



AIRBORNE THERMAL INFRARED SURVEY  
SUMMER 1977  
ST. LUCIE PLANT  
QUARTER II FLIGHT  
March 10-11, 1977

Prepared for  
FLORIDA POWER & LIGHT COMPANY  
P.O. Box 013100  
Miami, FL 33101

9 December 1977

Prepared by  
TEXAS INSTRUMENTS INCORPORATED  
ECOLOGICAL SERVICES  
P.O. Box 5621  
Dallas, Texas 75222

Docket # **50-335 ENVIRO**  
Control # **781020060**  
Date **3/30/78** of Document:  
REGULATORY DOCKET FILE



## TABLE OF CONTENTS

Section	Title	Page
I	REGULATORY PURPOSE	I-1
II	FACILITY DESCRIPTION	II-1
	A. PLANT LOCATION	II-1
	B. GENERATING UNIT DESCRIPTION	II-1
	C. COOLING WATER SYSTEM CHARACTERISTICS	II-3
III	GENERAL INTRODUCTION TO THERMAL INFRARED IMAGERY TECHNIQUES	III-1
	A. INTRODUCTION	III-1
	B. DATA COLLECTION	III-1
	C. CALIBRATION	III-3
	D. PROCESSING TECHNIQUES AND DATA PRESENTATION FORMAT	III-4
IV	RESULTS	IV-1
V	DISCUSSION	V-1

## APPENDIXES

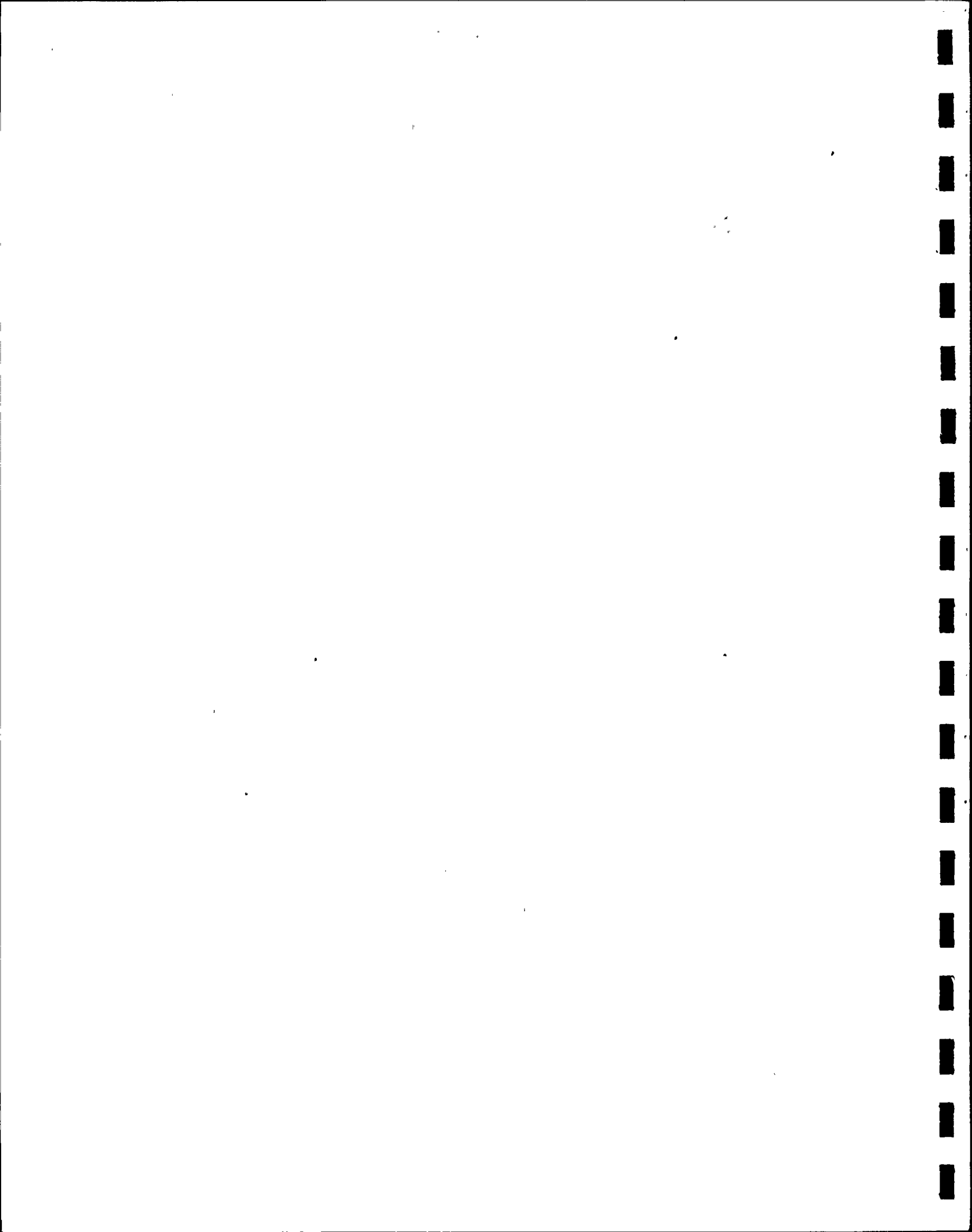
Appendix	Title	Page
A	FLIGHT LOGS	
B	DATA PRINTOUTS ATTACHMENTS A-J	

## ILLUSTRATIONS

Figure	Description	Page
II-1	Site Location Map	II-2
II-2	Plant Intake and Discharge System	II-4
V-1	Flight Pass 12:41 and 13:41 at High Tide	V-3
V-2	Flight Pass 07:42, 16:23, and 16:31 at Low Tide	V-4

## TABLE

Table	Title	Page
V-1	Excess Temperatures $\Delta T$ Isotherm	V-2





---

## PLATES

Plate	Title
IV-1	Flight Pass, 3/10/77, Time 12:41
IV-2	Isotherms, Flight Pass 3/10/77, Time 12:41
IV-3	Flight Pass, 3/11/77, Time 07:42
IV-4	Isotherms, Flight Pass, 3/11/77, Time 07:42
IV-5	Flight Pass, 3/11/77, Time 13:41
IV-6	Isotherms, Flight Pass, 3/11/77, Time 13:41
IV-7	Flight Pass, 3/11/77, Time 16:23
IV-8	Isotherms, Flight Pass, 3/11/77, Time 16:23
IV-9	Isotherms, Ft. Pierce Inlet, Flight Pass, 3/11/77, Time 16:23
IV-10	Isotherms, South of St. Lucie Plant, Flight Pass, 3/11/77, Time 16:23
IV-11	Flight Pass, 3/11/77, Time 16:31
IV-12	Isotherms, Flight Pass, 3/11/77, Time 16:31



## SECTION I

### REGULATORY PURPOSE

The thermal infrared surveys performed by Texas Instruments for Florida Power & Light Company (FPL) are designed to demonstrate compliance with the requirements of the facility NPDES Permit and the facility Environmental Technical Specifications. The specific regulatory requirements are as follows:

- NPDES Permit FL0002208 Special Conditions B., b., sentence 1 and 2.

The discharge into the Atlantic Ocean shall not cause a temperature rise in excess of  $0.8^{\circ}\text{C}$  ( $1.5^{\circ}\text{F}$ ) above ambient surface temperature outside a 162 hectares (400 acre) zone of mixing during the months of June through September, nor  $2.2^{\circ}\text{C}$  ( $4^{\circ}\text{F}$ ) rise during the remaining months. In addition, the surface temperature conditions within the zone of mixing will not exceed a rise of  $3.1^{\circ}\text{C}$  ( $5.5^{\circ}\text{F}$ ) over ambient temperature nor a maximum temperature of  $33.9^{\circ}\text{C}$  ( $93^{\circ}\text{F}$ ) as an instantaneous maximum at any point.

- St. Lucie Unit No. 1 Technical Specifications, Appendix B, Limiting Conditions, 2.1.1, Specification, paragraph 1.

The thermal discharge of St. Lucie Unit No. 1 into the Atlantic Ocean shall be limited to a maximum release temperature of  $111^{\circ}\text{F}$  and shall not cause a temperature rise in excess of  $1.5^{\circ}\text{F}$  above ambient surface temperature outside a 400 acre zone of mixing during the months of June through September, nor a  $4^{\circ}\text{F}$  rise during the remaining months. In addition, the surface temperature conditions within the zone of mixing shall not exceed a rise of  $5.5^{\circ}\text{F}$  over ambient temperature nor a maximum temperature of  $93^{\circ}\text{F}$  as an instantaneous maximum at any point.

In accordance with the last sentence of the St. Lucie plant NPDES Permit, Special Conditions B., b., FPL submitted to the EPA Regional Administrator on November 21, 1974, a proposed thermal monitoring program to satisfy the NPDES Permit and Environmental Technical Specifications monitoring requirements, which included the surface area temperature limitation. The thermal infrared survey performed for FPL and reported in this document complies with all the regulatory and monitoring program criteria relating to



the thermal infrared imagery requirements. In addition, the four required flight patterns were to be performed approximately on a quarterly basis in order to obtain a representation of seasonal effects due to wind, temperature and currents on the St. Lucie plant plume. The four flights are to be represented in separate reports as Quarter I through Quarter IV Flights.\*

---

\*Environmental Technical Specifications, St. Lucie Plant Unit No. 1  
Technical Specifications, Appendix B, 3.1.A.6.





## SECTION II

### FACILITY DESCRIPTION

#### A. PLANT LOCATION

The plant is located on Hutchinson Island in St. Lucie County, about halfway between the cities of Fort Pierce and Stuart on the east coast of Florida (see Figure II-1). The site is approximately 120 highway miles north of Miami, 225 miles south of Jacksonville and 150 miles east of Tampa. Lake Okeechobee is approximately 35 miles to the southwest.

Hutchinson Island is approximately 22 miles long by 1 mile wide at its maximum width. The Atlantic Ocean lies to the east, and the Indian River separates the island from the mainland to the west. Indian River is not a river in the usual sense. It is a long, thin, tidal lagoon stretching down the southeastern coast of Florida between the mainland and a series of offshore islands. The river is approximately 7200 feet wide at the plant site.

Hutchinson Island is generally flat. Much of it consists of swamp covered with dense vegetation characteristic of Florida coastal mangrove swamps. From the ocean shore the land rises slightly in a dune or ridge to approximately 15 feet above mean low water.

The plant is located on 1132 acres near the midpoint of the island. The plant occupies approximately 300 acres adjacent to Big Mud Creek, an inlet off the Indian River, and across State Road A-1-A from the ocean shore.

#### B. GENERATING UNIT DESCRIPTION

St. Lucie Unit No. 1 is a nuclear unit of pressurized water design. The reactor heat from the reactor's primary system coolant loops is transferred to a secondary coolant system in two steam generators. Here,





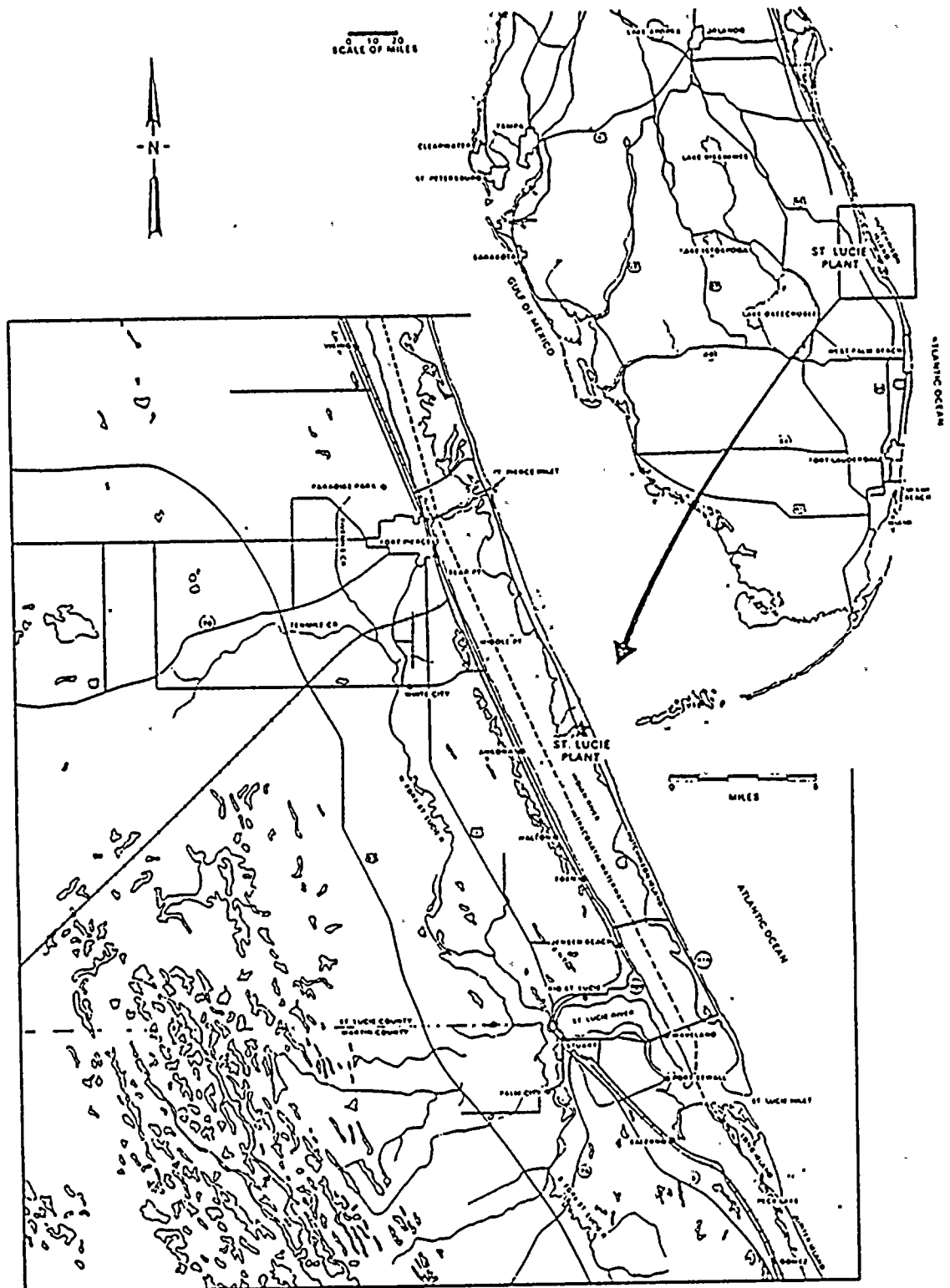


Figure II-1. Site Location Map



the water in the secondary system is converted to steam to drive the turbine-generator; the secondary coolant steam is condensed back to water in a condenser cooled by water from the Atlantic Ocean.

### C. COOLING WATER SYSTEM CHARACTERISTICS

The condenser cooling water system is a once-through system with intake and discharge in the Atlantic Ocean. Design flow is 530,000 gpm (1180 cfs) with a maximum and normal temperature rise across the condenser of 24°F. The major components of the system include (1) two intake lines, (2) one discharge line, (3) an intake canal, and (4) a discharge canal. Figure II-2 presents a general plan view of the system.

The intake is located 1200 feet offshore and about 2400 feet south of the discharge structure. As shown in Figure II-2, the top of the intake is situated approximately 8 feet below the water surface at mean low water. Horizontal intake velocities will approach 1 fps.

From the ocean intake point, water is drawn through two buried pipelines (ID 10.5 feet) at 6 fps to the intake canal. This 300-foot wide canal begins 450 feet west of the shoreline and carries the cooling water some 5000 feet to the plant intake structure at approximately 0.3 to 0.5 fps.

The plant intake structure consists of four bays, each containing one coarse screen, traveling screen and circulating water pump. Approach velocities to each bay will be less than 1 fps. From this structure the water flows through a buried pipeline to the condenser at about 7 fps.

The heated water leaving the condenser flows through a buried pipeline for 500 feet to the discharge canal. This open canal is 200 feet wide and extends approximately 1735 feet to a point 400 feet west of the shoreline. There, the discharged water is carried in a 12-foot diameter concrete pipe buried under the beach and ocean floor out to the ocean discharge structure, located 1200 feet out from the shoreline.



The ocean discharge structure, shown in Figure II-2, consists of a short transition section and a Y-type, high-velocity jet discharge; each port will be 7.5-feet in diameter. Ocean depth at the discharge point is -18 feet (MLW). The centerline of the discharge ports is ~30 feet below the water surface. Exit velocity of the discharge water from each port is ~13 fps. The design is a high-momentum type, which produces a relatively high degree of entrainment of ambient water, thus enhancing the diluting characteristics of the outfall.

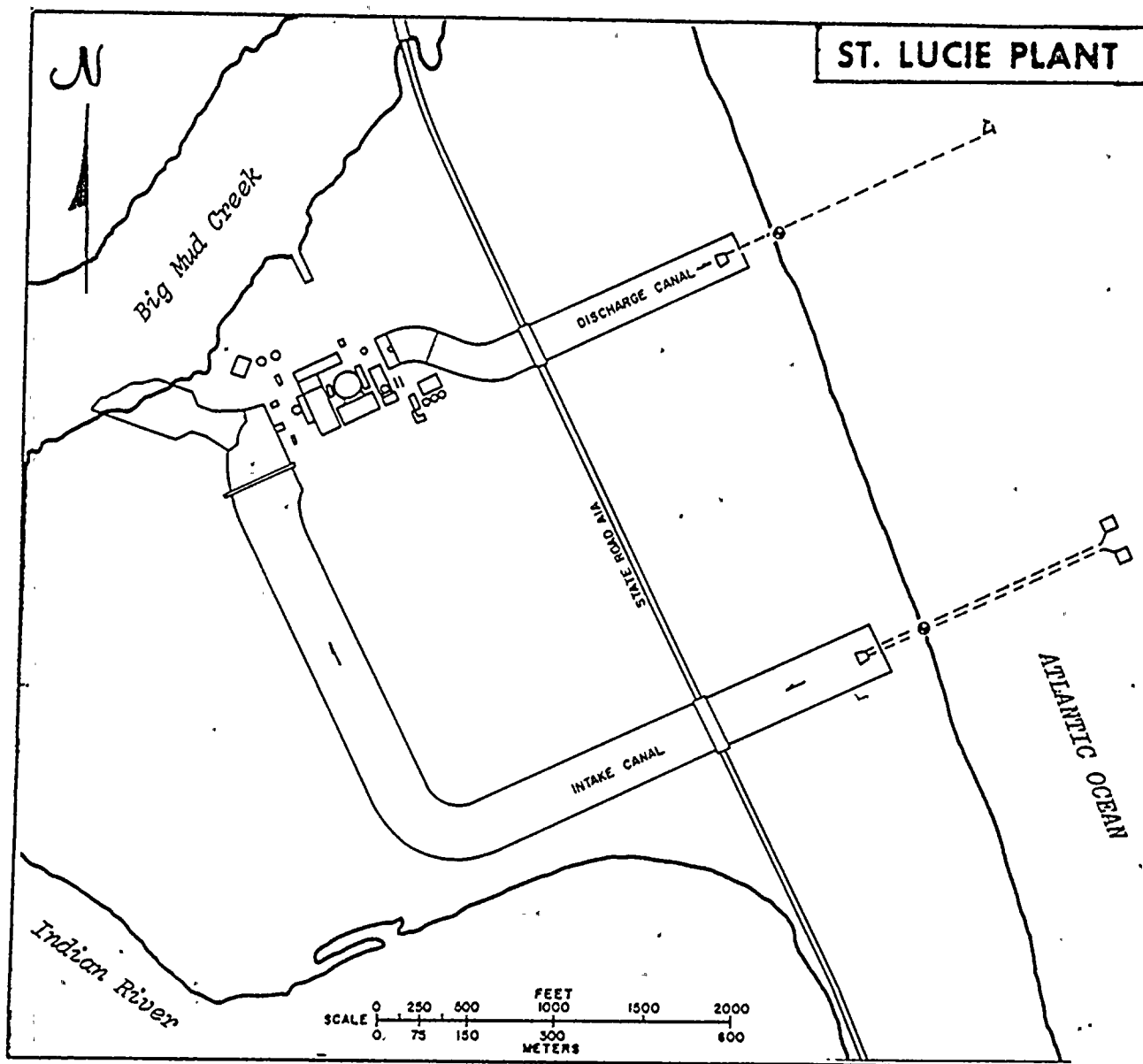


Figure II-2. Plant Intake and Discharge System



### SECTION III

#### GENERAL INTRODUCTION TO THERMAL INFRARED IMAGERY TECHNIQUES

##### A. INTRODUCTION

Thermal infrared imagery in the 8- to 14-micrometer portion of the electromagnetic spectrum was collected in the Atlantic Ocean area of the St. Lucie Plant intake and discharge. The survey provided surface thermal data compiled from more than 1,000,000 points per square mile.

All plume data were taken within 1 minute, allowing illustration of the thermal mixing pattern and other areas of warm water in a near-synoptic manner. Ambient surface temperatures were observed by ground personnel during the period of airborne data collection and used for the purpose of calibrating the computer-printed temperature maps.

Surface thermal data were developed into a series of computer-printed maps; each computer map of the discharge area was then optically changed to a scale of either 1 inch = 500 feet or 1 inch = 1200 feet with an overlay map of the discharge presented at a scale of either 1 inch = 500 feet or 1 inch = 1200 feet. Additionally, computer printouts of enlarged areas, included in Appendix B, were used for calibration purposes.

##### B. DATA COLLECTION

Infrared imagery was produced by a series of scan lines perpendicular to the flight direction and was similar in appearance to strip photography. Relative radiometric temperature differences were represented by the imaged grey tones as illustrated in Plates IV-1 through IV-11. Light tones, as they appeared on the positive print of infrared imagery, represented higher radiometric temperatures. Dark image tones corresponded to lower radiometric temperatures.

A Texas Instruments RS-310D airborne infrared scanning system was used to collect the thermal infrared data over the St. Lucie plant. This





system recorded data in the 8- to 14-micrometer portion of the electromagnetic spectrum, and temperature reference sources were located within the field-of-view of the scanner system to allow temperature calibration of the image tones for map compilation.

At the start of each scan, the detector was focused first on a hot calibrated radiation source and then on a cold calibrated source. These two sources thus provided verification of calibration of temperature and system gain on each scan line. To aid in analyzing data, the two radiation sources usually were set near the highest and lowest radiation expected from the water to be measured.

As a further aid to produce clear, usable data from these scans, the detector voltage was digitized each  $1/2000$  radian of scan angle ( $0.0286$ ). The resulting computer tape had one scan line per record on the tape with 1890 points digitized on that tape for each record (scan line). The digitized information, which included the calibration sources, was recorded on a special high-speed digital tape recorder. This is a special tape not directly usable on a standard computer due to its format and its high packing density. Therefore, the areas of interest were copied from the special tape onto a standard computer tape (9 track 800 BPI) by slowing the special tape to  $1/16$  of original speed and employing programs in a TI 980 computer used especially for this purpose.

A map was formed by printing a series of scan lines (computer records) along a computer page. Each digitized point was a measure of the radiation from the surface as modified by the atmosphere between the surface and the scanner. Since infrared radiation would not pass through water, the radiation power was a function of the surface only; no radiation came from below the surface.

Other involved factors were:

- 1) Radiation efficiency of water
- 2) Angle of water surface to the scanner







- 3) Difference between temperature of surface molecules and temperature of water 1 to 6 inches below the surface, where it can be measured by a thermometer.
- 4) Atmospheric loss or absorption
- 5) Difference in atmospheric path length.

Factor 1) was small, about 0.98 percent, and was calibrated out through use of ground measurements. Factor 2) was also small and was averaged out in the computer; it was seen as  $\pm 0.3^{\circ}\text{F}$  when looking at waves. Factor 3) was small but was also calibrated out through use of ground temperature measurements.

Factor 4) was variable, depending on water vapor, water droplets in the air, and temperature of the droplets; most could be calibrated out through use of ground measurements. Factor 5) was a function of scan angle and was small for the  $30^{\circ}$  off-axis scan angles used in the calibrated scanner, therefore no correction was made for this factor.

#### C. CALIBRATION

It was possible to have sufficiently calibrated information by using only the calibrated sources and flying one extremely low pass along with the normal higher pass. However, when possible, final calibration of the data was done by using water bodies in the areas of measurement as hot and cold calibration sources. At the St. Lucie plant site, the intake and discharge canals provided two sources for this calibration.

For final calibration, three areas were used: the intake canal, the discharge canal, and an area of ocean outside the influence of the hot water discharge canal. Where possible, this ocean area was chosen in the vicinity of the intake structure. A computer printout was made of each of these three areas, and 400 digitized elements were averaged to obtain the average value of the radiation number received in that area. Using average radiation numbers derived for the inlet canal, discharge canal and ocean





area, the computer read from the computer tape and printed out a map of surface water temperature over the entire area covered by the tape. Using the mathematics of the scanner, aircraft height, and aircraft speed, the map was scaled to fit existing maps.

#### D. PROCESSING TECHNIQUES AND DATA PRESENTATION FORMAT

The recorded airborne thermal infrared data were prepared in two formats: qualitative image presentations and quantitative isothermal maps.

The qualitative data included in this report illustrates the qualitative, near-synoptic view of surface-temperature variations of the survey area depicted as image tones. These grey-tone maps have some panoramic distortion on the sides, making a scale change-out on the sides of the "heat picture."

The plane's altitude was used to determine the computer's printout for the temperature point areas from a linear relationship with the mapping scales. To make a computer printout of temperature, flight data was sampled along the x direction (across flight path) and along the y direction (along flight path) in a ratio of samples to produce the same map scale in both x and y directions. At the same time, the panoramic distortion was removed in the x direction. The resulting map was reasonably distortion-free. Such a map can then be enlarged or compressed optically to any desired scale. Isotherm lines are drawn directly on the printed temperature map and an isotherm line map traced off of these lines.

The digital number of radiation for each point was multiplied by a scale factor that produced a scale of numbers in degrees Fahrenheit or Centigrade as desired. An offset number was then applied to make one of the areas printout as the zero reference. It was easier to visualize a plume if it was referenced against a zero background rather than printing the actual temperature as read from a thermometer. The scaling factor used to produce Fahrenheit degrees and the offset factor to produce a zero reference area in the printout were derived from a calibration printout of enlarged areas





which show the intake canal, discharge canal, and a reference ocean area. This calibration printout was adjusted to follow closely the delta temperatures as measured in the canals from the ground.





## SECTION IV

### RESULTS

#### FLIGHT PASS 3/10/77, TIME 12:41

This flight pass was taken with a wind of 4 mph from a direction of  $140^{\circ}$  with the resulting surface plume widening outward (probably caused by momentum) in the direction of the outlet nozzles; spreading northward (probably caused by the wind) parallel to the shore. For reasons still unknown, the far field of the plume splits. This plume configuration compared well with the winter flight (Quarter I), but in an opposite flown direction. (See Quarter I report.) Plate IV-1 is a grey-toned image illustrating the surface plume.

The following parameters were measured during the overflight:

- Ambient air temperature over land  $78.6^{\circ}\text{F}$
- Ambient ocean temperature  $70^{\circ}\text{F}$
- Tide @ 13:00 +2.5 feet
- Discharge canal elevation 10.68 feet above MLW
- Plant delta T (inlet to outlet of plant)  $23.44^{\circ}\text{F}$
- Discharge flow 509,000 gpm
- Reactor power 98.41 percent
- Gross power generated 826 megawatts
- Intake canal temperature (taken at east end of canal)  $67.5^{\circ}\text{F}$
- Discharge canal temperature (taken at 300 feet from east end of canal)  $90.40^{\circ}\text{F}$
- Temperature difference between canals  $22.9^{\circ}\text{F}$

Calibration: The ground measurements showed a temperature differential of  $22.9^{\circ}\text{F}$  between canals. The calibration printout showed a differential of  $22.5^{\circ}\text{F}$  between canals. The printout showed the intake canal surface to be  $1.8^{\circ}\text{F}$  warmer than the surface ambient temperature of the ocean (Attachment A).



### SUMMARY OF FINDINGS

Temperature distributions measured offshore at the St. Lucie plant are presented on Plate IV-2 and Attachment B.

The maximum surface temperature within the plume was 75.0°F, (5.0°F above ambient) covering an area of 0.2 acre, and the areal extent of the 5°F isotherm was about 75 feet in diameter. The 1.5°F isotherm was shown to cover a large area from 350 to 397 acres which was probably due to the effects of the northward directional wind. The 1.5°F isotherm line appeared to intersect with other warm water along the shore about 1.4 miles north of the discharge canal. The combined 1.5°F area of the plume and the other water was ~397 acres. Each temperature point on the printout (Attachment B) was ~0.093 acres.

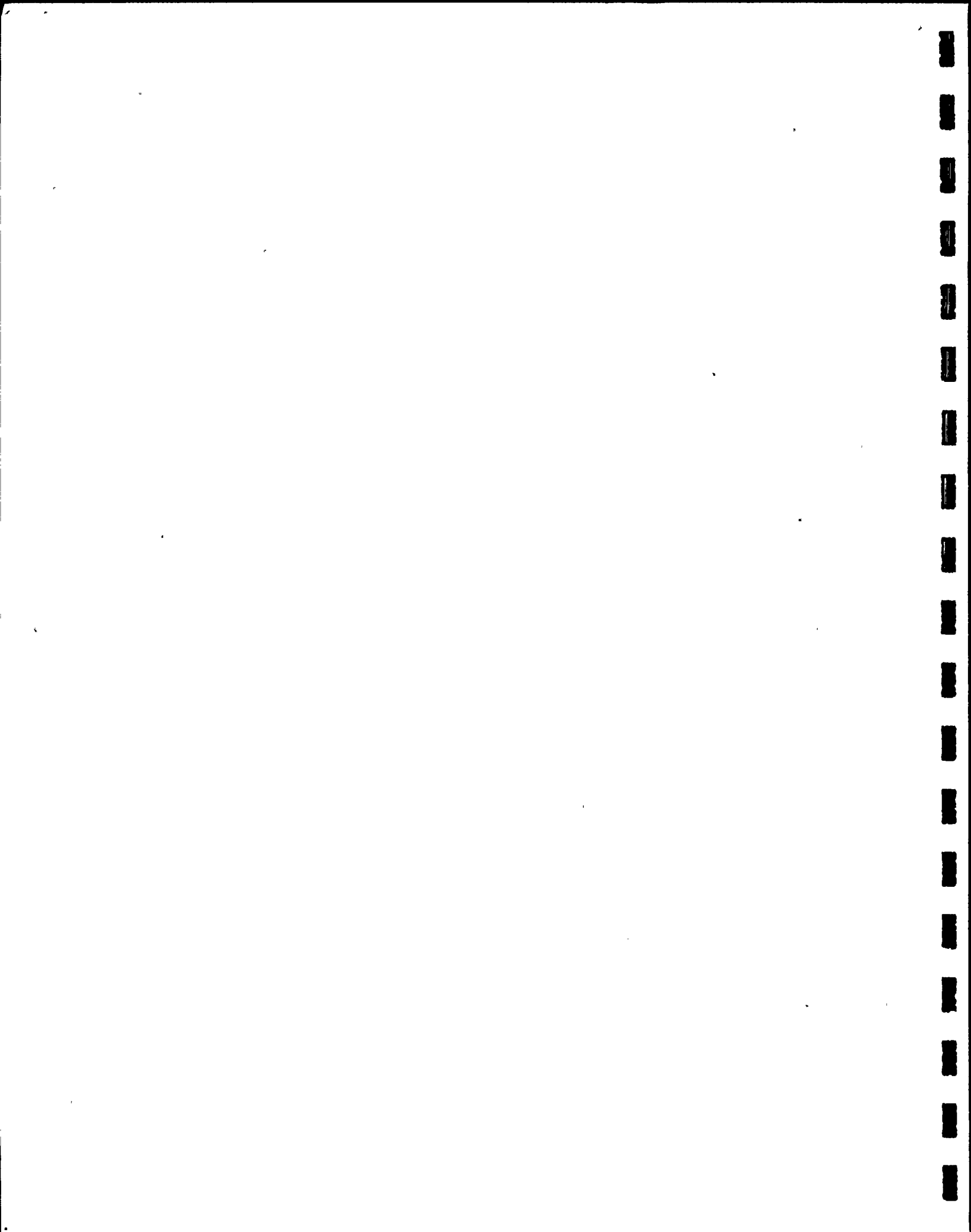
Temperature isotherms and their respective areas for various temperatures above ambient ( $\Delta T$ ) are listed as follows:

<u><math>\Delta T</math> Isotherm (°F)</u>	<u>Area (acres)</u>
5.0	0.2
4.0	2.4
3.0	9.7
2.0	159.0
1.5	350-397

#### FLIGHT PASS 3/11/77, TIME 07:42

The objective of this flight pass was to obtain surface temperature data affected by low tidal conditions. Morning clouds limited the altitude of the flight to 1000 feet, therefore, limiting the width of coverage to approximately 900 feet. This was the only flight pass available for analysis of the low tidal condition. Plate IV-3 is a grey-toned image illustrating the surface plume at low tide.







The following parameters were measured during the overflight:

Wind 2 mph from 140°

Ambient air temperature over land 70.9°F

Ambient ocean temperature 70°F

Tide @ 07:03 +0.3 feet

Discharge canal elevation 6.6 feet above MLW

Plant delta T (inlet to outlet of plant) 23.0°F

Discharge flow 509,000 gpm

Reactor power at 99.42 percent

Gross power generated 830 megawatts

Intake canal temperature (taken at east end of canal) 68.8°F

Discharge canal temperature (taken at 300 feet from end of canal)  
91.9°F

Temperature difference between canals 23.1°F

Calibration: The ground measurements showed a differential between canals of 23.1°F. The calibration printout showed a differential of 22.4°F between the average temperature of the intake canal and discharge canal (Attachment C).

#### SUMMARY OF FINDINGS

Temperature distribution measured offshore of the St. Lucie plant are presented in Plate IV-4 and Attachment D. The maximum surface temperature measured within the plume was 76.0°F (6.0°F above ambient). The areal extent of the 6.0°F temperature  $\Delta T$  isotherm covered an area of 0.1 acre. Due to the low cloud layer and the low altitude flight pass, about one-half of the plume could not be adequately recorded. The computer printout (attachment D) has been rerun to reflect a high altitude pass. The 1.5°F isotherm could not be totally measured, but the 1.5°F surface area that had been recorded showed an area about 90 acres. It has been estimated that the 1.5°F isotherm area contained approximately one half of the total surface area and including that the total area could be between 180 to 200 acres.





