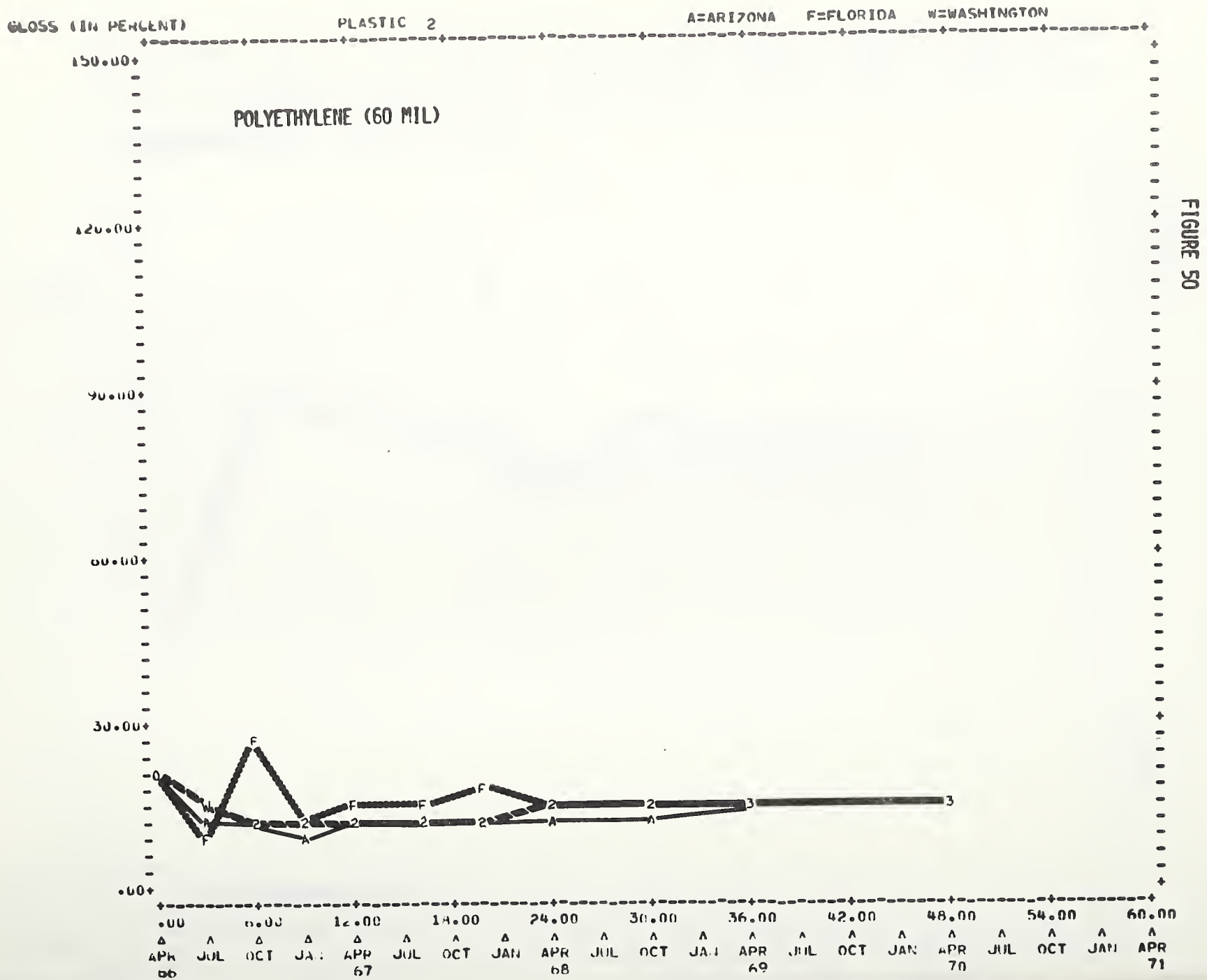

GLOSS (IN PERCENT)
PLASTIC 2
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYETHYLENE (60 MIL)
150.00
120.00
90.00
60.00
30.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 50

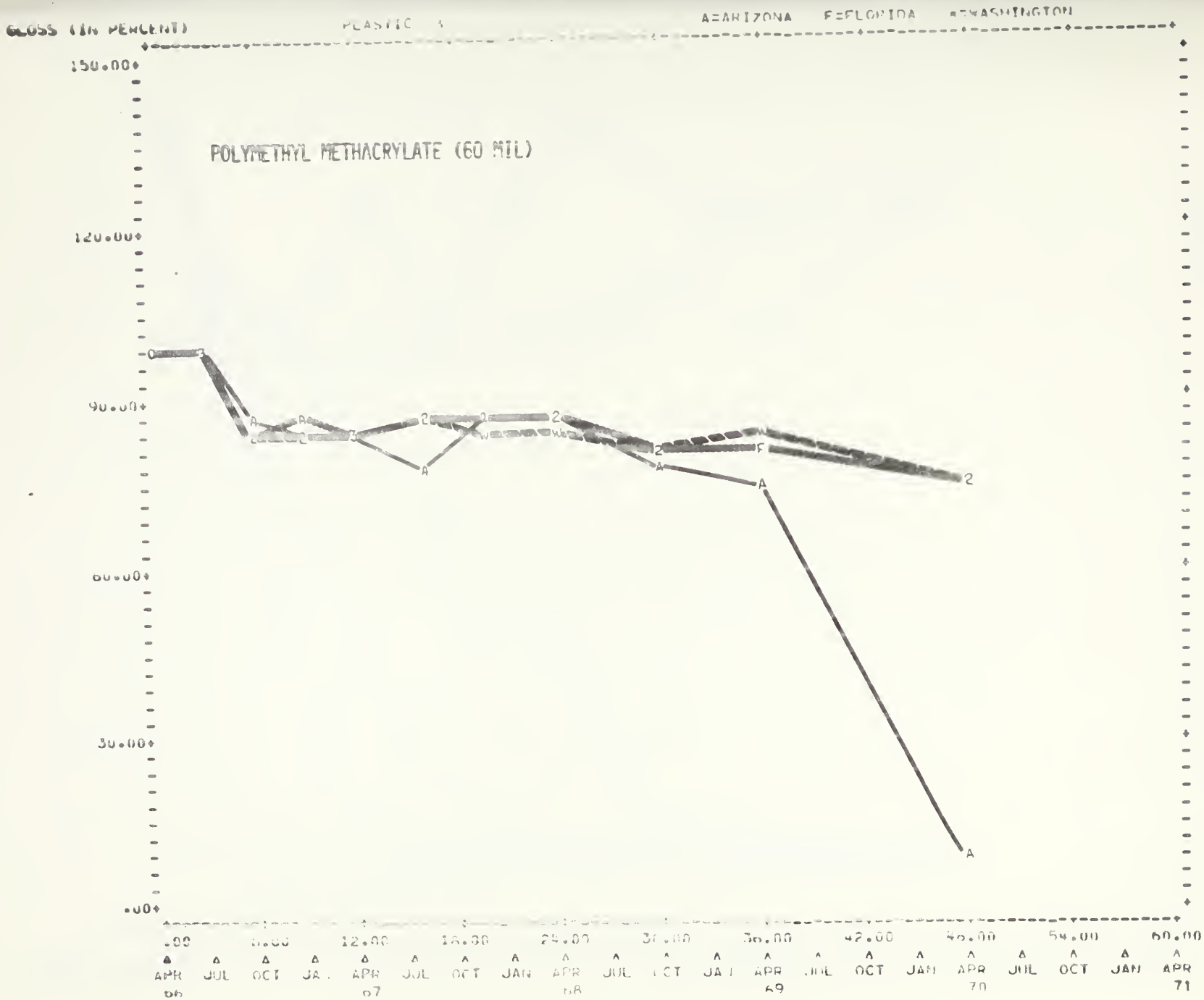

GLOSS (IN PERCENT)
PLASTIC A
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYMETHYL METHACRYLATE (60 MIL)
150.00
120.00
90.00
60.00
30.00
.00
0.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 51

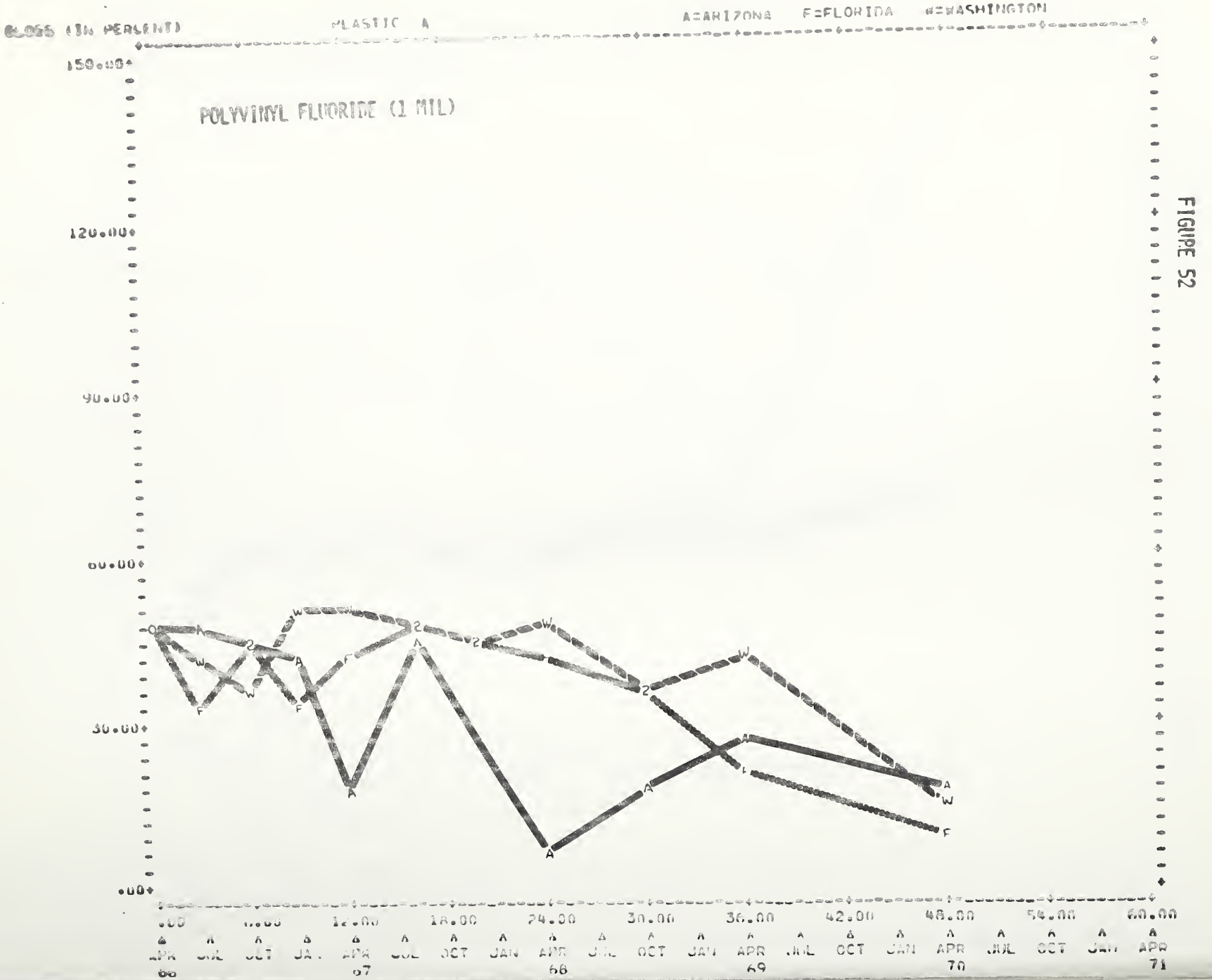

GLOSS (IN PERCENT)
PLASTIC A
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL FLUORIDE (1 MIL)
150.00
120.00
90.00
60.00
30.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR JUL OCT JAN APR JUL OCT JAN APR JUL OCT JAN APR JUL OCT JAN APR JUL OCT JAN APR
66 67 68 69 70 71

FIGURE 52

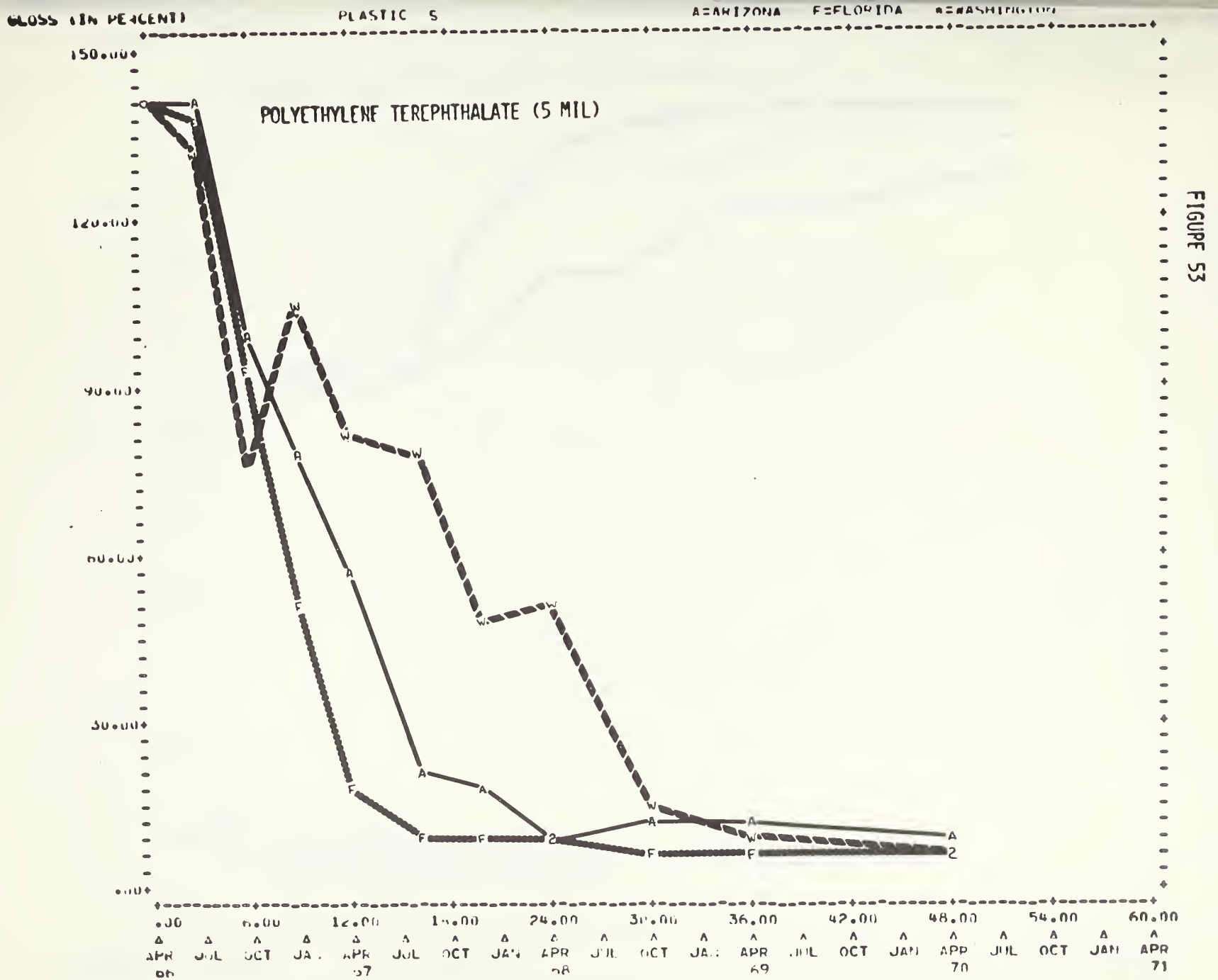

GLOSS (IN PERCENT)
PLASTIC 5
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYETHYLENE TEREPHTHALATE (5 MIL)
150.00
120.00
90.00
60.00
30.00
.00
0.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 53

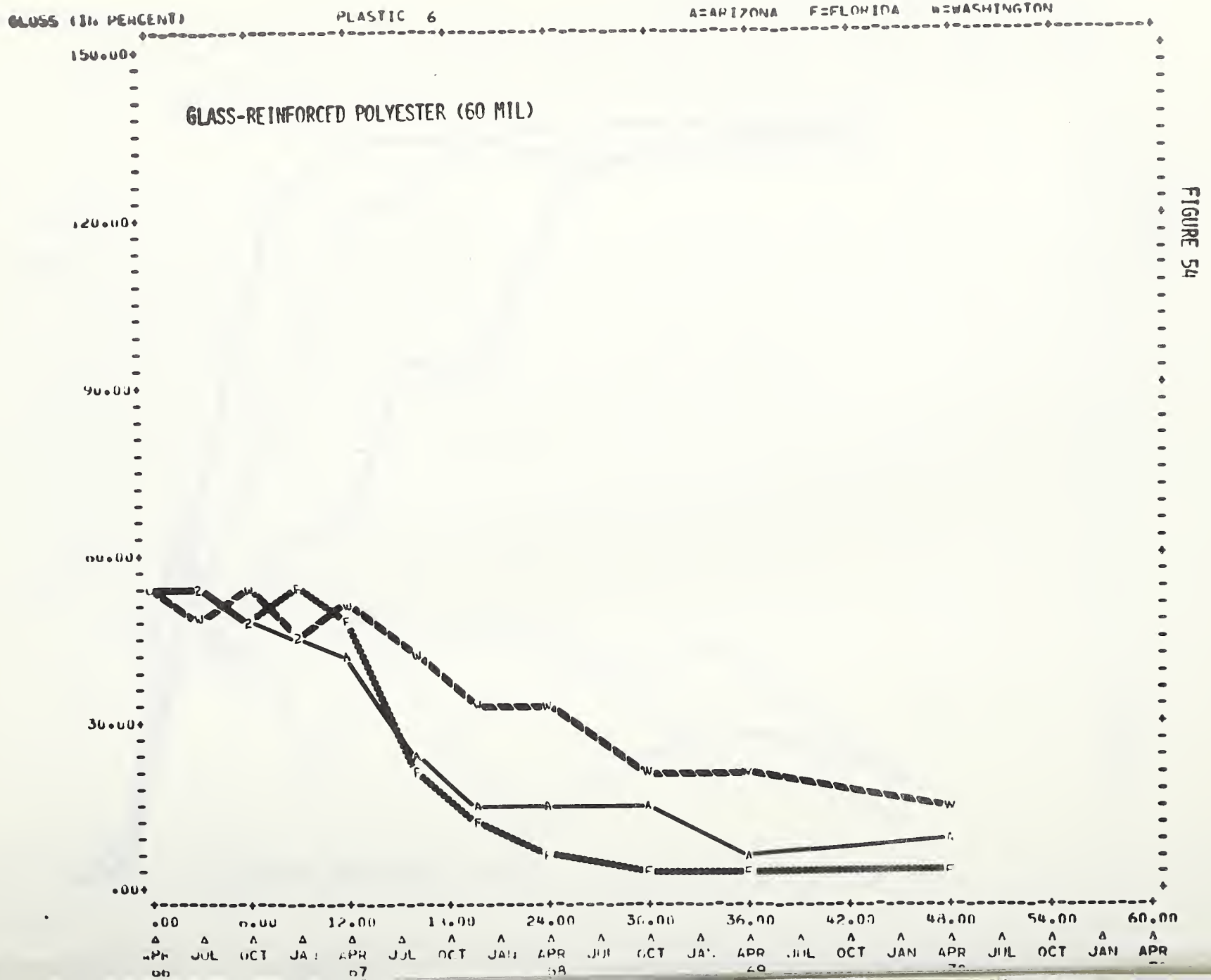

GLOSS (IN PERCENT)
PLASTIC 6
A=ARIZONA F=FLORIDA W=WASHINGTON
GLASS-REINFORCED POLYESTER (60 MIL)
150.00
120.00
90.00
60.00
30.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR
JUL
OCT
JAN
APR
JUL
OCT
JAN
APR
JUL
OCT
JAN
APR
JUL
OCT
JAN
APR
JUL
OCT
JAN
APR
66
67
68
69

