

AD AD 46 915



TECHNICAL REPORT H-75-4

LOS ANGELES AND LONG BEACH HARBORS MODEL STUDY.

Report 5.

TIDAL VERIFICATION AND BASE CIRCULATION TESTS
APPENDIX B: SURFACE-CURRENT PATTERN MOSAICS

by

William H. McAnally, Jr.

Hydraulics Laboratory

U. S. Army Engineer Waterways Experiment Station
P. O. Box 631, Vicksburg, Miss. 39180

September 1975

Report 5 of a Series

Approved For Public Release; Distribution Unlimited

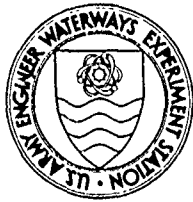
Handwritten circled number 10 and other scribbles.

Handwritten circled number 11 and other scribbles.

7D NO. FILE COPY

Prepared for U. S. Army Engineer District, Los Angeles
Los Angeles, Calif. 90053

038 100



TECHNICAL REPORT H-75-4

FILES AND LONG BEACH PORTS MODEL STUDY.

Report 5.

CHANNEL AND BASE CIRCULATION TESTS. SURFACE-CURRENT PATTERN MOSAICS.

by

William H./McAnally, Jr.

Hydraulics Laboratory
Engineer Waterways Experiment Station
Box 631, Vicksburg, Miss. 39180

September 1975

Report 5 of a Series

Available For Public Release; Distribution Unlimited

DDC
RECEIVED
DEC 2 1977
ALBUQUERQUE
A

1144p

14 WES-TR-H-75-4-5

S. Army Engineer District, Los Angeles
Los Angeles, Calif. 90053

8 100

2

APPENDIX B: SURFACE-CURRENT PATTERN MOSAICS

This appendix contains surface-current pattern mosaics of base tidal circulation tests conducted in the physical model of Los Angeles-Long Beach Harbors. Descriptions of the model and tests plus other data are included in the main report.*

Mosaics are included for each hour of a complete tidal cycle under two tidal conditions--a typical spring range tide (7.1-ft diurnal range) and a neap range tide (3.5-ft diurnal range). A plot of tidal elevations for gage LA is shown on the hour 0 mosaic for each tidal condition.

These mosaics, reproduced at about 35 percent of the original size, are 10-sec (400 sec prototype time) time-exposure photographs of confetti floating on the water surface. Confetti streak lengths may be converted to current speed by subtracting the confetti chip width from the length and then using the speed scale shown on each mosaic. A bright light was flashed just before the camera lens was closed, resulting in a bright spot (or dot) at approximately the end of each confetti streak which indicates the direction of flow; however, the dot is not discernible on some of the streaks. Care should be taken not to interpret clusters of confetti as streaks. The text of the main report provides additional information on the use of these mosaics.

* W. H. McAnally, Jr., "Los Angeles and Long Beach Harbors Model Study; Tidal Verification and Base Circulation Tests," Technical Report H-75-4, Report 5, Sep 1975, U. S. Army Engineer Waterways Experiment Station, CE, Vicksburg, Miss.

Destroy this report when no longer needed. Do not return
it to the originator.

N





SCALES IN FEET

DDC
DEC 2 1977

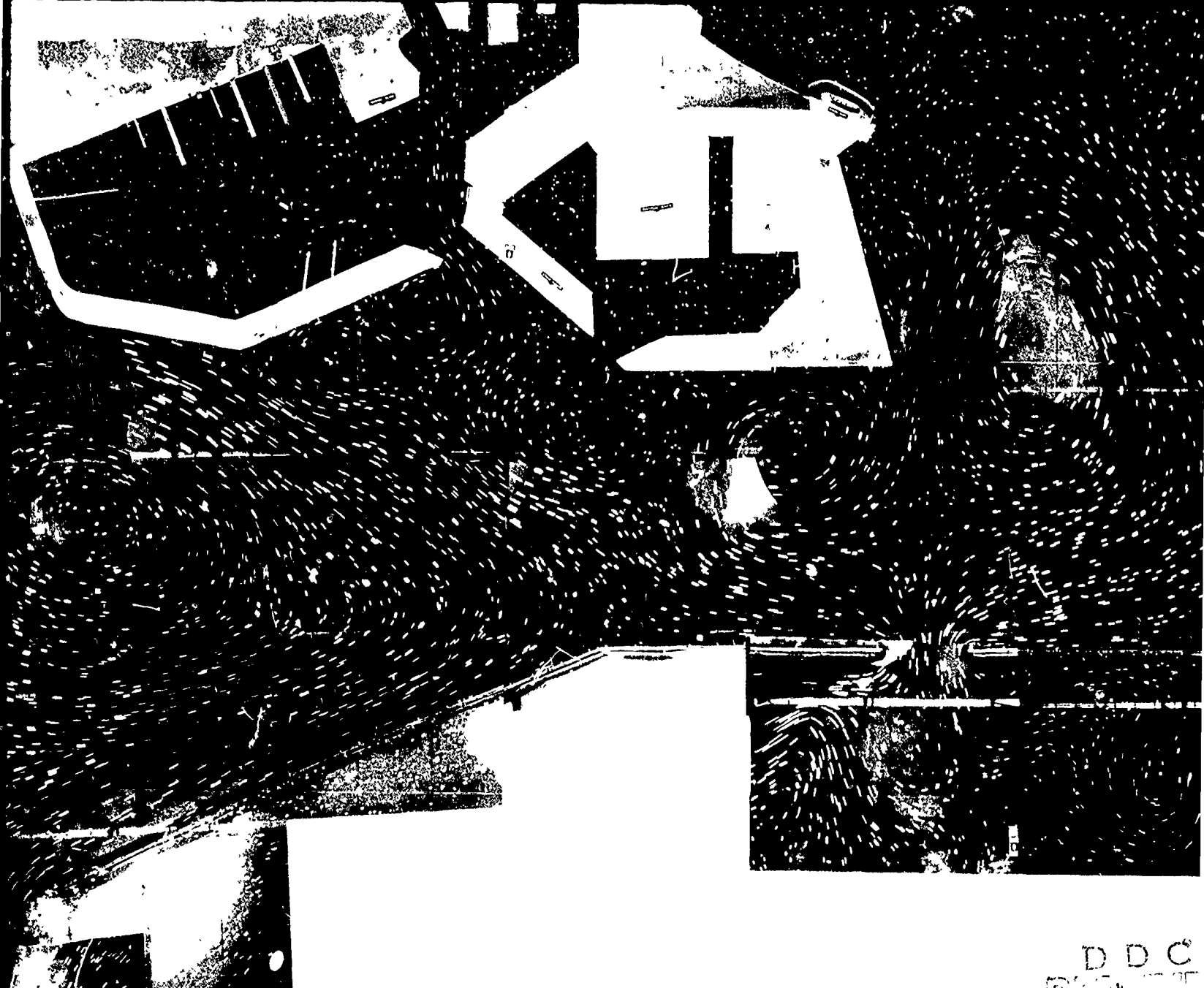
(1)



DDC
DEC 2 1977

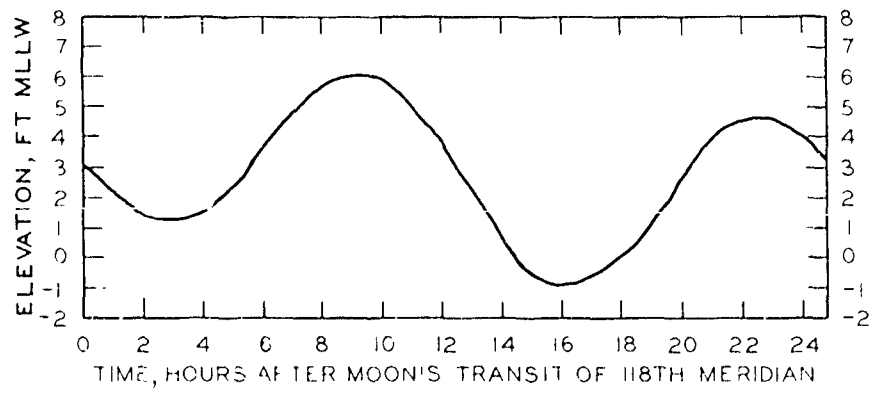
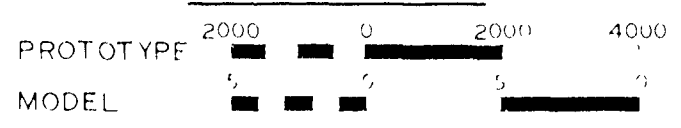
N





D D C
 DECEMBER 2 1977

SCALES IN FEET



SURFA



DDC
 DEC 2 1977

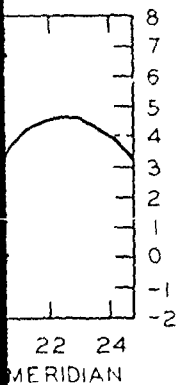
VELOCITY SCALE
 1 0 1 2 3 FPS
 PROTOTYPE 1/100

4000

MODEL STUDY OF
 LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

BASE TEST
 SPRING TIDE
 HOUR 0





N



SCALES IN FEET



VELOCITY SCALE

BY	DISBURSEMENT
Date	





SCALES IN FEET

PROTOTYPE	2000	0	2000	4000
MODEL	5	0	5	10

SURF



4000
J
10

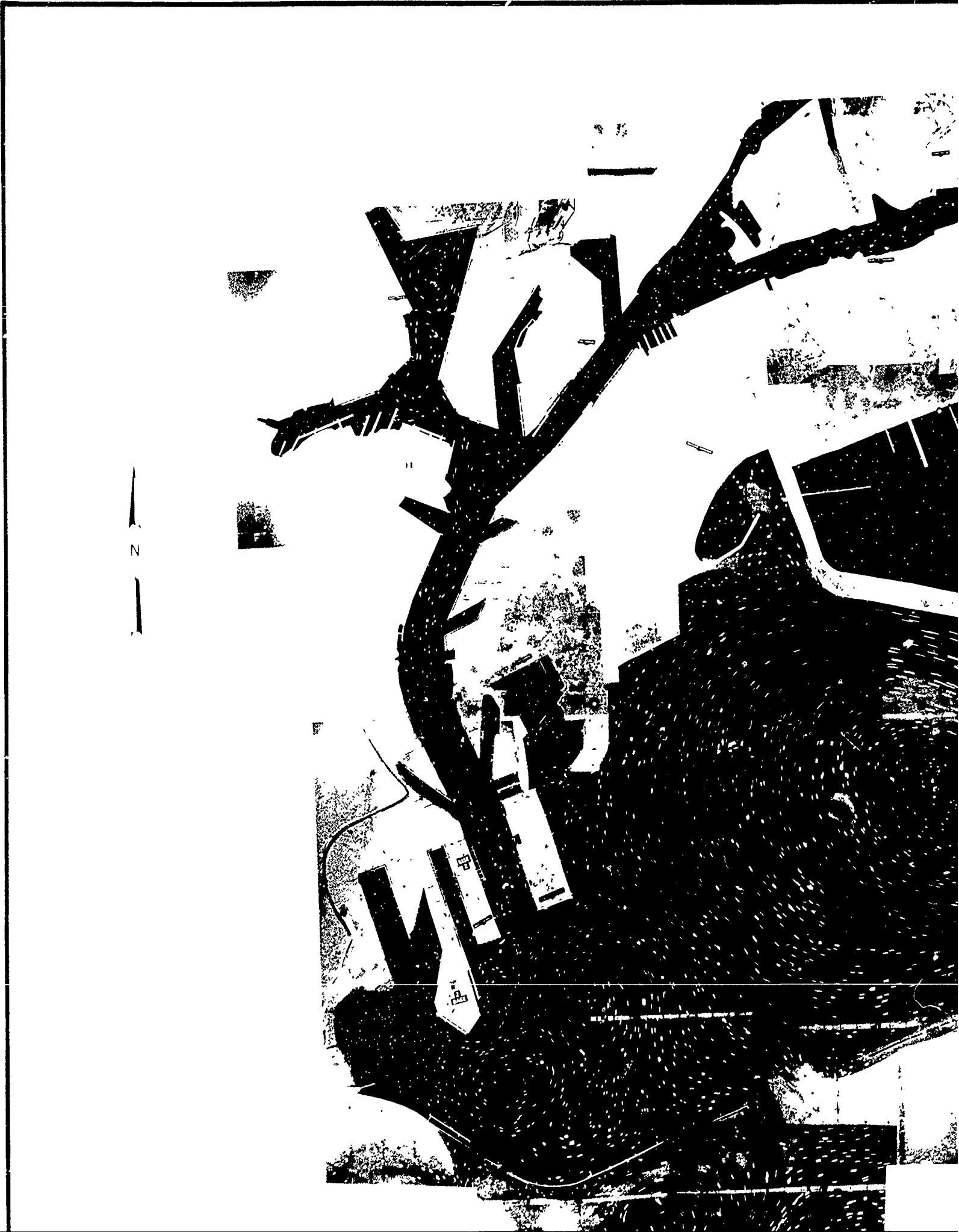
VELOCITY SCALE
1 0 1 2 3 FPS
PROTOTYPE (1:100)

By
Date
123

MODEL STUDY OF
LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

BASE TEST
SPRING TIDE
HOUR 1





SCALES IN FEET

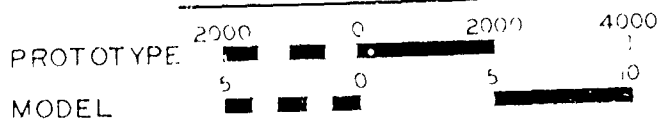


VELOCITY SCALE





SCALES IN FEET




LOS /

SURFACE



VELOCITY SCALE

1 0 1 2 3 FPS
 PROTOTYPE 

4000

0

MODEL STUDY OF
 LOS ANGELES-LONG BEACH HARBORS

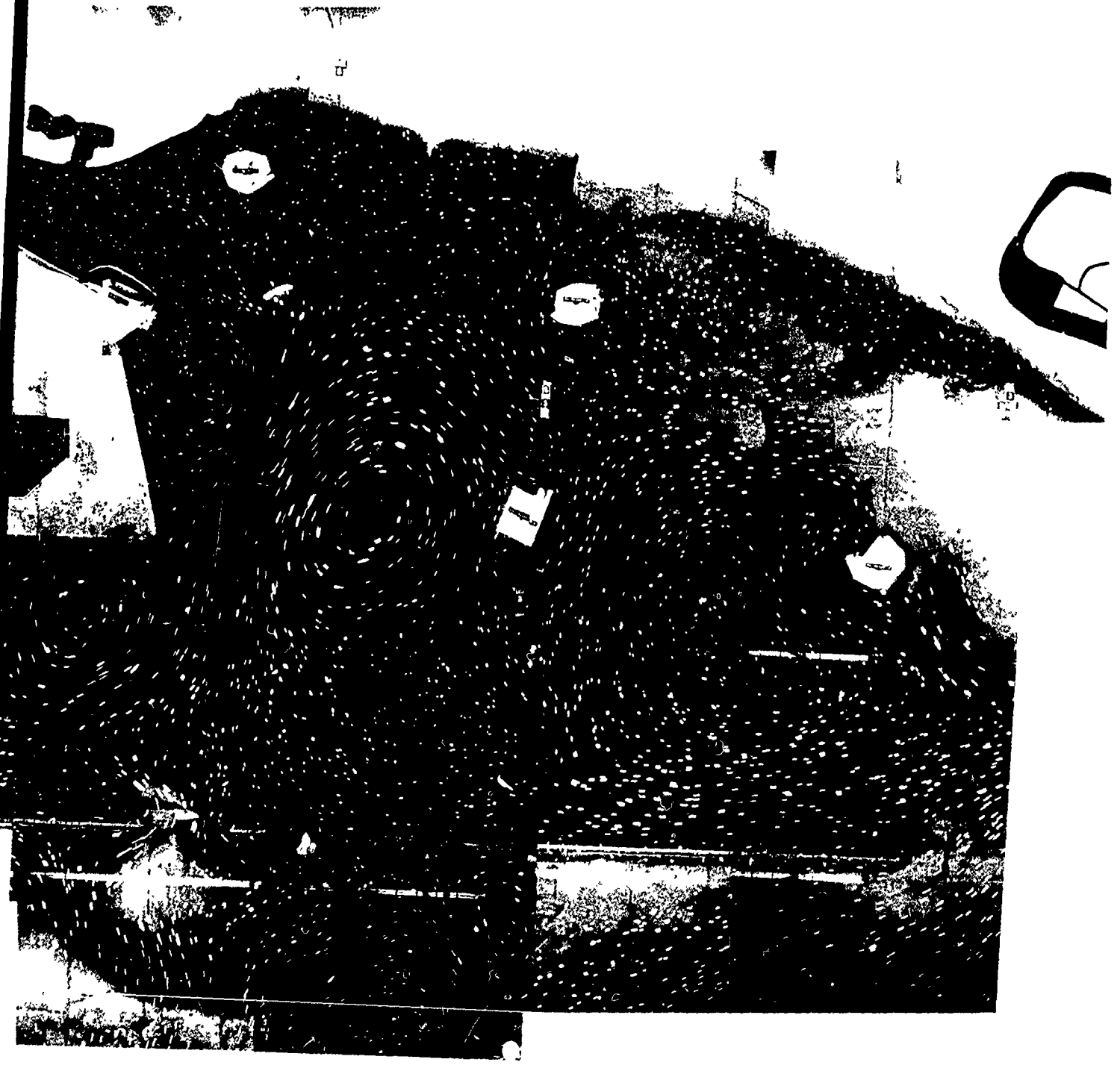
SURFACE CURRENT PATTERNS

BASE TEST
 SPRING TIDE
 HOUR 2





SCALES IN FEET



VELOCITY SCALE

1.0 1.2 3.0 5.0



N



SCALES IN FEET

PROTOTYPE	2000	0	2000	4000
MODEL	5	0	5	10

SURFA

5



4000
1
10

VELOCITY SCALE
1 0 1 2 3 FPS
PROTOTYPE (unit: 1, 1, 1)

MODEL STUDY OF
LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

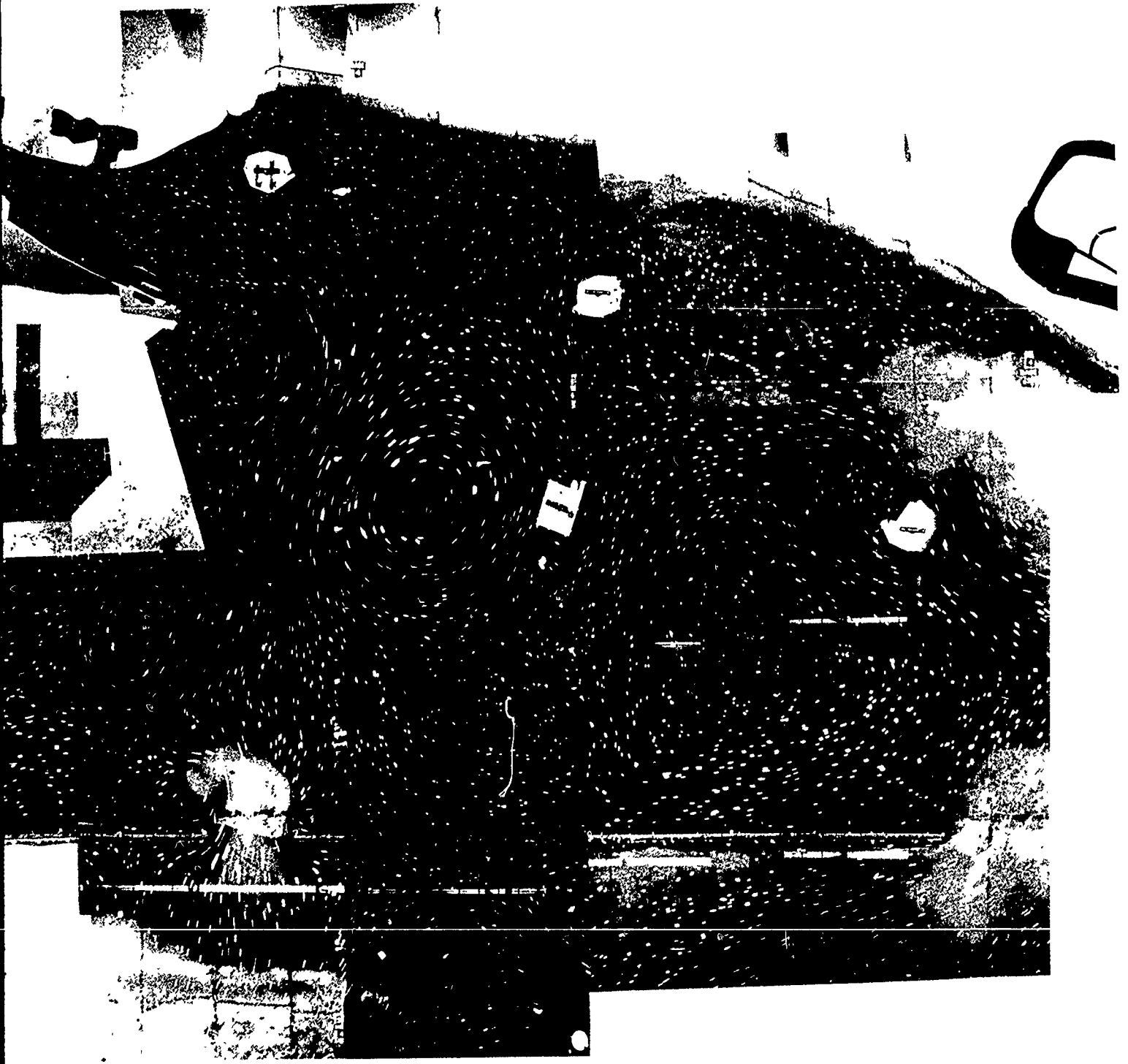
BASE TEST
SPRING TIDE
HOUR 3

10





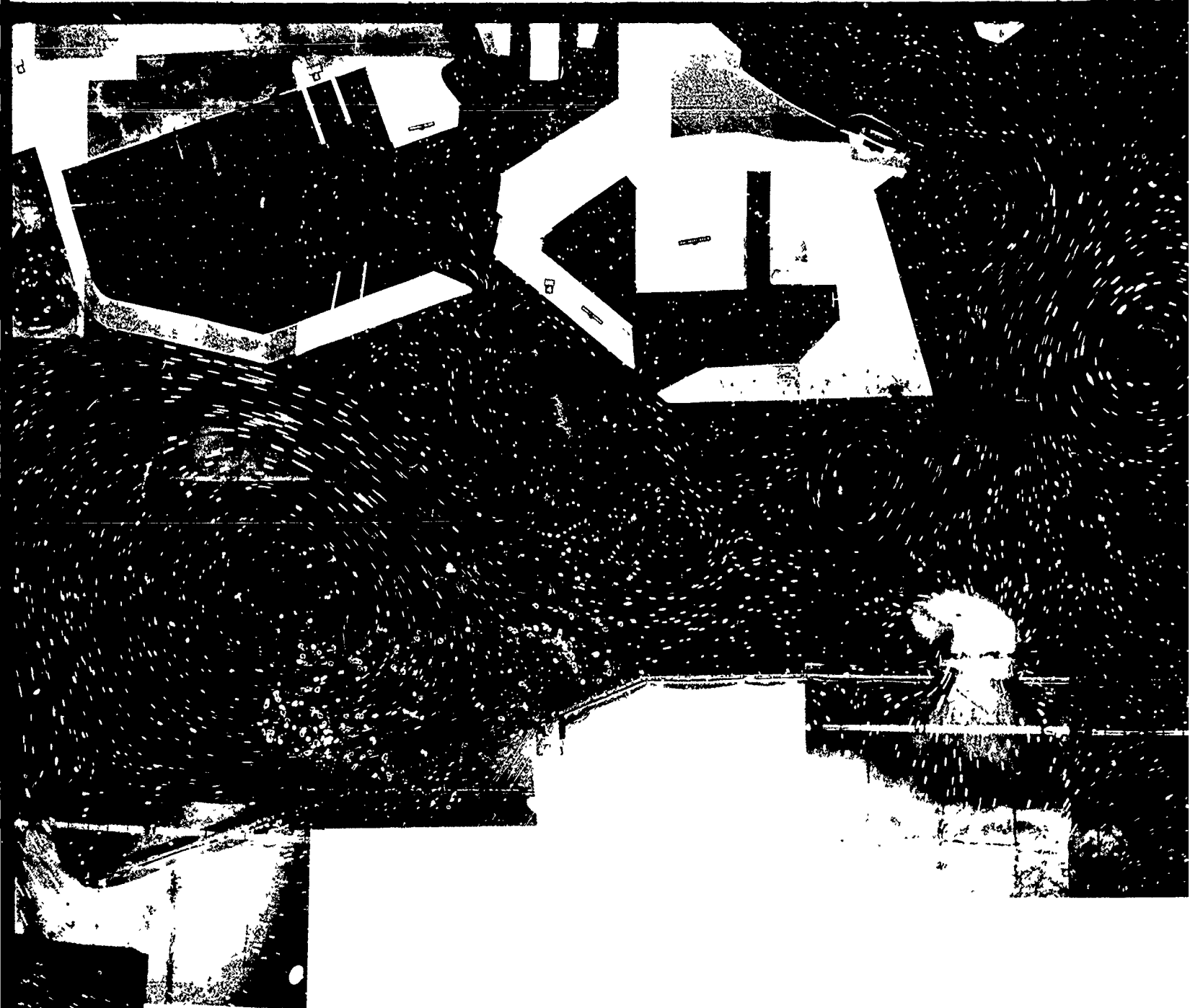
SCALES IN FEET



VELOCITY SCALE

N





SCALES IN FEET

	2000	0	2000	4000
PROTOTYPE	█	█	█	█
MODEL	5	0	5	10

SURF



4000
 }
 10

VELOCITY SCALE
 1 0 1 2 3 FPS
 PROTOTYPE *(faint text)*

MODEL STUDY OF
 LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

BASE TEST
 SPRING TIDE
 HOUR 4

1

N





SCALES IN FEET



VELOCITY SCALE

1:1.2.3.4.5.6.7.8.9.10.11.12.13.14.15.16.17.18.19.20.21.22.23.24.25.26.27.28.29.30.31.32.33.34.35.36.37.38.39.40.41.42.43.44.45.46.47.48.49.50.51.52.53.54.55.56.57.58.59.60.61.62.63.64.65.66.67.68.69.70.71.72.73.74.75.76.77.78.79.80.81.82.83.84.85.86.87.88.89.90.91.92.93.94.95.96.97.98.99.100



N

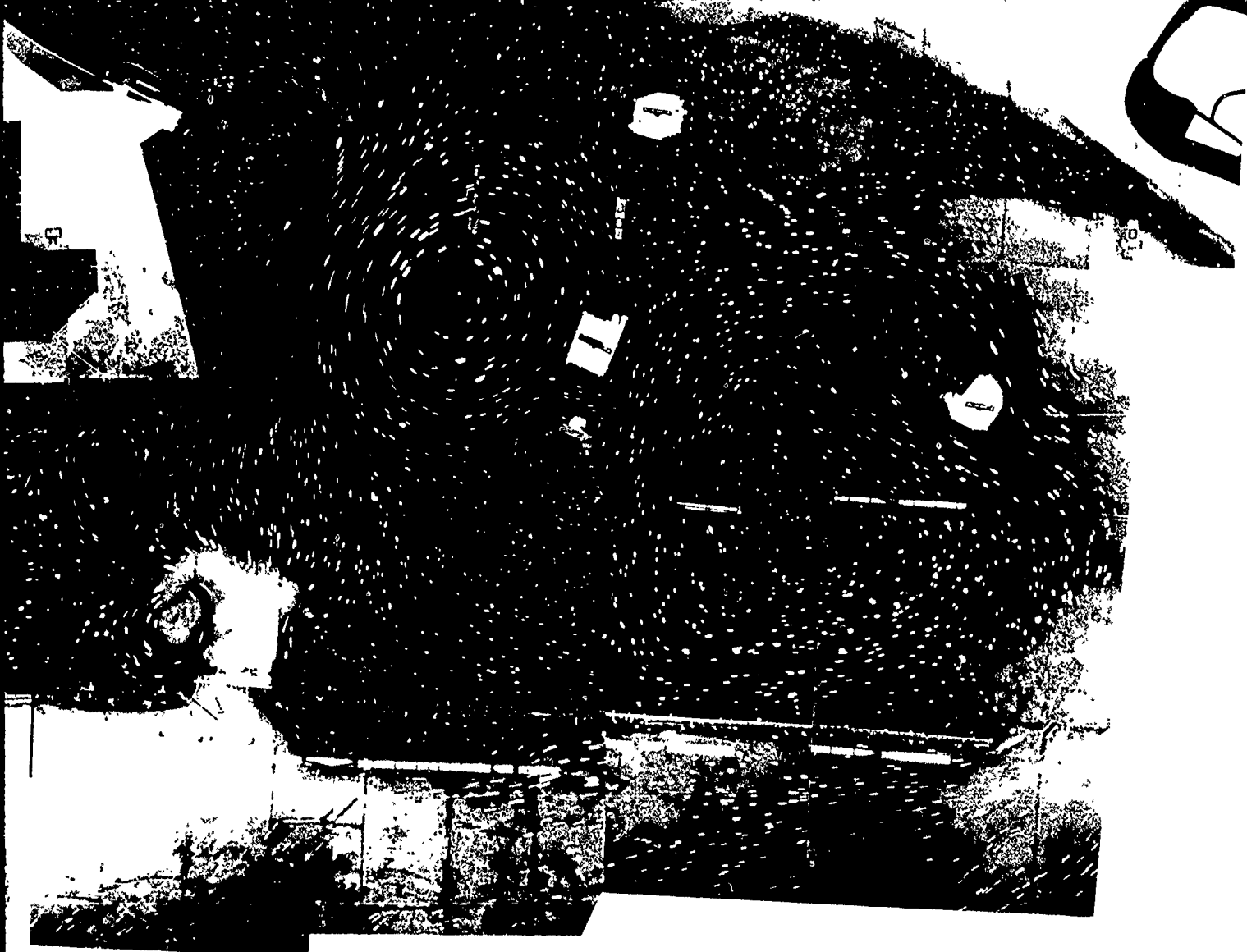


SCALES IN FEET

PROTOTYPE	2000	0	2000	4000
MODEL	5	0	5	10

SURFA

4



4000
)
 10

VELOCITY SCALE
 1 0 1 2 3 FPS
 PROTOTYPE (1:100)