Temperature isotherms and their respective areas for various temperatures above ambient ( $\Delta T$ ) are listed as follows:

$\Delta T$ Isotherm ( $^{\circ}F$ )	Area (acres)
6.0	0.1
5.0	0.2
4.0	5.4
3.0	21.1
2.0	23.0
1.5	200 (estimated)

FLIGHT PASS 3/11/77, TIME 13:41

This flight pass shows both the Indian River area behind the plant and the Atlantic Ocean in front of the plant at mid-day. The pass covered the essential portion of the plume and both the intake canal and discharge canal used for calibration. Plate IV-5 is a grey-toned image of the mid-day flight pass.

The following parameters were measured during the overflight:

Wind 4 mph from  $140^{\circ}$

Ambient air temperature over land  $78.6^{\circ}F$

Ambient ocean temperature  $70^{\circ}F$

Tide @ 13:00 +2.5 feet

Discharge canal elevation 10.68 feet above MLW

Plant delta T (inlet to outlet of plant)  $23.44^{\circ}F$

Discharge flow 509,000 gpm

Reactor power at 98.41 percent

Gross power generated 826 megawatt

Intake canal temperature (taken at east end of canal)  $68.97^{\circ}F$

Discharge canal temperature (taken at 300 feet from ed of canal)  
 $92.1^{\circ}F$

Temperature differences between canals  $23.1^{\circ}F$



Calibration: The ground measurements showed a differential between canals of  $23.1^{\circ}\text{F}$ . The calibration printout showed a differential of  $23.3^{\circ}\text{F}$  between the average temperature of the intake canal and discharge canal (Attachment E).

#### SUMMARY OF FINDINGS

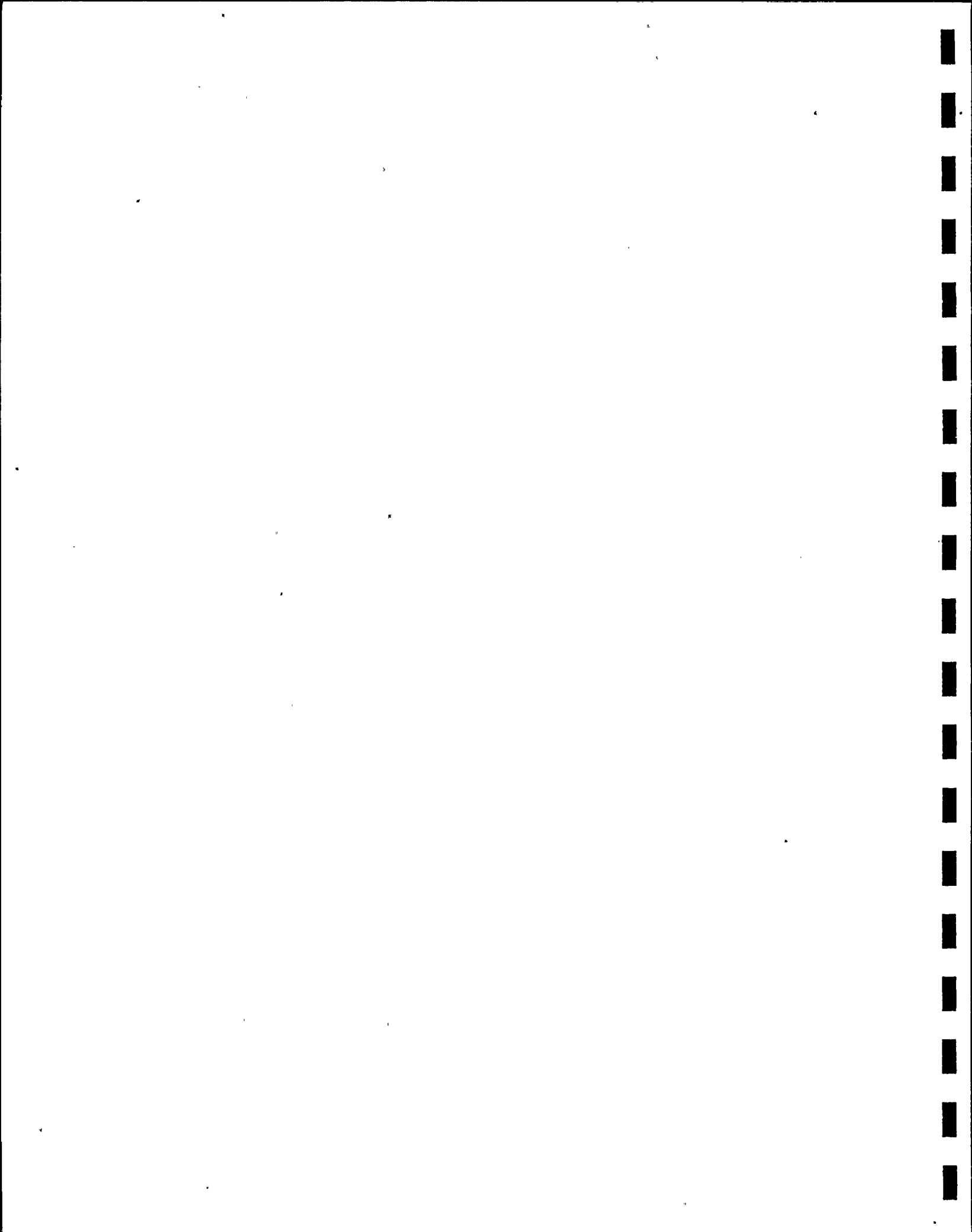
Temperature distributions measured offshore of the St. Lucie plant are presented in Plate IV-6 and Attachment F. The maximum surface temperature measured within the plume was  $74.0^{\circ}\text{F}$  ( $4.0^{\circ}\text{F}$  above ambient) and covering an area of 0.1 acre. The flight pass did not include the entire plume, so the total  $1.5^{\circ}\text{F}$  isotherm area ( $\sim 350$  acres) could not be computed accurately. The  $1.5^{\circ}\text{F}$  isotherm of the plume also extended into another mass of warm surface water. Thus, the extent of the  $1.5^{\circ}\text{F}$  plume isotherm cannot be separated or accurately computed once the masses begin to mix. The  $1.5^{\circ}\text{F}$  plume isotherm was estimated from the printout of an area of 230 acres with a total  $1.5^{\circ}\text{F}$  isotherm area estimated to be less than 350 acres.

Temperature isotherms and their respective areas for various temperature above ambient ( $\Delta T$ ) are listed as follows:

<u><math>\Delta T</math> Isotherm (<math>^{\circ}\text{F}</math>)</u>	<u>Area (acres)</u>
4.0	0.1
3.0	5.9
2.0	120.2
1.5	350.0 (estimated)

#### FLIGHT PASS 3/11/77, TIME 16:23

This flight pass consisted of a coverage along the coast from the Ft. Pierce Inlet south to the Martin County line. The flight pass was approximately 12 miles long. The station area and both end segments were converted to computer tapes for isothermal printouts. Plate IV-7 is the grey-toned image of the flight pass.





The following parameters were measured during the overflight:

Wind 8 mph at 130°

Ambient air temperature over land 76.2°F

Ambient ocean temperature 70°F

Tide @ +0.5 feet

Discharge canal elevation 9.42 feet above MLW

Plant delta T (inlet to outlet of plant) 23.46°F

Discharge flow 509,000 gpm

Reactor power at 98.55 percent

Gross power generated 825 megawatts

Intake canal temperature (taken at east end of canal) 69.41°F

Discharge canal temperature (taken at 300 feet from end of canal)  
92.93°F

Temperature differences between canals 23.52°F

Calibration: The flight pass data of 16:31 was used to calibrate the 16:23 pass. The ground measurements showed a differential between canals of 23.5°F. The calibration printout which is included as Attachment G shows a temperature differential between the canals of 23.8°F.

#### SUMMARY OF FINDINGS

Temperature distributions found offshore of the St. Lucie plant, the end segments of the Ft. Pierce Inlet, and the south of the plant are presented as Plate IV-8, 9, and 10 respectively and Attachment H, I, and J respectively. The maximum surface temperature measured within the plume was 72°F (2°F above ambient), but the 1.5°F isotherm could not be computed completely due to a mass of warm water which was present and mixed with the plume. An estimated area of the plume 1.5°F isotherm was 250 acres. The surface temperature of the ambient ocean increased at the south end of the plant as the mass of warm water approached the coastline. The warmest surface temperature measured was 75°F, 5°F greater than the ambient temperature measured at the plant area. The mass of warm water which was mixing with the plant plume, appeared to be part of the Gulf Stream.



Temperature isotherms and their respective areas for various temperatures above ambient ( $\Delta T$ ) are listed as follows:

<u><math>\Delta T</math> Isotherm (<math>^{\circ}F</math>)</u>	<u>Area (acres)</u>
2.0	16.5
1.5	250 (estimated)

FLIGHT PASS 3/11/77, TIME 16:31

This flight pass shows the plume temperature from the St. Lucie plant and the warm mass of surface temperatures that appears to relate to the Gulf Stream. Plate IV-11 is a grey-toned image of the flight pass. The parameters measured during the overflight are listed as follows:

Wind 8 mph at  $130^{\circ}$   
Ambient air temperature over land  $76.2^{\circ}F$   
Ambient ocean temperature  $70^{\circ}F$   
Tide @ +0.5 feet  
Discharge canal elevation 9.42 feet above MLW  
Plant delta T (inlet to outlet of plant)  $23.46^{\circ}F$   
Discharge flow 509,000 gpm  
Ractor power at 98.55 percent  
Gross power generated 825 megawatts  
Intake canal temperature (taken at east end of canal)  $69.41^{\circ}F$   
Discharge canal temperature (taken at 300 feet from end of canal)  
 $92.93^{\circ}F$   
Temperature differences between canal  $23.52^{\circ}F$

Calibration: The ground measurements showed a temperature differential between canals of  $23.5^{\circ}F$ . The calibration printout showed a temperature differential between the canals of  $23.8^{\circ}F$ . The calibration printout is included as Attachment G.





### SUMMARY OF FINDINGS

Temperature distributions measured offshore of the St. Lucie plant are presented in Plate IV-12 and Attachment K. The maximum surface temperature measure within the plume was 73°F (3°F above ambient), covering an area of 1.3 acres. The 1.5°F isotherm area could not be measured in its entirety since the area extended beyond the measured coverage. The 1.5°F isotherm area covered by the computer printout was 70 acres. It appeared that only a 10 to 20 percent additional area would remain at the 1.5°F isotherm if the entire plume could have been measured.

Temperature isotherms and their respective areas for various temperatures above ambient ( $\Delta T$ ) are listed as follows:

<u><math>\Delta T</math> Isotherm (°F)</u>	<u>Area (acres)</u>
3.0	3.6
2.0	27.4
1.5	84 (estimated)

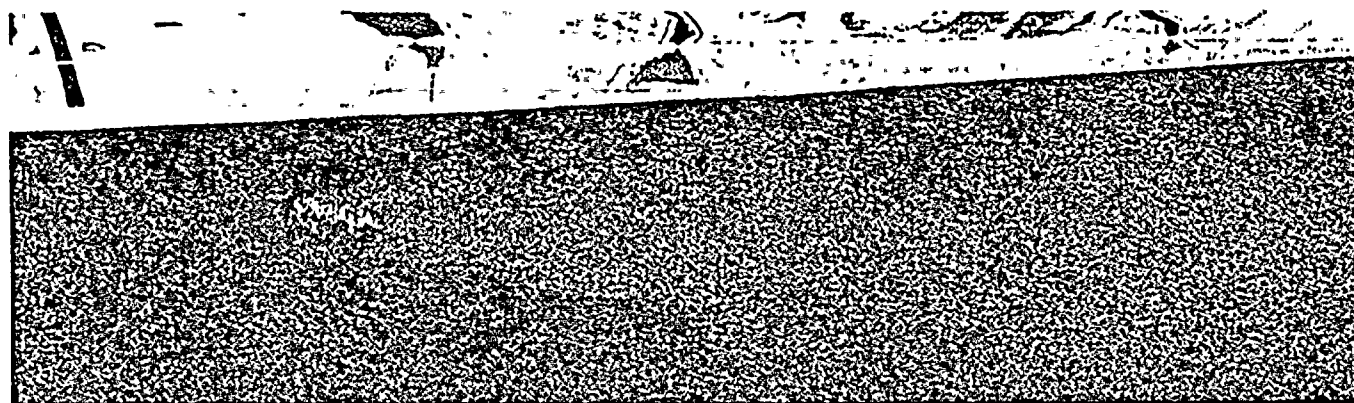
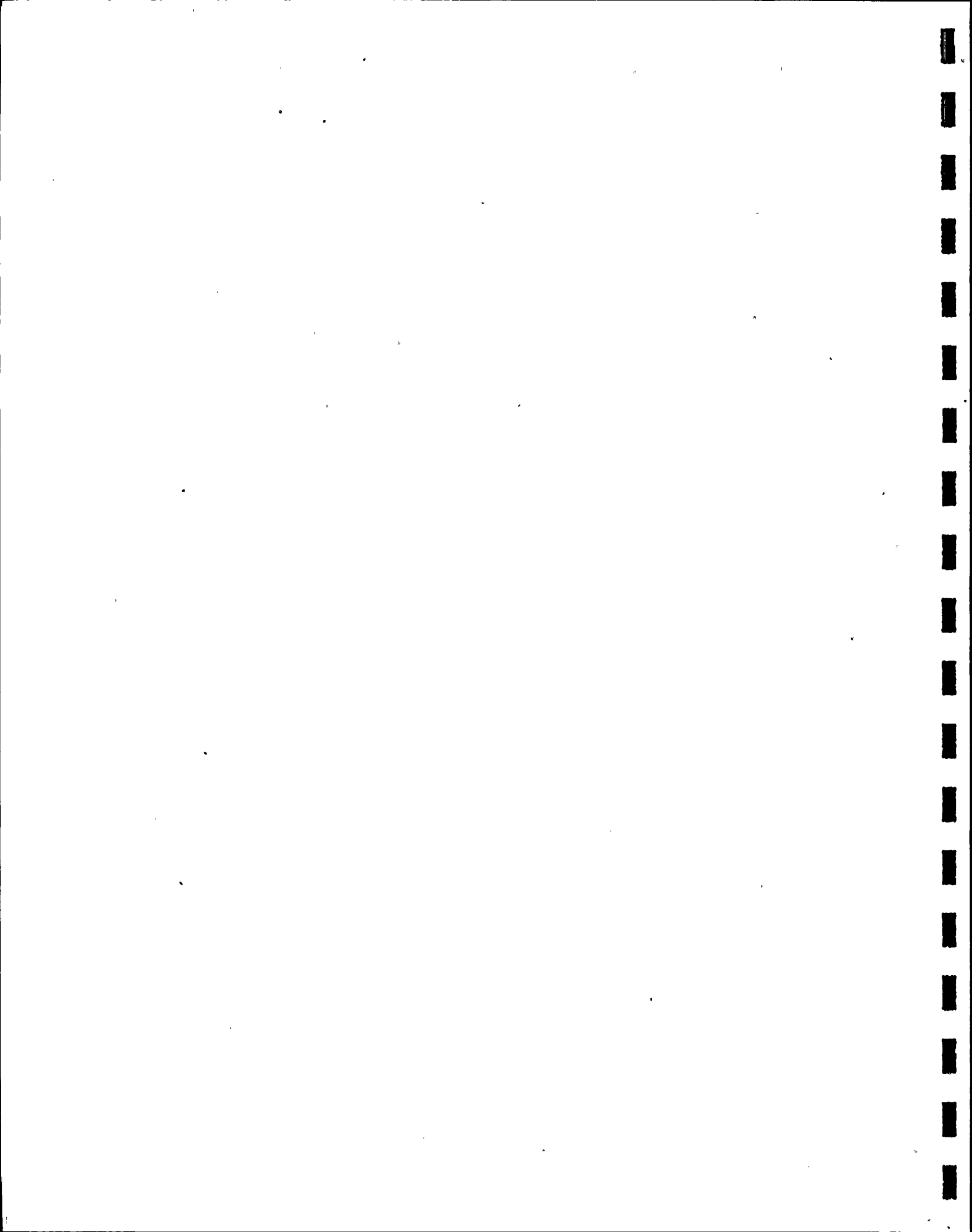


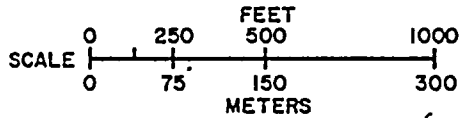
Plate IV-1. Flight Pass, 3/10/77, Time 12:41

Plate IV-2. Isotherms, Flight Pass 3/10/77, Time 12:41



ST. LUCIE PLANT ISOTHERMS PLATE IV-2  
FLIGHT PASS 3/10/77, TIME 12:41

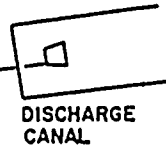
REACTOR POWER 99.29%  
DISCHARGE FLOW 518,000 GPM  
WIND S. 4 MPH  
INTAKE CANAL 67.5°F  
DISCHARGE CANAL 90.4°F  
TIDE +2.85 FT.  
MAX. PLUME 5°F  
AMBIENT OCEAN 70°F



A

1.5°F

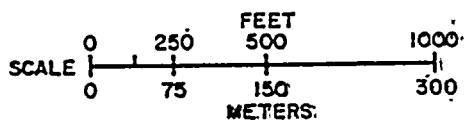
ACRES 350-397 est.



DISCHARGE  
CANAL

ST. LUCIE PLANT ISOTHERMS PLATE IV-2  
FLIGHT PASS 3/10/77, TIME 12:41

REACTOR POWER 99.29%  
DISCHARGE FLOW 518,000 GPM  
WIND S. 4 MPH  
INTAKE CANAL 67.5°F  
DISCHARGE CANAL 90.4°F  
TIDE +2.85 FT.



MAX PLUME 5°F  
AMBIENT OCEAN 70°F  
ACRES 159.0

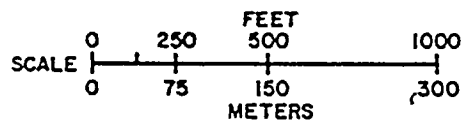


DISCHARGE  
CANAL



ST. LUCIE PLANT ISOTHERMS PLATE IV-2  
FLIGHT PASS 3/10/77, TIME 12:41

REACTOR POWER 99.29%  
DISCHARGE FLOW 518,000 GPM  
WIND S. 4 MPH  
INTAKE CANAL 67.5°F  
DISCHARGE CANAL 90.4°F  
TIDE +2.85 FT.



MAX PLUME 5°F  
AMBIENT OCEAN 70°F  
ACRES 9.7



C

3°F

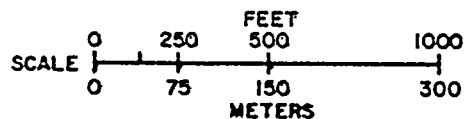
DISCHARGE CANAL





ST. LUCIE PLANT ISOTHERMS PLATE IV-2  
FLIGHT PASS 3/10/77, TIME 12:41

REACTOR POWER 99.29%  
DISCHARGE FLOW 518,000 GPM  
WIND S. 4 MPH  
INTAKE CANAL 67.5°F  
DISCHARGE CANAL 90.4°F  
TIDE +2.85 FT.



MAX PLUME 5°F  
AMBIENT OCEAN 70°F  
ACRES 1.4



7

4°F

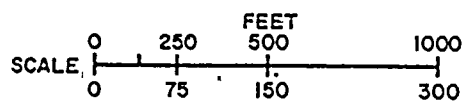
D

DISCHARGE  
CANAL

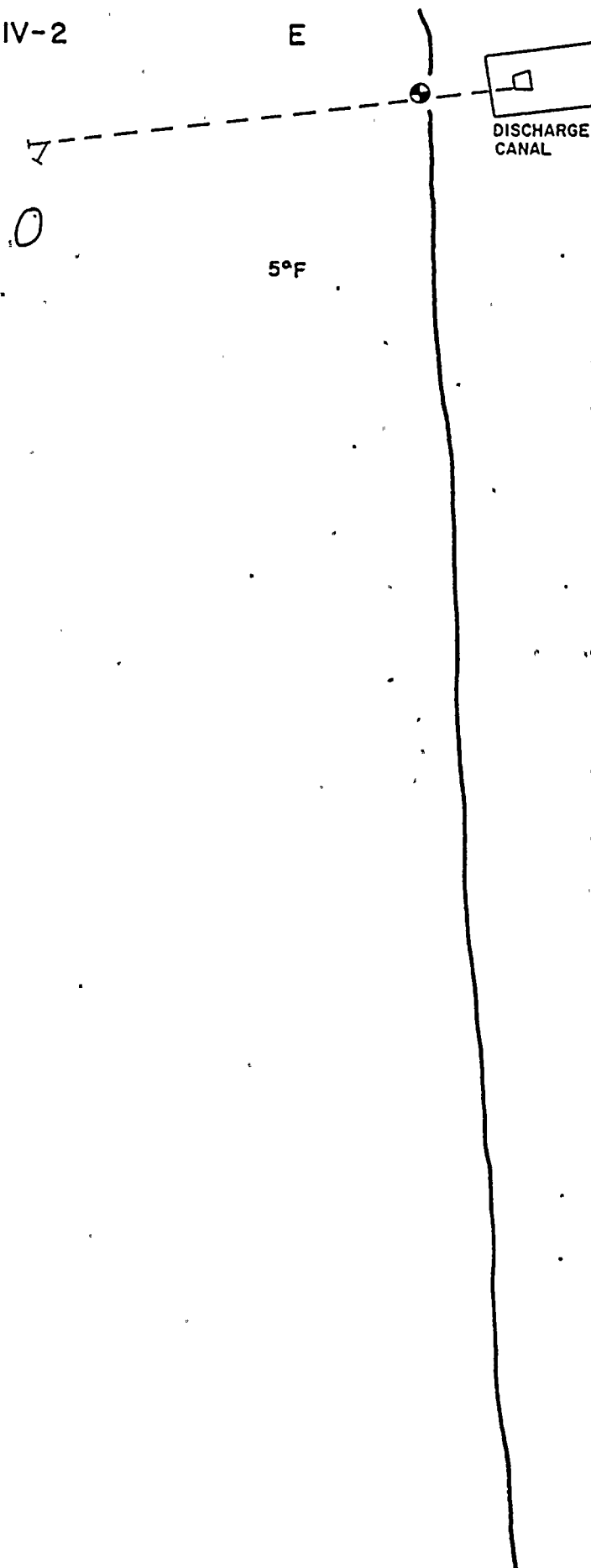


ST. LUCIE PLANT ISOTHERMS PLATE IV-2  
FLIGHT PASS 3/10/77, TIME 12:41

REACTOR POWER 99.29%  
DISCHARGE FLOW 518,000 GPM  
WIND S. 4 MPH  
INTAKE CANAL 67.5°F  
DISCHARGE CANAL 90.4°F  
TIDE +2.85 FT.



MAX PLUME 5°F  
AMBIENT OCEAN 70°F  
ACRE 0.2



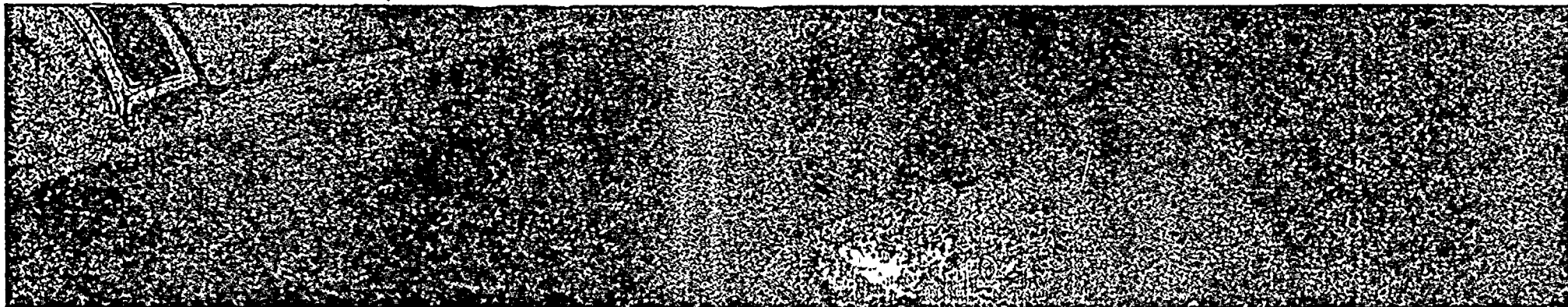


Plate IV-3. Flight Pass, 3/11/77, Time 07:42

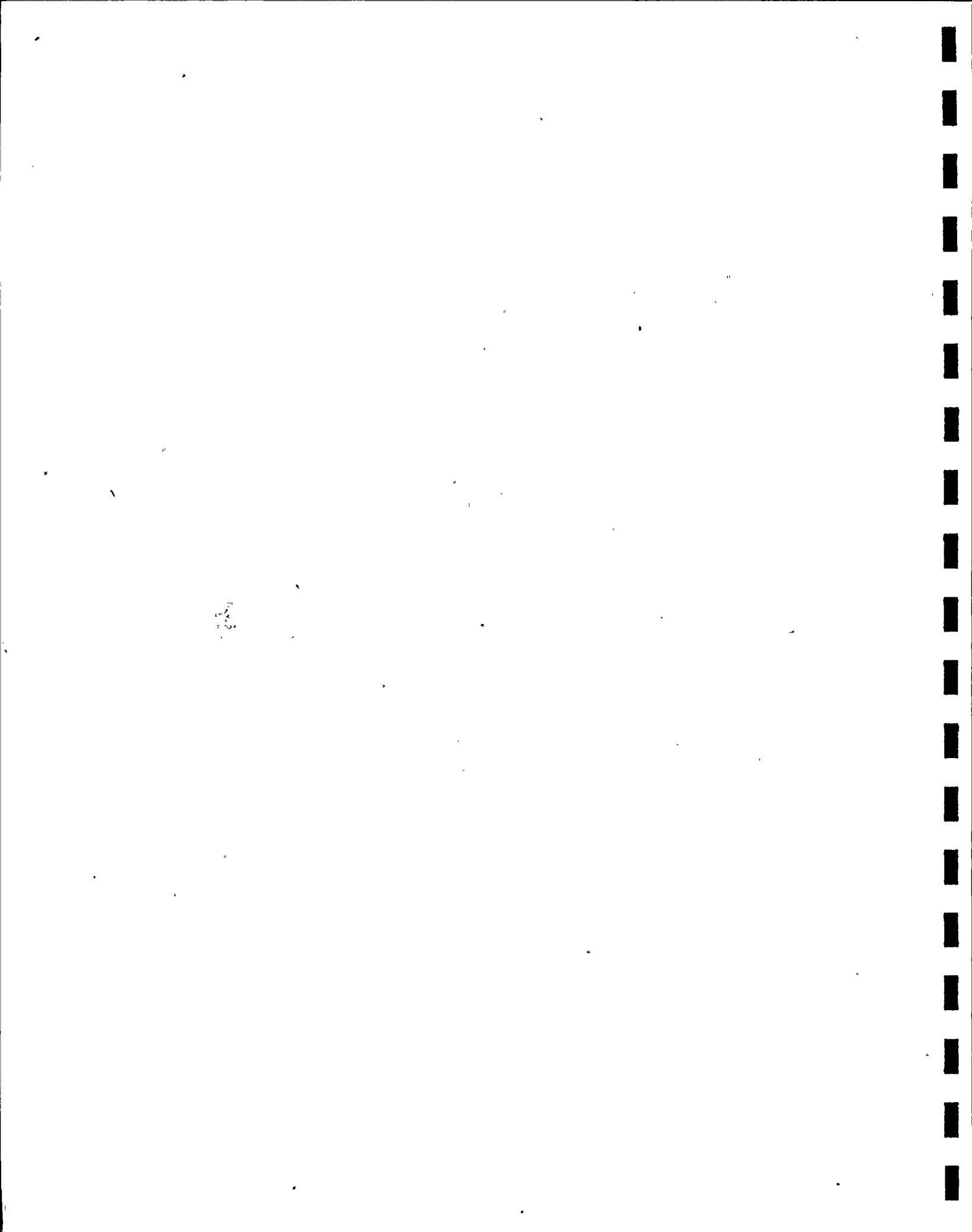
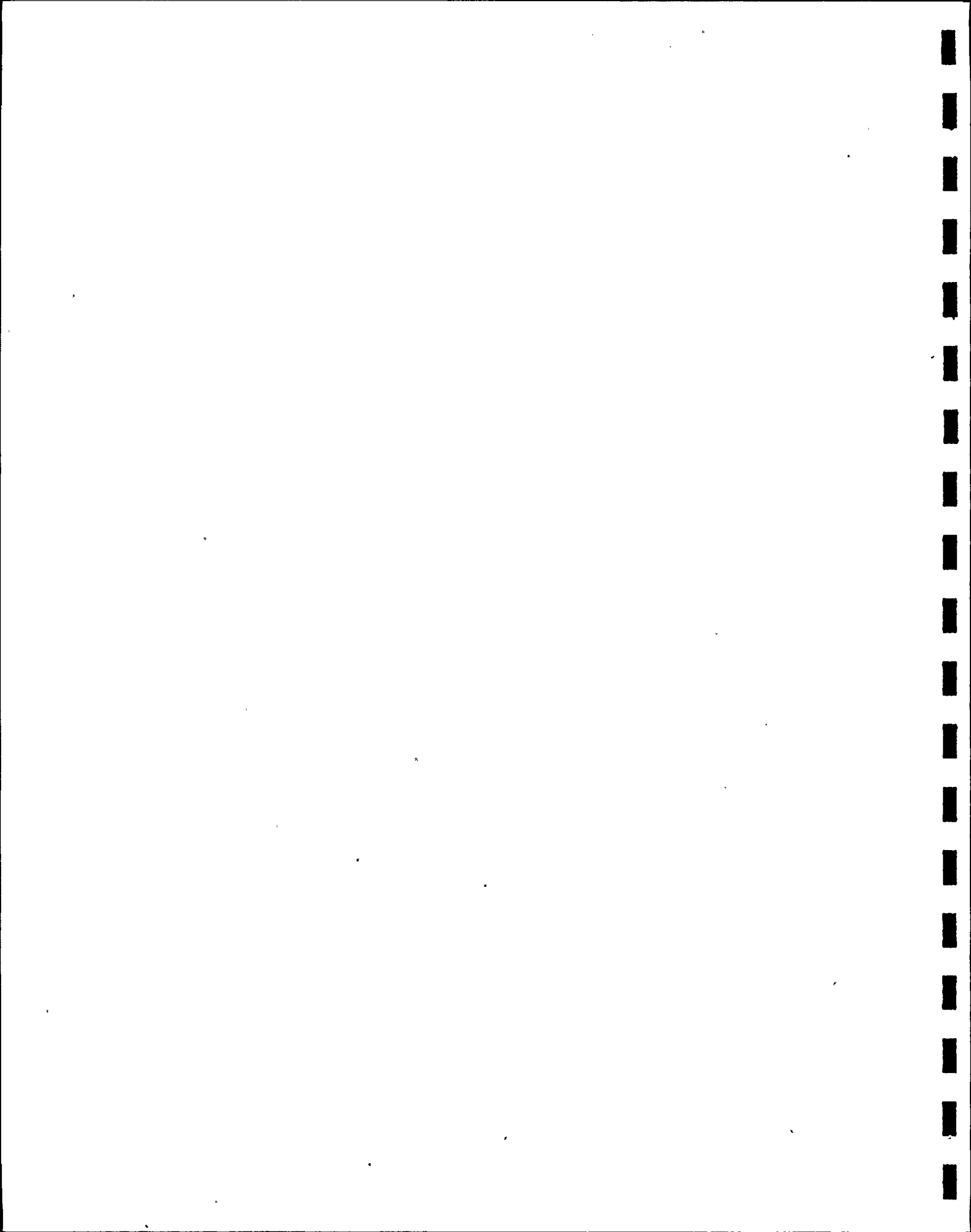