FIGURE 54

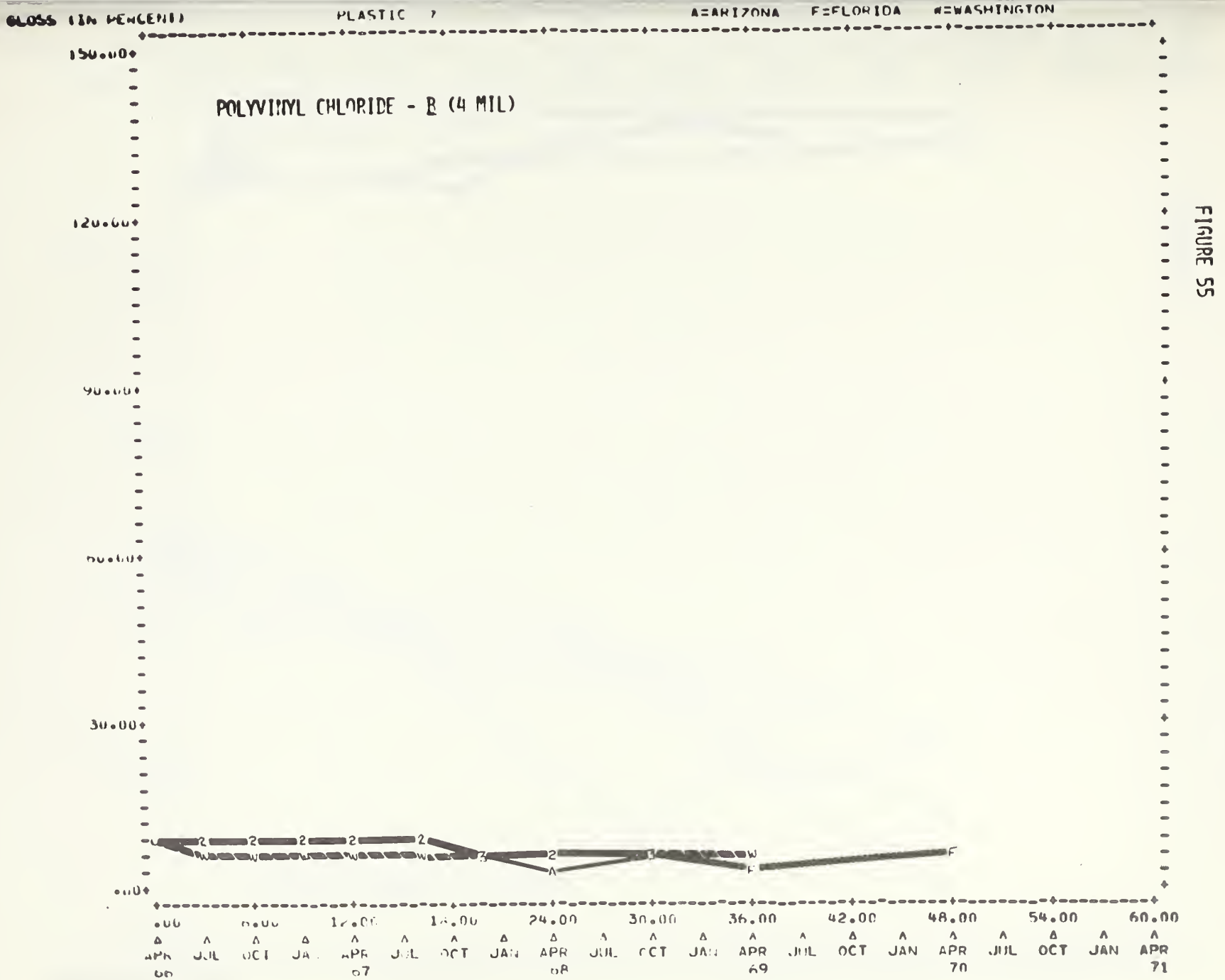

GLOSS (IN PERCENT)
PLASTIC 7
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL CHLORIDE - B (4 MIL)
150.00
120.00
90.00
60.00
30.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 55

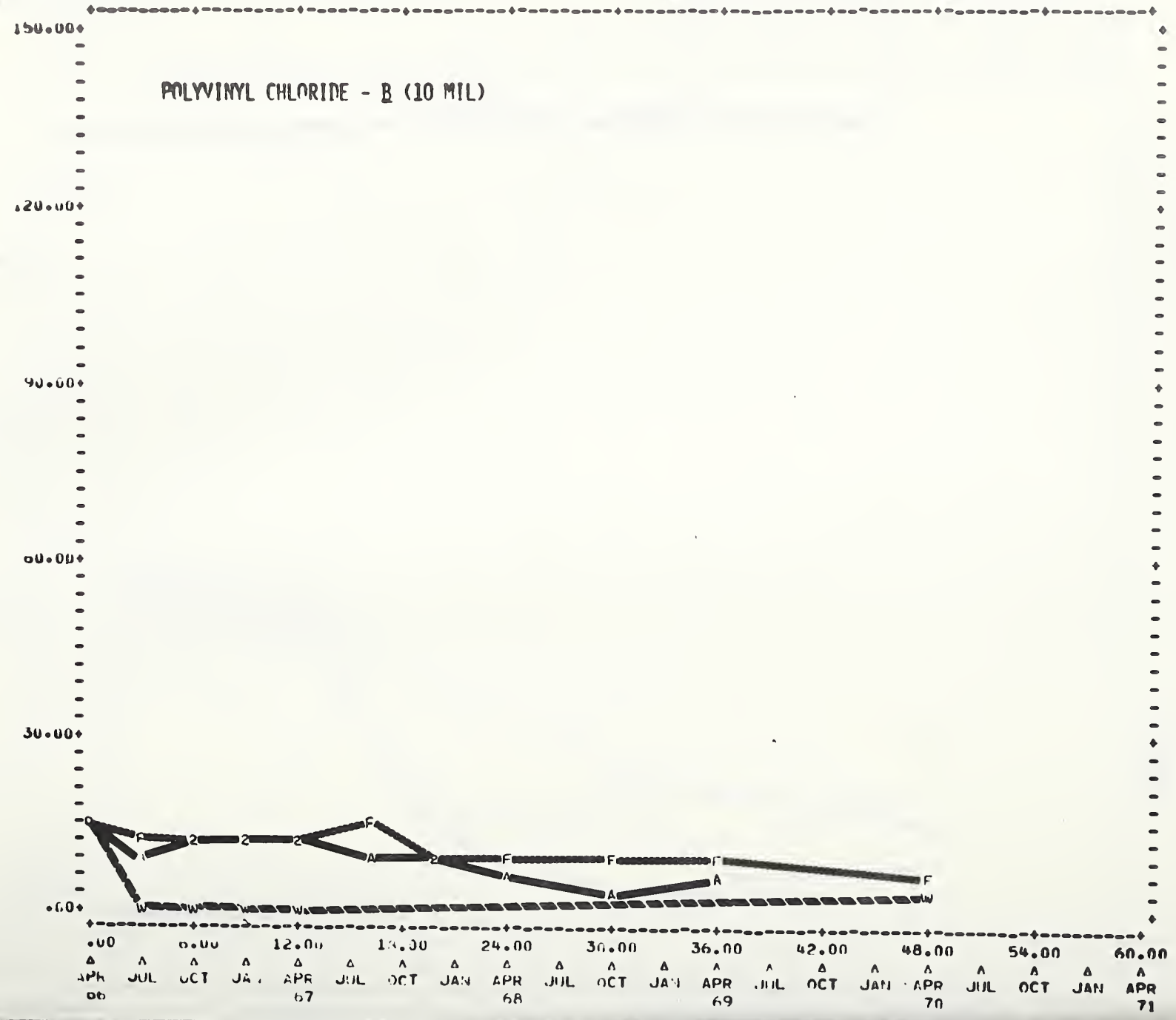

GLOSS (IN PERCENT)
PLASTIC 8
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL CHLORIDE - B (10 MIL)
150.00
120.00
90.00
60.00
30.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 56

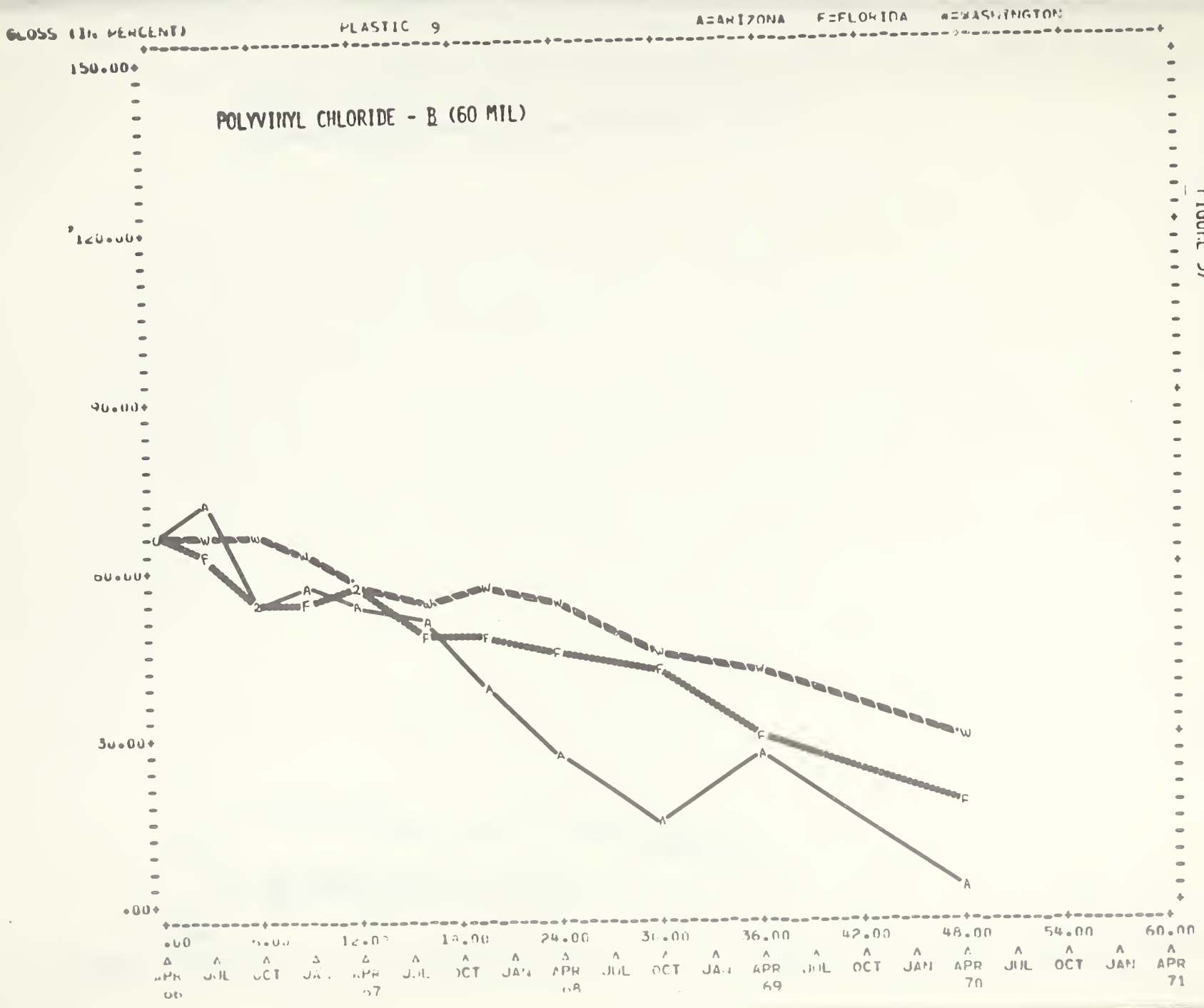

GLOSS (1% PERCENT)
PLASTIC 9
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL CHLORIDE - B (60 MIL)
150.00
120.00
90.00
60.00
30.00
.00
.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 57

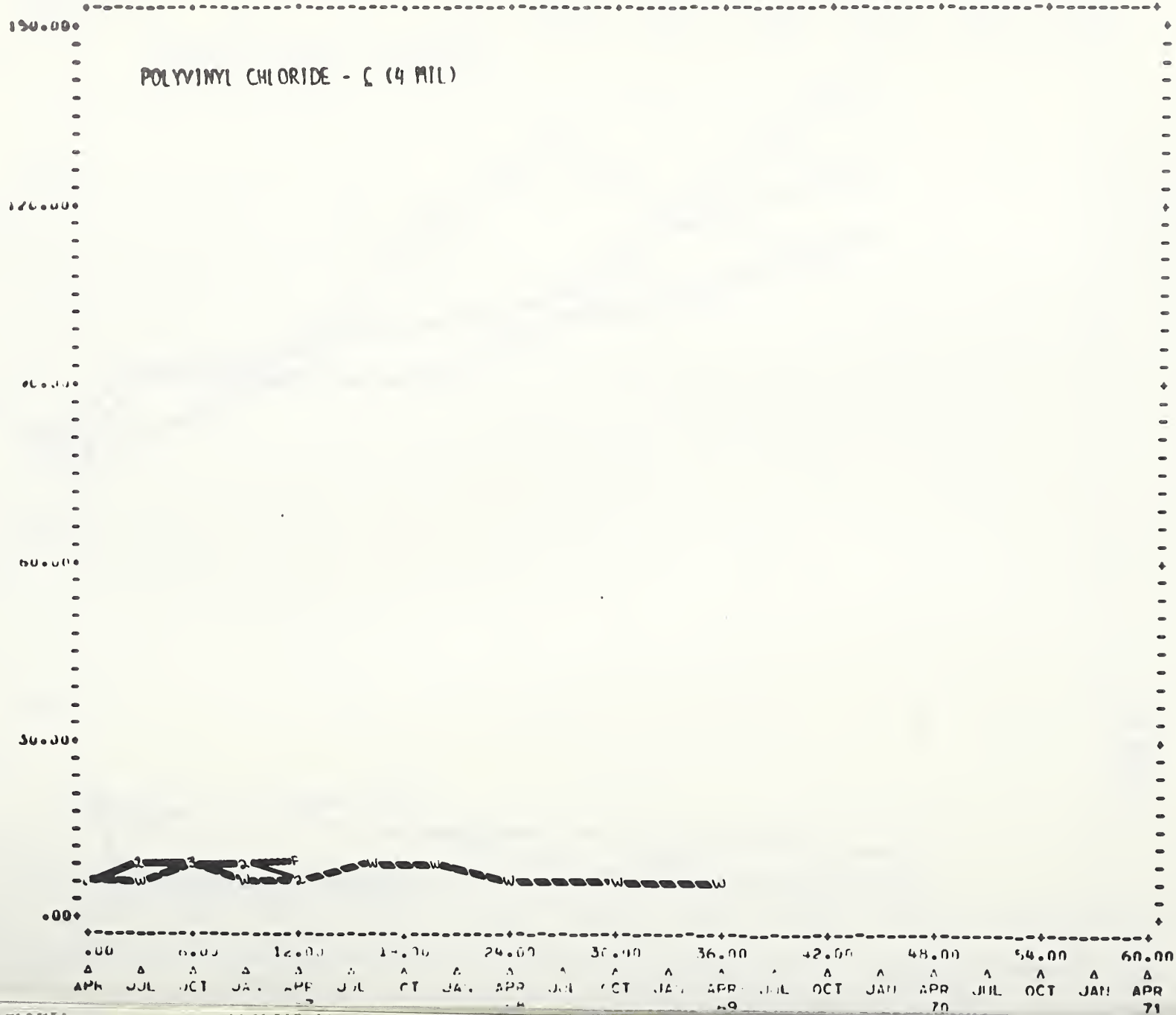

GLOSS (60 PERCENT)
PLASTIC 10
ARIZONA
FLORIDA
WASHINGTON
POLYVINYL CHLORIDE - C (4 MIL)
150.00
120.00
90.00
60.00
30.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR
JUL
OCT
JAN
APR
JUL
OCT
JAN
APR
JUL
OCT
JAN
APR
JUL
OCT
JAN
APR
JUL
OCT
JAN
APR
70
71

FIGURE 58

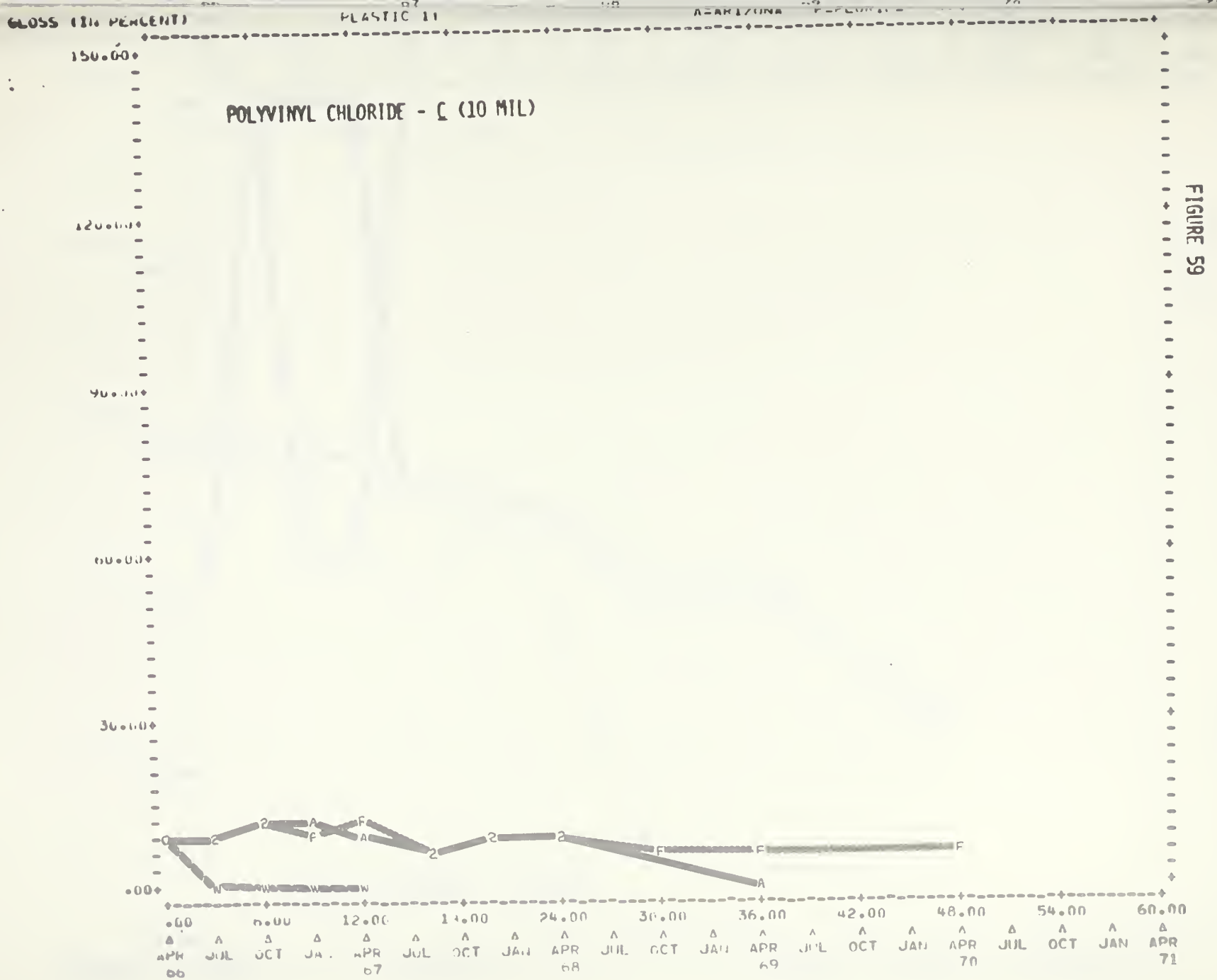

GLOSS (8% PERCENT)
PLASTIC 11
A=ARIZONA
POLYVINYL CHLORIDE - C (10 MIL)
150.00
90.00
60.00
30.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 59