MODEL STUDY OF
 LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

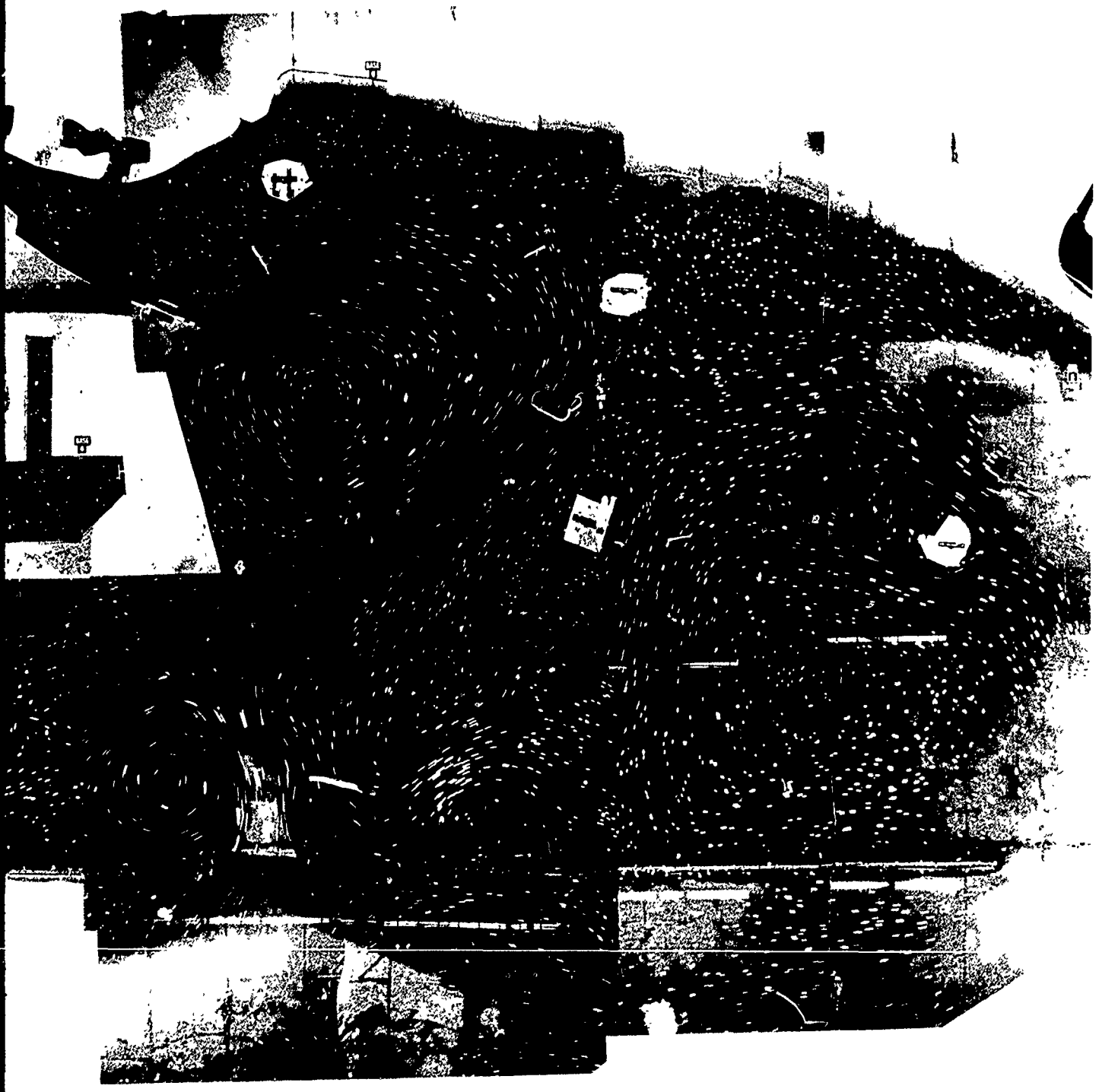
BASE TEST
 SPRING TIDE
 HOUR 5

N





SCALES IN FEET



VELOCITY SCALE

1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0



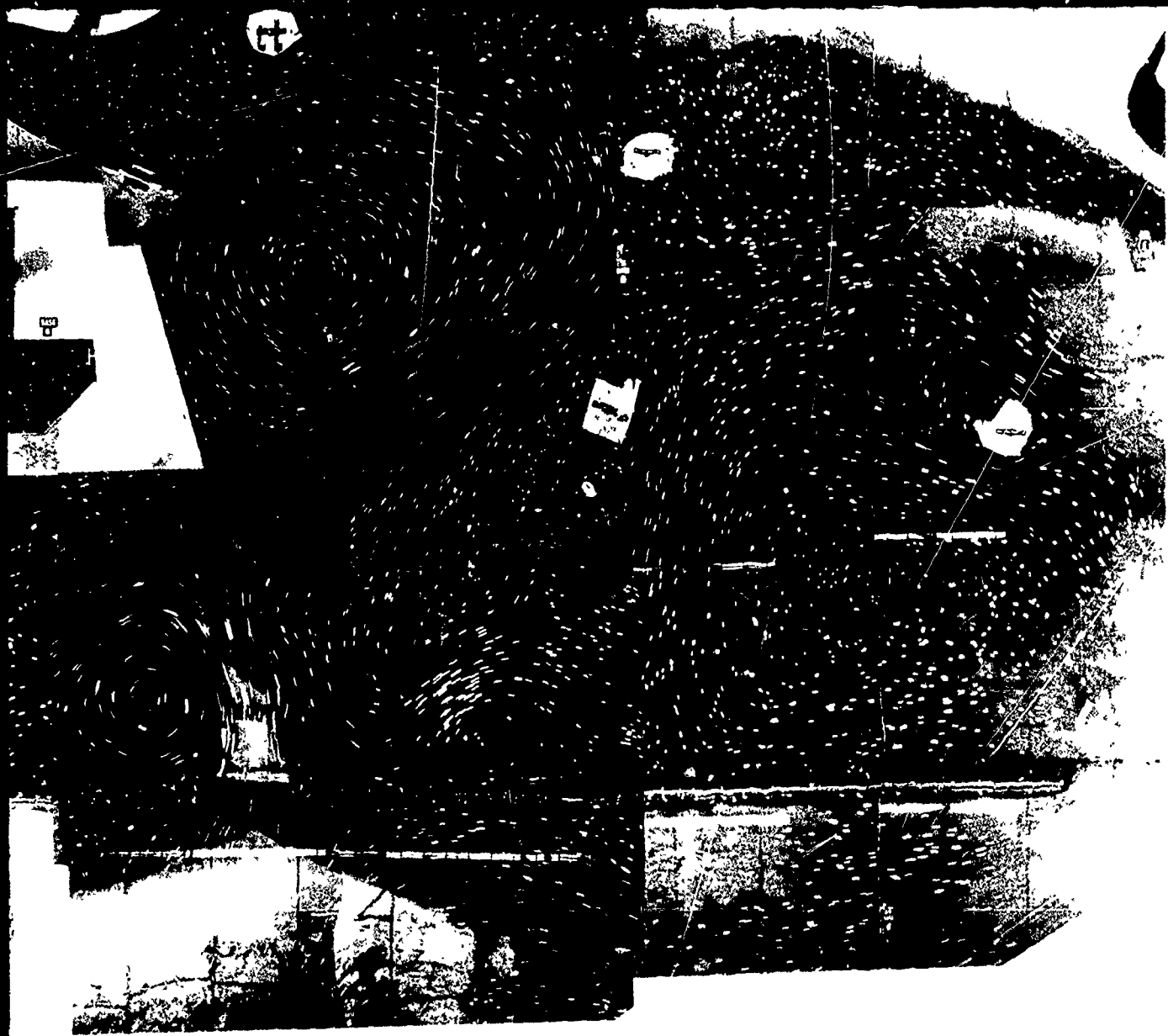
H



SCALES IN FEET

PROTOTYPE	2000	0	2000	4000
MODEL	5	0	5	10

SUF



VELOCITY SCALE

1 0 1 2 3 FPS
 PROTOTYPE 1000 2000 3000

4000

10

MODEL STUDY OF
 LOS ANGELES-LONG BEACH HARBORS

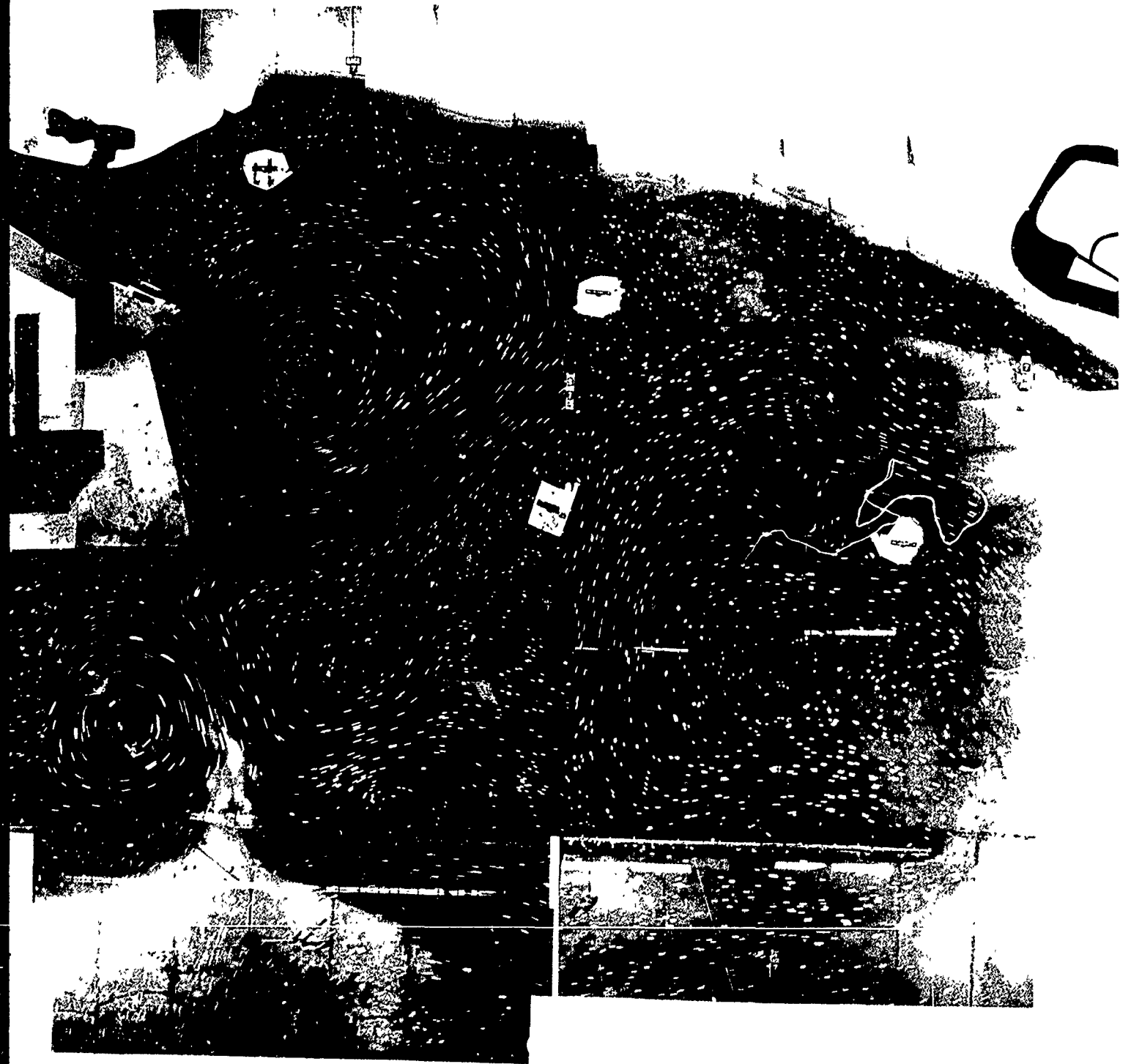
SURFACE CURRENT PATTERNS

BASE TEST
 SPRING TIDE
 HOUR 6





SCALES IN FEET

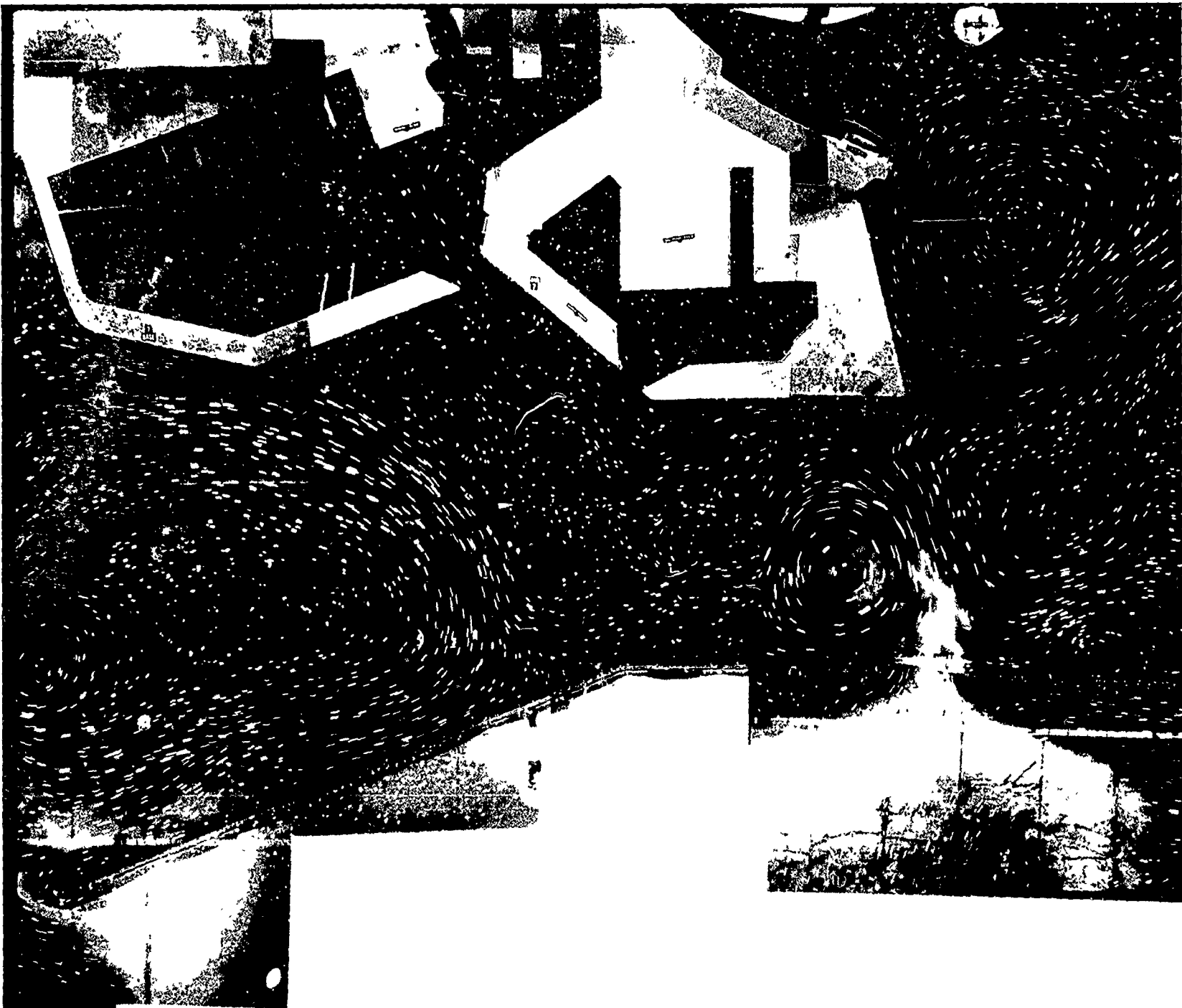


VELOCITY SCALE

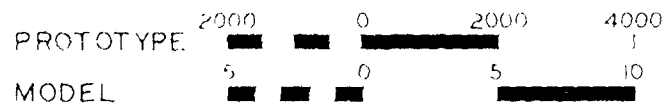
N



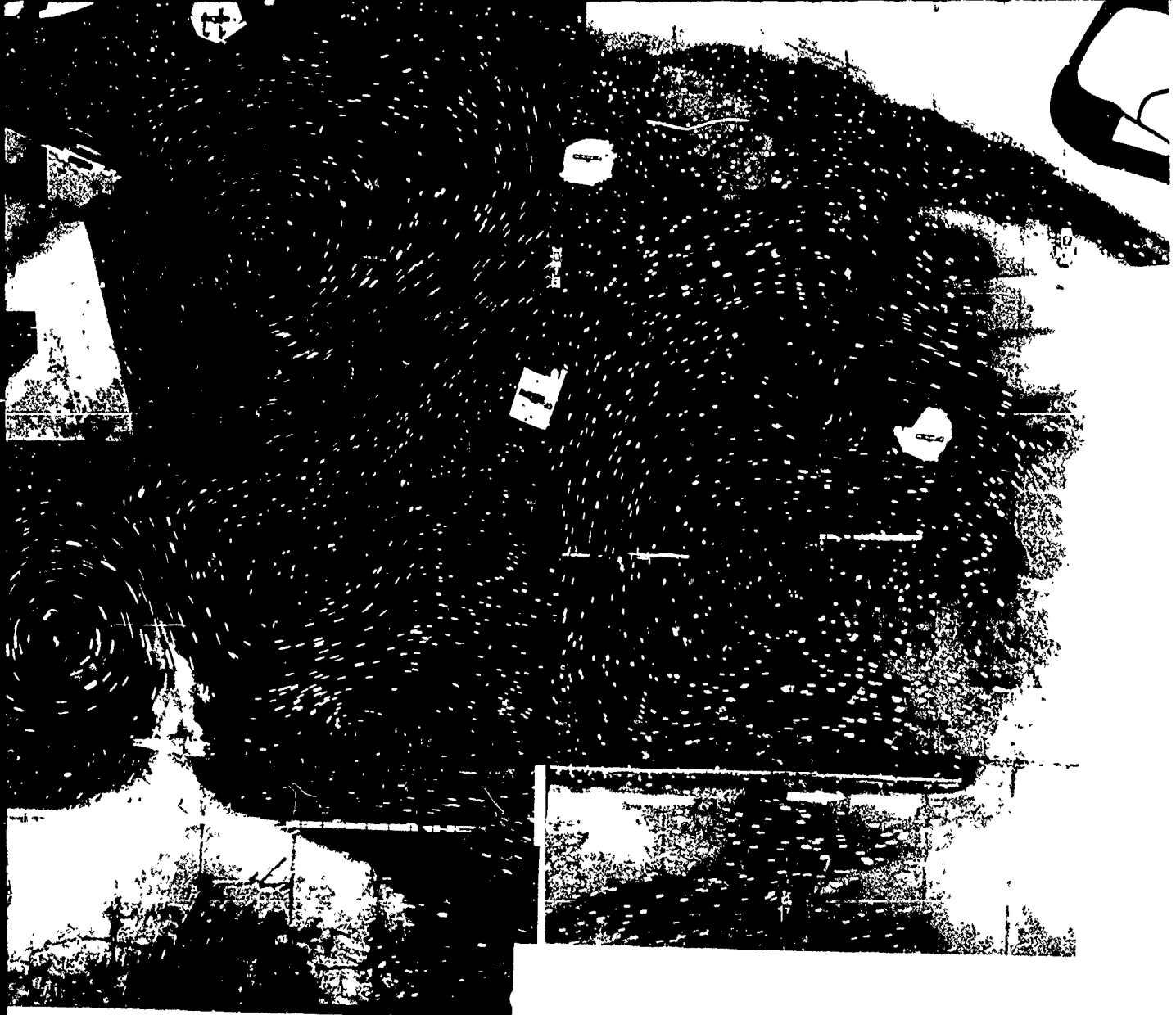
4



SCALES IN FEET



SURFA



VELOCITY SCALE

1 0 1 2 3 FPS
 PROTOTYPE (1:1)

1000
 1
 10

MODEL STUDY OF
 LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

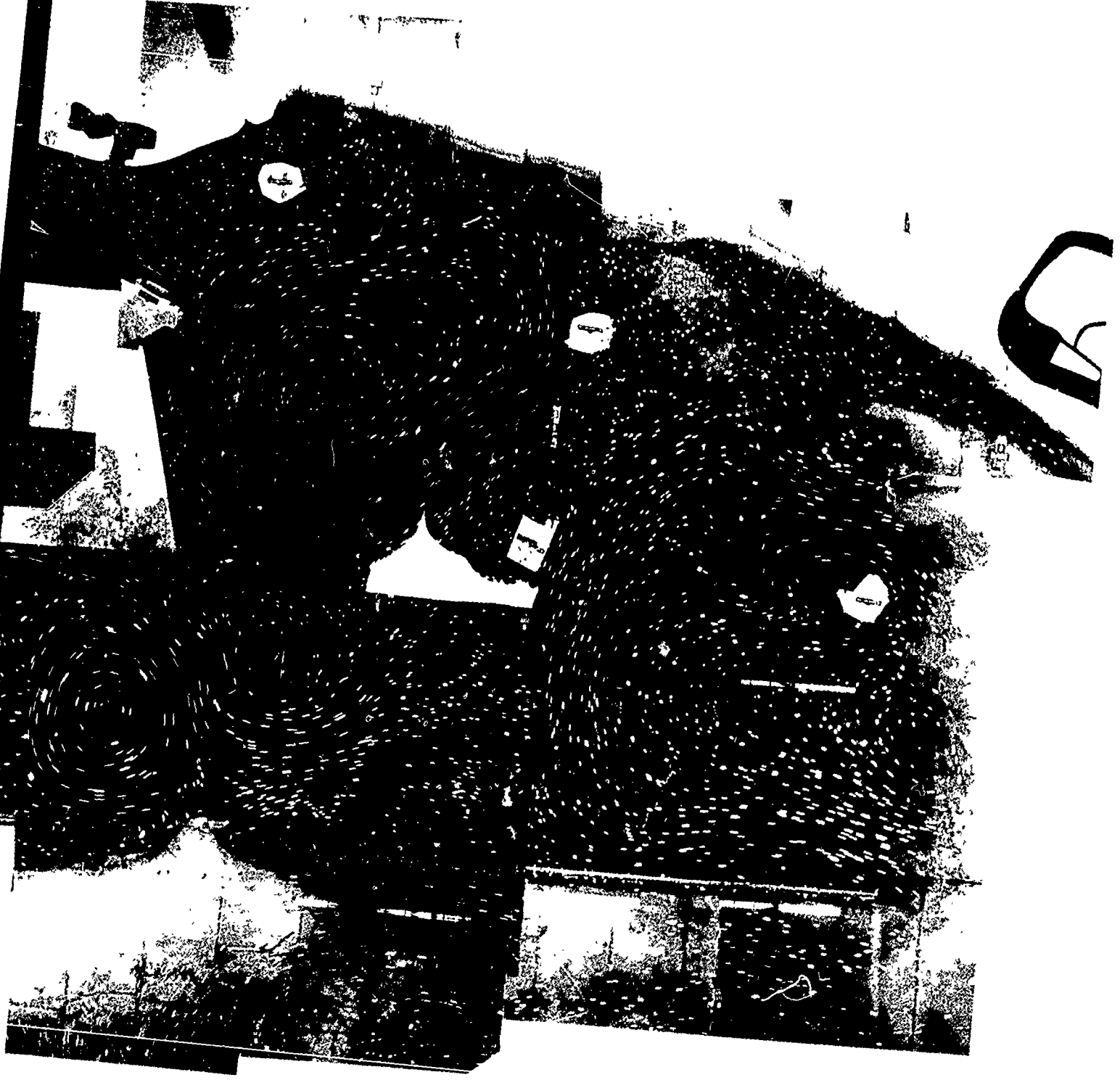
BASE TEST
 SPRING TIDE
 HOUR 7

N





SCALES IN FEET



VELOCITY SCALE

1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0

N



4



SCALES IN FEET

PROTOTYPE	2000	0	2000	4000
	█	█	█	█
MODEL	5	0	5	10
	█	█	█	█

LC

SURFAC



4000
10

VELOCITY SCALE
1 0 1 2 3 FPS
PROTOTYPE 1 1 1 1 1 1

MODEL STUDY OF
LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

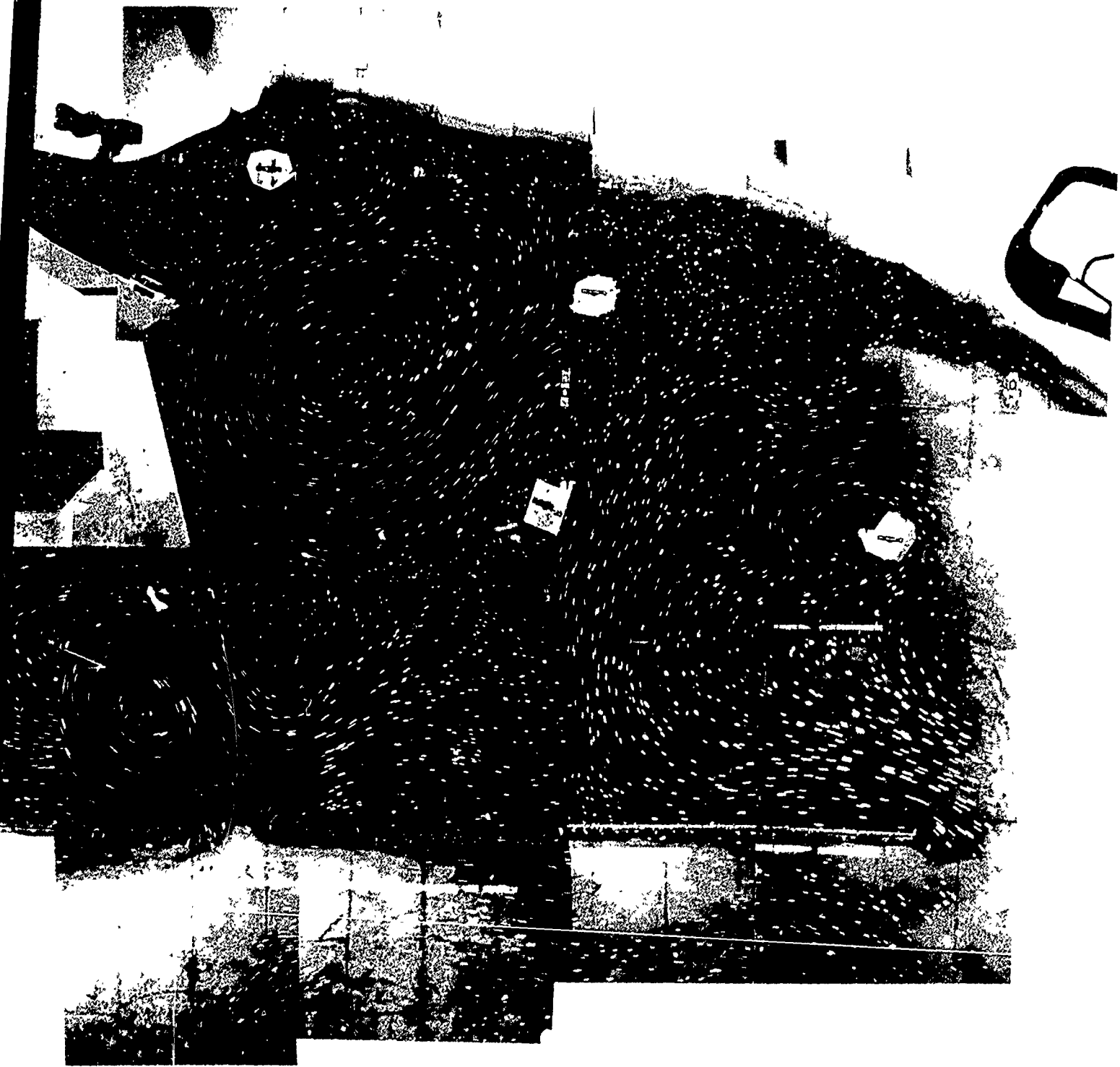
BASE TEST
SPRING TIDE
HOUR 8

N





SCALES IN FEET



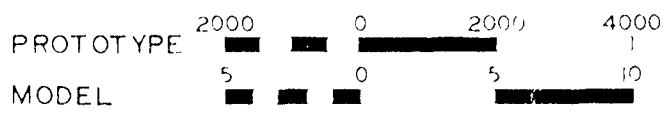
VELOCITY SCALE

N



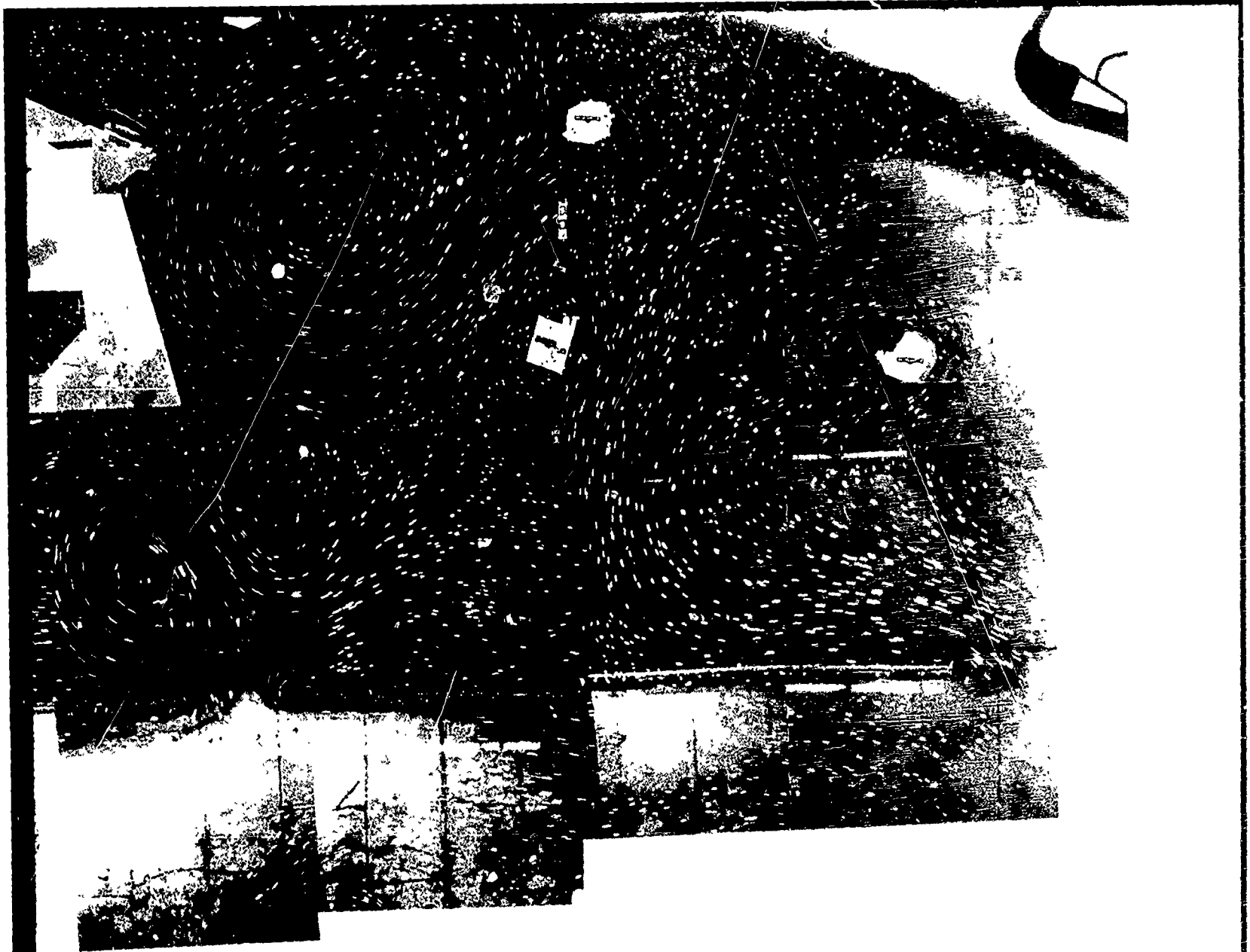


SCALES IN FEET



SUP

5



4000
1
10

VELOCITY SCALE
1 0 1 2 3 FPS
PROTOTYPE (1:100)

MODEL STUDY OF
LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

BASE TEST
SPRING TIDE
HOUR 9

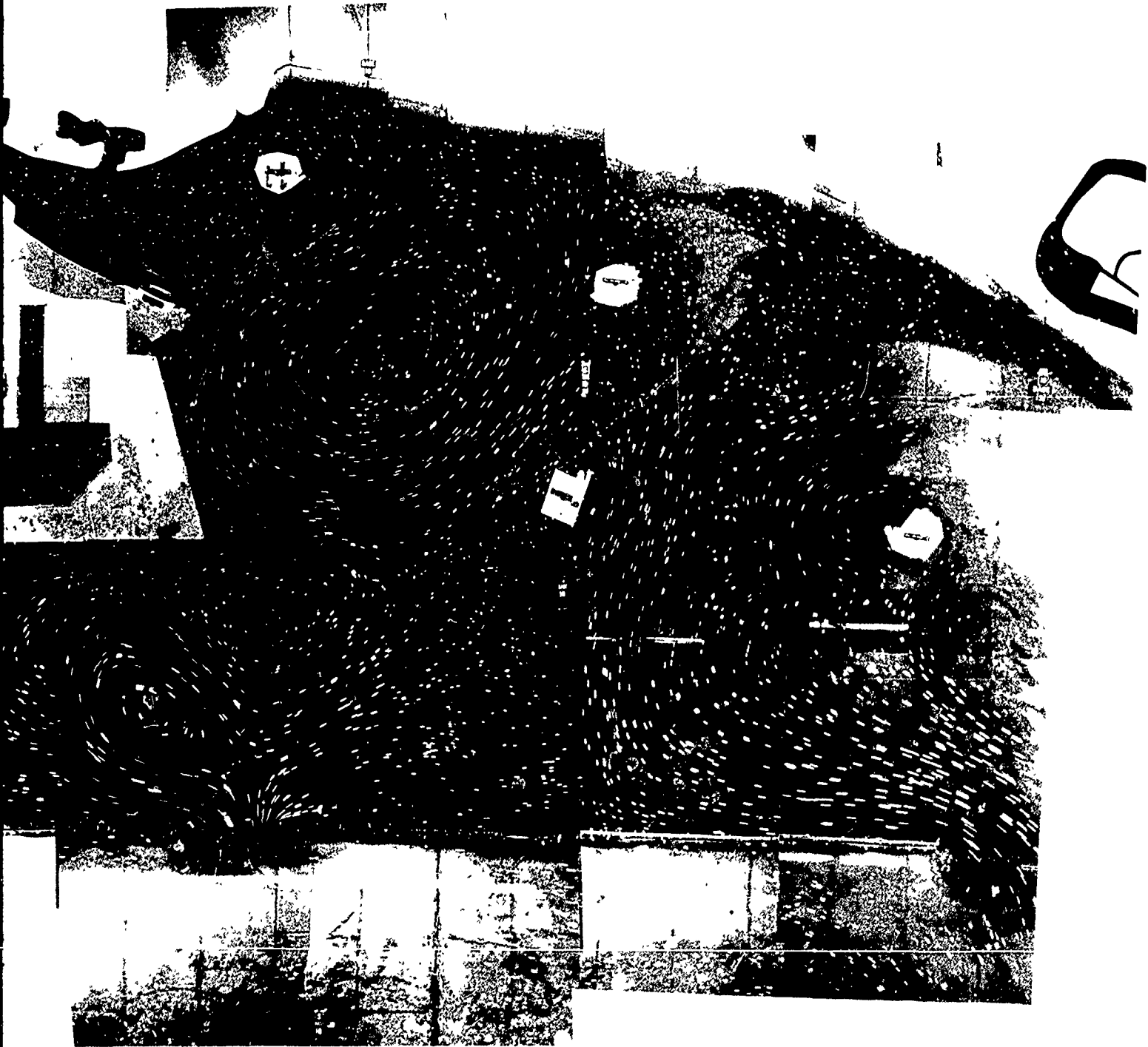
60

N





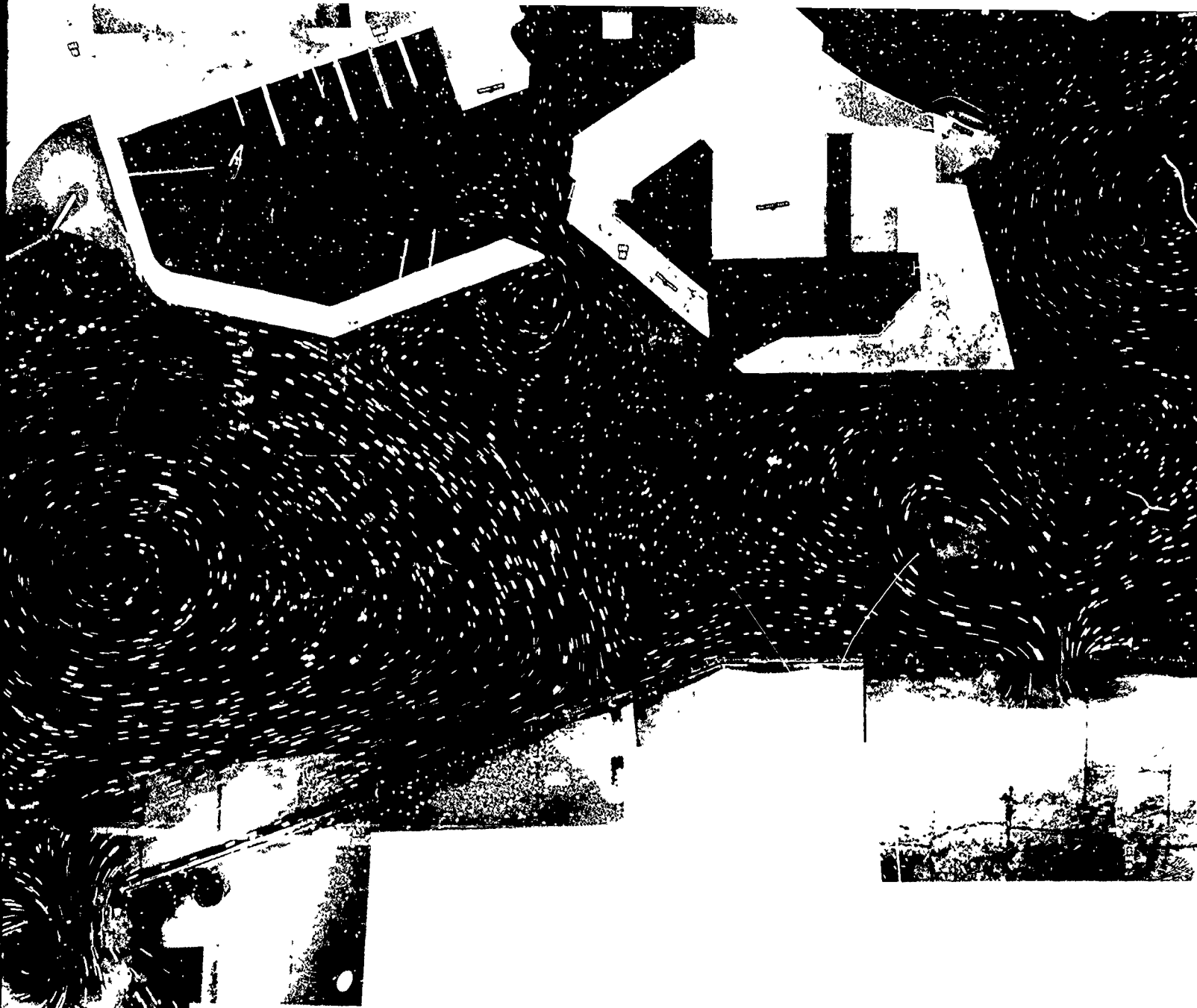
SCALES IN FEET



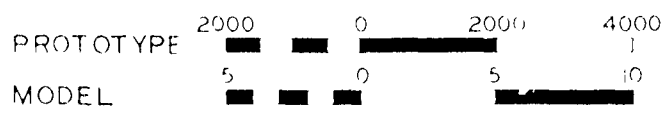
VELOCITY SCALE

N





SCALES IN FEET



SUF



4000
10

VELOCITY SCALE

1 0 1 2 3 FPS
PROTOTYPE (1:10)