Plate IV-4. Isotherms, Flight Pass, 3/11/77, Time 07:42

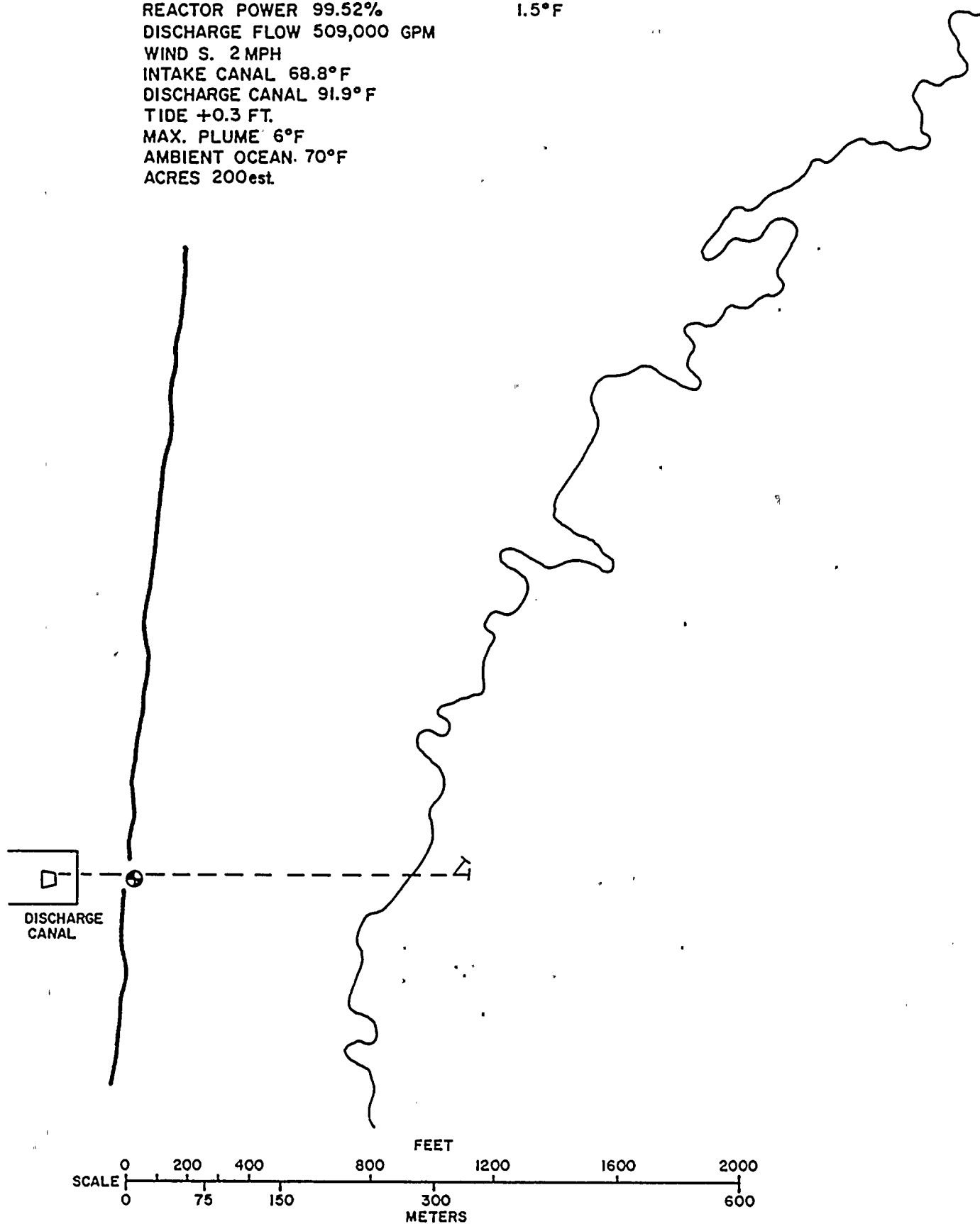


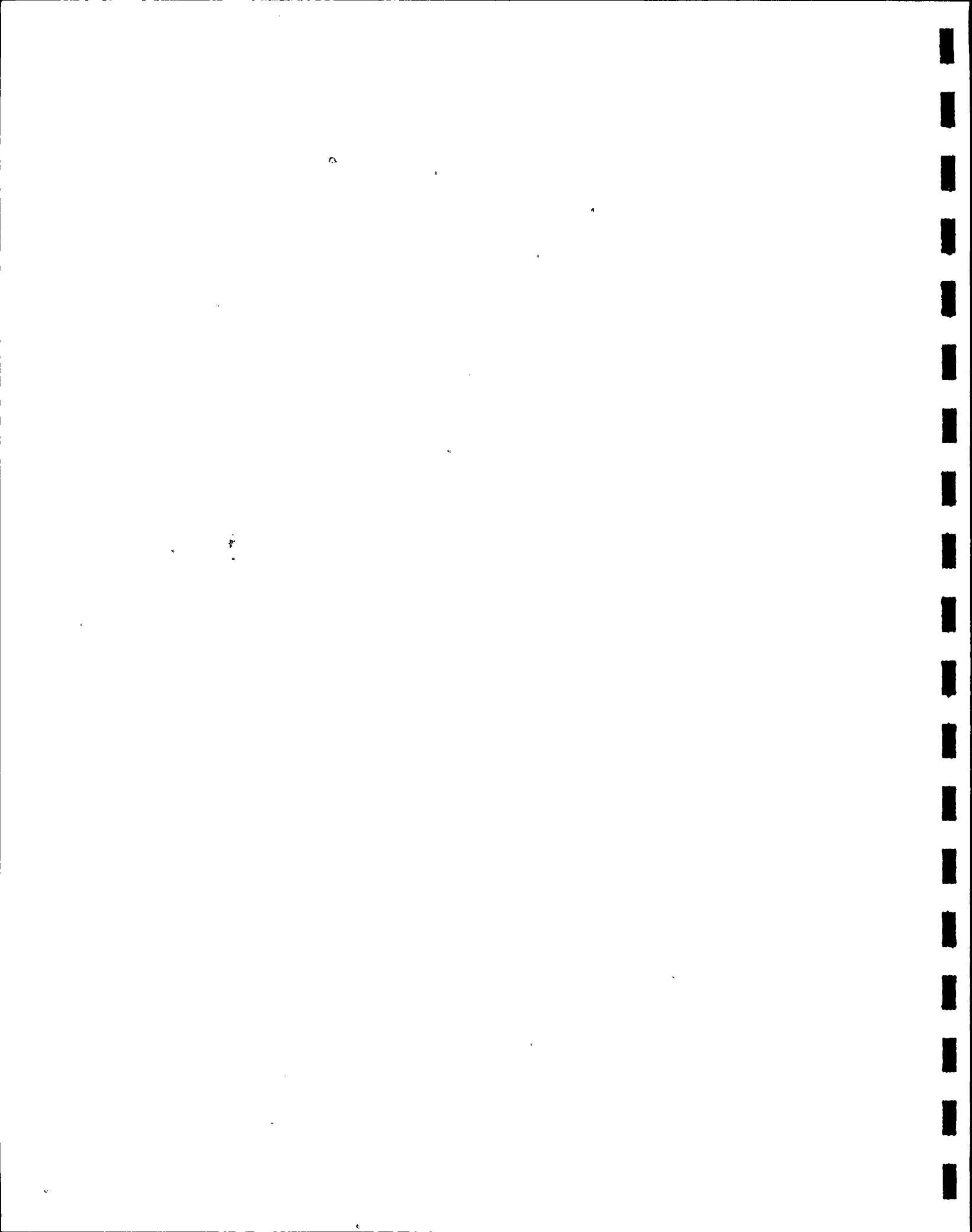


ST. LUCIE PLANT ISOTHERMS PLATE IV-4 A  
FLIGHT PASS 3/11/77, TIME 07:42

REACTOR POWER 99.52%  
DISCHARGE FLOW 509,000 GPM  
WIND S. 2 MPH  
INTAKE CANAL 68.8°F  
DISCHARGE CANAL 91.9°F  
TIDE +0.3 FT.  
MAX. PLUME 6°F  
AMBIENT OCEAN. 70°F  
ACRES 200est

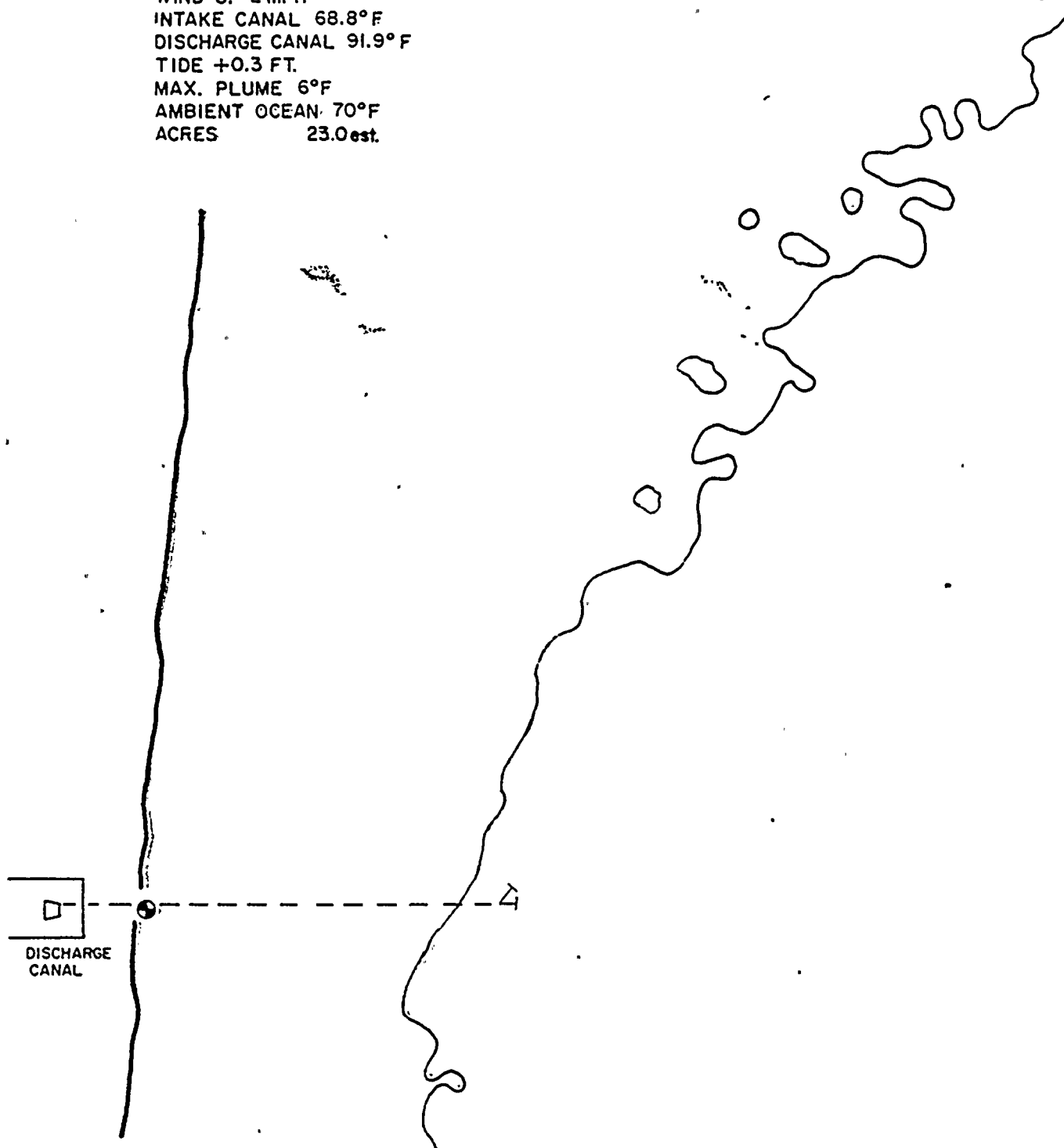
1.5°F





ST. LUCIE PLANT ISOTHERMS PLATE IV-4 B  
FLIGHT PASS 3/11/77, TIME 07:42

REACTOR POWER 99.52%  
DISCHARGE FLOW 509,000 GPM 2°F  
WIND S. 2 MPH  
INTAKE CANAL 68.8°F  
DISCHARGE CANAL 91.9°F  
TIDE +0.3 FT.  
MAX. PLUME 6°F  
AMBIENT OCEAN 70°F  
ACRES 23.0 est.

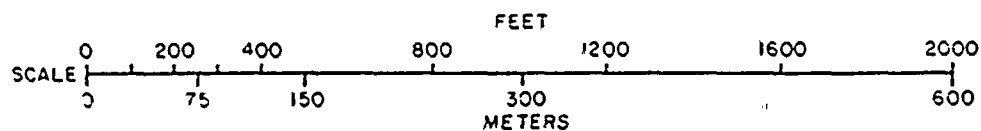
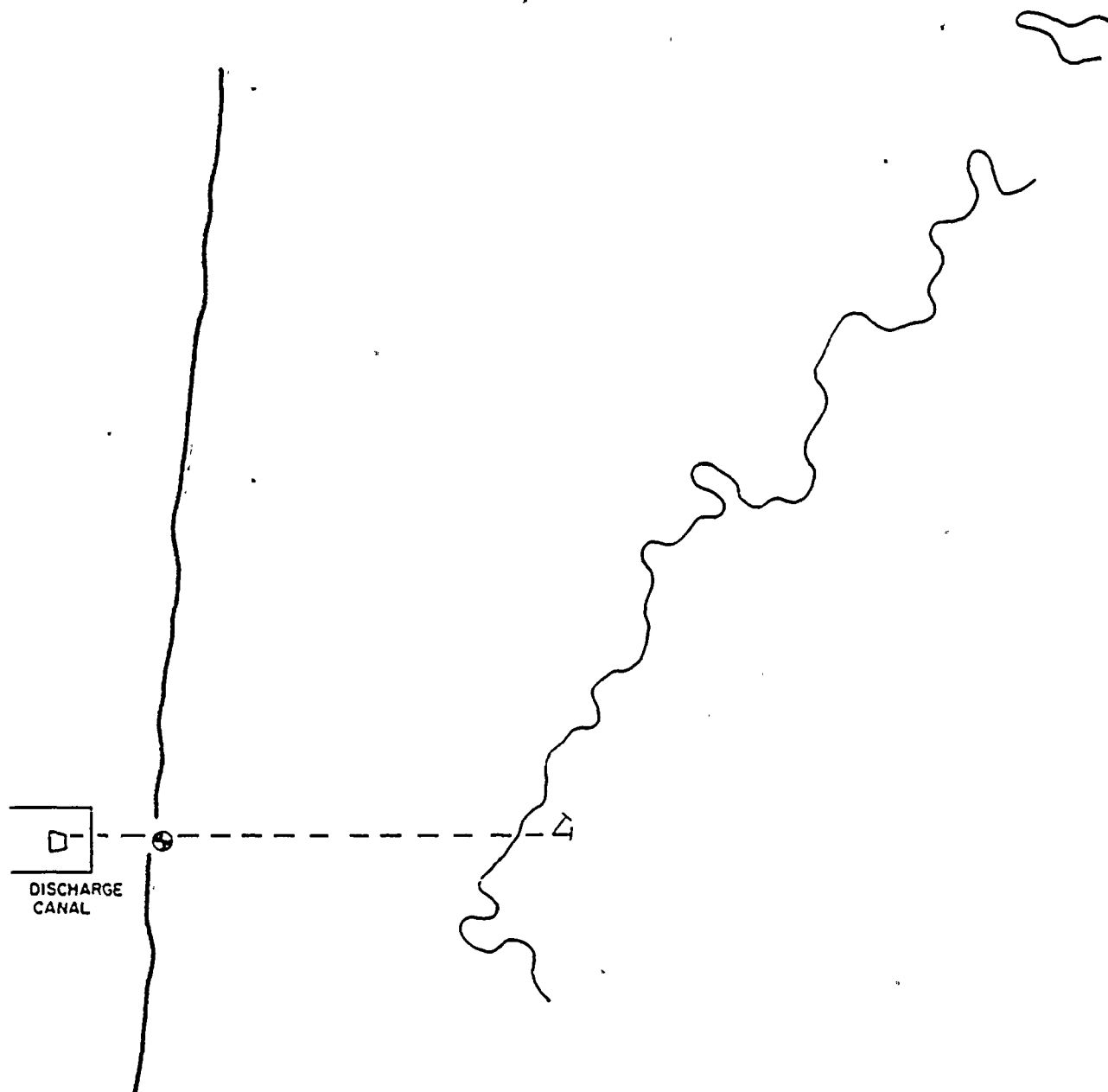


SCALE 0 200 400 800 1200 1600 2000  
0 75 150 300 600  
FEET METERS

ST. LUCIE PLANT ISOTHERMS PLATE IV-4 C  
FLIGHT PASS 3/11/77, TIME 07:42

REACTOR POWER 99.52%  
DISCHARGE FLOW 509,000 GPM  
WIND S. 2 MPH  
INTAKE CANAL 68.8°F  
DISCHARGE CANAL 91.9°F  
TIDE +0.3 FT.  
MAX. PLUME 6°F  
AMBIENT OCEAN 70°F  
ACRES 21.1 est.

3°F



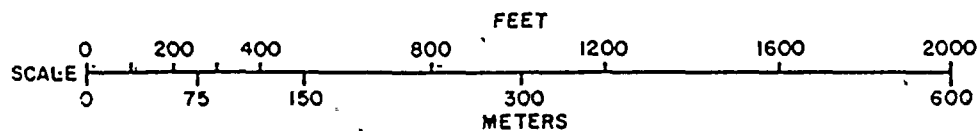
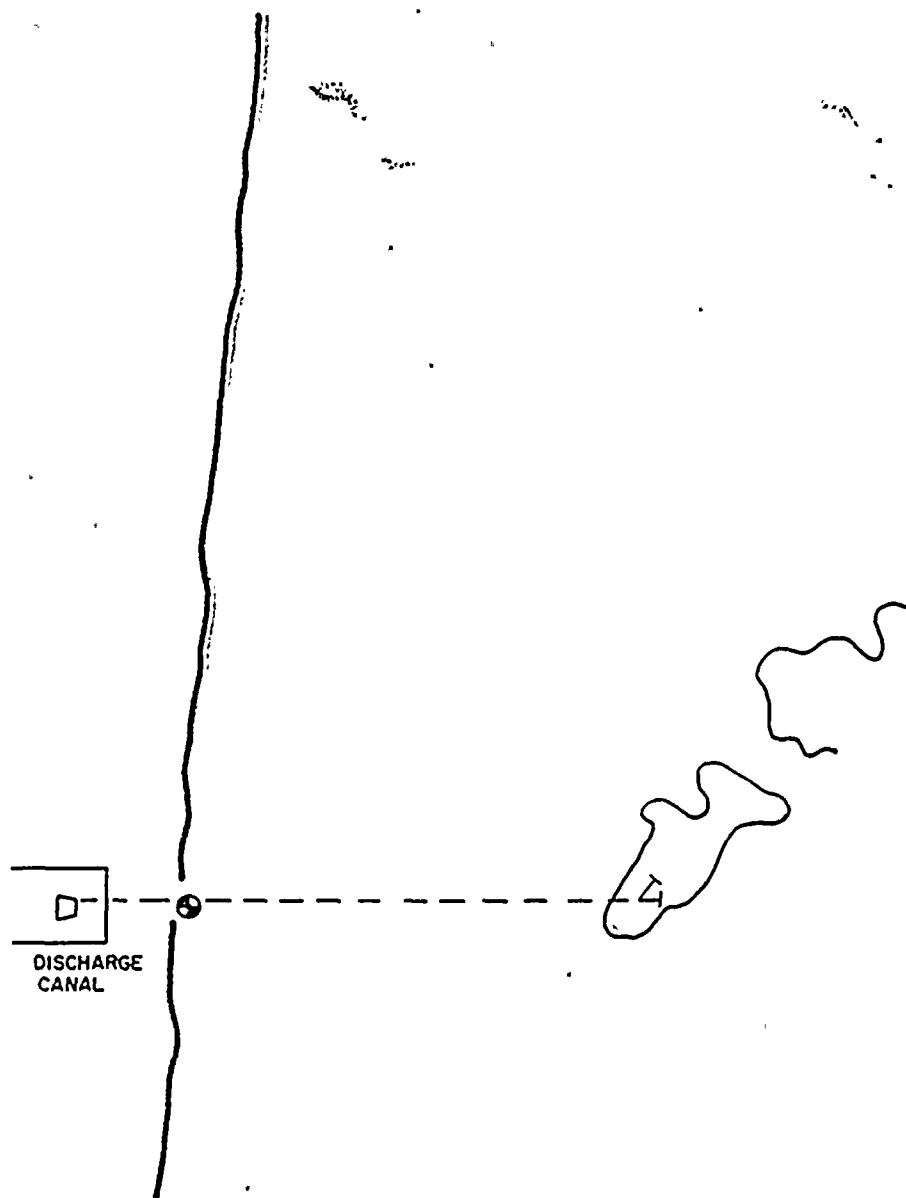
ST. LUCIE PLANT ISOTHERMS PLATE IV-4  
FLIGHT PASS 3/11/77, TIME 07:42

D

REACTOR POWER 99.52%  
DISCHARGE FLOW 509,000 GPM  
WIND S. 2 MPH  
INTAKE CANAL 68.8°F  
DISCHARGE CANAL 91.9°F  
TIDE +0.3 FT.  
MAX. PLUME 6°F  
AMBIENT OCEAN 70°F  
ACRES

4°F

5.4 est.

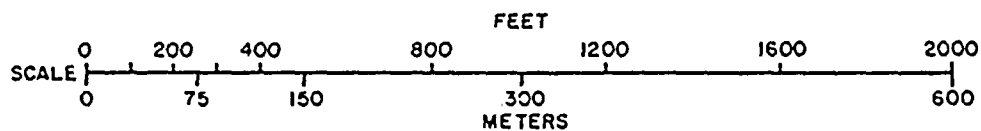
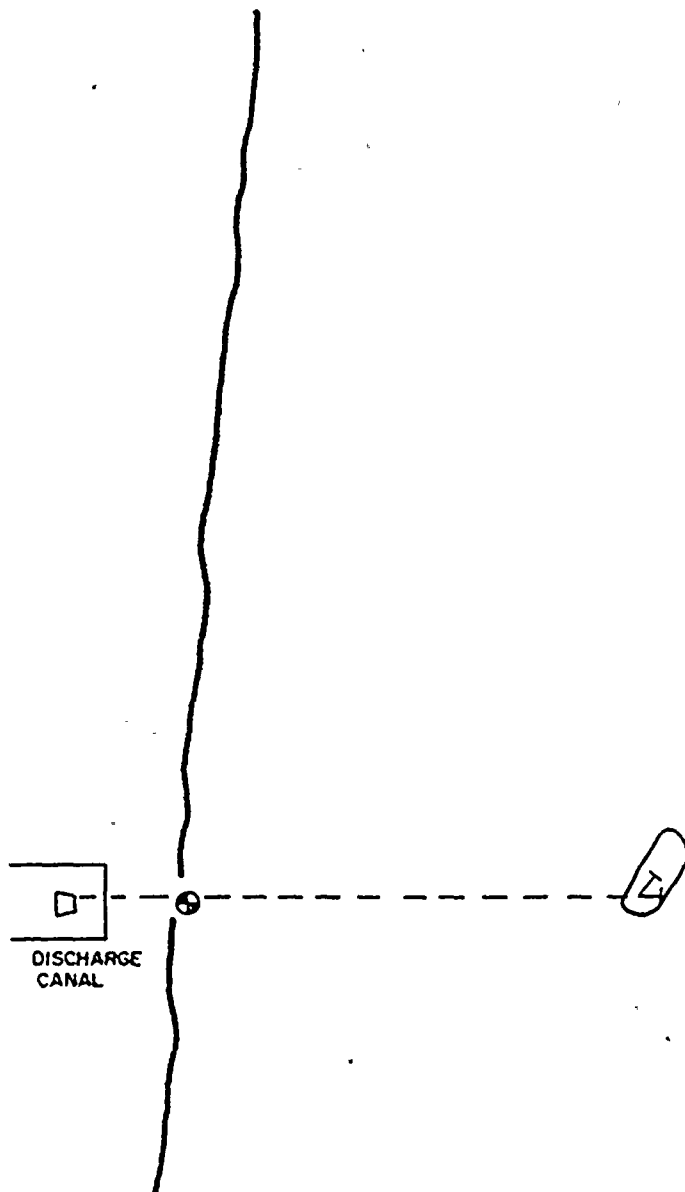




ST. LUCIE PLANT ISOTHERMS PLATE IV-4  
FLIGHT PASS 3/11/77, TIME 07:42

E

REACTOR POWER 99.52%  
DISCHARGE FLOW 509,000 GPM  
WIND S. 2 MPH  
INTAKE CANAL 68.8°F  
DISCHARGE CANAL 91.9°F 5°F  
TIDE +0.3 FT.  
MAX. PLUME 6°F  
AMBIENT OCEAN 70°F  
ACRES 0.2







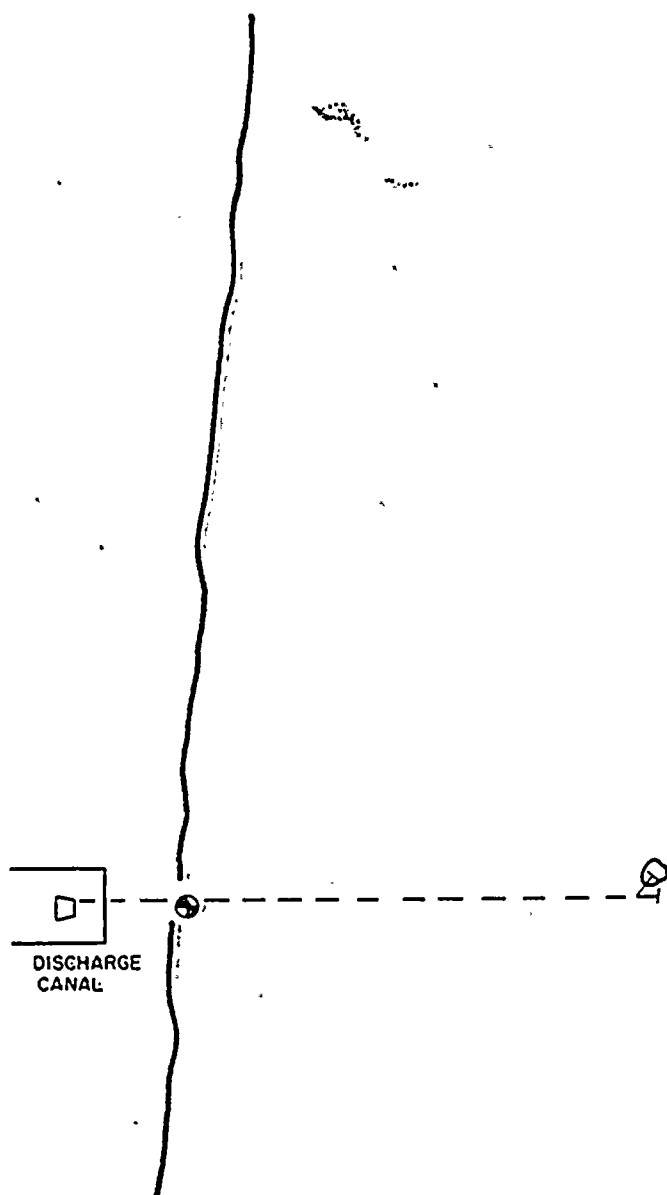
ST. LUCIE PLANT ISOTHERMS PLATE IV-4  
FLIGHT PASS 3/11/77, TIME 07:42

F

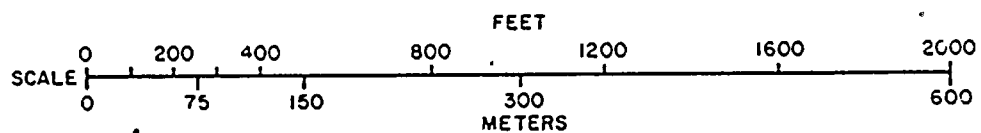
REACTOR POWER 99.52%  
DISCHARGE FLOW 509,000 GPM  
WIND S. 2 MPH  
INTAKE CANAL 68.8°F  
DISCHARGE CANAL 91.9°F  
TIDE +0.3 FT.  
MAX. PLUME 6°F  
AMBIENT OCEAN 70°F  
ACRES

6°F

0.1



DISCHARGE  
CANAL



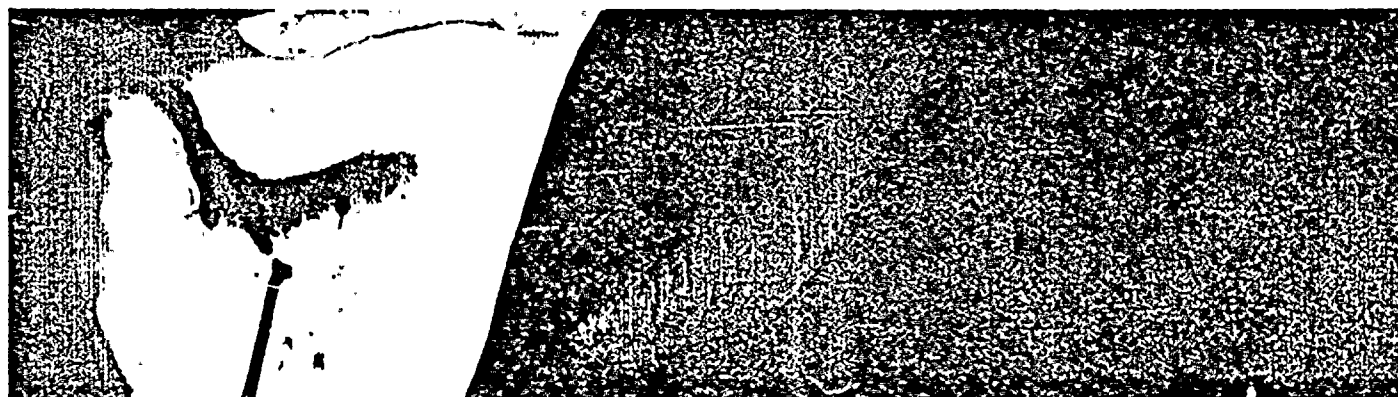


Plate IV-5. Flight Pass, 3/11/77, Time 13:41,



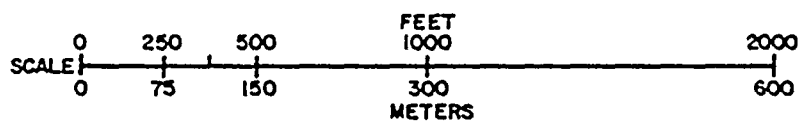
Plate IV-6. Isotherms, Flight Pass, 3/11/77, Time 13:41

ST. LUCIE PLANT ISOTHERMS PLATE IV-6 A  
FLIGHT PASS 3/11/77, TIME 13:41

DISCHARGE  
CANAL

REACTOR POWER 98.41%  
DISCHARGE FLOW 509,000 GPM  
WIND S. 4 MPH  
INTAKE CANAL 68.97°F  
DISCHARGE CANAL 92.1°F  
TIDE +2.5 FT.  
MAX. PLUME 4°F  
AMBIENT OCEAN 70°F  
ACRES 350

1.5°F

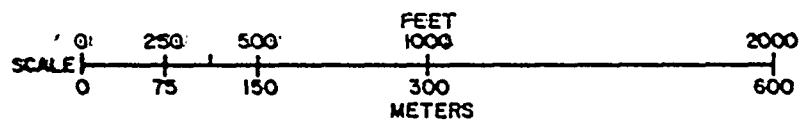


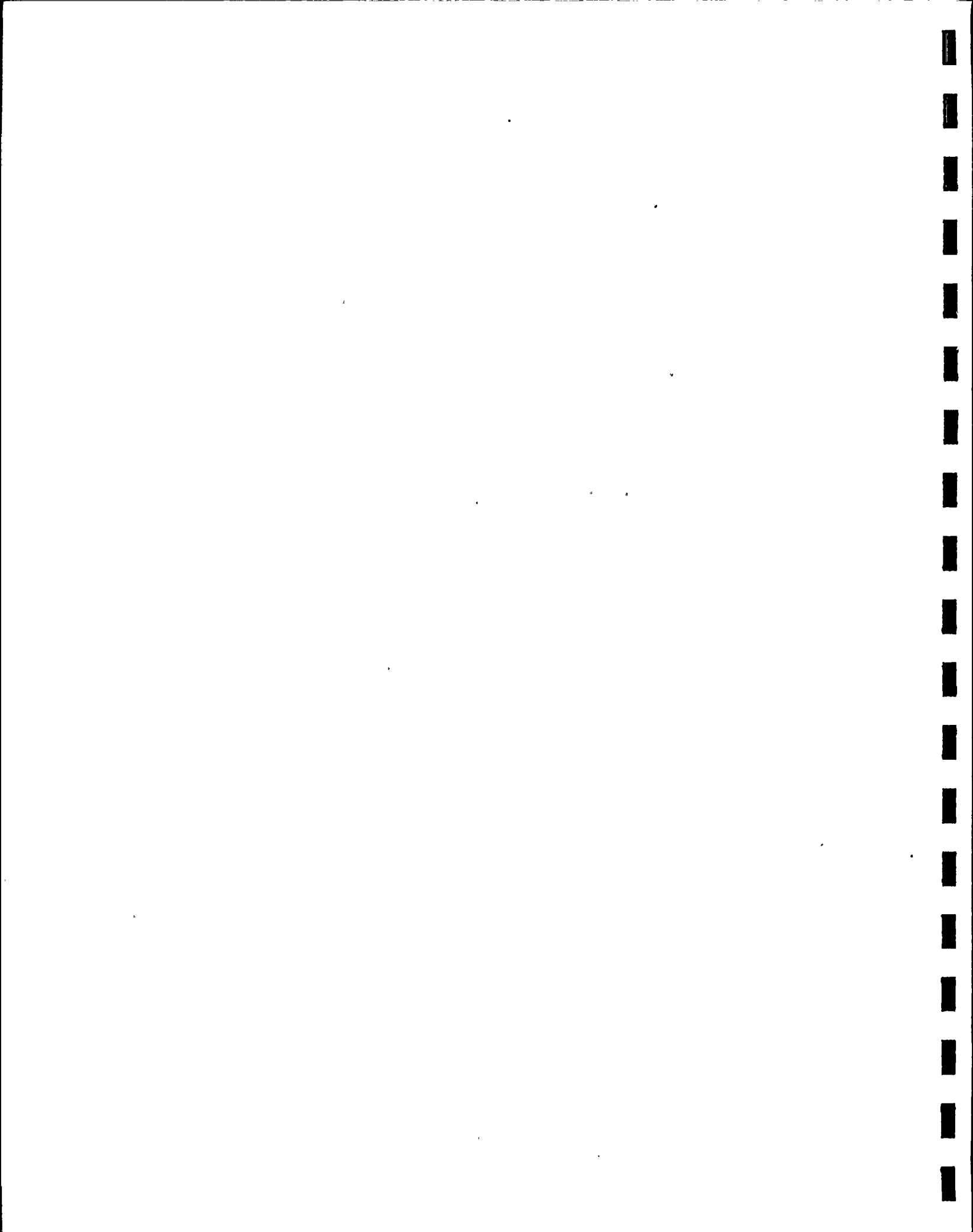
ST. LUCIE PLANT ISOTHERMS PLATE IV-6 B  
FLIGHT PASS 3/11/77, TIME 13:41

DISCHARGE  
CANAL

REACTOR POWER 98.41%  
DISCHARGE FLOW 509,000 GPM  
WIND S. 4 MPH  
INTAKE CANAL 68.97°F  
DISCHARGE CANAL 92.1°F  
TIDE +2.5 FT.  
MAX PLUME 4°F  
AMBIENT OCEAN 70°F  
ACRES 120.2

2°F





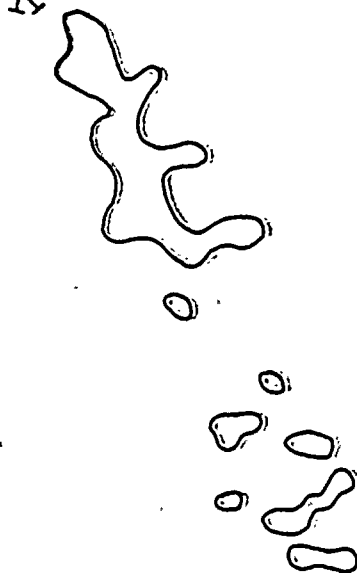
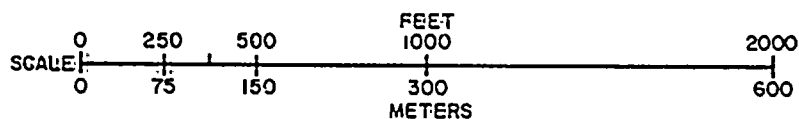
ST. LUCIE PLANT ISOTHERMS PLATE IV-6  
FLIGHT PASS 3/11/77, TIME 13:41

C

DISCHARGE  
CANAL

REACTOR POWER 98.41%  
DISCHARGE FLOW 509,000 GPM  
WIND S. 4 MPH  
INTAKE CANAL 68.97°F  
DISCHARGE CANAL 92.1°F  
TIDE +2.5 FT.  
MAX PLUME 4°F  
AMBIENT OCEAN 70°F  
ACRES 5.9

3°F







ST. LUCIE PLANT ISOTHERMS PLATE IV-6  
FLIGHT PASS 3/11/77, TIME 13:41

D

DISCHARGE  
CANAL

REACTOR POWER 98.41%  
DISCHARGE FLOW 509,000 GPM  
WIND S. 4 MPH  
INTAKE CANAL 68.97°F  
DISCHARGE CANAL 92.1°F  
TIDE  $\pm 2.5$  FT.  
MAX PLUME 4°F  
AMBIENT OCEAN 70°F  
ACRE 0.11

4°F

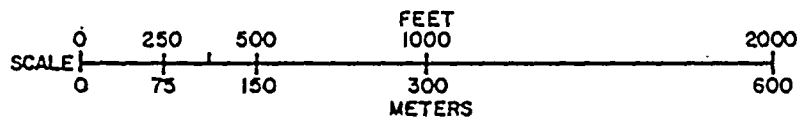




Plate IV-7. Flight Pass. 3/11/77. Time 16:23.