GLOSS (IN PERCENT) PLASTIC 12 A=ARIZONA F=FLORIDA W=WASHINGTON

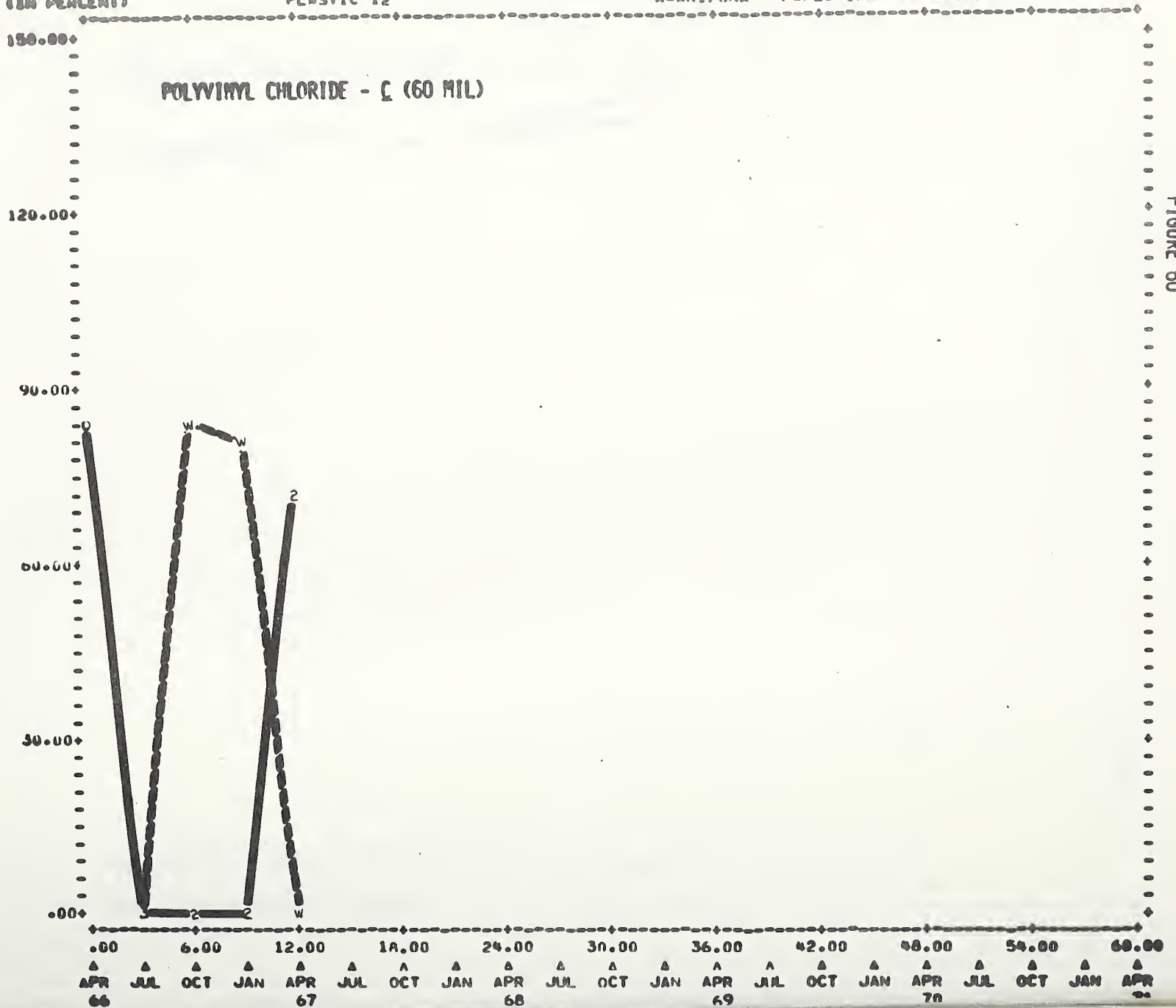



FIGURE 60

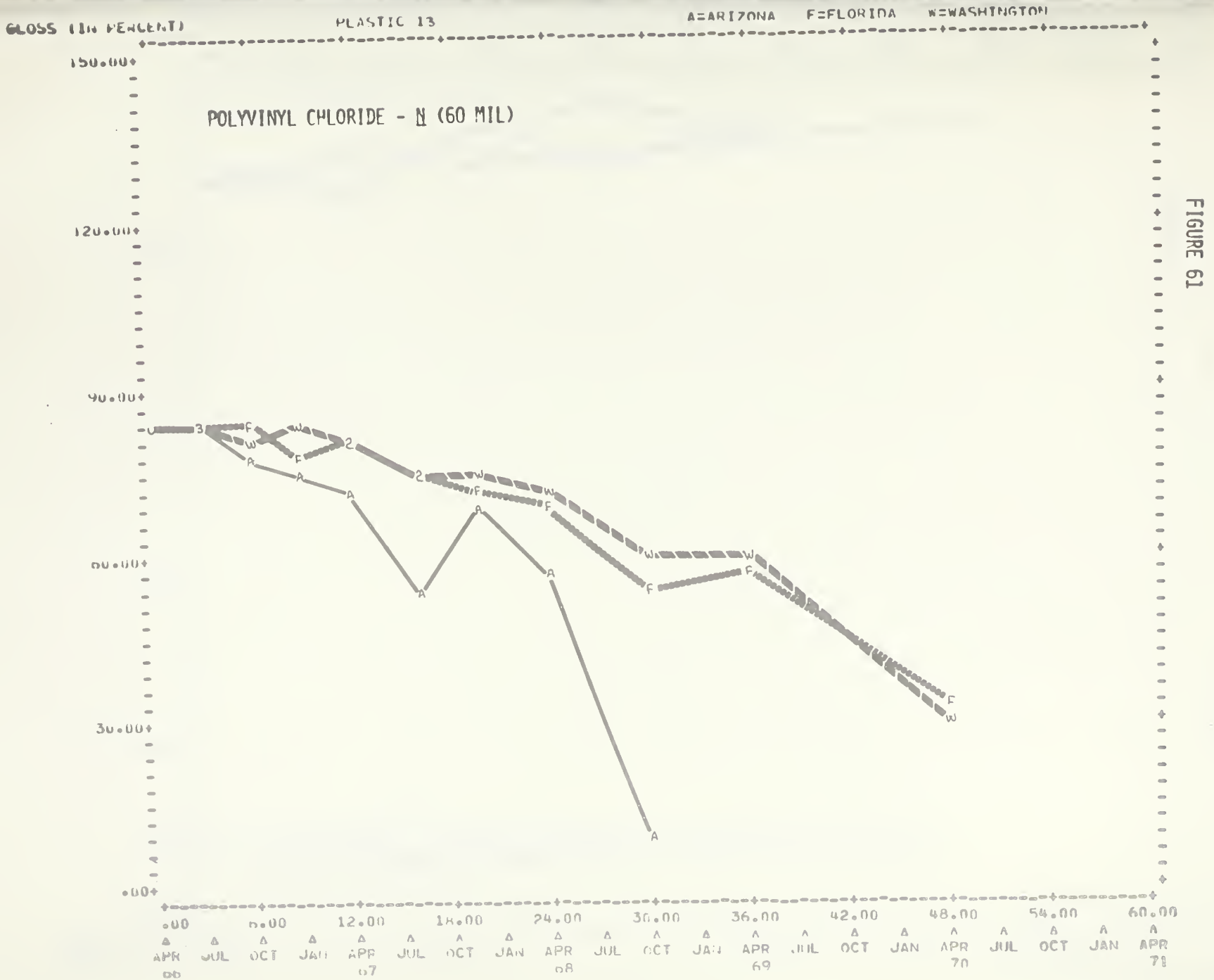

GLOSS (IN PERCENT)
PLASTIC 13
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL CHLORIDE - N (60 MIL)
150.00
120.00
90.00
60.00
30.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 61

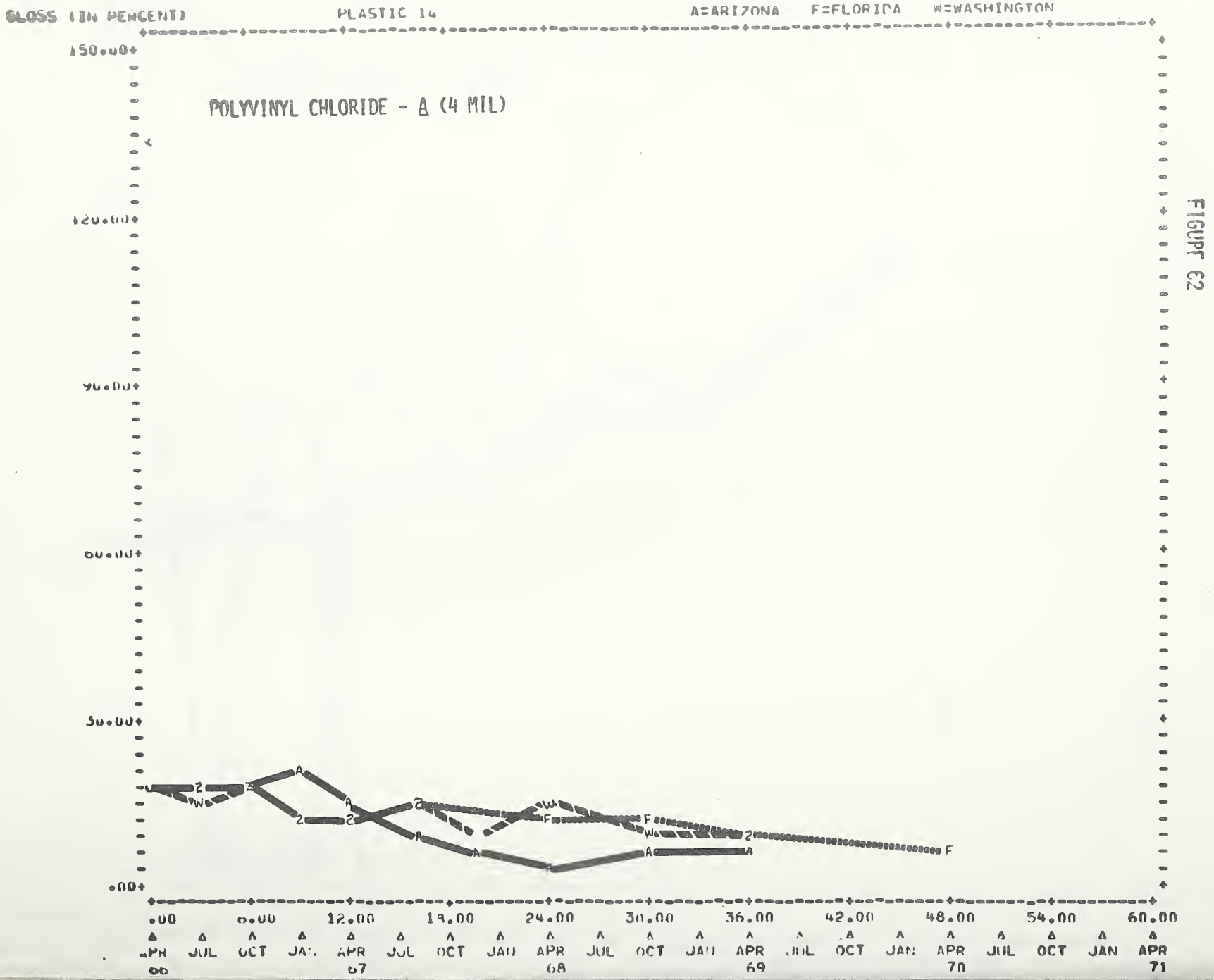

GLOSS (IN PERCENT)
PLASTIC 14
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL CHLORIDE - A (4 MIL)
150.00
120.00
90.00
60.00
30.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 62

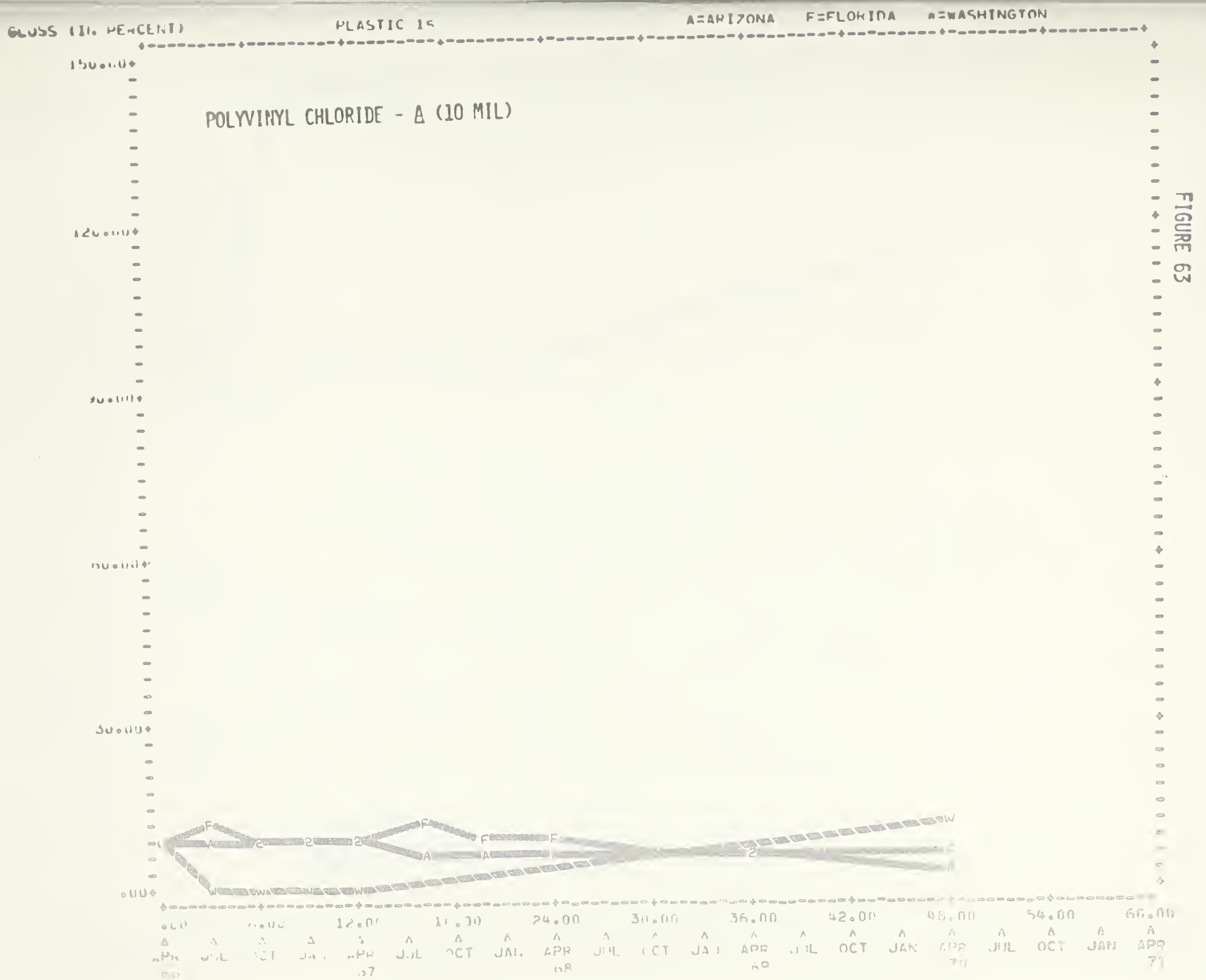

GLOSS (10 PERCENT)
PLASTIC 15
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL CHLORIDE - A (10 MIL)
150.00
120.00
90.00
60.00
30.00
0.00
0.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 63

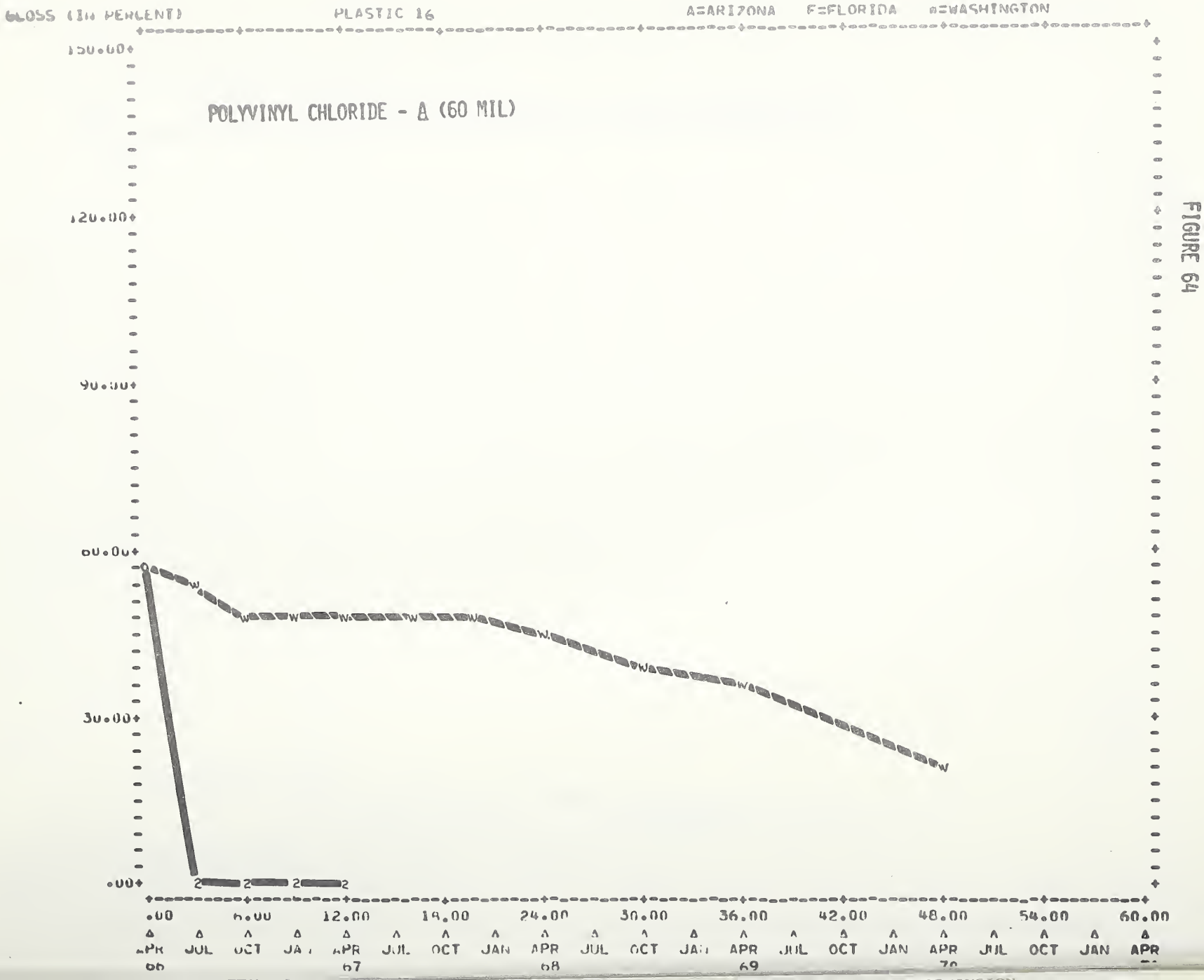

GLOSS (IN PERCENT)
PLASTIC 16
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL CHLORIDE - A (60 MIL)
120.00
90.00
60.00
30.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR JUL OCT JAN APR JUL OCT JAN APR JUL OCT JAN APR JUL OCT JAN APR JUL OCT JAN APR
66 67 68 69 70

FIGURE 64

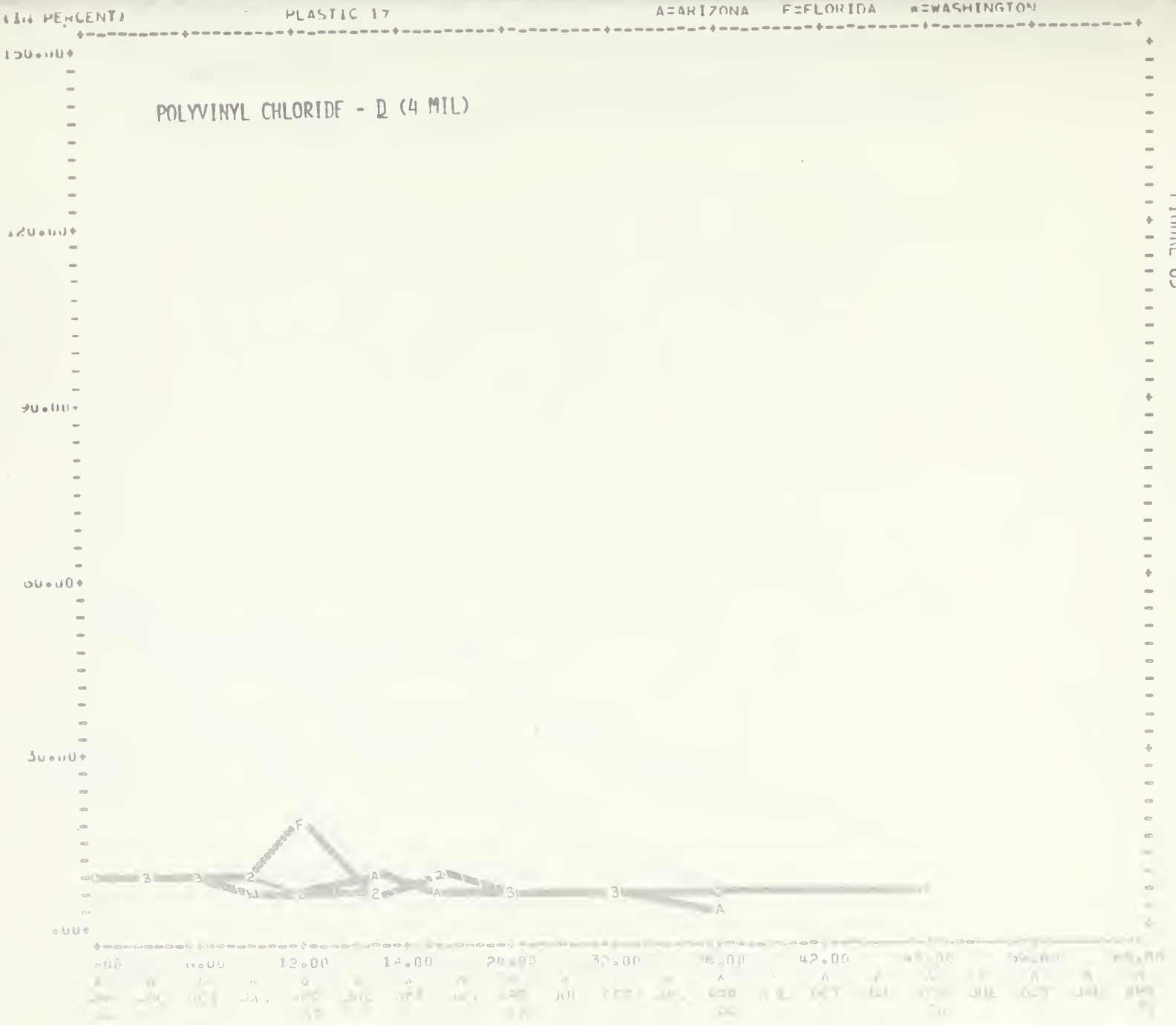

GLOSS (60 PERCENT)
PLASTIC 17
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL CHLORIDE - D (4 MIL)
150.00
120.00
90.00
60.00
30.00
.00
.00
12.00
18.00
24.00
30.00
36.00
42.00

FIGURE 65

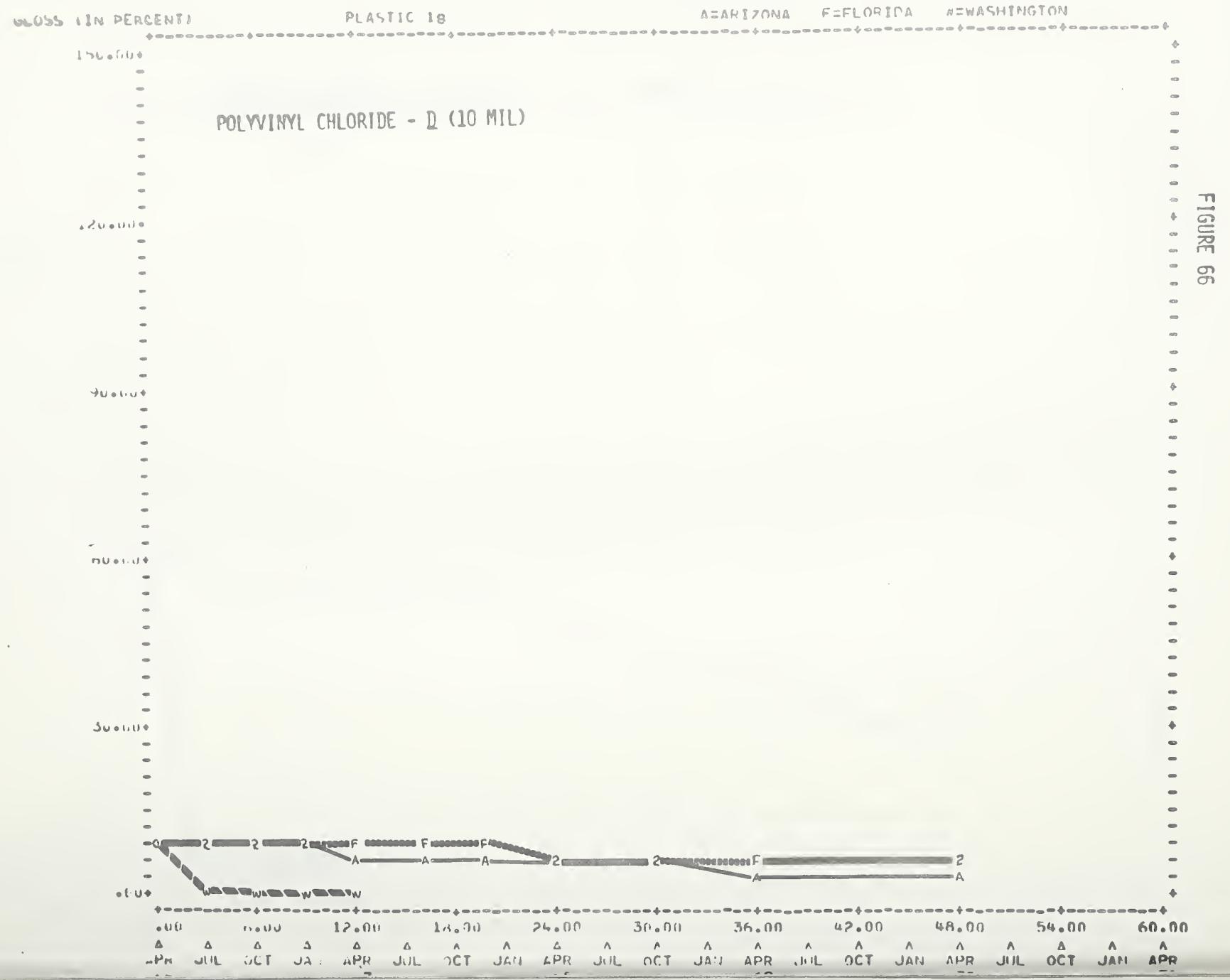

GLOSS (IN PERCENT)
PLASTIC 18
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL CHLORIDE - D (10 MIL)
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR JUL OCT JAN APR JUL OCT JAN APR JUL OCT JAN APR JUL OCT JAN APR JUL OCT JAN APR

