AIRBORNE THERMAL INFRARED SURVEY
WINTER 1977
QUARTER I FLIGHT

22 July 1977

Prepared for

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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°C (1.5°F) above ambient surface temperature outside a 162 hectacres (400 acre) zone of mixing during the months of June through September, nor 2.2°C (4°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°C (5.5°F) over ambient temperature nor a maximum temperature of 33.9°C (93°F) as an instantaneous maximum at any point.

- St. Lucie Plant 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°F and shall not cause a temperature rise in excess of 1.5°F above ambient surface temperature outside a 400 acre zone of mixing during the months of June through September, nor a 4°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°F over ambient temperature nor a maximum temperature of 93°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 (see Technical Specifications Appendix B, 3.1.A.6).*

*Environmental Technical Specifications, St. Lucie Plant Unit No. 1 Technical Specifications, Appendix B.

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,

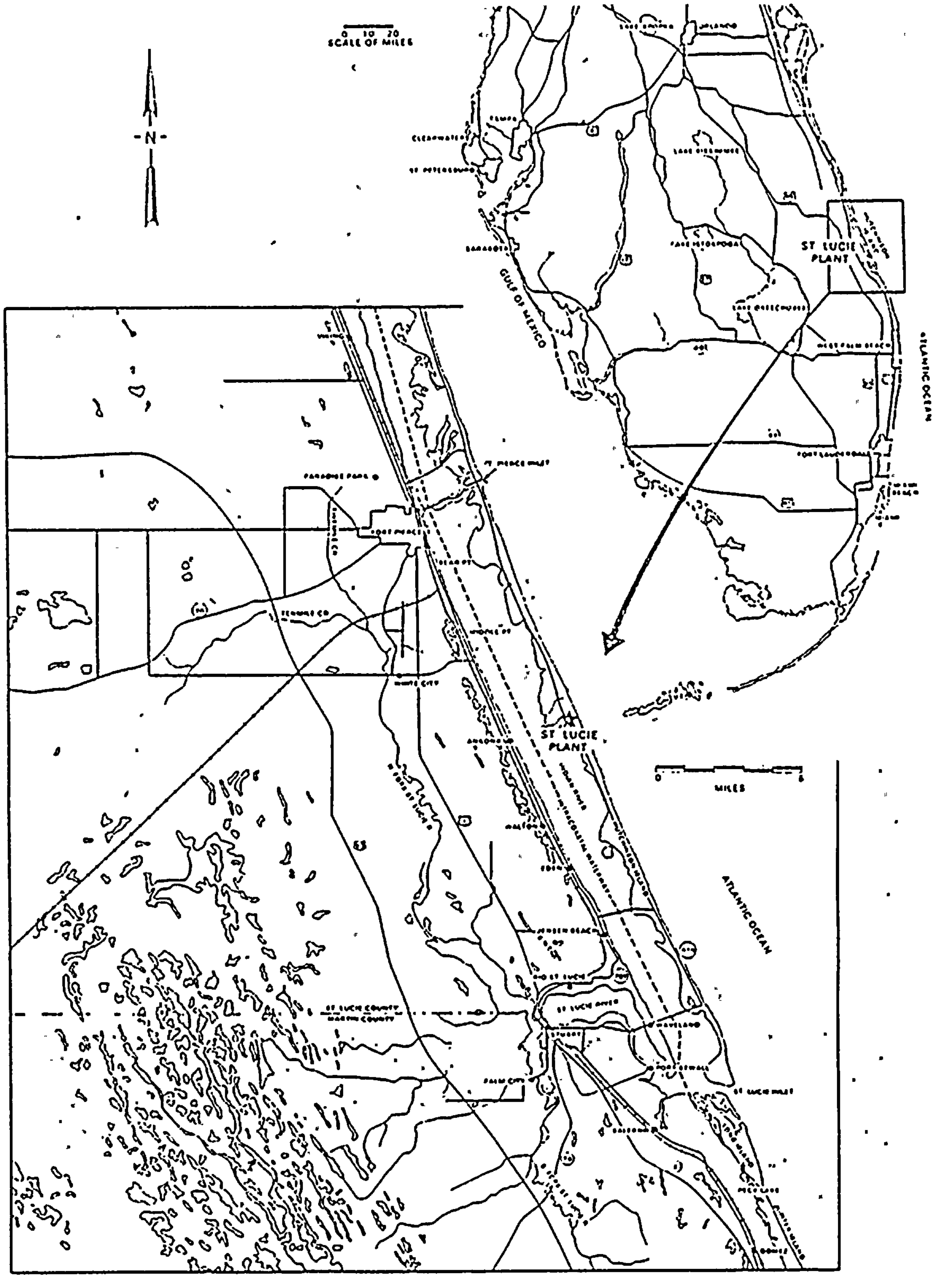


Figure II-1. Site Location Map

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 sructure, 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.