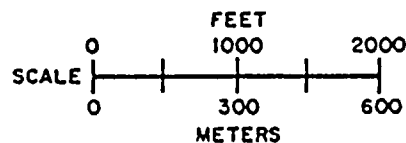
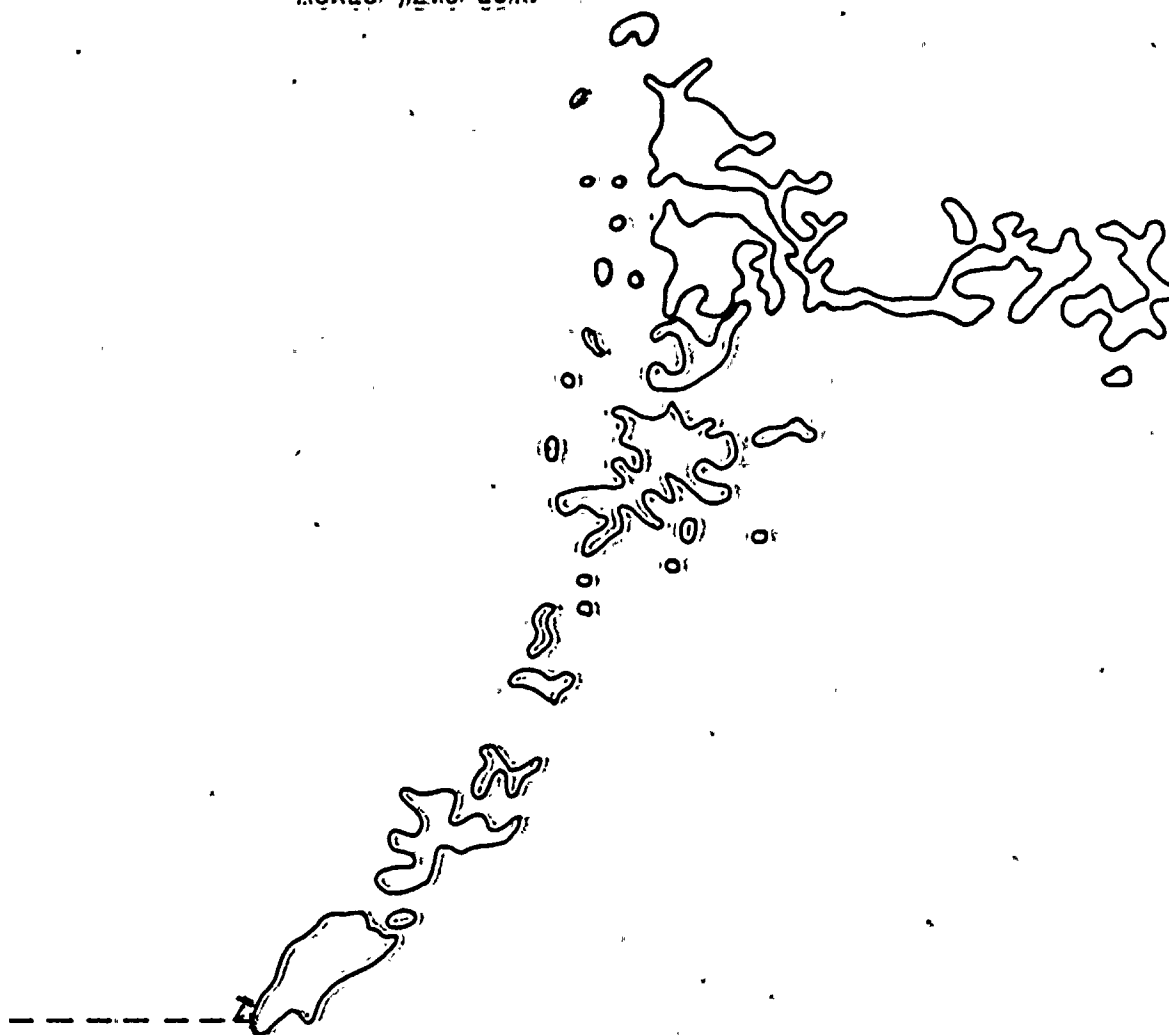
100  
100  
100

ST. LUCIE PLANT ISOTHERMS PLATE IV-8  
FLIGHT PASS 3/11/77, TIME 16:23



REACTOR POWER 98.55%  
DISCHARGE FLOW 509,000 GPM  
WIND S. 8 MPH  
INTAKE CANAL 69.41°F  
DISCHARGE CANAL 92.93°F  
TIDE +0.5 FT  
MAX PLUME 2°F  
AMBIENT OCEAN 70°F  
ACRES: 72.0 EST.

1.5°F





ST. LUCIE PLANT ISOTHERMS PLATE IV-8  
FLIGHT PASS 3/11/77, TIME 16:23



REACTOR POWER 98.55%  
DISCHARGE FLOW 509,000 GPM  
WIND S:8 MPH  
INTAKE CANAL 69.41°F  
DISCHARGE CANAL 92.93°F  
TIDE +0.5 FT.  
MAX. BLUME 2°F  
AMBIENT OCEAN 70°F  
AGRES 116.5

2°F



SCALE 0 1000 2000  
0 300 600  
FEET  
METERS

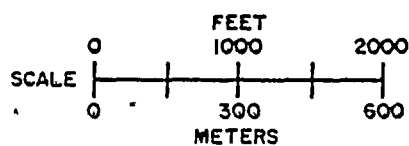
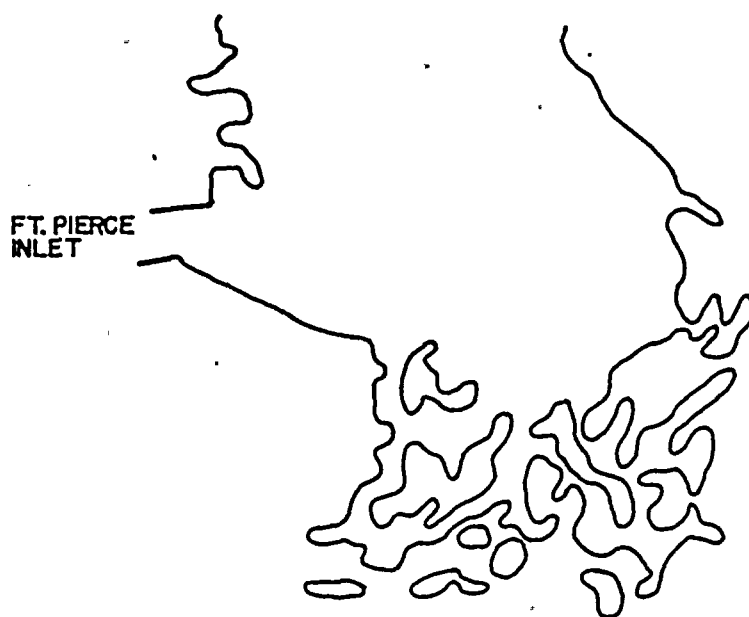
Plate IV-9. Isotherms, Ft. Pierce Inlet, Flight Pass, 3/11/77, Time 16:23



ST. LUCIE PLANT ISOTHERMS PLATE IV-9 A  
FLIGHT PASS 3/11/77 TIME 16:23

REACTOR POWER 98.55%  
DISCHARGE FLOW 509,000 GPM  
WIND S. 8 MPH  
INTAKE CANAL 69.41°F  
DISCHARGE CANAL 92.93°F  
TIDE +0.5 FT.  
MAX PLUME -1°F  
AMBIENT OCEAN 70°F  
ACRES 112.7

-1°F





ST. LUCIE PLANT ISOTHERMS PLATE IV-9

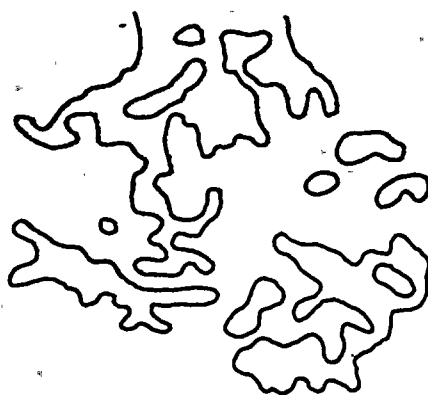
B

FLIGHT PASS 3/11/77 TIME 16:23

REACTOR POWER 98.55%  
DISCHARGE FLOW 509,000 GPM  
WIND S. 8 MPH  
INTAKE CANAL 69.41°F  
DISCHARGE CANAL 92.93°F  
TIDE +0.5 FT.  
MAX PLUME -1°F  
AMBIENT OCEAN 70°F  
ACRES 36.9

-2°F

FT. PIERCE  
INLET



SCALE 0 1000 2000  
0 300 600  
FEET  
METERS





10





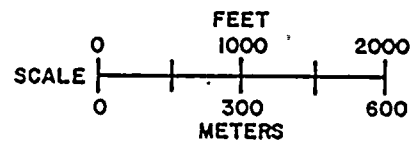
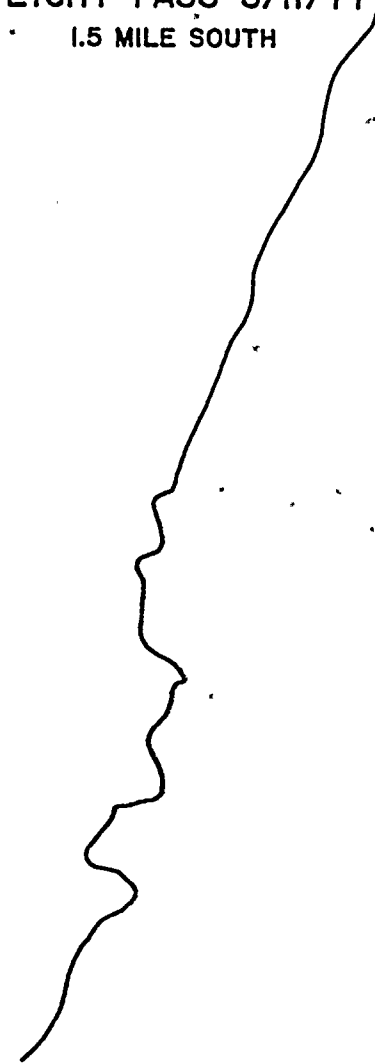
ST. LUCIE PLANT ISOTHERMS PLATE IV-10  
FLIGHT PASS 3/11/77, TIME 16:23

A

1.5 MILE SOUTH

REACTOR POWER 98.55%  
DISCHARGE FLOW 509,000 GPM  
WIND S. 8 MPH  
INTAKE CANAL 69.41°F  
DISCHARGE CANAL 92.93°F  
TIDE +0.5 FT.  
MAX PLUME 4°F  
AMBIENT OCEAN 70°F

1°F

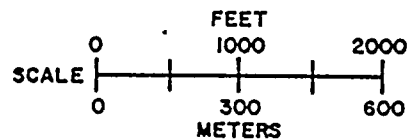


ST. LUCIE PLANT ISOTHERMS PLATE IV-10  
FLIGHT PASS 3/11/77 TIME 16:23

B

1.5 MILE SOUTH

REACTOR POWER 98.55%  
DISCHARGE FLOW 509,000 GPM 2°F  
WIND S. 8 MPH  
INTAKE CANAL 69.41°F  
DISCHARGE CANAL 92.93°F  
TIDE +0.5 FT  
MAX PLUME 4°F  
AMBIENT OCEAN 70°F





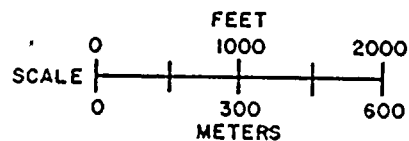
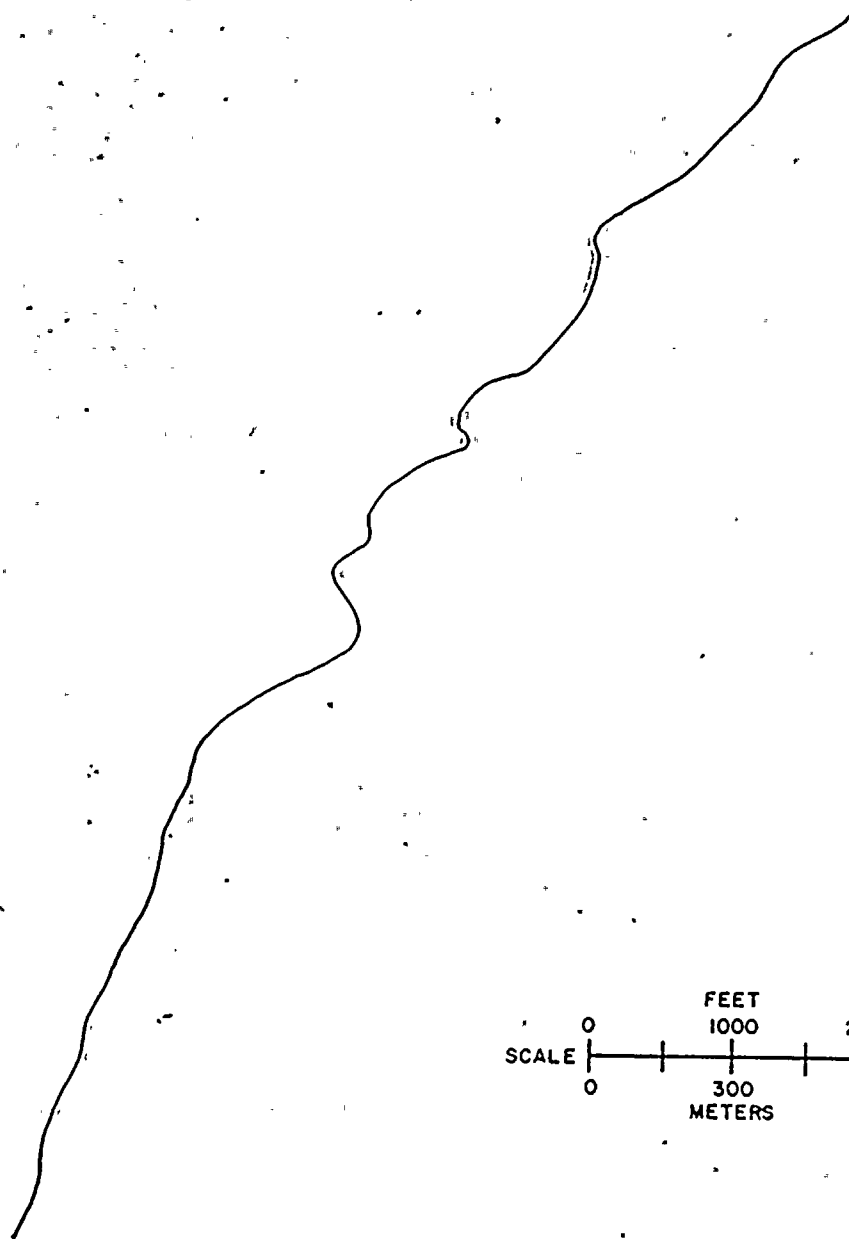
ST. LUCIE PLANT ISOTHERMS PLATE IV-10  
FLIGHT PASS 3/11/77 TIME 16:23

C

1.5 MILE SOUTH

REACTOR POWER 98.55%  
DISCHARGE FLOW 509,000 GPM  
WIND S. 8 MPH  
INTAKE CANAL 69.41°F  
DISCHARGE CANAL 92.93°F  
TIDE +0.5 FT.  
MAX PLUME 4°F  
AMBIENT OCEAN 70°F

3°F





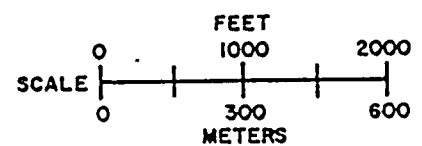
ST. LUCIE PLANT ISOTHERMS PLATE IV-10  
FLIGHT PASS 3/11/77 TIME 16:23

D

1.5 MILE SOUTH

REACTOR POWER 98.55%  
DISCHARGE FLOW 509,000 GPM  
WIND S. 8 MPH  
INTAKE CANAL 69.41°F  
DISCHARGE CANAL 92.93°F  
TIDE  $\pm 0.5$  FT.  
MAX. PLUME 4°F  
AMBIENT OCEAN 70°F

4°F



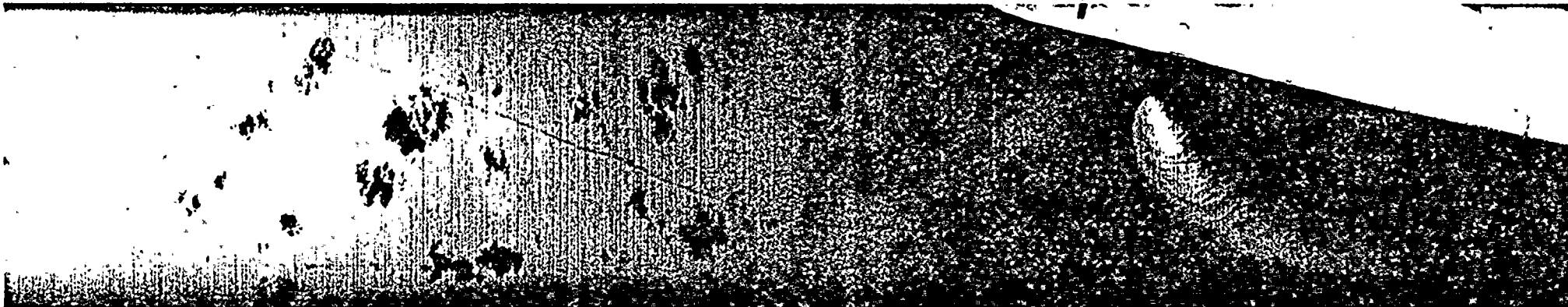


Plate IV-11. Flight Pass, 3/11/77, Time 16:31



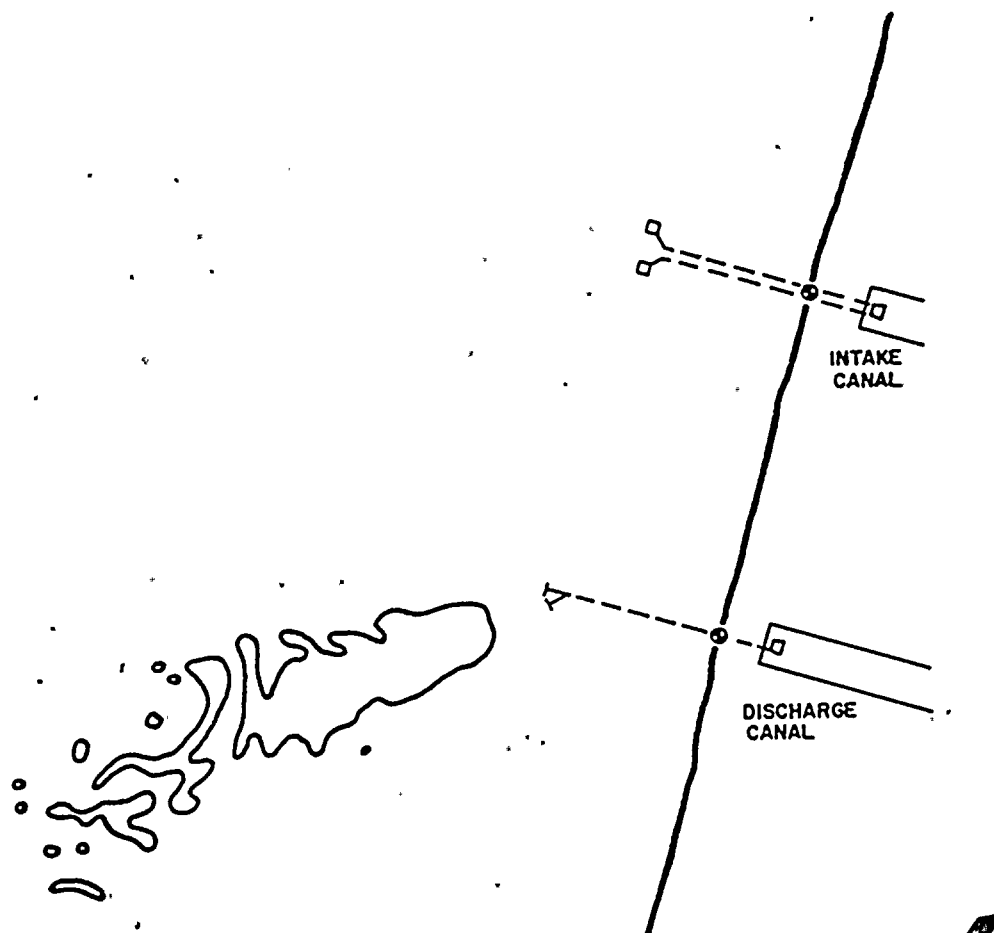


ST. LUCIE PLANT ISOTHERMS PLATE IV-12  
FLIGHT PASS 3/11/77, TIME 16:31

B

REACTOR POWER 98.55%  
DISCHARGE FLOW 509,000 GPM  
WIND S. 8 MPH  
INTAKE CANAL 69.41°F  
DISCHARGE CANAL 92.93°F  
TIDE +0.5 FT.  
MAX PLUME 3°F  
AMBIENT OCEAN 70°F..  
ACRES 27.4

2°F



SCALE 0 1000 2000  
0 300 600  
FEET  
METERS



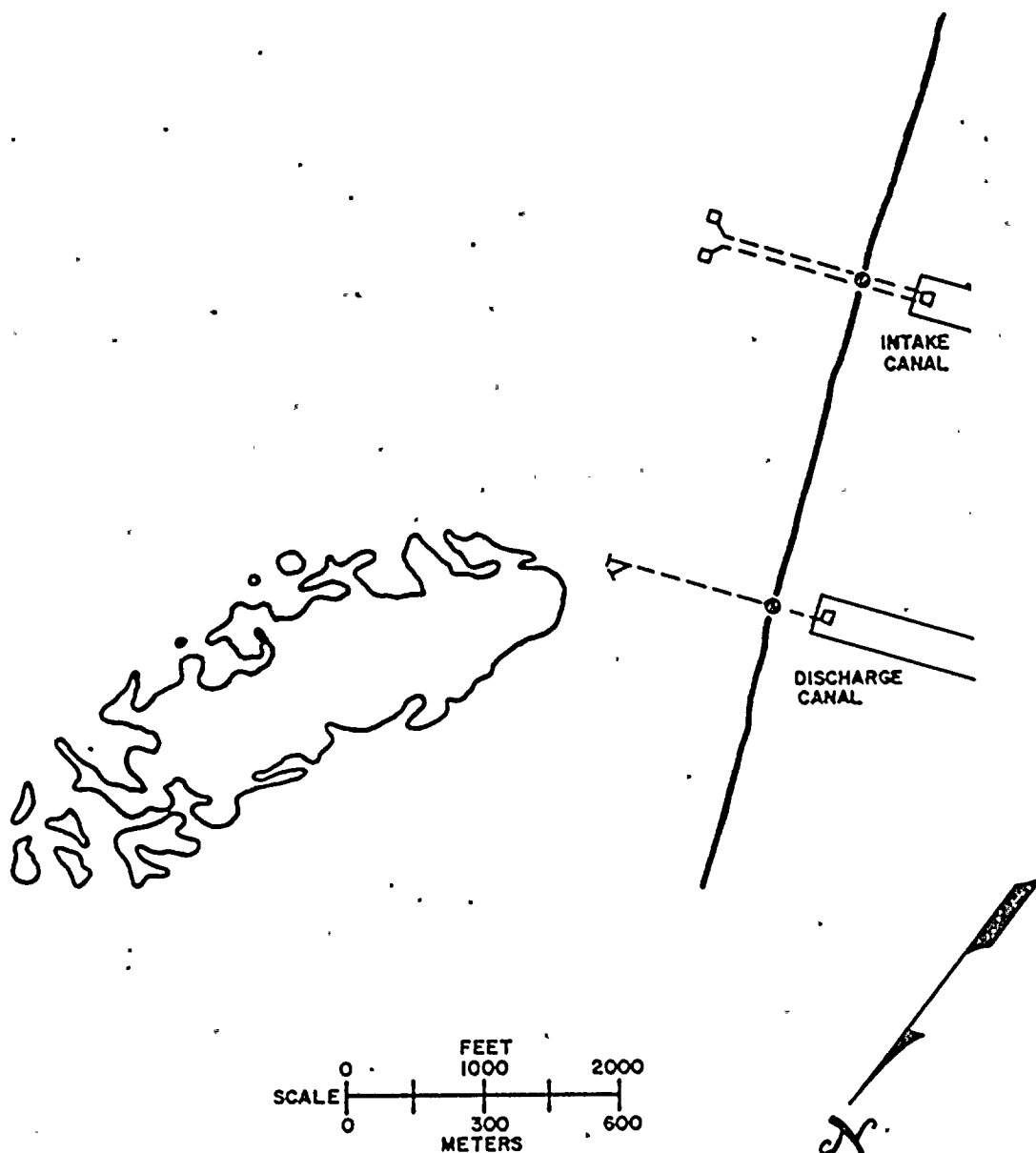


ST. LUCIE PLANT ISOTHERMS PLATE IV-12  
FLIGHT PASS 3/11/77, TIME 16:31



REACTOR POWER 98.55%  
DISCHARGE FLOW 509,000 GPM  
WIND S. 8 MPH  
INTAKE CANAL 69.41°F  
DISCHARGE CANAL 92.93°F  
TIDE +0.5 FT.  
MAX PLUME 3°F  
AMBIENT OCEAN 70°F  
ACRES 84 EST.

1.5°F

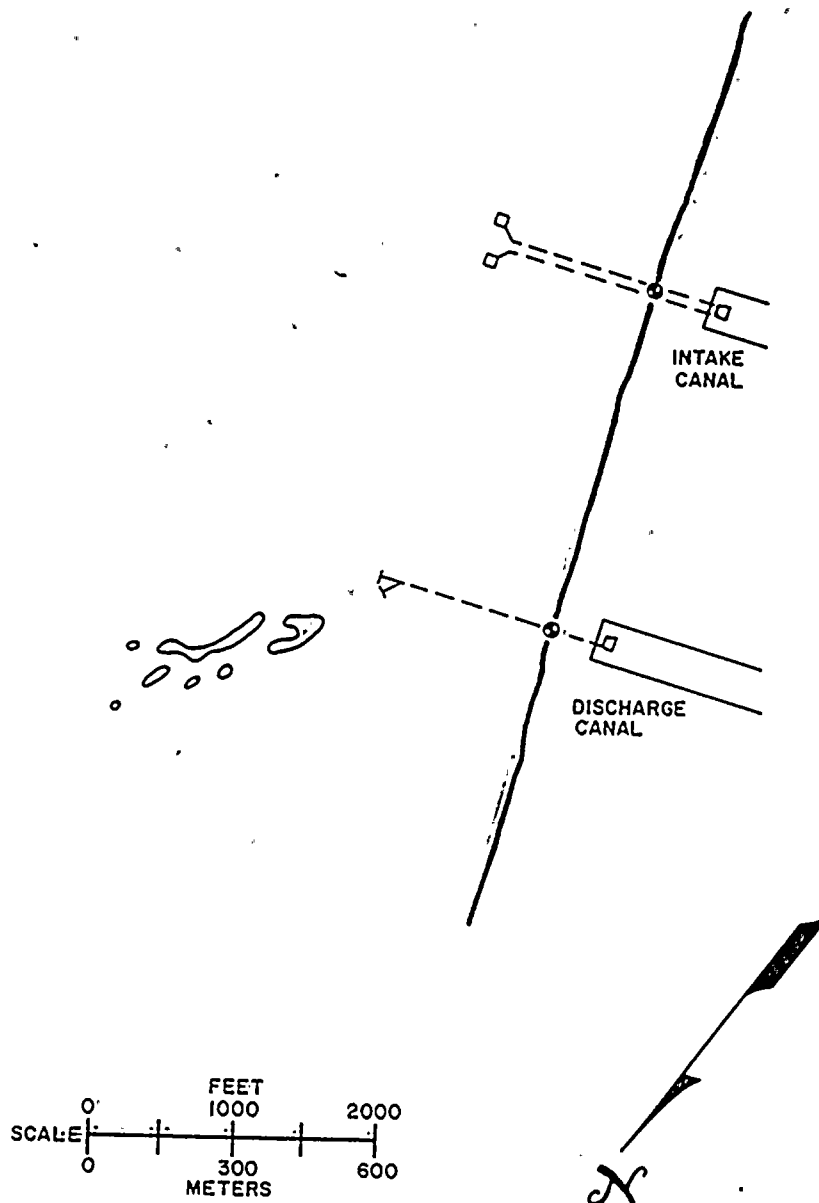


ST. LUCIE PLANT ISOTHERMS PLATE IV-12  
FLIGHT PASS 3/11/77, TIME 16:31

C

REACTOR POWER 98.55%  
DISCHARGE FLOW 509,000 GPM  
WIND S. 8 MPH  
INTAKE CANAL 69.41°F  
DISCHARGE CANAL 92.93°F  
TIDE +0.5 FT.  
MAX PLUME 3°F  
AMBIENT OCEAN 70°F  
AGRES 3.6

3°F







## SECTION V

### DISCUSSION

The imagery taken during March 10-11, 1977 shows the strong effect of the wind direction and wind speed which was previously seen in the January imagery. The hot water appeared to rise to the surface quickly and then diffused along the surface effected by wind, at least as much, as by water currents.

The temperature of the water varied with time and with position along the coast. The flight lines taken on the afternoon of March 11 were longer lines which showed the large mass of warm water separate from the plant plume. The northern and western edges of the warm water mass came within a mile of the plant plume. The southern and eastern edges of the mass were not found, even though the aircraft flew as far south as the St. Lucie Inlet and as far as 8 miles from the coast. The two passes at 16:23 and 16:31 showed the mass with temperatures as high as  $3.0^{\circ}\text{F}$  above the nominal ambient temperature near the plant.

Table V-1 shows the excess temperatures  $\Delta T$  isotherms with their given areas at high and low tide. Figure V-1 compares flight pass 12:41 and 13:41 at high tide ( $+2.5$ ). Flight pass 13:41 shows from the bar graph to have lower surface areas. Figure V-2 compares flight passes 07:42, 16:23 and 16:31 at low tide ( $+0.5$ ), and flight passes 16:23 and 16:31 shows from the bar graph that each  $\Delta T$  isotherm (except  $2.0^{\circ}\text{F}$  for flight pass 16:31) to have a much lower surface areas as well as lower excess temperatures.

The reason for these lower surface areas and lower excess temperatures could be the warm water intrusion of the Gulf stream.

The mass changed with time. The mass was much farther from shore on 10 March 1977 than on 11 March 1977. On 11 March 1977, the mass appeared





Table V-1  
Excess Temperatures  $\Delta T$  Isotherm

FLIGHT PASS 3/10/77 12:41 REACTOR POWER 98.4% TIDE 013:00 +2.5 ft		FLIGHT PASS 3/11/77 07:42 REACTOR POWER 99.42% TIDE 007:03 +0.3 ft		FLIGHT PASS 3/11/77 13:41 REACTOR POWER 98.41% TIDE 013:00 +2.5 ft		FLIGHT PASS 3/11/77 16:23 REACTOR POWER 98.55% TIDE N/A +0.5 ft		FLIGHT PASS 3/11/77 16:31 REACTOR POWER 98.55% TIDE N/A +0.5 ft	
$\Delta T$ ISOTHERMS (°F)	AREA (acres)	$\Delta T$ ISOTHERMS (°F)	AREA (acres)	$\Delta T$ ISOTHERMS (°F)	AREA (acres)	$\Delta T$ ISOTHERMS (°F)	AREA (acres)	$\Delta T$ ISOTHERMS (°F)	AREA (acres)
6.0	-	6.0	0.1	6.0	-	6.0	-	6.0	-
5.0	0.2	5.0	0.2	5.0	-	5.0	-	5.0	-
4.0	2.4	4.0	5.4 Est.	4.0	0.1	4.0	-	4.0	-
3.0	9.7	3.0	21.1 Est.	3.0	5.9	3.0	-	3.0	3.6
2.0	159.0	2.0	23.0 Est.	2.0	120.2	2.0	16.5	2.0	27.4
1.5	350-397 Est.	1.5	200.0 Est.	1.5	350.0 Est.	1.5	72.0 Est.	1.5	84.0 Est.

to follow the coast near the St. Lucie Inlet and then turned outward from the coast about two-miles south of the plant. It is possible that the warm water intrusion are offshoots from the Gulf stream which undulates into the shore and back outward on a cyclic principle.