FIGURE 66

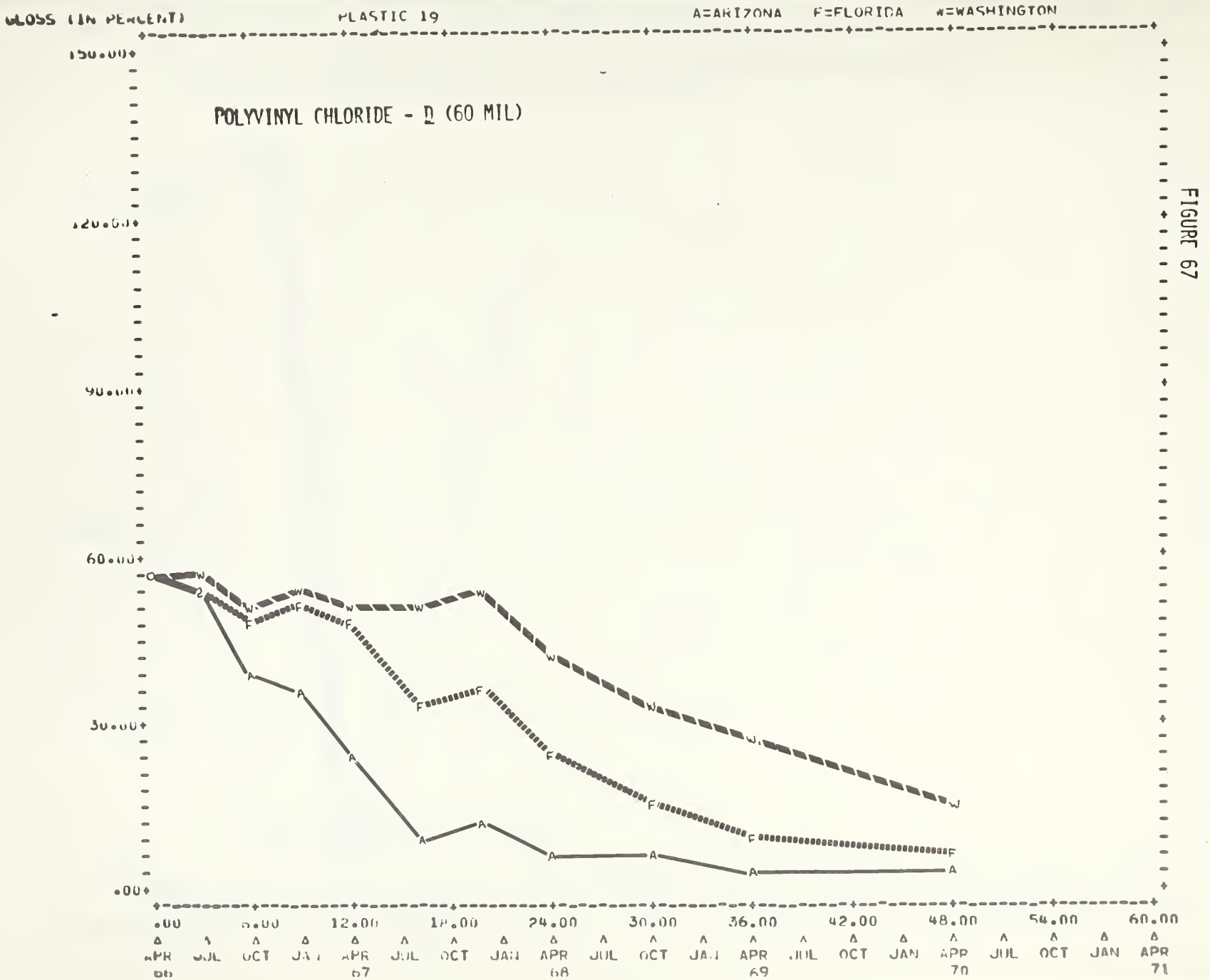

GLOSS (IN PERCENT)
PLASTIC 19
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL CHLORIDE - D (60 MIL)
150.00
120.00
90.00
60.00
30.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 67

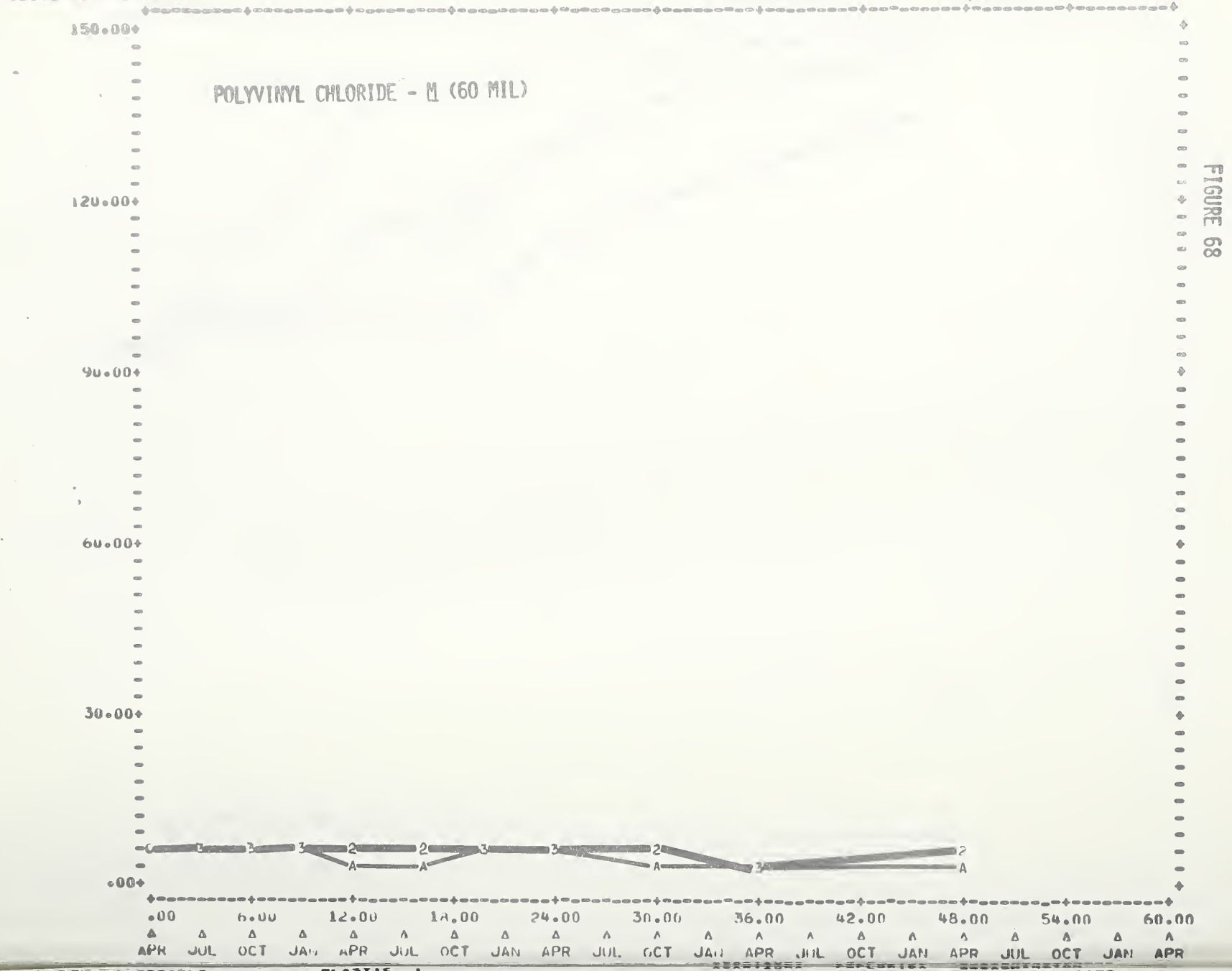

GLOSS (IN PERCENT)
PLASTIC 20
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL CHLORIDE - M (60 MIL)
150.00
120.00
90.00
60.00
30.00
.00
.00 6.00 12.00 18.00 24.00 30.00 36.00 42.00 48.00 54.00 60.00
APR JUL OCT JAN APR JUL OCT JAN APR JUL OCT JAN APR JUL OCT JAN APR JUL OCT JAN APR

FIGURE 68

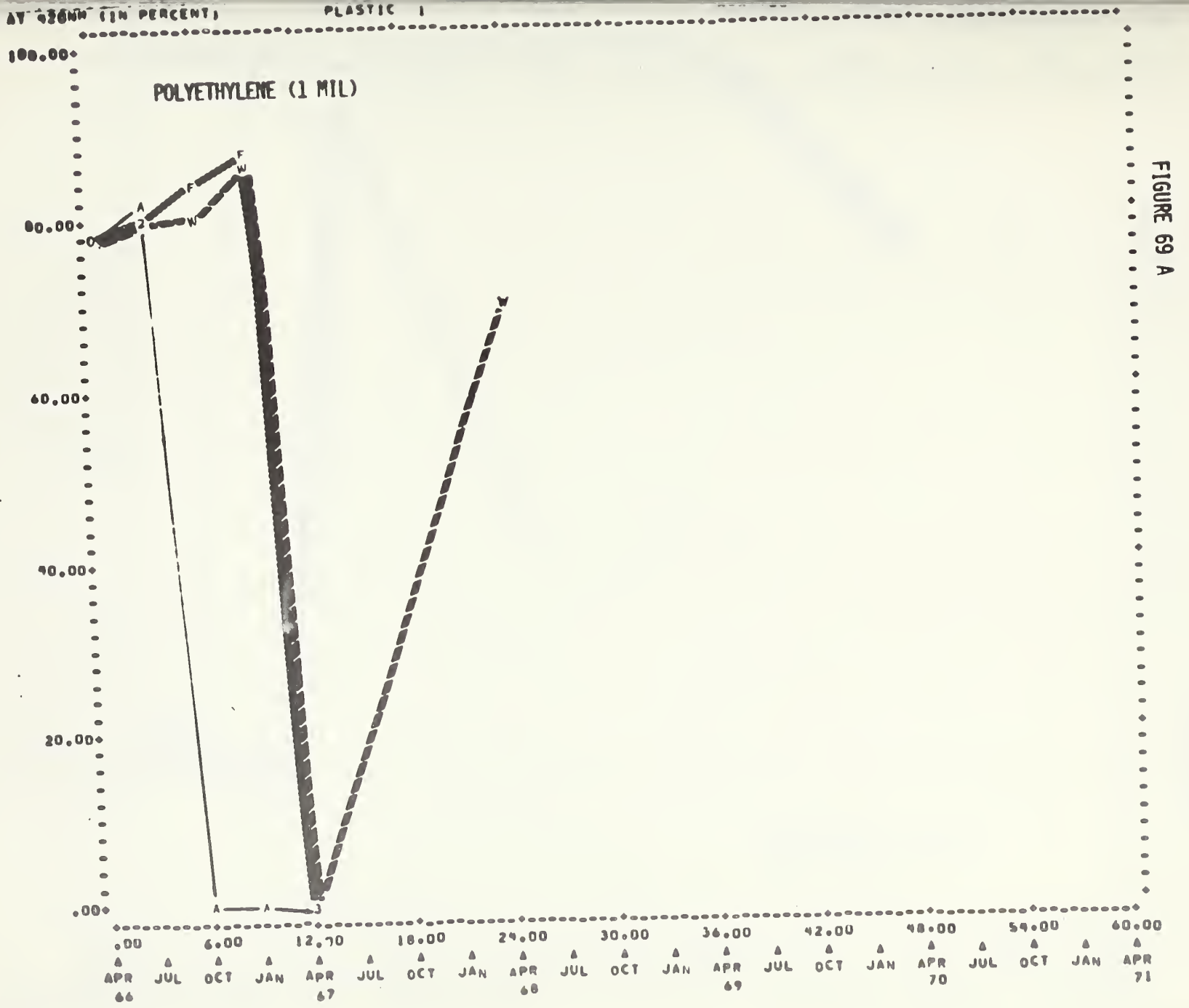

PLASTIC 1
POLYETHYLENE (1 MIL)
100.00
80.00
60.00
40.00
20.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 69 A

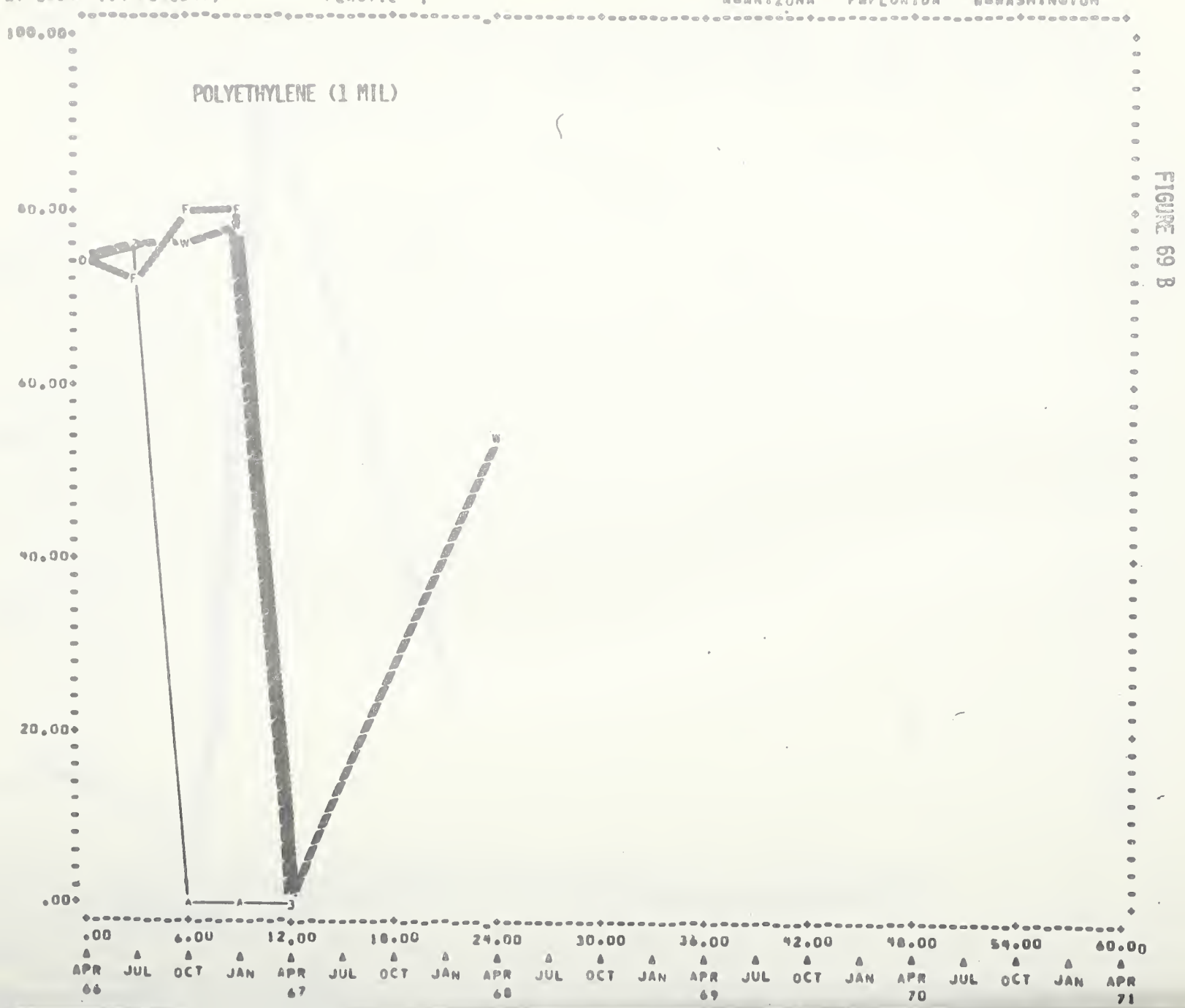

HAZE AT 550NM (IN PERCENT)
PLASTIC 1
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYETHYLENE (1 MIL)
100.00
80.00
60.00
40.00
20.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 69 B

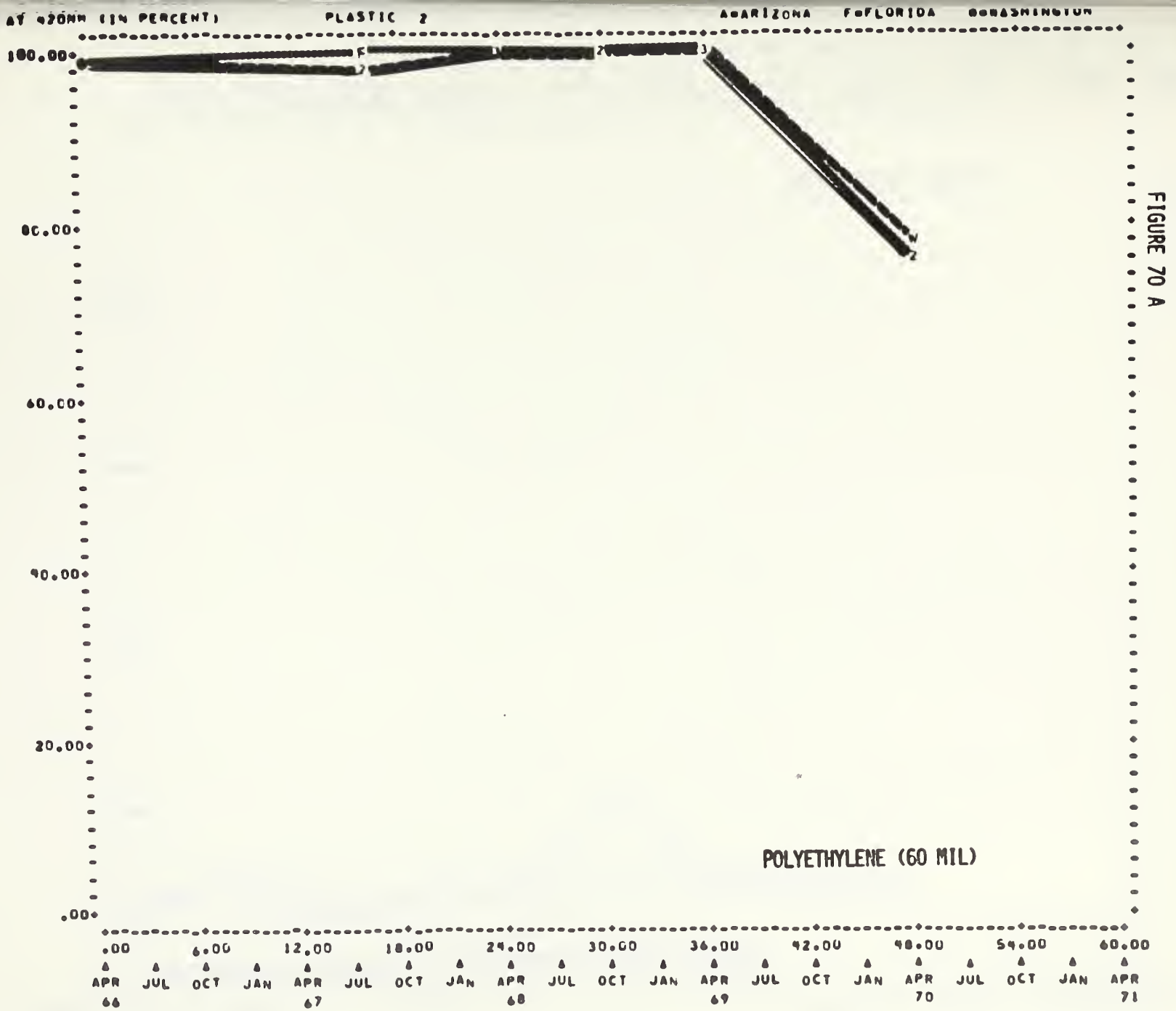

HAZE AT 420NM (IN PERCENT)
PLASTIC 2
ARIZONA
FLORIDA
WASHINGTON
100.00
80.00
60.00
40.00
20.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71
POLYETHYLENE (60 MIL)