MODEL STUDY OF
LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

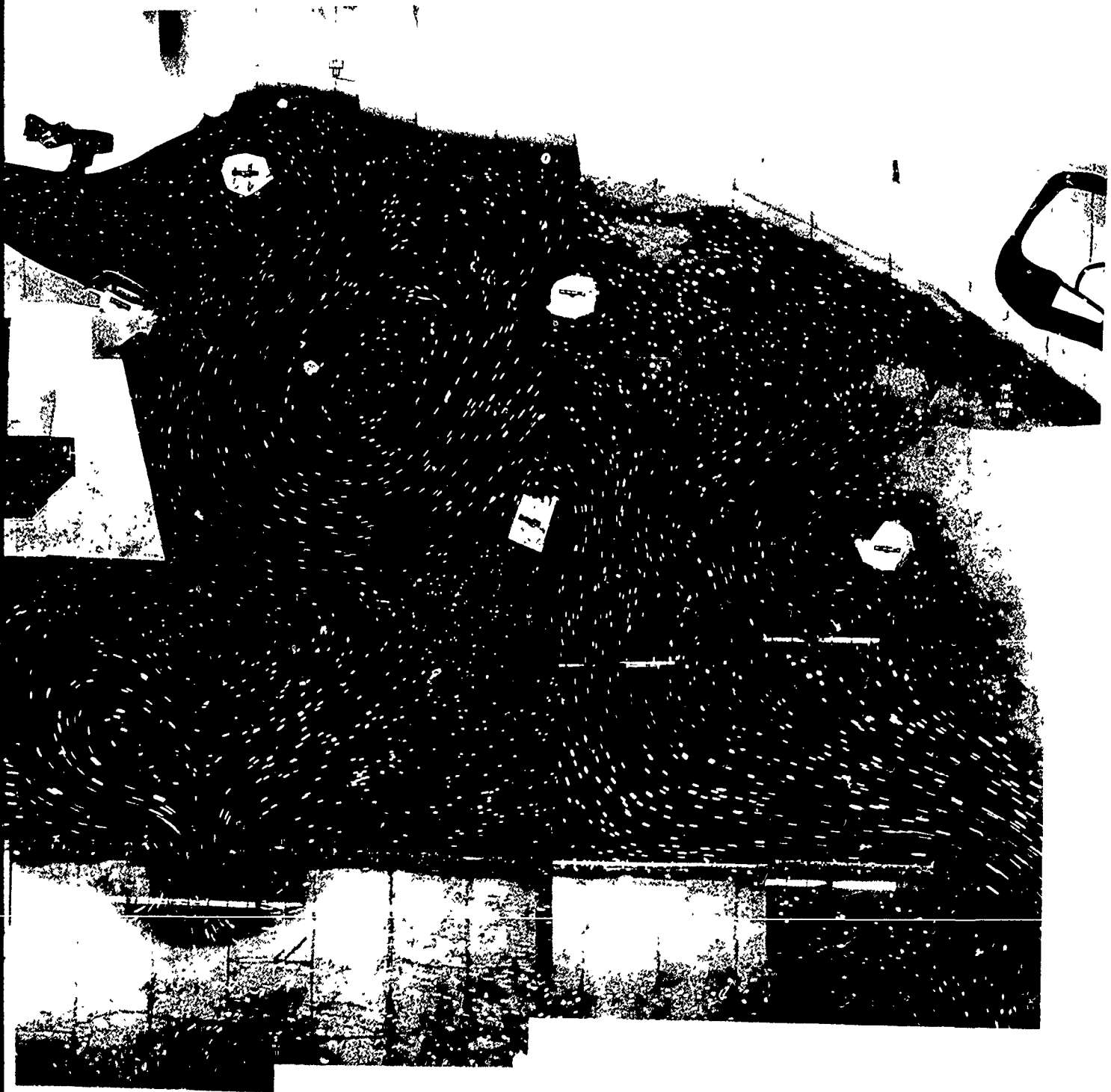
BASE TEST
SPRING TIDE
HOUR 10



N



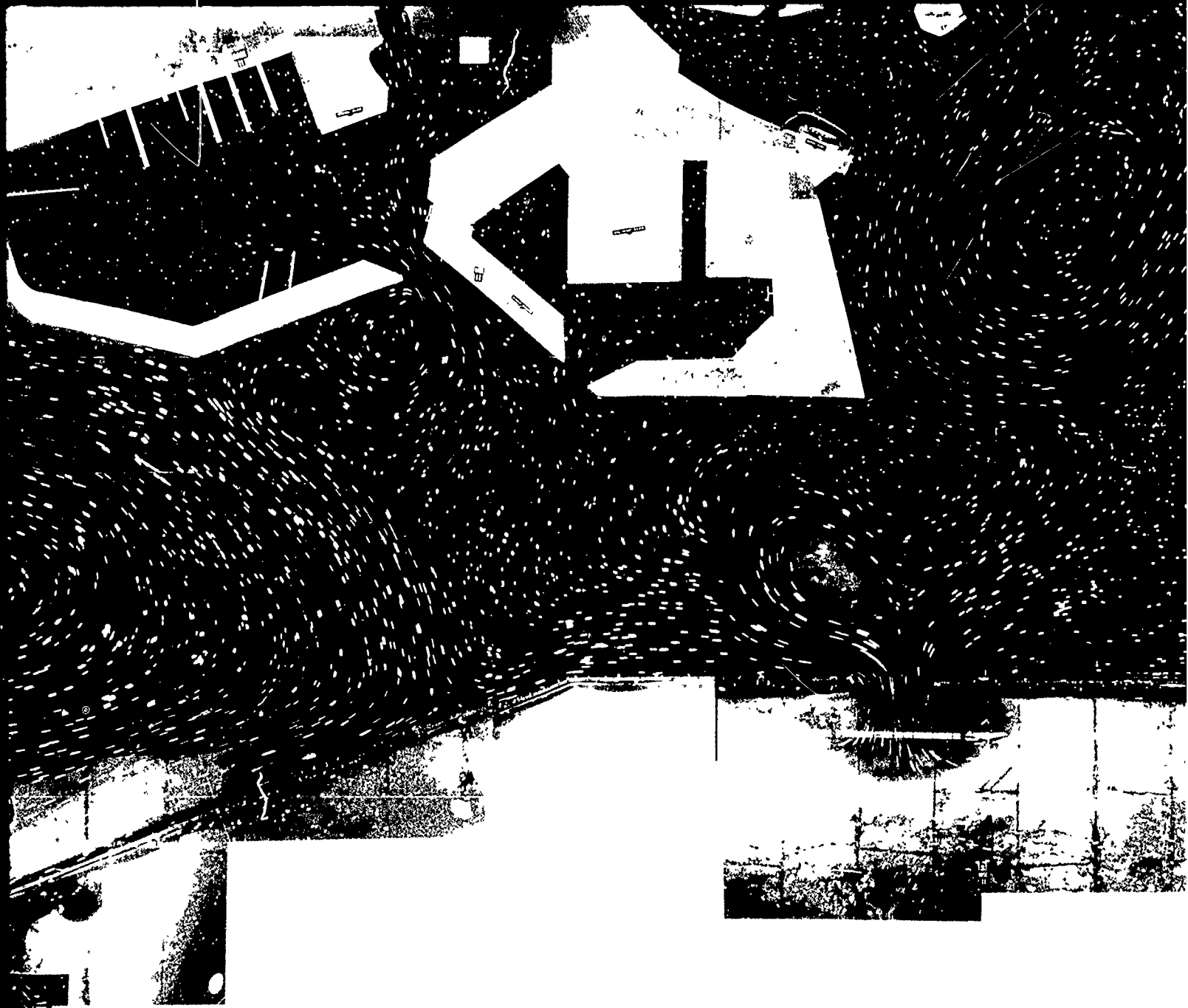
SCALES IN FEET



N



4

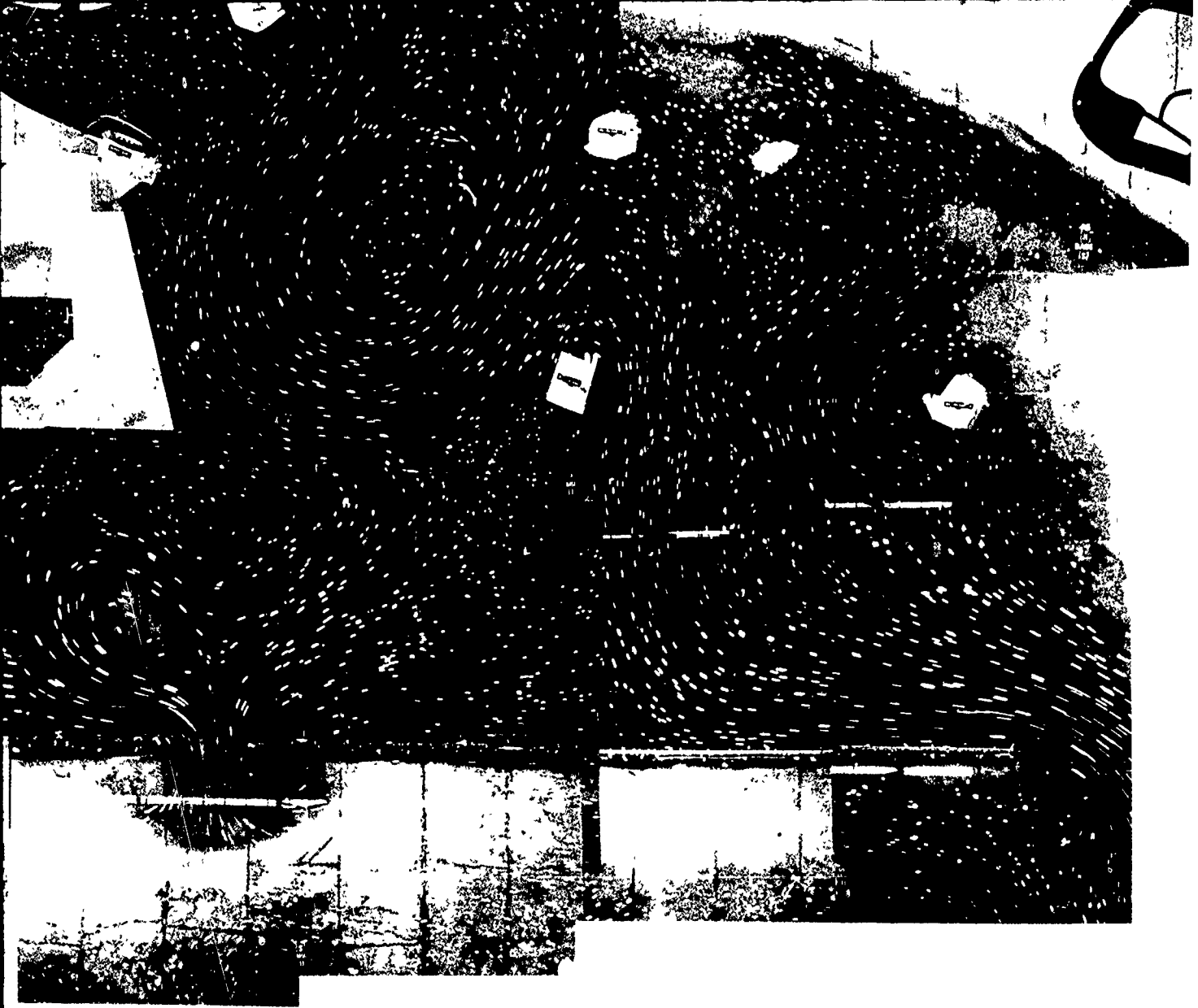


SCALES IN FEET

PROTOTYPE	2000	0	2000	4000
MODEL	5	0	5	10

LOS

SURFAC



4000

VELOCITY SCALE

1 0 1 2 3 FPS
 PROTOTYPE (mm) 1 1 1

MODEL STUDY OF
 LOS ANGELES-LONG BEACH HARBORS

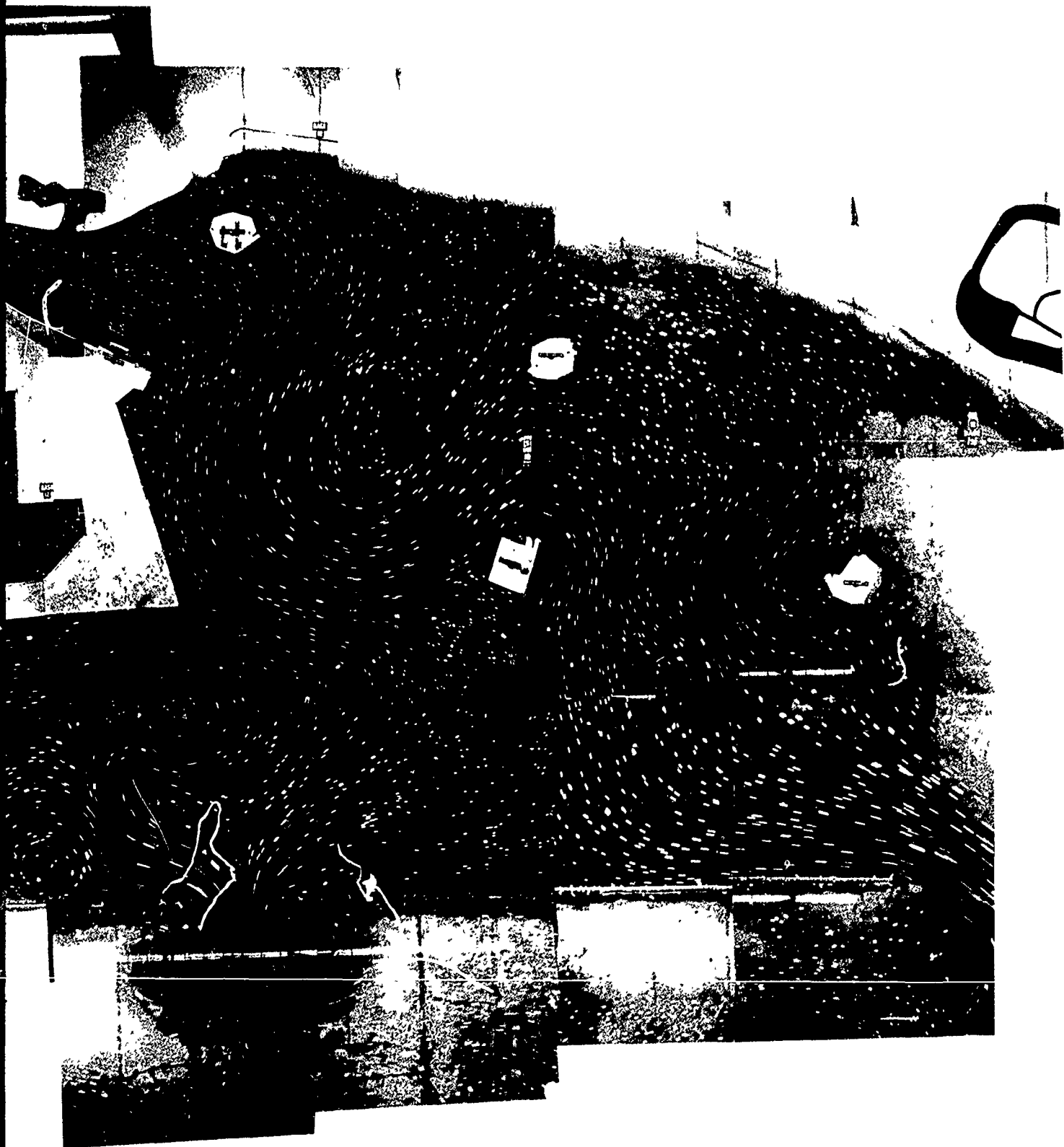
SURFACE CURRENT PATTERNS

BASE TEST
 SPRING TIDE
 HOUR 11



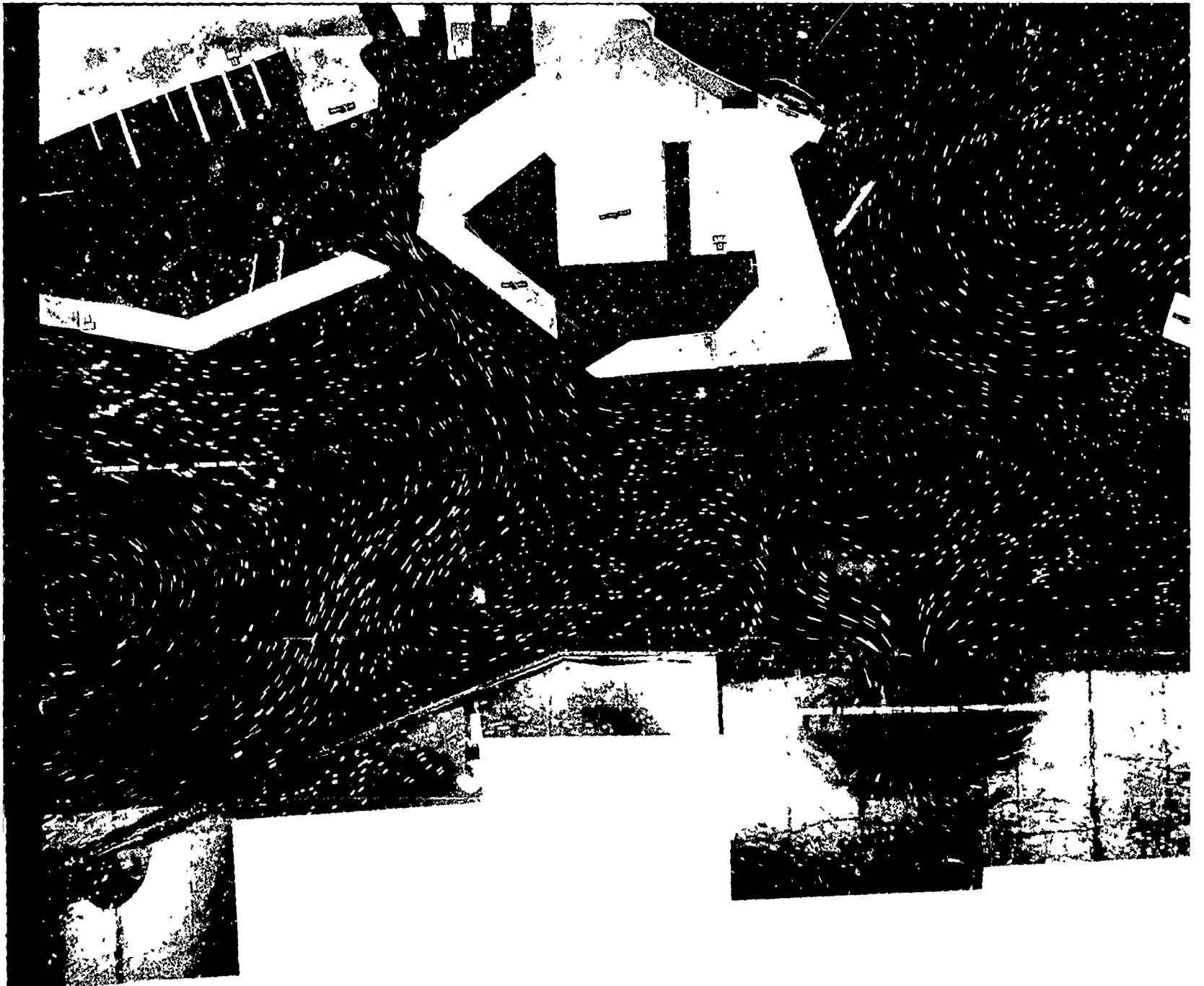


SCALES IN FEET





1

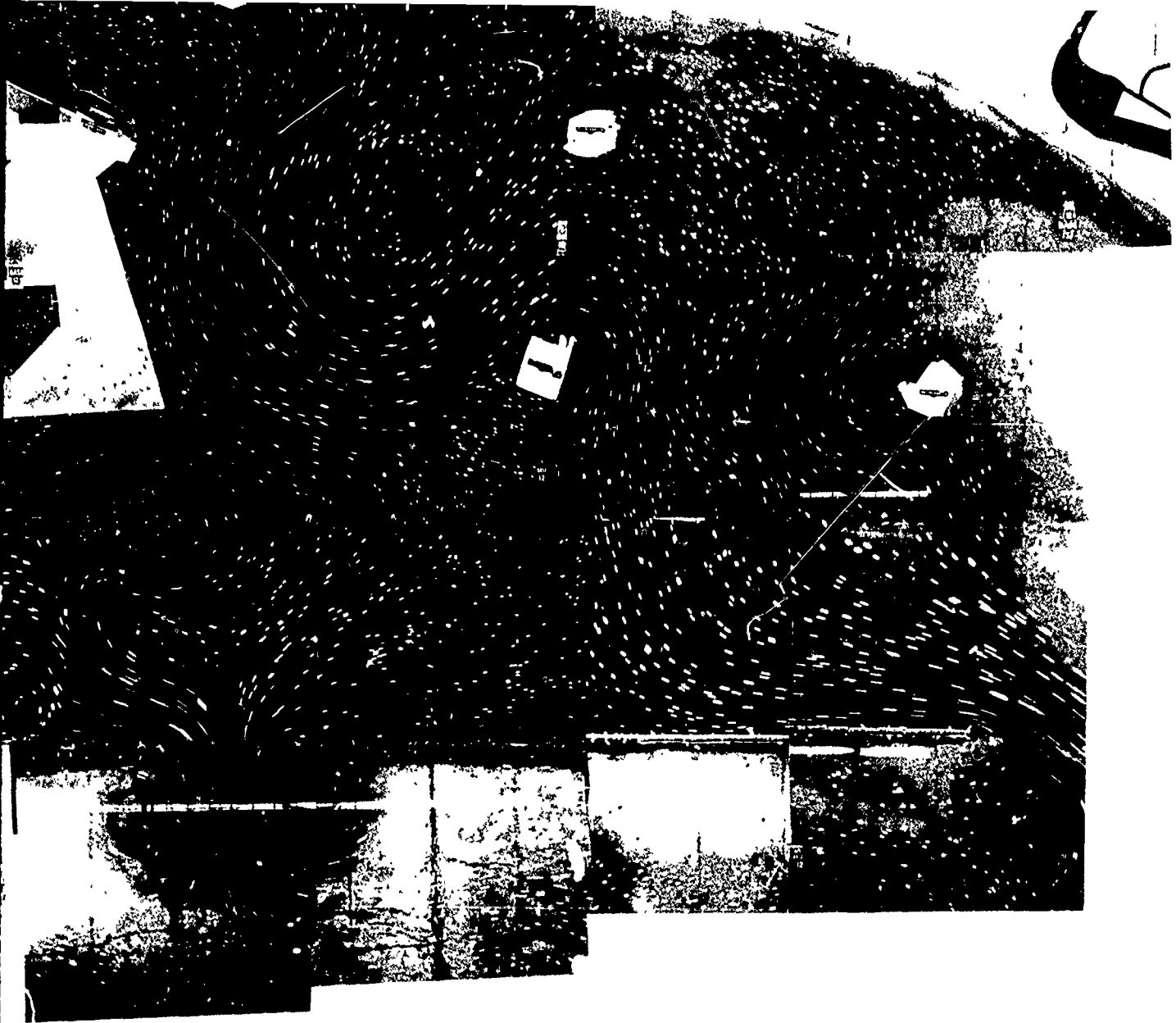


SCALES IN FEET

PROTOTYPE	2000	0	2000	4000
MODEL	5	0	5	10

LOS

SURFAC.



VELOCITY SCALE

1 0 1 2 3 FPS
 PROTOTYPE $\frac{1}{100}$ [Symbol]

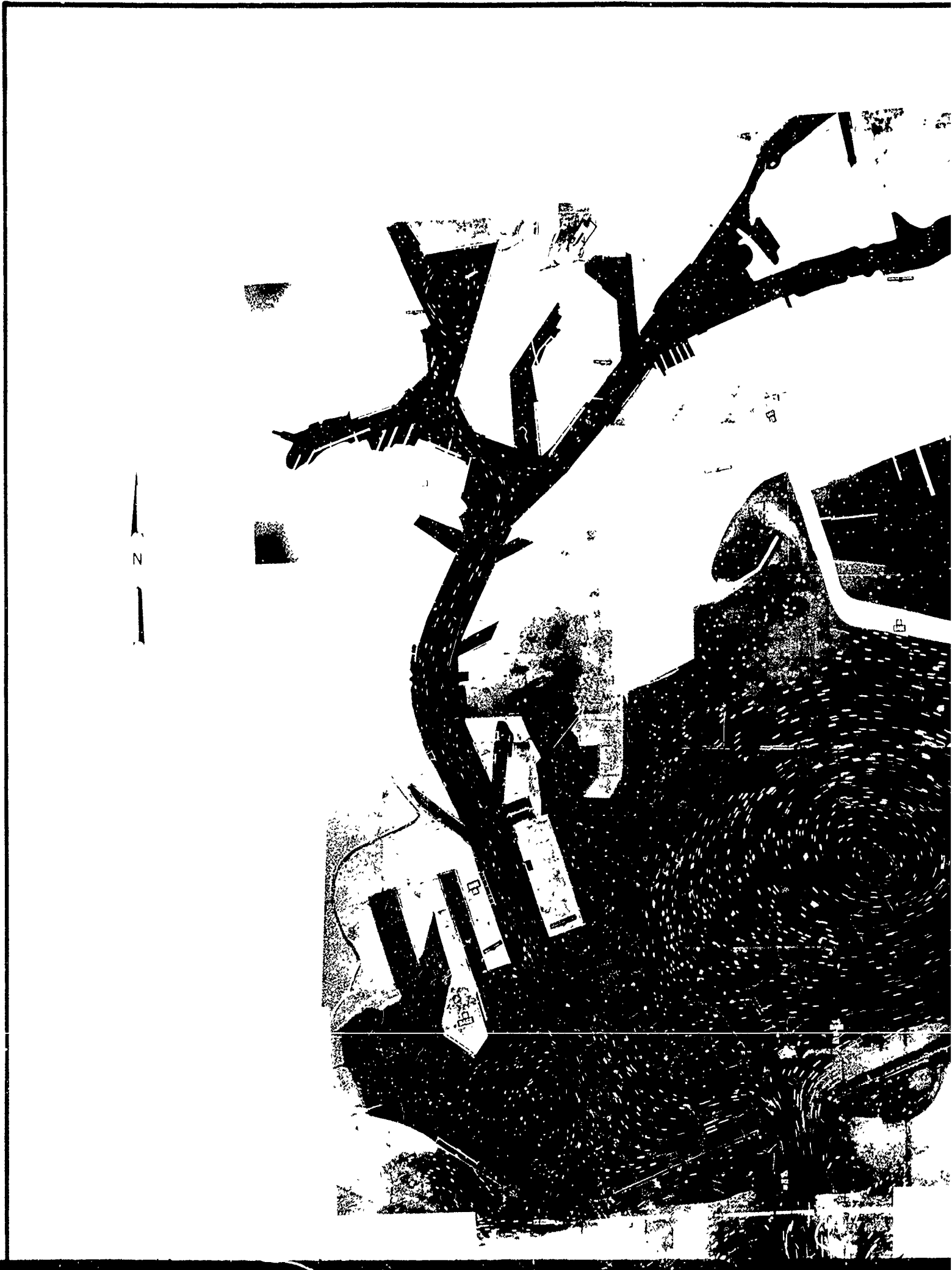
4000

10

MODEL STUDY OF
 LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

BASE TEST
 SPRING TIDE
 HOUR 12





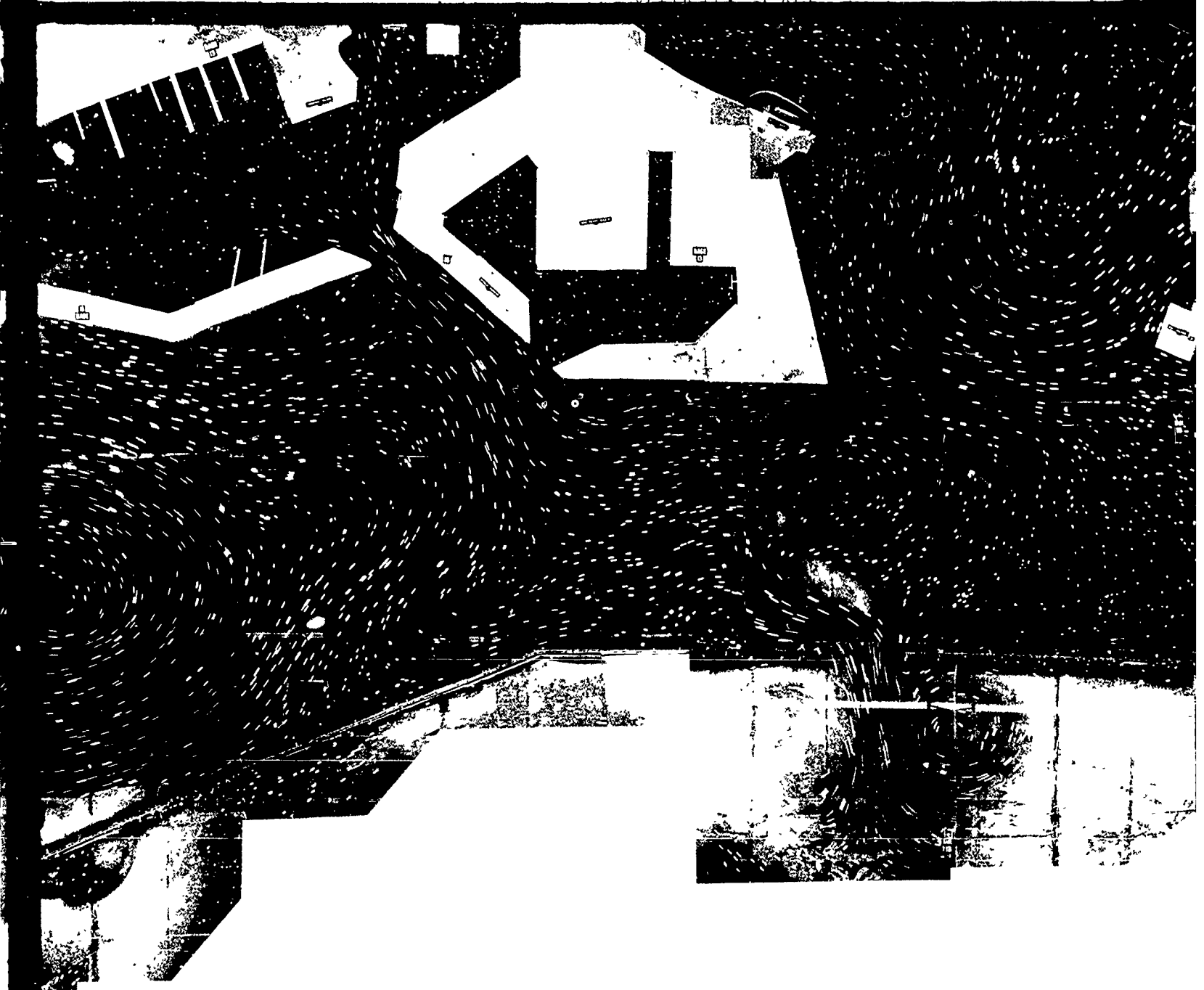
SCALES IN FEET



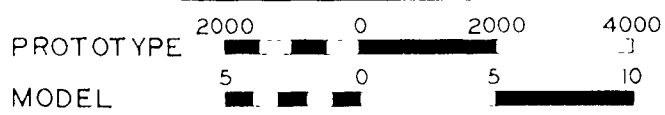
N



4



SCALES IN FEET



LOS
SURFACE



4000
 7
 10

VELOCITY SCALE
 1 0 1 2 3 FPS
 PROTOTYPE 1:100

MODEL STUDY OF
 LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

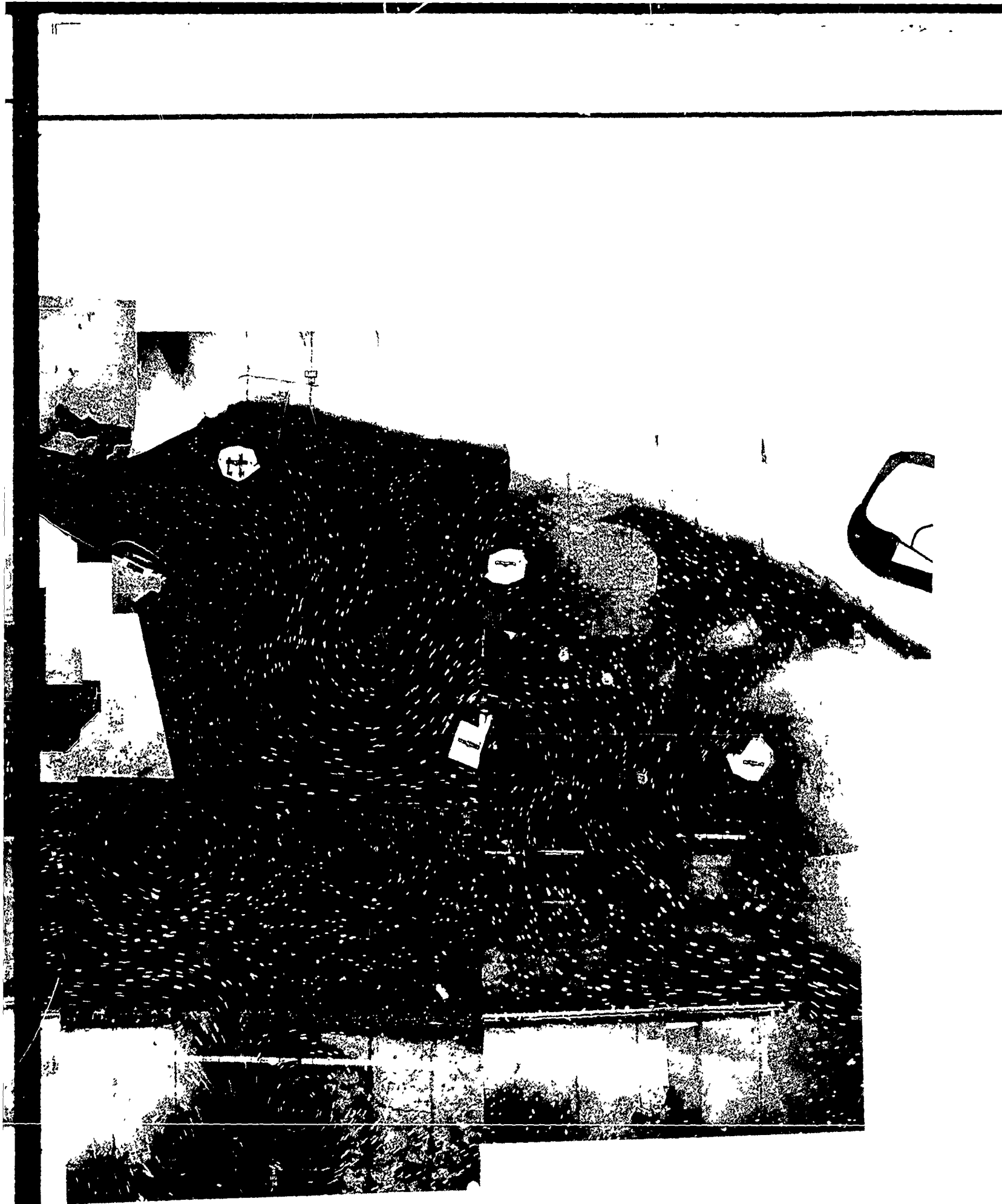
BASE TEST
 SPRING TIDE
 HOUR 13

N





SCALES IN FEET

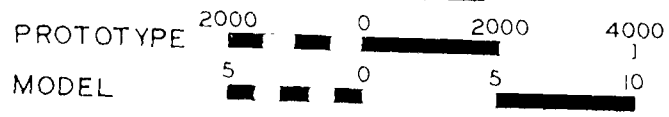


VELOCITY SCALE





SCALES IN FEET



LOS AN

SURFACE

5



4000
1
10

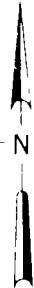
VELOCITY SCALE

PROTOTYPE 1 0 1 2 3 FPS

MODEL STUDY OF
LOS ANGELES-LONG BEACH HARBORS

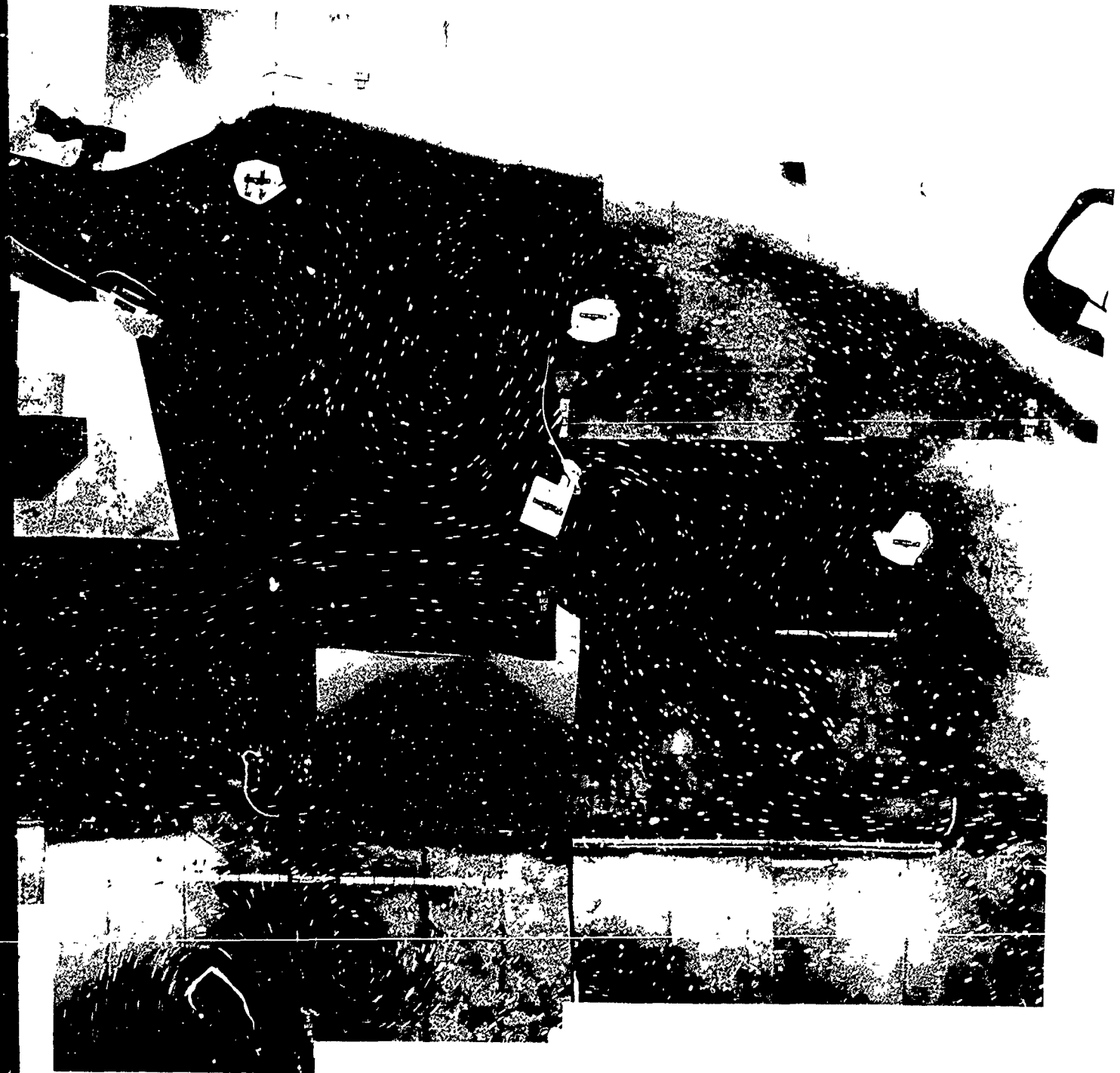
SURFACE CURRENT PATTERNS

BASE TEST
SPRING TIDE
HOUR 14





SCALES IN FEET



VELOCITY SCALE

N



SCALES IN FEET



LOS ANG

SURFACE (

5



4000
|
0

VELOCITY SCALE
1 0 1 2 3 FPS
PROTOTYPE (1:100)