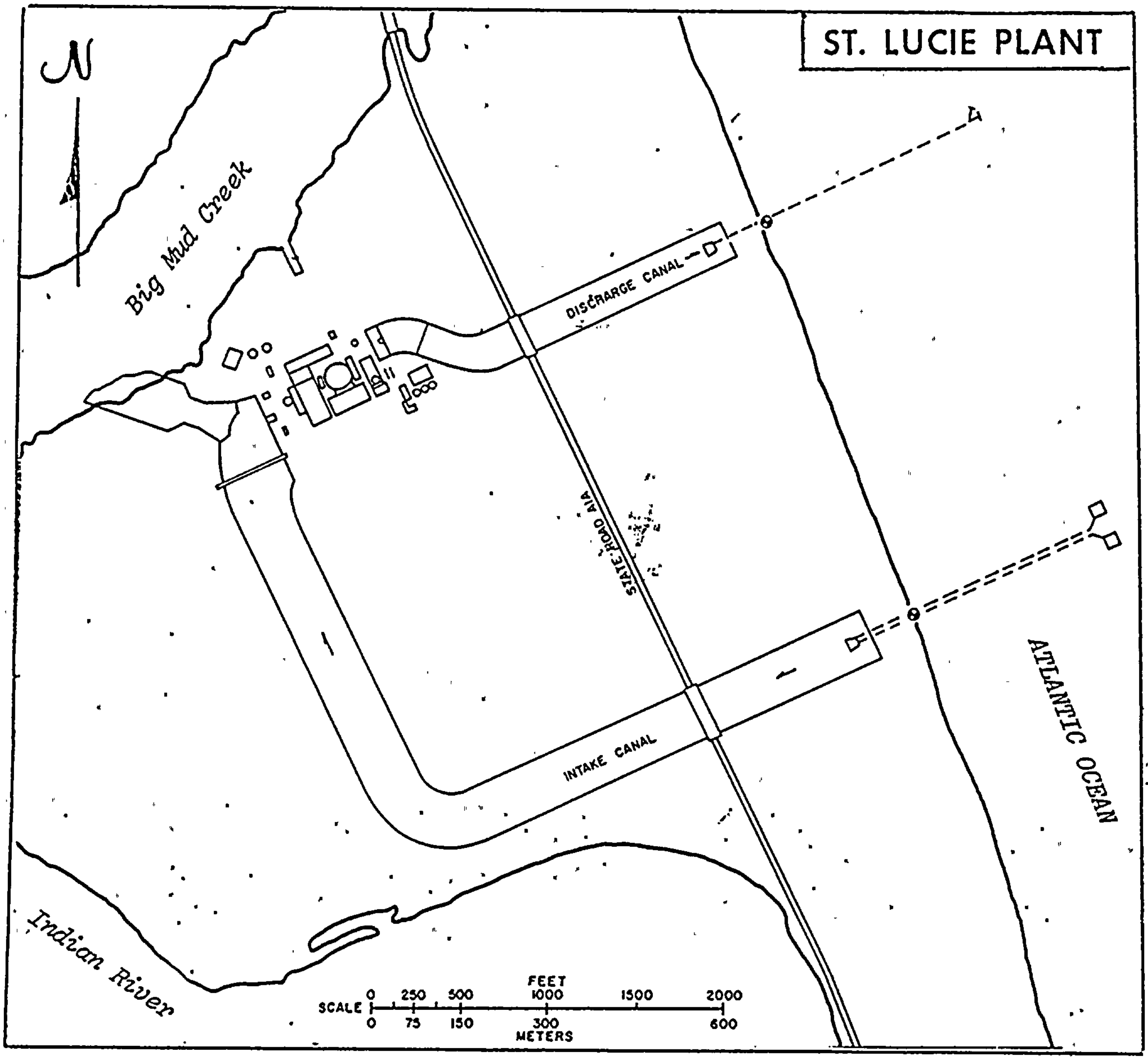


Figure II-2. Plant Intake and Discharge System

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 provides 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 1 inch = 500 feet with an overlay map of the discharge presented at 1 inch = 500 feet. Additionally, computer printouts of enlarged areas, included as an appendix were used for calibration purposes.

B. DATA COLLECTION

Infrared imagery is produced by a series of scan lines perpendicular to the flight direction and is similar in appearance to strip photography. Relative radiometric temperature differences are represented by the imaged grey tones as illustrated in Figures III-1, and III-2. Light tones, as they appear on the positive print of infrared imagery, represent higher radiometric temperatures. Dark image tones correspond 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

Figure III-1. Flight Pass, 1/28/77, 19:35

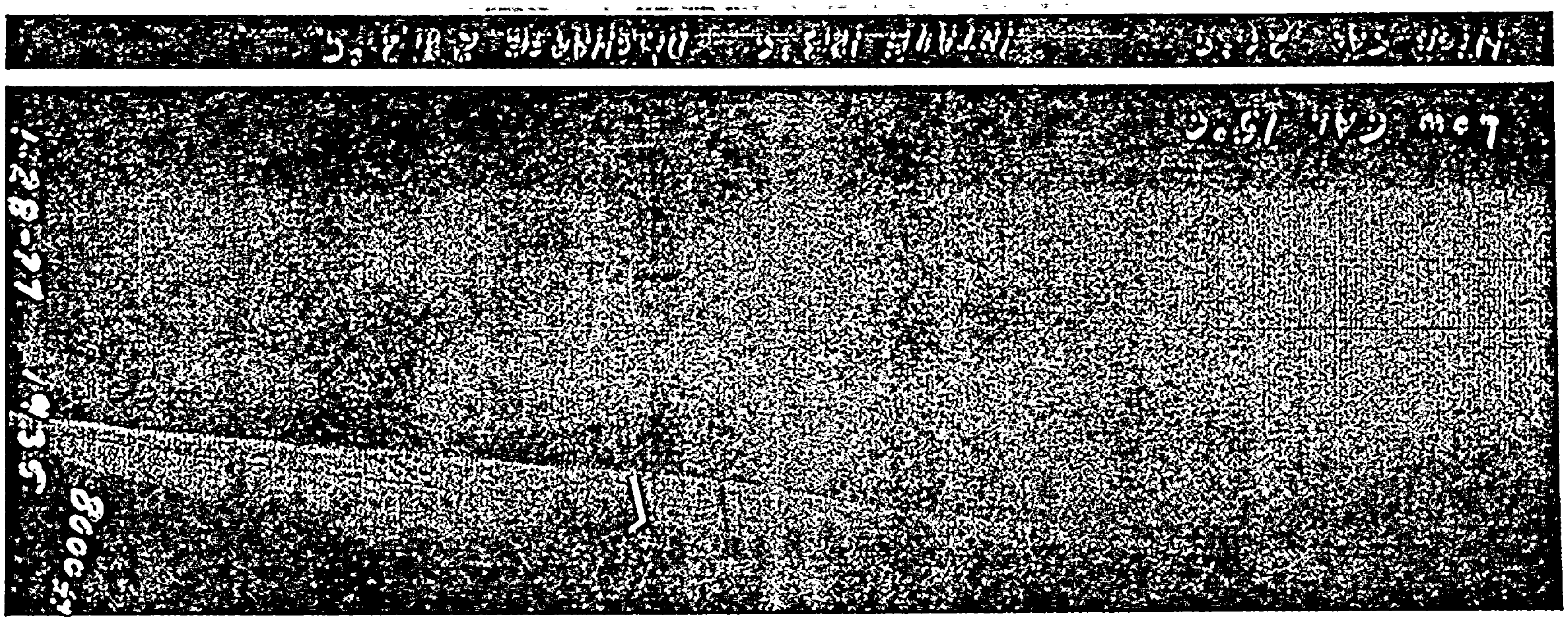