FIGURE 70 A

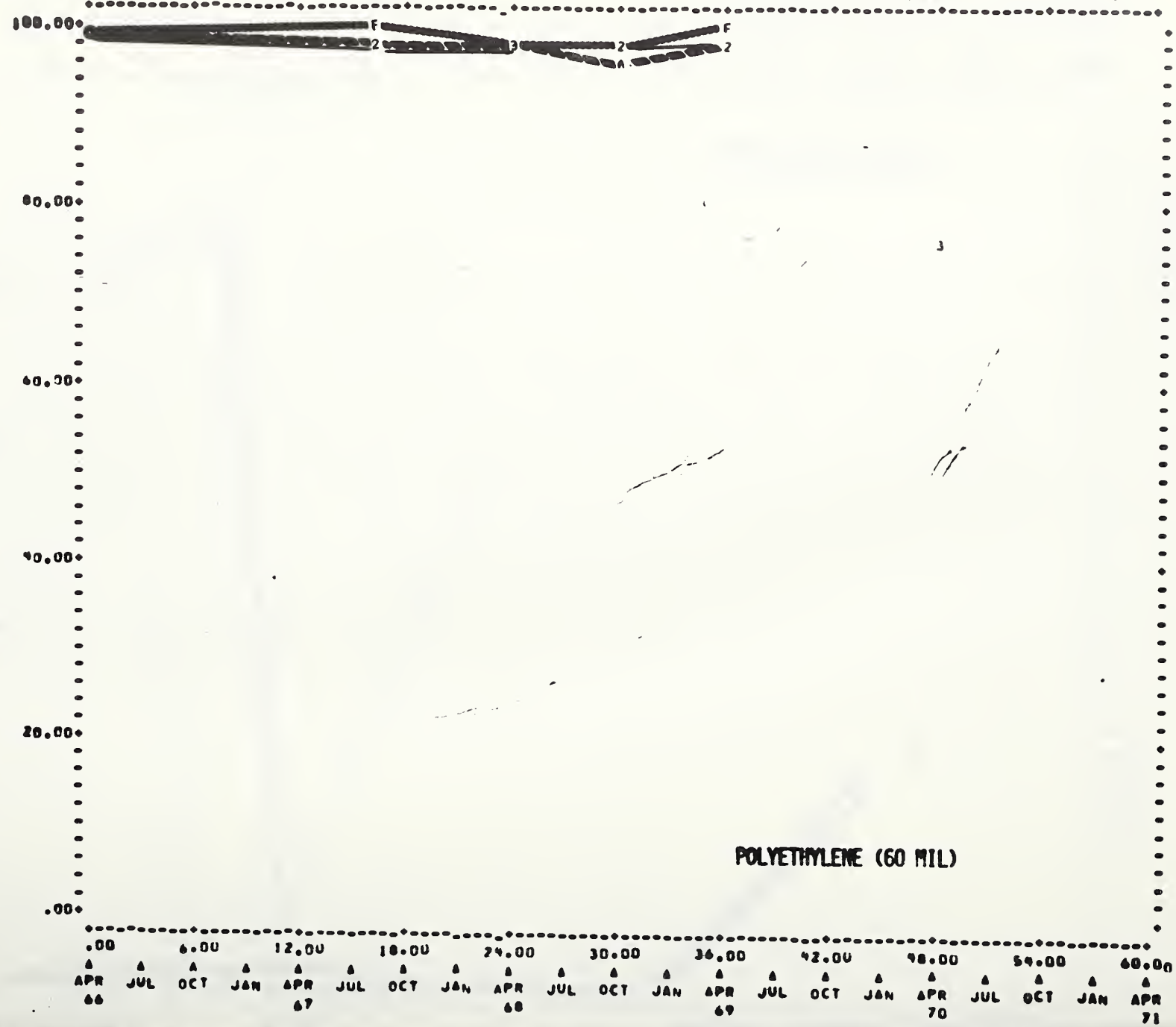

HAZE AT 550NM (IN PERCENT)
PLASTIC 2
A=ARIZONA F=FLORIDA B=WASHINGTON
100.00
80.00
60.00
40.00
20.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71
POLYETHYLENE (60 MIL)

FIGURE 70 B

HAZE AT 420MM (IN PERCENT) PLASTIC 3 ARIZONA FLORIDA WASHINGTON

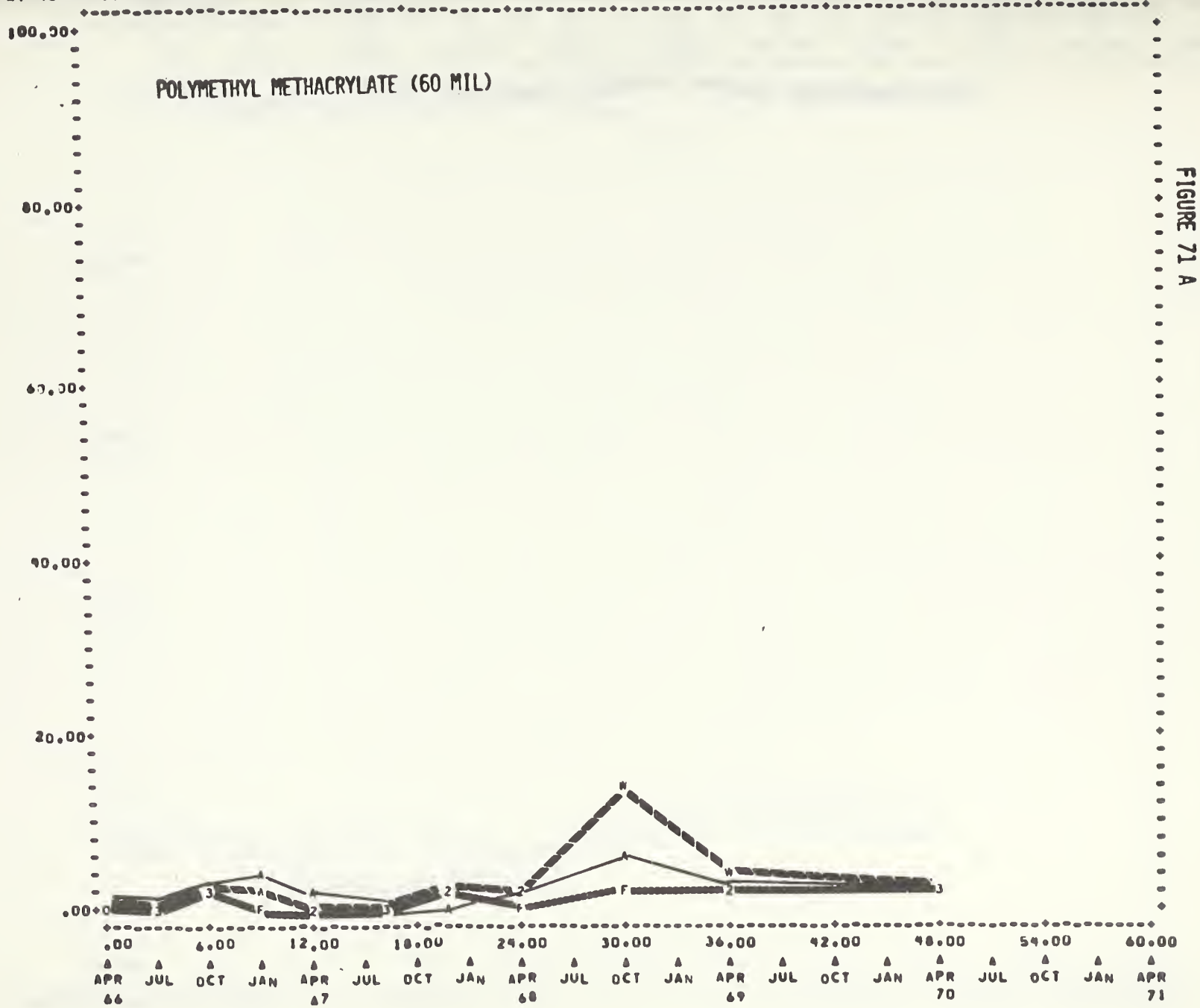



FIGURE 71 A

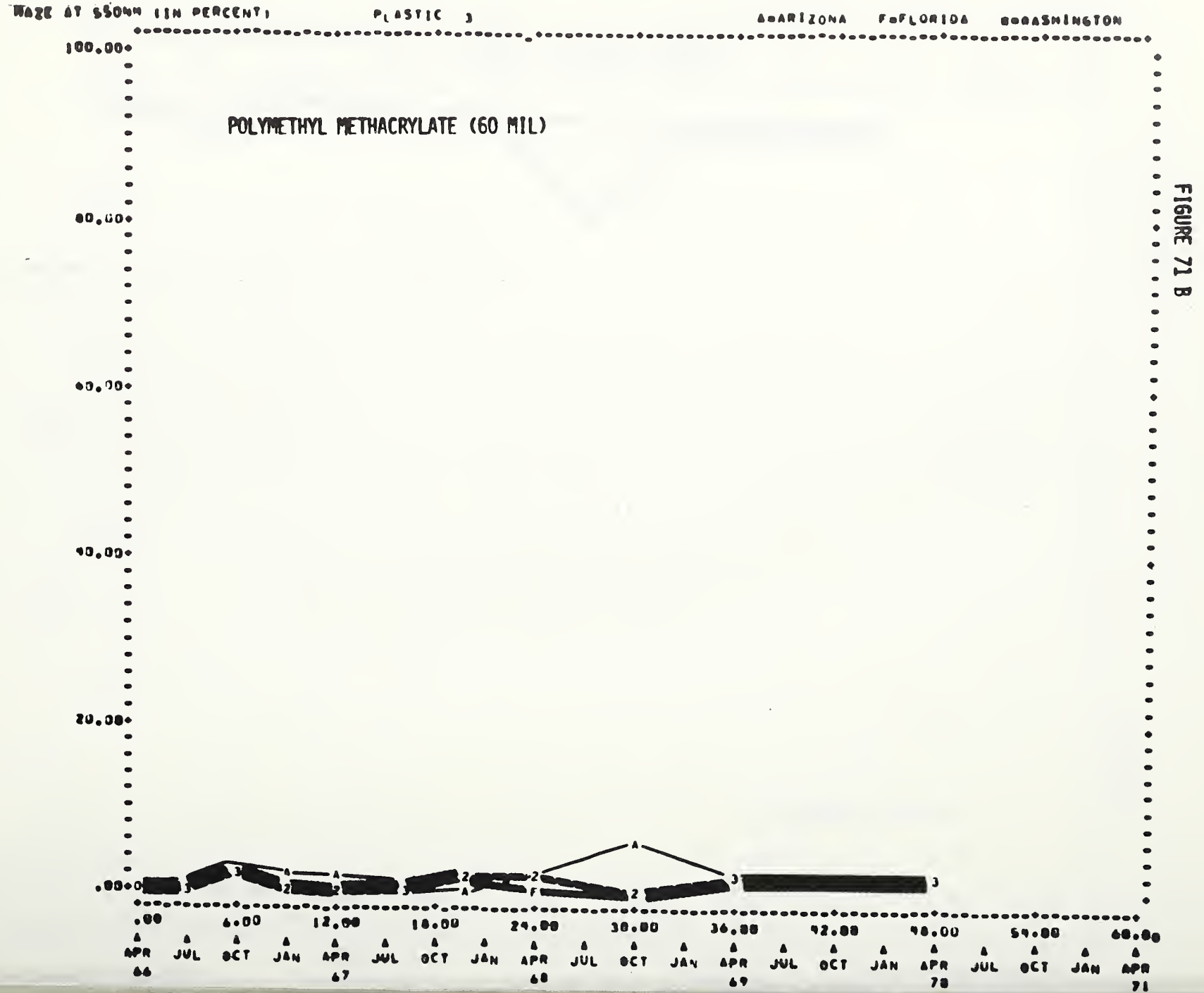

HAZE AT 550NM (IN PERCENT)
PLASTIC 3
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYMETHYL METHACRYLATE (60 MIL)
100.00
80.00
60.00
40.00
20.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 71 B

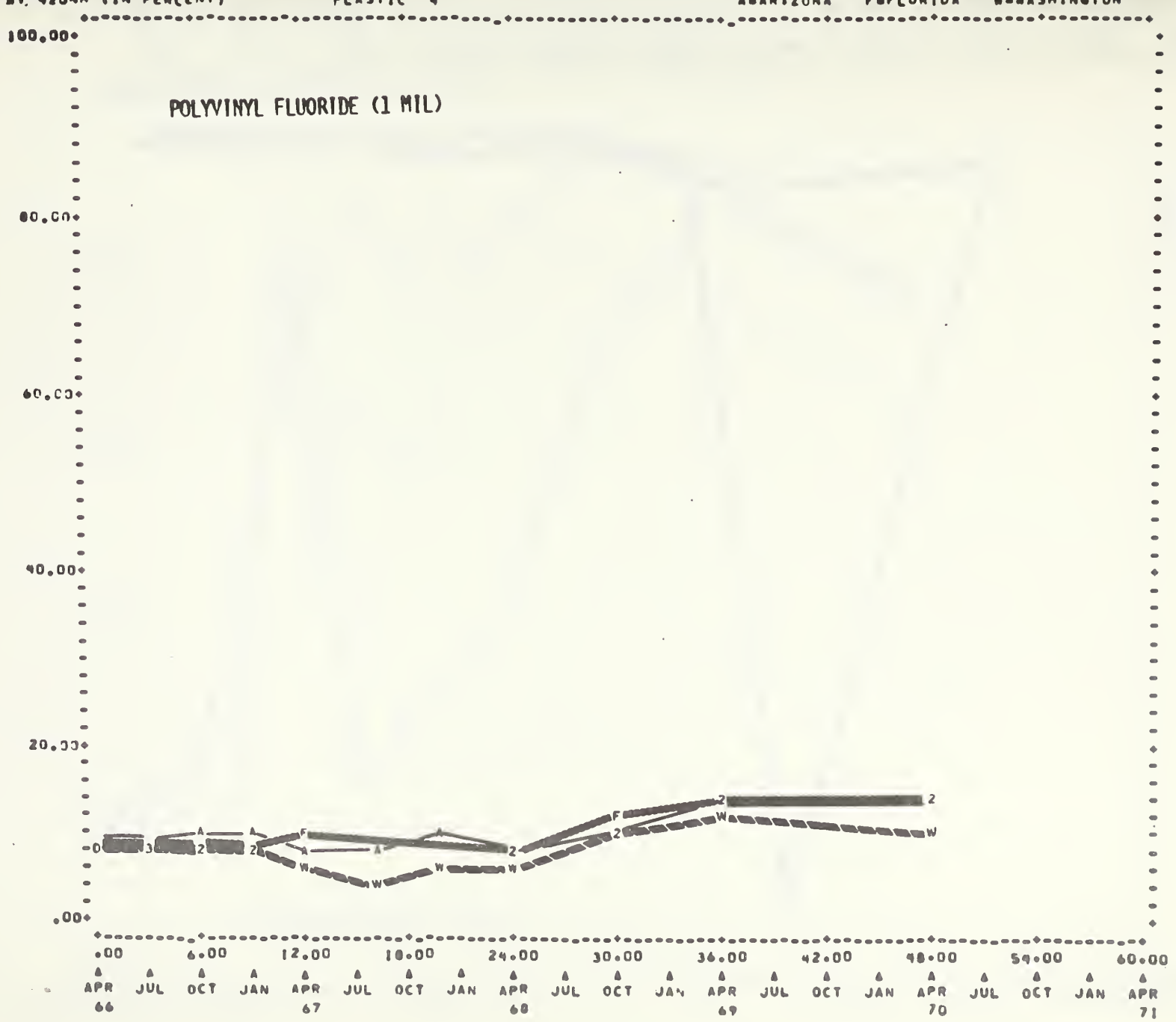

HAZE AT 420NM (IN PERCENT)
PLASTIC 4
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL FLUORIDE (1 MIL)
100.00
80.00
60.00
40.00
20.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 72 A

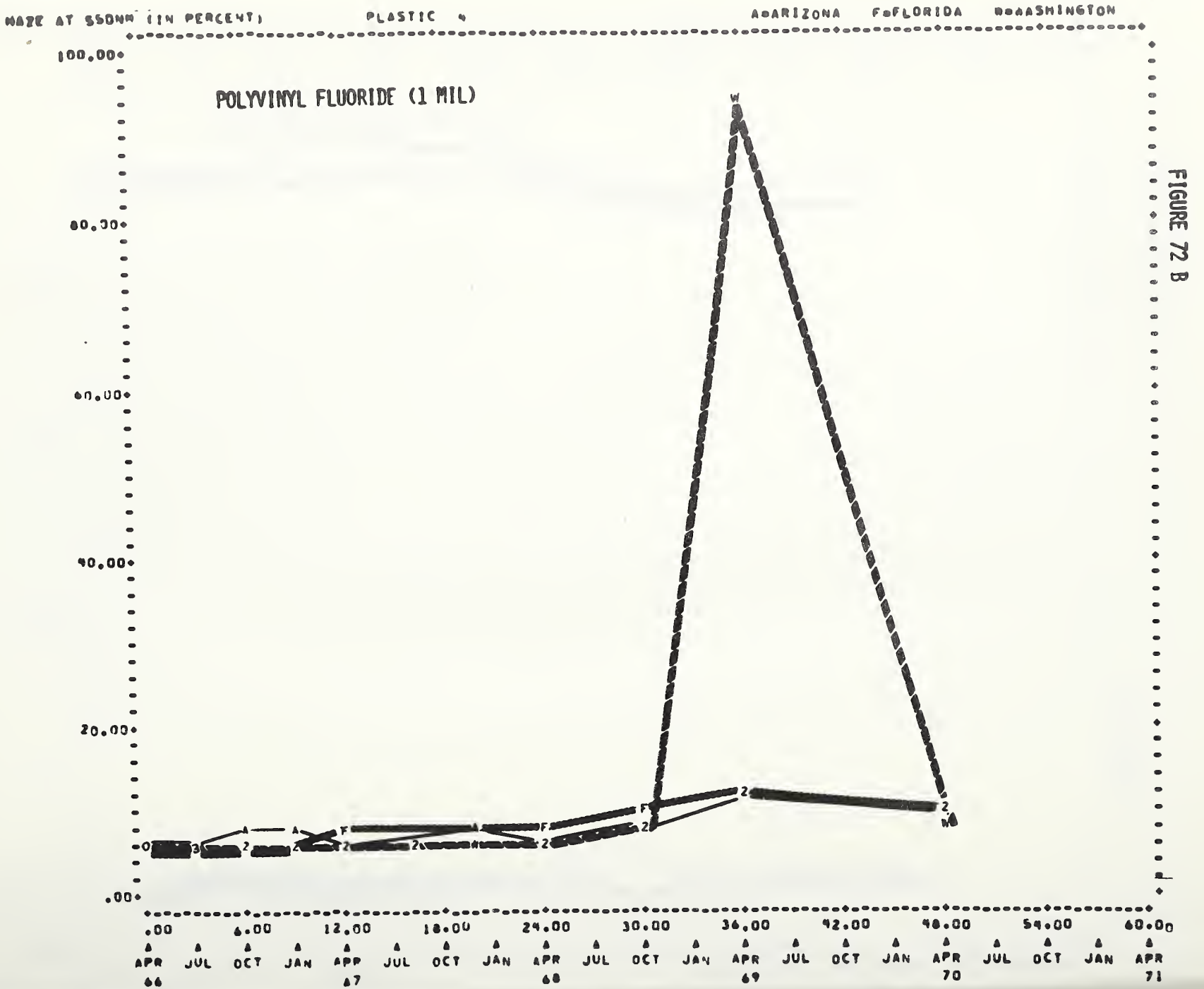

HAZE AT 550NM (IN PERCENT)
PLASTIC 4
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL FLUORIDE (1 MIL)
100.00
80.00
60.00
40.00
20.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 72 B

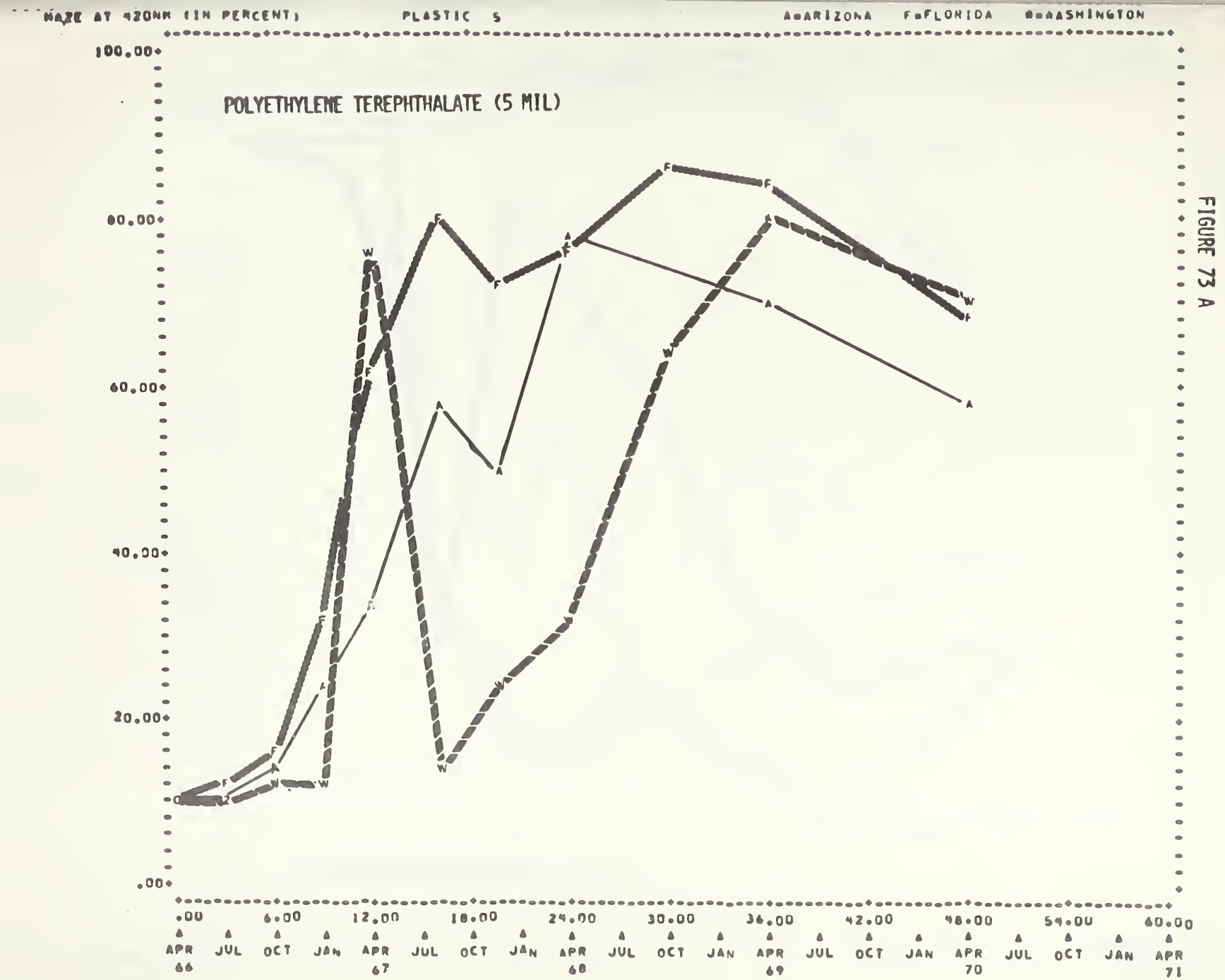

HAZE AT 420NM (IN PERCENT)
PLASTIC 5
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYETHYLENE TEREPHTHALATE (5 MIL)
100.00
80.00
60.00
40.00
20.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 73 A