MODEL STUDY OF
LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

BASE TEST
SPRING TIDE
HOUR 15

6





SCALES IN FEET



VELOCITY SCALE

N



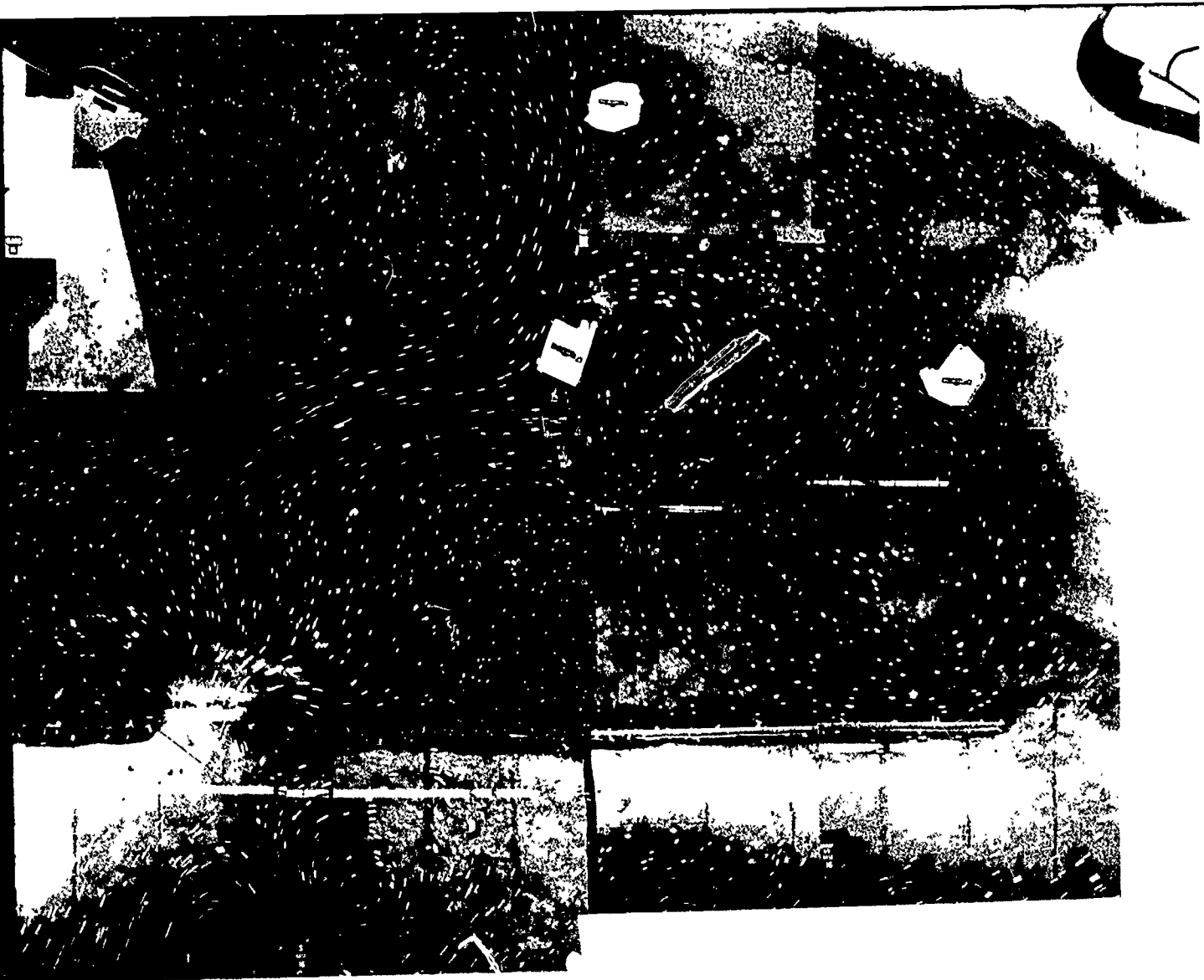
4



SCALES IN FEET

PROTOTYPE.	2000	0	2000	4000
MODEL	5	0	5	10

SURF



VELOCITY SCALE

1 0 1 2 3 FPS
 PROTOTYPE 1 1 1 1 1

4000

0

MODEL STUDY OF
 LOS ANGELES-LONG BEACH HARBORS

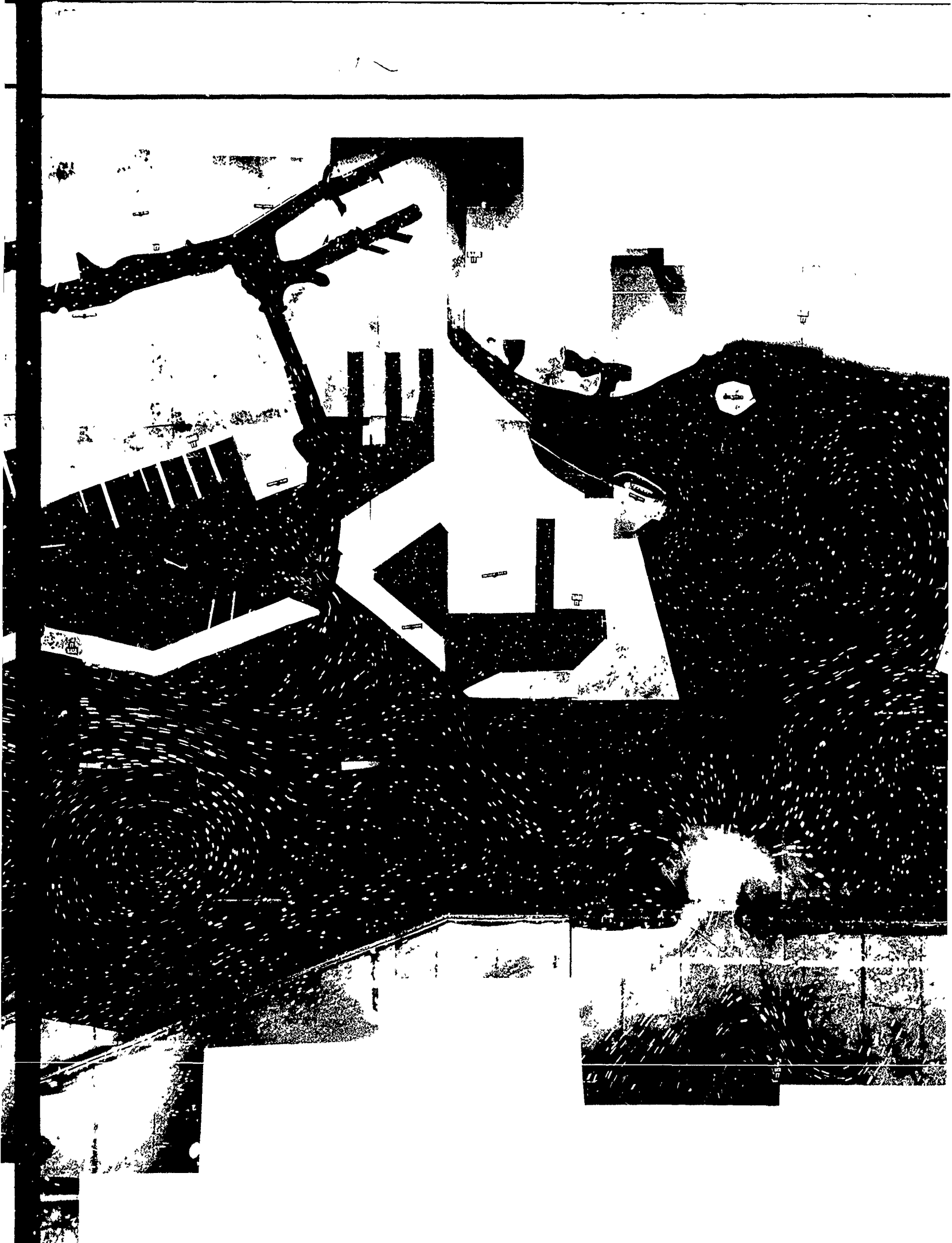
SURFACE CURRENT PATTERNS

BASE TEST
 SPRING TIDE
 HOUR 16

1

N





SCALES IN FEET



VELOCITY SCALE



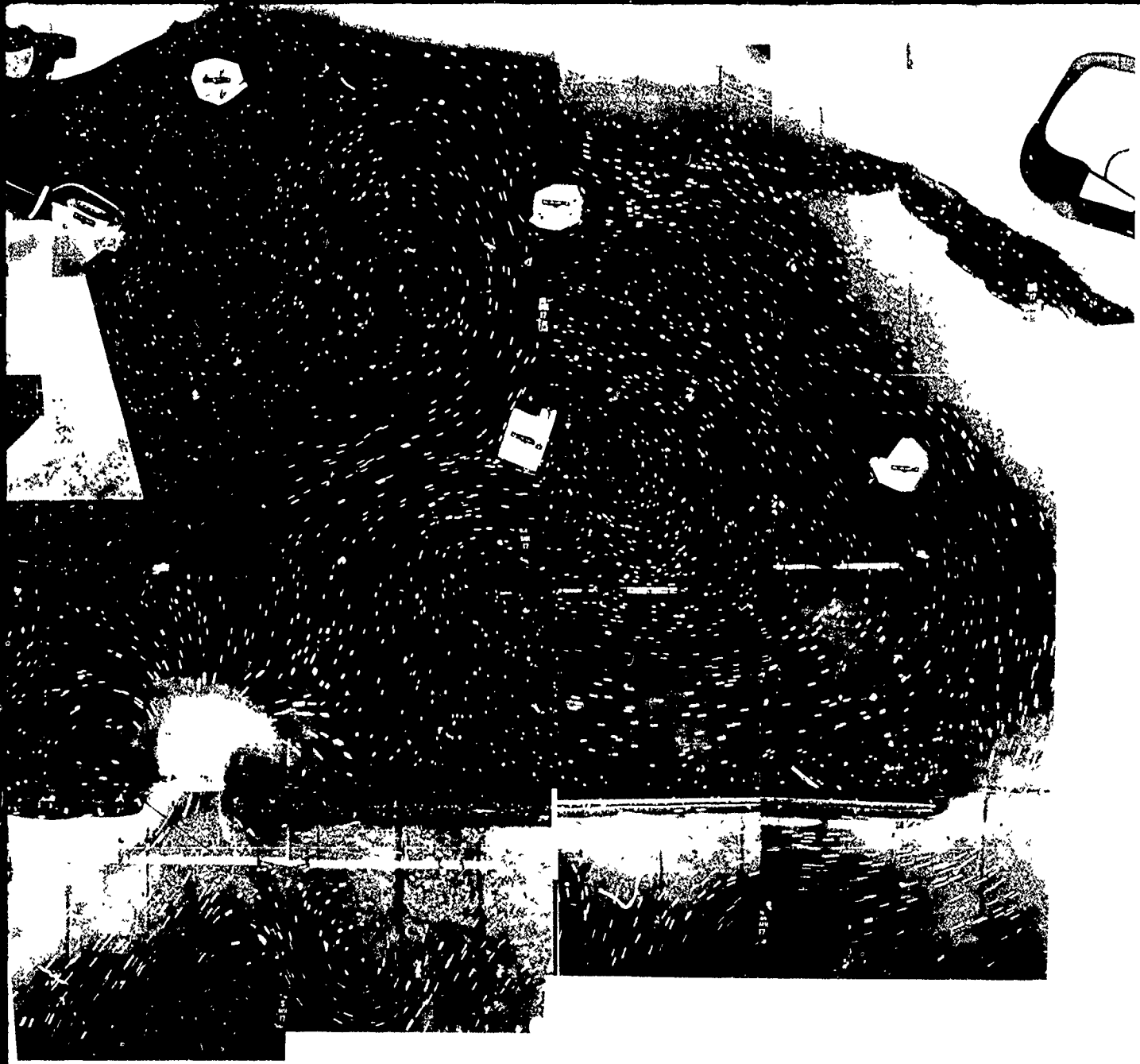


SCALES IN FEET



LOS

SURFACI



VELOCITY SCALE
 1 0 1 2 3 FPS
 PROTOTYPE: 1:100

MODEL STUDY OF
 LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

BASE TEST
 SPRING TIDE
 HOUR 17

4000

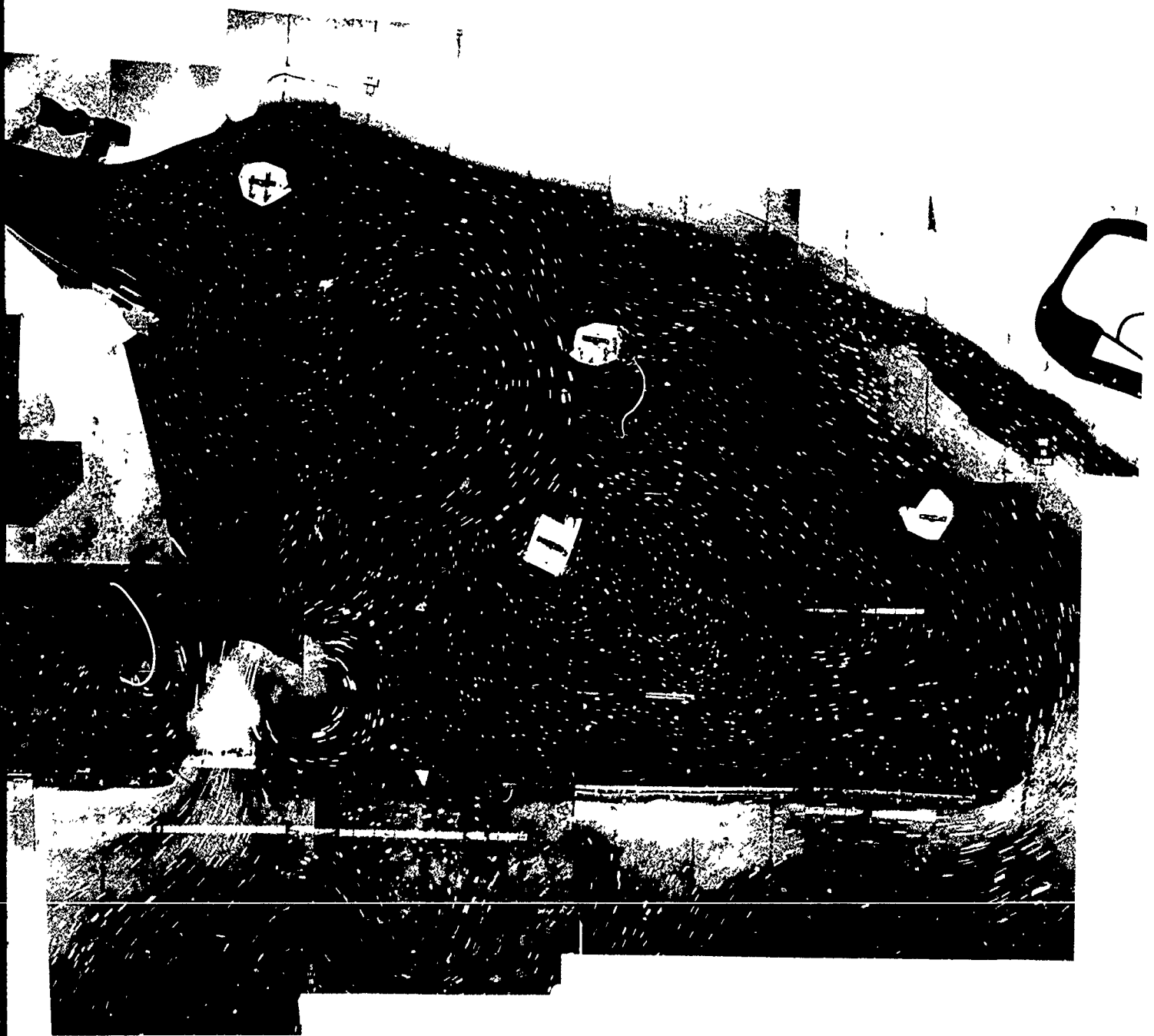
5



N



SCALES IN FEET



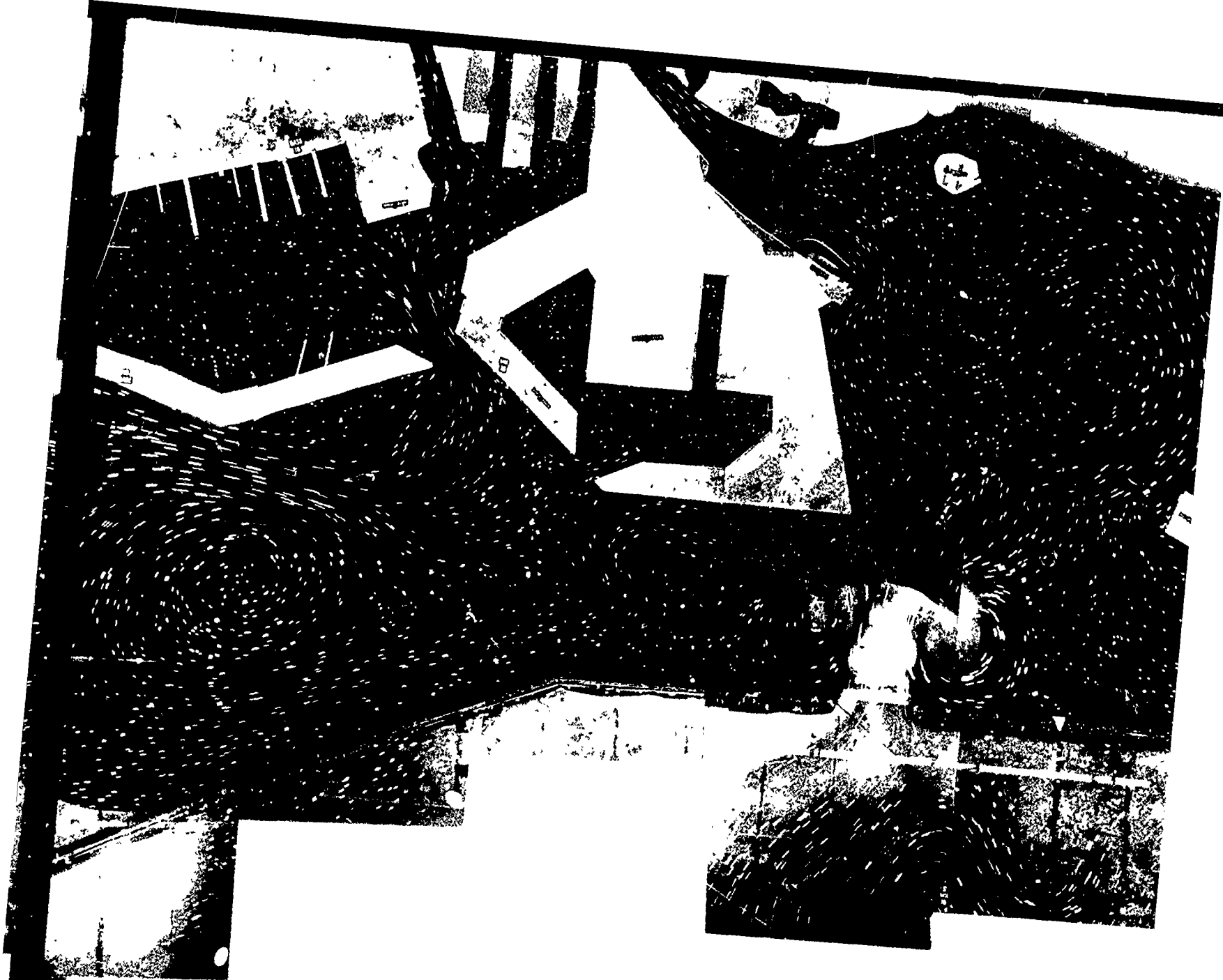
VELOCITY SCALE

1000 FEET

2



4



SCALES IN FEET

PROTOTYPE	2000	0	2000	4000
MODEL	5	0	5	10

LOS
SURFACI



VELOCITY SCALE

1 0 1 2 3 FPS
 PROTOTYPE 1/1 1/1 1/1

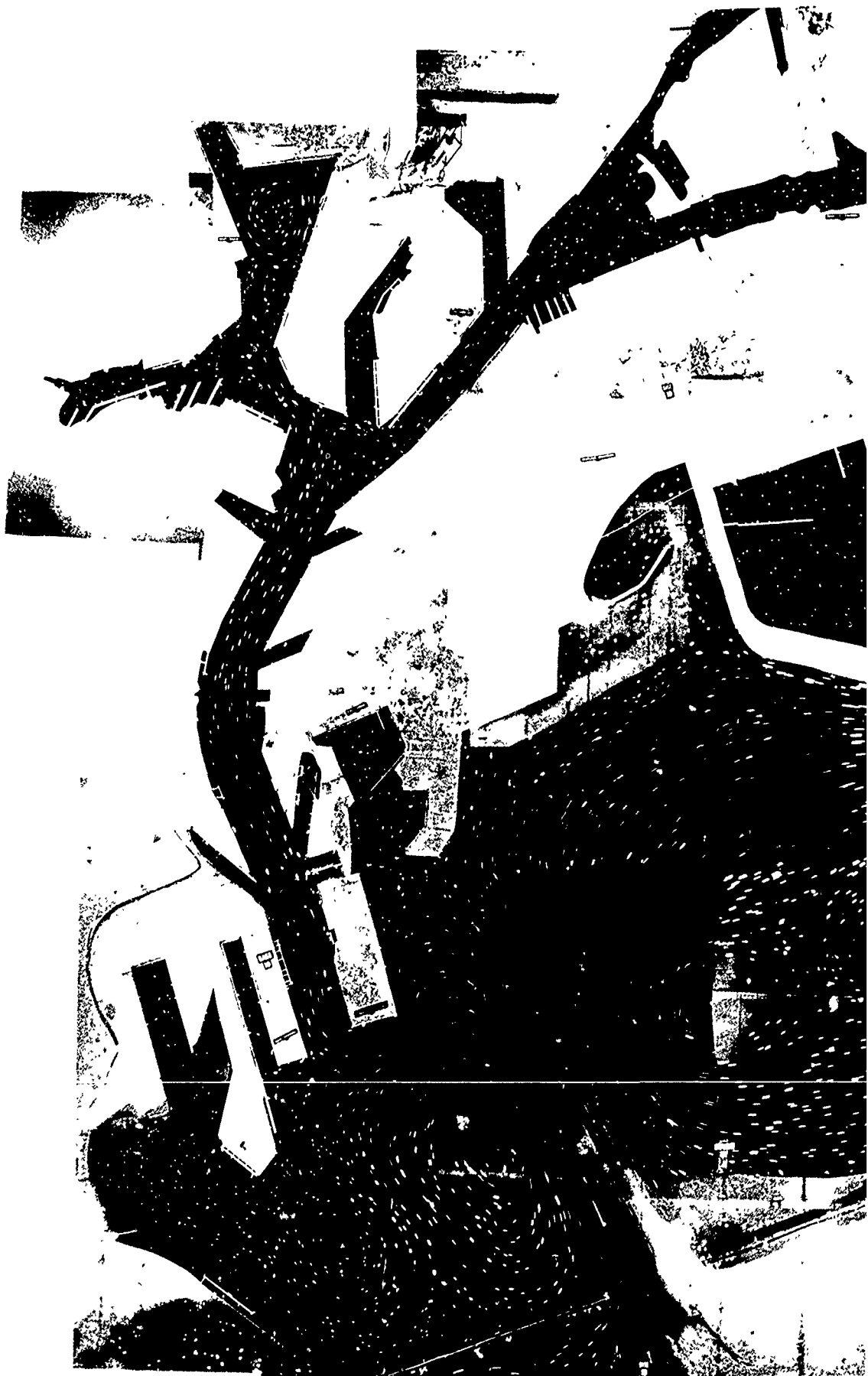
4 000
 10

MODEL STUDY OF
 LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

BASE TEST
 SPRING TIDE
 HOUR 18

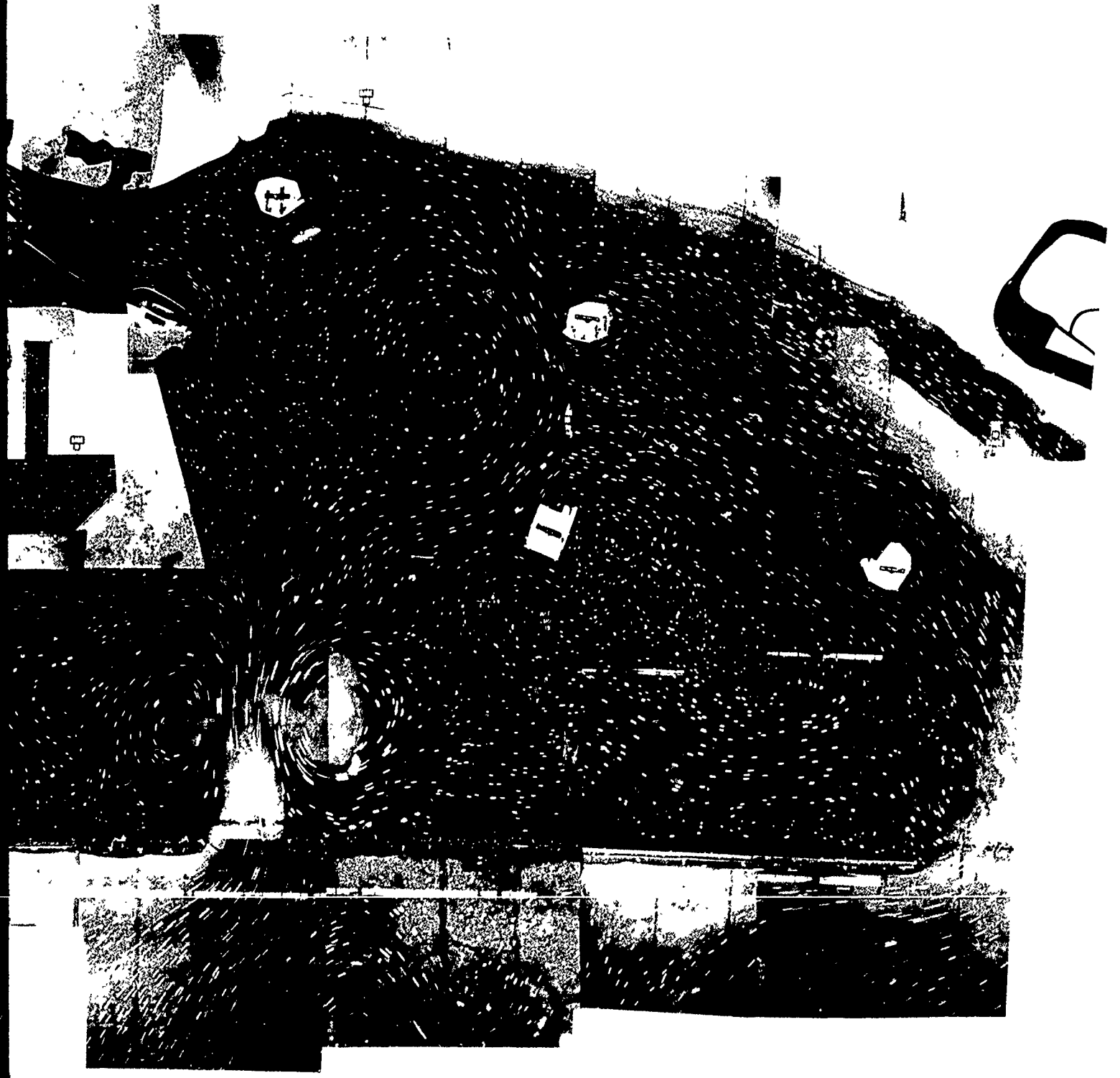
6



N



SCALES IN FEET



VELOCITY SCALE

N



4



SCALES IN FEET

PROTOTYPE	2000	0	2000	4000
MODEL	5	0	5	10

VI
PR
MOD
LOS ANGELES

SURFACE CUI

B
S



VELOCITY SCALE

1 0 1 2 3 FPS
 PROTOTYPE 1/16 1/8 1/4

4000
 1
 0

MODEL STUDY OF
 LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

BASE TEST
 SPRING TIDE
 HOUR 19



N





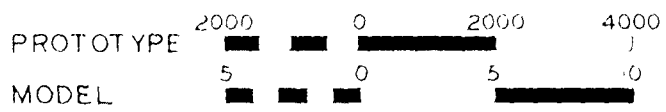
VELOCITY SCALE



N



SCALES IN FEET



LOS A

SURFACE

5



4000
 7
 6

VELOCITY SCALE
 1 0 1 2 3 FPS
 PROTOTYPE (1:100)

MODEL STUDY OF
 LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

BASE TEST
 SPRING TIDE
 HOUR 20

5

6





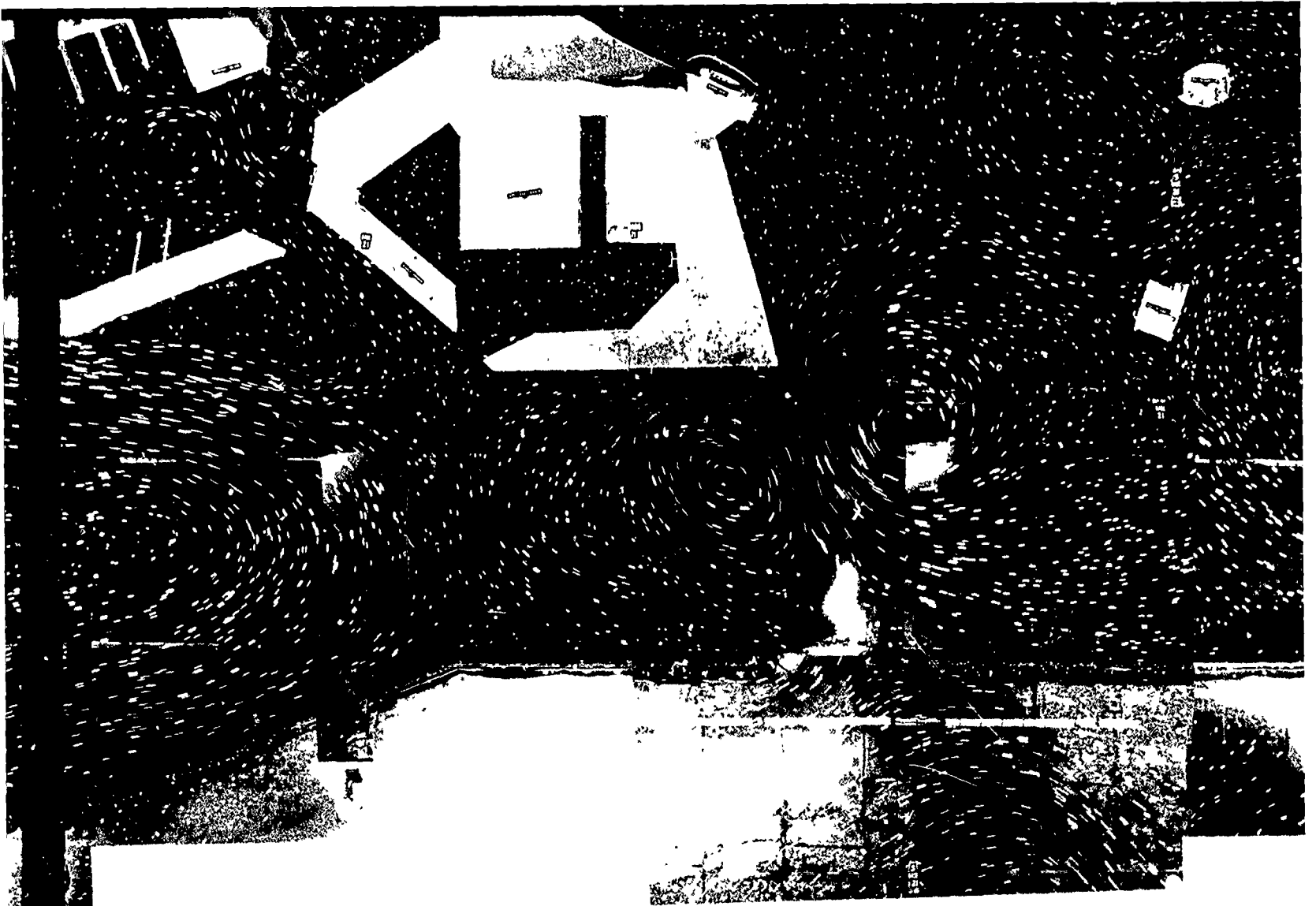
SCALES IN FEET



VELOCITY SCALE



2



SCALES IN FEET

PROTOTYPE	2000	0	2000	4000
MODEL	5	0	5	10

VELO

PROTOTY

MODEL

LOS ANGELES-L

SURFACE CURF

BAS

SPR

HC

5



VELOCITY SCALE

1 0 1 2 3 FPS
 PROTOTYPE [|||||]

4000
 10

MODEL STUDY OF
 LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

BASE TEST
 SPRING TIDE
 HOUR 21

N



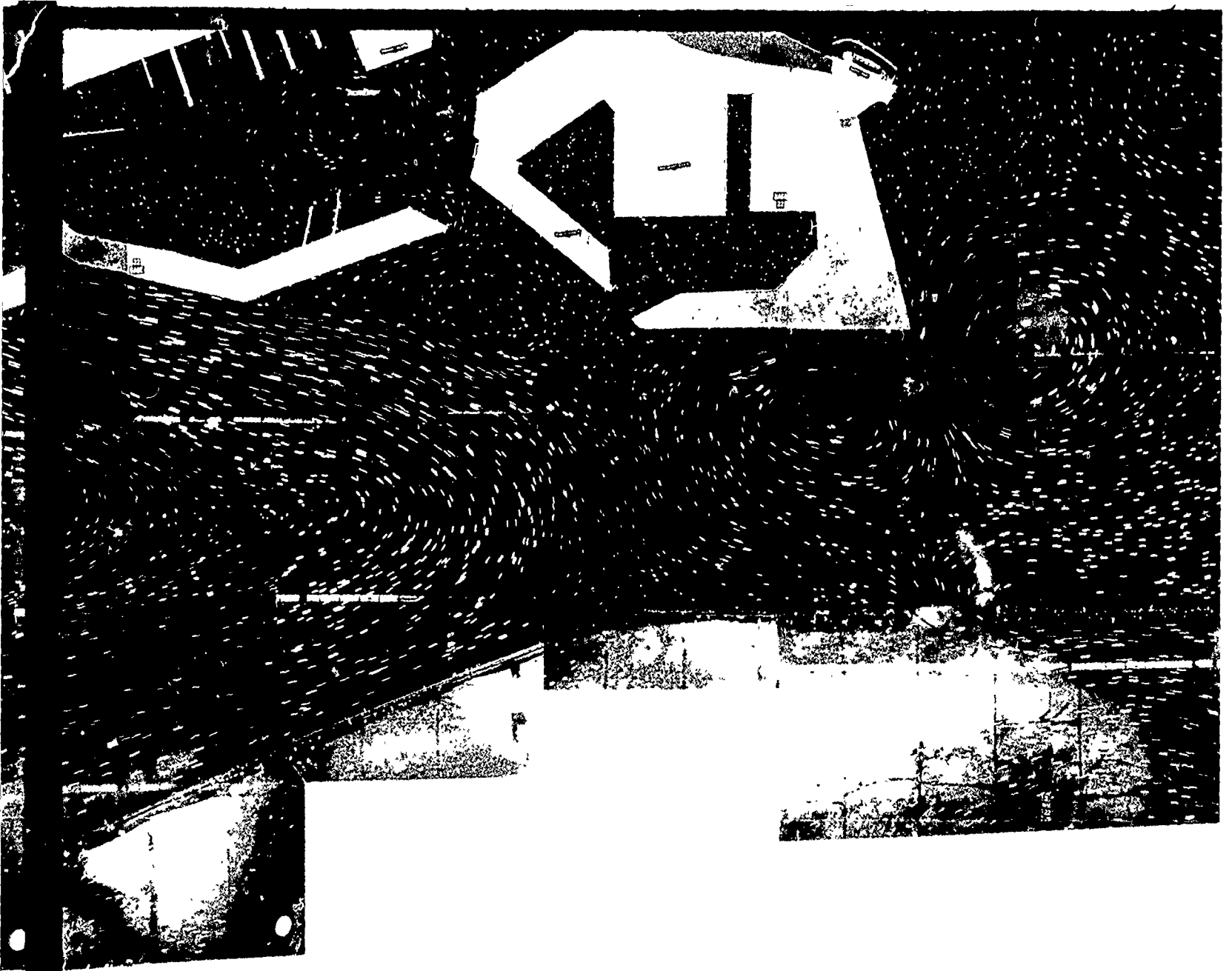


SCALES IN FEET



N



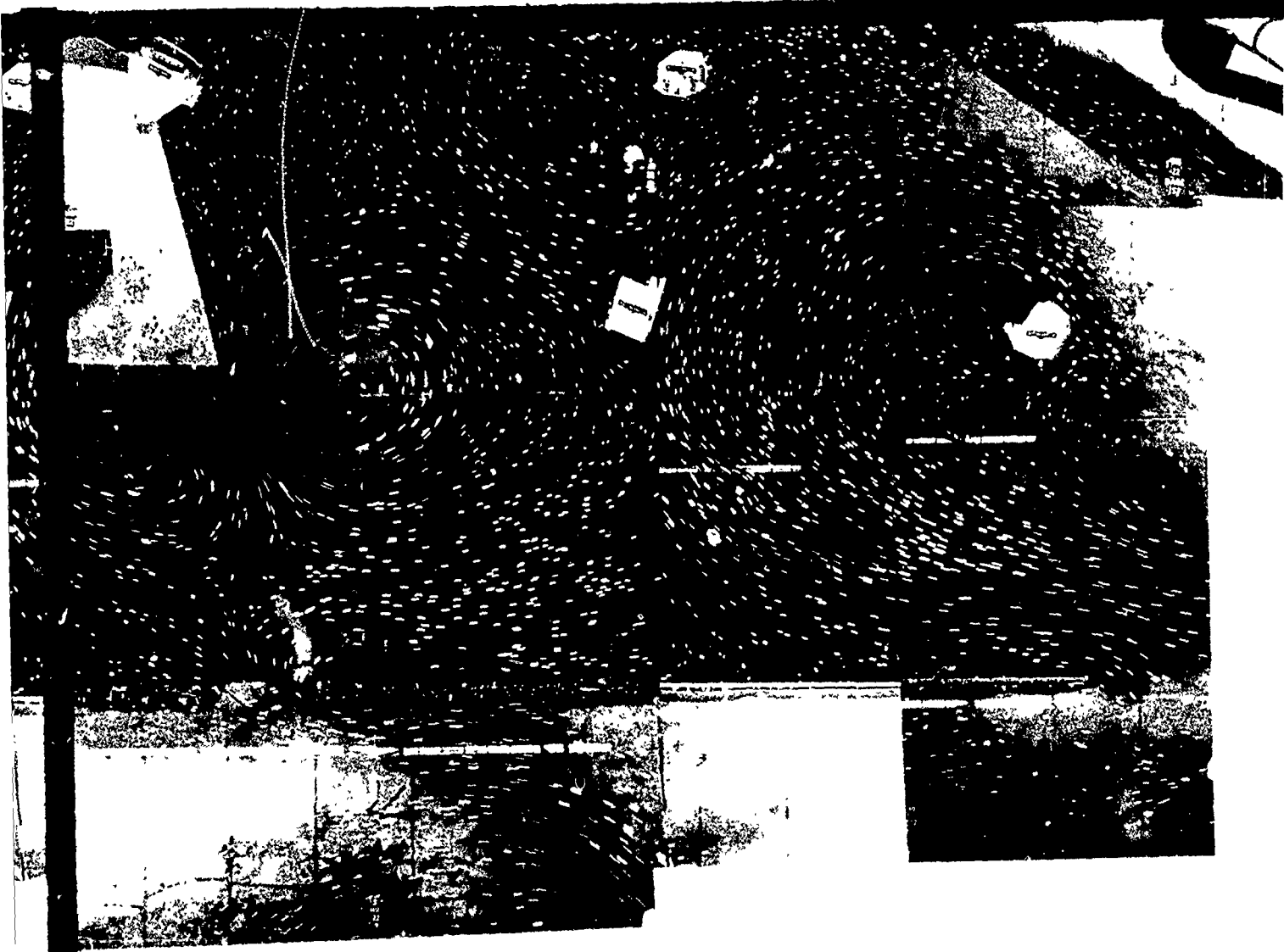


SCALES IN FEET

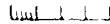
	2000	0	2000	4000
PROTOTYPE	█	█	█	
MODEL	5	0	5	10
	█	█	█	█