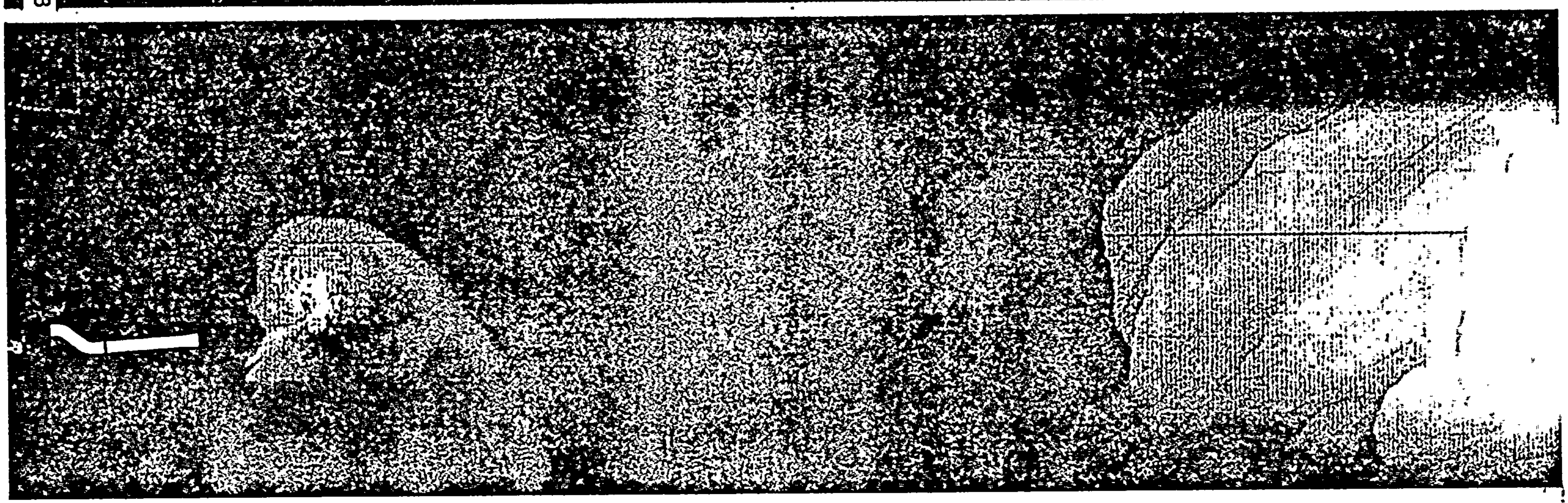


Figure III-2. Flight Pass, 1/26/77, 19:16



system records data in the 8- to 14-micrometer portion of the electromagnetic spectrum, and temperature reference sources are 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 provide verification of calibration of temperature and system gain on each scan line. To aid in analyzing data, the two radiation sources usually are 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 has 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 are 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 is formed by printing a series of scan lines (computer records) along a computer page. Each digitized point is a measure of the radiation from the surface as modified by the atmosphere between the surface and the scanner. Since infrared radiation will not pass through water, the radiation power is a function of the surface only; no radiation comes from below the surface.

Other factors are involved such as the following:

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

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

C. CALIBRATION

It is 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 is 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."

To make a computer printout of temperature, flight data are 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 is removed in the x direction. The resulting map is thus 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 is multiplied by a scale factor that produces a scale of numbers in degrees Fahrenheit or Centigrade as desired. An offset number is then applies to make one of the areas printout as the zero reference. It is easier to visualize a plume if it is referenced against a zero background rather than printing the actual temperature as read from a thermometer. The scaling factor used to produce Fahrenheight degrees and the offset factor to produce a zero reference area in the printout are derived from a calibration printout of enlarged areas which show the intake canal, discharge canal, and a reference ocean area. This calibration printout is adjusted to follow closely the delta temperatures as measured in the canals from the ground.

SECTION IV

RESULTS

FLIGHT PASS 1/29/77, Time 14:44

This flight pass was taken with a wind of 11 knots from a direction of 350° with the resulting surface plume widening outward (probably caused by momentum) in the direction of the outlet nozzles; then spreading southeastward (probably caused by wind) parallel to the shore. The plume splits (cause unknown) as it flows southward.

The following parameters were measured during overflight:

Wind @ 33 feet height N at 12 mph

Ambient air temperature over land 58.2°F

Ambient ocean temperature 16°C

Tide @ 15:15 +2.18 feet

Discharge canal elevation 10.15 feet above MLW

Plant delta T (inlet to outlet of plant) 19.8°F

Discharge flow 513,000 gpm

% Reactor power 82 percent

Gross power generated 681 Megawatts

Intake canal temperature (taken at east end of canal) 19.2°C (66.6°F)

Discharge canal temperature (taken 300 feet from east end of canal) 29.3°C (84.7°F)

Temperature difference between canals 10.1°C (18.18°F)

Calibration: The ground measurements showed a differential between canals of 18.18°F, the calibration printout showed a differential between canals of 18.19°F. This printout showed the intake canal surface to be the same temperature as the surface temperature of the ambient ocean.

SUMMARY OF FINDINGS

The maximum surface temperature within the plume was 4°F. Temperature isotherms and their respective areas for various temperatures above ambient (ΔT) are listed below.

ΔT Isotherm Temperature	Area	Overlay
4°F	3.1 acres	1/29/77 14:44
1.5°F	15.6 acres	1/29/77 14:44
1°F	22 acres	1/29/77 14:44
0.5°F	38.3 acres	1/29/77 14:44

Temperature distributions found offshore of the plant are presented in isothermal map, Plate IV-1 and grey-toned photo, Plate IV-2.

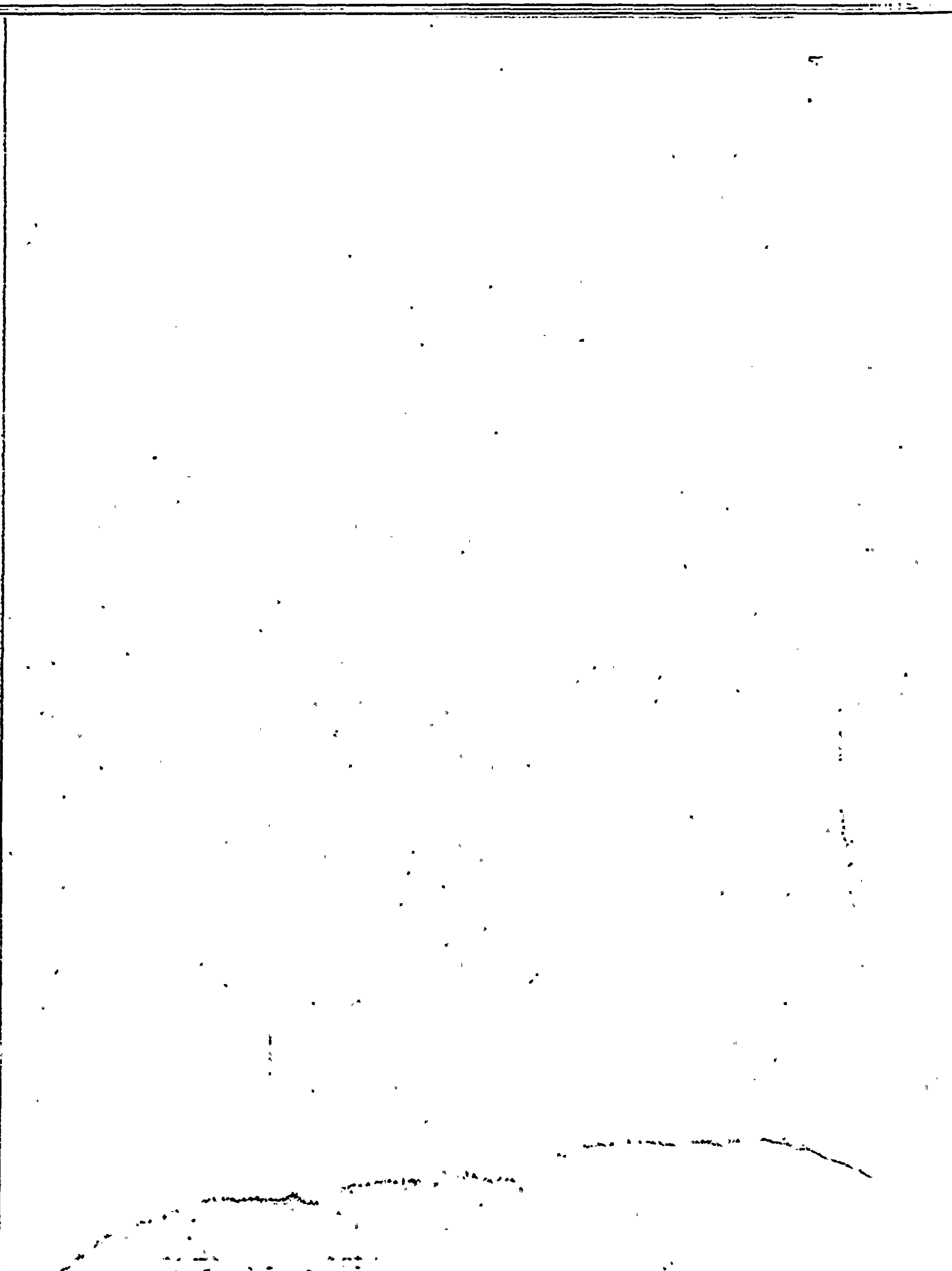
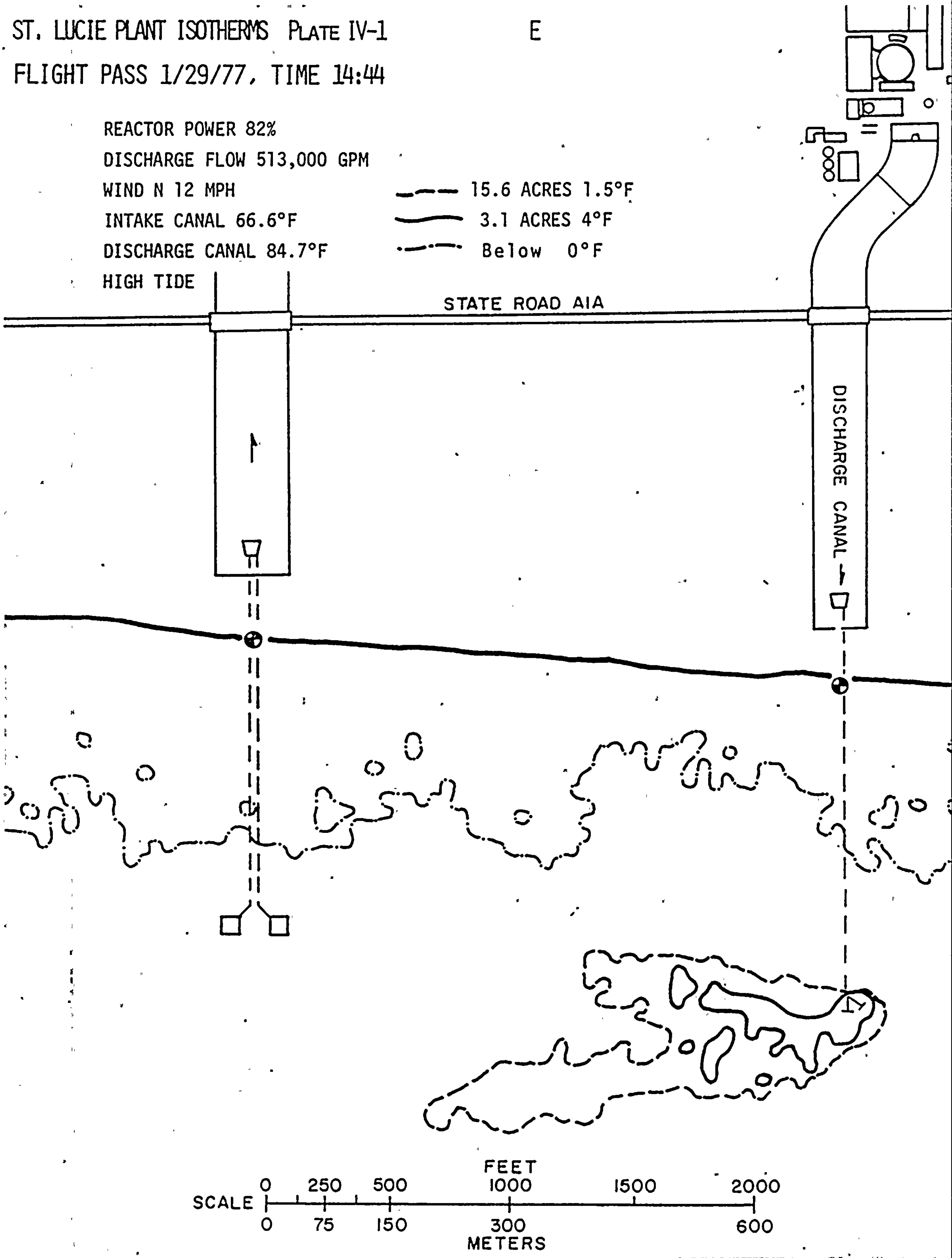


Plate IV-1. Isotherms, Offshore of St. Lucie Plant

ST. LUCIE PLANT ISOTHERMS PLATE IV-1 E

FLIGHT PASS 1/29/77, TIME 14:44



ST. LUCIE PLANT ISOTHERMS PLATE IV-1 D

FLIGHT PASS 1/29/77, TIME 14:44

REACTOR POWER 82%

DISCHARGE FLOW 513,000 GPM

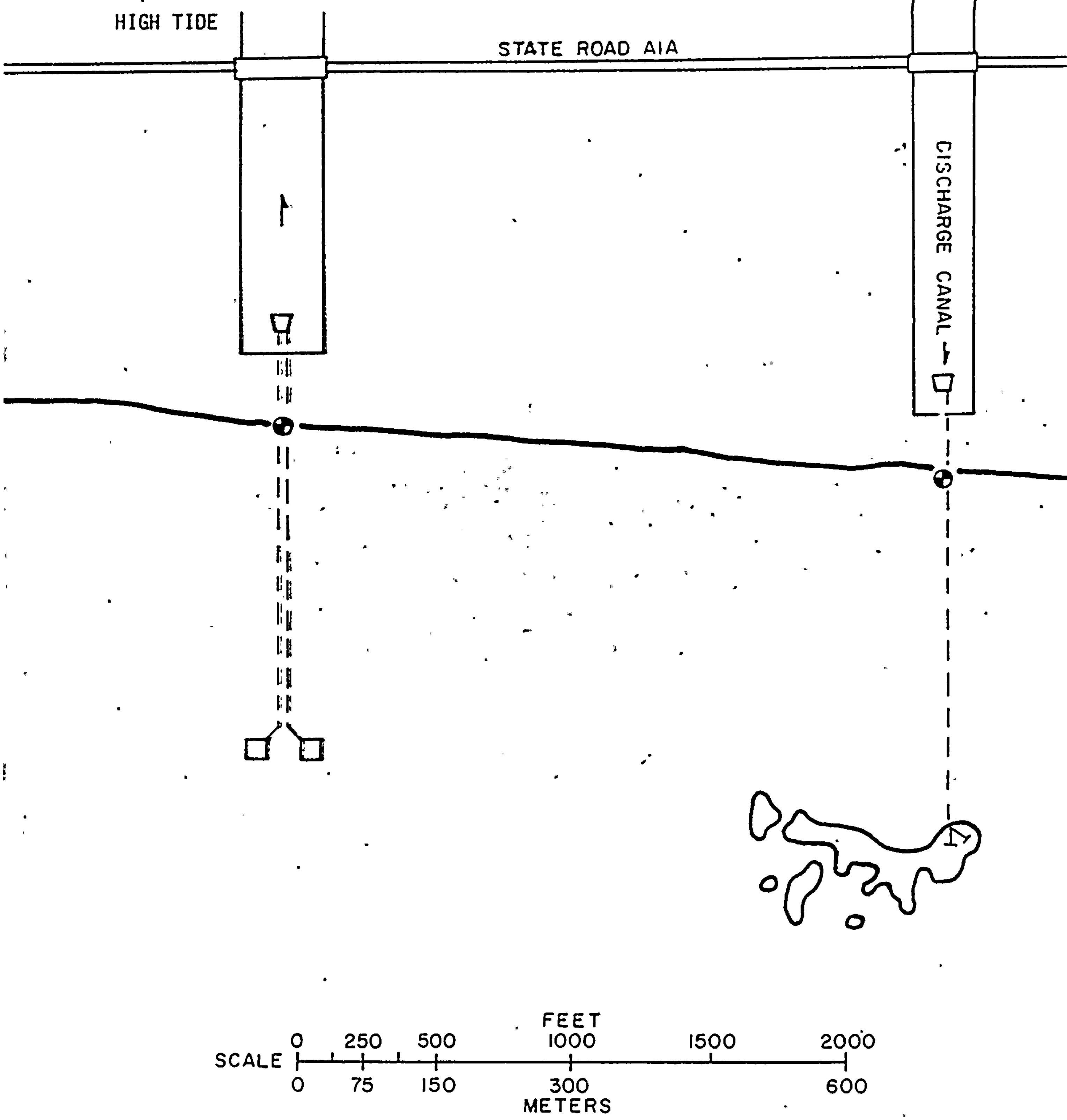
WIND N 12 MPH

INTAKE CANAL 66.6°F

DISCHARGE CANAL 84.7°F

HIGH TIDE

3.1 ACRES 4°F



ST. LUCIE PLANT ISOTHERMS PLATE IV-1 C

FLIGHT PASS 1/29/77, TIME 14:44

REACTOR POWER 82%

DISCHARGE FLOW 513,000 GPM

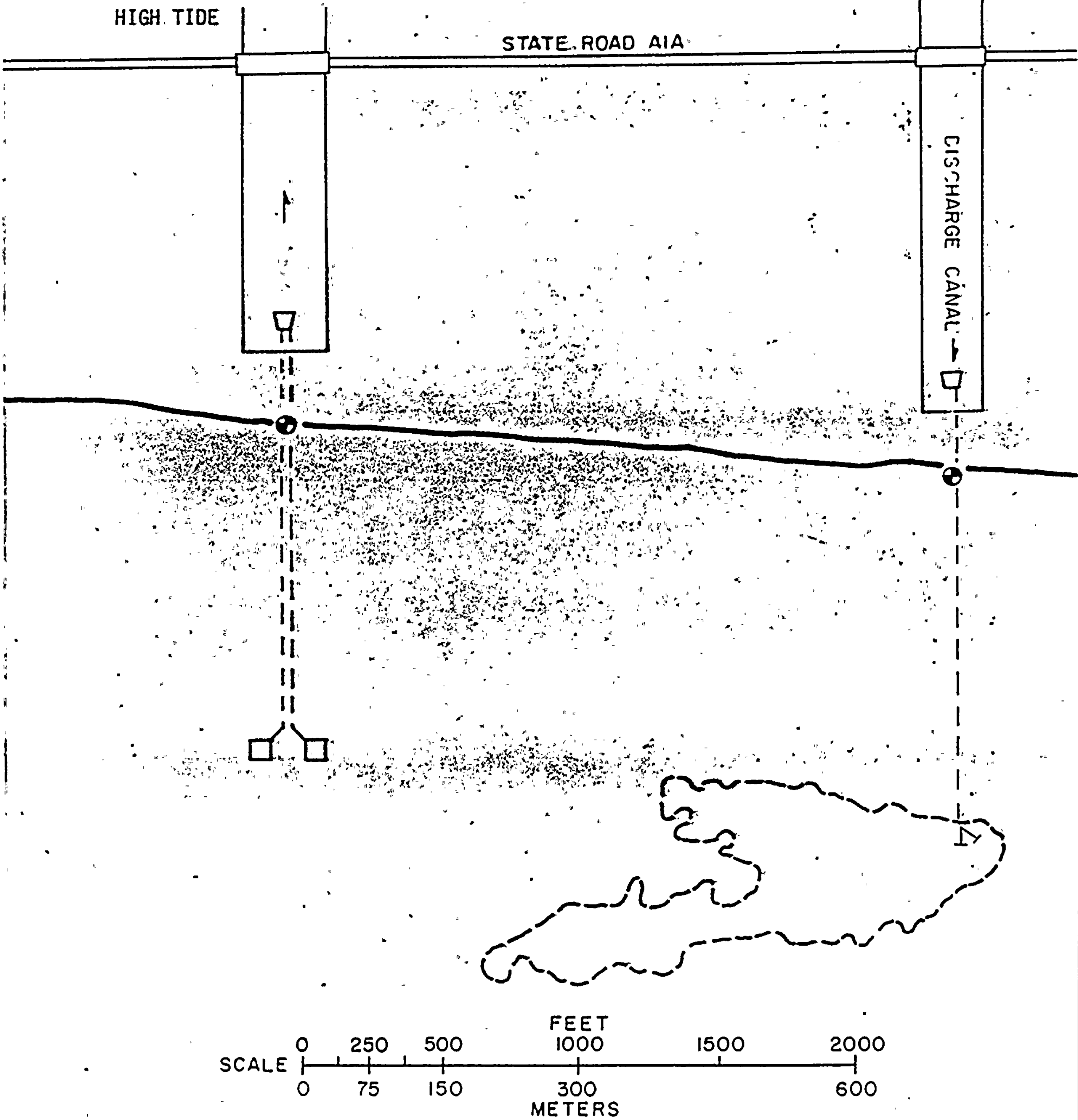
WIND N 12 MPH

INTAKE CANAL 66.6°F

DISCHARGE CANAL 84.7°F

HIGH TIDE

15.6 ACRES 1.5°F



ST. LUCIE PLANT ISOTHERMS PLATE IV-1 B

FLIGHT PASS 1/29/77, TIME 14:44

REACTOR POWER 82%

DISCHARGE FLOW 513,000 GPM

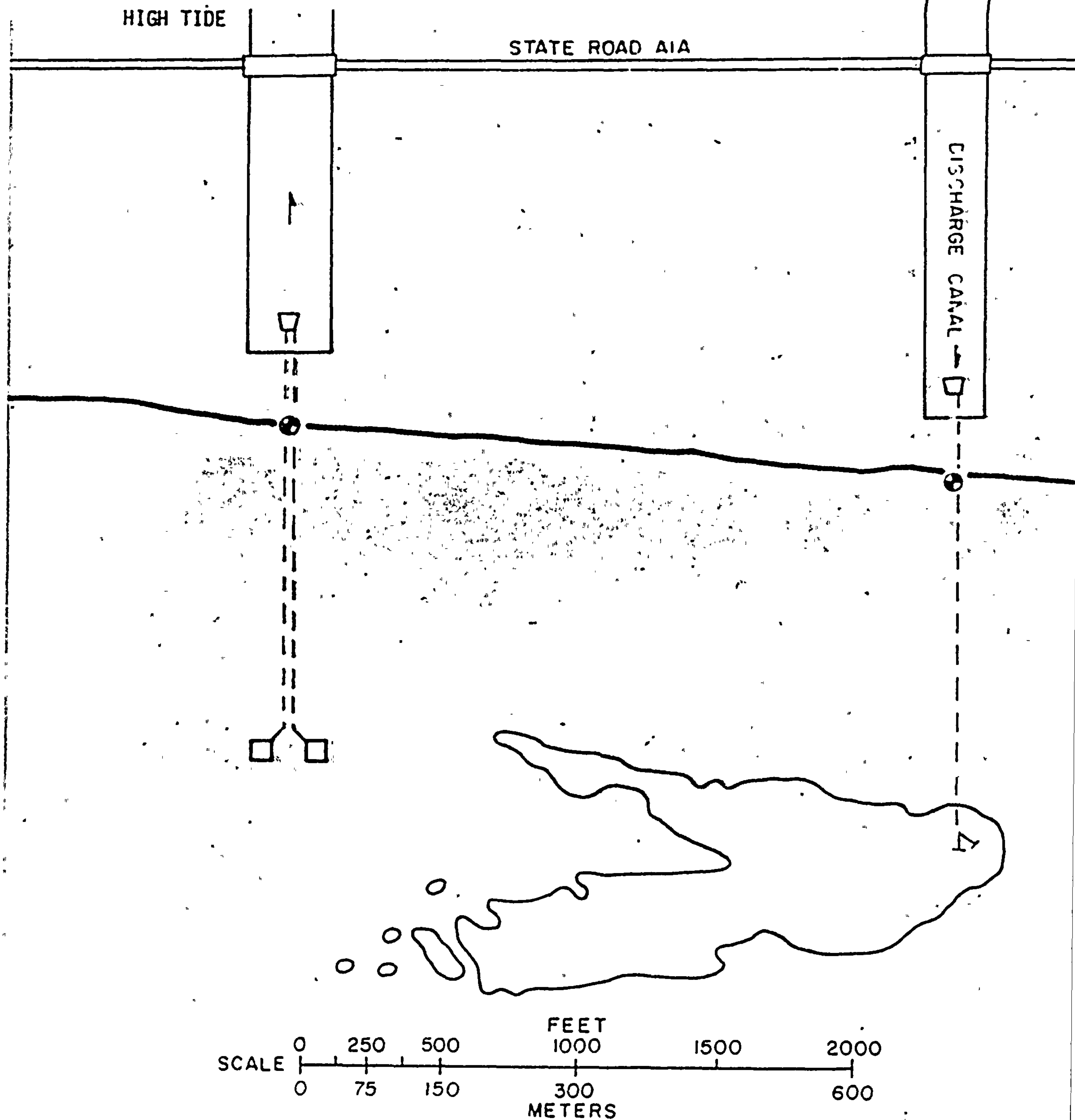
WIND N 12 MPH

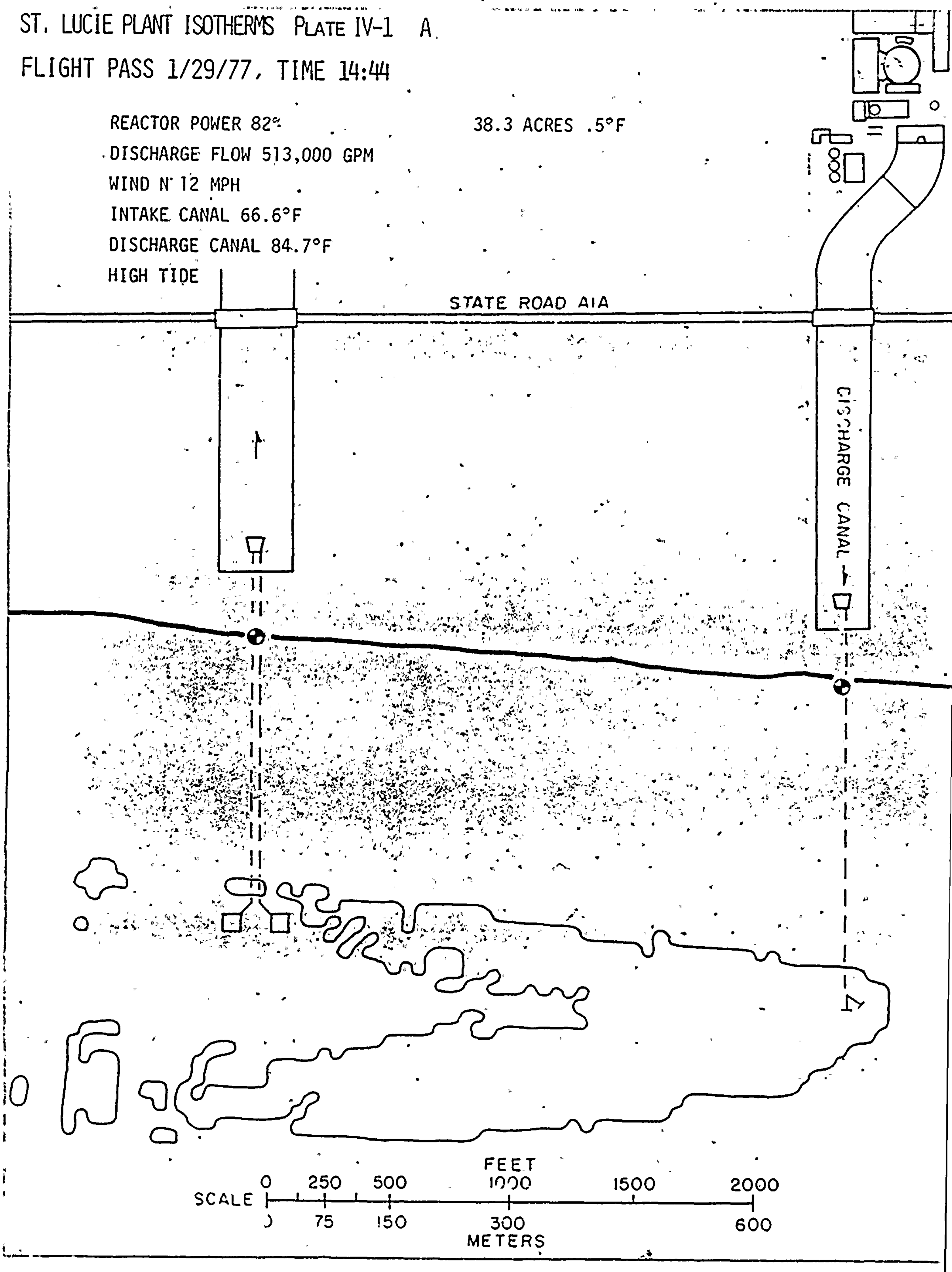
INTAKE CANAL 66.6°F

DISCHARGE CANAL 84.7°F

HIGH TIDE

22.0 ACRES 1°F




ST. LUCIE PLANT ISOTHERMS PLATE IV-1 A
FLIGHT PASS 1/29/77, TIME 14:44
REACTOR POWER 82%
DISCHARGE FLOW 513,000 GPM
WIND N 12 MPH
INTAKE CANAL 66.6°F
DISCHARGE CANAL 84.7°F
HIGH TIDE
38.3 ACRES .5°F
STATE ROAD A1A
DISCHARGE CANAL
4
FEET
SCALE
0 250 500 1000 1500 2000
0 75 150 300 600
METERS

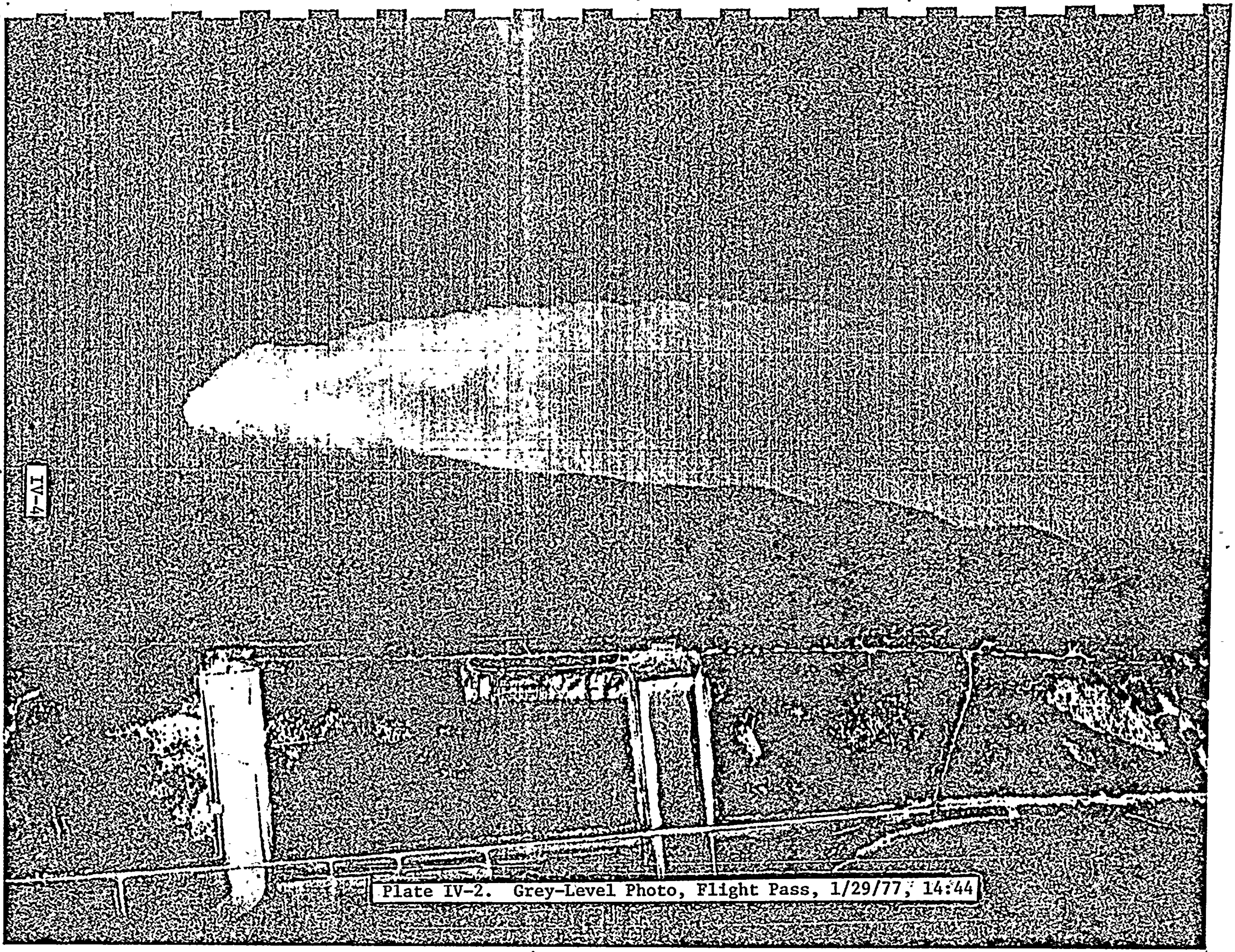


Plate IV-2. Grey-Level Photo, Flight Pass, 1/29/77, 14:44

SECTION V

DISCUSSION

The shape and size of the surface plume appeared to be strongly affected by the wind direction and velocity. In a little or no wind condition, the plume spread eastward and northeastward, following the direction of the outlet nozzles and showed no great surface areas of warm water. When the wind was greater that 7 knots, the surface plume measured with infrared overflights always followed the general wind direction.

A strong wind from south or downshore appeared to quickly bring the warm water to the surface in a narrow point, spreading it quickly downwind over a large thin surface area. A strong wind from the north appeared to catch the warm water as it spread eastward into a wide starting point, spreading the plume downwind into a wide thin surface area. In other words, a northward blowing plume started with a narrow point while the southward blowing plume spread eastwardly into a wide starting point.

As can be seen on the isothermal map, Plate IV-1 and the grey-level photo, Plate IV-2, the surface water nearshore was much colder than the ambient ocean surface 1500 feet from shore. The shore temperature of 63°F was 3.5 degrees colder than the cold area extending out 200 to 700 feet from shore where a sharp increase in temperature occurred to the ambient ocean temperature of 66.5°F. This cold water next to the shoreline is probably the same cold water which permeated the entire area from the plant northward on the 25th and 26th of January, when overflights were made without the digitizer. At that time the canal temperature was 15.2°C (59.4°F) and the infrared overflight did not record cooler water nearshore. However, on the 26th of January, a large mass of warm water began showing along shore, 3 to 4 miles south of the plant, and this mass separated from the shore (Overflight 1/26/77, 19:06) as it came closer to the plant. The edge of the mass was about 1.5 miles offshore of the plant on the 26th of January (Overflight 1/26/77, 19:16). The first edge "jump" in temperature of that mass was about 4 degrees above ambient; the second edge "jump" was about 5 degrees more for a total of 9 degrees.

By the 28th and 29th of January, this warm water effect had moved northward along the shore to cover the entire vicinity of the plant. The only place where the original water temperature could be seen in the variable 200 to 700 foot nearshore area, which was 2 to 3.5 degrees colder.

This mass of warm water is too large to have been caused by the power plant; it appears more likely to be an offshoot of the Gulf stream. It flows northward along the shore like a river of warm water until it reaches the vicinity of Stuart-Ft. Pierce where it turns and angles obliquely from shore. The exact point where the turn and separation from shore occurs changes with time, with at least a 4 mile change being observed during the January 25-29 period.

APPENDIX A

FLIGHT LOGS

FLIGHT LOG St. Lucie

DATE 1-25-77 TAKE OFF TIME 12:28

TAKE OFF WIND 190 - 5 kt TAKE OFF PLACE Stuart

Inlet Canal 15.2°C Discharge Canal 26.8°C

RUN #	TIME ON	TIME OFF		TAPE FT ON	TAPE FT OFF	FILM FRAME ON	FILM FRAME OFF	HEADING	ALT	SPEED	
								090			Cal 25°C/20°C
								170			
		13:36						090	2,000	150 kt	
		13:48						270			

FLIGHT LOG St. Lucie

DATE 1-26-77 TAKE OFF TIME 18:05

TAKE OFF WIND S-7 TAKE OFF PLACE Stuart

Intake Canal 15.2°C Discharge Canal 26.2°C

RUN #	TIME			TAPE FT		FILM FRAME		HEADING	ALT	SPEED	
	ON	OFF		ON	OFF	ON	OFF				
		18:31						N	10,000		20/25 Indian River
		18:34						S	10,000		
		19:06						S			15/25 Ft. Pierce → S
		19:09						E	4,000		
		19:12						W			
		19:16						E	4,000		
		19:20						260	4,000		

FLIGHT LOG St. Lucie

DATE 1-28-77 TAKE OFF TIME 19:10

TAKE OFF WIND S-5 TAKE OFF PLACE Stuart

Intake 18.3°C Discharge 28.2°C

RUN #	TIME			TAPE FT		FILM FRAME		HEADING	ALT	SPEED	
	ON	OFF		ON	OFF	ON	OFF				
		19:28						260	8,000		15/26
		19:35						170			

FLIGHT LOG St. Lucie Plant

DATE 1-29-77 TAKE OFF TIME 14:25

TAKE OFF WIND N-19 kt TAKE OFF PLACE Stuart

Intake Canal 19.2°C Discharge Canal 29.3°C

RUN #	TIME			TAPE FT		FILM FRAME		HEADING	ALT	SPEED	
	ON	OFF		ON	OFF	ON	OFF				Cal Sources
		14:44		yes				S	4,000		15/26
		14:48						S	4,000		
		14:52						290	4,000		

APPENDIX B

DATA PRINTOUTS

1/21/77 [illegible] CALIBRATION PRINT OUT

INTAKE CANAL M K J 1466 1518 220

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-12	-11	-19	0	-7
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	-7	-20	-19	-1	-16
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-6	0	-6	0	-6	-12
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-6	0	-6	0	-6	-12
0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-5	0	0	-18	0	0
0	3	0	0	0	0	0	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-5	0	0
0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	-18	0	0	0	-6
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-5	-8	0	-13
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-5	-8	0	-13
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-5	-8	0	-13
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	21	21	0	0	22	0	0	0	11	0	0	0	11	0	0	0	0	0	0	0	0	0	-18	0
0	0	0	1	0	0	0	3	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	-8	0	0	0	0
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2	1	0	0	0	0	0	108	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	1
2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	4	1	1	0	0	2	2	0	1	0	2
2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	4	1	1	0	0	2	2	0	1	0	2

1/29/77 14:44. CALIBRATION PRINT OUT

DISCHARGE CANAL H K J 2355 2410 . 220

[illegible]

STOP IR IS N IY D 3000 2410 10 384 0.170

10/183.1 20/184.15 30/183.56 40/183 50/182.14 60/181.4 70/181.65 80/182.05 90/181.95 100/181.95

18:29 = PRINT OUT

18:16

18:18 GROUND MEASUREMENT

1/29/77 14:44 ΔF

```
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0-3-3-3-3-3-3-3-4-7-5 0-3-2 2-3-5 0 0 0-7-3 3-7
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0-3-2-3-3-3-3-3-3-3-4 0-2-3 0-4-5 0 0 1 0-6-6 4-5
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0-2-2-3-3-3-3-3-3-2-3-2 0 0-4-5-1 1 0 0-2-5-7 4-2
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0-2-2-2-3-3-3-3-3-3-5-5 0-6-7-5 0 0 0 0-7-6-6 4-1
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0-3-3-2-3-3-3-3-3-4-3-6-3 0-4-1 1 1-2 0 0-8-6 3 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0-3-3-3-3-3-3-3-3-3-5-4-4-3-2-4-4-3-1-1-3-3-7 5-3
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0-1 0-2-2-5-4-3-3-2-3-2-2 0-5-3 0-4-7-5-2-2-1 1 0-6 4 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0-1-3-2-3-3-3-3-3 2-3-3-1-6-5-4-4-3 0 2-1 1 0 0-7 2 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0-3-1-2-3-2-3-3-2-3-3-3-2-4-3-5 0 1 4 5 2-2-1-1-6 4 1
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0-3-1-1-3-3-1-3-2-3-2-3-2-1-2 0 0-2-3-4 2 0-1-1-6 1 2
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0-1-2-1-2-3-3-3-3-3-3-3-3 0-1-4 0-6-4-3-6-1 2 0-2-5 4-1
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0-2-1-2-2-3-3-3-3-3-3-3-3 2-6-7-3-4-4-4-6-6 0 0 0-3 0-1
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0-1-1 0-2-2-3-3-3-3-3-4-6-5-4-4-5-6-5-2-4-3-3 0-4-4-6-6-6-3-7
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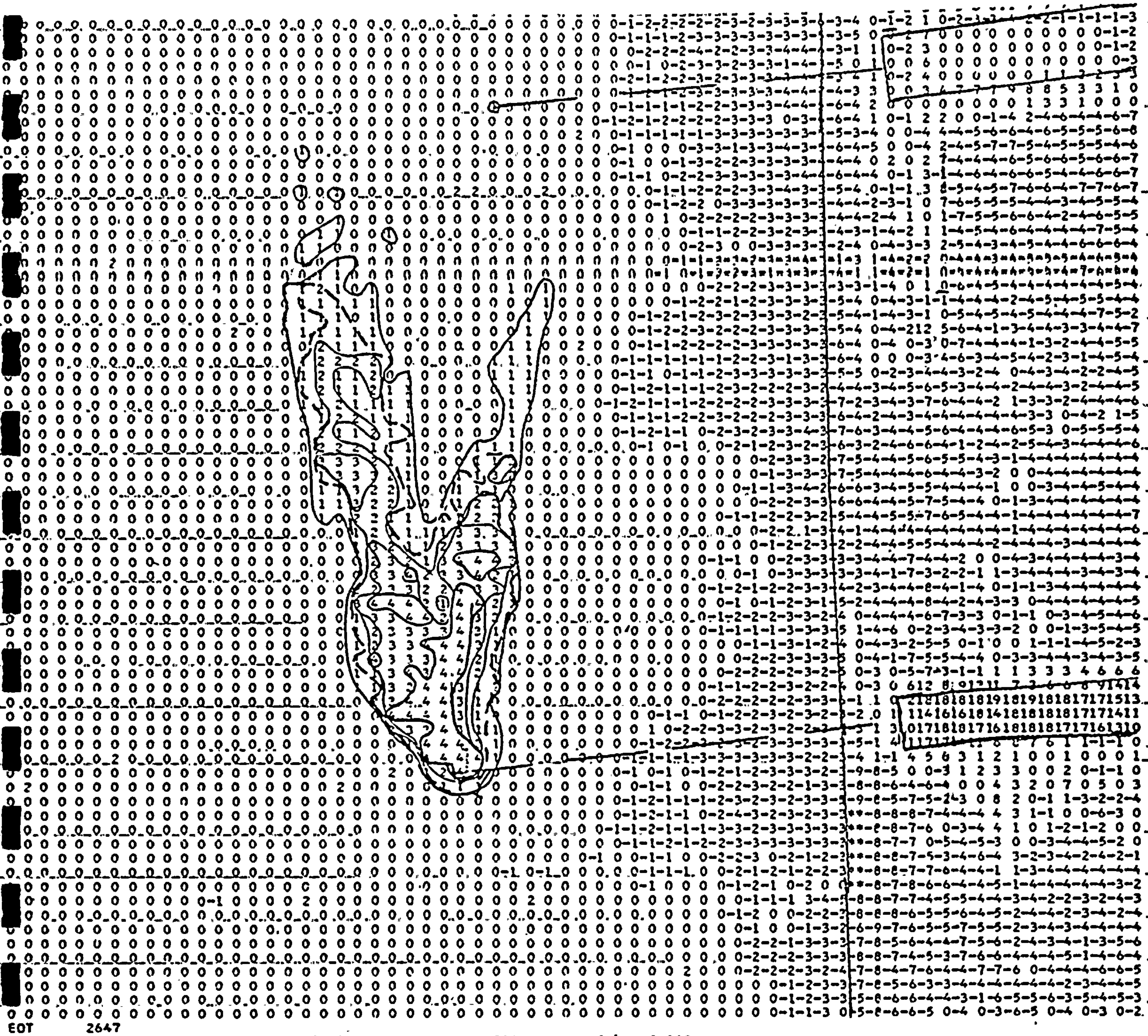

EOT 2647

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15.6 ACRES AREA 1½° ΔT BNUWARNER?