HAZE AT 550NM (IN PERCENT) PLASTIC 5 A=ARIZONA F=FLORIDA W=WASHINGTON

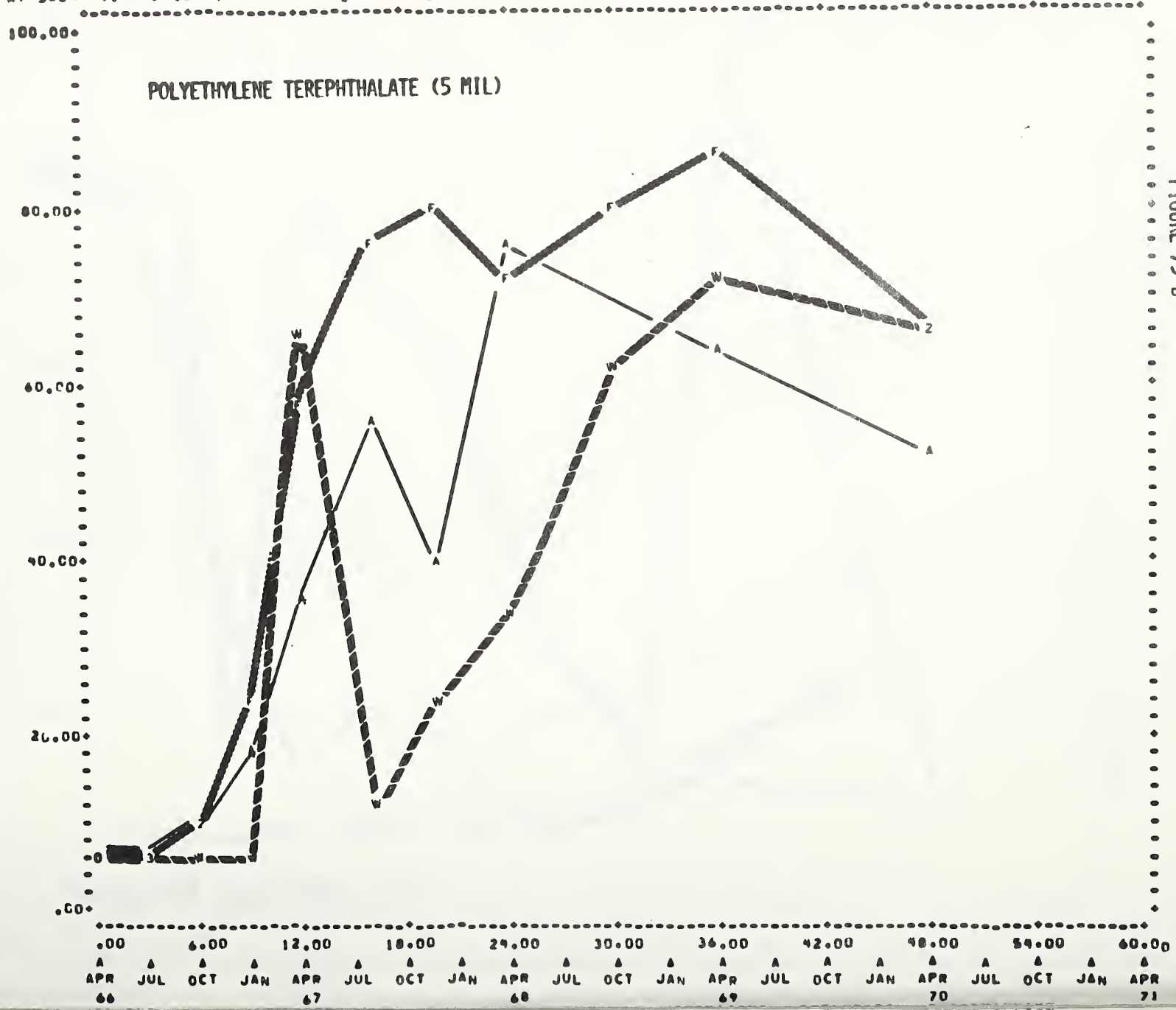



FIGURE 73 B

HAZE AT 420NM (IN PERCENT) PLASTIC 6

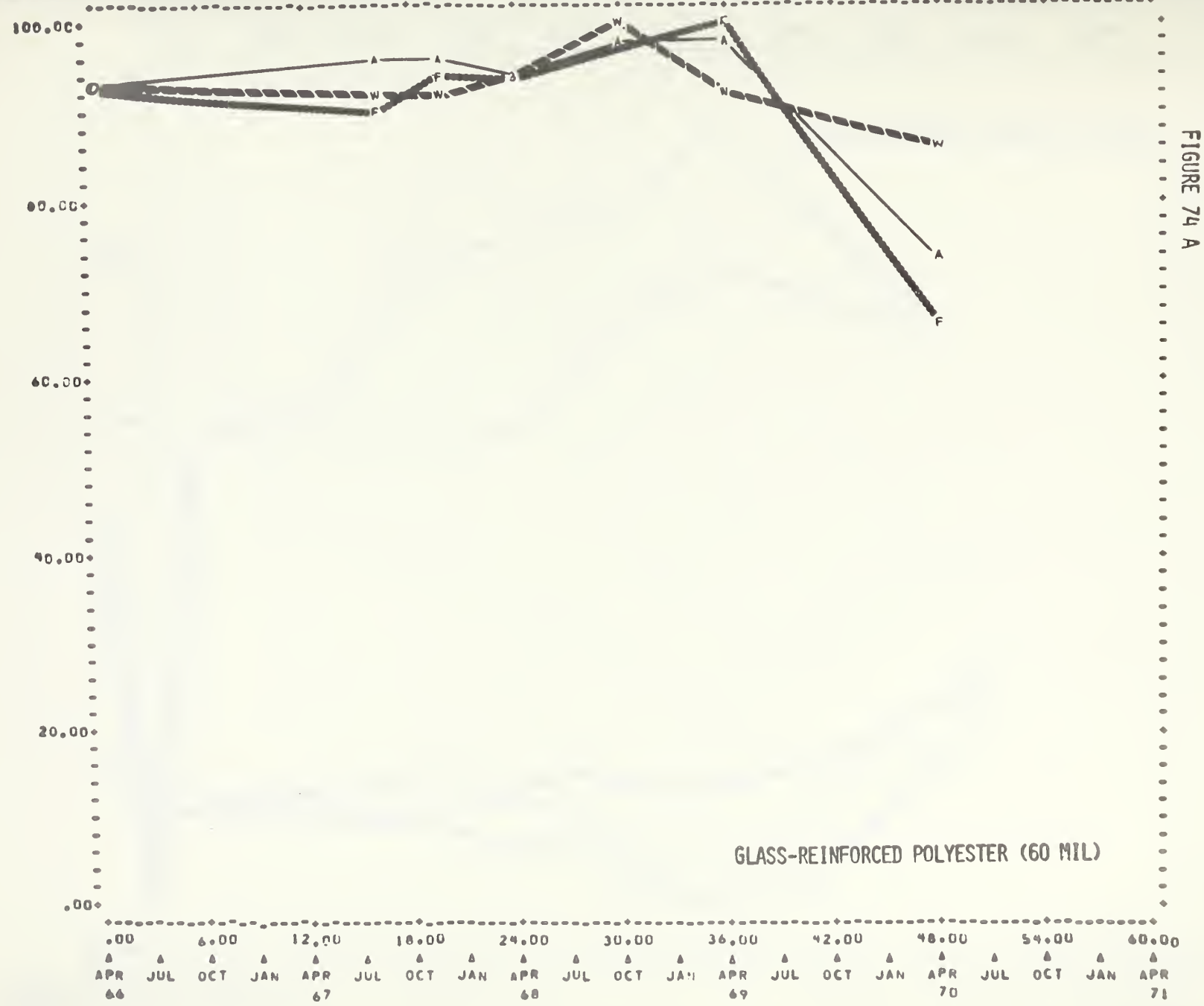



FIGURE 74 A

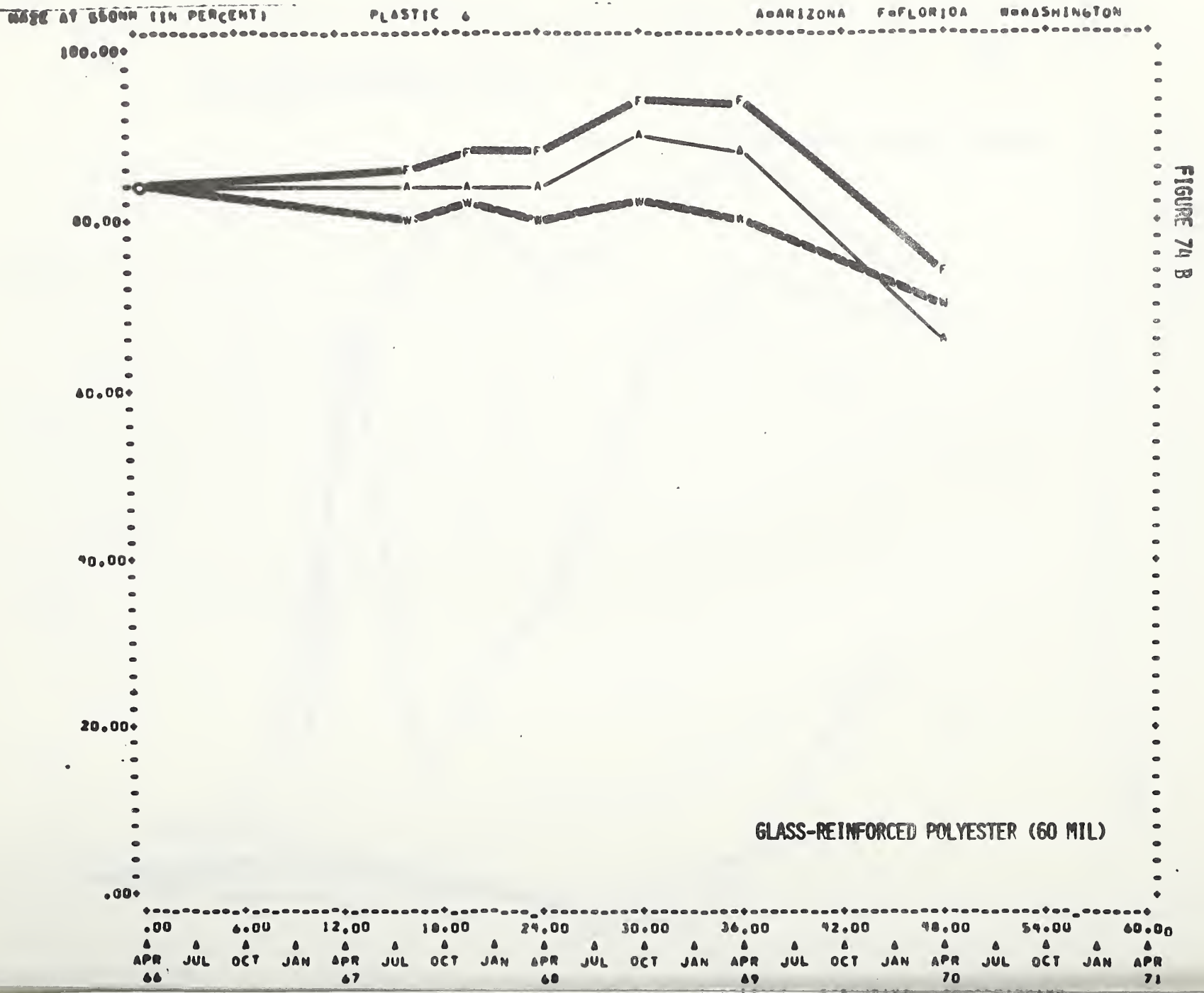

GLASS AT 60MM (IN PERCENT)
PLASTIC 6
A=ARIZONA F=FLORIDA W=WASHINGTON
100.00
80.00
60.00
40.00
20.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71
GLASS-REINFORCED POLYESTER (60 MIL)

FIGURE 74 B

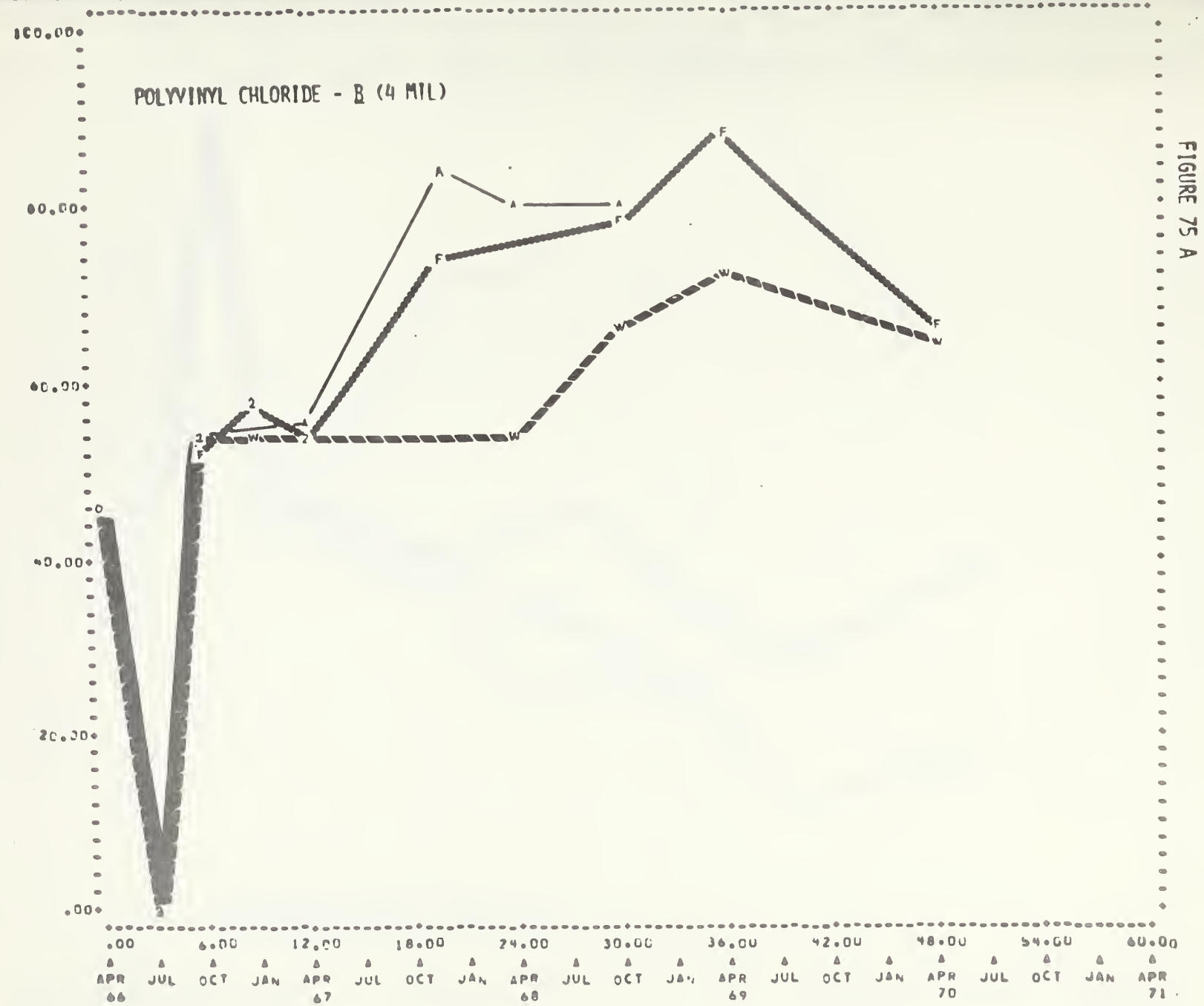

POLYVINYL CHLORIDE - B (4 MIL)
100.00
80.00
60.00
40.00
20.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 75 A

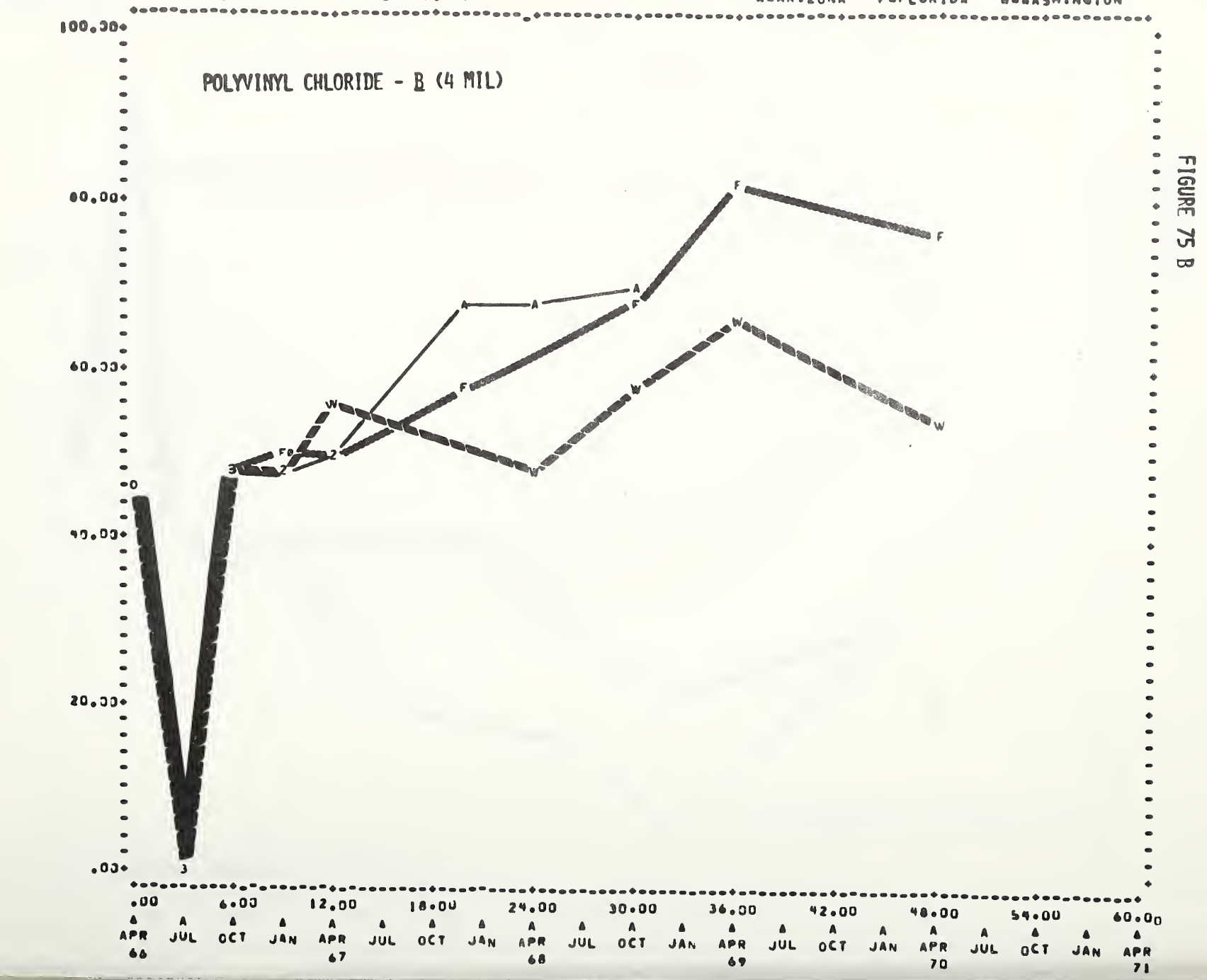

MAZE AT SSOHN (IN PERCENT)
PLASTIC 7
A=ARIZONA F=FLORIDA B=WASHINGTON
POLYVINYL CHLORIDE - B (4 MIL)
100.00
80.00
60.00
40.00
20.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 75 B