Although the warm water mass described above is separate from the plant's water discharge, it was close enough to the plant's plume that the edges of the 1.5°F isotherm lines of the plume and mass mixed on the 16:23 and 16:31 flight measurements.

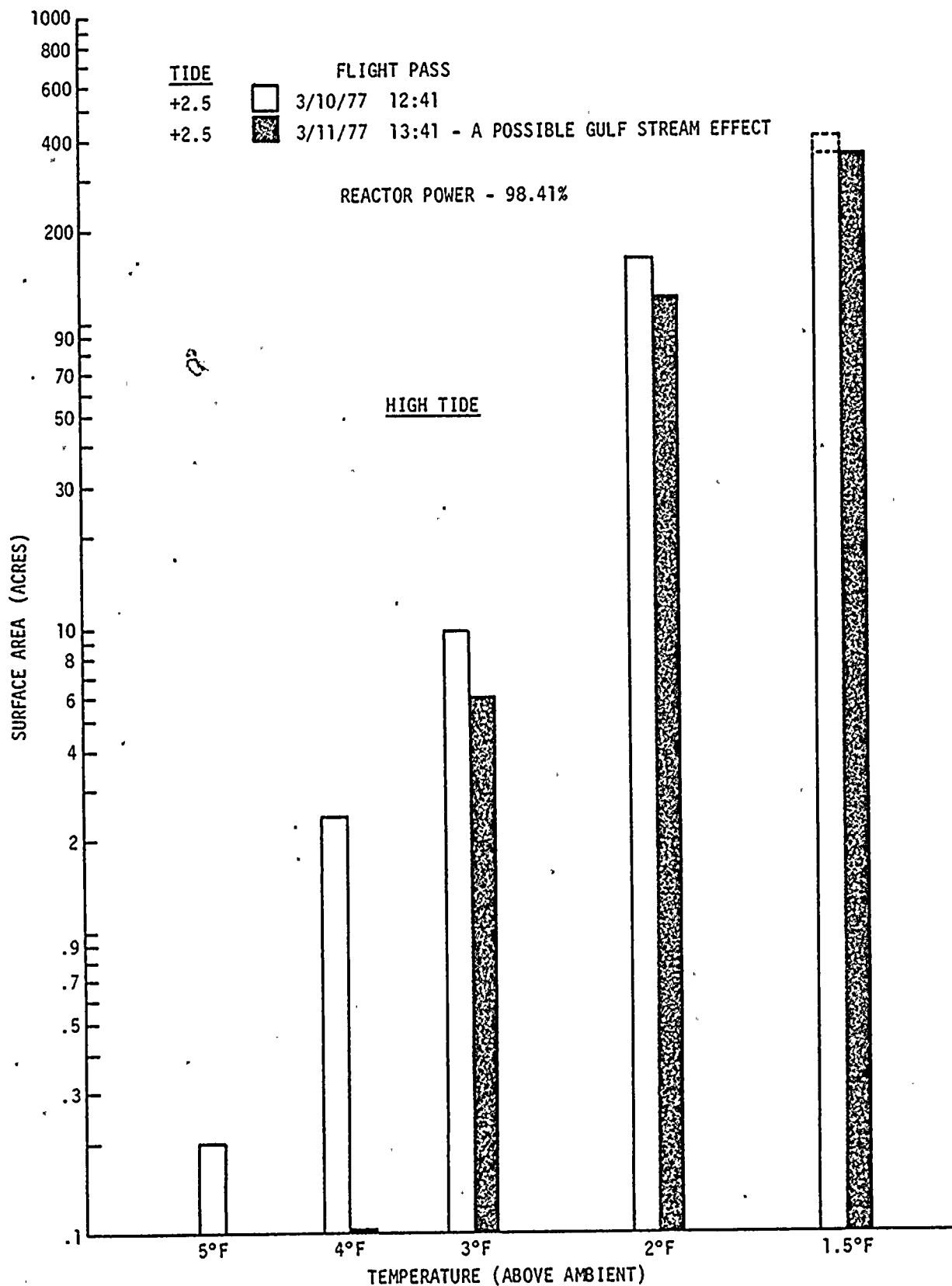


Figure V-1. Flight Pass 12:41 and 13:41 at High Tide (+2.5)

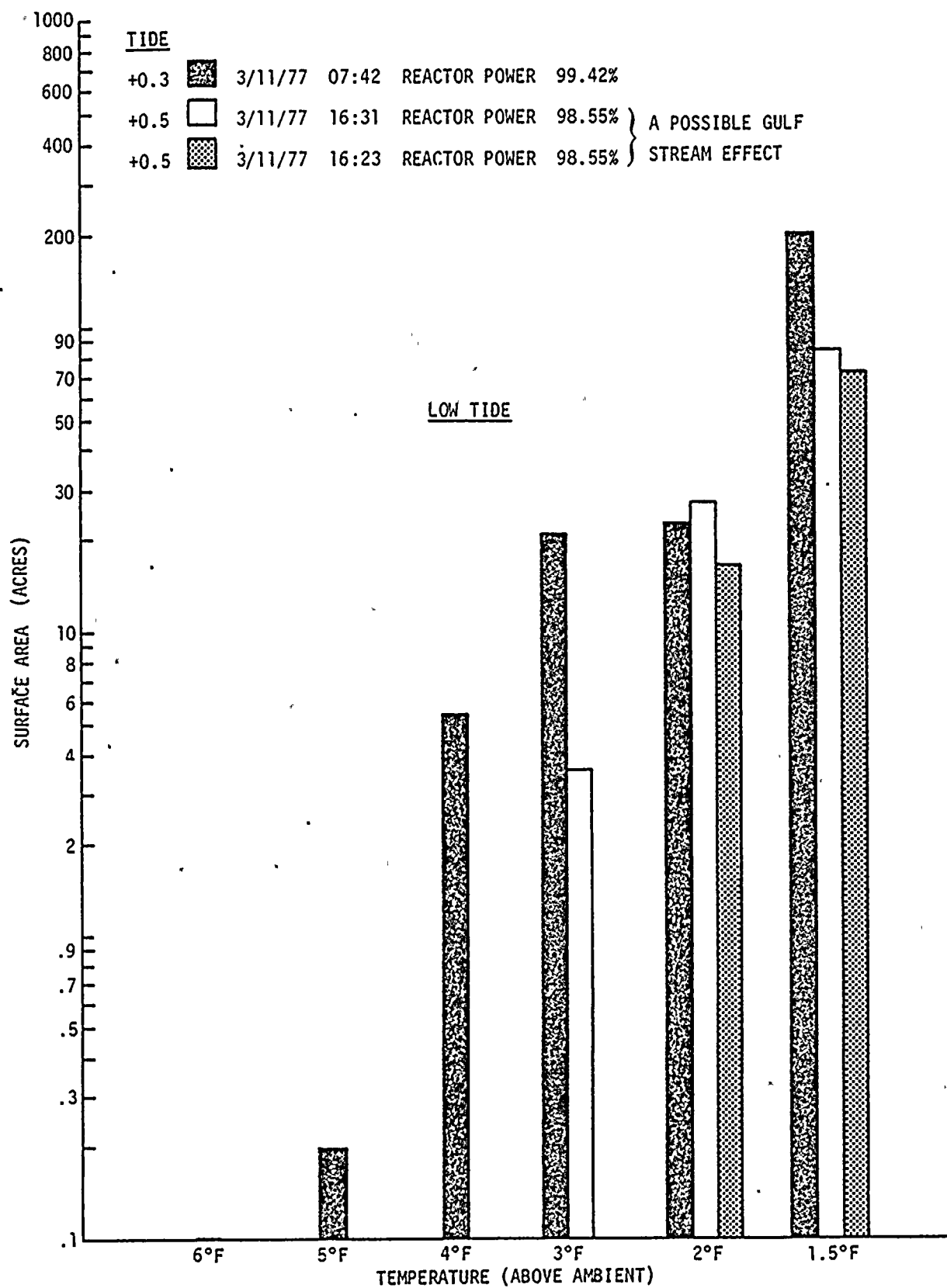


Figure V-2. Flight Pass 07:42, 16:23, and 16:31 at Low Tide (+0.5)





APPENDIX A  
FLIGHT LOGS



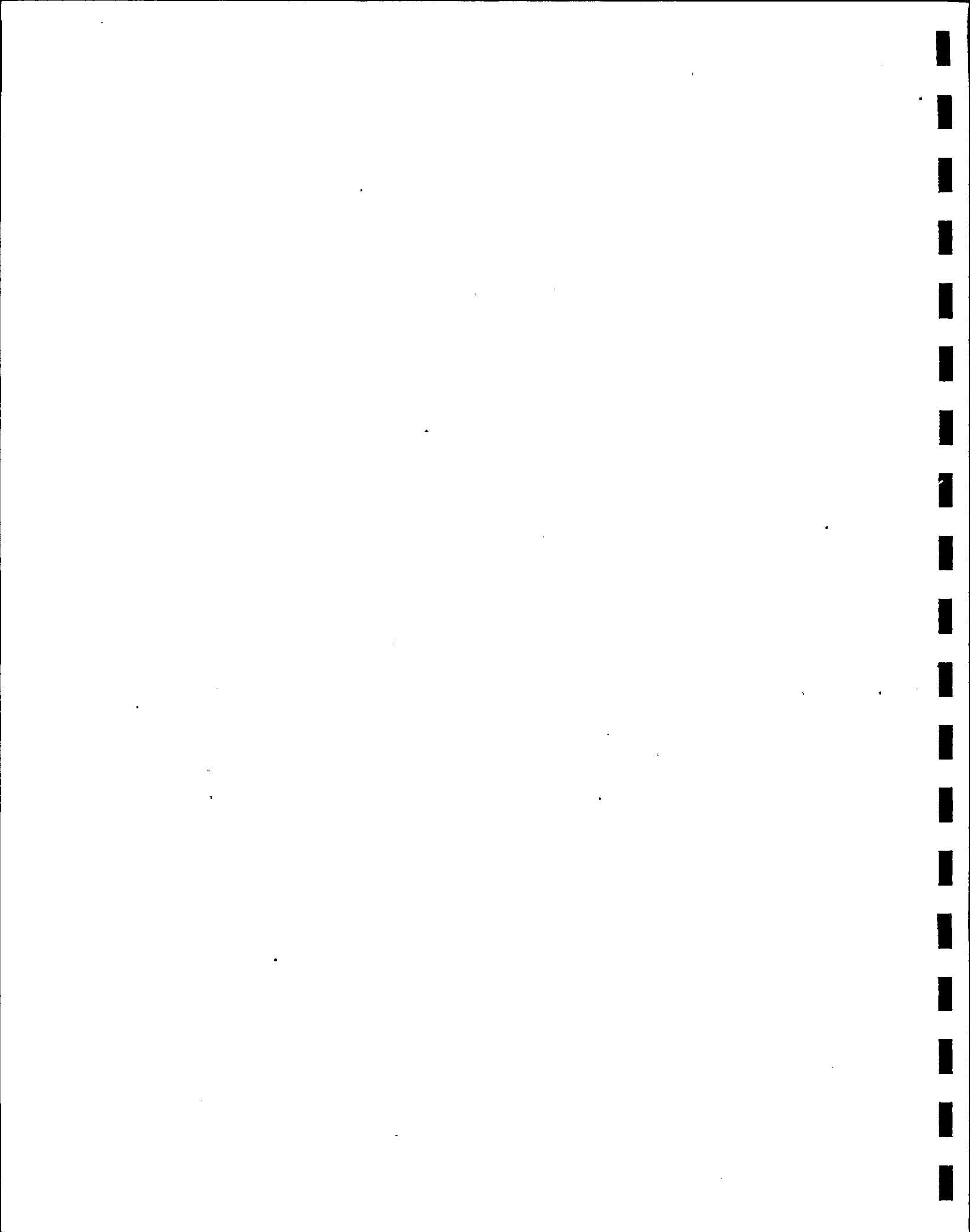
FLIGHT LOG St. LucieDATE 3/10/77TAKE OFF TIME 11:43 Local timeTAKE OFF WIND 5-15-18 KTTAKE OFF PLACE Stuart Fla

Discharge 90.4

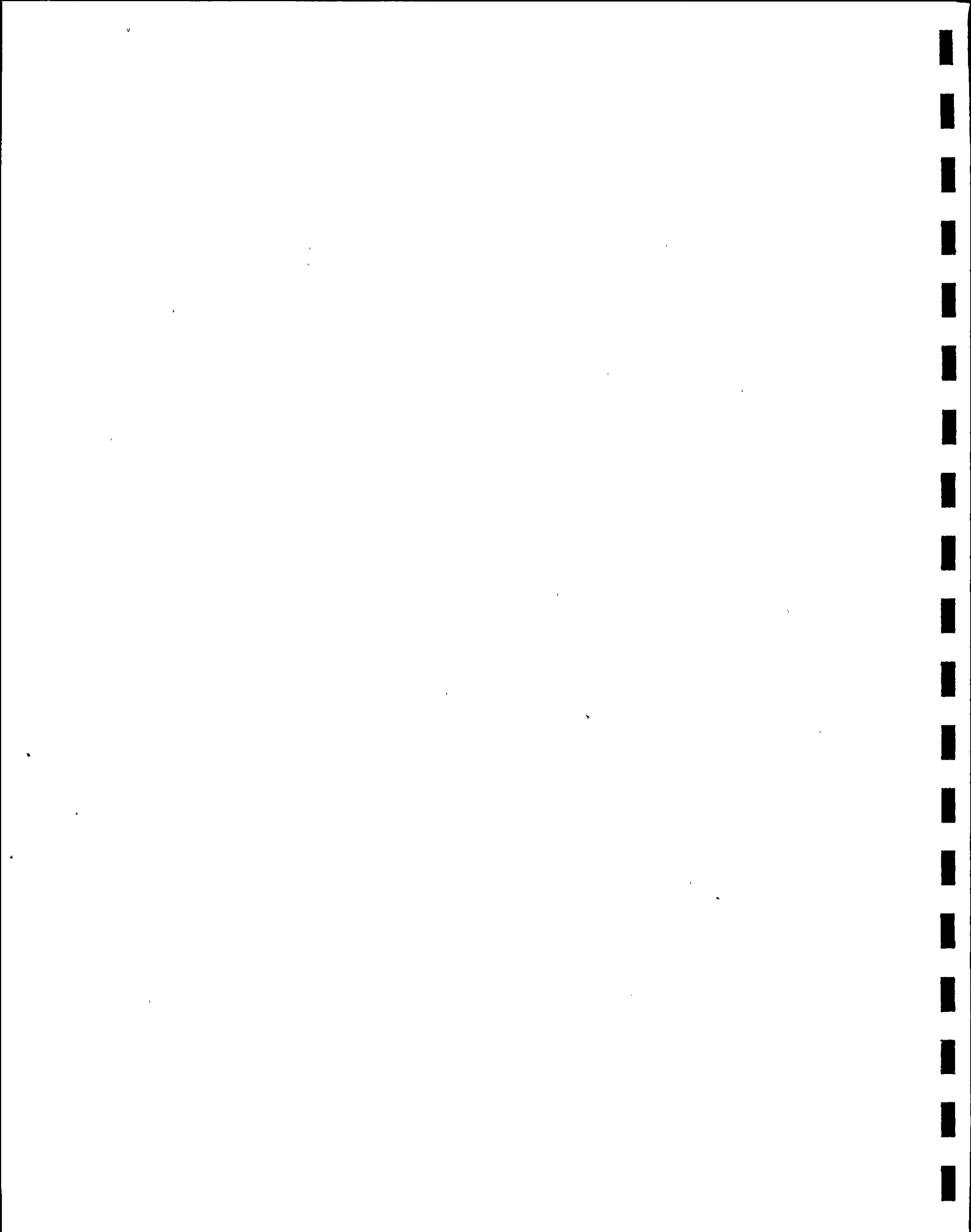
Intake 67.5

RUN #	TIME		TAPE FT		FILM FRAME		HEADING	ALT	SPEED
	ON	OFF	ON	OFF	ON	OFF			
1		12:27	----	----		12:27	E		Tape 1
2		12:33	532	1433		12:33	W		
3		12:41	1439	1900			S		
4		12:48	1900	2569			E		
5		12:52	2569	2961			W		
6		13:10	2961	3459			210°		
7		13:20				13:20	S		
Visual Readings From 500 ft									
Cold Canal 0.6 CM 67.5° F									
Hot Canal 5.6 CM 90.4° F									
Difference 5.0 CM 22.9° F or 4.58°/CM									
Hot Spot in Plume 4.58° F									
Extremely small Hot Spot in Plume 1.1 CM = 5.04° F									
Note: Extremely Small Hot Spot in Plume Flashes Through in Much Less Than a Second of Time and Can Not Be Read Accurately.									
Therefore 1.1 CM is an Approximate Estimate of Height of Hot Spot.									



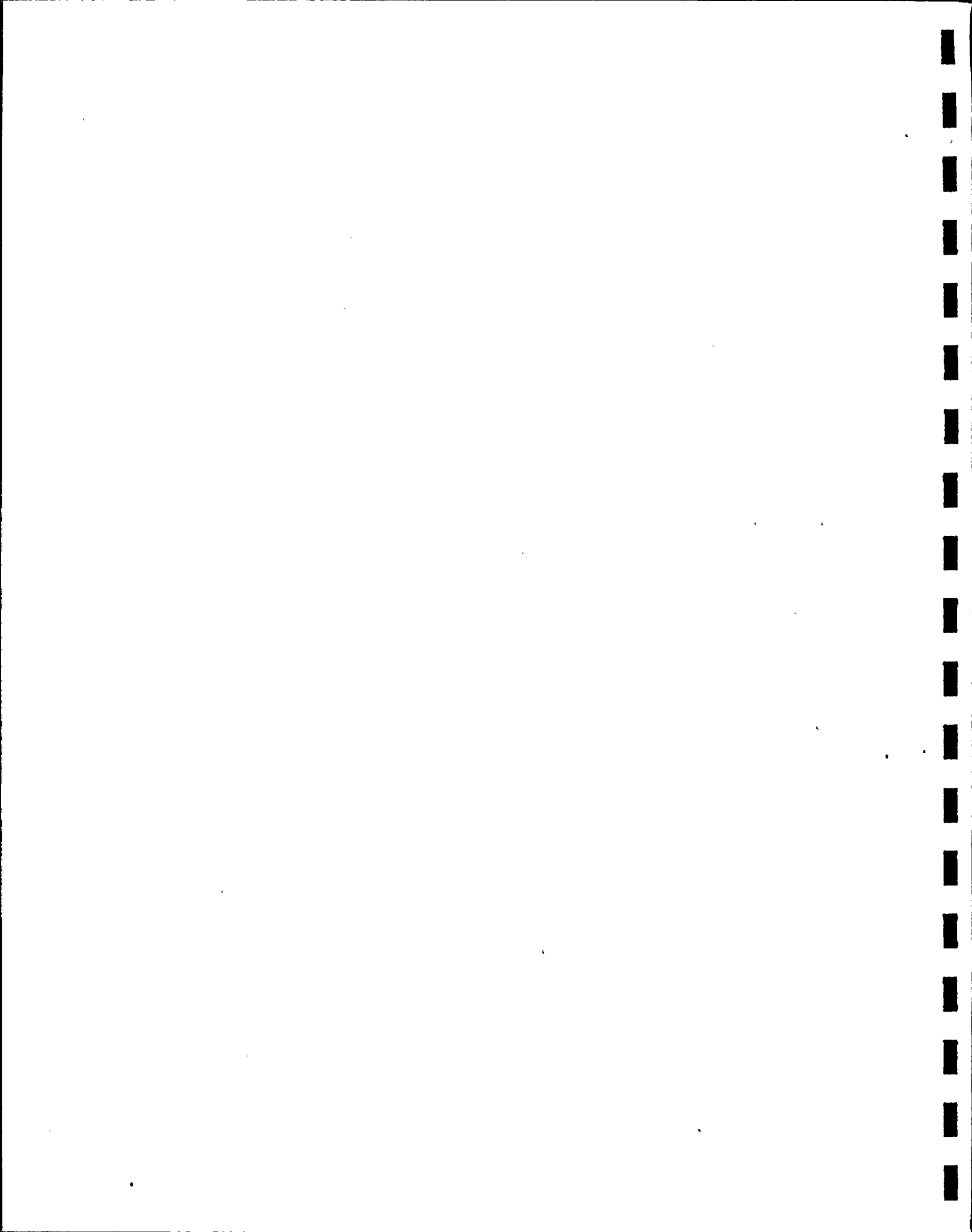












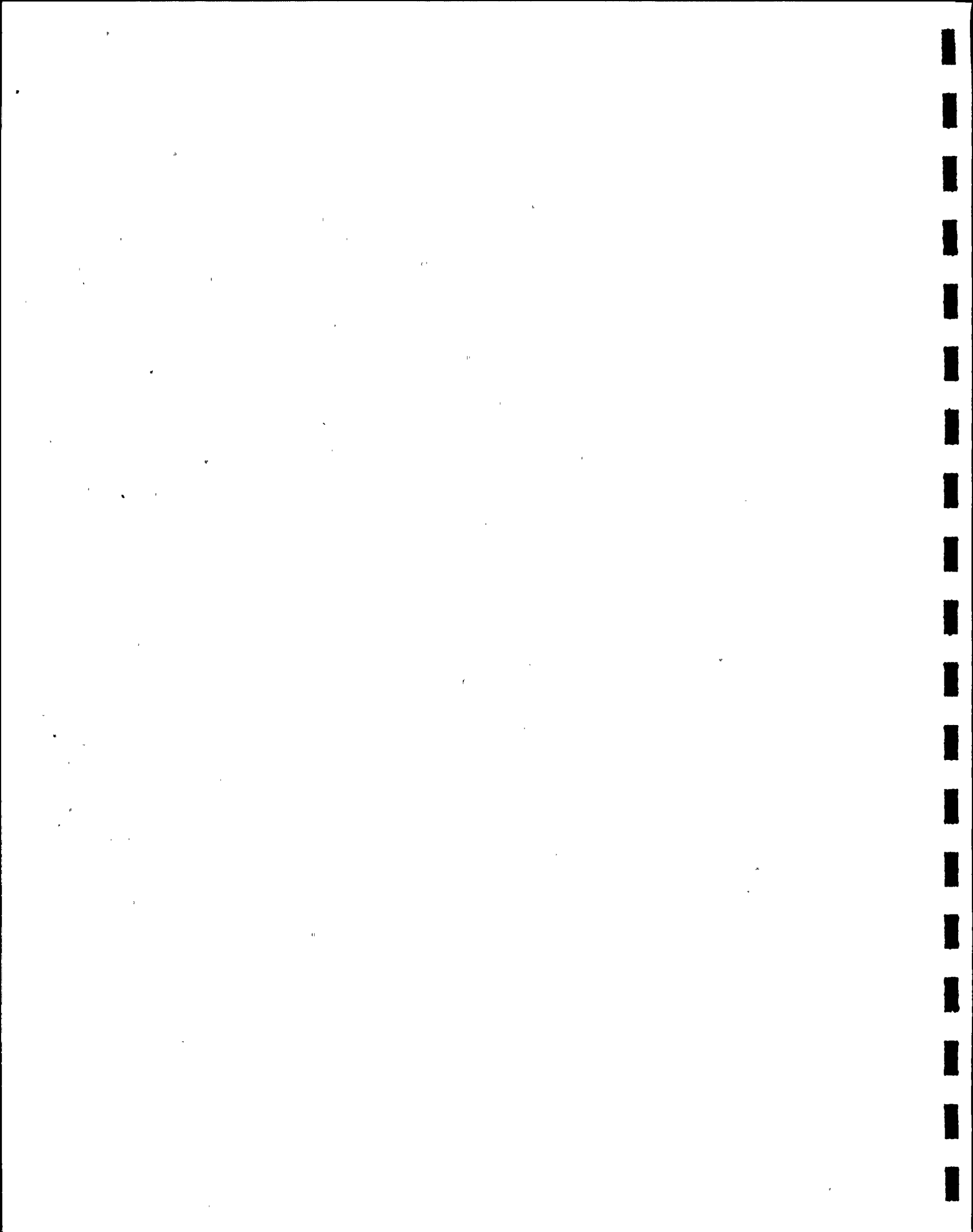


APPENDIX B  
DATA PRINTOUTS  
ATTACHMENTS

A - K











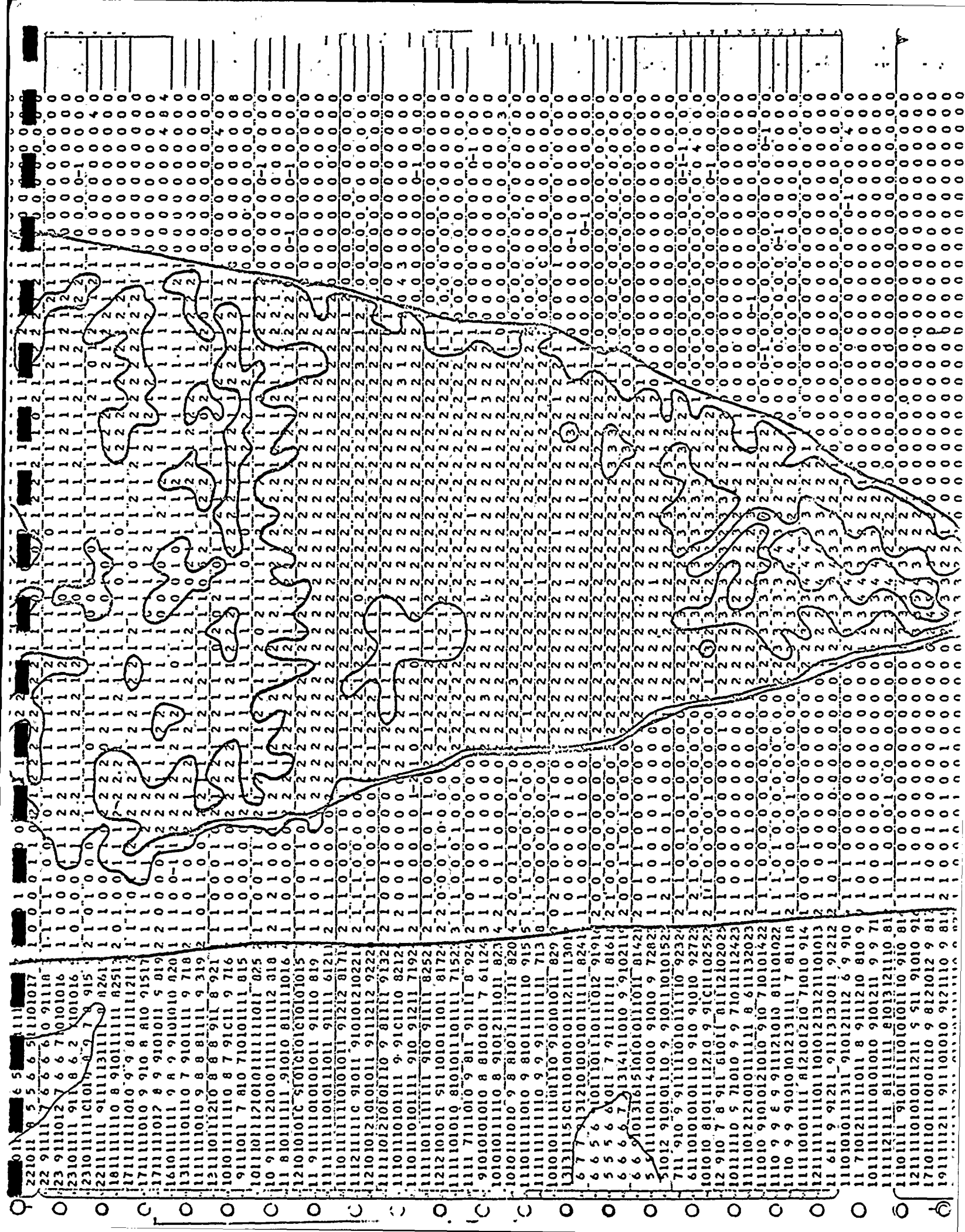
1110 915	3 2 2 2 1	0 0 1 0 1 1 0 0 0 0 0
1010 81	3 2 2 2 2	0 0 0 0 1 0 0 0 0 0 0
12 9 815	3 2 2 2 1	0 0 1 0 0 0 0 0 1 0 0 0
11 8 815	7 2 2 2 2	0 0 0 0 0 0 0 0 0 0 0
11 8 814	3 6 2 2 2	1 0 0 0 0 0 0 0 0 0 0
10 9 814	2 2 2 1 1	0 0 0 0 0 0 0 0 0 0 0
10 9 810	3 2 2 2 2	0 0 0 0 0 0 0 0 0 0 0
1010 811	3 2 2 2 2	0 0 0 0 0 0 0 0 0 0 0
10 9 810	3 2 2 1 2	0 0 0 0 0 0 0 0 0 0 0
1110 711	4 2 2 2 2	0 0 0 0 0 0 0 0 0 0 0
11 9 817	4 2 2 2 2	0 0 0 0 0 0 0 0 0 0 0
10 9 811	7 2 2 2 2	0 0 0 0 0 0 0 0 0 0 0
1010 816	7 2 2 2 2	0 0 0 0 0 0 0 0 0 0 0
1010 8101	3 2 2 2 2	0 0 0 0 0 0 0 0 0 0 0
10 9 91014	2 2 2 1 1	0 0 0 0 0 0 0 0 0 0 0
1111 81112	2 2 2 1 2	0 0 0 0 0 0 0 0 0 0 0
1111 81512	2 2 2 1 2	0 0 0 0 0 0 0 0 0 0 0
1111 81112	2 2 2 1 1	0 0 0 0 0 0 0 0 0 0 0
1111 8 812	2 2 2 2 2	0 0 0 0 0 0 0 0 0 0 0
1111 9 814	2 2 1 1 2	0 0 0 0 0 0 0 0 0 0 0
910 91013	2 2 2 2 2	0 0 0 0 0 0 0 0 0 0 0
10 910 812	1 2 1 2 2	0 0 0 0 0 0 0 0 0 0 0
1011 9 812	3 2 2 2 2	0 0 0 0 0 0 0 0 0 0 0
1111 9 8 9 4	2 2 1 1 1	0 0 0 0 0 0 0 0 0 0 0
1110 9 811 7	2 2 2 1 2	0 0 0 0 0 0 0 0 0 0 0
10 9151511 9	2 2 2 2 2	0 0 0 0 0 0 0 0 0 0 0
9 710141312	2 2 2 2 2	0 0 0 0 0 0 0 0 0 0 0
912 9151112	2 2 1 1 1	0 0 0 0 0 0 0 0 0 0 0
13 810171415	2 2 1 2 1	0 0 0 0 0 0 0 0 0 0 0
7 7 8131215	2 2 1 1 1	0 0 0 0 0 0 0 0 0 0 0
7 6 8111011	2 2 2 1 1	0 0 0 0 0 0 0 0 0 0 0
9 6 613 912	2 2 2 1 2	0 0 0 0 0 0 0 0 0 0 0
8 911111011	2 2 2 1 1	0 0 0 0 0 0 0 0 0 0 0
11131310 910	2 2 1 1 2	0 0 0 0 0 0 0 0 0 0 0
111011 91010	2 2 1 1 2	0 0 0 0 0 0 0 0 0 0 0
1110 911 810	3 2 1 1 2	0 0 0 0 0 0 0 0 0 0 0
111010 91210	2 2 1 1 1	0 0 0 0 0 0 0 0 0 0 0
101110 911101	2 2 1 1 1	0 0 0 0 0 0 0 0 0 0 0
10111011111014	2 1 2 1 2	0 0 0 0 0 0 0 0 0 0 0
11101111 9 910	2 2 1 2 1	0 0 0 0 0 0 0 0 0 0 0
11131112 9 812	2 2 2 2 1	0 0 0 0 0 0 0 0 0 0 0
10111111 9 815	3 2 1 1 2	0 0 0 0 0 0 0 0 0 0 0
9111011 81212	2 2 1 2 1	0 0 0 0 0 0 0 0 0 0 0
8111111 9 813	2 2 1 1 0	0 0 0 0 0 0 0 0 0 0 0
8131211 913 9	2 2 2 2 1	0 0 0 0 0 0 0 0 0 0 0
915111110 917	2 2 1 2 2	0 0 0 0 0 0 0 0 0 0 0
14121111 9 910	3 2 1 2 2	0 0 0 0 0 0 0 0 0 0 0
1111111210 814	3 2 2 1 1	0 0 0 0 0 0 0 0 0 0 0
1111111210 810	4 2 1 1 2	0 0 0 0 0 0 0 0 0 0 0
11101112111012	5 1 1 1 1	0 0 0 0 0 0 0 0 0 0 0
10 9101111 912	2 1 1 1 1	0 0 0 0 0 0 0 0 0 0 0
1010111111 8101	2 1 1 2 1	0 0 0 0 0 0 0 0 0 0 0

Scale 1"=500' 3/10/77, Time 12:41

B



[illegible]

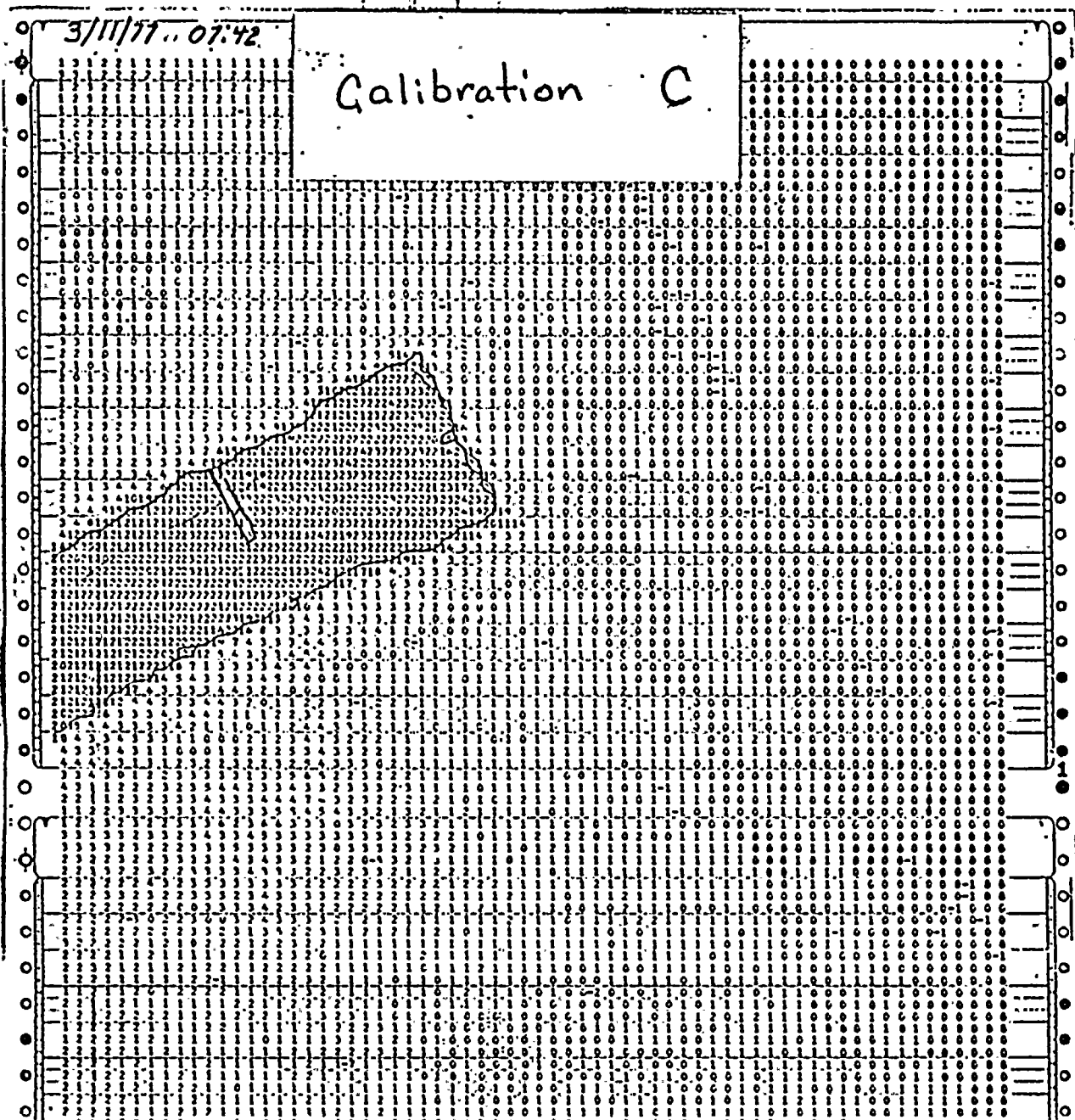


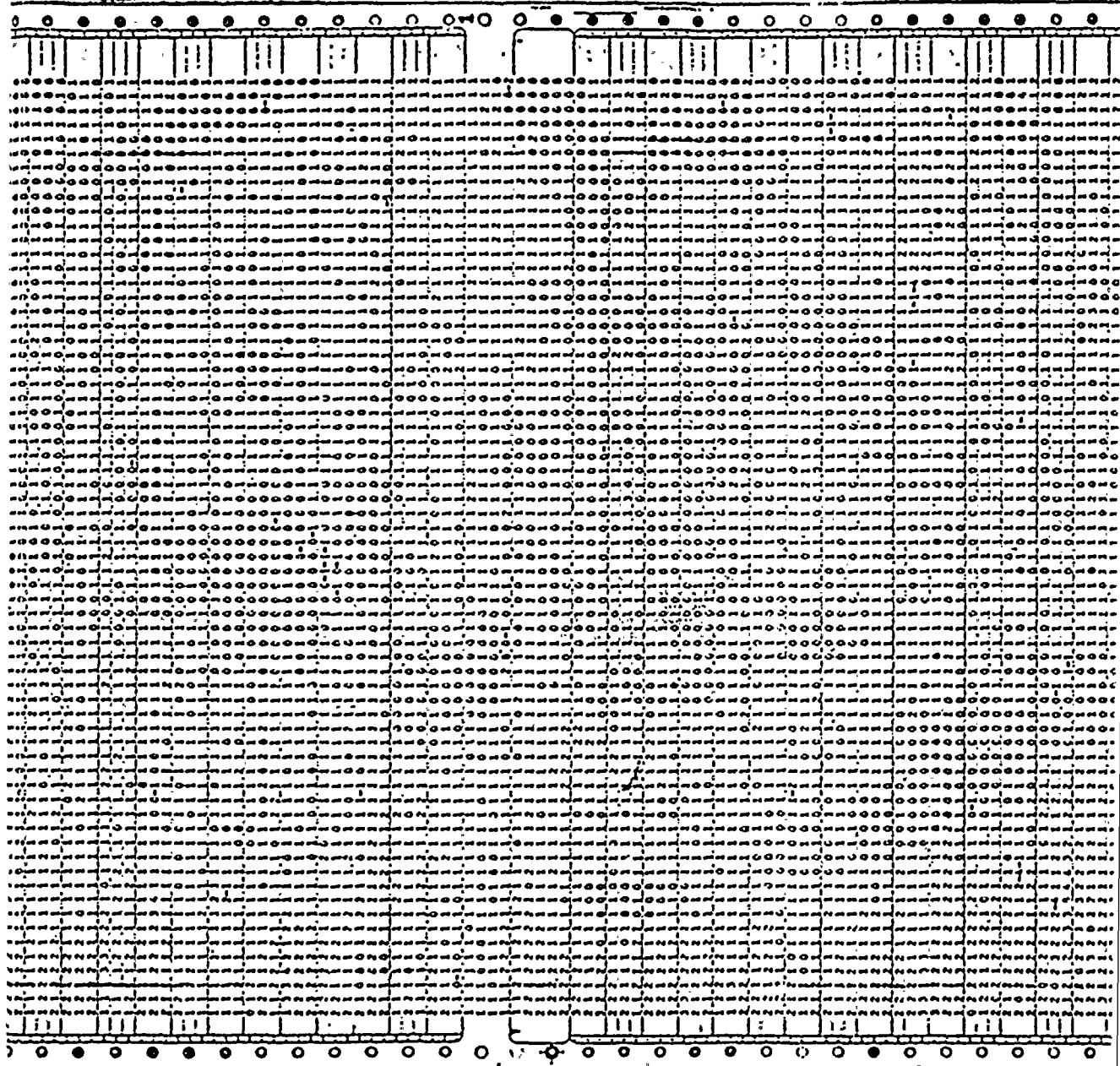


[illegible]

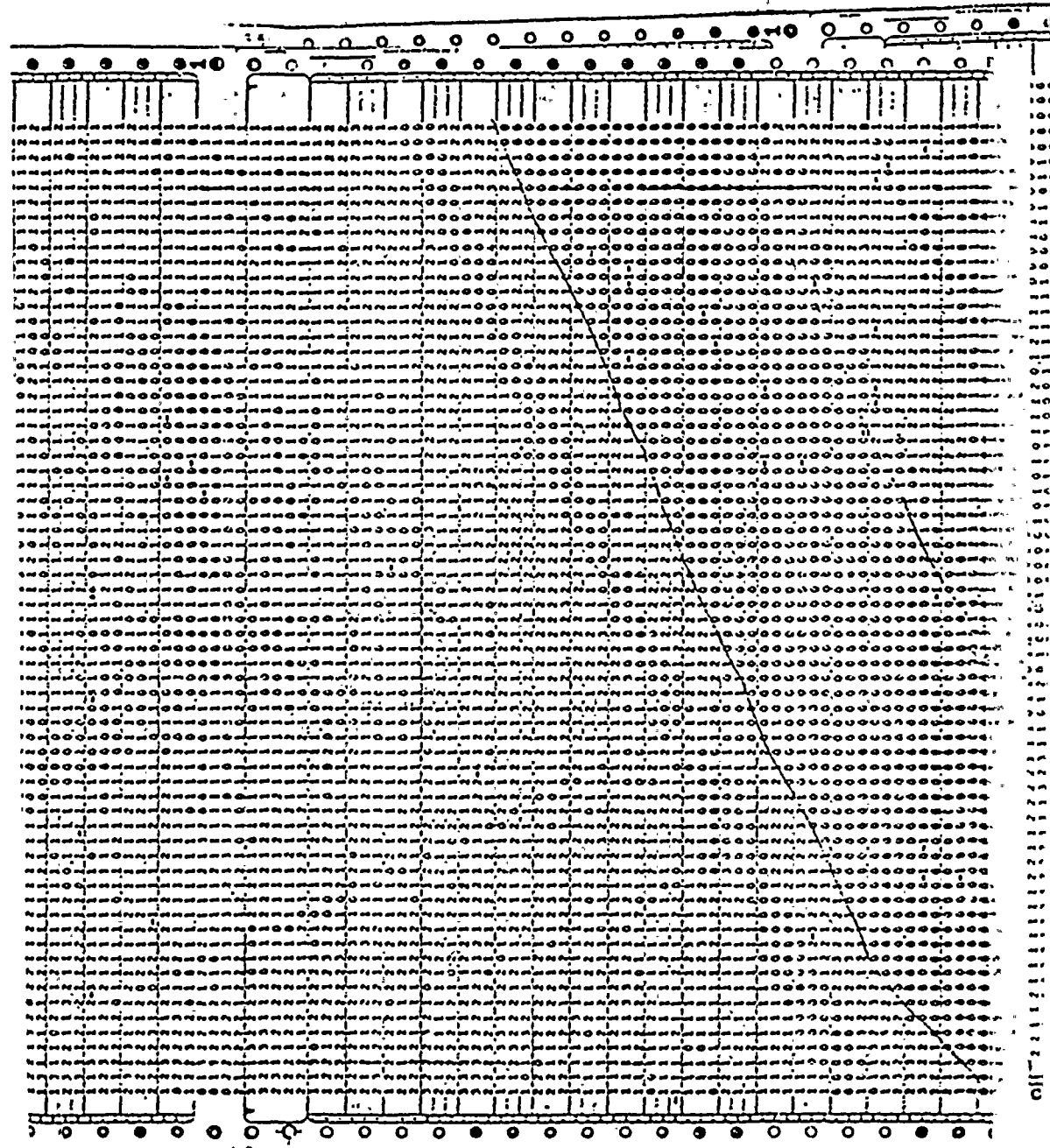
3/11/77 07:42

Calibration C

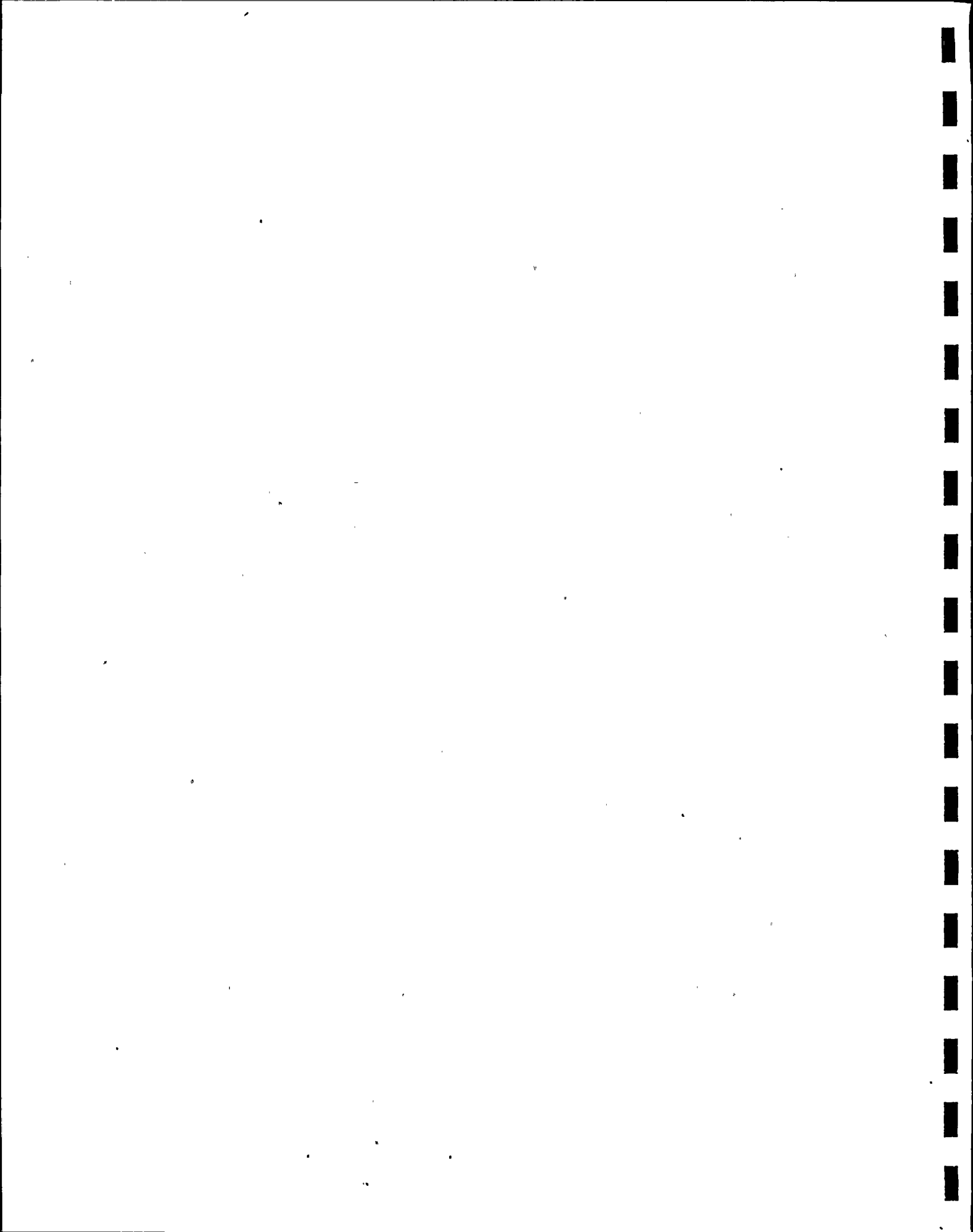




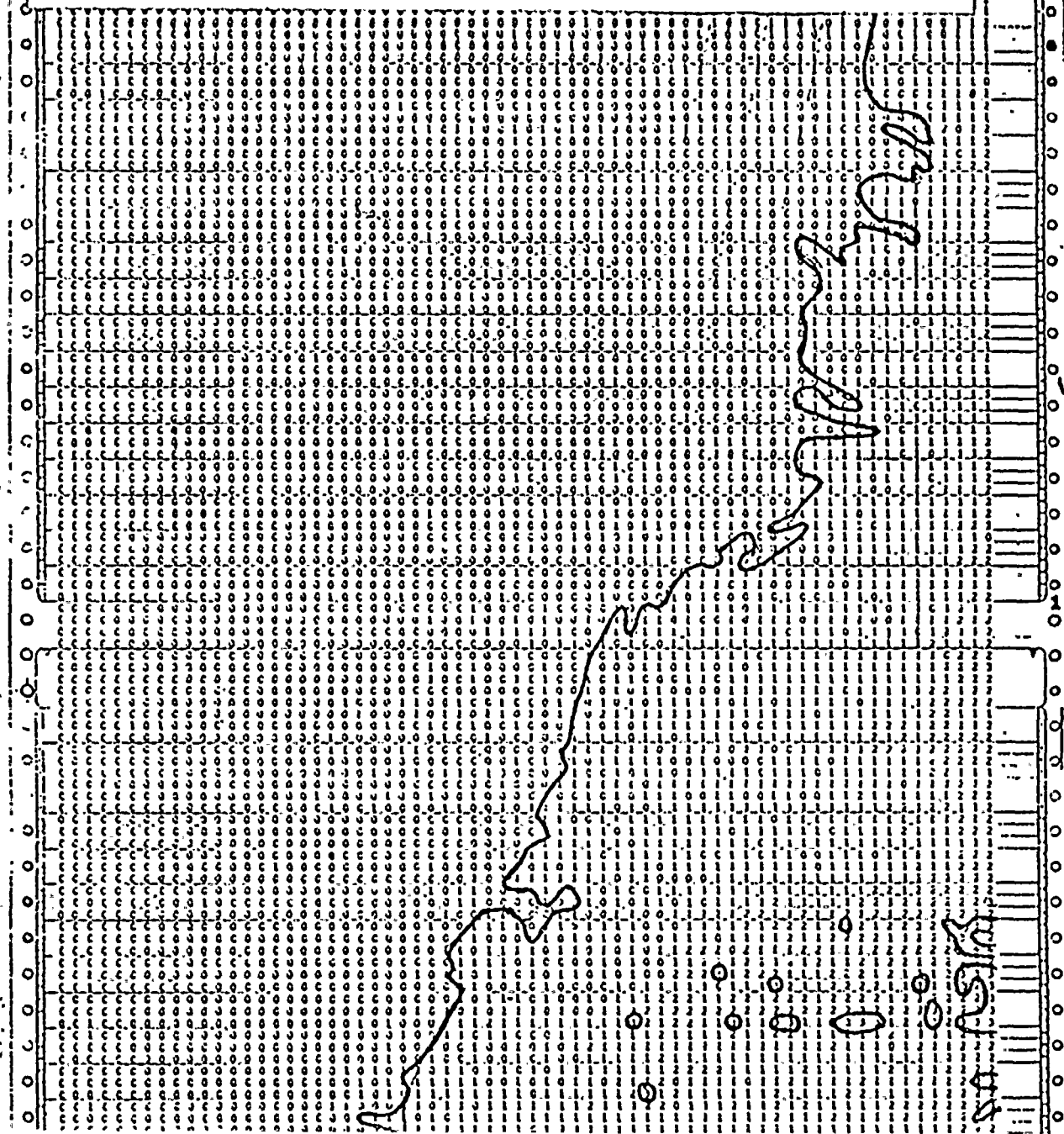


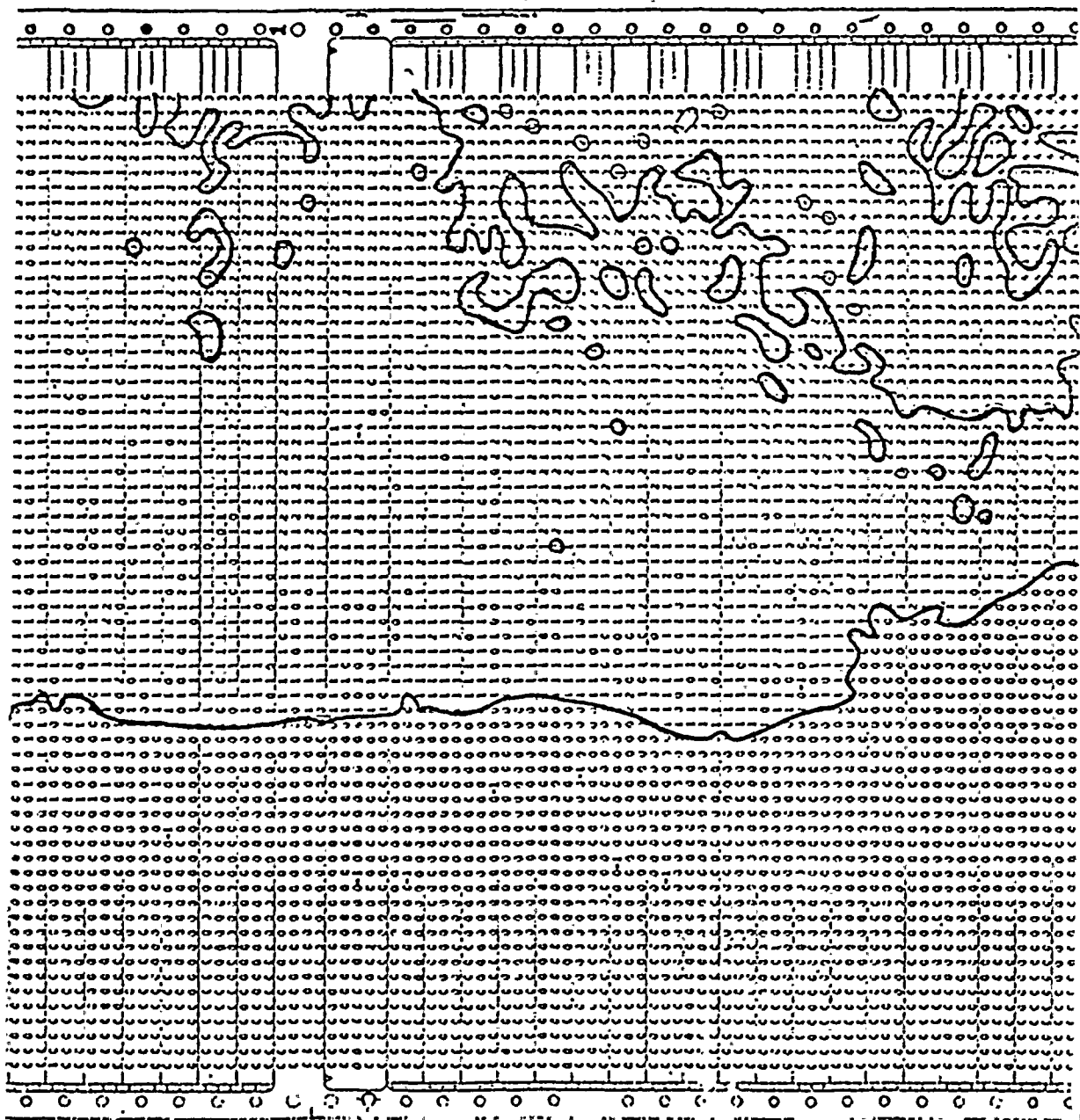


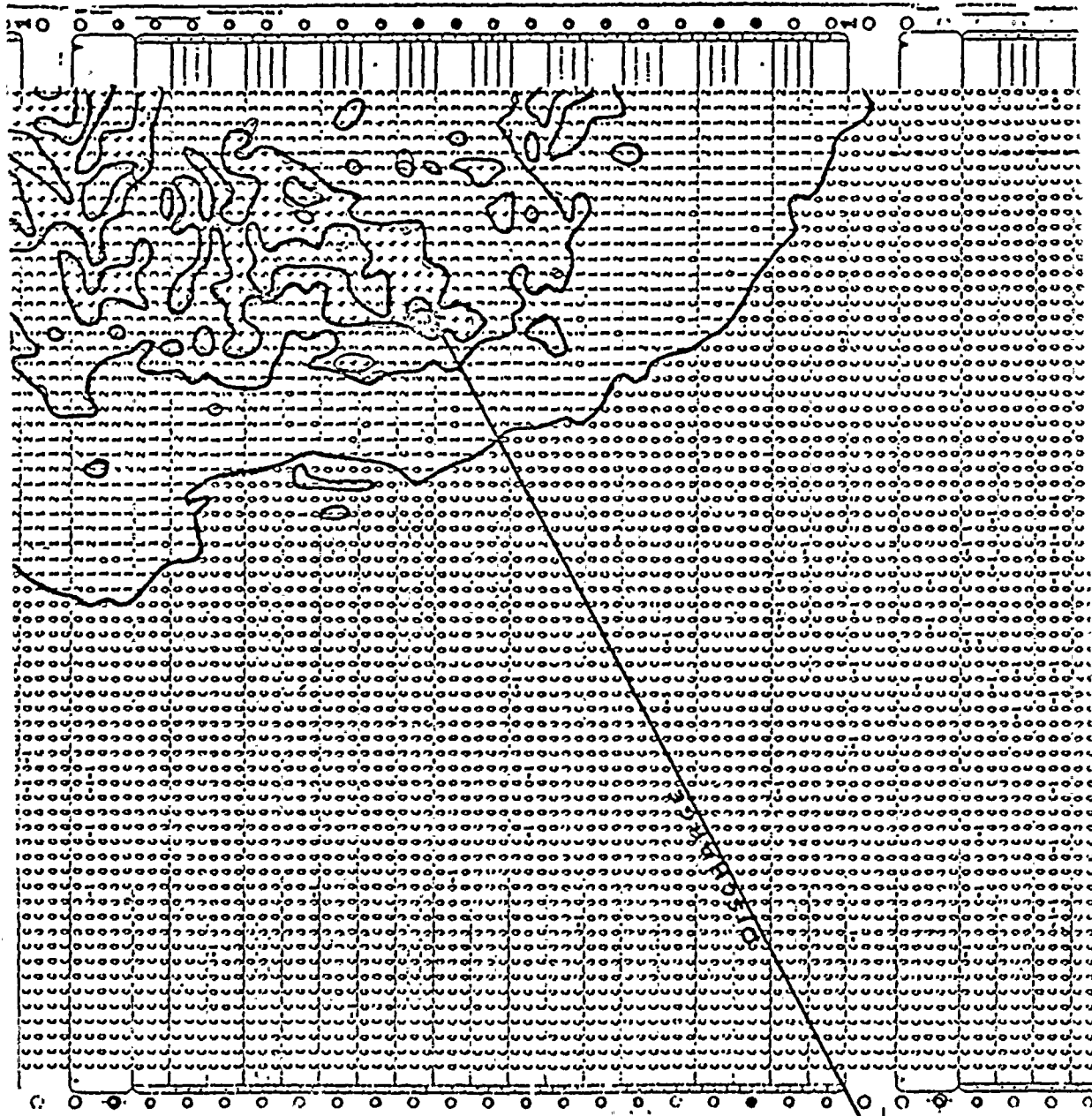


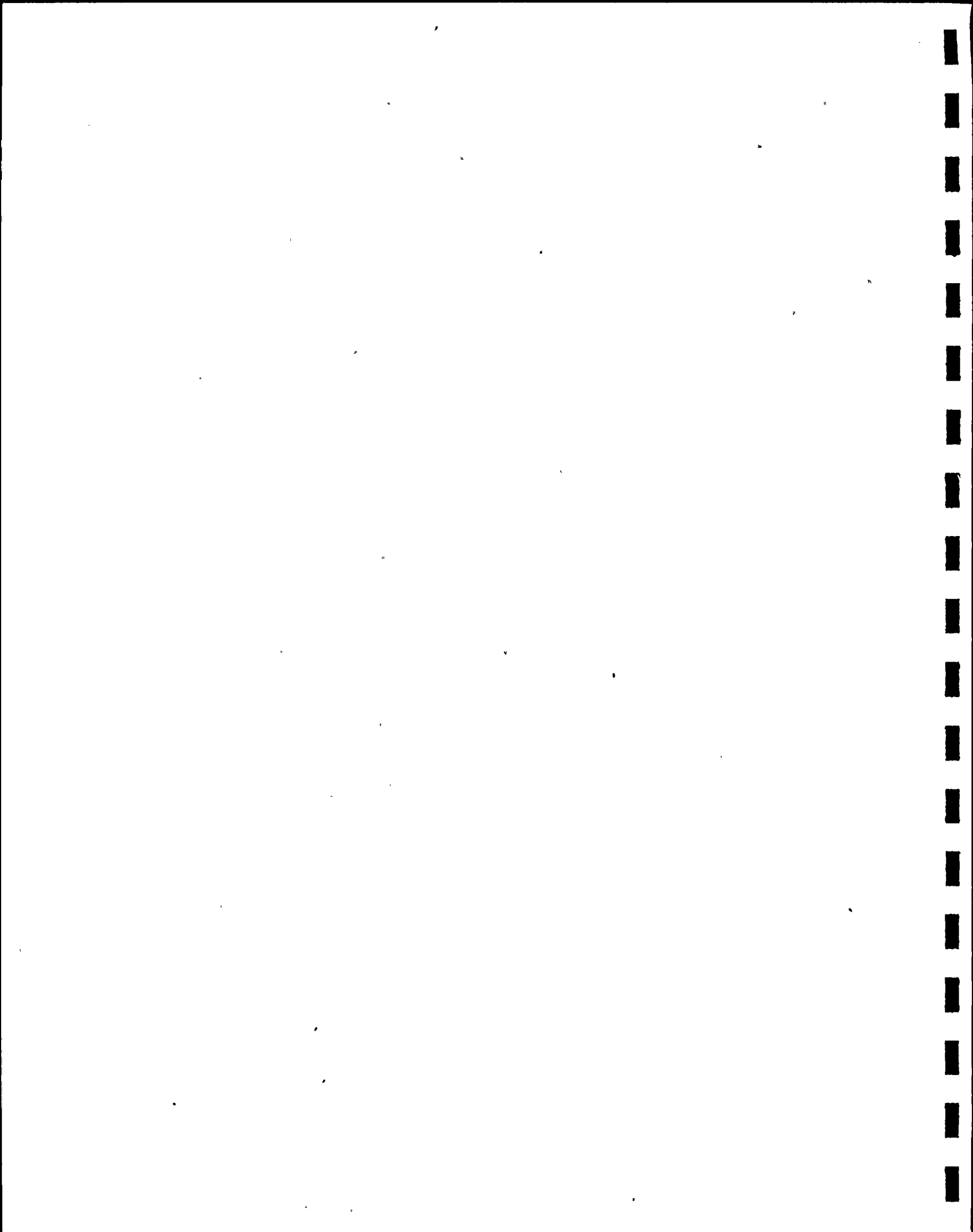


Scale 1" = 155' 3/11/77, Time 07:42 D









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	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021	1022	1023	1024	1025	1026	1027	1028	1029	1030	1031	1032	1033	1034	1035	1036	1037	1038	1039	1040	1041	1042	1043	1044	1045	1046	1047	1048	1049	1050	1051	1052	1053	1054	1055	1056	1057	1058	1059	1060	1061	1062	1063	1064	1065	1066	1067	1068	1069	1070	1071	1072	1073	1074	1075	1076	1077	1078	1079	1080	1081	1082	1083	1084	1085	1086	1087	1088	1089	1090	1091	1092	1093	1094	1095	1096	1097	1098	1099	1100	1101	1102	1103	1104	1105	1106	1107	1108	1109	1110	1111	1112	1113	1114	1115	1116	1117	1118	1119	1120	1121	1122	1123	1124	1125	1126	1127	1128	1129	1130	1131	1132	1133	1134	1135	1136	1137	1138	1139	1140	1141	1142	1143	1144	1145	1146	1147	1148	1149	1150	1151	1152	1153	1154	1155	1156	1157	1158	1159	1160	1161	1162	1163	1164	1165	1166	1167	1168	1169	1170	1171	1172	1173	1174	1175	1176	1177	1178	1179	1180	1181	1182	1183	1184	1185	1186	1187	1188	1189	1190	1191	1192	1193	1194	1195	1196	1197	1198	1199	1200	1201	1202	1203	1204	1205	1206	1207	1208	1209	1210	1211	1212	1213	1214	1215	1216	1217	1218	1219	1220	1221	1222	1223	1224	1225	1226	1227	1228	1229	1230	1231	1232	1233	1234	1235	1236	1237	1238	1239	1240	1241	1242	1243	1244	1245	1246	1247	1248	1249	1250	1251	1252	1253	1254	1255	1256	1257	1258	1259	1260	1261	1262	1263	1264	1265	1266	1267	1268	1269	1270	1271	1272	1273	1274	1275	1276	1277	1278	1279	1280	1281	1282	1283	1284	1285	1286	1287	1288	1289	1290	1291	1292	1293	1294	1295	1296	1297	1298	1299	1300	1301	1302	1303	1304	1305	1306	1307	1308	1309	1310	1311	1312	1313	1314	1315	1316	1317	1318	1319	1320	1321	1322	1323	1324	1325	1326	1327	1328	1329	1330	1331	1332	1333	1334	1335	1336	1337	1338	1339	1340	1341	1342	1343	1344	1345	1346	1347	1348	1349	1350	1351	1352	1353	1354	1355	1356	1357	1358	1359	1360	1361	1362	1363	1364	1365	1366	1367	1368	1369	1370	1371	1372	1373	1374	1375	1376	1377	1378	1379	1380	1381	1382	1383	1384	1385	1386	1387	1388	1389	1390	1391	1392	1393	1394	1395	1396	1397	1398	1399	1400	1401	1402	1403	1404	1405	1406	1407	1408	1409	1410	1411	1412	1413	1414	1415	1416	1417	1418	1419	1420	1421	1422	1423	1424	1425	1426	1427	1428	1429	1430	1431	1432	1433	1434	1435	1436	1437	1438	1439	1440	1441	1442	1443	1444	1445	1446	1447	1448	1449	1450	1451	1452	1453	1454	1455	1456	1457	1458	1459	1460	1461	1462	1463	1464	1465	1466	1467	1468	1469	1470	1471	1472	1473	1474	1475	1476	1477	1478	1479	1480	1481	1482	1483	1484	1485	1486	1487	1488	1489	1490	1491	1492	1493	1494	1495
---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------

INTAKE ARPA M K J 1900 1840 0

3/11/77, 13:41

Calibration

E.

INTAKE AREA M K J		1900		1840	
4	4	7	15	14	10
2	7	10	20	10	9
15	15	14	10	2	7
10	5	4	4	5	4
1	2	2	1	2	2
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	





[illegible][illegible]

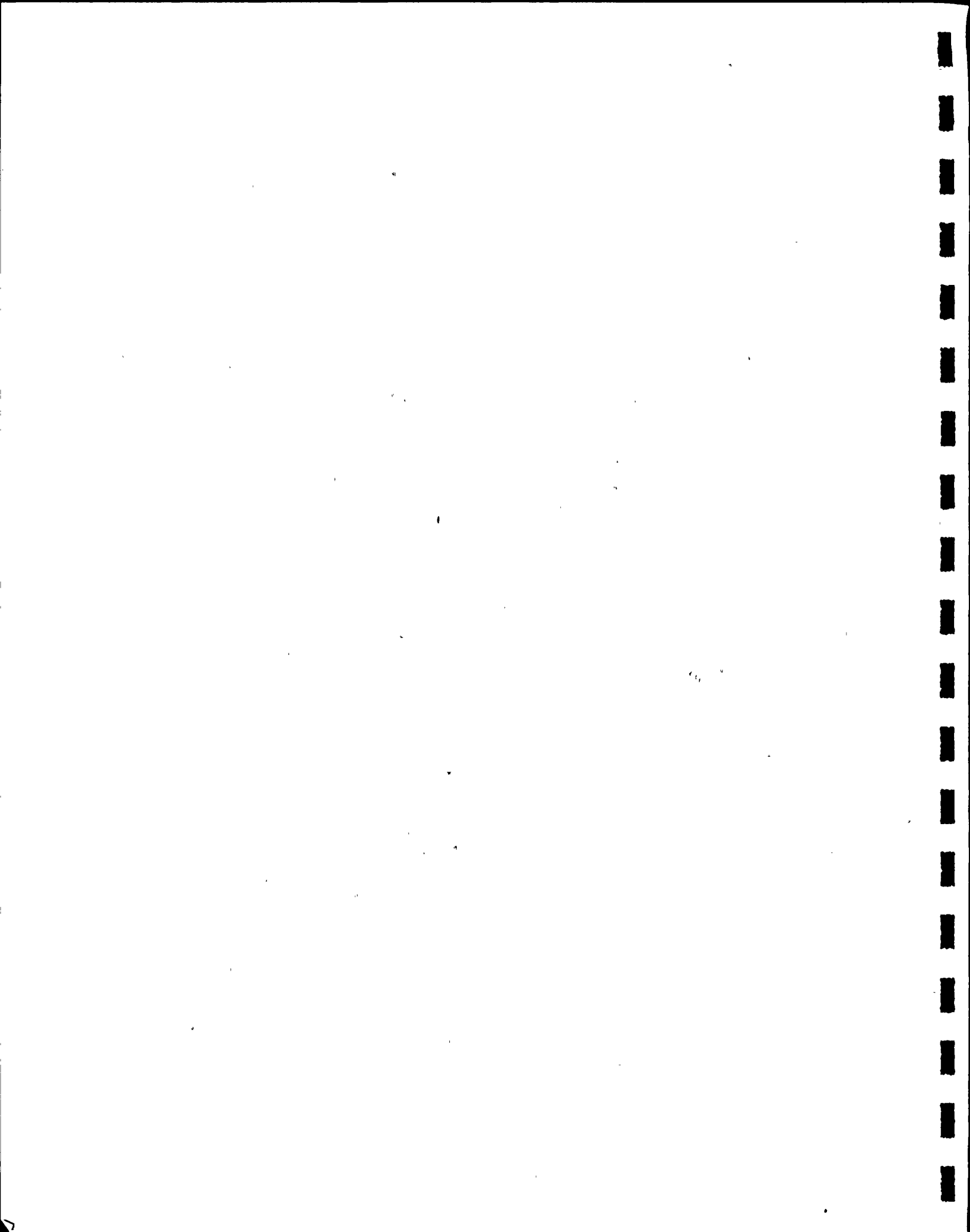


[illegible]

Scale = 500

3/11/77 Time 13:41

F



[illegible]



[illegible]



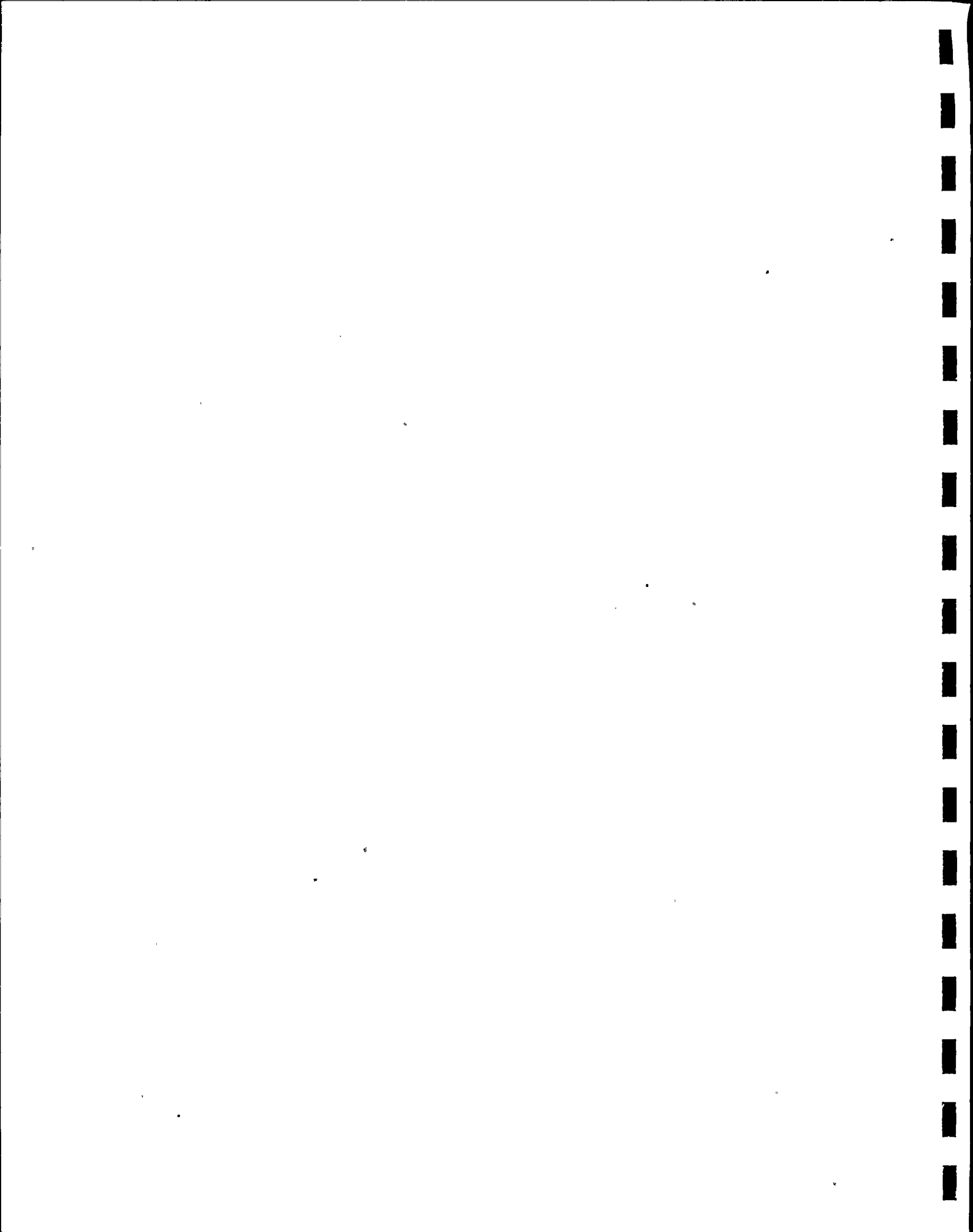






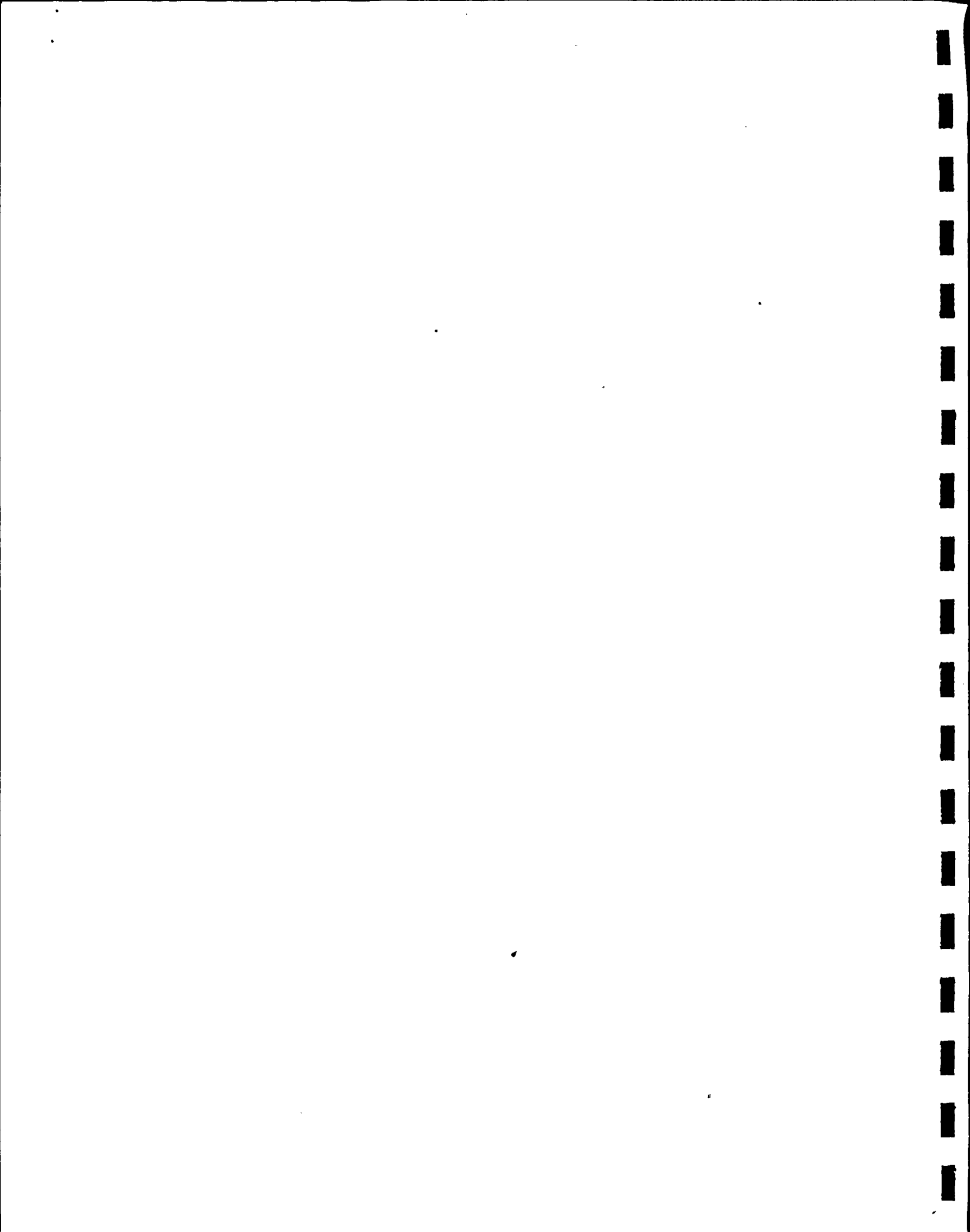
3/11/77 1631										Calibration										G										
INTAKE AREA M K J 2770																														
0	0	5	16	5	8	15	13	10	14	0	0	5	16	5	8	15	13	10	14	0	0	5	16	5	8	15	13	10	14	
10	14	11	11	10	10	13	14	17	8	8	12	9	11	10	11	0	5	1	14	4	4	5	17	5	12	14	13	13	13	
11	8	5	8	2	4	6	0	5	0	10	8	17	14	5	3	4	1	8	18	5	8	11	0	0	0	0	0	0	0	
11	8	5	8	2	4	6	0	5	0	10	8	17	14	5	3	4	1	8	18	5	8	11	0	0	0	0	0	0	0	
7	5	16	15	1	14	17	5	4	16	8	1	3	6	0	12	13	12	10	0	0	0	0	0	0	0	0	0	0	0	
14	8	17	11	8	5	1	1	5	6	9	26	16	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
22	4	23	21	0	0	0	11	12	8	15	2	5	4	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
13	14	14	3	4	4	10	16	2	8	6	0	17	5	4	11	5	17	5	3	10	4	13	3	13	9	17	19	17	16	
13	14	14	3	4	4	10	16	2	8	6	0	17	5	4	11	5	17	5	3	10	4	13	3	13	9	17	19	17	16	
5	6	11	6	0	0	10	10	0	4	11	18	12	4	2	3	12	6	14	19	4	0	8	3	7	5	13	6	5	5	
0	13	11	11	2	2	4	1	3	5	11	6	14	19	4	0	8	3	5	6	11	13	11	17	12	12	17	0	0	0	
0	10	9	7	10	11	3	13	2	3	4	4	9	9	4	0	0	7	9	13	6	5	5	4	8	0	0	0	0	0	
11	17	11	11	16	7	3	12	6	3	17	10	17	16	11	18	12	16	18	12	16	18	12	16	18	12	16	18	12	16	
6	4	16	1	5	0	4	6	14	3	10	11	6	4	13	24	5	3	3	6	17	16	16	6	3	8	1	2	1	7	
14	0	5	0	4	2	0	6	1	6	3	7	9	3	4	4	6	10	11	13	8	10	6	10	4	10	8	13	1	5	
2	1	4	12	17	11	6	11	5	5	6	1	6	6	2	7	2	11	1	0	9	16	13	17	12	17	2	2	3	11	
8	17	16	13	11	5	8	17	8	5	6	19	14	1	4	2	12	4	16	10	5	11	9	4	16	16	6	1	1	6	
0	8	4	17	16	13	11	5	0	5	8	0	17	2	0	1	17	17	14	10	8	16	17	13	11	19	11	8	1	1	
0	5	2	6	6	5	17	0	2	4	0	6	9	20	12	13	11	2	5	16	0	0	0	0	0	0	0	0	0	0	
13	2	7	4	4	0	3	5	13	4	4	7	8	11	18	20	0	5	7	9	8	16	10	9	16	10	9	16	10	9	
19	0	11	14	11	0	2	6	5	11	6	0	13	18	12	1	13	13	16	10	8	11	17	17	8	6	20	13	11	14	
19	1	14	2	3	5	6	1	1	10	5	7	13	15	16	0	4	5	17	11	17	14	11	14	15	12	15	12	15	12	
24	8	2	9	4	0	5	0	4	6	4	2	18	0	4	1	11	0	11	11	5	5	0	11	7	8	1	7	6	0	
6	5	4	4	4	4	4	0	2	5	3	0	19	9	0	17	4	8	16	10	9	16	10	9	16	10	9	16	10	9	
11	5	0	4	13	11	0	11	17	11	6	16	4	14	6	12	16	14	19	17	16	12	17	13	10	15	16	8	2	8	
4	19	17	16	11	4	12	18	13	13	11	12	16	2	3	18	12	17	23	20	17	17	10	13	20	17	22	19	5	5	
2	4	11	13	6	11	4	0	6	17	5	0	4	10	6	2	2	0	6	10	12	16	15	12	17	5	19	11	2	1	
24	12	7	3	3	2	8	0	7	10	9	10	17	10	8	1	19	2	7	11	8	0	0	11	17	14	10	8	17	16	
24	12	7	3	3	2	8	0	7	10	9	10	17	10	8	1	19	2	7	11	8	0	0	11	17	14	10	8	17	16	
11	0	5	3	3	5	6	3	2	10	1	3	11	0	4	3	11	10	16	13	0	4	5	8	12	16	17	7	6	5	
5	2	17	13	11	13	16	16	7	17	0	4	0	8	12	5	16	11	13	6	13	11	13	20	17	16	18	6	13	7	
26	6	0	0	6	6	7	4	0	2	6	6	6	26	24	8	2	8	11	11	11	2	2	9	11	17	0	3	6	1	
12	18	11	5	8	11	7	0	12	11	12	11	2	6	16	6	13	13	10	12	6	1	11	10	13	15	4	10	17	12	
14	3	8	2	0	4	6	12	7	13	9	11	2	2	16	11	1	7	1	16	16	10	17	17	13	18	17	13	13	5	
7	16	13	14	2	4	6	4	12	10	7	1	11	7	5	7	12	0	6	10	10	6	5	11	3	11	17	0	10	1	
0	0	2	19	14	11	0	7	6	10	14	5	7	9	12	11	0	7	14	11	4	8	8	9	10	14	14	11	10	9	
17	4	10	4	0	7	11	7	4	5	0	16	16	12	5	13	11	10	2	13	1	17	17	16	11	6	11	18	19	0	
6	6	4	4	19	17	2	4	4	0	6	0	11	19	1	7	20	0	10	5	6	0	12	13	0	0	4	1	16	12	
28	6	11	10	12	0	0	10	6	0	0	11	11	5	4	8	1	11	2	4	10	11	11	11	11	11	11	11	11	11	
9	16	11	10	12	0	0	10	6	0	0	5	11	11	5	4	8	1	11	2	4	10	11	11	11	11	11	11	11	11	
5	2	3	13	16	11	16	8	17	22	2	7	11	5	6	10	11	3	8	16	13	14	17	20	15	14	0	17	21	16	
17	2	2	4	7	17	13	17	18	17	11	3	4	17	17	5	12	17	8	13	12	17	0	11	18	15	13	17	20	19	
4	11	19	16	3	5	4	0	6	13	8	0	4	0	0	6	1	14	19	4	3	4	0	8	3	2	13	6	4	8	
0	6	5	19	19	3	0	0	5	5	12	2	4	4	0	5	0	4	13	3	5	6	0	13	5	10	17	12	9	12	17
17	17	18	1	13	6	17	16	11	8	5	11	16	11	17	2	12	2	11	16	13	12	15	16	16	18	17	2	2	13	
5	7	3	6	3	2	11	5	9	10	4	0	11	12	5	6	5	2	16	7	0	0	16	17	11	0	17	16	17	6	
11	2	2	11	13	10	13	5	6	16	17	13	17	13	10	4	1	2	11	17	16	5	12	17	15	21	17	19	16	21	
11	2	2	11	13	10	13	5	6	16	17	13	17	13	10	4	1	2	11	17	16	5	12	17	15	21	17	19	16	21	
5	1	8	9	16	0	0	10	11	13	8	1	5	0	11	13	7	3	7	9	6	4	5	0	6	11	11	13	8	0	
5	1	8	9	16	0	0	10	11	13	8	1	5	0	11	13	7	3	7	9	6	4	5	0	6	11	11	13	8	0	
12	0	2	24	1	17	11	10	19	17	12	0	8	13	16	0	11	15	15	19	18	12	17	12	18	12	13	6	1	2	
14	8	15	2	2	16	14	2	14	17	16	17	11	17	17	11	17	15	11	2	3	11	16	17	17	11	16	11	13	13	
14	8	15	2	2	16	14	2	14	17	16	17	11	17	17	11	17	15	11	2	3	11	16	17	17	11	16	11	13	13	
13	6	7	2	3	11	2	1	6	11	20	13	5	4	6	1	5	13	17	16	12	10	17	11	1	10	17	11	11	4	

7/10  
4/77



71	45	81013	84101154	94	92	91	90	93	93	92	91	75120152123144120	46	25	19	22	18	16	20	27	24	44	63	77	96	91900	83	79	93	93	93102	98153					
73	93	9157	9770104	96	91	85	36	95	91	68	68121766171746116	41	0	-6	-6	-6	-6	-6	5	17	29	57	69	90	80	77	65	88	92	94	96						
93131	17	55101108109100	99	97	94	93	91	94	91	70	7114617151119152101	13	-4	3	-4	0	11	10	0	0	5	3	8	40	64	76	78	73	88	93	95						
89	99	93	57116120104	98	98	91	83	82	91	95	67111147131431117	45	6	4	0	-2	-7	-4	11	5	0	-9	-8	-14	16	36	59	62	59	68	74	93					
85	99	93	57116120104	98	98	91	83	82	91	95	67111147131431117	45	6	4	0	-2	-7	-4	11	5	0	-9	-8	-14	16	36	59	62	59	68	74	93					
90	90	92	64125116121	92	94	95	67	71	84	56	63126157126124111	10	-4	-6	-10	-6	-4	-7	-8	-1	-7	-14	-31	-27	-11	-11	-11	7	22	43	91	71	64				
98101	70	92117115	98	98	99	82	66	79	90	47	631271571561244139	21	-1	-7	-7	-7	-6	5	-7	3	-4	-7	-7	-21	-27	-17	-7	-9	0	12	26	33	65				
105101	35101114112102101	91	91	87	86	92	91	93	73	771461717164167155	29	13	-6	5	0	-3	0	-1	3	-6	0	-6	-24	-12	0	0	-2	-9	-8	0	23	50					
103101	12	91102100101	99	91	89	78	84	73	80	66	78150182171167139	21	0	0	-4	-4	5	-1	10	-4	-2	-7	-9	-24	-22	-5	-8	-7	-9	-8	-12	3	17				
103101	72	51102100101	91	91	89	78	84	73	80	66	78150182171167139	21	0	0	-4	-4	5	-1	10	-4	-2	-7	-9	-24	-22	-5	-8	-7	-9	-8	-12	3	17				
111	90	3210104	58	9102	94	98	87	90	77	74	70118103173154110	28	10	21	0	-8	-4	7	2	-14	-26	-12	-7	-3	-8	-8	-7	-7	-12	-12	-12	-12					
105	94	91	98	91	910410102	98	94	84	82	78	96172203197147	60	32	36	13	3	4	12	0	3	-1	-26	-21	-7	-6	-6	-8	-13	-9	-8	-14	-7	0				
94	95	92108	94	96105120110	97	97	88	96	80	51	86165201199175	77	76	56	13	1	14	11	0	6	-4	-19	-24	6	-6	-6	-7	-6	-7	-7	-8	-13	-6				
94	95	52103	54	56105120110	97	97	88	96	80	51	86165201199175	77	76	56	13	1	14	11	0	6	-4	-19	-24	6	-6	-6	-7	-6	-7	-7	-8	-13	-6				
77	74	528	53	92	56	99103106100	94	92	85	79	48	8517614716421	32	19	40	-1	-2	-4	0	0	10	-24	-13	0	-6	0	-4	5	-1	-8	0	-8	-4	-7			
61	69	40	68	88	94	94102101	92	98	86	77	68	43	9175126117	97	16	14	1	0	-6	-6	-6	0	0	-3	-27	-26	-7	-10	-7	-9	-12	-10	-11	-7	-13	-12	-15
61	62</																																				

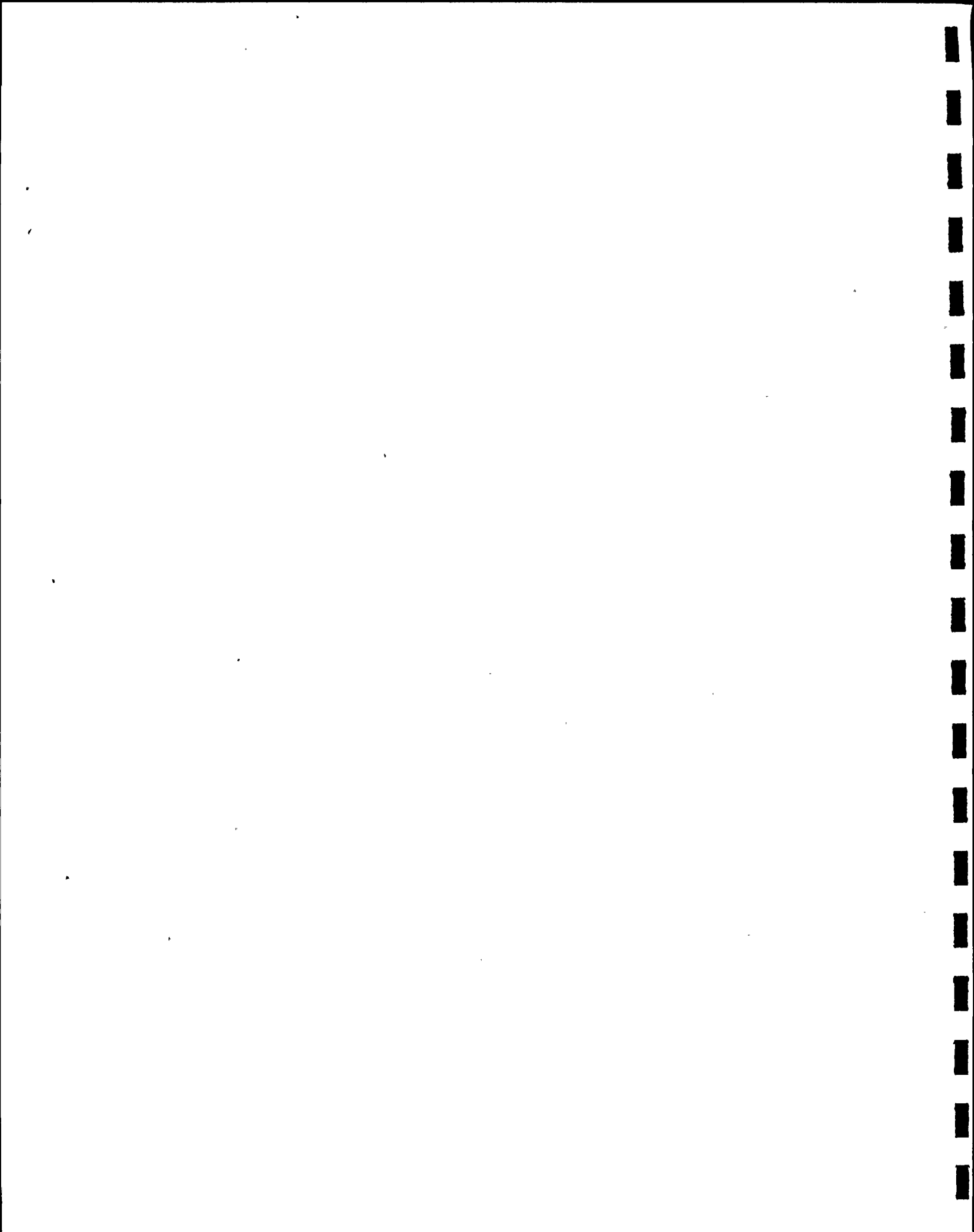
[illegible]

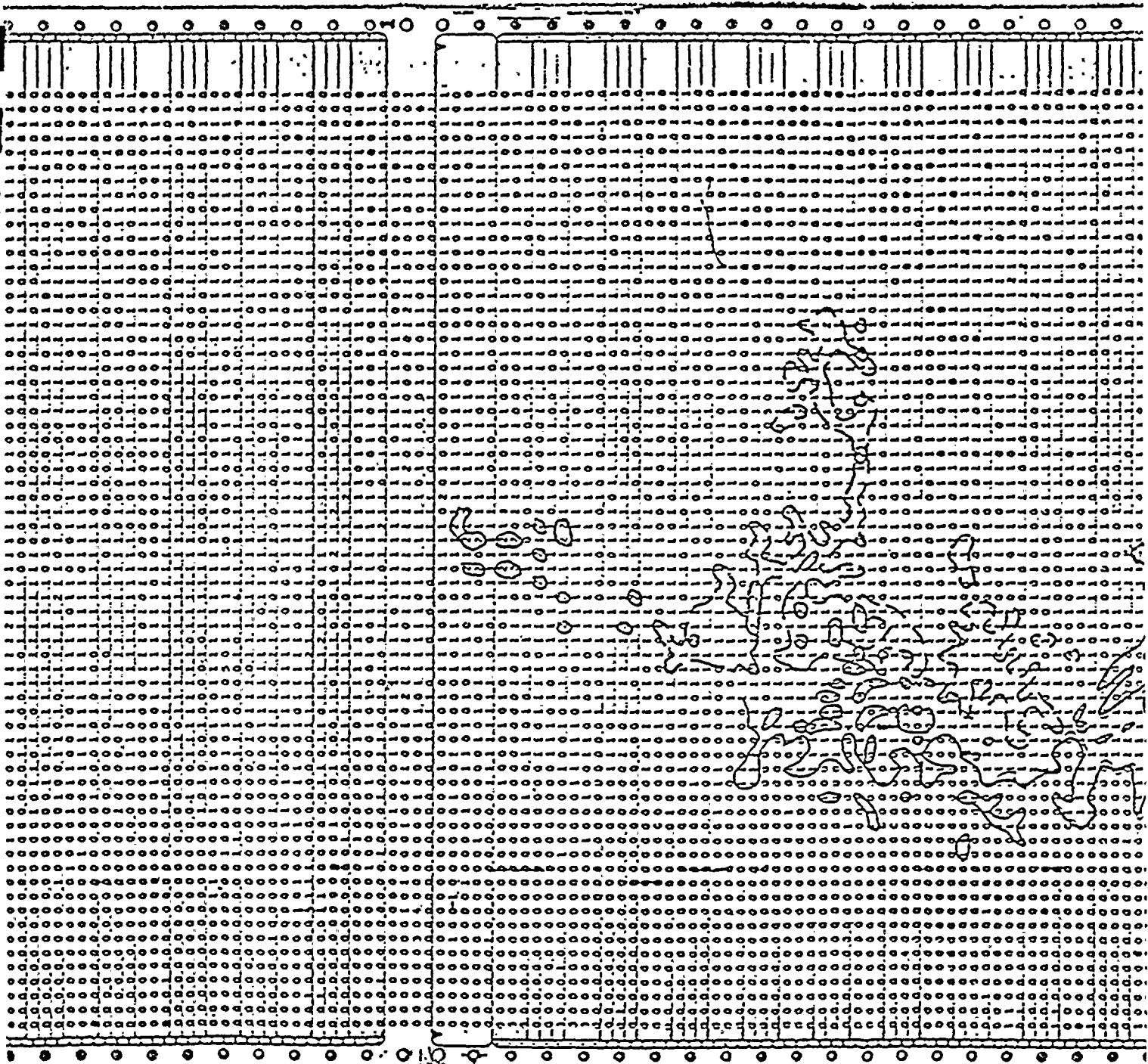




*Oceanic Fertilizer Co. IN ISLAND AREA*

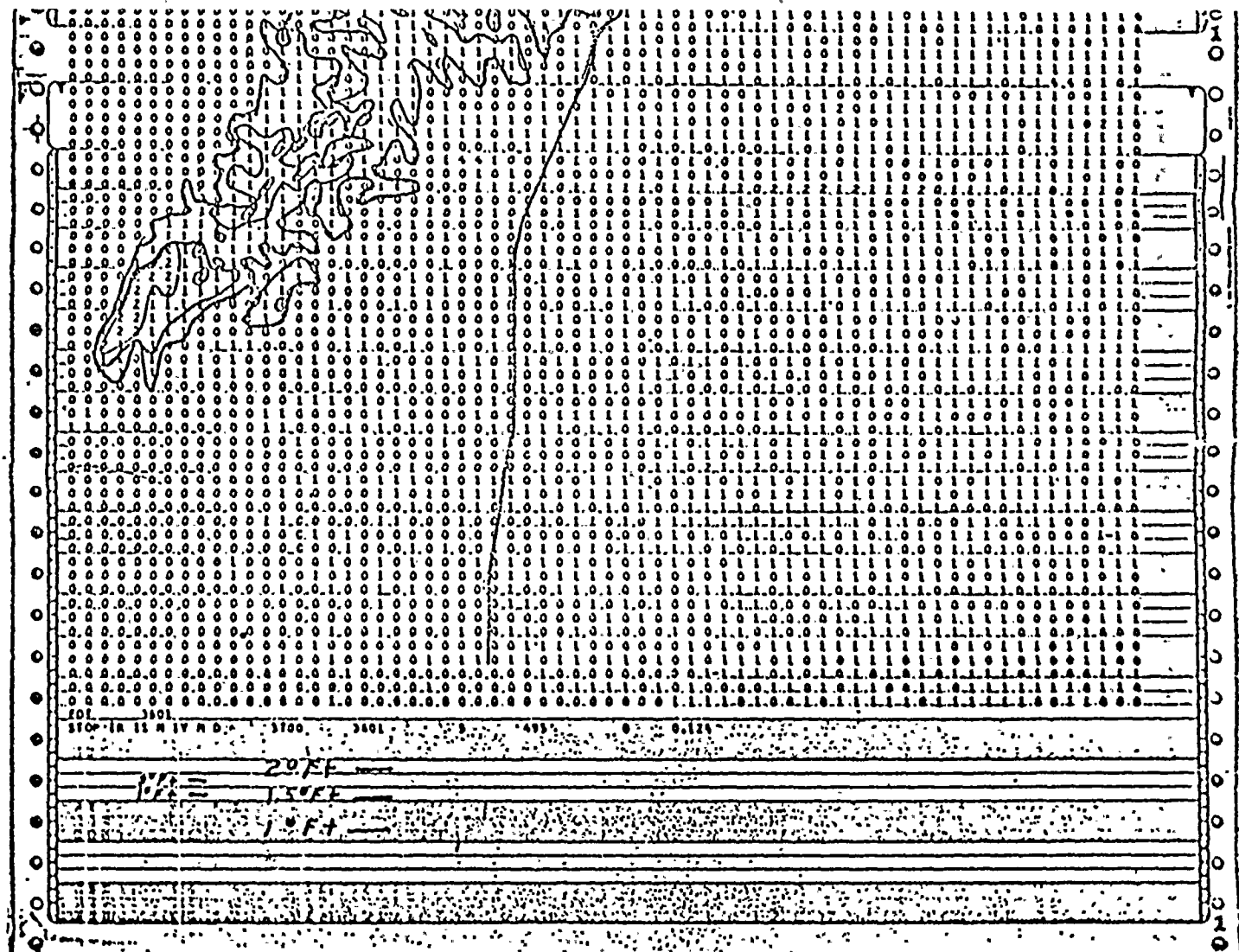
4





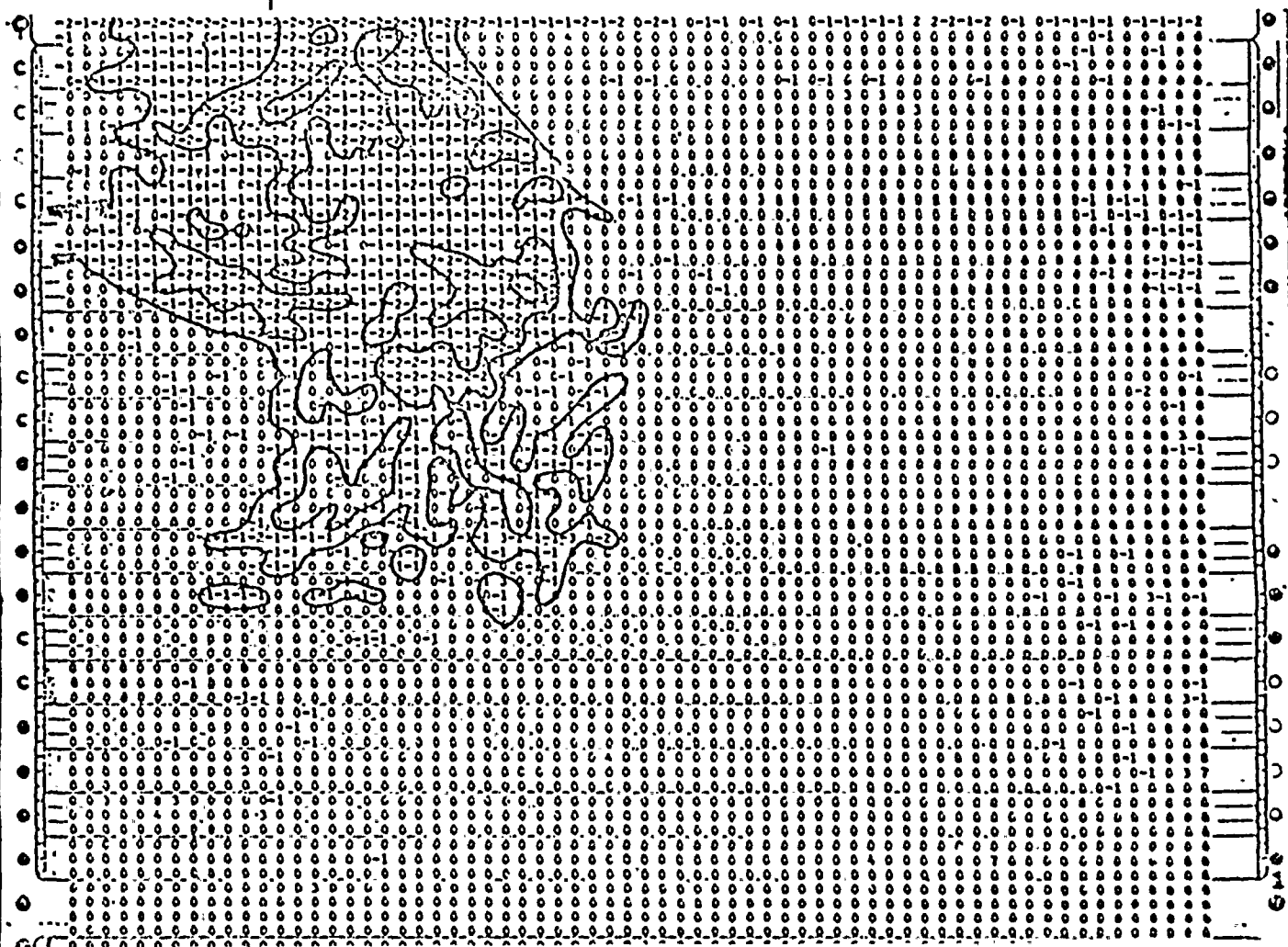
THESE DRAWINGS ARE THE PROPERTY OF THE UNITED STATES GOVERNMENT AND ARE NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT PERMISSION IN WRITING FROM THE ASSISTANT SECRETARY FOR ACQUISITION, DEFENSE PROGRAMS AND POLICIES, DEPARTMENT OF DEFENSE, WASHINGTON, D.C. 20301-6000.

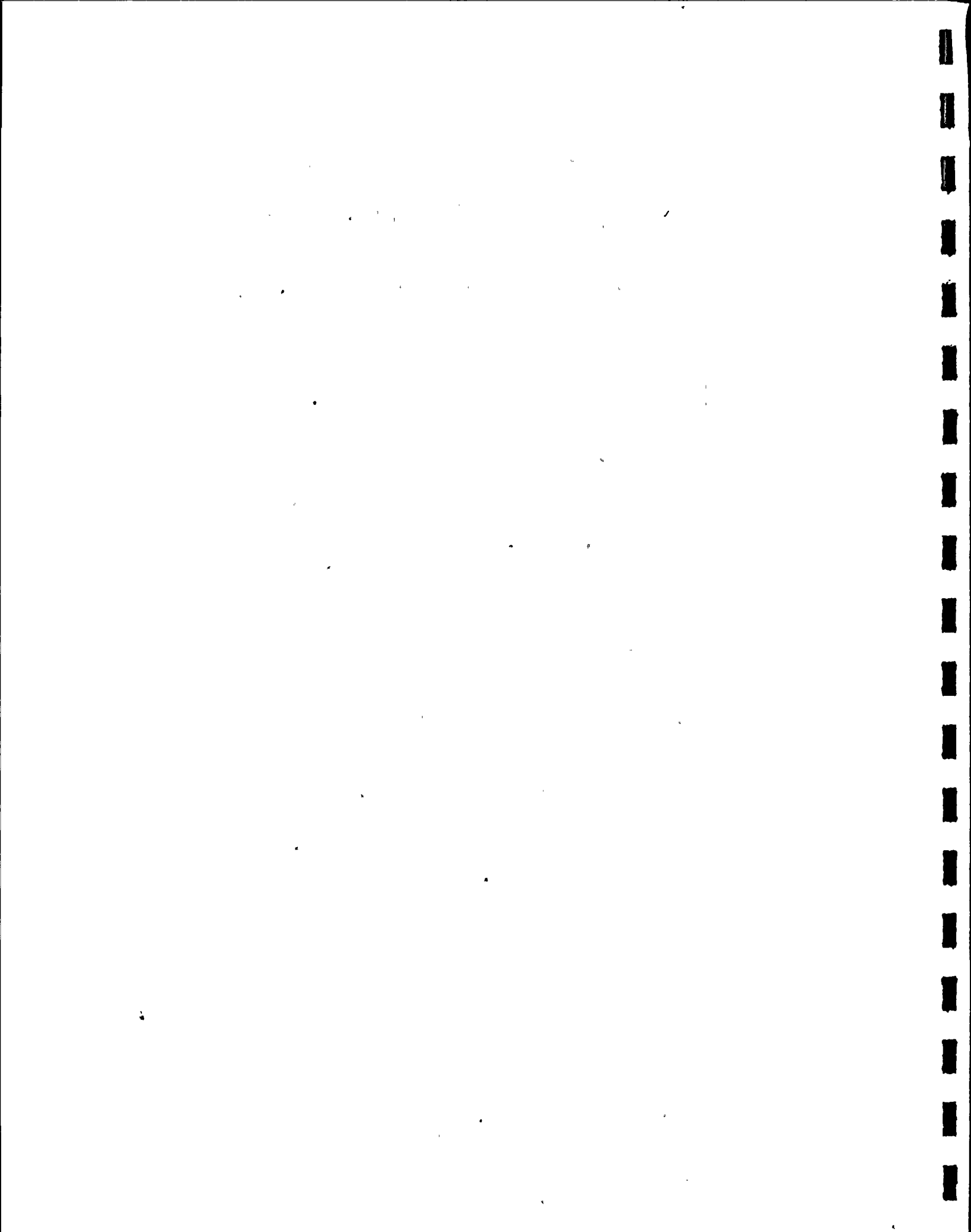
U.S. GOVERNMENT PRINTING OFFICE: 1980 O - 300-000

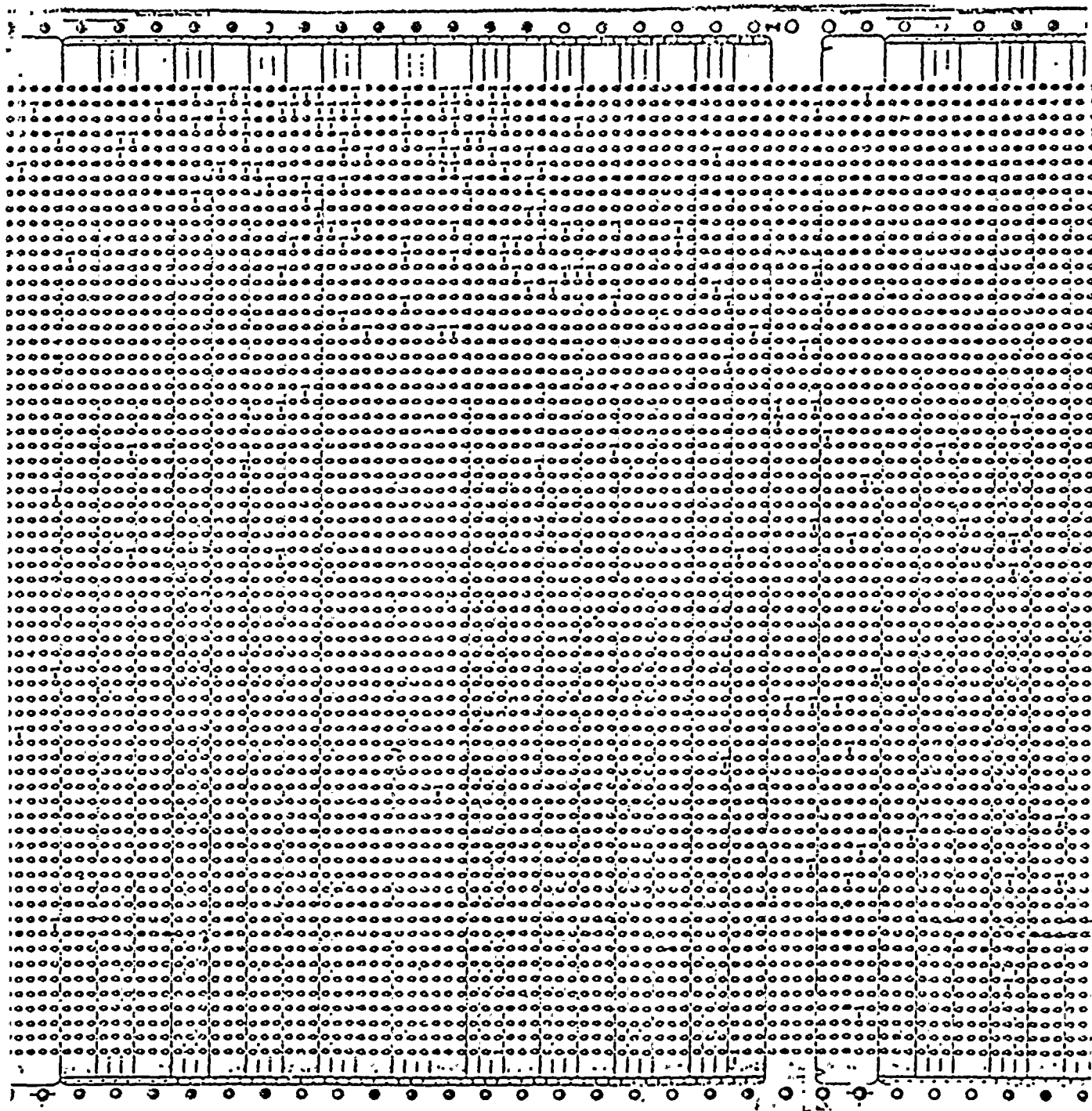


Scale 1" = 1200' 3/11/77, Time 16:23

I



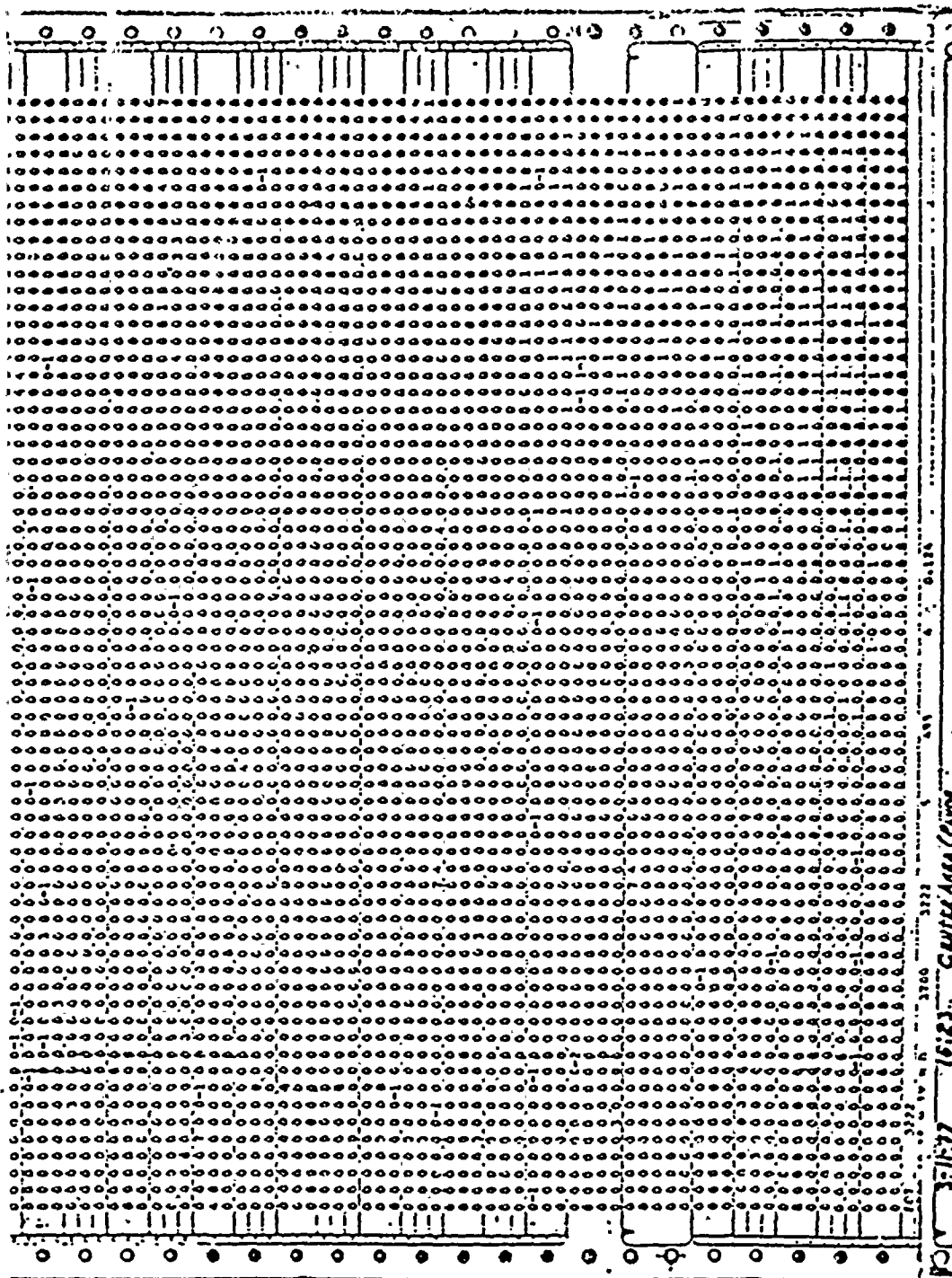




1. The drawing shows a top-down view of a mechanical assembly, likely a conveyor system, consisting of a long, narrow structure with multiple parallel tracks or belts. The structure is supported by a series of vertical posts or rollers. The drawing is highly detailed, showing the intricate arrangement of parts and the overall layout of the system.

2. The drawing includes numerous small circles representing fasteners or rivets along the edges and internal components. The structure is supported by a series of vertical posts or rollers. The drawing is highly detailed, showing the intricate arrangement of parts and the overall layout of the system.

3. The drawing is a technical drawing of a mechanical assembly, likely a conveyor system, showing a top-down view of a long, narrow structure with multiple parallel tracks or belts. The drawing includes numerous small circles representing fasteners or rivets along the edges and internal components. The structure is supported by a series of vertical posts or rollers. The drawing is highly detailed, showing the intricate arrangement of parts and the overall layout of the system.



POY 3-15-77 16:23: CANTAMIA (Pino)

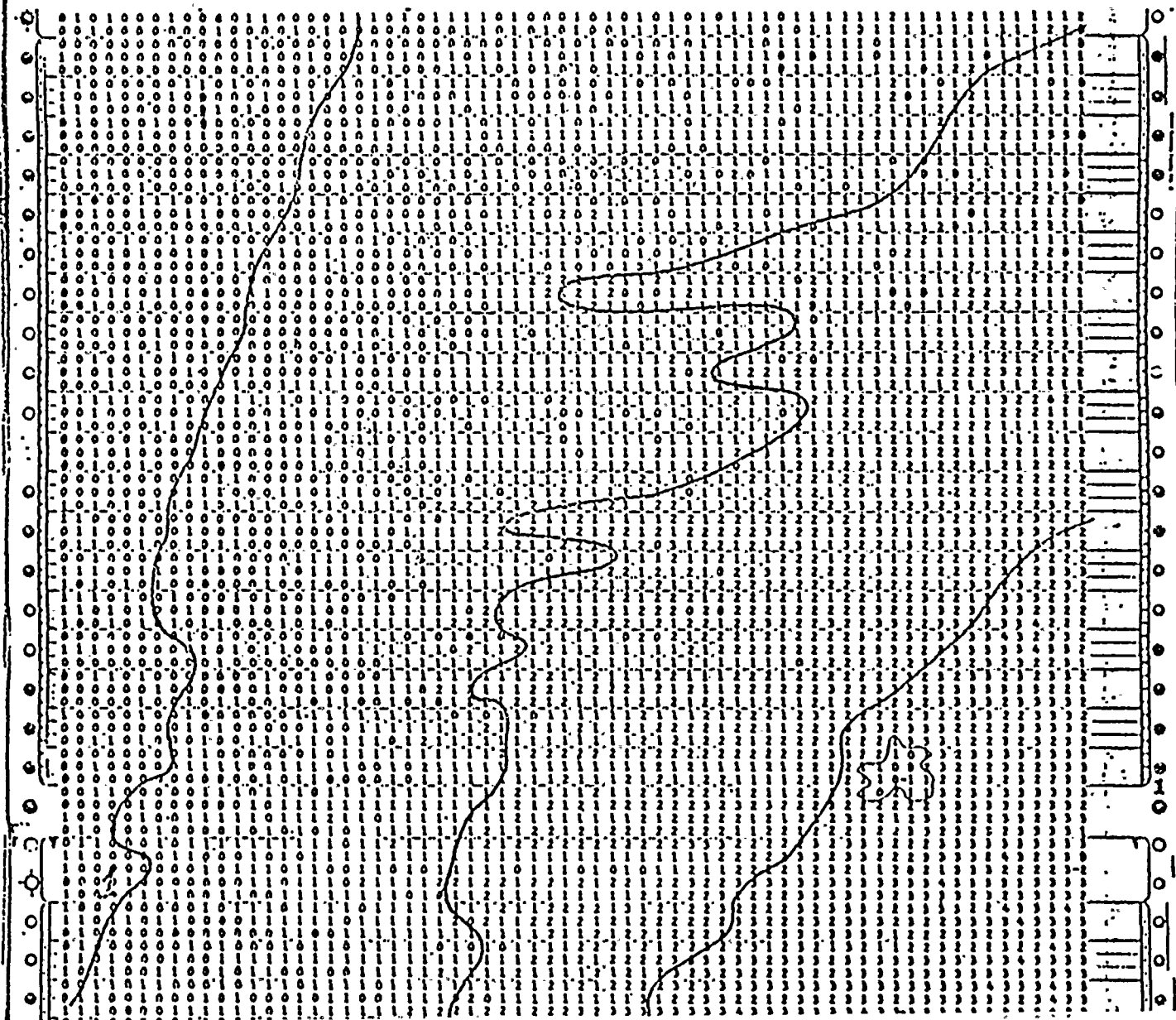
Below the main grid, there are several lines of text, which appear to be a list or a series of entries. The text is very small and difficult to read, but it seems to be organized in a structured manner, possibly a table or a list of items. The text is located in the bottom section of the page, below the main grid.

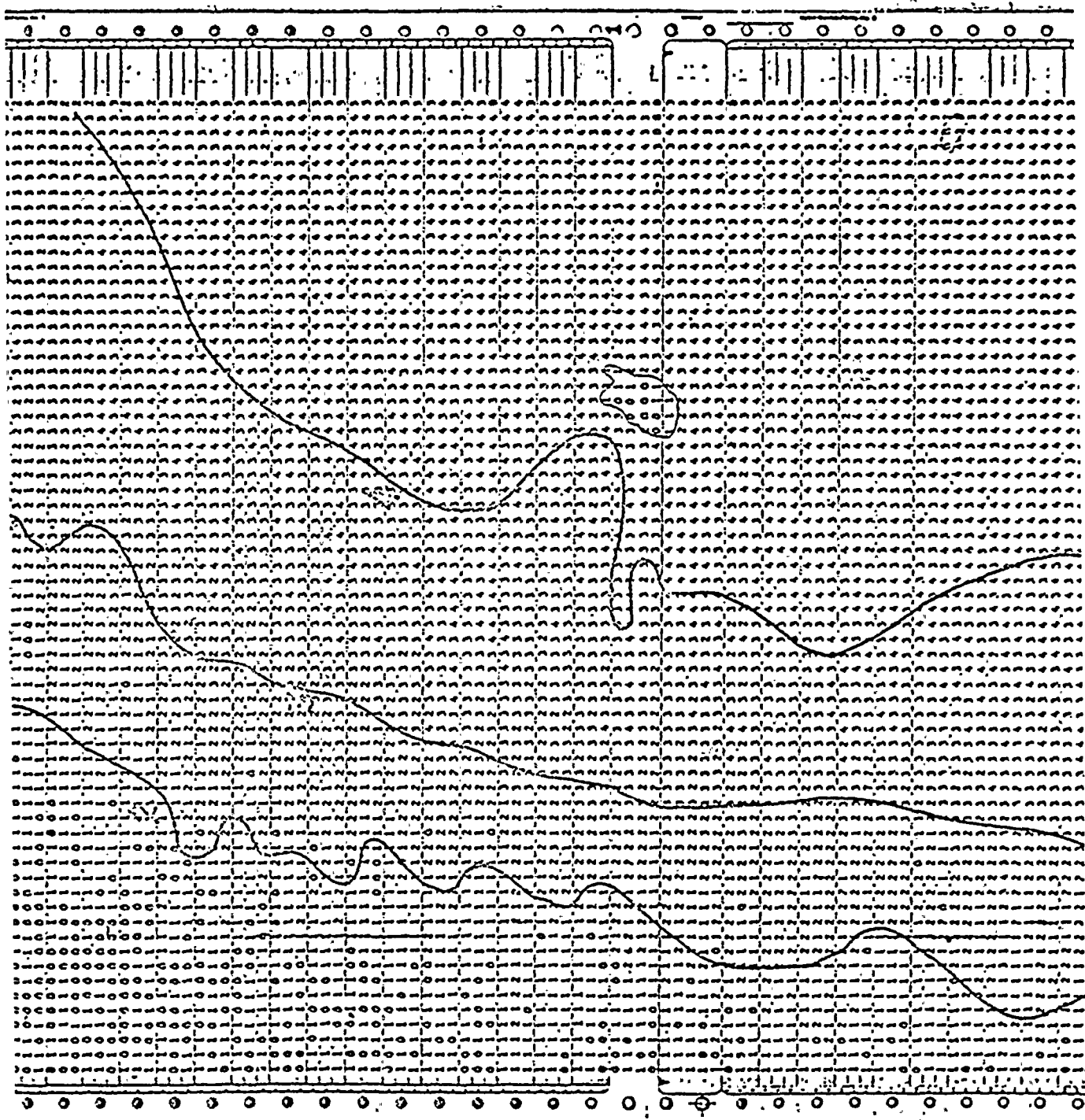




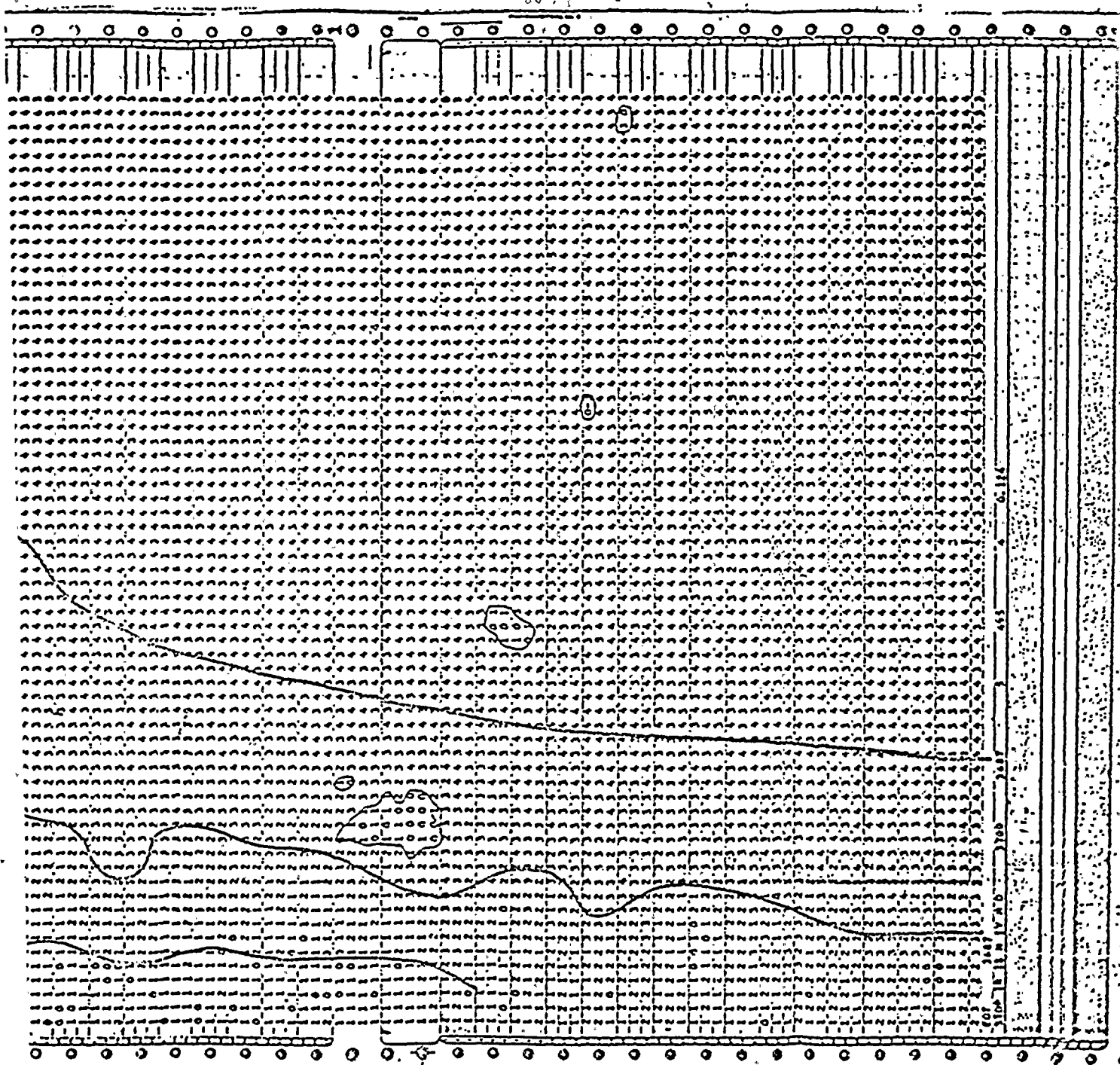
Scale 1" = 1200' 3/11/77, Time 16:23

I





Technical drawing showing a cross-section of a mechanical component, likely a pump or engine part. The drawing includes a central shaft/piston rod assembly, a crankshaft, and various housing components. The drawing is oriented horizontally, with the main body extending from left to right. The overall appearance is that of a technical sketch or a simplified engineering drawing.

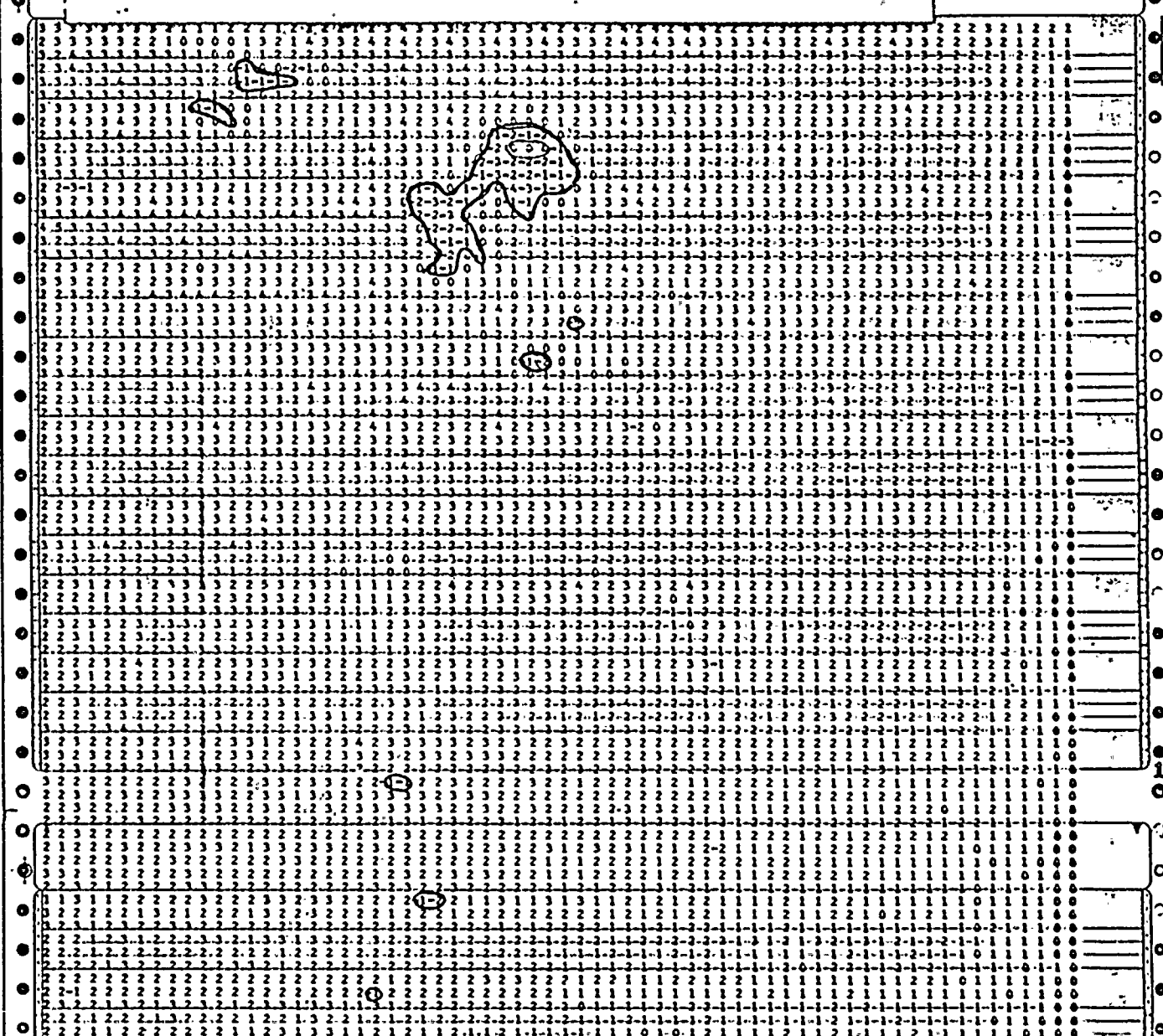




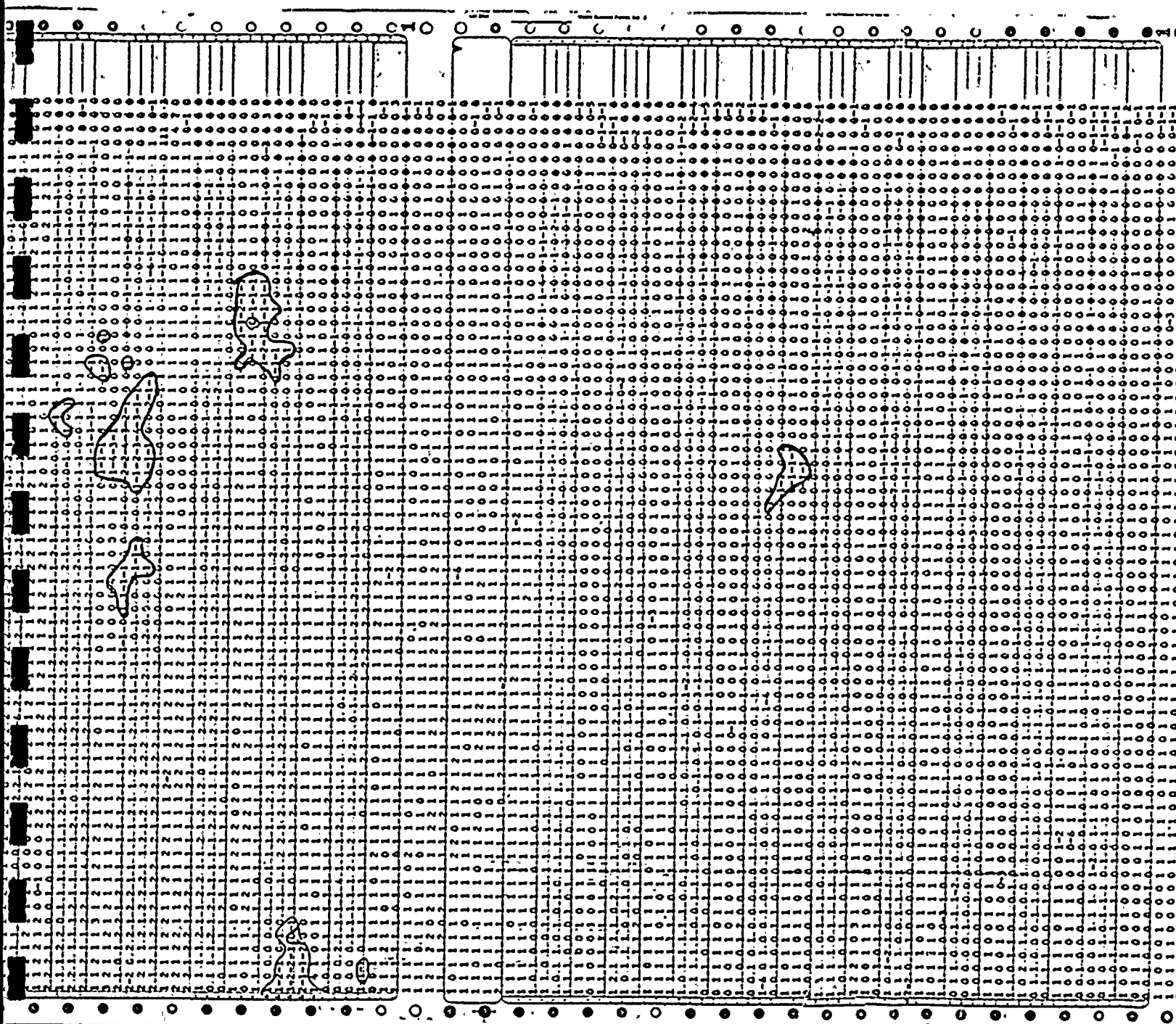
Scale 1"=1200'

3/11/77, Time 1631

K









Handwritten musical notation on three staves. The notation includes various notes, rests, and bar lines, typical of a musical score. The handwriting is in ink on aged paper.