SURFA

5



4000
 }
 10

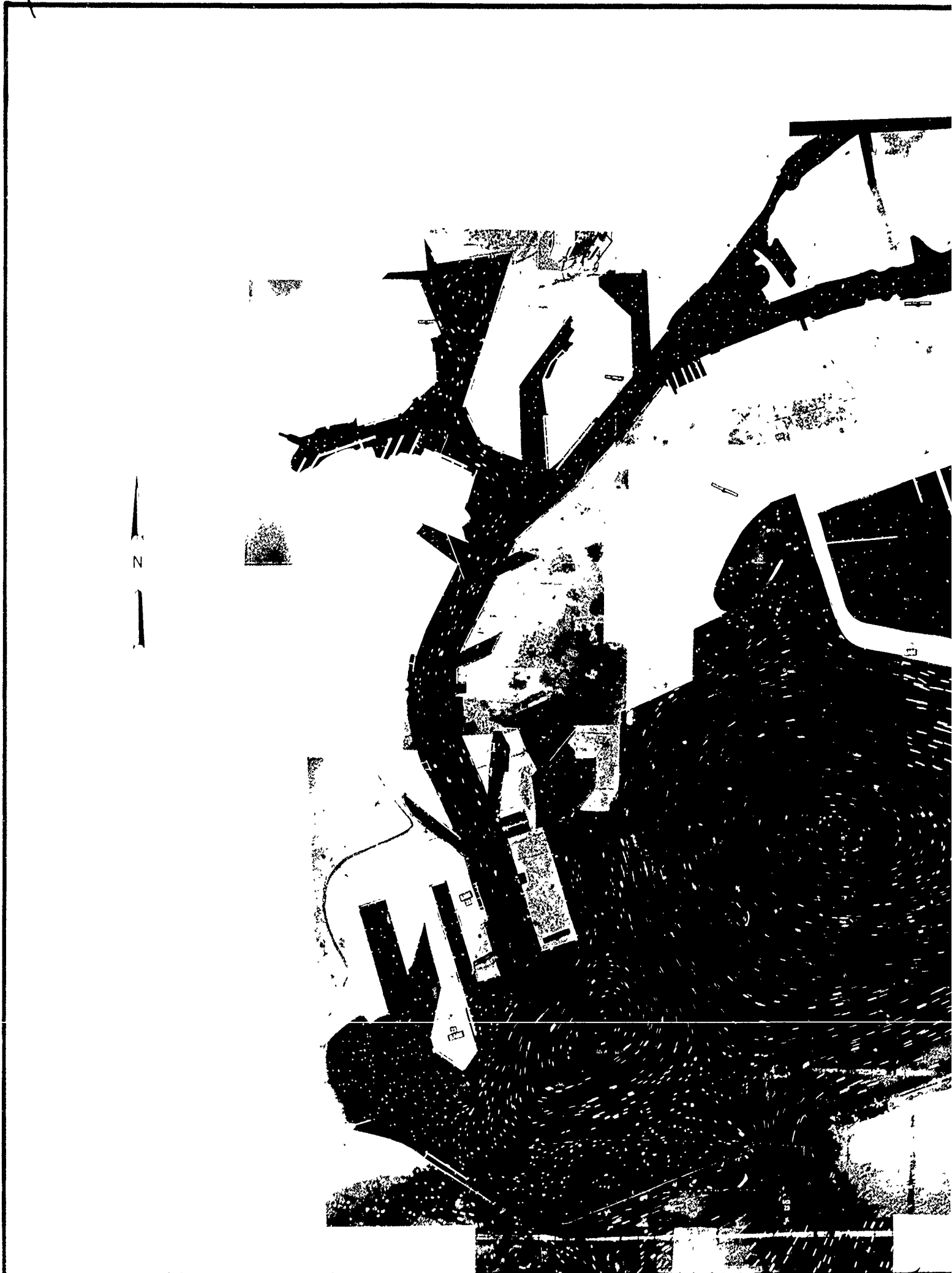
VELOCITY SCALE
 1 0 1 2 3 FPS
 PROTOTYPE 

MODEL STUDY OF
 LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

BASE TEST
 SPRING TIDE
 HOUR 22

4





SCALES IN FEET



VELOCITY SCALE

N



4



SCALES IN FEET

PROTOTYPE	2000	0	2000	4000
MODEL	5	0	5	10

VE
PROT

MOD
LOS ANGELES

SURFACE CUF

B.
S

5



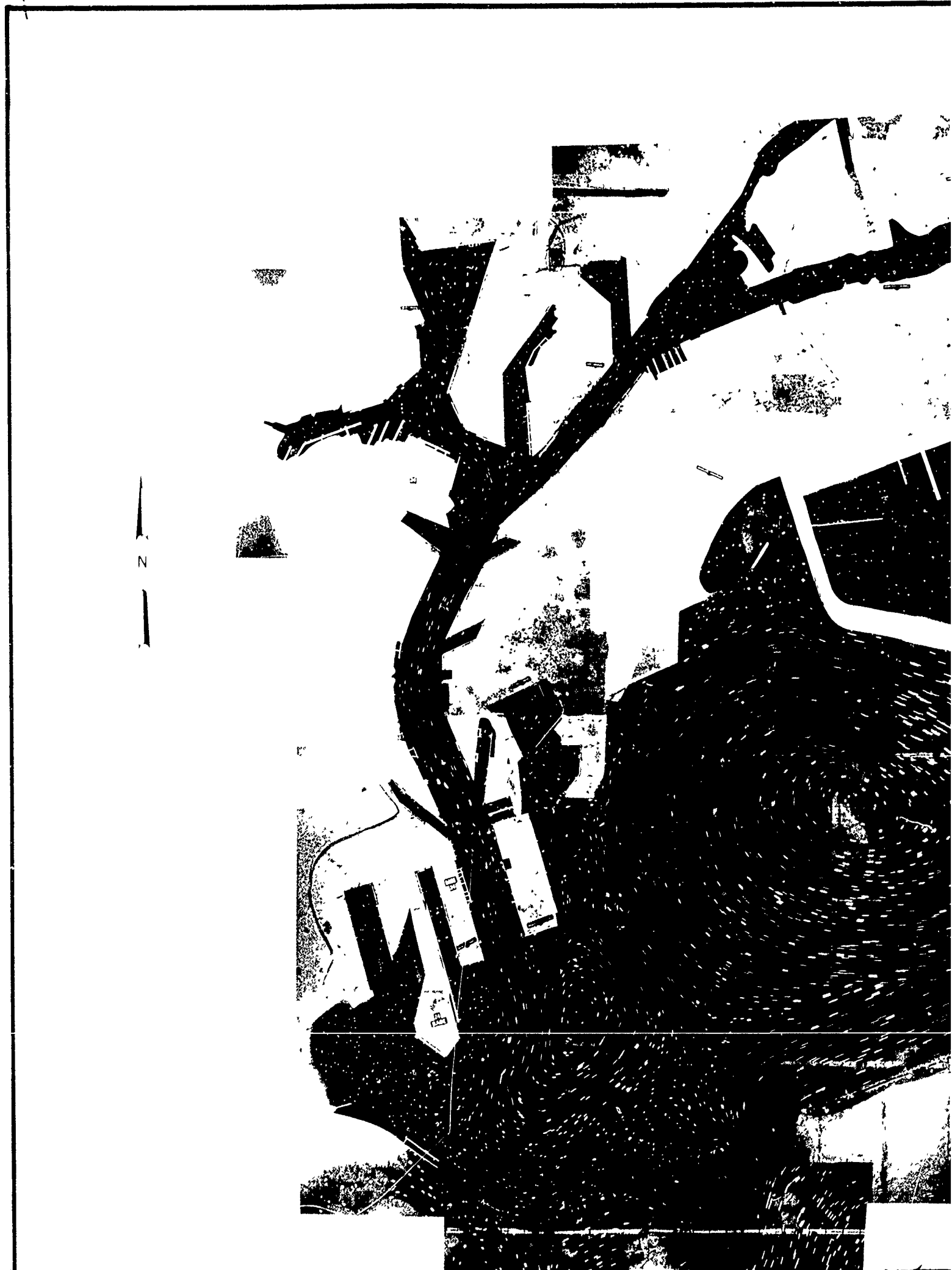
4000
 2
 9

VELOCITY SCALE
 1 0 1 2 3 FPS
 PROTOTYPE [L] [I] [I]

MODEL STUDY OF
 LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

BASE TEST
 SPRING TIDE
 HOUR 23

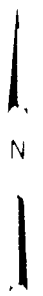


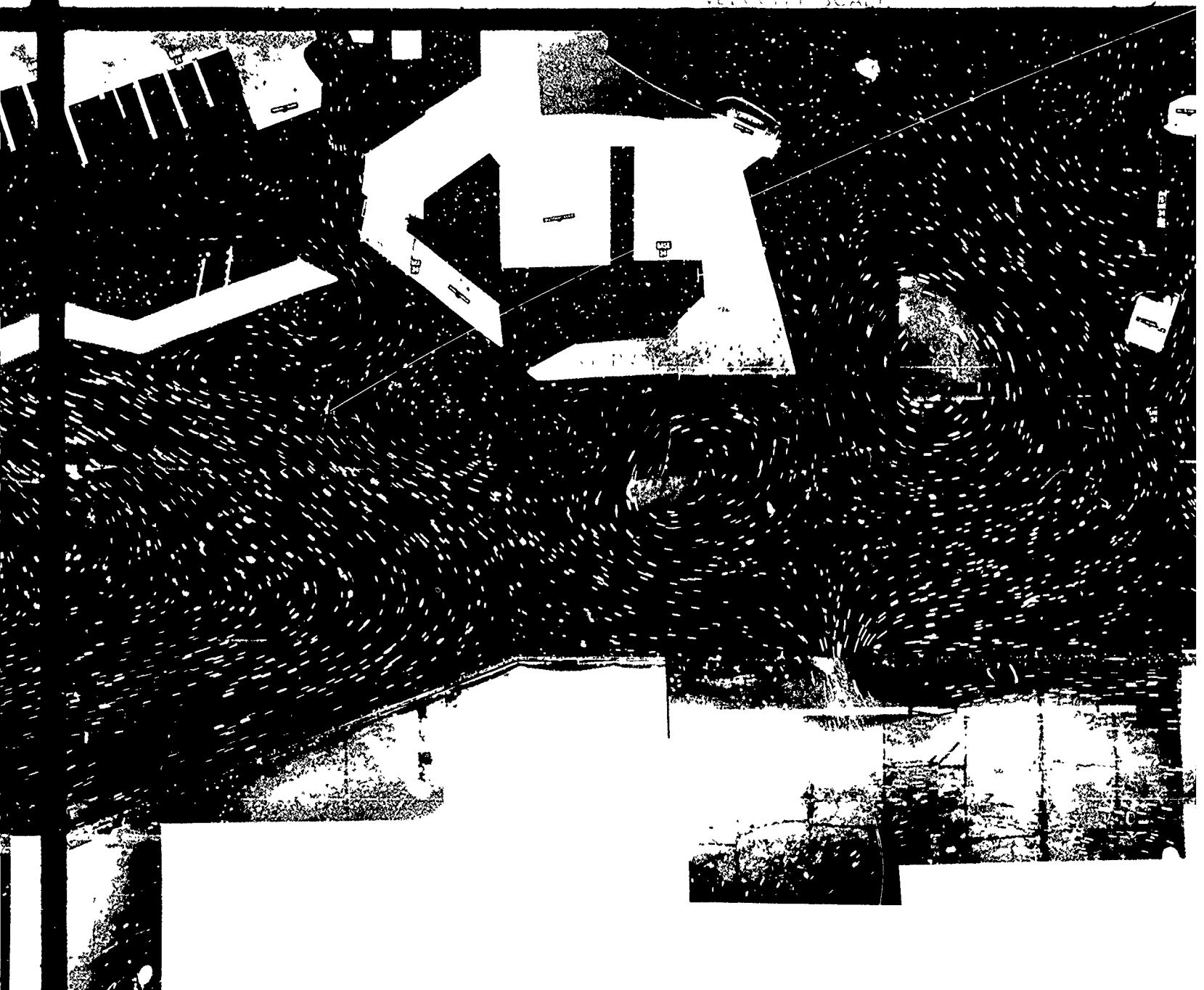


SCALES IN FEET

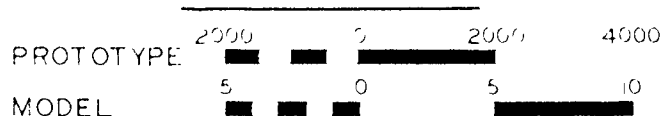


VELOCITY SCALE





SCALES IN FEET



LOS AN
SURFACE



VELOCITY SCALE

1 0 1 2 3 FPS
 PROTOTYPE 1/16 1/8 1/4 1/2 1

MODEL STUDY OF
 LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

BASE TEST
 SPRING TIDE
 HOUR 24



N

BT

6

BS

BASE

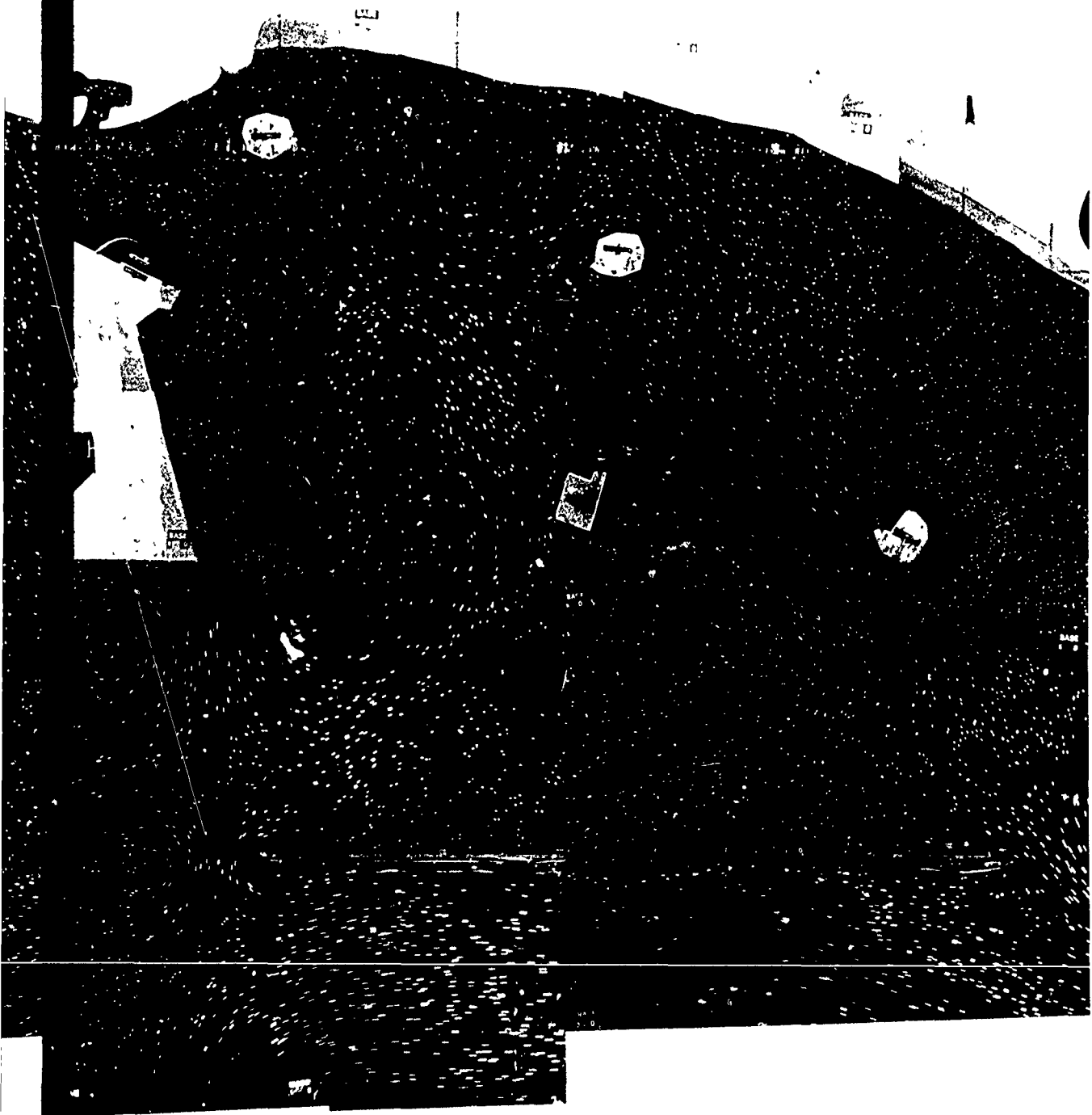
BS

BAS



BASE

SCALES IN FEET



VELOCITY SCALE

1000000

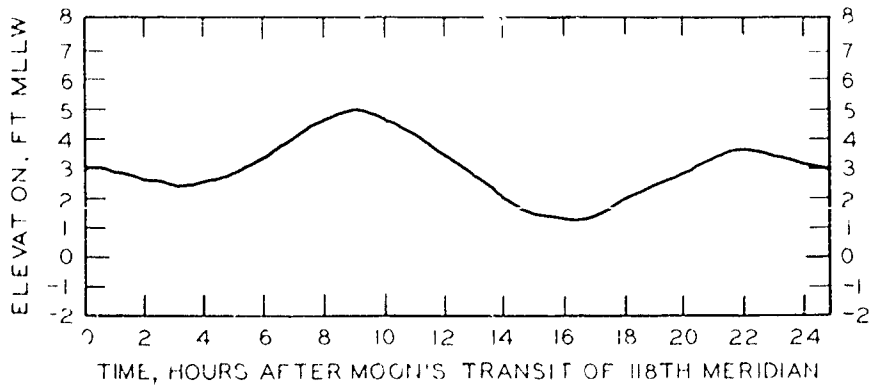
N



ELEVATION, FT. MLLW

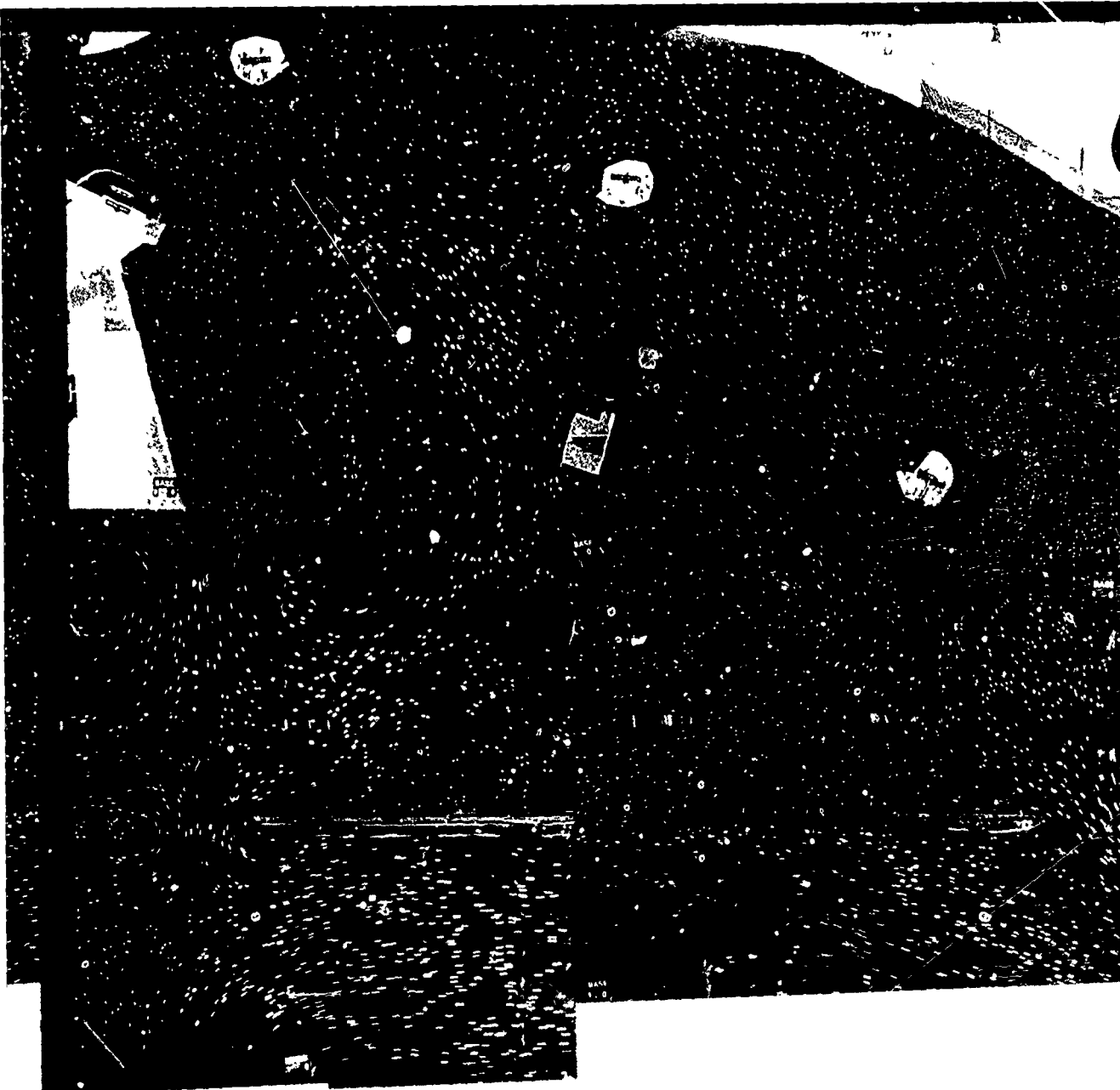


SCALES IN FEET



LO
SURFACE

5



VELOCITY SCALE

1 0 1 2 3 FPS
 PROTOTYPE 1000 1000

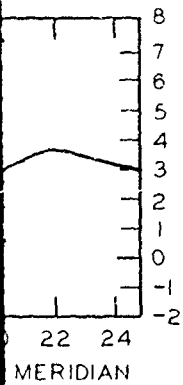
MODEL STUDY OF
 LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

BASE TEST
 NEAP TIDE
 HOUR 0

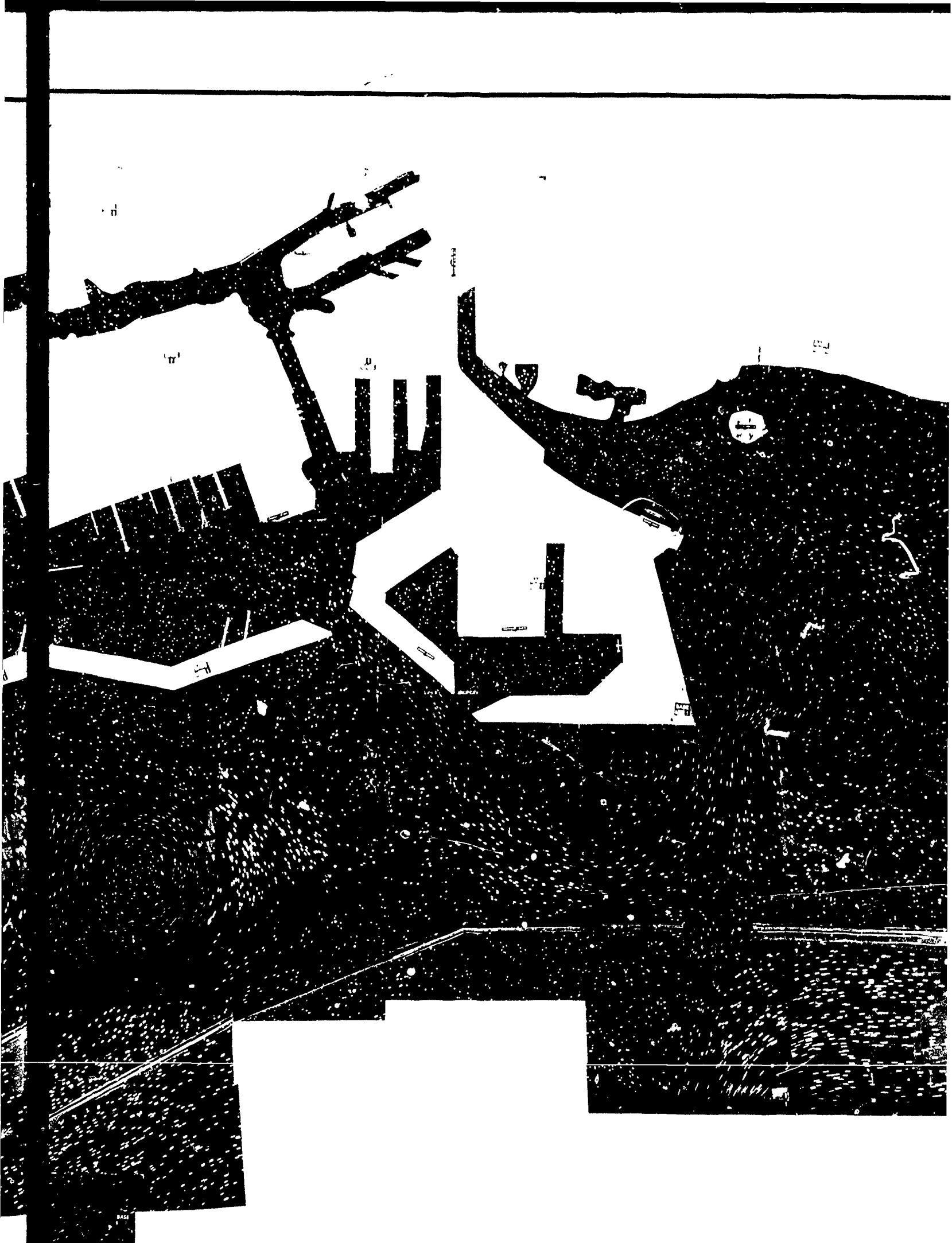
4000

0

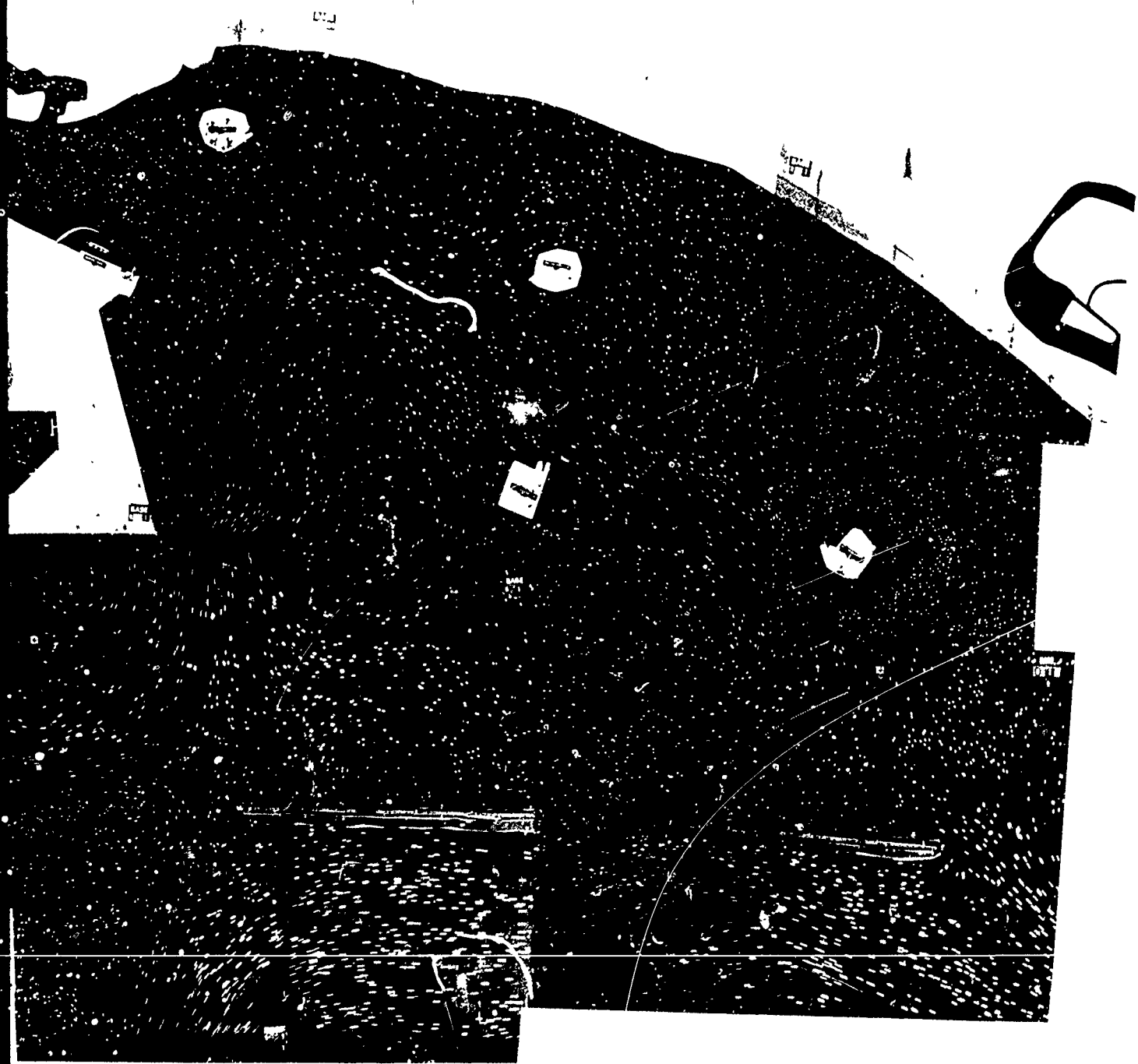




N



SCALES IN FEET



N





SCALES IN FEET

PROTOTYPE	2000	0	2000	4000
MODEL	5	0	5	10

LOS
SURFAC

5



4000
10

VELOCITY SCALE
1 0 1 2 3 FPS
PROTOTYPE 1/11 1

MODEL STUDY OF
LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

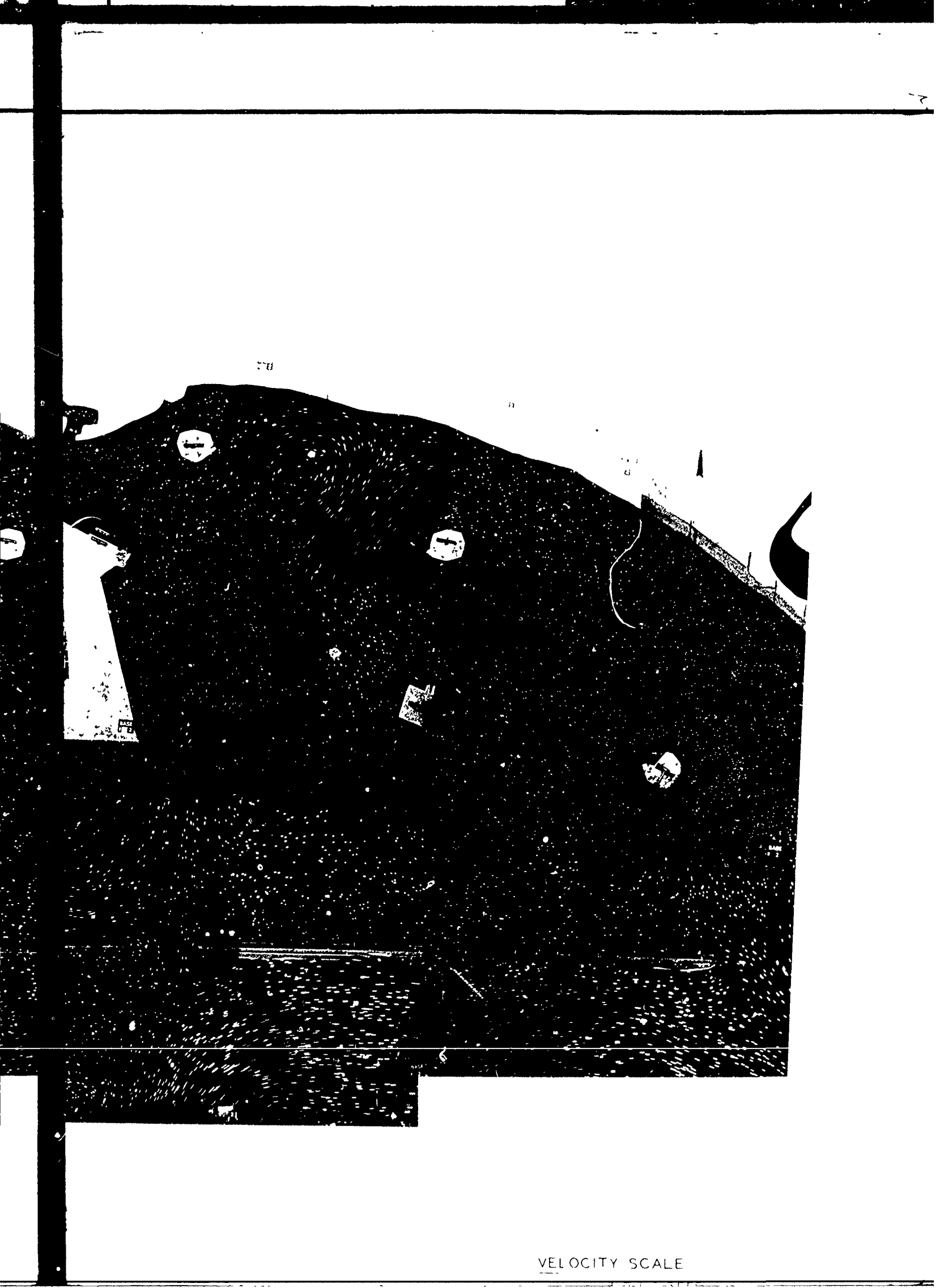
BASE TEST
NEAP TIDE
HOUR 1



N



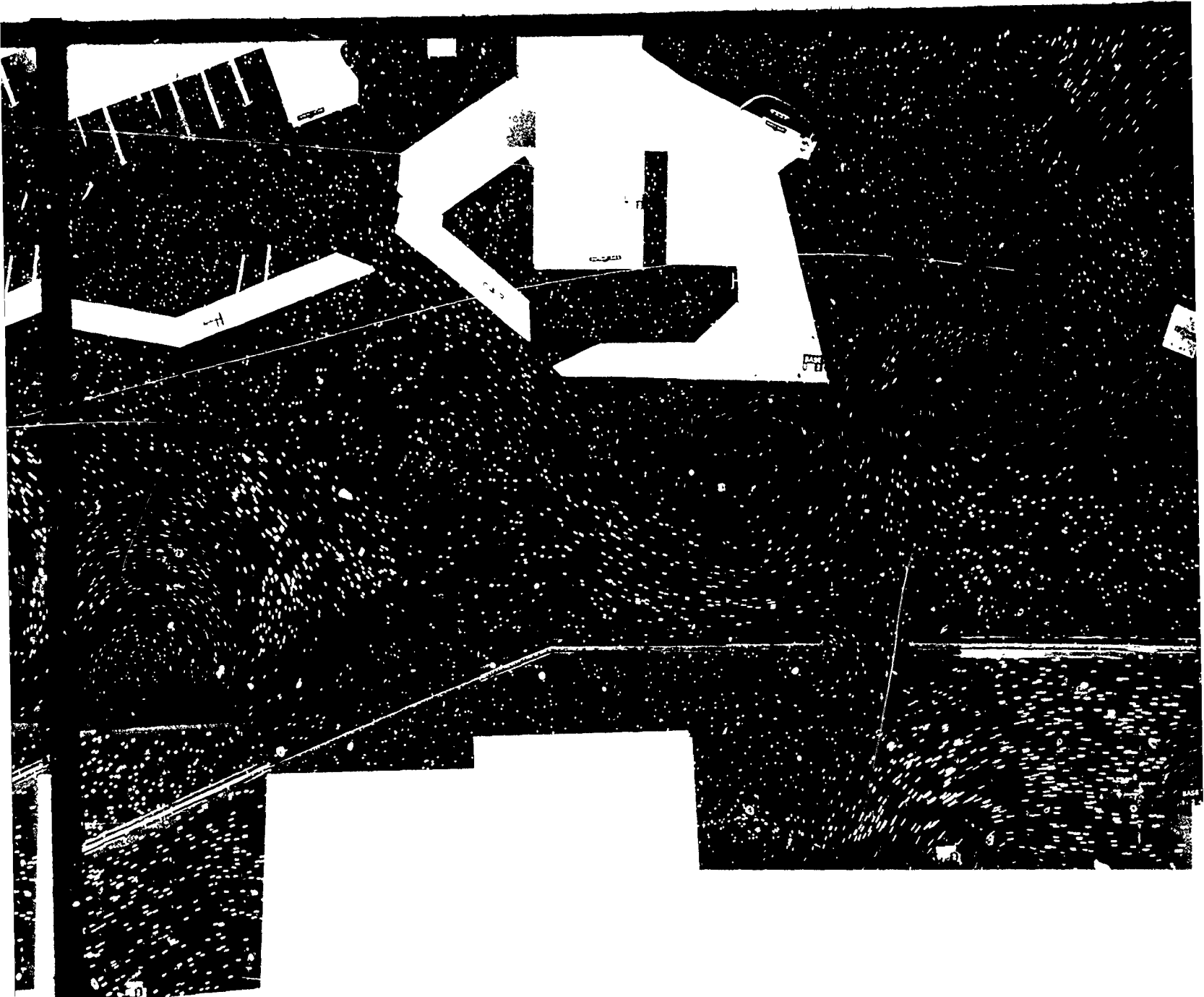
SCALES IN FEET



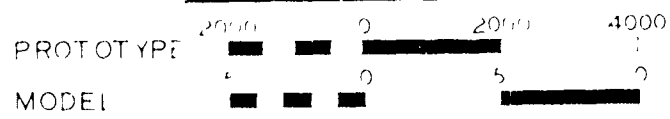
VELOCITY SCALE

N





SCALES IN FEET



LO.

SURFAC

5



VELOCITY SCALE

1 0 1 2 3 FPS
 PROTOTYPE 1/4 1/2 1

4000

10

MODEL STUDY OF
 LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

BASE TEST
 NEAP TIDE
 HOUR 2



58

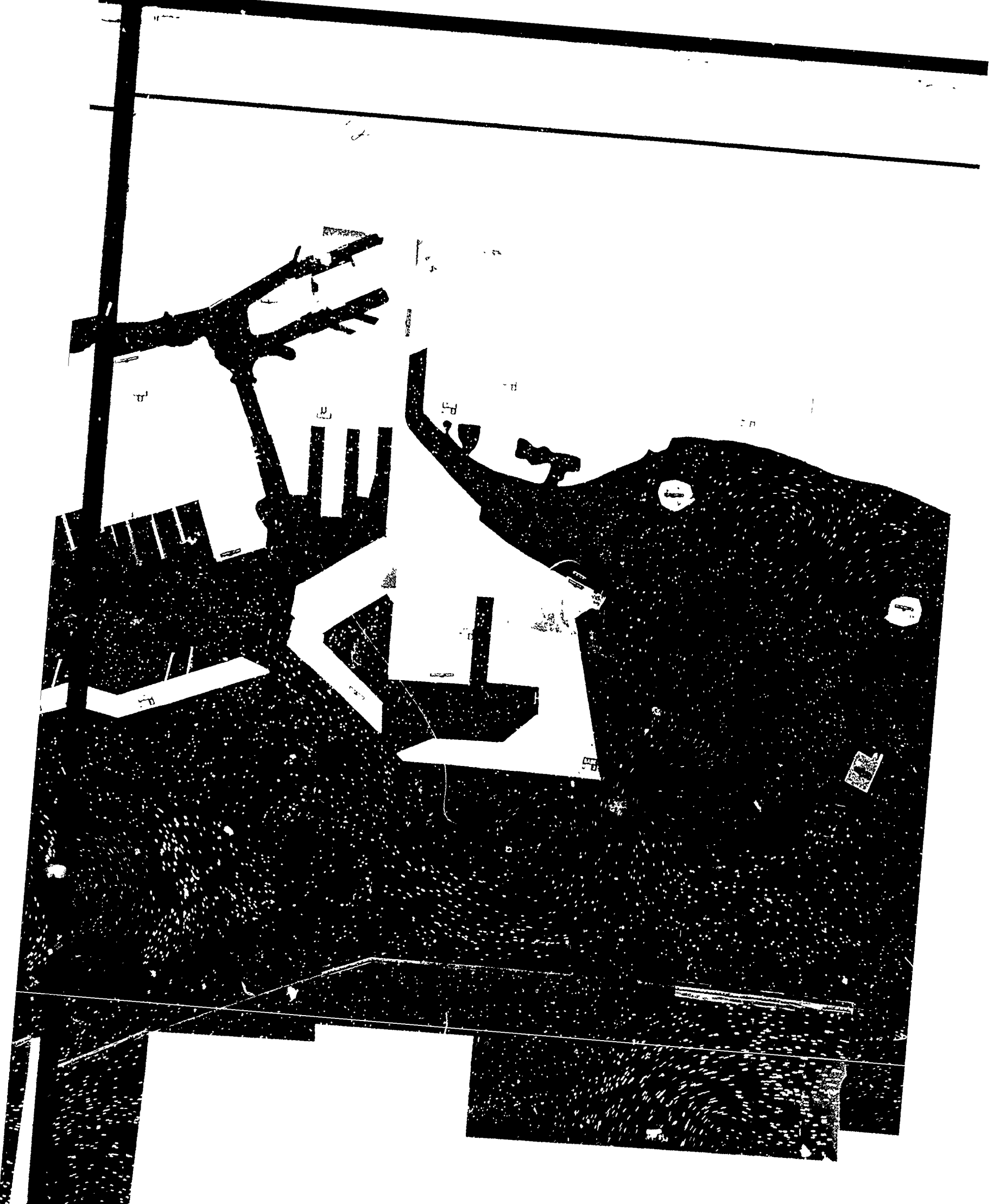
7

30

55

55

N



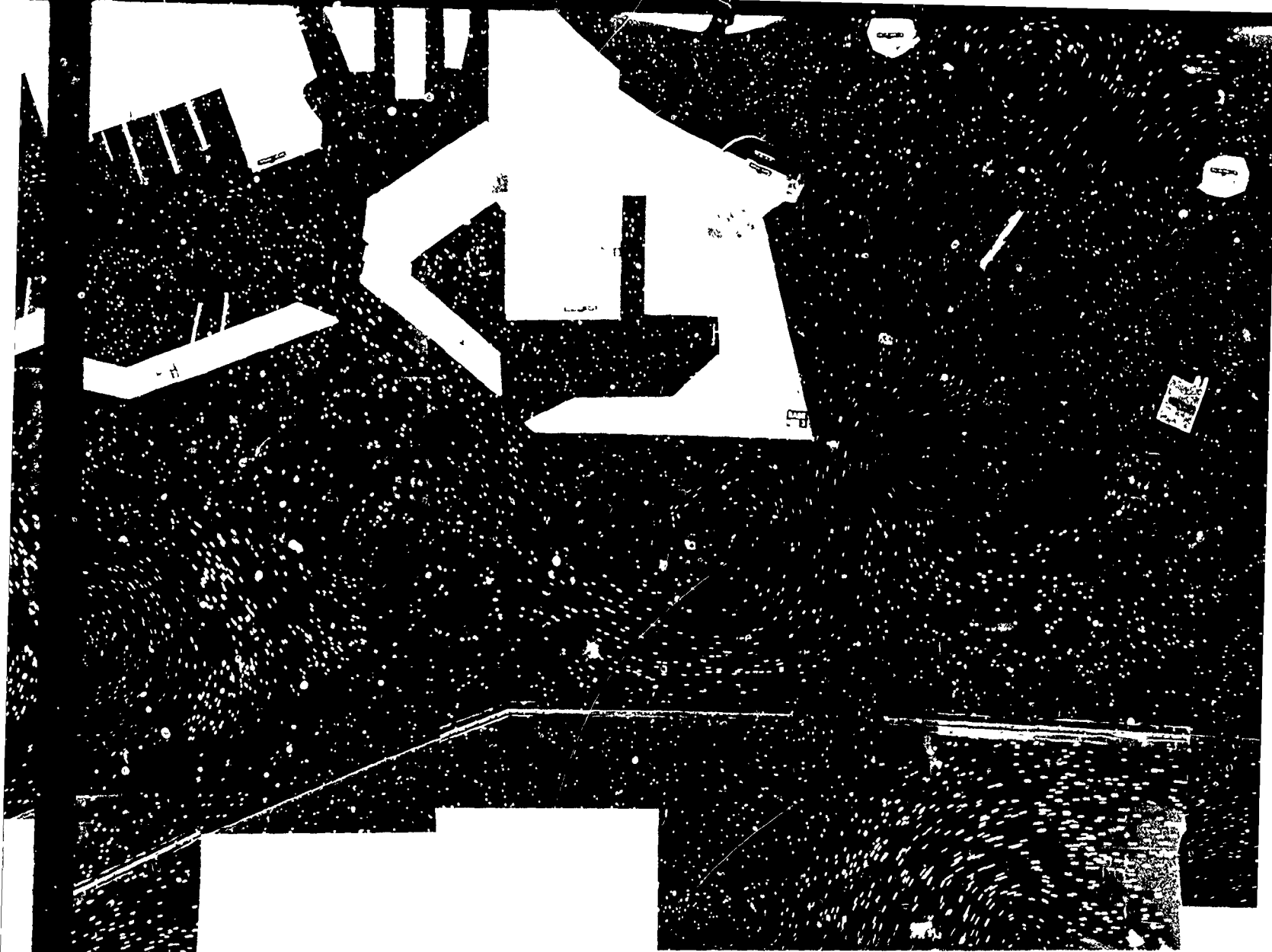
SCALES IN FEET



VELOCITY SCALE

N





SCALES IN FEET

PROTOTYPE	200	0	2000	4000
MODEL	5	0	5	10

LOS ANC

SURFACE



VELOCITY SCALE

1 0 1 2 3 FPS
PROTOTYPE (1:1)

MODEL STUDY OF
LOS ANGELES-LONG BEACH HARBORS

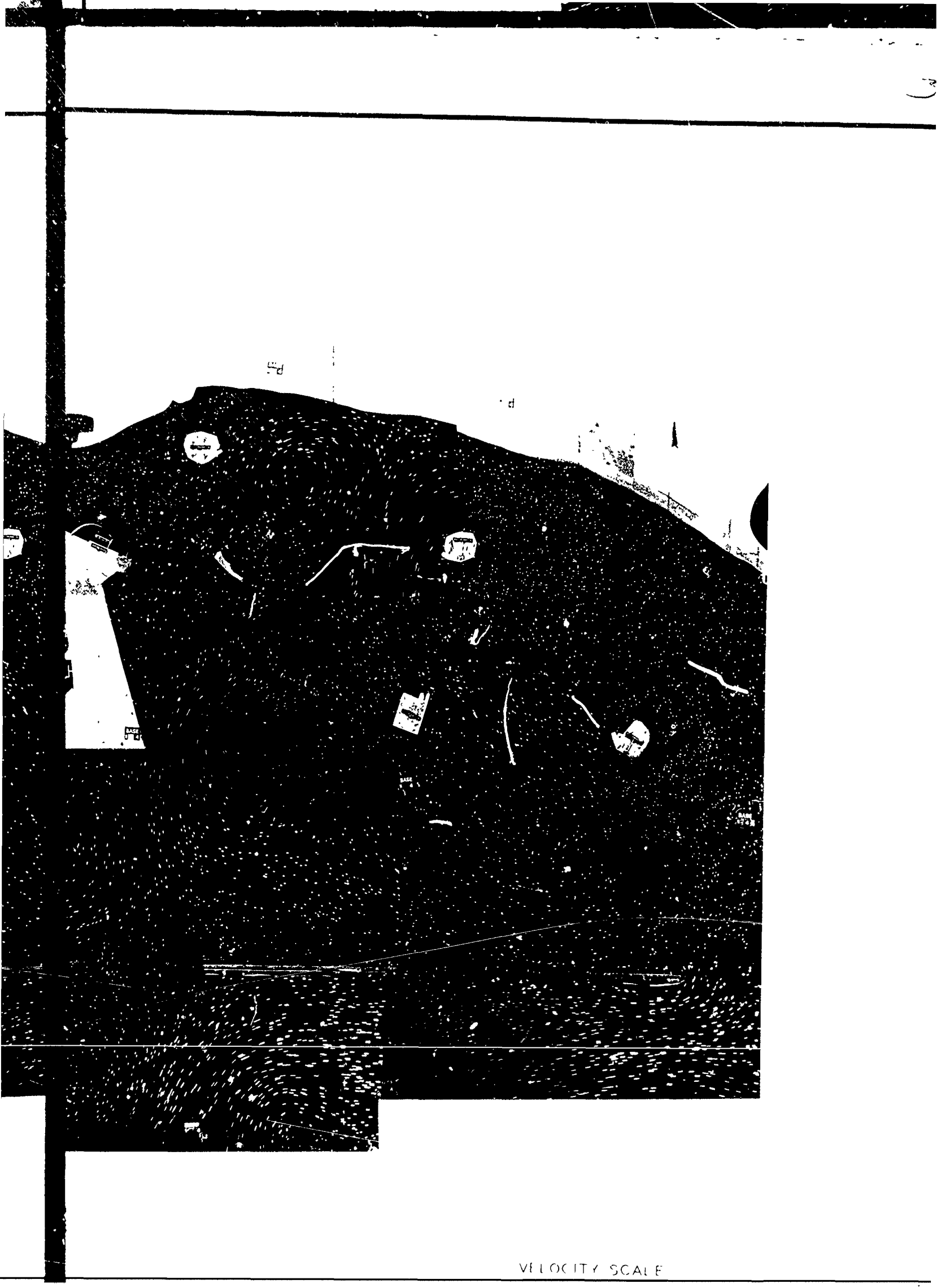
SURFACE CURRENT PATTERNS

BASE TEST
NEAP TIDE
HOUR 3





SCALES IN FEET



P.

P.

BASE
U 2

BASE
U 2

BASE
U 2

BASE
U 2

BASE
U 2

VELOCITY SCALE



N

R

R

R



SCALES IN FEET

PROTOTYPE	2000	0	2000	4000
MODEL	1	0	5	10

SURI

5



S A
CE

4000
|
10

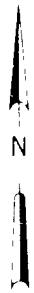
VELOCITY SCALE
10 FT. 3 FPS
PROT. (E. 1.1)

MODEL STUDY OF
LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

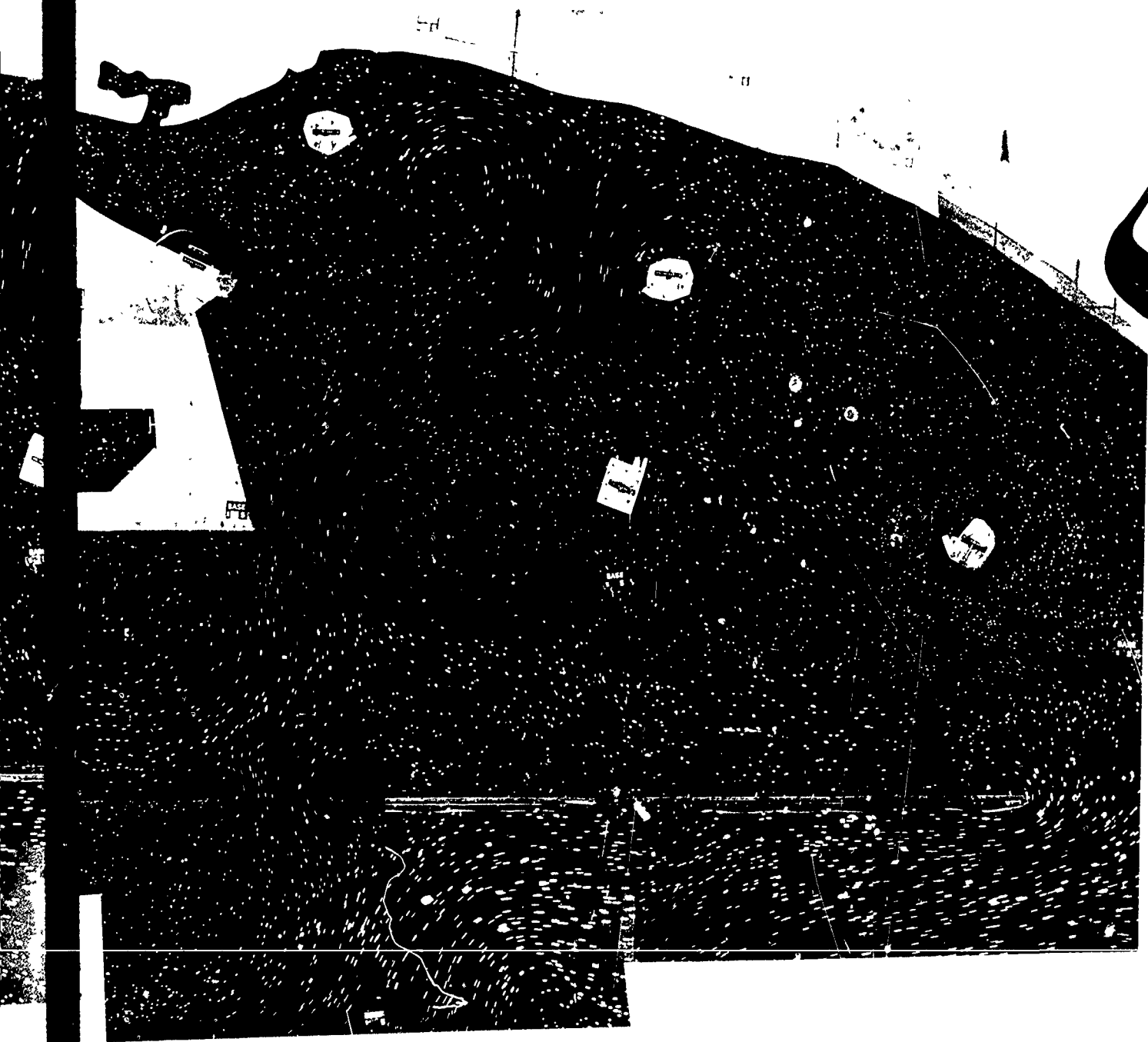
BASE TEST
NEAP TIDE
HOUR 4

1





SCALE'S IN FEET



VELOCITY SCALE

N





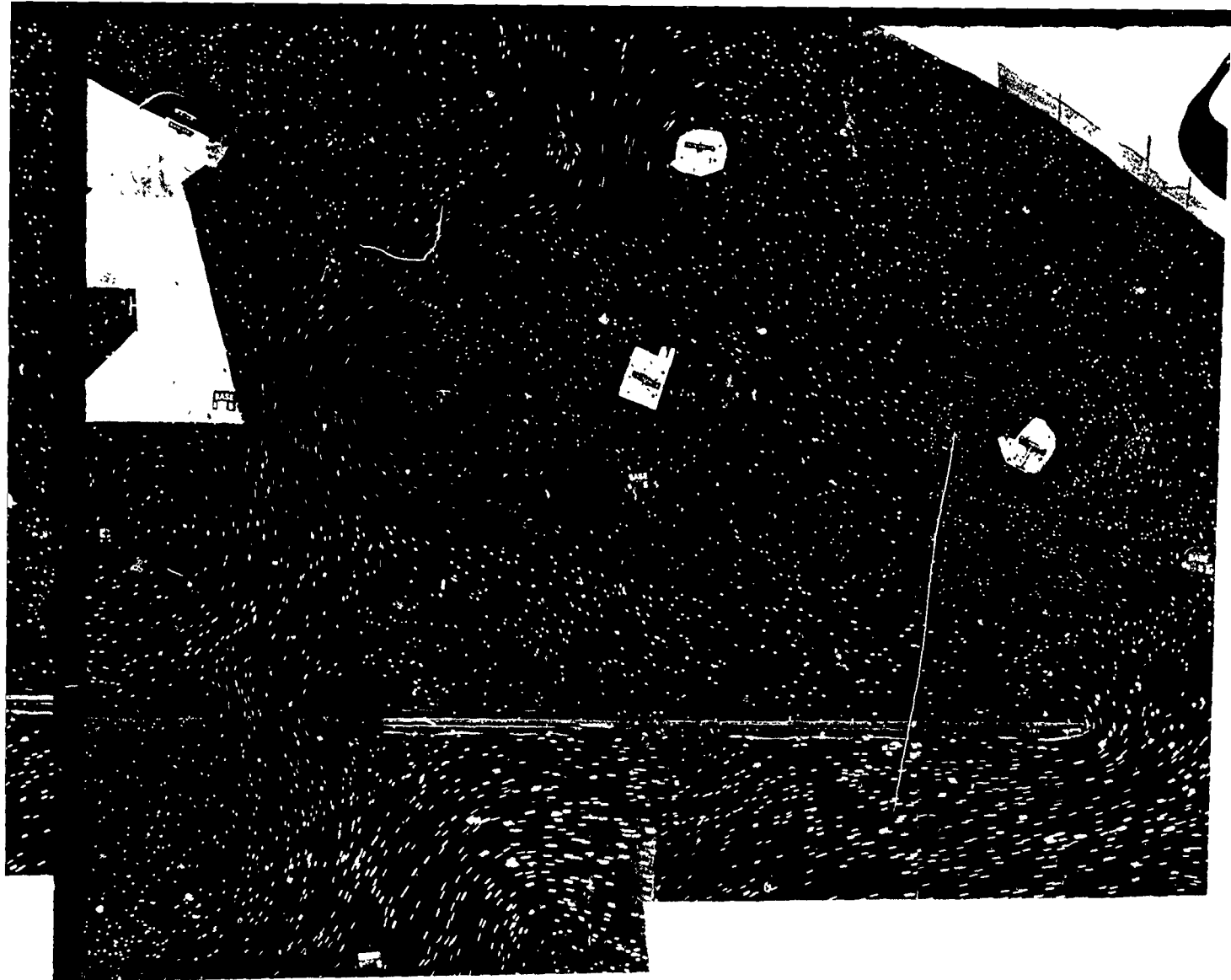
SCALES IN FEET

PROTOTYPE	2000	0	2000	4000
MODEL	5	0	5	10

LOS A

SURFACE

5



VELOCITY SCALE

1 0 1 2 3 FPS
 PROTOTYPE 1:1000

MODEL STUDY OF
 LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

BASE TEST
 NEAP TIDE
 HOUR 5

N



2



SCALES IN FEET



55

d

VELOCITY SCALE

1800

10 15 20

2

3





SCALES IN FEET

PROTOTYPE	2000	2	2000	4000
MODEL	5	0	5	10

VELC

DU 1111

MODE
LOS ANGELES-I

SURFACE CUR

BA
NE
H



VELOCITY SCALE

1 0 1 2 3 FPS
PROTOTYPE 1.1 . . . 1

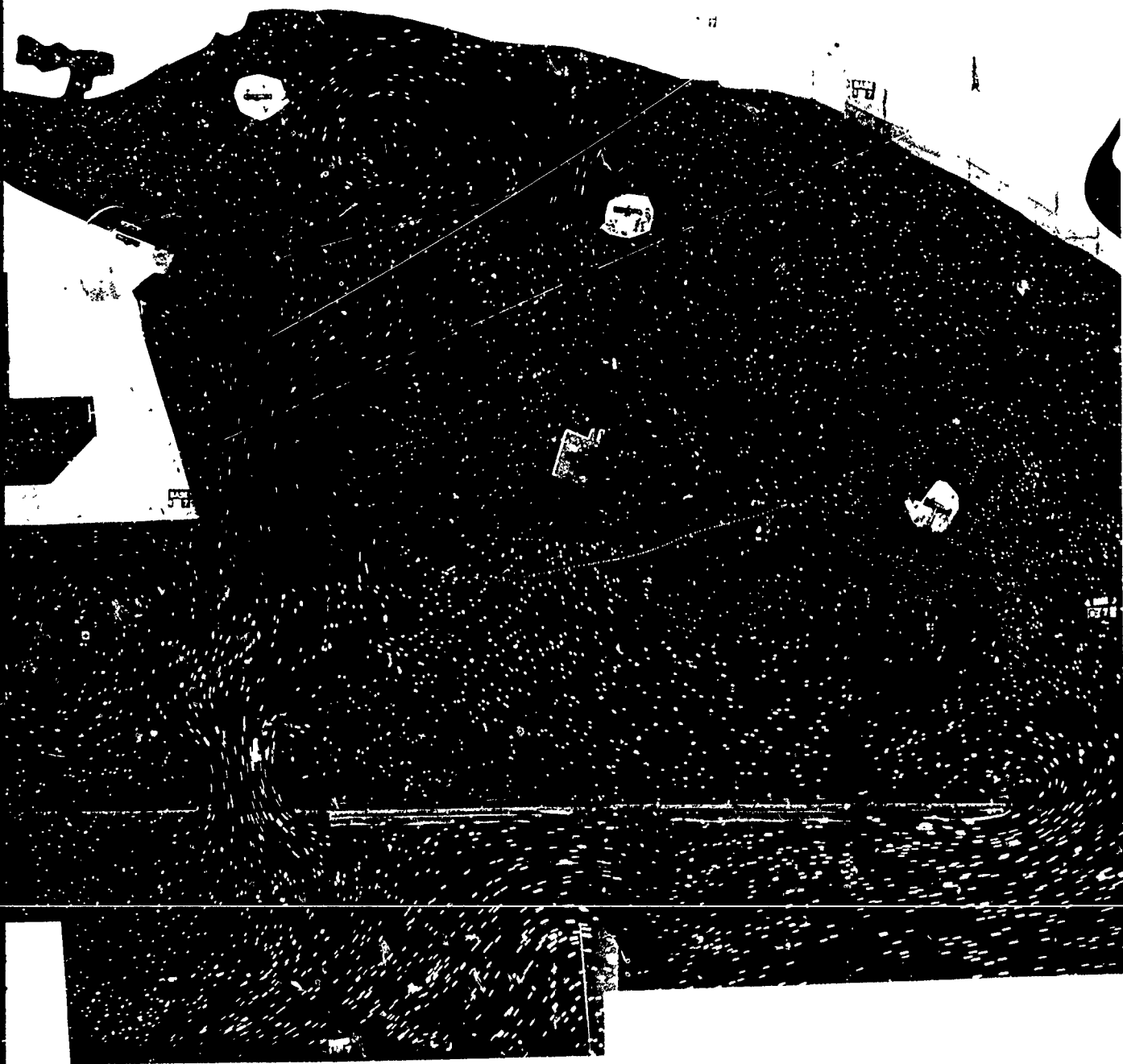
MODEL STUDY OF
LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

BASE TEST
NEAP TIDE
HOUR 6







N

2

11

11

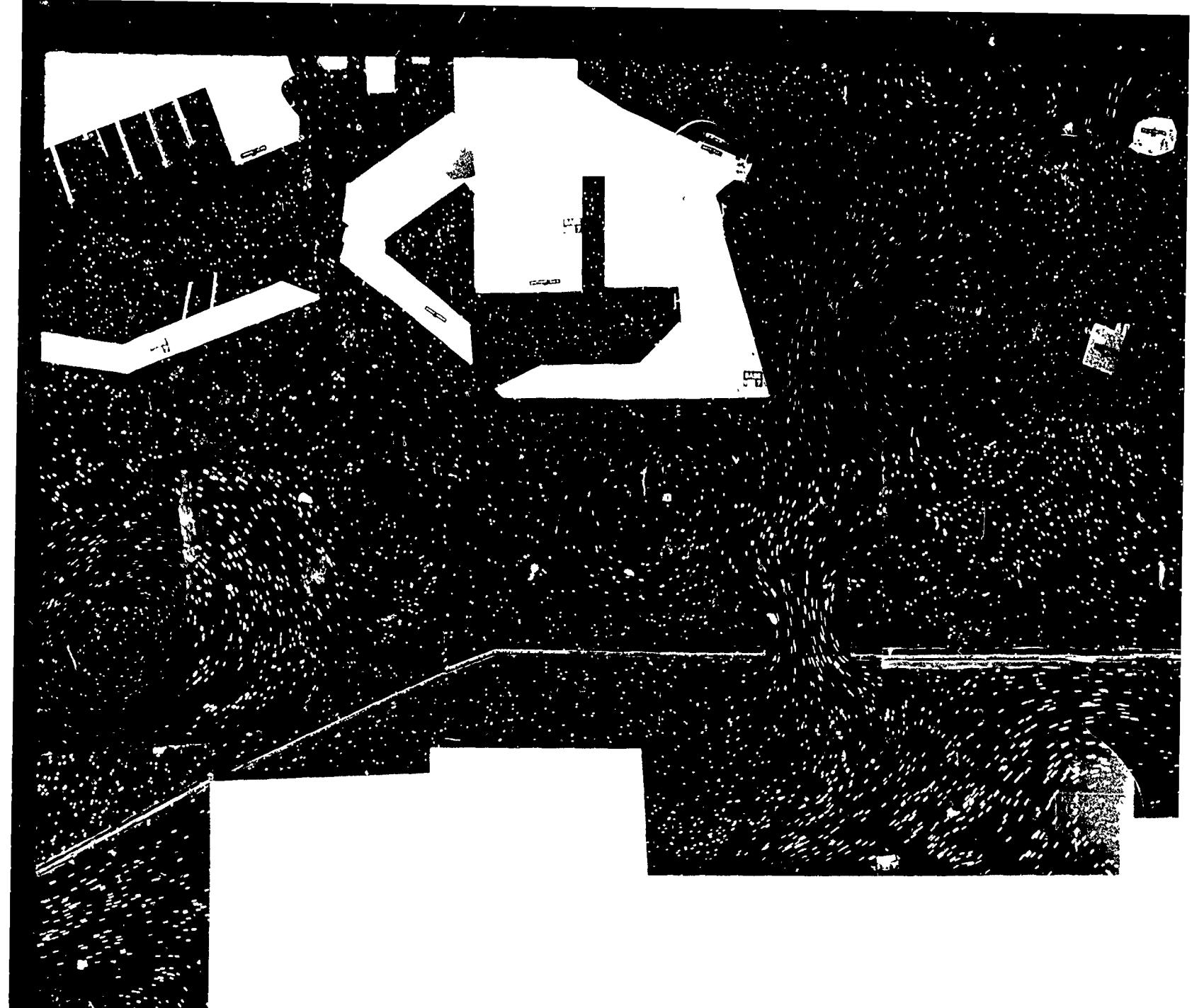
11

11

11



11



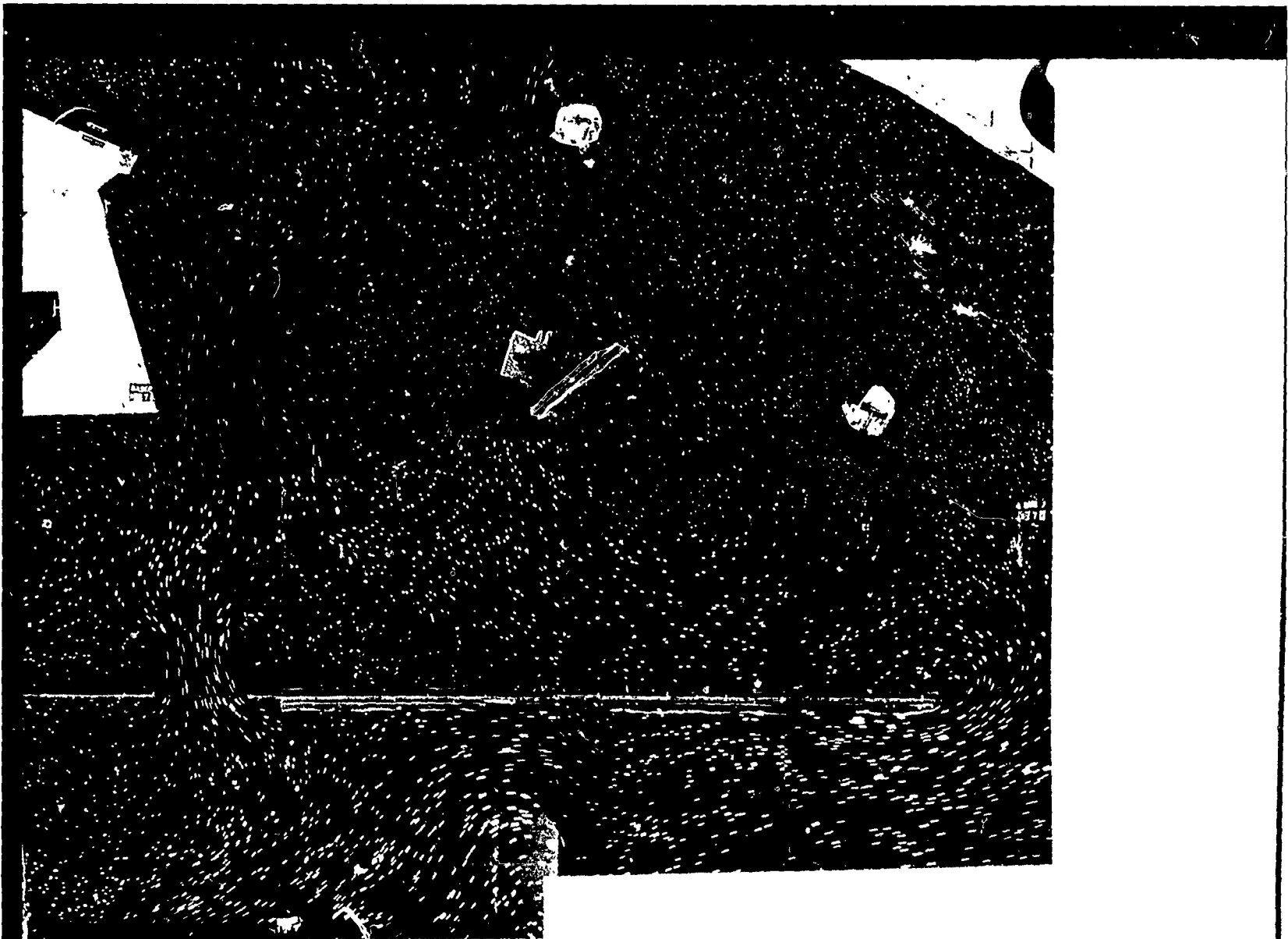
SCALES IN FEET

PROTOTYPE	2000	0	2000	4000
MODEL	5	0	5	10

LOS ANGELES

SURFACE

5



4000
 }
 10

VELOCITY SCALE
 1 0 1 2 3 FPS
 PROTOTYPE 1:100

MODEL STUDY OF
 LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

BASE TEST
 NEAP TIDE
 HOUR 7

1

N





5



N



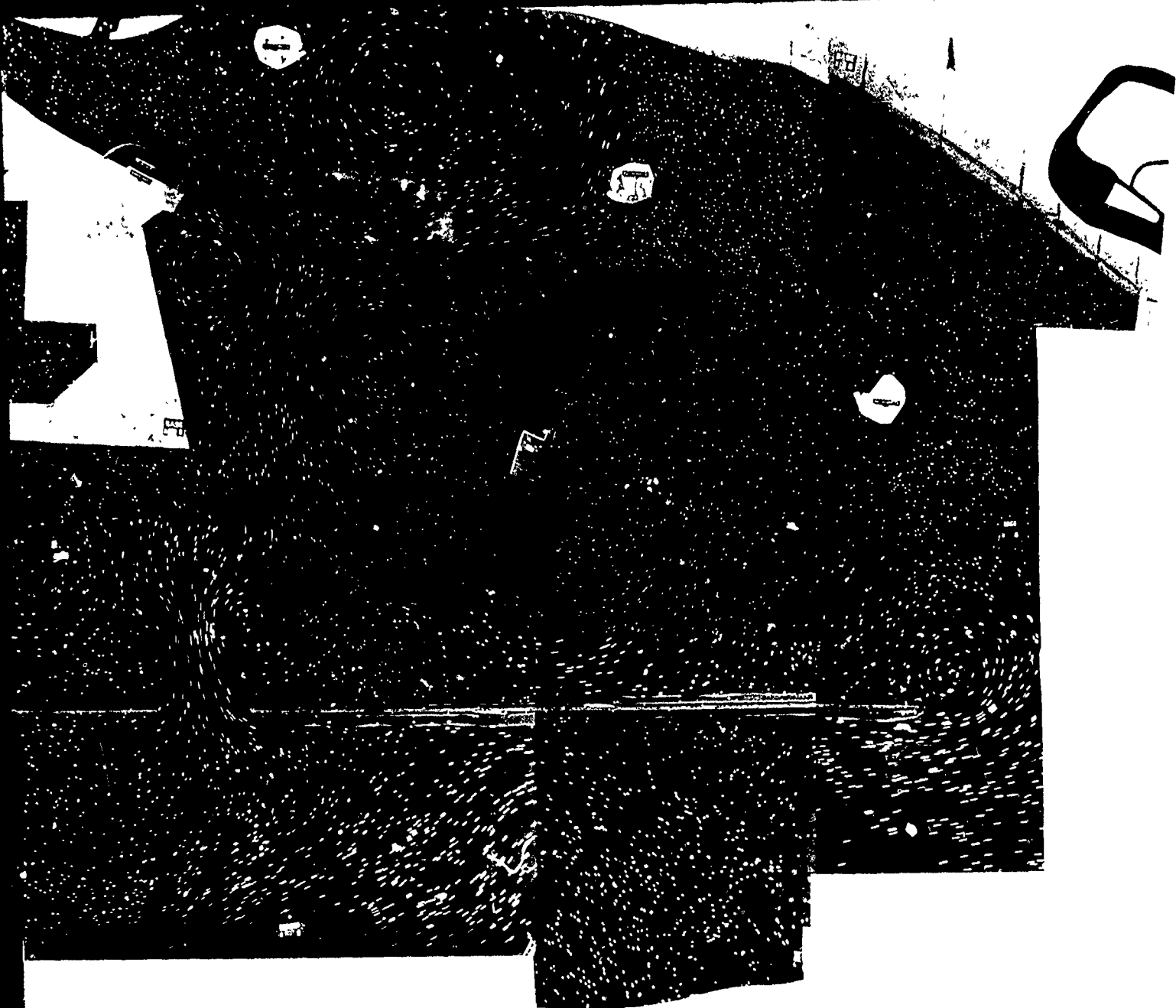


SCALES IN FEET

PROTOTYPE	2000	0	2000	4000
MODEL	5	0	5	10

LOS
SURFACI

5



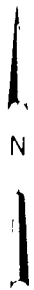
4000
10

VELOCITY SCALE
1 0 1 2 3 FPS
PROTOTYPE 1:1

MODEL STUDY OF
LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

BASE TEST
NEAP TIDE
HOUR 8





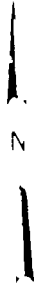
3

270



VELOCITY SCALE

SCALES IN FEET



4



SCALES IN FEET

PROTOTYPE	2000	0	2000	4000
MODEL	5	0	5	10

LOS AN

SURFACE



4000

VELOCITY SCALE

1 0 1 2 3 FPS
PROTOTYPE [unclear]

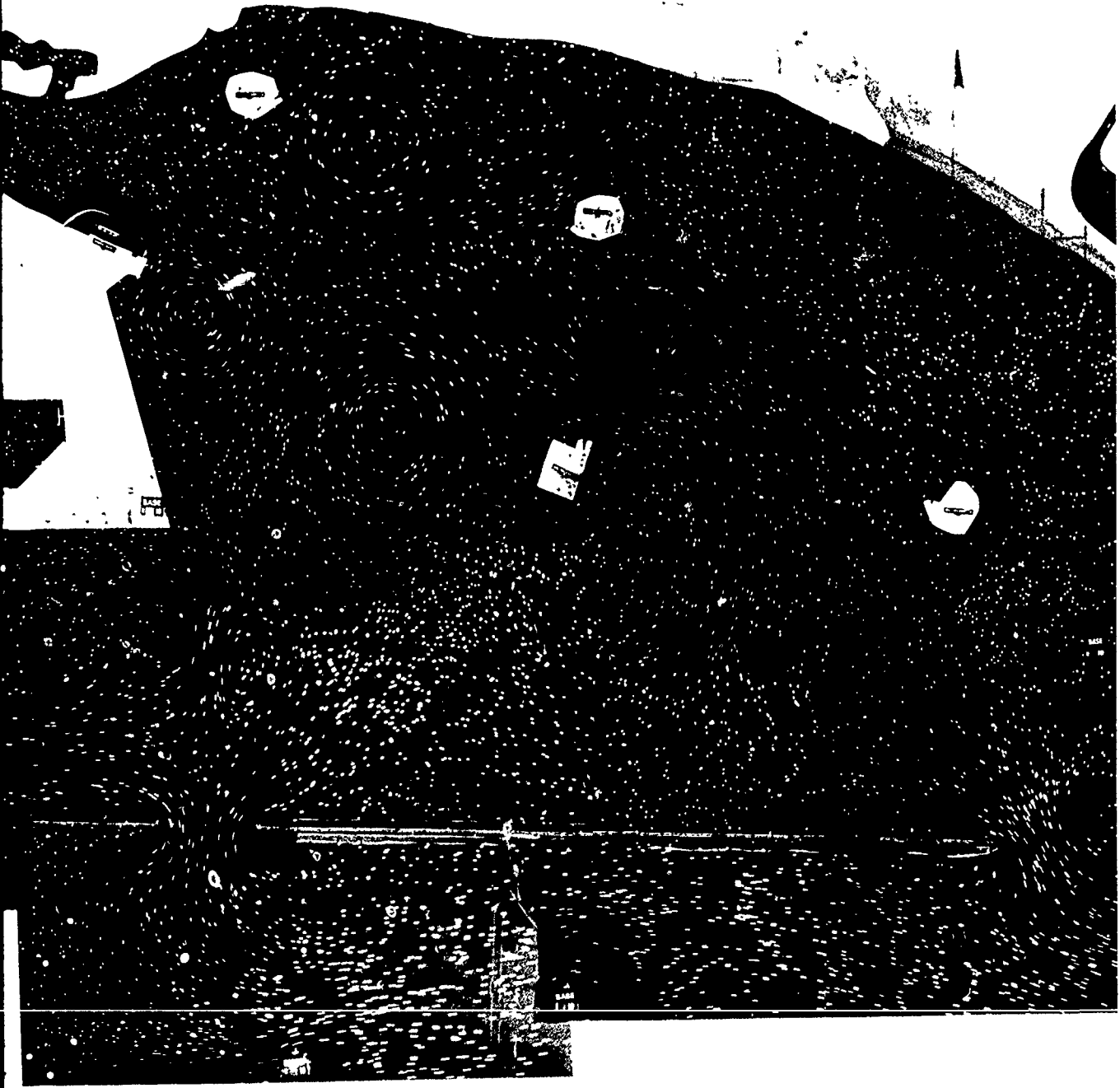
MODEL STUDY OF
LOS ANGELES-LONG BEACH HARBORS

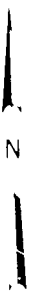
SURFACE CURRENT PATTERNS

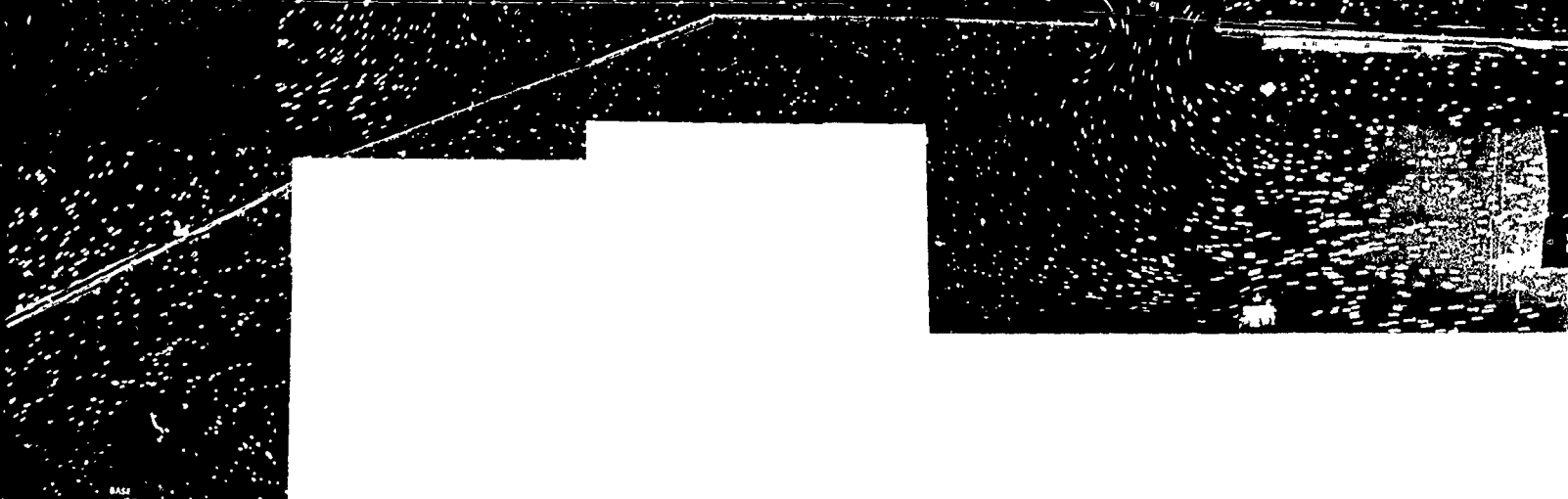
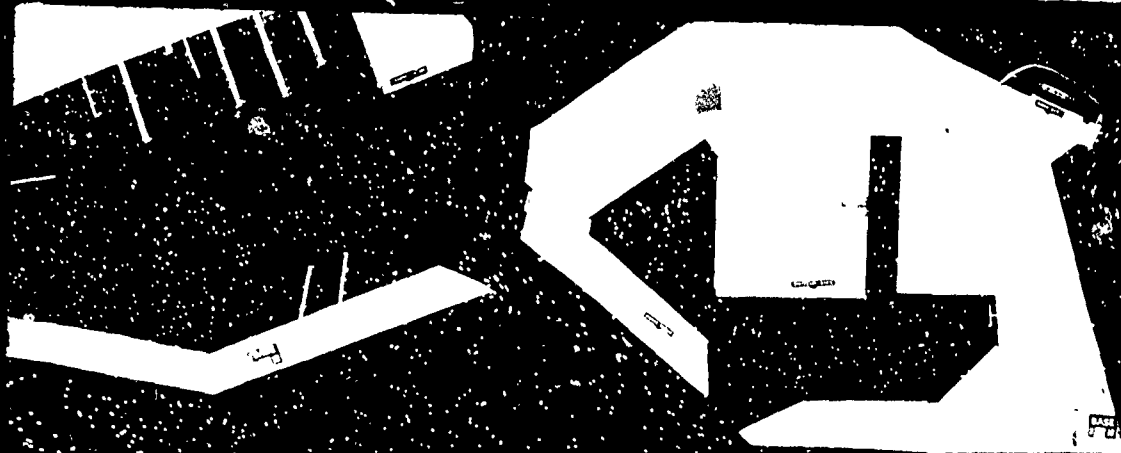
BASE TEST
NEAP TIDE
HOUR 9











SCALES IN FEET



LOS

SURFAC



4000

10

VELOCITY SCALE

1 0 1 2 3 FPS
PROTOTYPE

MODEL STUDY OF
LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

BASE TEST
NEAP TIDE
HOUR 10



N

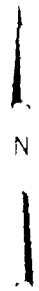
2



SCALE IN FEET



SCALES IN FEET





SCALES IN FEET

PROTOTYPE	2000	0	2000	4000
	■	■	■	■
MODEL	5	0	5	10
	■	■	■	■

N
LOS ANGELES

SURFACE CITY



4000
1
10

VELOCITY SCALE
1 0 1 2 3 FPS
PROTOTYPE

MODEL STUDY OF
LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

BASE TEST
NEAP TIDE
HOUR 11

N





SCALES IN FEET



VELOCITY SCALE

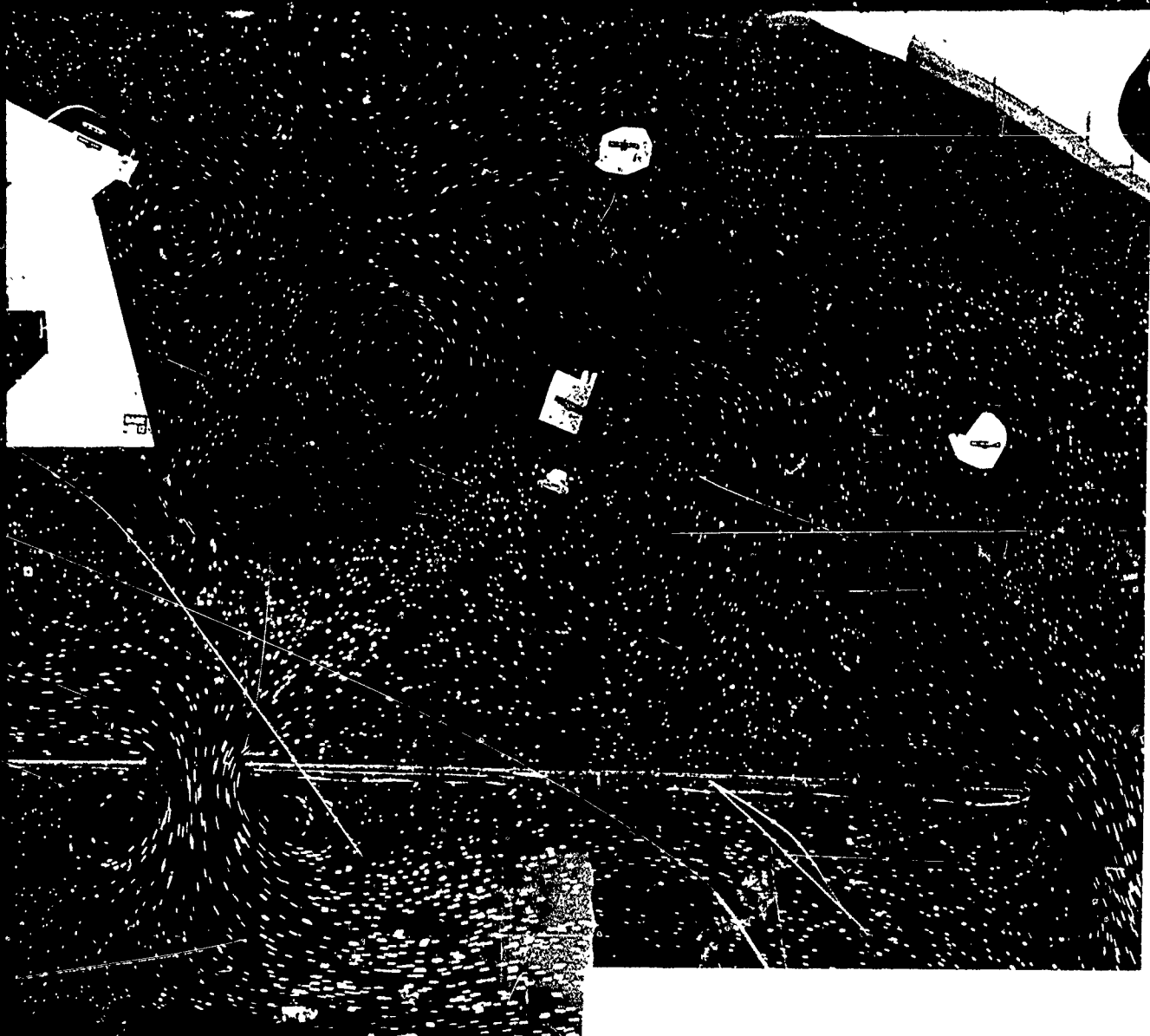




SCALES IN FEET



L
SURFA



4500
0

VELOCITY SCALE
 1 0 1 2 3 FPS
 PROTOTYPE 1/4 1/2 1

MODEL STUDY OF
 LOS ANGELES-LONG BEACH HARBORS

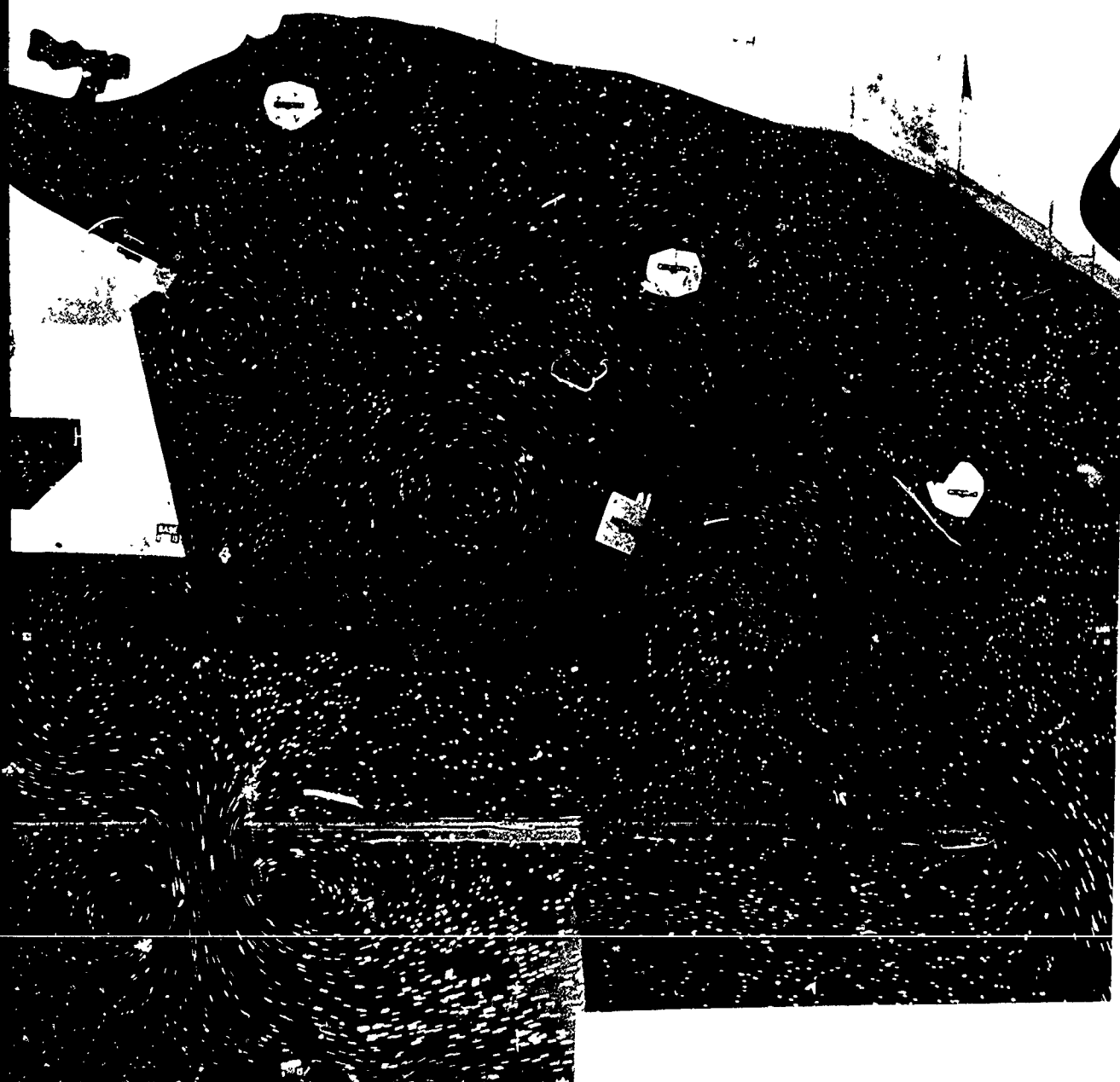
SURFACE CURRENT PATTERNS

BASE TEST
 NEAP TIDE
 HOUR 12

41







SCALES IN FEET

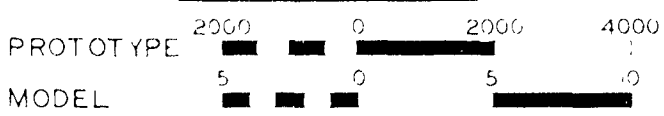
N



4



SCALES IN FEET



LO
SURFAC



4000
10

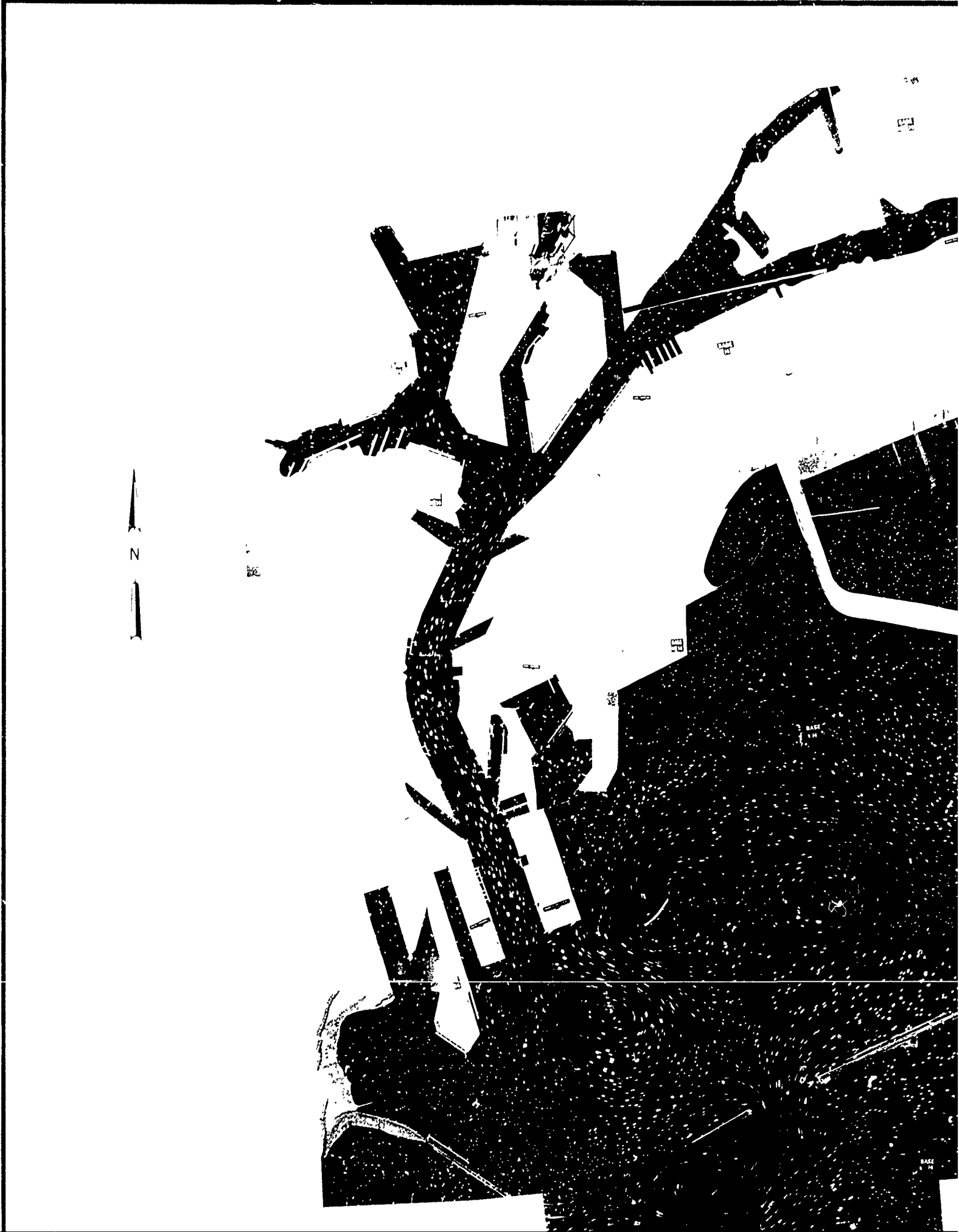
VELOCITY SCALE
1 0 1 2 3 FPS
PROTOTYPE

MODEL STUDY OF
LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

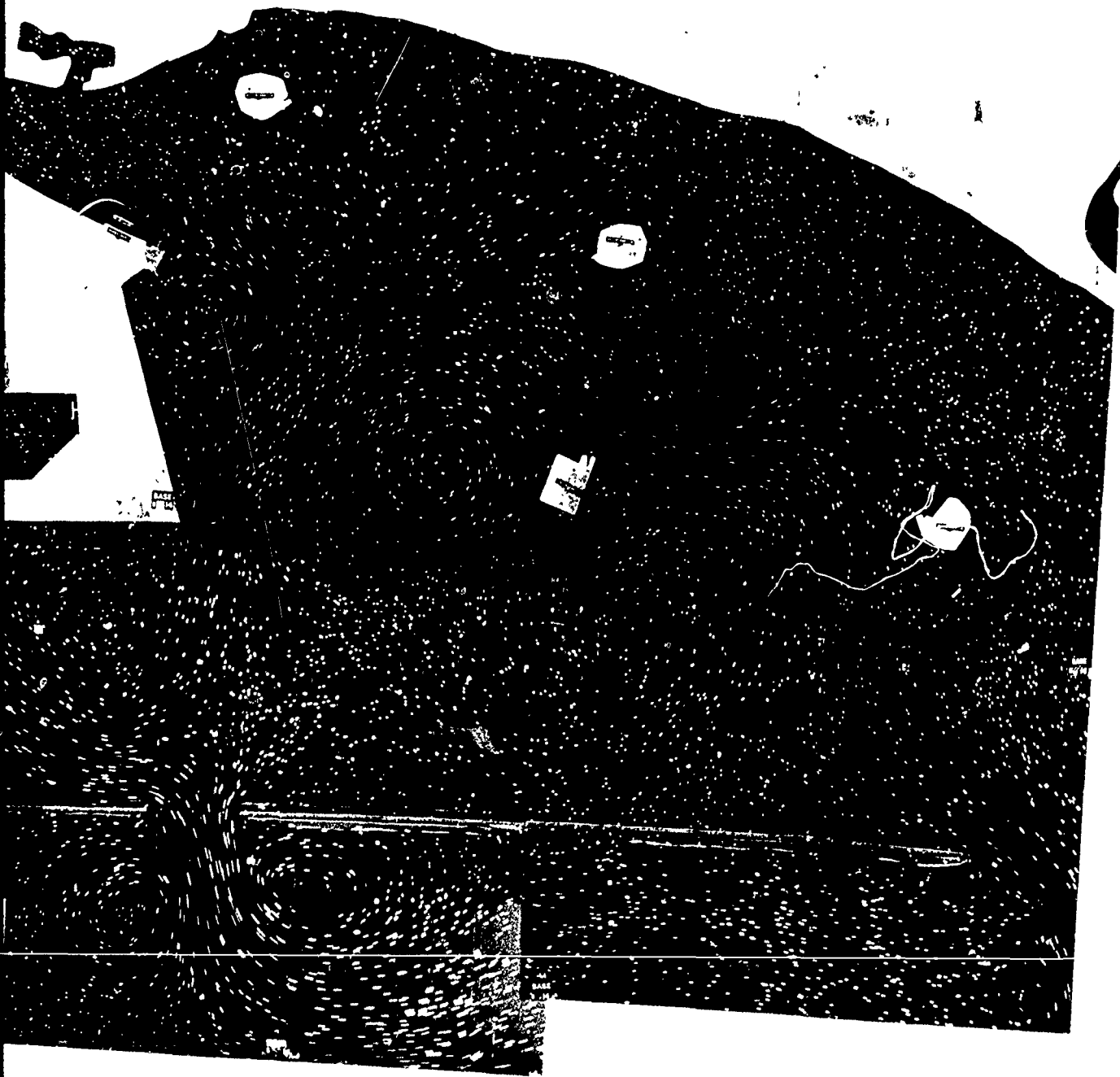
BASE TEST
NEAP TIDE
HOUR 13

b





SCALES IN FEET



N



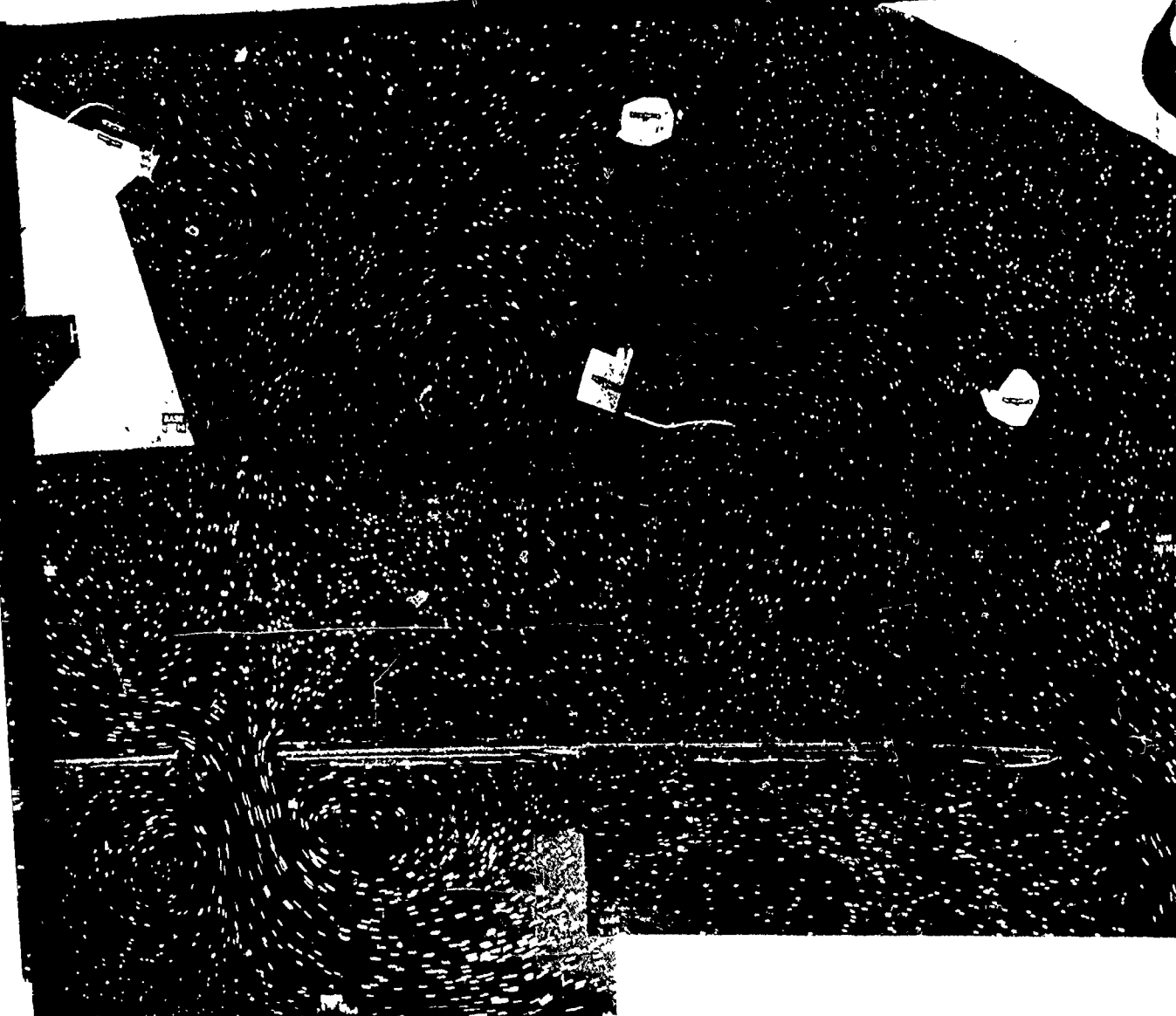
SCALES IN FEET

PROTOTYPE	200'	0	200'	4000'
MODEL	5"	0	5"	0

LOS AN

SURFACE

5



VELOCITY SCALE

1 0 1 2 3 FPS
PROTOTYPE (L.L.L.L.L.L.)

MODEL STUDY OF
LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

BASE TEST
NEAP TIDE
HOUR 14

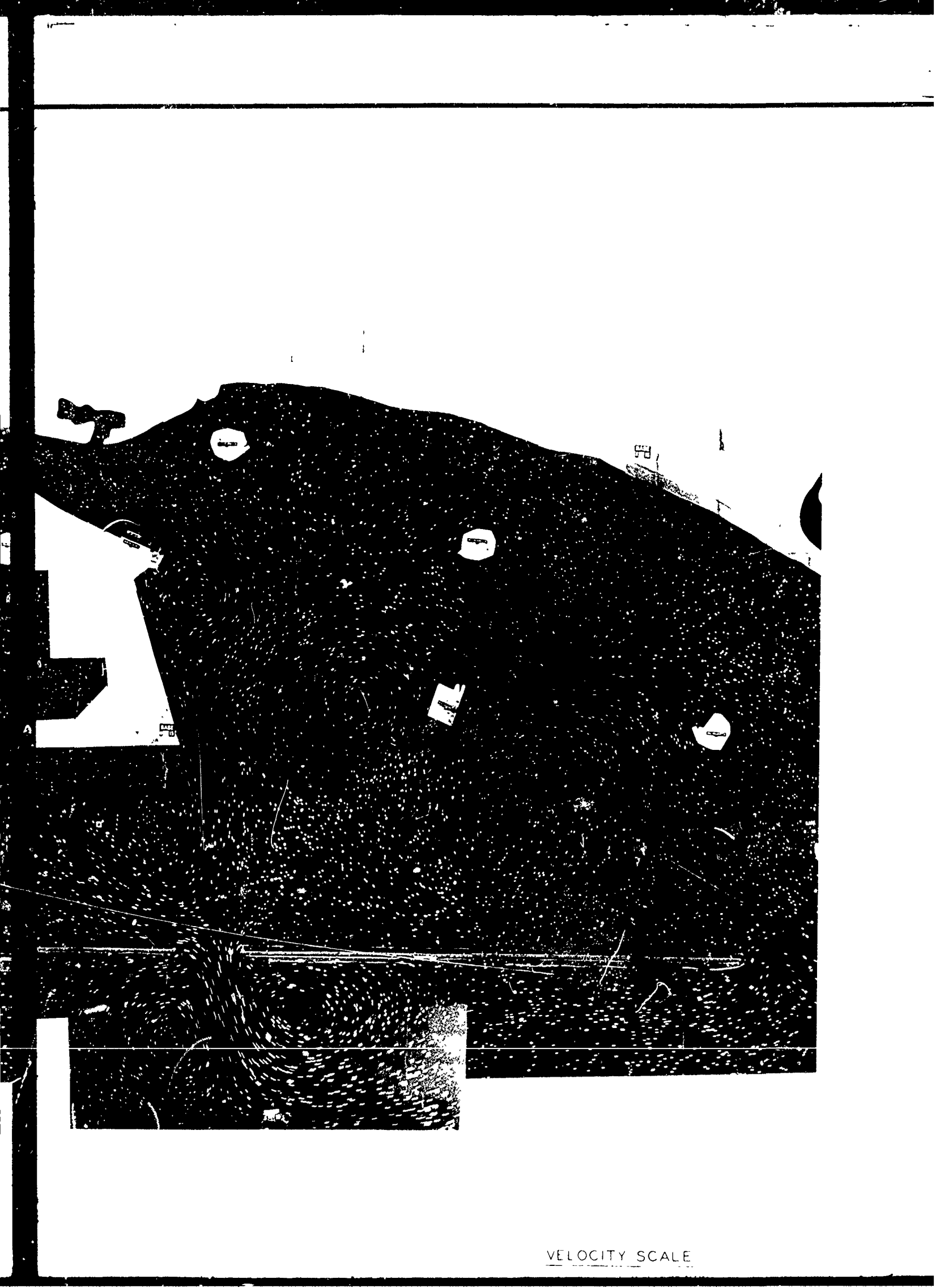
N



2

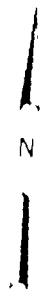


SCALES IN FEET



VELOCITY SCALE

SCALES IN FEET



4



SCALES IN FEET

	2000	0	2000	4000
PROTOTYPE	█	█	█	█
MODEL	█	█	█	█

LOS

SURFAC



VELOCITY SCALE

1 0 1 2 3 FPS
PROTOTYPE

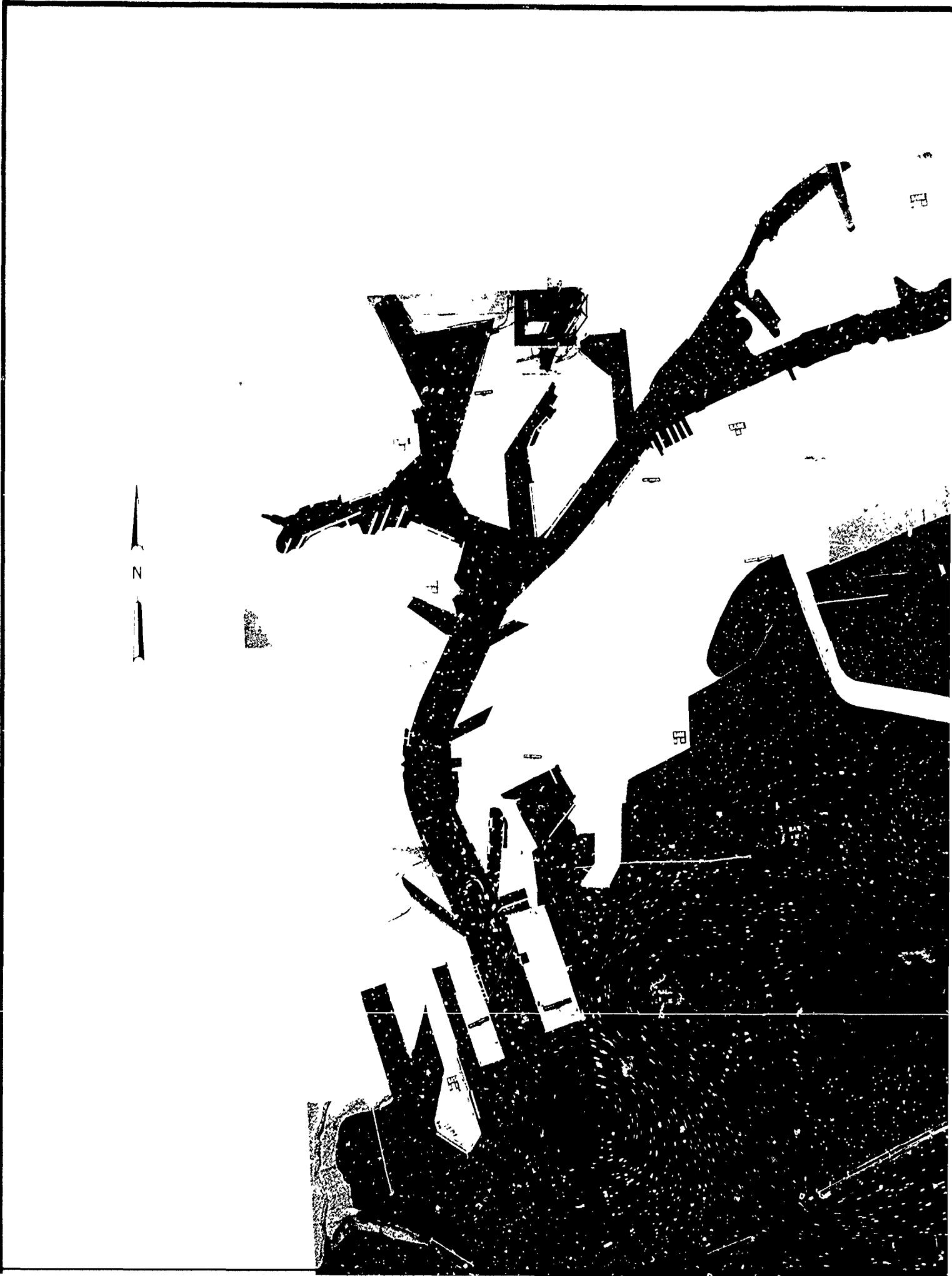
4000

5

MODEL STUDY OF
LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

BASE TEST
NEAP TIDE
HOUR 15





COPIES IN FILE

5



N





SCALES IN FEET

PROTOTYPE	2000	0	2000	4000
MODEL	5	0	5	0

LOS AN

SURFACE



VELOCITY SCALE

1 0 1 2 3 FPS
PROTOTYPE

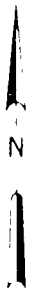
4000

0

MODEL STUDY OF
LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

BASE TEST
NEAP TIDE
HOUR 16





SCALES IN FEET

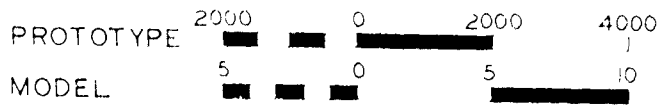


VELOCITY SCALE

2



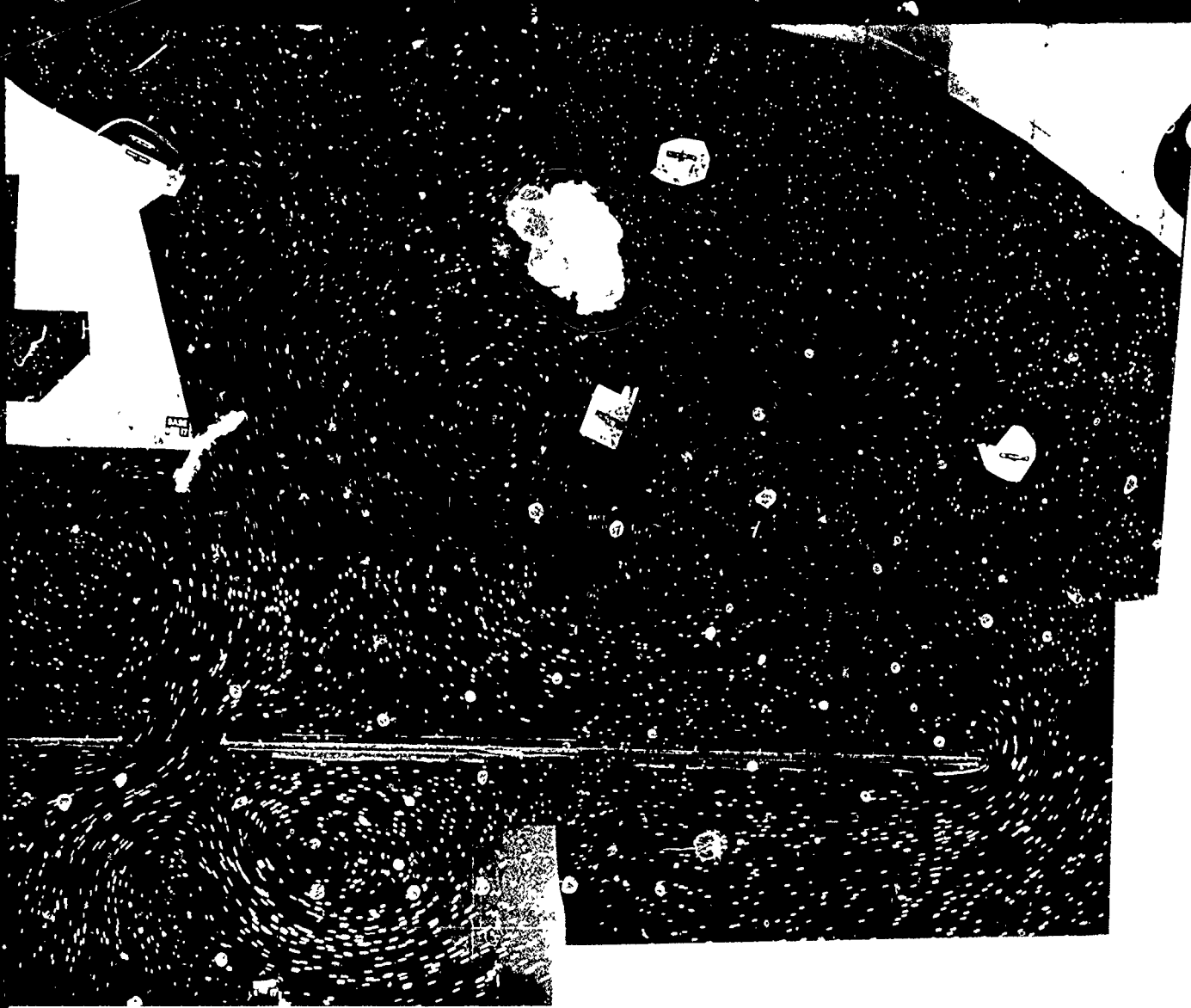
SCALES IN FEET



LOS A

SURFACE

5



4000

VELOCITY SCALE
 PROTOTYPE 1 0 1 2 3 FPS

MODEL STUDY OF
 LOS ANGELES-LONG BEACH HARBORS

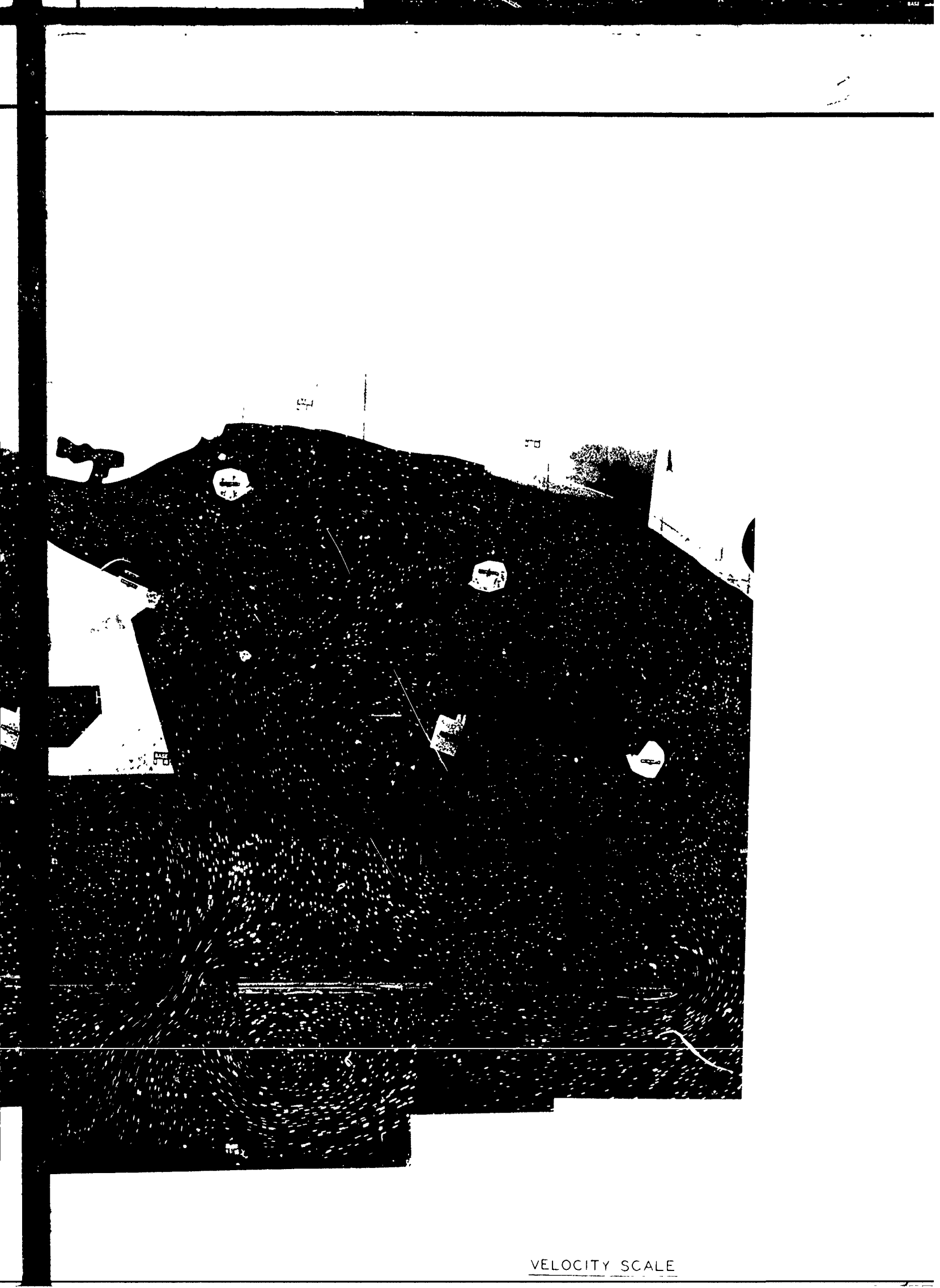
SURFACE CURRENT PATTERNS

BASE TEST
 NEAP TIDE
 HOUR 17





SCALES IN FEET



VELOCITY SCALE



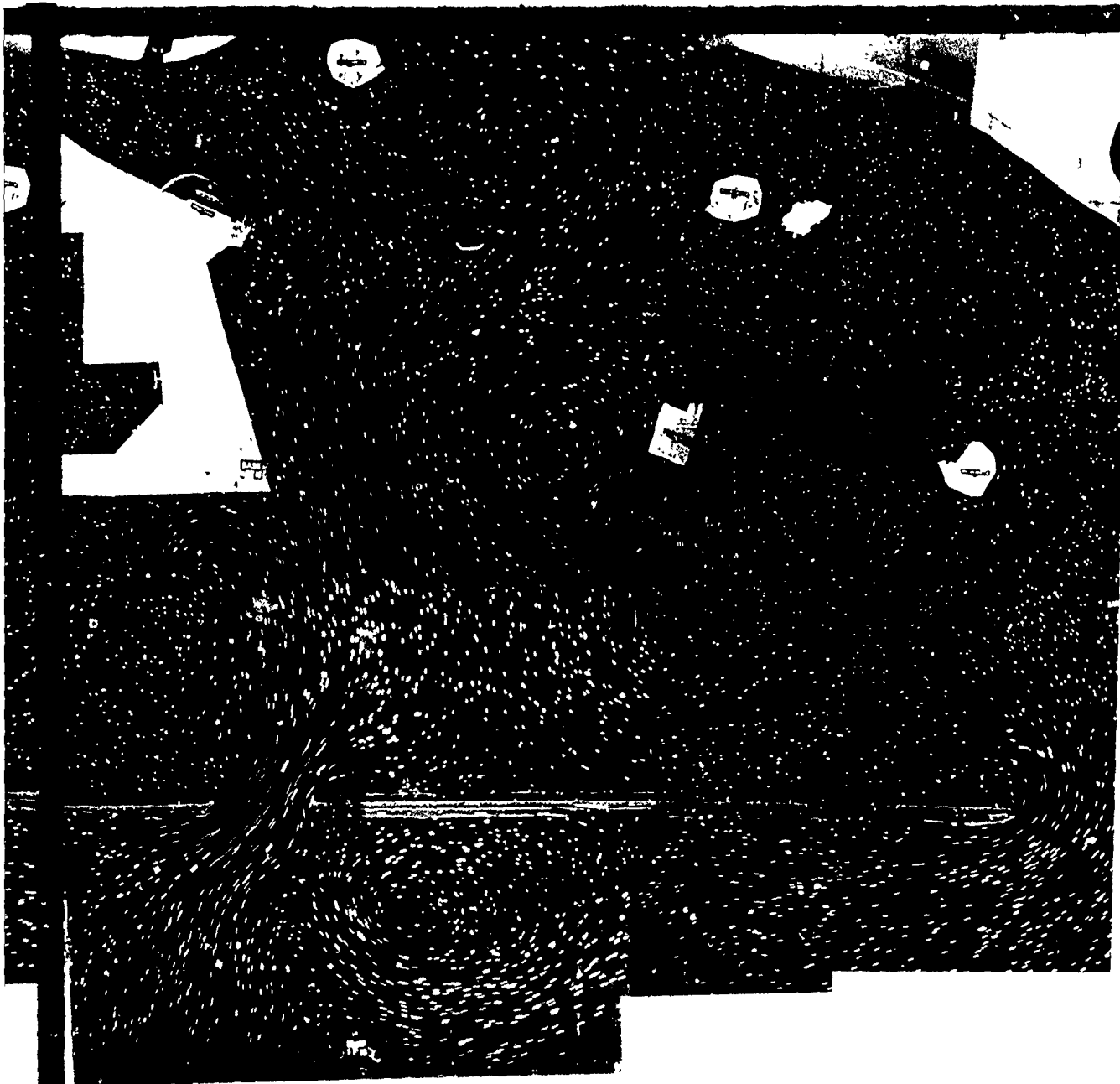
SCALES IN FEET

PROTOTYPE	2000	5	2000	4000
MODEL	5	0	5	10

LOS

SURFAC

5



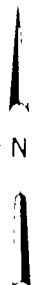
4000

VELOCITY SCALE
 1 0 1 2 3 FPS
 PROTOTYPE

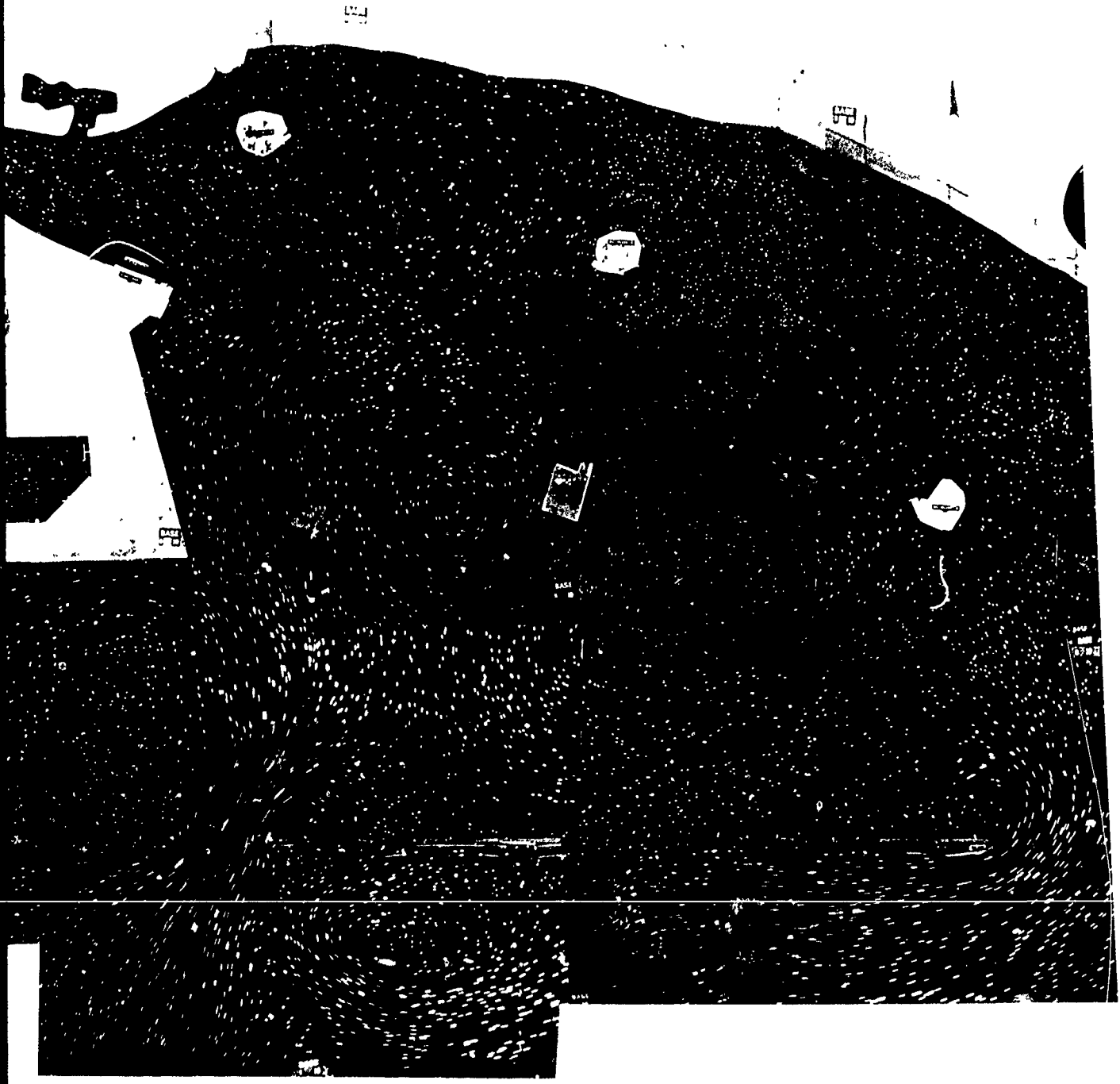
MODEL STUDY OF
 LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

BASE TEST
 NEAP TIDE
 HOUR 18







VELOCITY SCALE

N

42



H

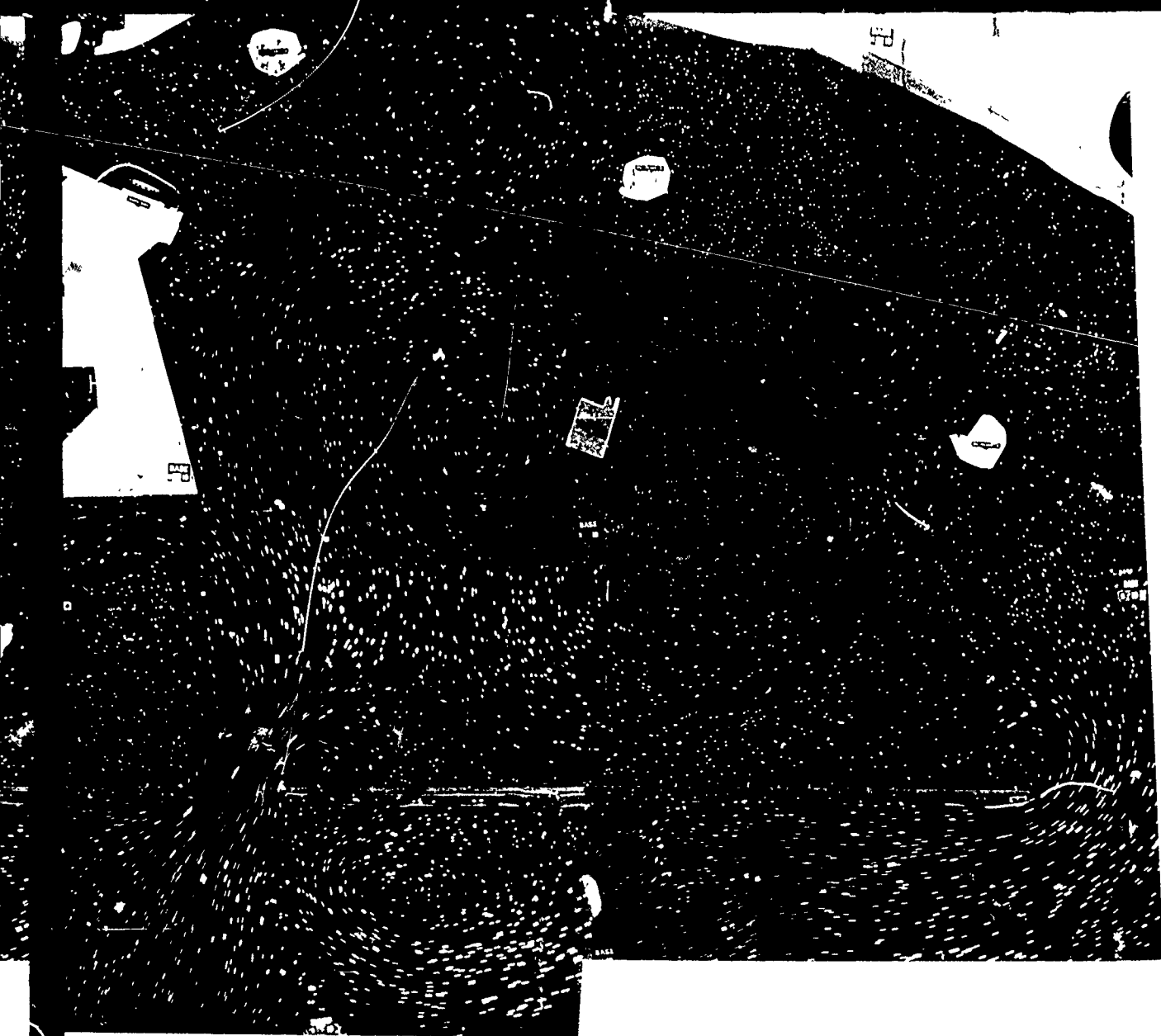
SCALES IN FEET

PROTOTYPE	0	2000	4000
MODEL	0	5	10

LOS A

SURFACE

5



VELOCITY SCALE

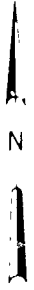
1 0 1 2 3 FPS
 PROTOTYPE 1:1000

4000

MODEL STUDY OF
 LOS ANGELES-LONG BEACH HARBORS

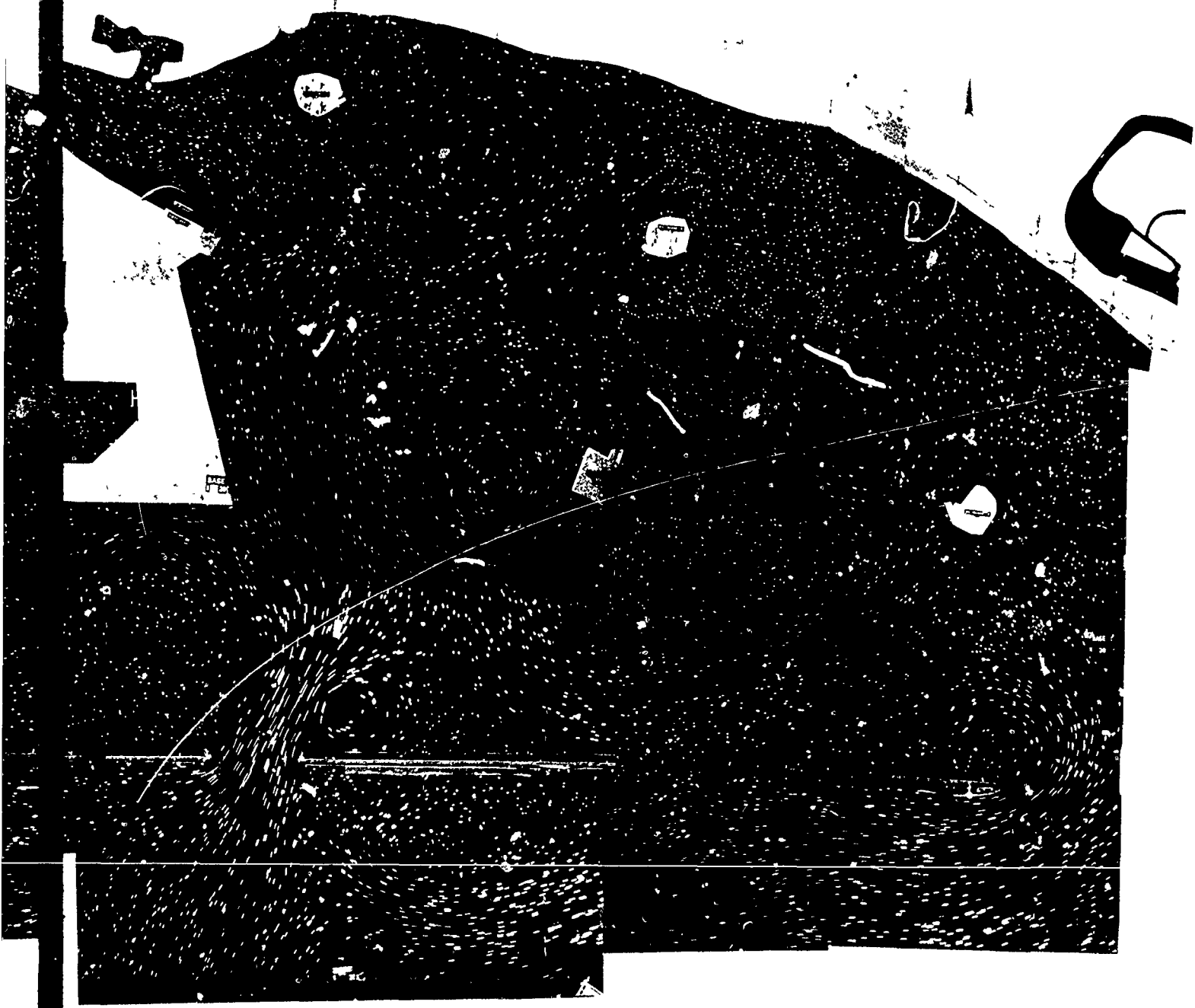
SURFACE CURRENT PATTERNS

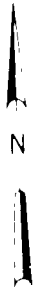
BASE TEST
 NEAP TIDE
 HOUR 19





SCALES IN FEET







SCALES IN FEET



L

SURFA

15



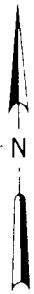
VELOCITY SCALE
 10 CM 3 FPS
 PROTOTYPE 1:100

MODEL STUDY OF
 LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

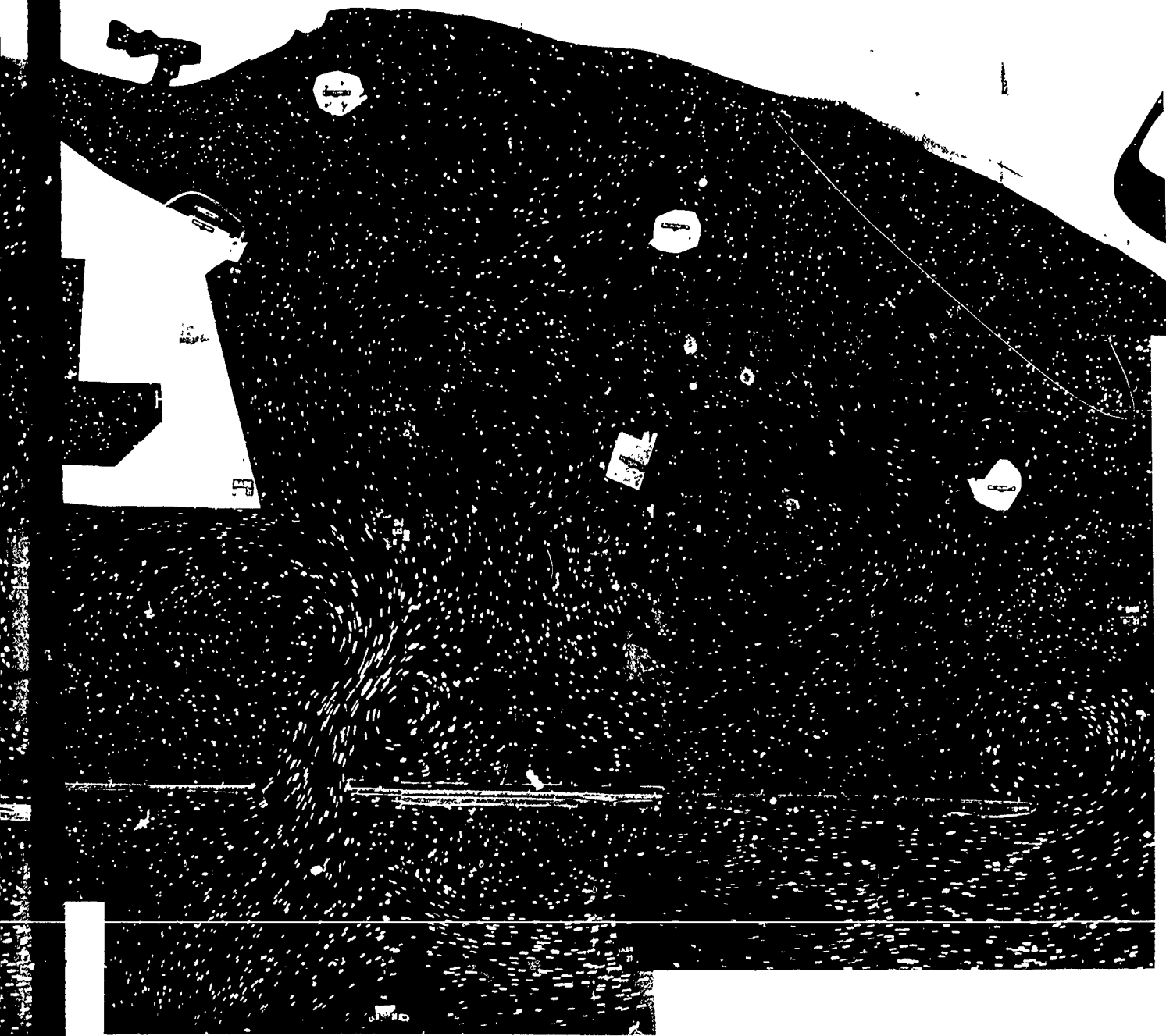
BASE TEST
 NEAP TIDE
 HOUR 20

4000
 1
 10





SCALES IN FEET



VELOCITY SCALE



7





SCALES IN FEET

PROTOTYPE	2000	0	2000	4000
MODEL	5	0	5	10

SURFA

5



4000
3
.0

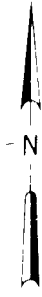
VELOCITY SCALE
1 0 1 2 3 FPS
PROTOTYPE

MODEL STUDY OF
LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

BASE TEST
NEAP TIDE
HOUR 21

6



BASE

BASE



SCALES IN FEET



VELOCITY SCALE

2



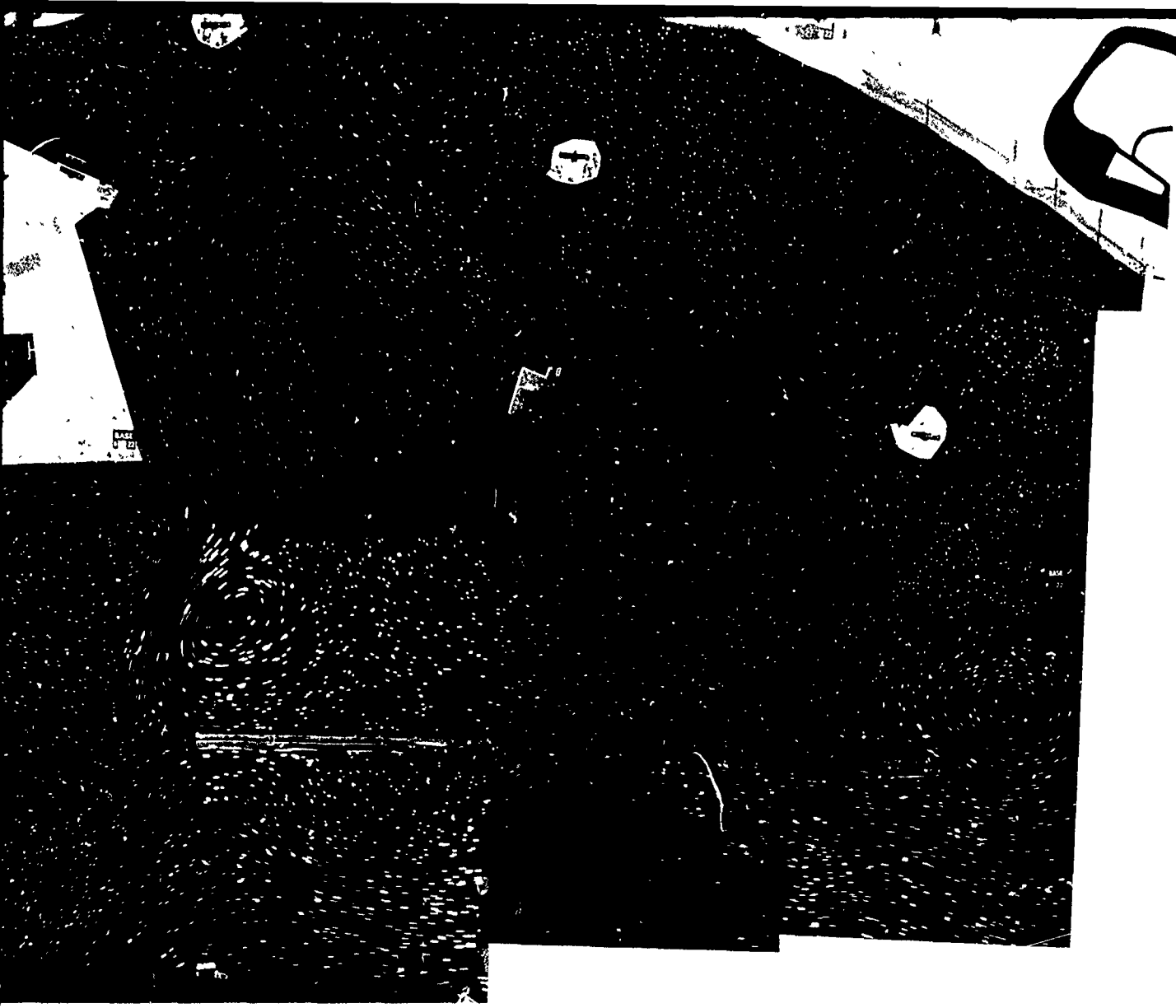


SCALES IN FEET

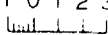
PROTOTYPE	2000	0	2000	4000
MODEL	5	0	5	10

LOS A

SURFACE



4000
 J
 10

VELOCITY SCALE
 1 0 1 2 3 FPS
 PROTOTYPE 

MODEL STUDY OF
 LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

BASE TEST
 NEAP TIDE
 HOUR 22

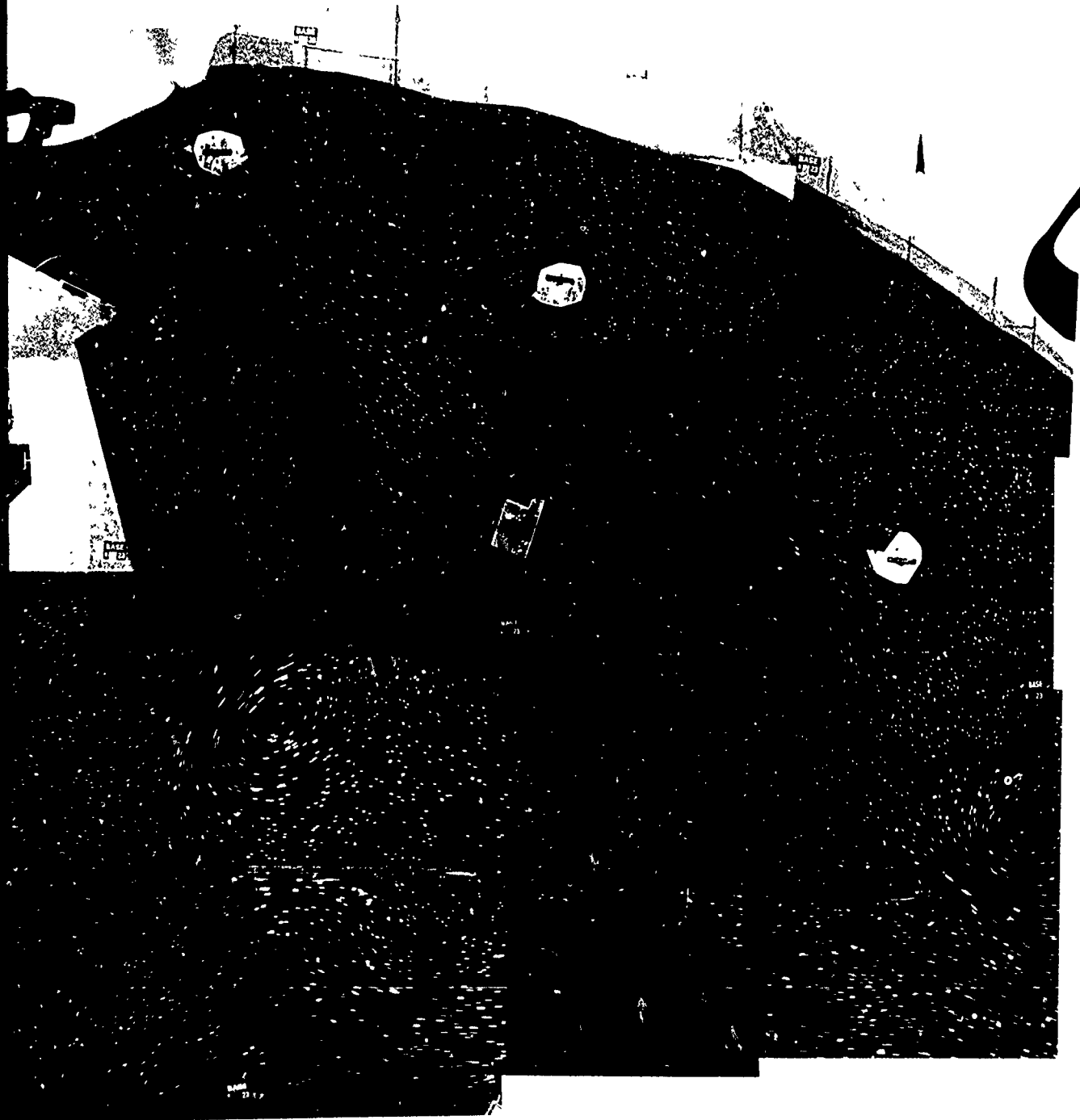
N



2



SCALES IN FEET



N

62

7



BASE
12



SCALES IN FEET

PROTOTYPE	2000	0	2000	4000
MODEL	5	0	5	10

L

SURFA

5



4000
1
10

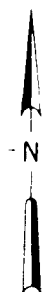
VELOCITY SCALE
1 0 1 2 3 FPS
PROTOTYPE

MODEL STUDY OF
LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

BASE TEST
NEAP TIDE
HOUR 23

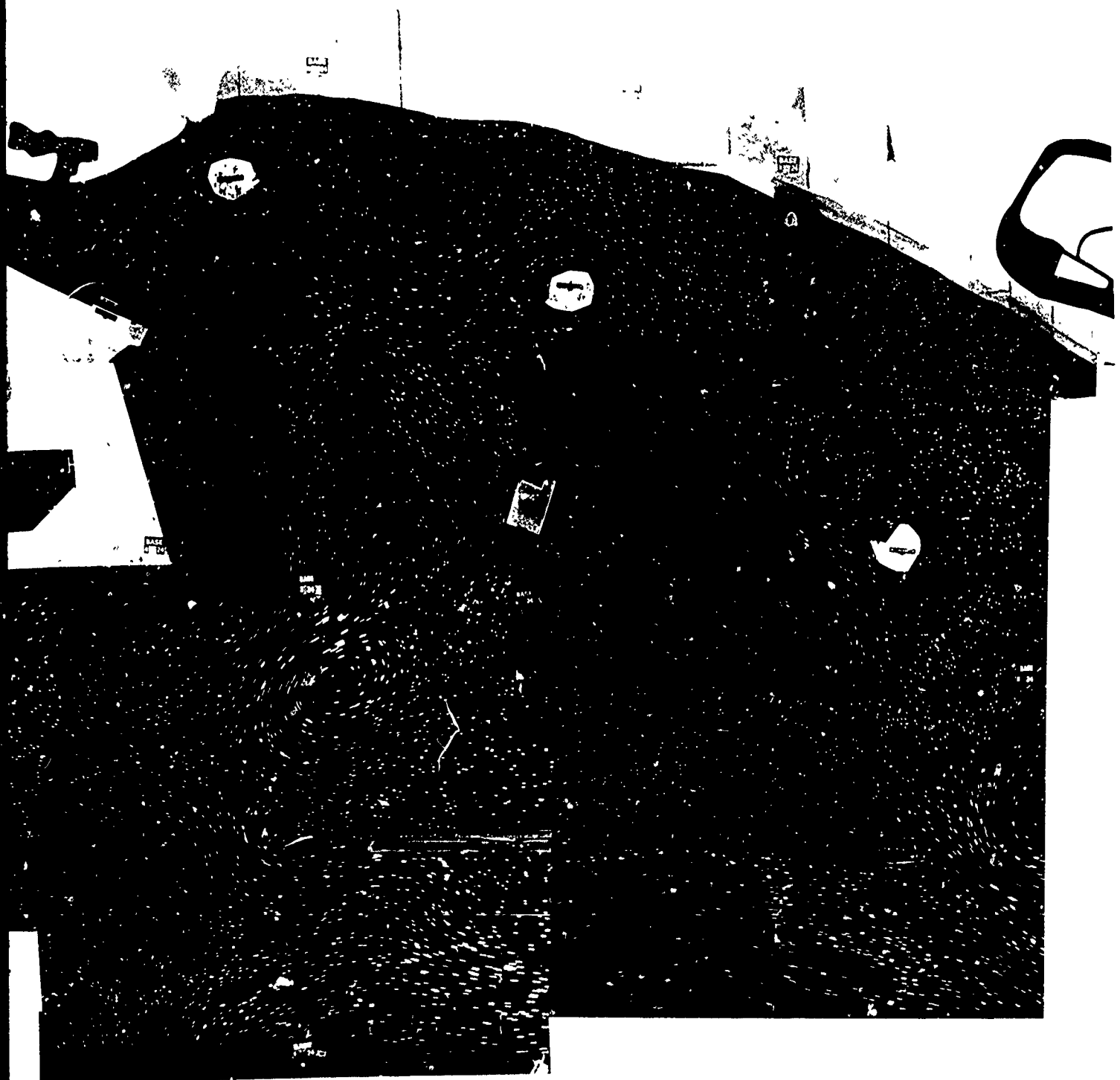
6



2



SCALES IN FEET

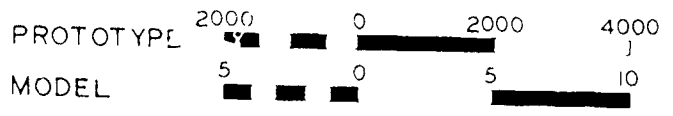




h



SCALES IN FEET



LOS ANGE

SURFACE C

5



4000
J
10

VELOCITY SCALE
1 0 1 2 3 FPS
PROTOTYPE

MODEL STUDY OF
LOS ANGELES-LONG BEACH HARBORS

SURFACE CURRENT PATTERNS

BASE TEST
NEAP TIDE
HOUR 24

6