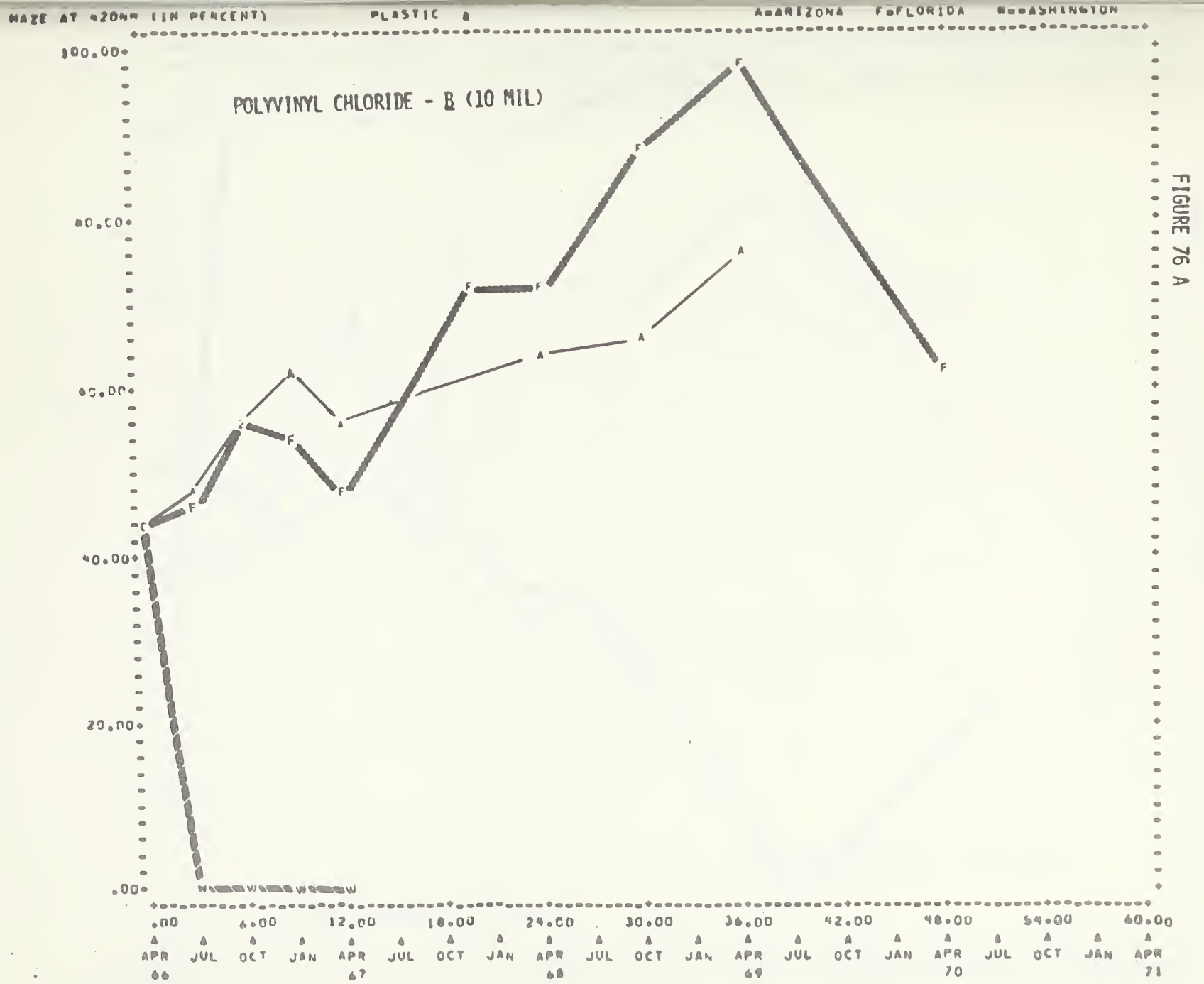

HAZE AT 420MM (IN PERCENT)
PLASTIC B
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL CHLORIDE - B (10 MIL)
100.00
80.00
60.00
40.00
20.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 76 A

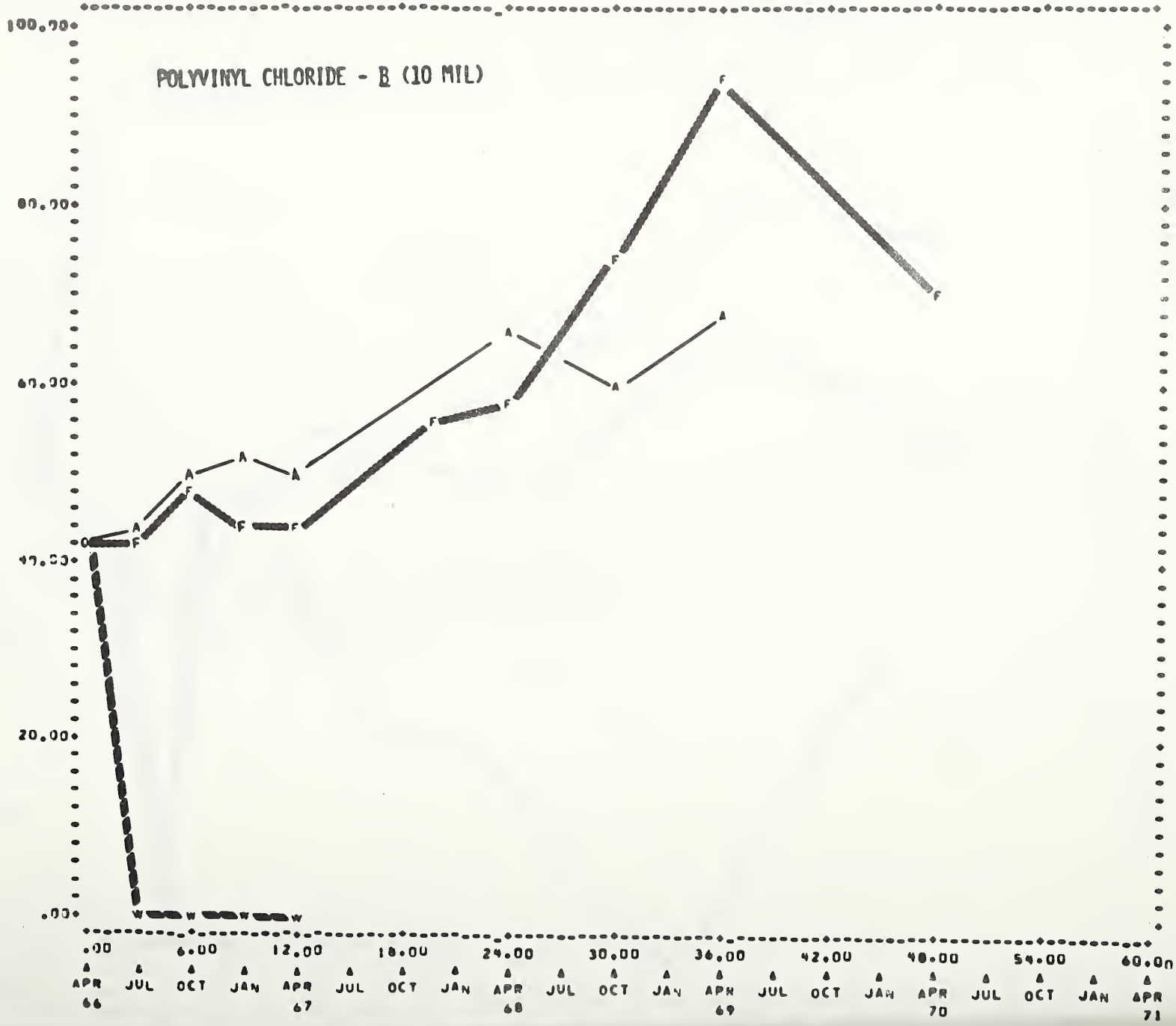

MAZE AT 550NM (IN PERCENT)
PLASTIC B
A=ARIZONA F=FLORIDA B=WASHINGTON
POLYVINYL CHLORIDE - B (10 MIL)
100.00
80.00
60.00
40.00
20.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 76 B


MAZE AT 420NN (IN PERCENT)
PLASTIC 9
A=ARIZONA F=FLORIDA W=WASHINGTON
100.00
80.00
60.00
40.00
20.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71
POLYVINYL CHLORIDE - B (60 MIL)

FIGURE 77 A

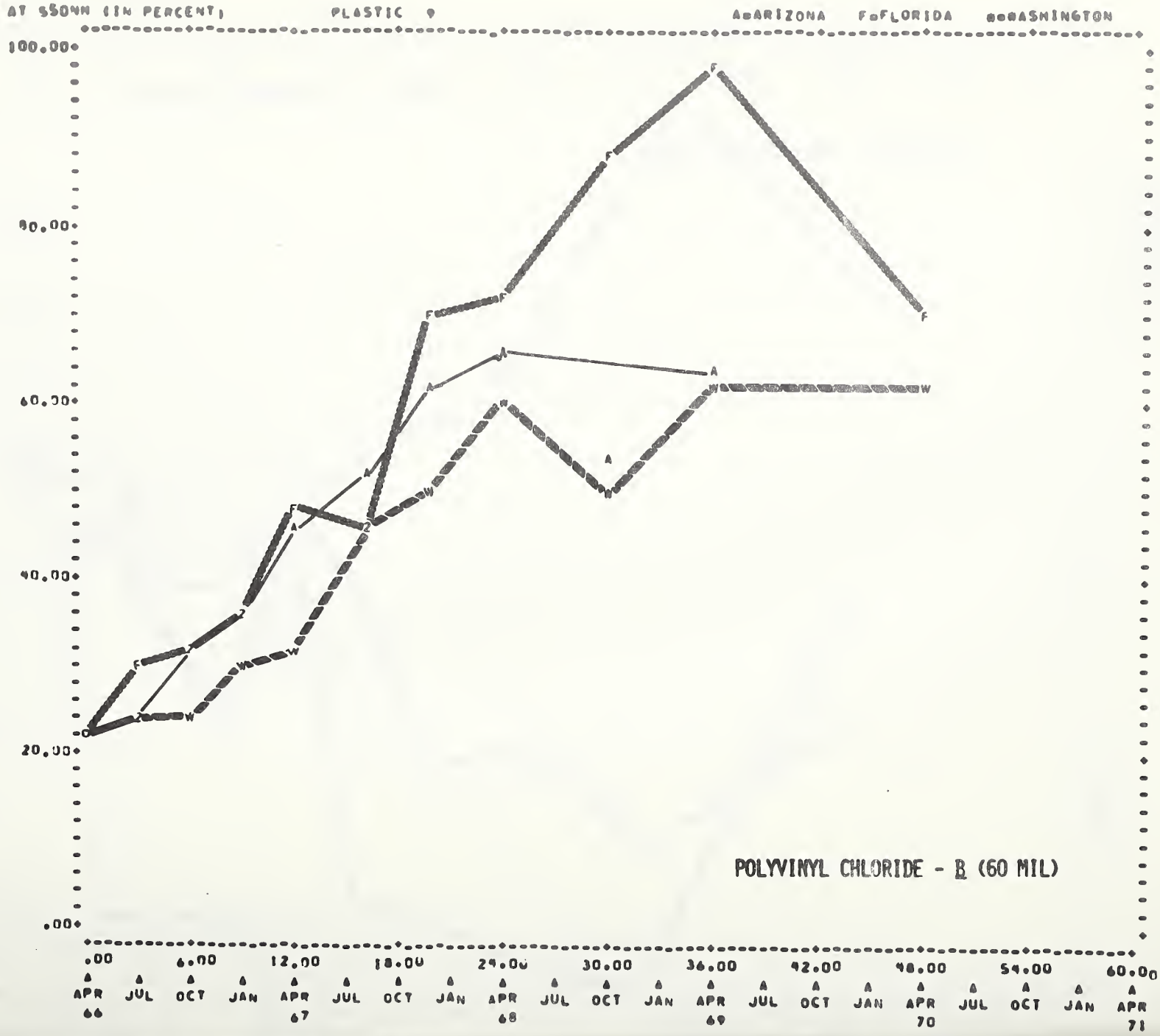

HAZE AT SOWN (IN PERCENT)
PLASTIC 9
A=ARIZONA F=FLORIDA W=WASHINGTON
100.00
80.00
60.00
40.00
20.00
.00
.00 APR 66
6.00 OCT
12.00 APR 67
18.00 OCT
24.00 APR 68
30.00 OCT
36.00 APR 69
42.00 OCT
48.00 APR 70
54.00 OCT
60.00 APR 71
JUL
JAN
POLYVINYL CHLORIDE - B (60 MIL)

FIGURE 77 B

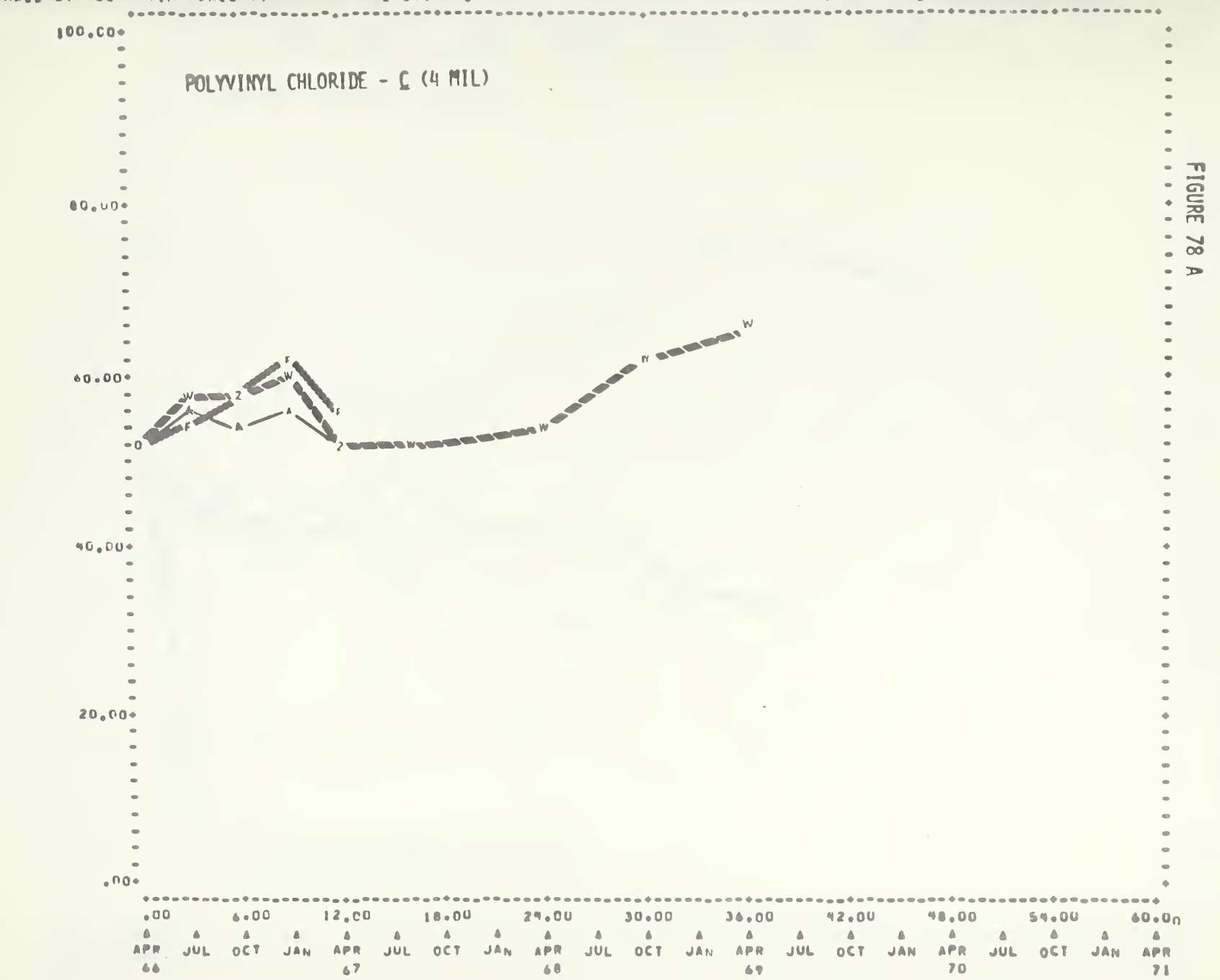

HAZE AT 420NM (IN PERCENT)
PLASTIC ID
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL CHLORIDE - C (4 MIL)
100.00
80.00
60.00
40.00
20.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 78 A

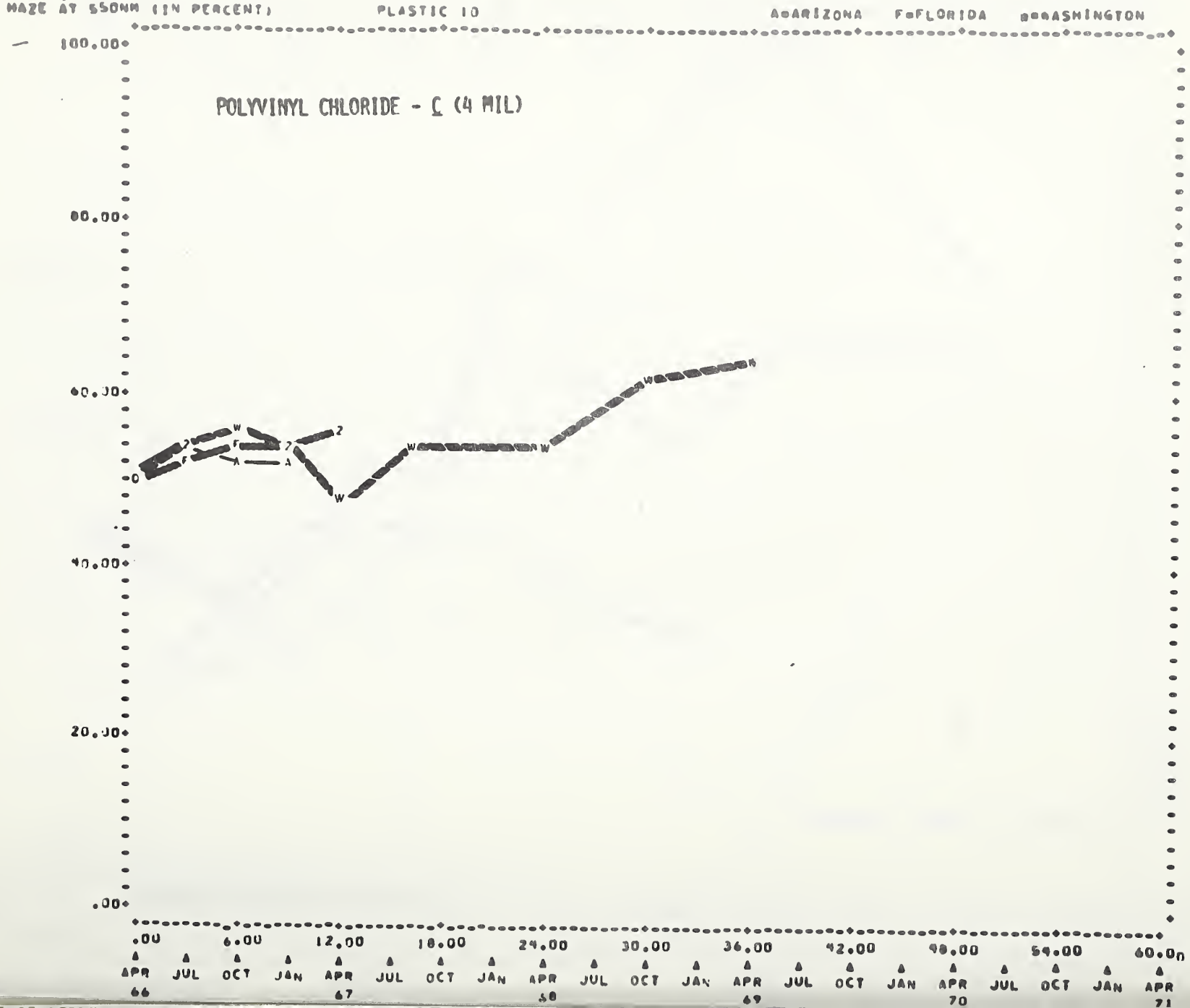

HAZE AT 550NM (IN PERCENT)
PLASTIC 10
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL CHLORIDE - C (4 MIL)
100.00
80.00
60.00
40.00
20.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 78 B

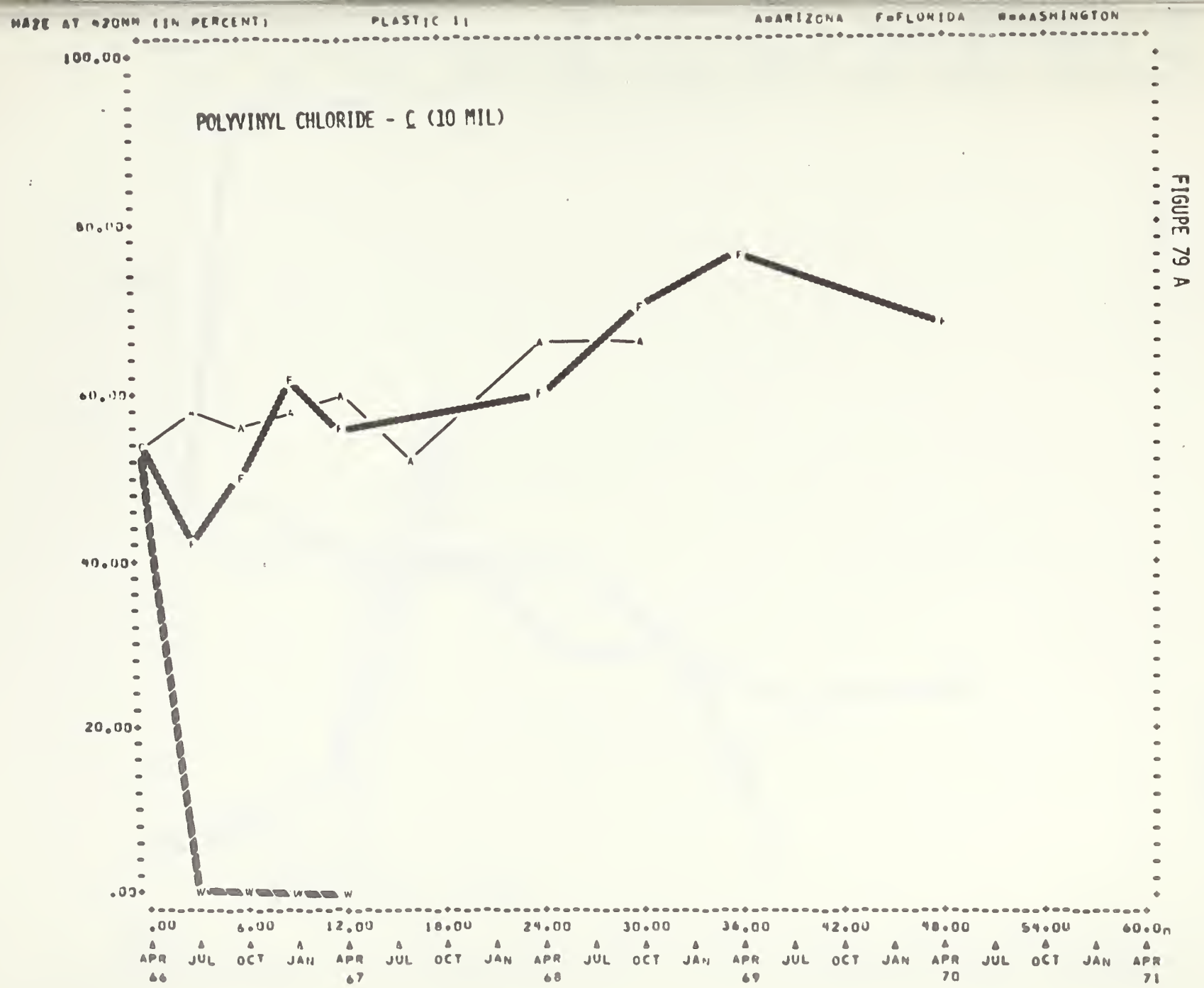

HAZE AT 420NM (IN PERCENT)
PLASTIC II
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL CHLORIDE - C (10 MIL)
100.00
80.00
60.00
40.00
20.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.0n
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 79 A

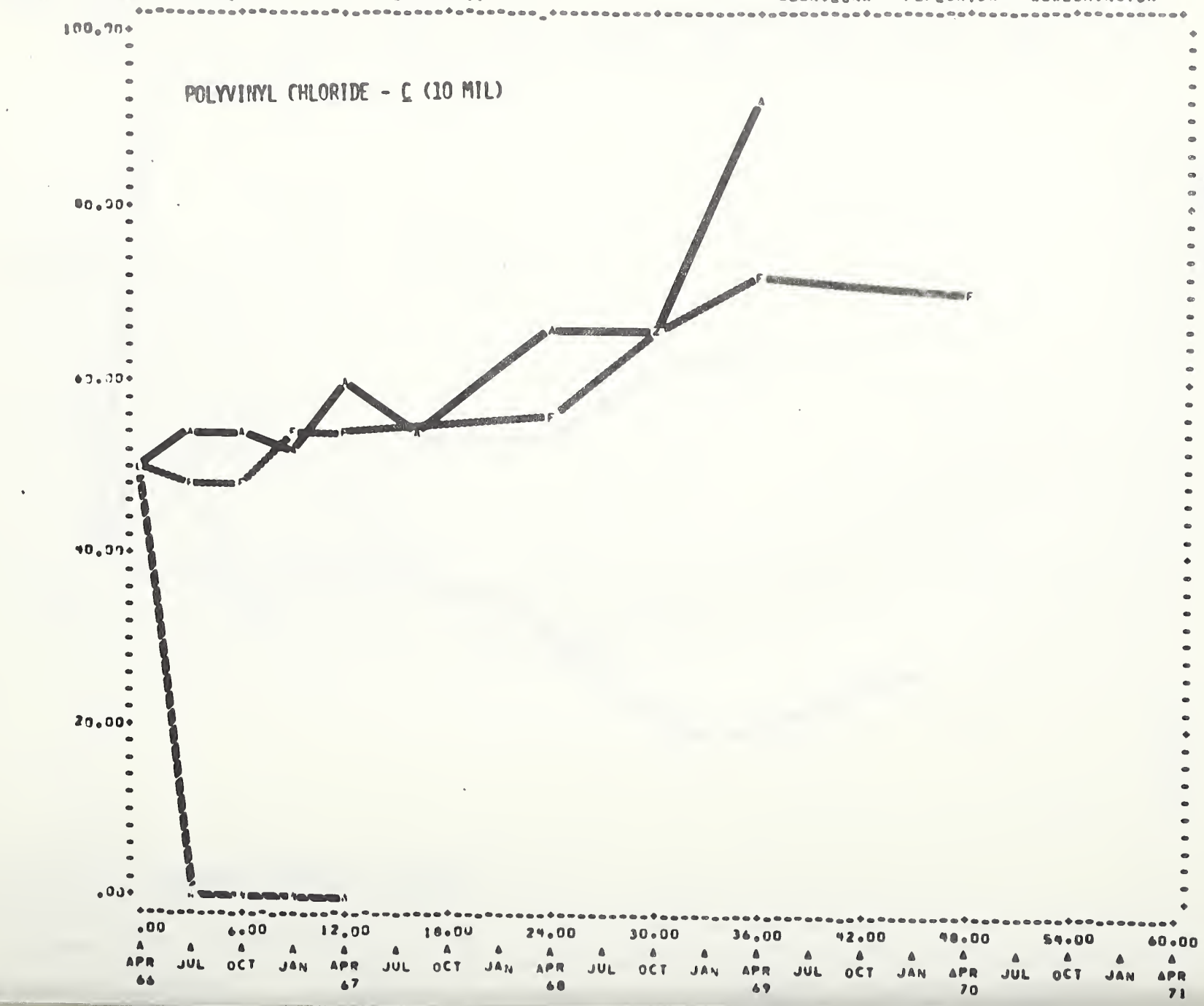

HAZE AT 550NM (IN PERCENT)
PLASTIC II
AeARIZONA FeFLORIDA WeWASHINGTON
POLYVINYL CHLORIDE - C (10 MIL)
100.00
80.00
60.00
40.00
20.00
.00
.00 APR 66
6.00 JUL OCT JAN
12.00 APR 67
18.00 JUL OCT JAN
24.00 APR 68
30.00 JUL OCT JAN
36.00 APR 69
42.00 JUL OCT JAN
48.00 APR 70
54.00 JUL OCT JAN
60.00 APR 71

FIGURE 79 B

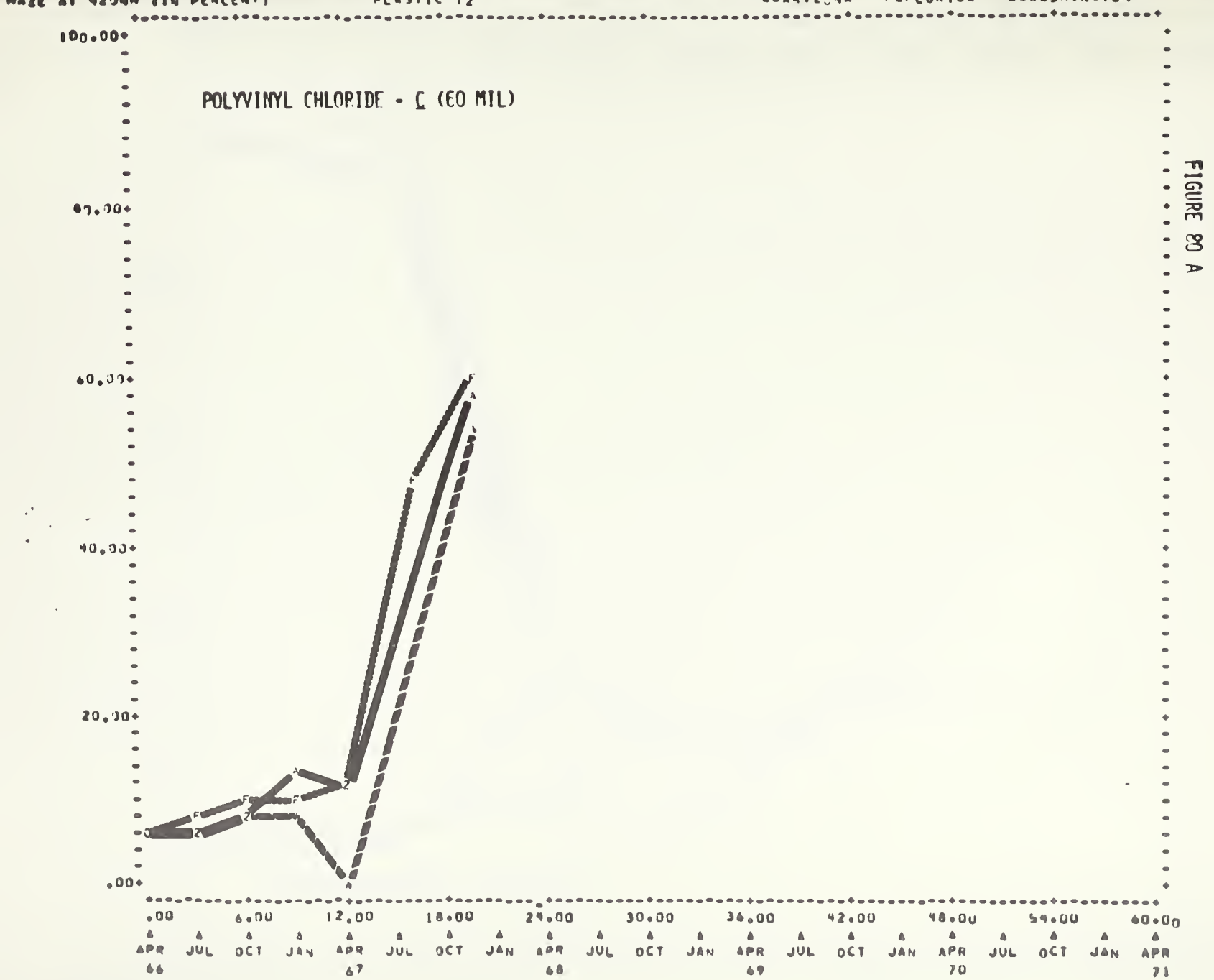

HAZE AT 420NM (IN PERCENT)
PLASTIC 12
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL CHLORIDE - C (60 MIL)
100.00
80.00
60.00
40.00
20.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 80 A

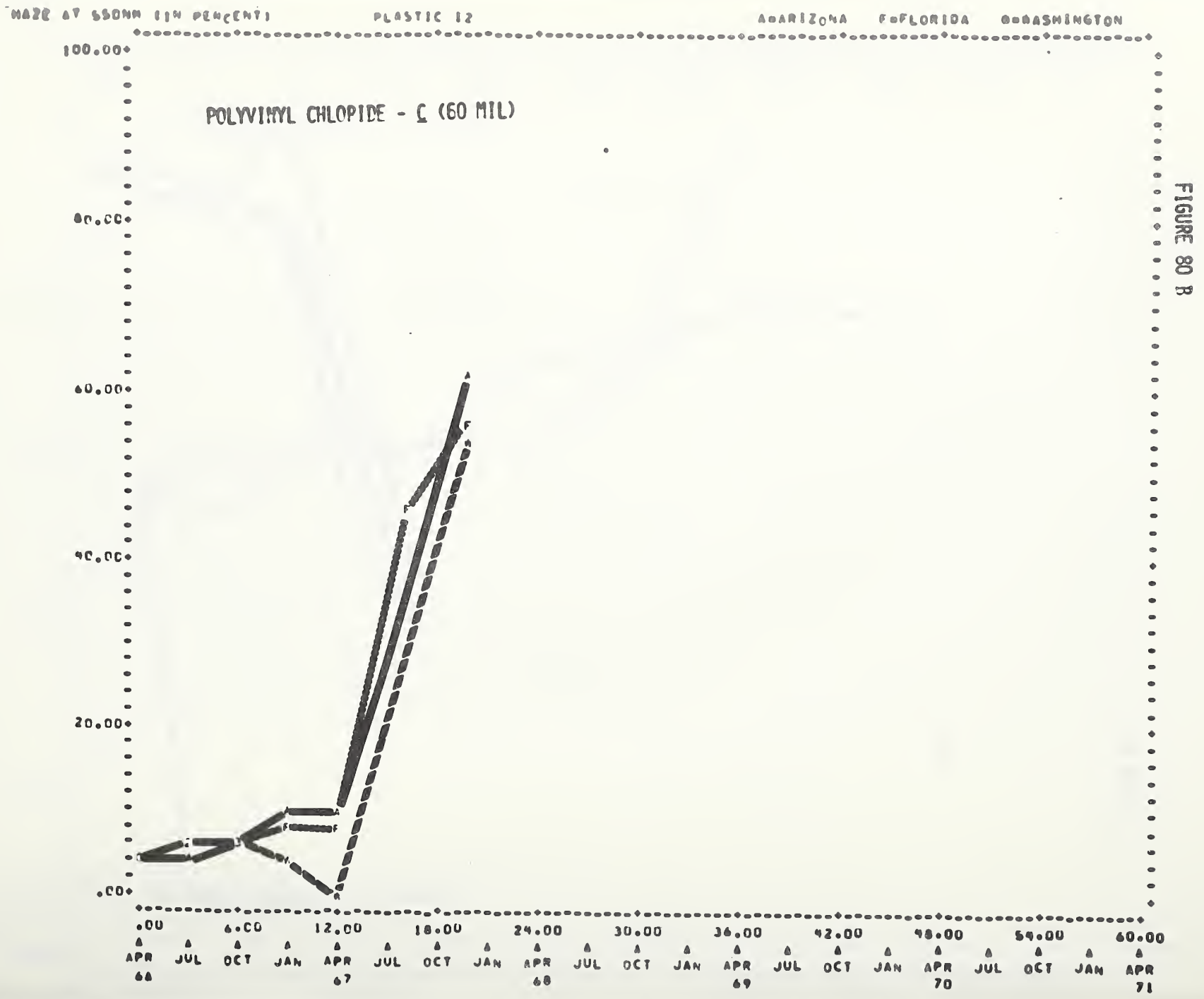

HAZE AT 550NM (IN PERCENT)
PLASTIC 12
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL CHLOPIDE - C (60 MIL)
100.00
80.00
60.00
40.00
20.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 80 B

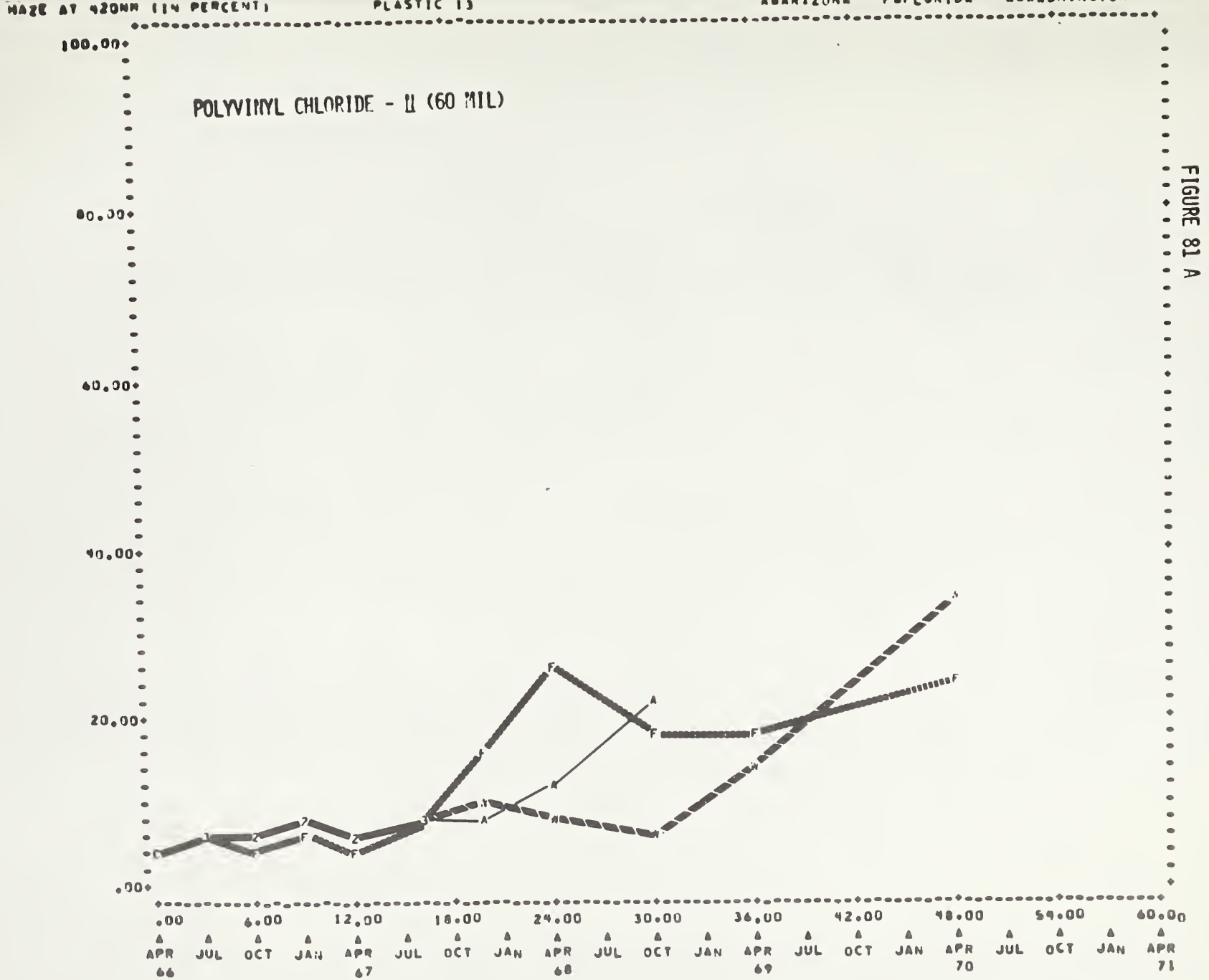

HAZE AT 420NM (IN PERCENT)
PLASTIC 13
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL CHLORIDE - U (60 MIL)
100.00
80.00
60.00
40.00
20.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 81 A

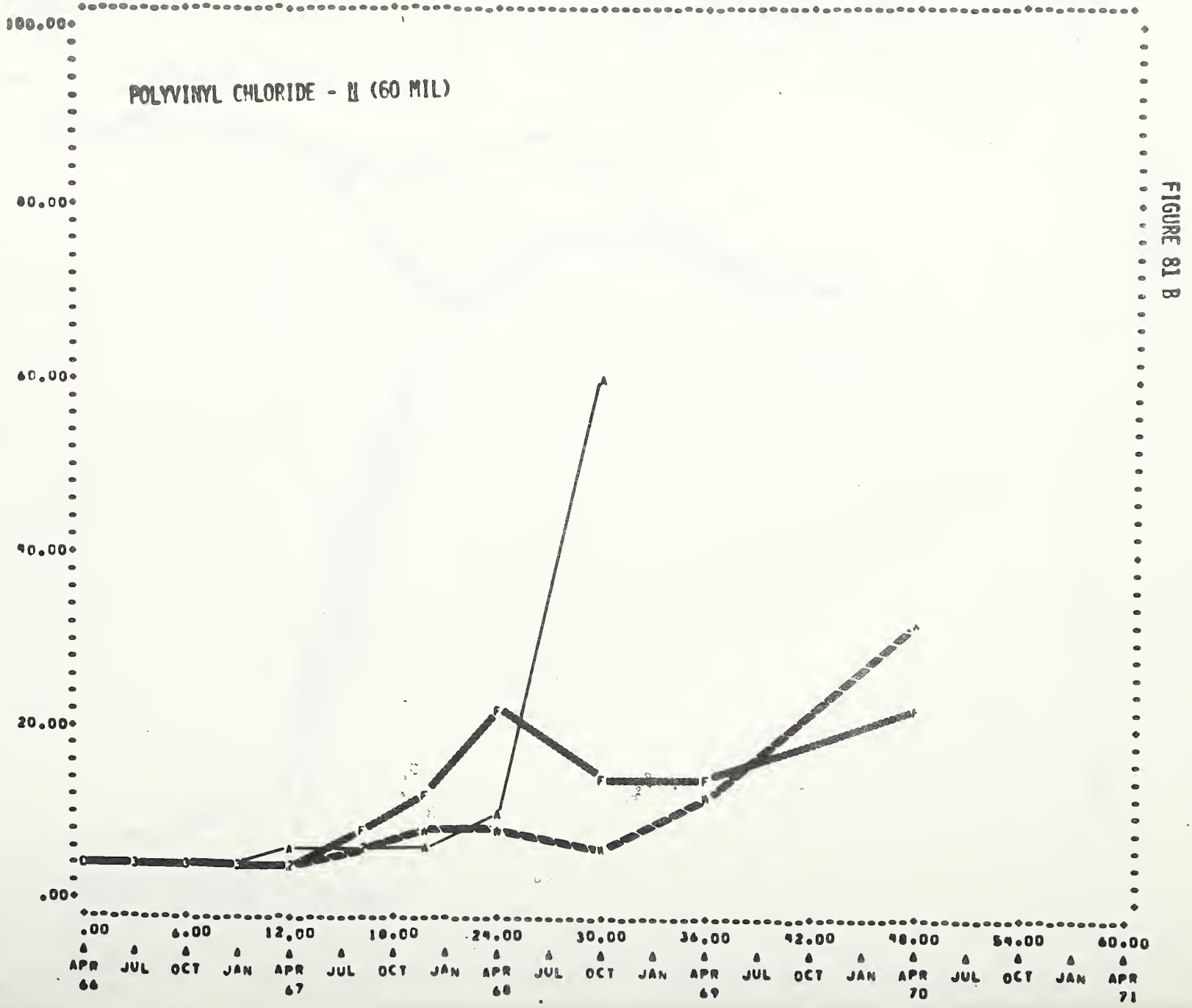

HAZE AT 550NM (IN PERCENT)
PLASTIC 13
A=ARIZONA F=FLORIDA W=WASHINGTON
POLYVINYL CHLORIDE - M (60 MIL)
100.00
80.00
60.00
40.00
20.00
.00
.00
6.00
12.00
18.00
24.00
30.00
36.00
42.00
48.00
54.00
60.00
APR 66
JUL
OCT
JAN
APR 67
JUL
OCT
JAN
APR 68
JUL
OCT
JAN
APR 69
JUL
OCT
JAN
APR 70
JUL
OCT
JAN
APR 71

FIGURE 81 B


DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS