

DCS

AUG 05 1991

Docket No. 50-29

Yankee Atomic Electric Company  
ATTN: Mr. Jay K. Thayer  
Vice President and  
Manager of Operations  
580 Main Street  
Bolton, Massachusetts 01740-1398

Dear Mr. Thayer:

Subject: FEMA ANALYSIS OF THE PROMPT ALERT AND NOTIFICATION  
SYSTEM FOR THE YANKEE ROWE NUCLEAR POWER STATION

This letter transmits the Federal Emergency Management Agency (FEMA) review of the "Yankee Nuclear Power Station Site-Specific Offsite Radiological Emergency Preparedness Alert and Notification System Quality Assurance Verification"

FEMA has determined that there is reasonable assurance that the alert and notification system at the Yankee Nuclear Power Station is adequate to promptly alert and notify the public in the event of a radiological emergency at the site.

If you have any questions concerning this matter, please contact Mr. Craig Conklin of my staff at (215) 337-5083.

Sincerely,  
Original Signed By:  
James H. Joyner  
James H. Joyner, Chief  
Facilities Radiological Safety and  
Safeguards Branch  
Division of Radiation Safety and  
Safeguards

Enclosure: As stated

OFFICIAL RECORD COPY

IE 35

9108210035 910805  
PDR ADOCK 05000029  
F PDR

(1)

AUG 05 1991

cc w/encl:

N. St. Laurent, Plant Superintendent

G. Papinic, Jr., Senior Project Engineer - Licensing

R. Hallisey, Dept. of Public Health, Commonwealth of Massachusetts

Yankee Service List

Public Document Room (PDR)

Local Public Document Room (LPDR)

Nuclear Safety Information Center (NSIC)

NRC Resident Inspector

Commonwealth of Massachusetts, SLO Designee

State of Vermont, SLO Designee

RECEIVED PUBLIC DOCUMENT ROOM

AUG 05 1991

bcc w/encl:

Region I Docket Room (with concurrences)

Management Assistant DRMA (w/o encl)

J. Joyner, DRSS

J. Rogge, DRP

N. Perry, SRI

H. Eichenholz, SRI - Vermont Yankee

J. Linville, DRP

K. Brockman, EDO

P. Sears, NRR

Conklin

  
8/5/91

Lazarus

  
8/5/91

Joyner

  
8/5/91

OFFICIAL RECORD COPY

YANKEE HEARING SERVICE LIST

Dr. Andrew C. Kadak  
President and Chief Executive Officer  
Yankee Atomic Electric Company  
580 Main Street  
Bolton, Massachusetts 01740-1398

Mr. Jay K. Thayer  
Vice President and Manager  
of Operations  
Yankee Atomic Electric Company  
580 Main Street  
Bolton, MA 01740-1398

Resident Inspector  
Yankee Nuclear Power Station  
U.S. Nuclear Regulatory Commission  
Post Office Box 28  
Monroe Bridge, Massachusetts 01350

Thomas Dignan, Esq.  
Lopes and Gray  
One International Place  
Boston, Massachusetts 02110-2624

Ms. Jane M. Grant  
Senior Engineer - License Renewal  
Yankee Atomic Electric Company  
580 Main Street  
Bolton, Massachusetts 01740-1398

Mr. John L. Lovering, Acting Director  
Director of Massachusetts  
Civil Defense Agency  
400 Worcester Road  
P. O. Box 1496  
Framingham, Massachusetts 01701

Robert M. Hallisey, Director  
Radiation Control Program  
Massachusetts Dept. of Public Health  
150 Tremont Street, 7th Floor  
Boston, Massachusetts 02111

Ms. Louise McCarren  
Commissioner  
Vermont Dept. of Public Service  
120 State Street, 3rd Floor  
Montpelier, Vermont 05602

Regional Administrator, Region I  
U.S. Nuclear Regulatory Commission  
475 Allendale Road  
King of Prussia, Pennsylvania 19406

Mr. N. N. St. Laurent  
Plant Superintendent  
Yankee Atomic Electric Company  
Star Route  
Rowe, Massachusetts 01367

YANKEE NUCLEAR POWER STATION  
SITE-SPECIFIC OFFSITE RADIOLOGICAL EMERGENCY  
PREPAREDNESS ALERT AND NOTIFICATION SYSTEM  
QUALITY ASSURANCE VERIFICATION

Prepared for

Federal Emergency Management Agency  
Washington, D.C. 20472  
Under Contract No. EMW-83-C-1217

April 3, 1991

YANKEE NUCLEAR POWER STATION  
SITE-SPECIFIC OFFSITE RADIOLOGICAL EMERGENCY  
PREPAREDNESS ALERT AND NOTIFICATION SYSTEM  
QUALITY ASSURANCE VERIFICATION

Prepared for

Federal Emergency Management Agency  
Washington, D.C. 20472  
Under Contract No. EMW-83-C-1217

April 3, 1991

*910521096*

## TABLE OF CONTENTS

I.	INTRODUCTION	1
	A. Identification	1
	1. Site Information	1
	2. Governments Within The 10-Mile Emergency Planning Zone	2
	B. Scope Of Review	2
	1. Emergency Plans For Offsite Response Organizations	2
	2. Alert And Notification System Design Report	5
	3. FEMA Evaluation Findings	6
II.	FINDINGS FOR EVALUATION CRITERION E.6	7
	A. Administrative Means Of Alerting (E.6.1, FEMA-43)	8
	B. Physical Means Of Alerting (E.6.2, FEMA-43)	13
	1. Sirens (E.6.2.1, FEMA-43)	13
	2. Tone Alert Radios (E.6.2.3, FEMA-43)	23
	3. Special Alerting (E.6.2.4, FEMA-43)	27
III.	FINDINGS FOR EVALUATION CRITERION N.1	29
IV.	FINDINGS FOR EVALUATION CRITERIA E.5, F.1, N.2, N.3, AND N.5	37
	REFERENCE LIST	38
	APPENDIX A: Topographical Profile Charts OSPM Topographical Input Data OSPM Siren Sound Pressure Level Input Data OSPM Meteorological Input Data OSPM Siren Sound Pressure Level Output Data	
	APPENDIX B: Sample Size Determination	

Yankee Nuclear Power Station  
Site-Specific Offsite Radiological Emergency  
Preparedness Alert And Notification System  
Quality Assurance Verification

Commonwealth Of Massachusetts

Town Of Buckland  
Town Of Charlemont  
Town Of Clarksburg  
Town Of Colrain  
Town Of Florida  
Town Of Hawley  
Town Of Heath  
Town Of Monroe  
City Of North Adams  
Town Of Rowe  
Town Of Savoy

State Of Vermont  
Town Of Halifax  
Town Of Readsboro  
Town Of Stamford  
Town Of Whitingham  
Town Of Wilmington

I. INTRODUCTION

A. Identification

1. Site Information

The Yankee Nuclear Power Station is located in the Town of Rowe in Franklin County, Massachusetts, on the east bank of the Deerfield River, less than a mile from the Vermont-Massachusetts border. The power

station site is approximately 48 miles north-northwest of Springfield, Massachusetts, and is situated at the bottom of a densely wooded, deep river valley in the hilly and forested Berkshire Hills region of western Massachusetts.<sup>1</sup>

## 2. Governments Within The 10-Mile Emergency Planning Zone

The emergency planning zone (EPZ) for the Yankee Nuclear Power Station is defined by a 10-mile-radius circle with the power station as the center point. The EPZ includes portions of the Commonwealth of Massachusetts and the State of Vermont, and all or portions of 16 municipalities.

The total EPZ population is approximately 24,435 persons. There is only one urban area, the City of North Adams, Massachusetts (1980 population 18,063), within the Yankee Nuclear Power Station EPZ. The remainder of this area is rural and contains several small communities with populations of less than 2,500.<sup>1,2</sup>

## B. Scope Of Review

### 1. Emergency Plans For Offsite Response Organizations

Yankee Atomic Electric Company's "Final Analysis Report of the Alert and Notification Systems for Yankee (Rowe) EPZ"<sup>3</sup> (hereinafter referred to as the Design Report) describes the public alert and notification system utilized in this quality assurance verification review. Portions of the radiological emergency response plans for the Commonwealth of

Massachusetts and the State of Vermont that are applicable to this review are:

- . Commonwealth of Massachusetts, Massachusetts Comprehensive Emergency Response Plan; Appendix 3, "Radiological Emergency Response Plan for Fixed Site Nuclear Facilities," (draft, dated September, 1989);<sup>4</sup> and
- . State of Vermont, "Vermont Radiological Emergency Response Plan (Fixed Facility)," Revised March, 1984.<sup>5</sup>

The local emergency plans for the Massachusetts towns within the Yankee Nuclear Power Station EPZ used in this review include the following municipalities:

- . Town of Buckland, "Radiological Emergency Response Plan, Town of Buckland," Approved by the Commonwealth of Massachusetts in August, 1990;<sup>22</sup>
- . Town of Charlemont, "Radiological Emergency Response Plan, Town of Charlemont," approved by the Commonwealth of Massachusetts in August, 1990;<sup>23</sup>
- . Town of Clarksburg, "Radiological Emergency Response Plan, Town of Clarksburg," approved by the Commonwealth of Massachusetts in August, 1990;<sup>24</sup>
- . Town of Colrain, "Radiological Emergency Response Plan, Town of Colrain," approved by the Commonwealth of Massachusetts in August, 1990;<sup>6</sup>

- . Town of Florida, "Radiological Emergency Response Plan, Town of Florida," approved by the Commonwealth of Massachusetts in August, 1990;<sup>25</sup>
- . Town of Hawley, "Radiological Emergency Response Plan, Town of Hawley," approved by the Commonwealth of Massachusetts in August, 1990;<sup>26</sup>
- . Town of Heath, "Radiological Emergency Response Plan, Town of Heath," approved by the Commonwealth of Massachusetts in August, 1990;<sup>7</sup>
- . Town of Monroe, "Radiological Emergency Response Plan, Town of Monroe," approved by the Commonwealth of Massachusetts in August, 1990;<sup>27</sup>
- . City of North Adams, "Radiological Emergency Response Plan, City of North Adams," approved by the Commonwealth of Massachusetts in August, 1990;<sup>28</sup>
- . Town of Rowe, "Radiological Emergency Response Plan, Town of Rowe," approved by the Commonwealth of Massachusetts in September, 1990;<sup>29</sup>
- . Town of Savoy, "Radiological Emergency Response Plan, Town of Savoy," approved by the Commonwealth of Massachusetts in August, 1990;<sup>30</sup>

The local emergency plans for the Vermont towns within the Yankee Nuclear Power Station EPZ used in this review include the following municipalities:

- . Town of Stamford, "Radiological Emergency Response Plan, Town of Stamford," approved by the State of Vermont on February 28, 1991;<sup>17</sup>
- . Town of Whitingham, "Radiological Emergency Response Plan, Town of Whitingham," approved by the State of Vermont on March 4, 1991;<sup>18</sup>
- . Town of Halifax, "Radiological Emergency Response Plan, Town of Halifax," approved by the State of Vermont on November 13, 1990;<sup>19</sup>
- . Town of Readsboro, "Radiological Emergency Response Plan, Town of Readsboro," approved by the State of Vermont on October 29, 1990;<sup>20</sup>
- . Town of Wilmington, "Radiological Emergency Response Plan, Town of Wilmington," approved by the State of Vermont on January 11, 1991;<sup>21</sup>

References 3 through 7 and 17 through 30 document the administrative means established for notifying and providing prompt instructions to the public within the Yankee Nuclear Power Station EPZ.

2. Alert And Notification System Design Report

The physical means established for alerting the public within the Yankee Nuclear Power Station EPZ are documented in Section E.6.2 and Appendices 2 through 7 of the Design Report.

### 3. FEMA Evaluation Findings

FEMA Region I and the Regional Assistance Committee have evaluated the following offsite emergency preparedness exercises and remedial exercise for the Yankee Nuclear Power Station:

- . FEMA, "Final Exercise Report, Joint State and Local Radiological Emergency Response Exercise for the Yankee Rowe Nuclear Power Station - Rowe, Massachusetts, March 25, 1982," August 23, 1982;<sup>8</sup>
- . FEMA, "Final Exercise Report, Joint State and Local Radiological Emergency Response Exercise for the Yankee Nuclear Power Station, Rowe, Massachusetts, April 6, 1983," September 26, 1983;<sup>9</sup>
- . FEMA, "Joint State and Local Radiological Emergency Response Exercise for the Yankee Nuclear Power Station, Rowe, Massachusetts, August 22, 1984," November 30, 1984;<sup>10</sup>
- . FEMA, "Corrective Action Report, Addendum to the 1984 Yankee-Rowe Exercise Report," January 7, 1985 (Remedial exercise of December 18, 1984);<sup>11</sup>
- . FEMA, "Joint State and Local Radiological Emergency Response Exercise for the Yankee Nuclear Power Station, Rowe, Massachusetts, June 11, 1986," August 18, 1987;<sup>15</sup> and
- . FEMA, "Joint State and Local Radiological Emergency Response Exercise for the Yankee Nuclear Power Station, Rowe, Massachusetts, April 26, 1988," August 23, 1990;<sup>16</sup>

## II. FINDINGS FOR EVALUATION CRITERION E.6

The Design Report describing the alert and notification system for the Yankee Nuclear Power Station was reviewed against evaluation criterion E.6 and Apper lix 3 of NUREG-0654/FEMA-REP-1, Revision 1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants" (hereinafter referred to as NUREG-0654/FEMA-REP-1, Rev. 1). This evaluation criterion states:

Each organization shall establish administrative and physical means, and the time rsquired for notifying and providing prompt instructions to the public within the plume exposure pathway Emergency Planning Zone. (See Appendix 3.) It shall be the licensee's responsibility to demonstrate that such means exist, regardless of who implements this requirement. It shall be the responsibility of the State and local governments to activate such a system.<sup>12</sup>

The bases for review against this evaluation criterion were the corresponding acceptance criteria of FEMA-43, "Standard Guide for the Evaluation of Alert and Notification Systems for Nuclear Power Plants"<sup>13</sup> (hereinafter referred to as FEMA-43). This quality assurance verification review was performed to make a determination of the alert and notification system adequacy prior to conducting a demonstration of this system for the Yankee Nuclear Power Station on August 29, 1985.

Based upon this quality assurance verification review and public survey results, ERCE (formerly International Energy Associates Limited) concludes that the design and implementation of the alert and notification system for the Yankee Nuclear Power Station and its supporting procedures conformed sufficiently to the acceptance criteria, as stated

in FEMA-43, for evaluation criterion E.6 of NUREG-0654/FEMA-REP-1, Rev. 1, to support a FEMA finding that the alert and notification system is adequate.

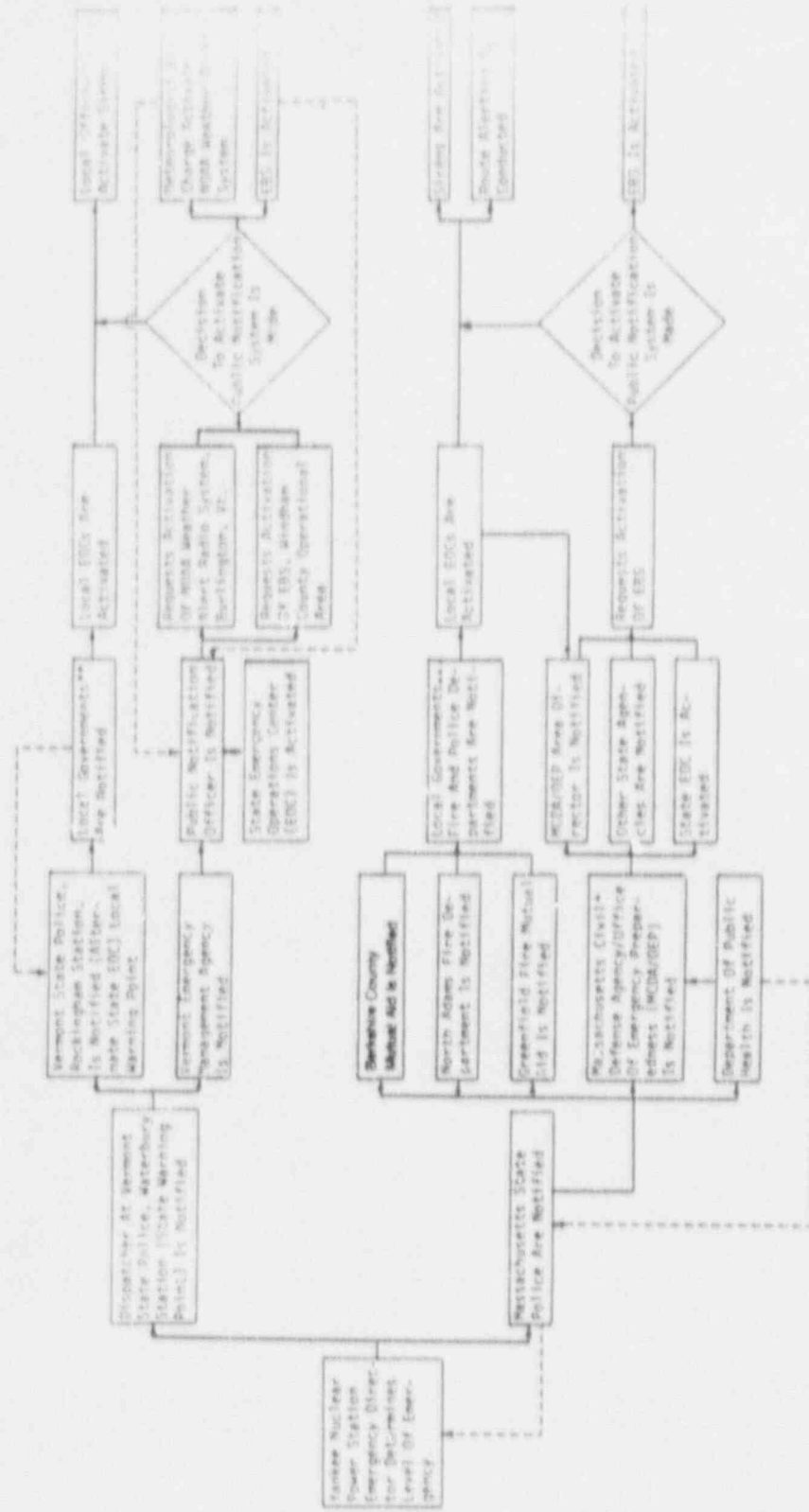
This portion of the quality assurance verification review evaluates the Yankee Nuclear Power Station's alert and notification system against FEMA-43 acceptance criteria in the following areas: the administrative means of alerting, the physical means of alerting, and the special alerting methods.

A. Administrative Means Of Alerting (E.6.1, FEMA-43)

The Design Report gives a general overview of those organizations and individuals within the state and local governments who are responsible for recommending the activation of the Yankee Nuclear Power Station public alert and notification system. The decision logic as shown in Figure 1 was developed from a review of the current emergency procedures and implementing instructions for the Commonwealth of Massachusetts and the State of Vermont. Additionally, emergency procedures and implementing instructions were reviewed for the local governments within the Commonwealth of Massachusetts and the State of Vermont.

As Figure 1 indicates, these procedures satisfy FEMA-43 acceptance criteria. The current documentation specifies the public alert and notification process from the time the message is conveyed from officials of the Yankee Nuclear Power Station to the states and local emergency response organizations to the local fire departments, who have responsibility for physically activating the sirens.

FIGURE 1  
 YANKEE NUCLEAR POWER STATION  
 ALERT AND NOTIFICATION SYSTEM ACTIVATION/ACTION SEQUENCE DIAGRAM



\*Coordination of response

\*\*Commonwealth of Massachusetts: Buckland, Chatham, Clarkburg, Colville, Florida, Heath, Haverhill, Housatonic, North Adams, South Adams, and Taunton.  
 State of Vermont: Addison, Bennington, St. Albans, Winochee, and Williston

In the event of a radiological emergency at the Yankee Nuclear Power Station, the station's Emergency Director determines the emergency classification and notifies the state warning points, which are the Massachusetts State Police and the Vermont State Police. This initial notification is communicated by means of a microwave net known as the Nuclear Alert System, WESCOM SS-4A. Commercial telephone is utilized as a back-up system, if necessary. Verification of the emergency notification is required only if the notification is received by means other than the Nuclear Alert System.

In the State of Vermont, the State Police at the Waterbury Station notify the local warning point, which is the State Police, Rockingham Station. The local warning point then notifies the appropriate local governments and organizations. At this time, state personnel are dispatched, at the direction of the State Police, Waterbury Station, to notify any local governments not reached by electronic means. The State Police also notify the Vermont Emergency Management Agency's Director and Deputy Director. The Deputy Director of Emergency Management directs the Emergency Management Communications Officer to act as Public Notification Officer. The Public Notification Officer is responsible for activation of the state Emergency Operations Center (EOC).

At the direction of the Vermont Emergency Management Agency, the Public Notification Officer contacts the National Oceanic and Atmospheric Administration (NOAA) Weather Alert Radio System control station (National Weather Service [NWS], Burlington, Vermont) and requests activation of the system. An unlisted NWS commercial telephone number is used in contacting the NWS.

The Public Notification Officer also contacts the area's primary Emergency Broadcast System (EBS) station, WTSA-WMMJ/FM, Brattleboro, Vermont, and requests activation of the EBS for the Windham County Operational Area. The station is initially notified by automatic dialer from the State Police, Rockingham Station, alerting the EBS to stand by. The station is later notified by the Public Notification Officer via either the Centrex line or commercial telephone and is given instructions for the broadcast of appropriate messages. Station WTSA-WMMJ/FM (Common Program Control Station - CPCS-1) is equipped with auxiliary power generation and a series of taped messages for different emergency classifications. The CPCS of each state immediately activates other primary radio stations to assist in broadcasting emergency messages and instructions.

In the Commonwealth of Massachusetts, the State Police immediately notifies the Massachusetts Civil Defense Agency and the Office of Emergency Preparedness (MCDA/OEP), the Department of Public Health (DPH), the Greenfield Fire Mutual Aid, and the North Adams and Berkshire County Fire Departments via commercial telephone, with beeper and civil defense radio back-up capability. Upon receipt of the emergency notification, a DPH official calls Yankee Nuclear Power Station's emergency control center on a dedicated, unlisted telephone to verify the notification and to receive other pertinent information. Local governments are notified by the Greenfield Fire Mutual Aid and the North Adams Fire Department and Berkshire County Mutual Fire Aids. Once the local EOC is activated, local officials notify the MCDA/OEP Area Director. Generally, it is the local police or fire department dispatcher who receives the initial notification. Each dispatcher makes confirmation

and proceeds to notify other designated local officials, usually through a beeper system and/or by telephone. Each Massachusetts community has unique procedures that are described in more detail in individual local radiological emergency response plans. Additionally, supplemental methods of alerting are used.

Once notification is conveyed to the appropriate officials at all levels, a decision is made regarding activation of the public alert and notification system, which includes fixed sirens, Weatheralert receivers, and mobile public address (PA) systems. The decision to activate the public alert and notification system rests with the affected state civil defense agencies through a coordinated effort between those agencies. Physical activation of the sirens is the responsibility of the local fire departments in municipalities in which sirens are utilized in the alerting process.

Prepared messages are stored at both the NWS station and the primary EBS station. During an actual emergency, EBS tone alert radios are monitored at the News Media Center by designated state personnel to ensure that correct information is being disseminated to the public.

In the event of a fast-breaking emergency, the Massachusetts and Vermont State Police and/or the Massachusetts Civil Defense Agency and Vermont Emergency Management Agency directly notify the primary EBS station and the NOAA Weather Alert Radio System and request that they provide advisory information to the public. Coordination is not required during a fast-breaking emergency. Simultaneously, the State Police of both Massachusetts and Vermont notify the local emergency

response organizations and direct them to activate the public alert and notification system.

FEMA exercise evaluations (references 8, 9, 10, 15, and 16) have demonstrated that the administrative mechanisms are in place to provide prompt notification to the general public in the event of an emergency situation at the Yankee Nuclear Power Station.

B. Physical Means Of Alerting (E.6.2, FEMA-43)

As described in the Design Report, the physical means of alerting for the Yankee Nuclear Power Station EPZ consists of 10 fixed siren units, approximately 3,500 tone alert receivers, and mobile PA units.

1. Sirens (E.6.2.1, FEMA-43)

The Yankee Nuclear Power Station siren alerting system, as submitted in the Design Report, was evaluated in accordance with the design evaluation methodology detailed in "Analysis of Siren System Pilot Test."<sup>14</sup>

The siren system as analyzed consists of 10 fixed sirens:

- 5 Federal Signal (FS) Thunderbolt Model 1000 (128 dBC);
- 3 FS Model STH10 (115 dBC);
- 1 FS Model 5 (112 dBC); and
- 1 FS Model 2 (104 dBC).

Anechoic-chamber measured octave band sound pressure spectrums (supplied by the siren manufacturer) were used to verify the rated output of all of the sirens.

Routine siren testing procedures and operability for the Yankee Nuclear Power Station have been reviewed and were determined to satisfy FEMA-43 requirements.

The evaluation of the siren system design calculation procedure was conducted by ascertaining the adequacy of the design procedure in the presence of site-specific topographical and meteorological conditions through comparisons of the design procedure with the Outdoor Sound Propagation Model (OSPM)<sup>14</sup> results for specific sirens.

The Yankee Nuclear Power Station siren alerting system design follows a field acoustic measurement process to account for site-specific effects and to determine the final siren coverages.

The licensee's siren coverage areas are depicted on maps in Appendix 3 of the Design Report. These siren coverage areas represent field survey results. The design report included this acoustical data plotted on the map. All of the areas on this map in which the measured siren sound pressure level was less than 12 dB above measured ambient were identified. The siren coverage contours were drawn by fitting the above outlined areas with boundary lines and compared to population density distributions within the Yankee Nuclear Power Station EPZ which were presented in Section E.6.2.1.1 of the Design Report.

The field surveys were conducted to determine the effective coverage of each siren. Effective coverage was defined as those areas with siren sound pressure levels at least 12 dB above the ambient, when both siren and ambient sound levels were measured in dBA. This criteria was stated as being conservative in that it incorporated the 10 dB differential as required in NUREG-0654/FEMA-REP-1, Rev. 1, and an additional 2 dB to account for the dBA to dBC conversion at the one-third octave band centered at the siren frequency of approximately 630 Hz.

The procedure the licensee used to measure the siren and the ambient sound levels and the correction of these sound levels from dBA to dBC is questionable in many respects. First, readings taken over a total time span of no more than 2 minutes cannot be expected to yield representative siren sound pressure levels at large distances and are certainly not representative of the ambient levels. Next, the correction of dBA readings by adding 2 dB to yield the dBC values cannot be readily accepted at face value since the actual results are critically dependent on the spectral composition of the ambient at the measurement spot; the proper measure is the one-third octave band filtered level as stated in FEMA-43. Last, field survey results presented in Appendix 3 of the Design Report cannot be readily interpreted because of the lack of monitoring location identification, and thus, determination cannot be made as to the validity of the 12 dB above ambient coverage contours as shown in Appendix 3 of the Design Report. For these reasons, this quality assurance verification review is conducted solely on a comparison of the FEMA criteria (60 dBC minimum coverage for populated areas with less

than 2,000 persons per square mile and 70 dBC minimum coverage for areas with 2,000 or more persons per square mile) with the coverage depicted on the maps in Appendix 3 of the Design Report.

Seven sirens, as depicted on the U.S. Geological Survey's North Adams quadrangle map (Figure 2 of this report), were selected for this quality assurance verification review. This selection (comprised of three FS 1000 sirens, one FS Model 2 siren, and three FS STH10 sirens) is representative of the site-specific topographical conditions around the more populated areas within the Yankee Nuclear Power Station EPZ.

Surface weather parameters, representative of site prevailing summer daytime conditions, were used in the OSPM calculations. Appendix A of this report contains OSPM topographical profile charts, OSPM topographical input, OSPM sound pressure level input, OSPM meteorological input, and OSPM sound pressure level output for each of the seven individual siren runs.

The predicted siren sound pressure levels vary and do not exhibit the usual smooth decay with distance, principally because of the varied terrain conditions within the Yankee Nuclear Power Station EPZ. To compare the ranging estimates of OSPM with the design procedure, the azimuths of the three FS 1000 sirens and the three FS STH10 sirens were classified into two categories according to terrain profiles: very hilly (major physical obstructions) and hilly (minor obstructions). Regressions of dBC versus the logarithm of distance were performed for the siren types over the two terrain categories.

# YANKEE SIREN CONTOUR PLDT

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

GEOPHYSICAL SURVEY

PHOTO INTERPRETATION  
MAPS AND PLANS  
WASHINGTON, D. C.



Map data were collected by the College of Forests,  
University of Vermont, and the Vermont State Forest  
Department, in cooperation with the U.S. Geological Survey.  
The data were collected in 1971. The map was prepared  
in 1972. The map is based on a 1:25,000 scale map  
of the area. The map is based on a 1:25,000 scale map  
of the area. The map is based on a 1:25,000 scale map  
of the area.

CONTAINING MAPS OF THE YANKEE SIREN CONTOUR  
PLDT AND THE 70 dBC CONTOUR

NORTH ADAMS MASS Vt  
1:25,000  
1972

The OSPM regression results of the siren sound pressure levels are presented in Figures 3 through 6 of this report. Also depicted is a 10 dB loss per distance doubled attenuation rate curve.

Several general observations can be made concerning the siren range comparisons. First, the 60 dBC and 70 dBC ranges for the FS 1000 sirens estimated by a 10 dB loss per distance doubled attenuation rate are conservative when compared to the OSPM results over hilly terrains, are only slightly conservative over very hilly terrains for 70 dBC, and are inadequate for 60 dBC over very hilly terrains. In the case of the smaller FS STH10 sirens, the 10 dB loss per distance doubled attenuation rate for both terrain categories is slightly conservative at 70 dBC and is inadequate at 60 dBC. Thus, additional attenuation considerations above and beyond the 10 dB loss per distance doubled attenuation rate are clearly necessary to account for terrain in the Yankee Nuclear Power Station EPZ.

The results of the individual OSPM runs were combined to generate a comprehensive overview of the siren sound pressure levels over the North Adams area as depicted in Figure 2 of this report. A surface interpolation and contouring program utilizing the output results of the seven sirens that influence the coverage in the area was used to generate the sound pressure level contour overlays. These contours account for site-specific topographical and meteorological effects.

FIGURE 3

COMPARATIVE OSPM RESULTS, HILLY TERRAIN (FS 1000 SIREN)

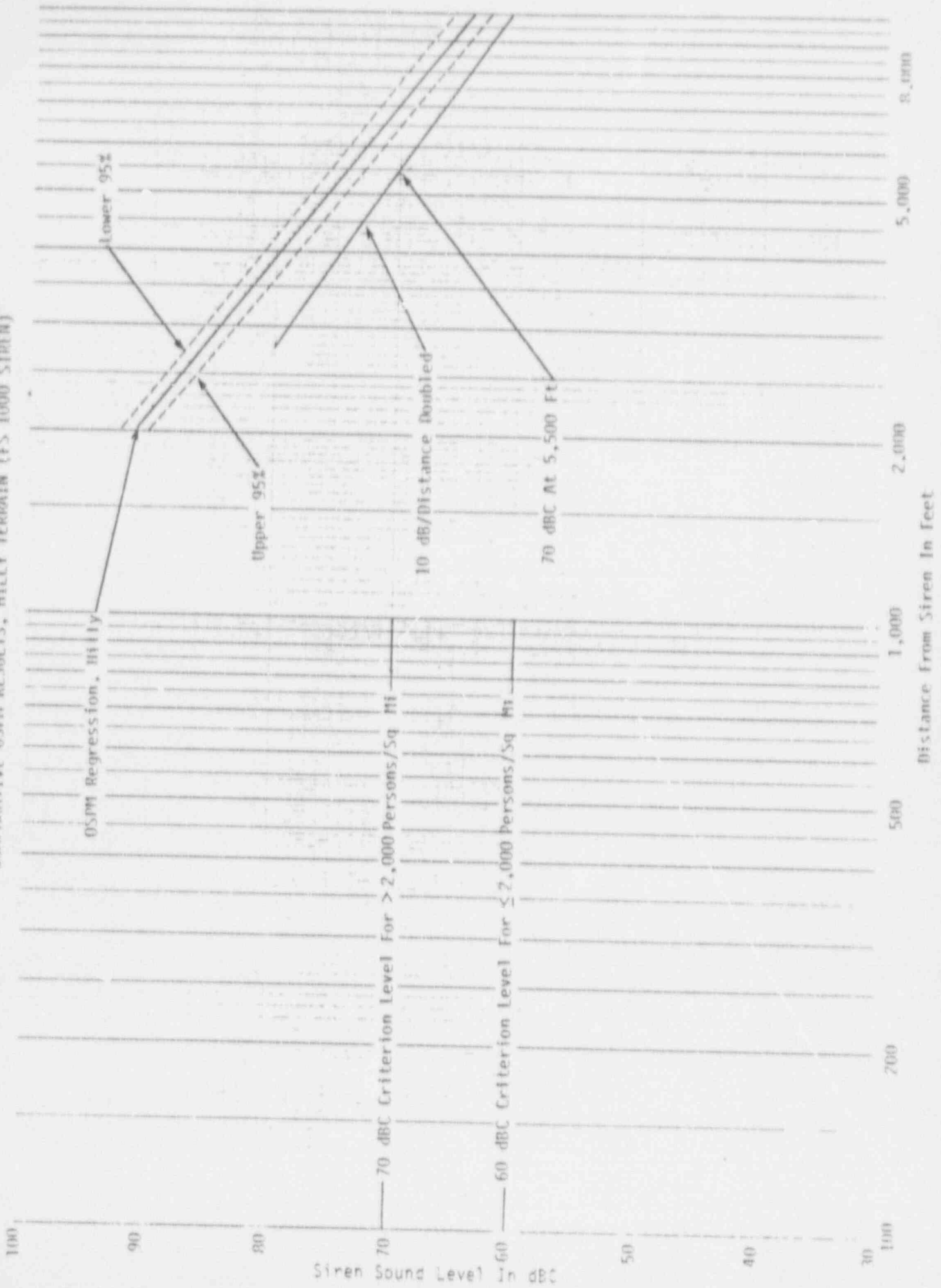


FIGURE 4

COMPARATIVE OSPM RESULTS, VERY HILLY TERRAIN (FS 1000 SIREN)

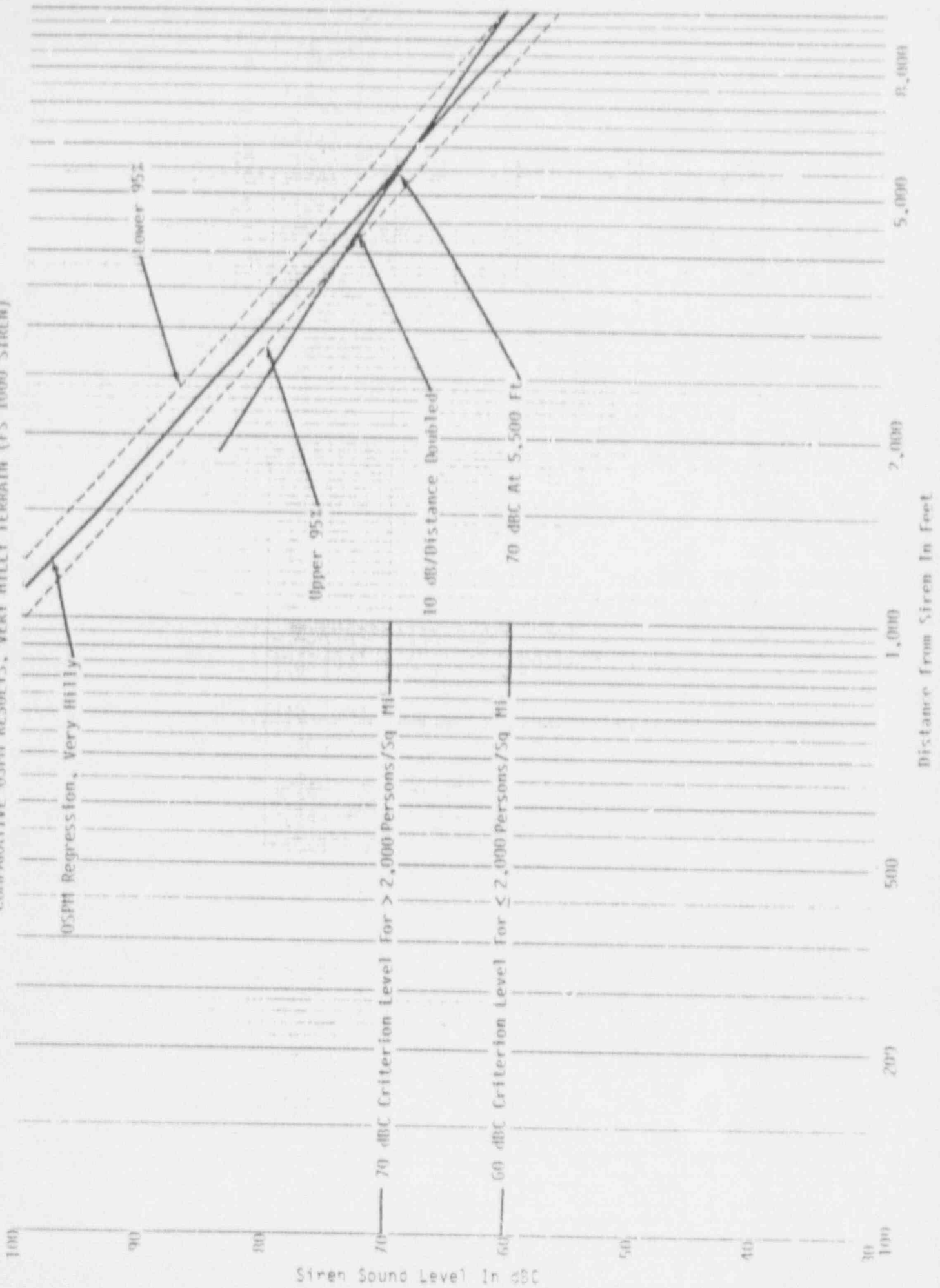


FIGURE 5

COMPARATIVE OSPM RESULTS, HILLY TERRAIN (FS 5TH 10 SIREN)

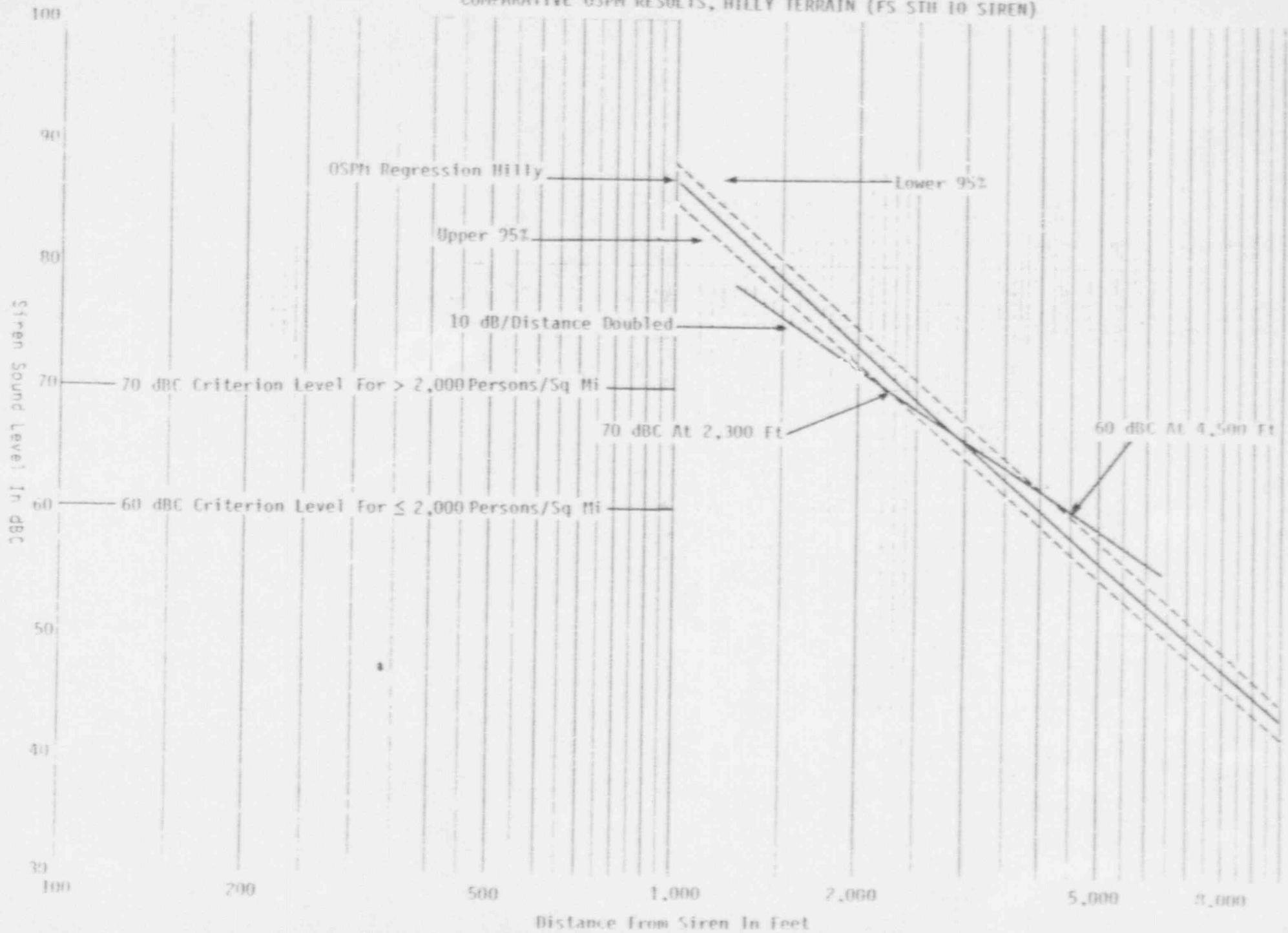
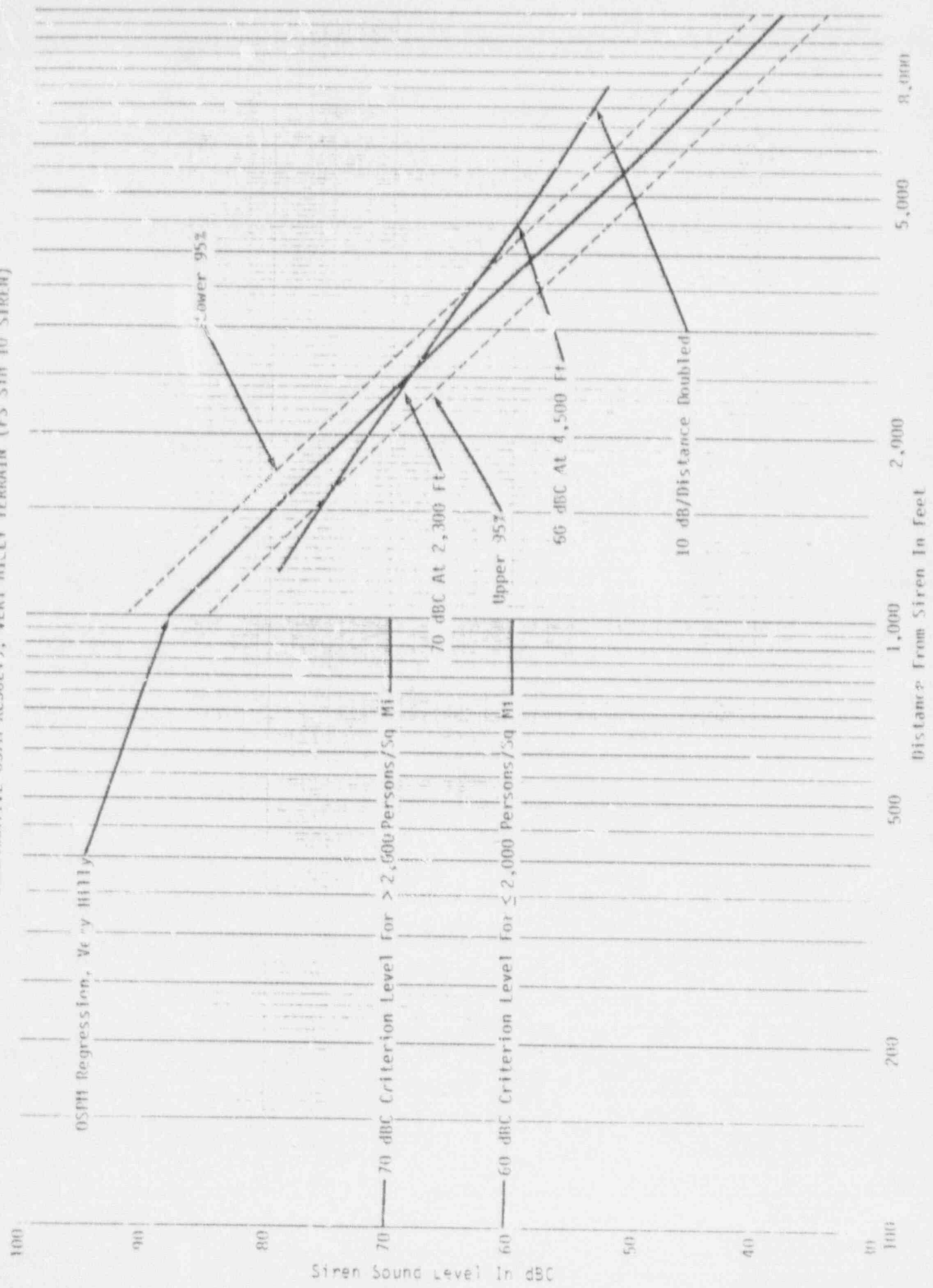


FIGURE 6  
 COMPARATIVE OSPM RESULTS, VERY HILLY TERRAIN (FS 5TH TO SIREN)



It was demonstrated by OSPM that essentially all of the populated areas within the EPZ of the USGS North Adams quadrangle map are expected to have a minimum siren sound pressure level of 60 dBC, and the area (City of North Adams) with more than 2,000 persons per square mile is expected to have a minimum siren sound pressure level of 70 dBC.

Comparisons of the OSPM-predicted 60 dBC and 70 dBC contours with the contours in the figures on pages 3-2-8 and 3-4-13 (Appendix 3) of the Design Report indicate that the coverage of the sirens as presented in the Design Report for North Adams is adequate.

Because the validity of the design process, as described earlier, could not be substantiated, the remaining Design Report's Appendix 3 siren coverage maps (pages 3-1-4 and 3-3-5) were compared with the OSPM-computed ranges to 60 dBC. The comparisons indicate that all Design Report coverages are adequate.

In conclusion, the Yankee Nuclear Power Station siren warning system is found to be adequate.

## 2. Tone Alert Radios (E.6.2.3, FEMA-43)

The second portion of the primary public alert and notification system for the Yankee Nuclear Power Station, as described in Section E.6.2.2 and Appendices 4 through 7 of the Design Report, is comprised of tone alert radios (referred to in the Design Report and hereinafter as Weatheralert receivers). The Weatheralert receivers (Model TA-45) provide both an initial alerting signal and an

instructional message to the portion of the EP2 population not within coverage of the sirens. These Weatheralert receivers are activated by a signal generated by a NOAA transmitter on Ames Hill, Marlboro, Vermont.

FEMA has developed guidelines as described in FEMA-43 that should be followed to maintain an effective and continual alert and notification program utilizing tone alert radios. These guidelines are as follows:<sup>13</sup>

- . The program should offer the tone alert radios to the public in geographical areas where needed and must make a "best-effort" attempt to place the radios. This program should include a record system (register) that contains an accurate list of addresses (names are optional) in geographical areas where tone alert radios are needed. Addresses where radios are offered to residents and refused by the residents should be noted.
- . A maintenance program offering operating checks should be available at least annually to all residences in areas where tone alert radios are needed. The maintenance program and the register program mentioned above may be integrated.
- . Tests of the tone alerting feature are desired at least monthly. The final determination of testing frequency will rest with appropriate local government officials. The results of these tests do not have to be monitored. The purpose of these tests is to offer the public a means to self-test their receivers.
- . Written guidance should accompany the radio. It should address (1) its general use, (2) self-testing frequency and method, (3) suggested placement to facilitate efficient monitoring, (4) the maintenance program, and (5) telephone numbers for repair or replacements. This information should be provided as a reminder to each tone alert radio holder annually. This public information program may also be integrated with the register and maintenance programs mentioned above.

- . Determination should be made that the broadcast medium for initiating the tone alert signal has adequate availability (24 hours a day, 7 days a week), signal strength, and signal quality.<sup>13</sup>

Distribution of the Weatheralert receivers is the overall responsibility of the Yankee Atomic Electric Company; however, local officials in each community using the receivers have assumed direct responsibility for distributing the receivers to the appropriate households. Communities within the Yankee Nuclear Power Station EPZ that use the Weatheralert receivers as their primary notification system are: Halifax, Stamford, Wilmington, Whitingham, and Readsboro, Vermont; and Florida, Savoy, Monroe, Rowe, Hawley, and Heath, Massachusetts. As a result, approximately 3,500 Weatheralert receivers were distributed to residences throughout the Yankee Nuclear Power Station EPZ. A member of each household signed an Equipment Loan Agreement form in triplicate, a copy of which was retained by the utility, the town, and the recipient. The utility's copy of these forms was used by the Yankee Atomic Electric Company to develop a computer list register for each town indicating the name, address, and telephone number of the recipient, and serial number of the receiver. Each town has a responsible official who maintains an up-to-date copy of the computer list, which is periodically returned to the Yankee Atomic Electric Company to use in updating its master copy.

In September 1983, Yankee Atomic Electric Company provided each recipient with a battery, a postcard with several questions regarding operating efficiency

of the receivers, and a copy of the revised written guidance, including a decal summarizing the operating instructions.

A continuing maintenance program has been established for the Weatheralert receivers issued to residences within the Yankee Nuclear Power Station EPZ. If a receiver fails to operate, the resident exchanges it with the appropriate local official as indicated on the decal accompanying the Weatheralert receiver. Each community is supplied with spare receivers for this purpose and for issuance to new residents within the community.

Testing of the Weatheralert receivers is conducted by the NWS every Wednesday between 11:00 a.m. and noon and is monitored by the office of HEW Communications, Inc. and several other 24-hour locations. In the event NWS fails to activate the test or if the test malfunctions, a representative of HEW Communications, Inc. will call NWS to determine the cause of the problem. After the problem has been identified, corrective action is taken immediately by HEW Communications, Inc. or NWS. Additionally, each receiver has a test button for self-testing purposes, according to the operating instructions and written guidance provided to each recipient of the Weatheralert receiver during the initial distribution phase.

The Weatheralert Model TA-45 receiver is an AC-powered, seven-channel receiver with an automatic battery back-up feature. The receiver is activated by a signal originating from the Ames Hill transmitter, which has redundant back-up circuitry and was installed to provide a link to the NWS Office in

Burlington, Vermont (24-hour operation). The frequency utilized specifically for the Yankee Nuclear Power Station EPZ is 162.425 MHz.

The tone alert system developed for the Yankee Nuclear Power Station, as described in the Design Report, meets FEMA-43 guidelines addressing tone alert radio systems.

3. Special Alerting (E.6.2.4, FEMA-43)

In addition to alerting the public by means of fixed sirens and Weatheralert receivers, local communities within the Yankee Nuclear Power Station EPZ have procedures in place to alert portions of the population that may not be covered by these two primary systems.

A mobile PA system is used as the primary means to alert the public in the Town of Buckland, Massachusetts. The mobile PA system is tested monthly and used on a daily basis.

A mobile PA system is also used in the Town of Charlemont, Massachusetts, as the primary means to alert approximately 10 families that do not have electricity.

The equipment was purchased from Federal Signal Corporation, Blue Island, Illinois. A complete mobile PA system consists of: a hook-on mounting kit, light bar, public address/siren, microphone, adapter-mike module, lip switch, speaker unit, and circuit breaker kit.

Transient populations at state parks, campgrounds, beaches, and boating areas are notified by means of mobile PA systems used by such organizations as the Massachusetts Department of Environmental Management, MCDA/OEP, the Vermont Agency of Environmental Conservation, other state personnel, and local response organizations.

Other supplemental alerting methods have been established in the event of an emergency at the Yankee Nuclear Power Station. Aerial notification is utilized in state parks in Massachusetts and is coordinated by MCDA/OEP with involvement by the Massachusetts Wing of the Civil Air Patrol and the U.S. Coast Guard. Door-to-door notification, if necessary, is conducted by local emergency response organizations. Certain utility-installed sirens, capable of two or more warning signals and voice, may be used to alert the public at specific areas such as beaches or parks.

Automatic telephones were installed in Stamford, Vermont, to alert approximately 15 families in the town that are without electricity. These telephones have the pre-set telephone numbers of all of these residents. This automatic telephone system can be considered supplemental to the siren system. In addition, the OSPM acoustical results indicate that siren CL3, located at the junction of Route 8 and Middle Road, provides at least 60 dBC coverage within the area identified on the U.S. Geological Survey's Stamford quadrangle map as the Town of Stamford.

### III. FINDINGS FOR EVALUATION CRITERION N.1

On August 29, 1985, the physical means (sirens, Weatheralert receivers, and mobile PA) used to alert the population within the Yankee Nuclear Power Station EPZ were demonstrated to satisfy the alert and notification aspects of Title 44 of the Code of Federal Regulations, Part 350.9(a) [44 CFR 350.9(a)]. This demonstration was conducted by using the methods specified in Section N.1.(a,b).2 of FEMA-43.<sup>13</sup> The results indicate that this portion of the alert and notification system evaluation is in conformance with FEMA-43 and NUREG-0654/FEMA-REP-1, Rev. 1.<sup>12</sup>

The August 29, 1985, demonstration of the Yankee Nuclear Power Station alerting system consisted of a triple activation of all sirens and Weatheralert receivers and a mobile PA demonstration as well as a subsequent telephone survey to estimate the proportion of EPZ households actually alerted. Siren and Weatheralert activations were initiated at approximately 7:00 p.m., 7:05 p.m., and 7:10 p.m. (Eastern Daylight Time). The mobile PA system began at approximately 7:00 p.m.

The telephone survey of EPZ residences began at approximately 7:13 p.m. (Eastern Daylight Time) and was completed within 1 hour and 5 minutes. This survey was conducted by 38 telephone interviewers, each with a separate WATS line and computer terminal.

The universe of households to be surveyed was determined by establishing a 10-mile-radius circle around the latitude and longitude of the plant. The sample incorporated a sorted master list of approximately 2,500 households (addresses and telephone numbers) within the established boundary.

A sufficient number of replicated subsamples were developed from the overall sample to ensure that the required number of telephone calls would be made, i.e., to establish the proportion of households alerted to within a 5% precision at a 95% confidence level. Appendix B of this report describes the methods used for sizing the sample to achieve this results.

The questionnaire used for the telephone survey is included as Figure 7 of this report.

As part of the telephone survey, 335 households believed to be within the Yankee Nuclear Power Station EPZ were contacted, and the responses were collected in an automated data base. Of this group, 101 respondents stated that they were not alerted. However, before running the final tabulations, addresses of all households interviewed were checked on a street map to validate their locations. Of the 335 addresses, 17 were outside the EPZ. Therefore, data were tabulated on the 318 respondent households that were located within the EPZ. Respondents at 48 of these households had been away from home at the time of the alerting system demonstration and, therefore, were not included in the alerting analysis. Of the remaining 270 households, 78.5% (212) indicated that they had been alerted during the demonstration. Using the estimated number of households within the EPZ (8,544 from references 1 and 2) in the confidence interval expression in Appendix B of this report, an estimated 95% confidence interval that ranges from 73.3% to 82.9% is yielded for the proportion of the total EPZ population alerted. In other words, at the 95% confidence level, between 73.3% and 82.9% of the households within the Yankee Nuclear Power Station EPZ would have stated that they were alerted by the siren, Weatheralert receiver, and mobile PA systems.

FIGURE 7

17930

Chilton Research Services  
Radnor, Pennsylvania

Study #9056  
August 29, 1985

OMB #3067-0103 (FEMA 9/85)  
FEMA NUCLEAR POWER PLANT ALERTING  
AND NOTIFICATION SYSTEM: PUBLIC TELEPHONE  
SURVEY

Yankee Rowe

Time Began \_\_\_\_\_ AM \_\_\_\_\_ PM Interview # \_\_\_\_\_  
Time Ended \_\_\_\_\_ AM \_\_\_\_\_ PM Zip Code \_\_\_\_\_ (1-5)  
Sample Type \_\_\_\_\_ (6-10)  
\_\_\_\_\_ (11)

RECORD BEFORE DIALING -Telephone #

(Area Code) (Exchange) (Number) (12-21)

INTRODUCTION:

Hello, my name is \_\_\_\_\_. We're calling households long distance from Chilton Research Services as part of a survey. This survey is sponsored by The Federal Emergency Management Agency (FEMA) of the United States Government. Your answers are voluntary and will be kept strictly confidential.

1. First of all, is this (REPEAT # DIALED)?

	Yes	1
TERMINATE AND DIAL AGAIN	No	2

2. As you may or may not know, there was a test of the public warning/alert notification system for the Yankee Rowe Nuclear Power Station. Did you, or any other member of this household, hear any type of emergency warning/alert signal from this test today?

33-

CONTINUE	Yes	1
SKIP TO Q. 4A	No	2
CONTINUE	Heard from another source	3
ASK IF ANY OTHER HOUSEHOLD MEMBER IS MORE KNOWLEDGEABLE	Don't Know	4

FIGURE 7 (CONTINUED)

3. What type of emergency test signal did you hear? DO NOT READ. CIRCLE ALL THAT APPLY

23-25

SKIP TO Q. 4	Siren (Probe for Type):	
	Large pole-mounted	1
	Police or Fire Vehicle	2
	Don't Know	3
	Tone alert radio	4
	Neighbor told me	5
	Other family member told me	6
	Other (SPECIFY) _____ _____ _____	9
CONTINUE	Don't Know	Y

3A. Did you hear . . . (READ LIST. CIRCLE ALL THAT APPLY)

(30-32)

	Large pole-mounted siren	1
	Police or Fire Vehicle Siren	2
	A tone alert radio	4
	From a neighbor	5
	From another family member	6
	Or by means of something else (SPECIFY) _____ _____ _____	9
DO NOT READ	Siren - Don't know type	3
	Don't Know	Y

FIGURE 7 (CONTINUED)

4. (IF "HEARD EMERGENCY SIGNAL" ASK Q. 4 BELOW; OTHERWISE SKIP TO Q. 4A)

Were you at home or away from home when you heard or were made aware of this emergency test signal?

37-

SKIP TO Q. 5	Home	1
	Away from home	2

4A. (IF "DID NOT HEAR EMERGENCY SIGNAL") Were you at home around 7:00 this evening?

38-

Yes	1
No	2
Don't Know	Y

4B. Has your household ever been issued a Tone Alert Radio?

39-

IF RESPONDENT WAS NOT HOME SKIP TO Q. 5, OTHERWISE ASK Q. 4C	Yes	1
	No	2
	Don't Know	Y

4C. Was it turned on at approximately 7:00 this evening?

40-

Yes	1
No	2
Don't Know	Y

5. Has your household ever received information which tells you what to do in the event of a "real" emergency at the Yankee Rowe Nuclear Power Station? This yellow booklet titled "Emergency Public Information" was mailed to you from your state - Civil Defense Agency and the Vermont Yankee Nuclear Power Corporation this January. Do you remember receiving this information?

41-

Yes	1
No	2
Don't Know	Y

FIGURE 7 (CONTINUED)

Because we need to determine whether or not you live within the 10 mile Emergency Planning Zone of the Yankee Rowe Nuclear Power Station, would you please give us this address? (PLEASE FOR ANSWER)

ADDRESS:

---

---

and the nearest intersection (or cross street) to this house.

---

Also, what community is this?

---

On behalf of Chilton Research Services and the Federal Emergency Management Agency, I would like to thank you for your time and for giving us this valuable information.

Respondents at the households issued Weatheralert receivers that reported that they were not alerted were asked whether their Weatheralert receivers were turned on and set so that an alerting signal could be received. Respondents at 20 households indicated that their Weatheralert receivers were not being operated in a manner that permitted receipt of an alerting signal. Thus, 84.8% of the households who were issued Weatheralert receivers and whose residents were home at the time of the demonstration had the receiver operating in a manner that permitted receipt of an alerting signal and reported that they were alerted.

Using the estimated number of households within the EPZ and the confidence interval expression in Appendix B of this report, a 95% confidence interval ranging from 79.9% to 88.7% is obtained for the proportion of the total EPZ population (excluding households that failed to operate their Weatheralert receiver in a manner that permitted receipt of an alerting signal) that would have stated that they were alerted by the Weatheralert receiver.

The sample of 318 households was also used to estimate the proportion of households within the EPZ that would have stated they received information about what to do in a real emergency at the Yankee Nuclear Power Station. Of these 318 households, 64.5% (205) responded that they had received the information, 32.7% (104) responded that they had not received the information, and 2.8% (9) did not know whether they had received the information. Using the approach discussed previously the following estimates for the entire EPZ population resulted (at the 95% confidence interval):

- Between 52.9% and 69.4% of the households would have reported receiving the information;

- . Between 27.9% and 37.9% of the households would have responded that they had not received the information; and
- . Between 1.5% and 5.2% of the households would not have known whether they had received the information.

In conclusion, no areas of the Yankee Nuclear Power Station siren, Weatheralert receiver, or mobile PA systems were identified as needing enhancements.

IV. FINDINGS FOR EVALUATION CRITERIA E.5, F.1, N.2, N.3, AND N.5

Those aspects of the alert and notification system addressing evaluation criteria E.5, F.1, N.2, N.3, and N.5 of NUREG-0654/FEMA-REP-1, Rev. 1, have been reviewed by FEMA, and the results are documented in several FEMA exercise reports, including FEMA's "Joint State and Local Radiological Emergency Response Exercise for the Yankee Nuclear Power Station, Rowe, Massachusetts, April 26, 1988," which was transmitted to the NRC by FEMA on August 23, 1990.<sup>16</sup>

REFERENCE LIST

1. Yankee Atomic Electric Company. 1974. "Yankee Nuclear Power Station Final Safety Analysis Report." January 3, 1974.
2. U.S. Department of Commerce, Bureau of the Census. 1983. 1980 Census of Population. Vol. 1, Ch. A, Part 1, "United States summary." PC80-1-A1. April 1983.
3. Yankee Atomic Electric Company. 1984. "Final Analysis Report of the Alert and Notification Systems for Yankee (Rowe) EPZ." April 1984.
4. Commonwealth of Massachusetts. Massachusetts Comprehensive Emergency Response Plan; Appendix 3, "Radiological Emergency Response Plan for Fixed Site Nuclear Facilities." (Draft, dated September, 1989).
5. State of Vermont. 1984. "Vermont Radiological Emergency Response Plan (Fixed Facility)." Revised March 1984.
6. Town of Colrain. 1982. "Radiological Emergency Response Plan, Town of Colrain." Approved by the Commonwealth of Massachusetts. August, 1990.
7. Town of Heath. 1982. "Radiological Emergency Response Plan, Town of Heath." Approved by the Commonwealth of Massachusetts. August, 1990.
8. Federal Emergency Management Agency. 1982. "Final Exercise Report, Joint State and Local Radiological Emergency Response Exercise for the Yankee Rowe Nuclear Power Station - Rowe, Massachusetts, March 25, 1982." August 23, 1982.
9. Federal Emergency Management Agency. 1983. "Final Exercise Report, Joint State and Local Radiological Emergency Response Exercise for the Yankee Nuclear Power Station, Rowe, Massachusetts, April 6, 1983." September 26, 1983.
10. Federal Emergency Management Agency. 1984. "Joint State and Local Radiological Emergency Response Exercise for the Yankee Nuclear Power Station, Rowe, Massachusetts, August 22, 1984." November 30, 1984.
11. Federal Emergency Management Agency. 1985. "Corrective Action Report, Addendum to the 1984 Yankee-Rowe Exercise Report." January 7, 1985 (Remedial Exercise of December 18, 1984).

12. Nuclear Regulatory Commission and Federal Emergency Management Agency. 1980. "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants." NUREG-0654/FEMA-REP-1. Revision 1. November 1980.
13. Federal Emergency Management Agency. 1983. "Standard Guide for the Evaluation of Alert and Notification Systems for Nuclear Power Plants." FEMA-43. September 1983.
14. International Energy Associates Limited. 1983. "Analysis of Siren System Pilot Test." IEAL-333. November 2, 1983.
15. Federal Emergency Management Agency. 1987. "Joint State and Local Radiological Emergency Response Exercise for the Yankee Nuclear Power Station, Rowe, Massachusetts, June 11, 1986." August 18, 1987.
16. Federal Emergency Management Agency. 1990. "Joint State and Local Radiological Emergency Response Exercise for the Yankee Nuclear Power Station, Rowe, Massachusetts, April 26, 1988." August 23, 1990.
17. Town of Stamford. 1991. "Radiological Emergency Response Plan, Town of Stamford." Approved by the State of Vermont. February 28, 1991.
18. Town of Whitingham. 1991. "Radiological Emergency Response Plan, Town of Whitingham." Approved by the State of Vermont. March 4, 1991.
19. Town of Halifax. 1990. "Radiological Emergency Response Plan, Town of Halifax." Approved by the State of Vermont. November 13, 1990.
20. Town of Readsboro. 1990. "Radiological Emergency Response Plan, Town of Readsboro." Approved by the State of Vermont. October 29, 1990.
21. Town of Wilmington. 1991. "Radiological Emergency Response Plan, Town of Wilmington." Approved by the State of Vermont. January 11, 1991.
22. Town of Buckland. 1990. "Radiological Emergency Response Plan, Town of Buckland." Approved by the Commonwealth of Massachusetts. August, 1990.
23. Town of Charlemont. 1990. "Radiological Emergency Response Plan, Town of Charlemont." Approved by the Commonwealth of Massachusetts. August, 1990.

24. Town of Clarksburg. 1990. "Radiological Emergency Response Plan, Town of Clarksburg." Approved by the Commonwealth of Massachusetts. August, 1990.
25. Town of Florida. 1990. "Radiological Emergency Response Plan, Town of Florida." Approved by the Commonwealth of Massachusetts. August, 1990.
26. Town of Hawley. 1990. "Radiological Emergency Response Plan, Town of Hawley." Approved by the Commonwealth of Massachusetts. August, 1990.
27. Town of Monroe. 1990. "Radiological Emergency Response Plan, Town of Monroe." Approved by the Commonwealth of Massachusetts. August, 1990.
28. City of North Adams. 1990. "Radiological Emergency Response Plan, City of North Adams." Approved by the Commonwealth of Massachusetts. August, 1990.
29. Town of Rowe. 1990. "Radiological Emergency Response Plan, Town of Rowe." Approved by the Commonwealth of Massachusetts. September, 1990.
30. Town of Savoy. 1990. "Radiological Emergency Response Plan, Town of Savoy." Approved by the Commonwealth of Massachusetts. August, 1990.

APPENDIX A

OSPM Topographical Profile Charts  
OSPM Topographical Input Data  
OSPM Siren Sound Pressure Level Input Data  
OSPM Meteorological Input Data  
OSPM Siren Sound Pressure Level Output Data

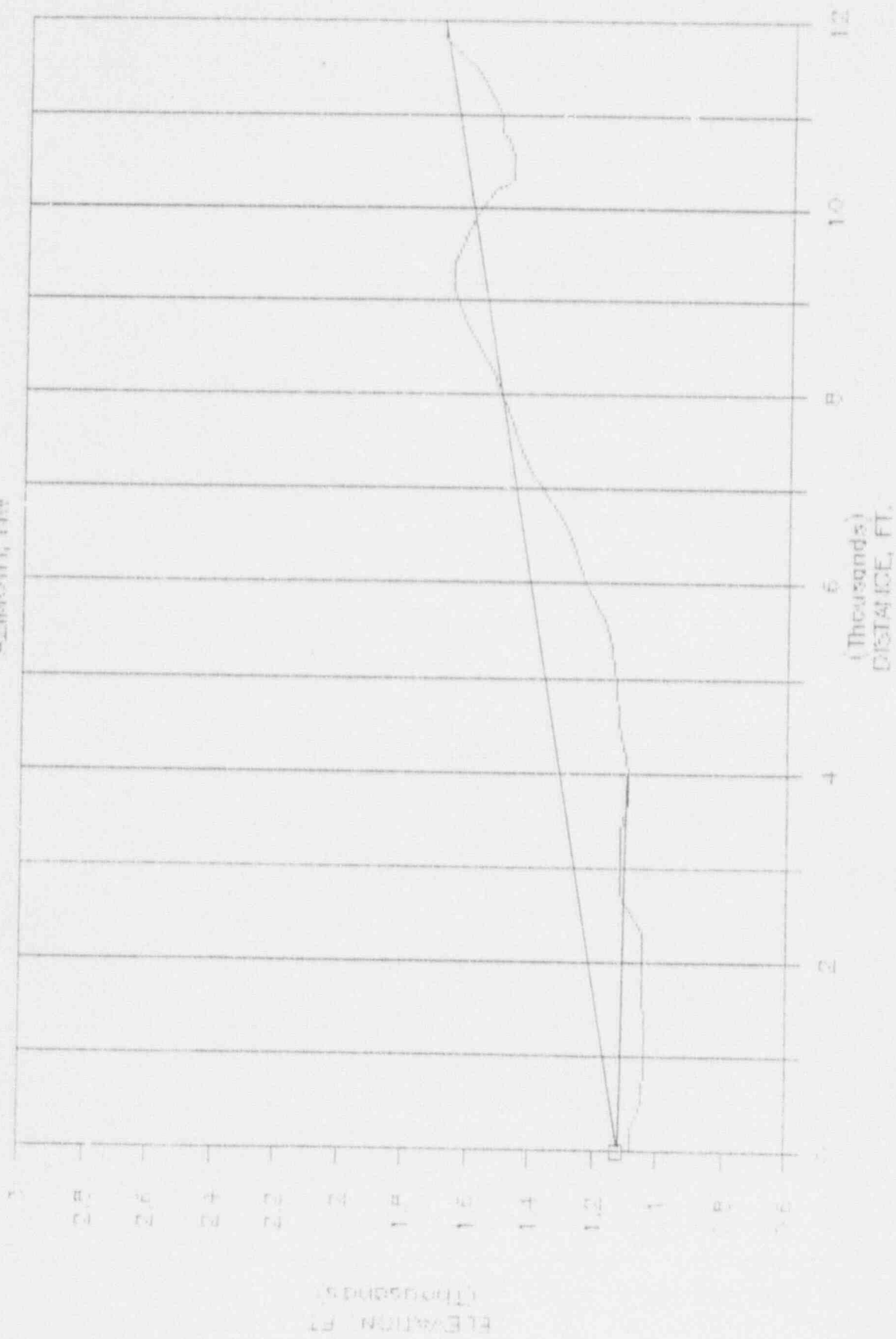
# YANKEE CL-1

AZIMUTH, N



# YANKEE CL-1

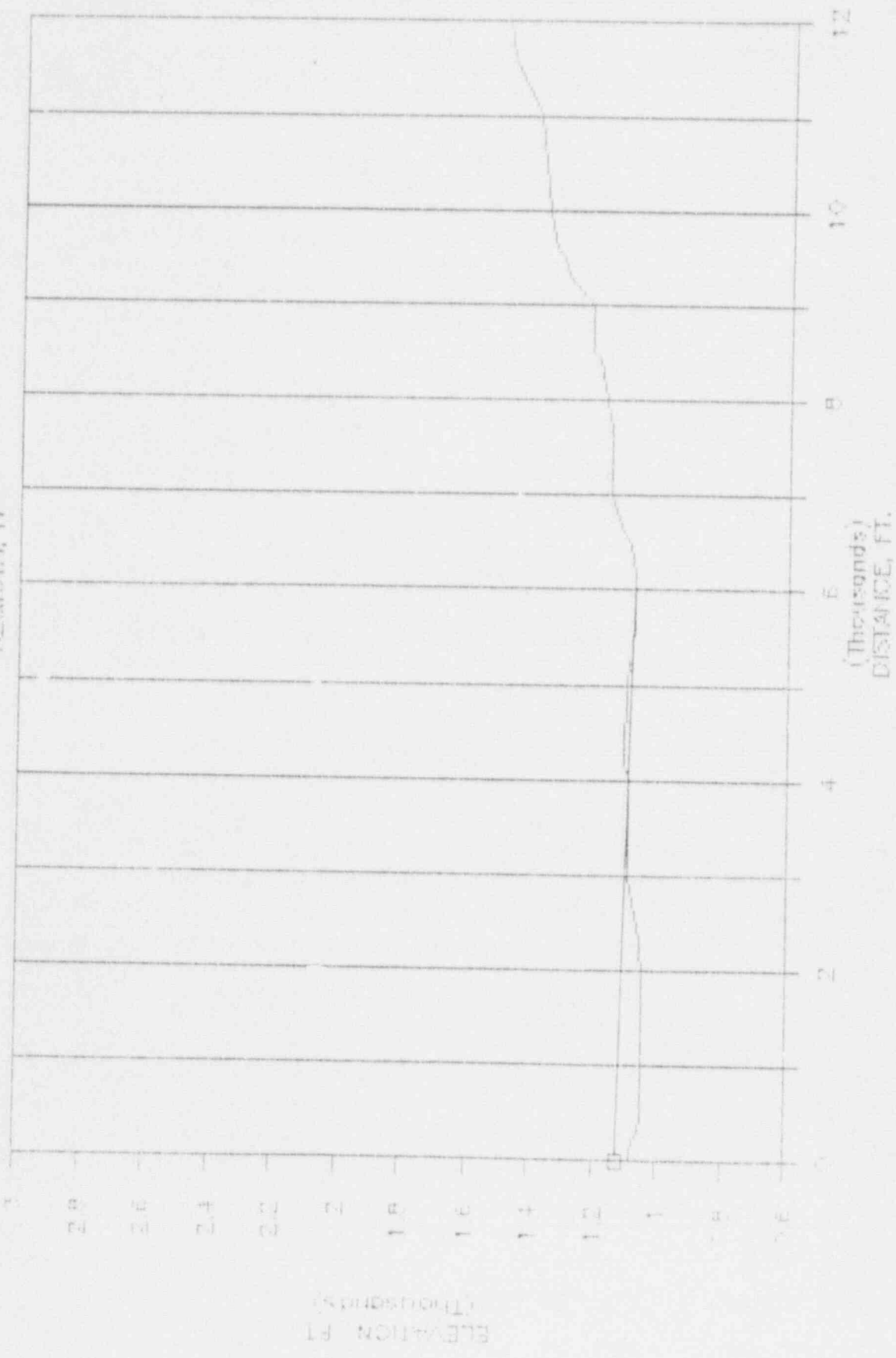
AZIMUTH, DEG



ELEVATION, FT  
(THOUSANDS)

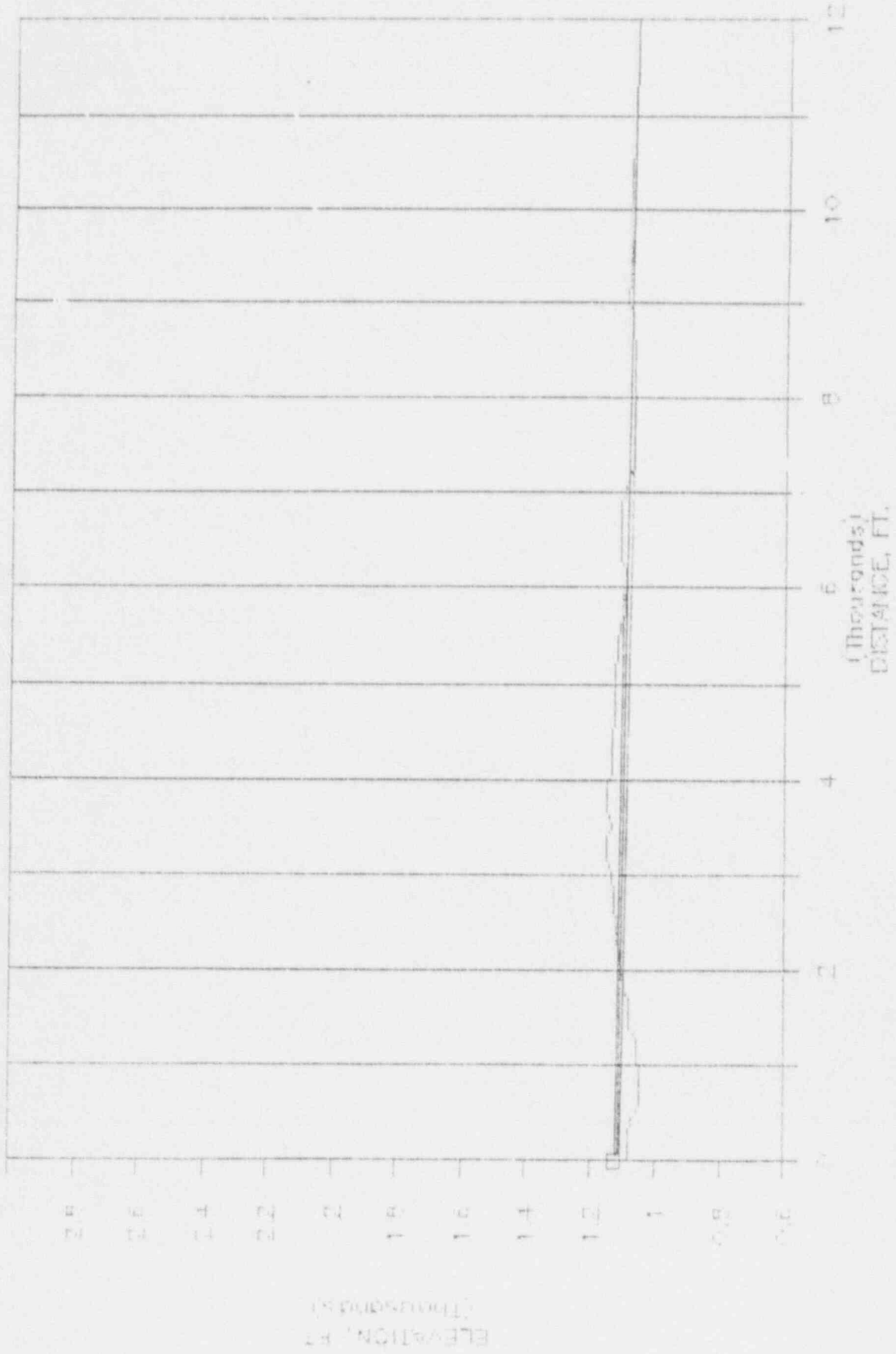
# YANKEE CL-1

AZMUTH, 0



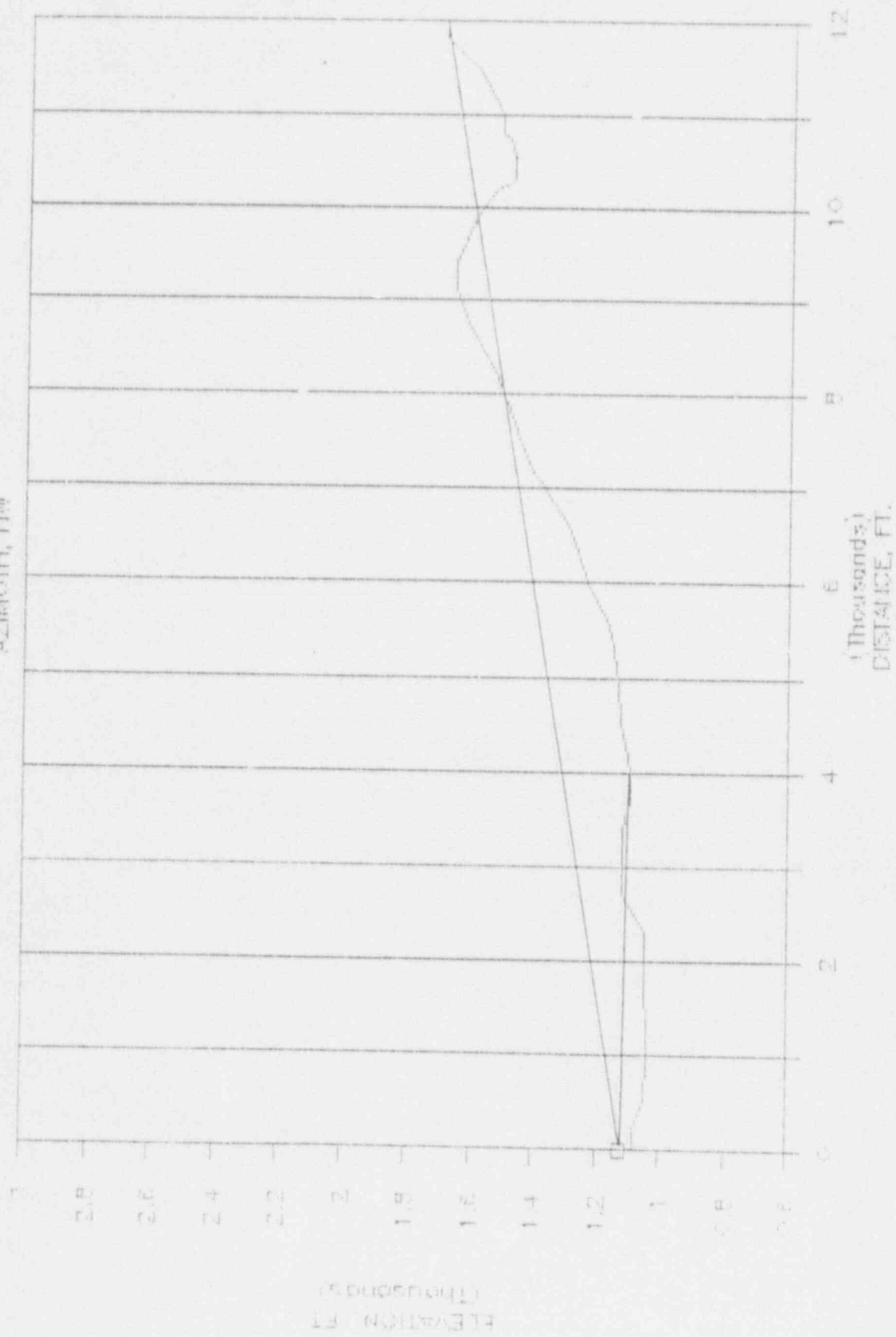
# YANFEE CL-1

AZIMUTH, THE



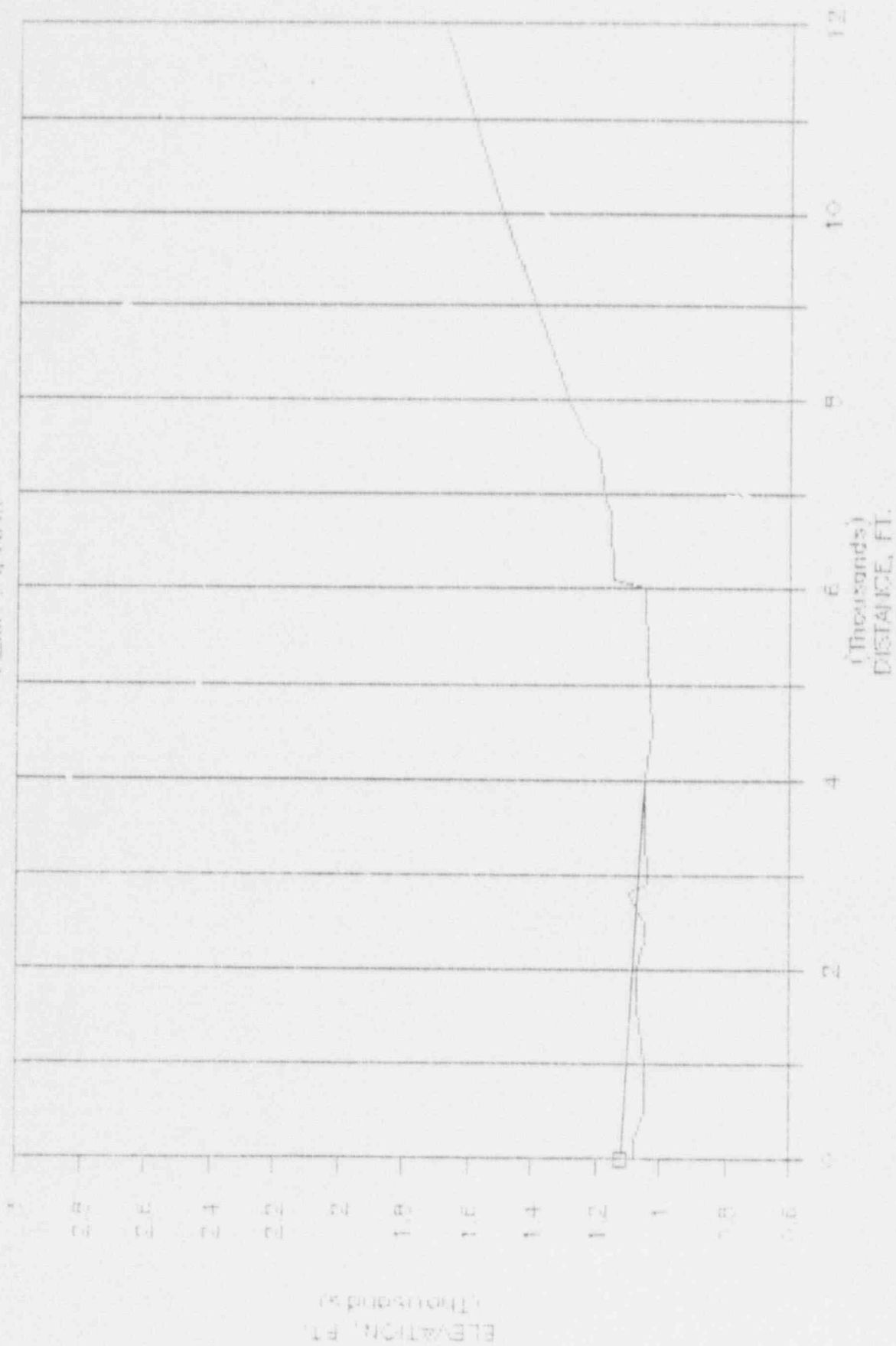
# YANKEE CL-1

AZIMUTH, 1100



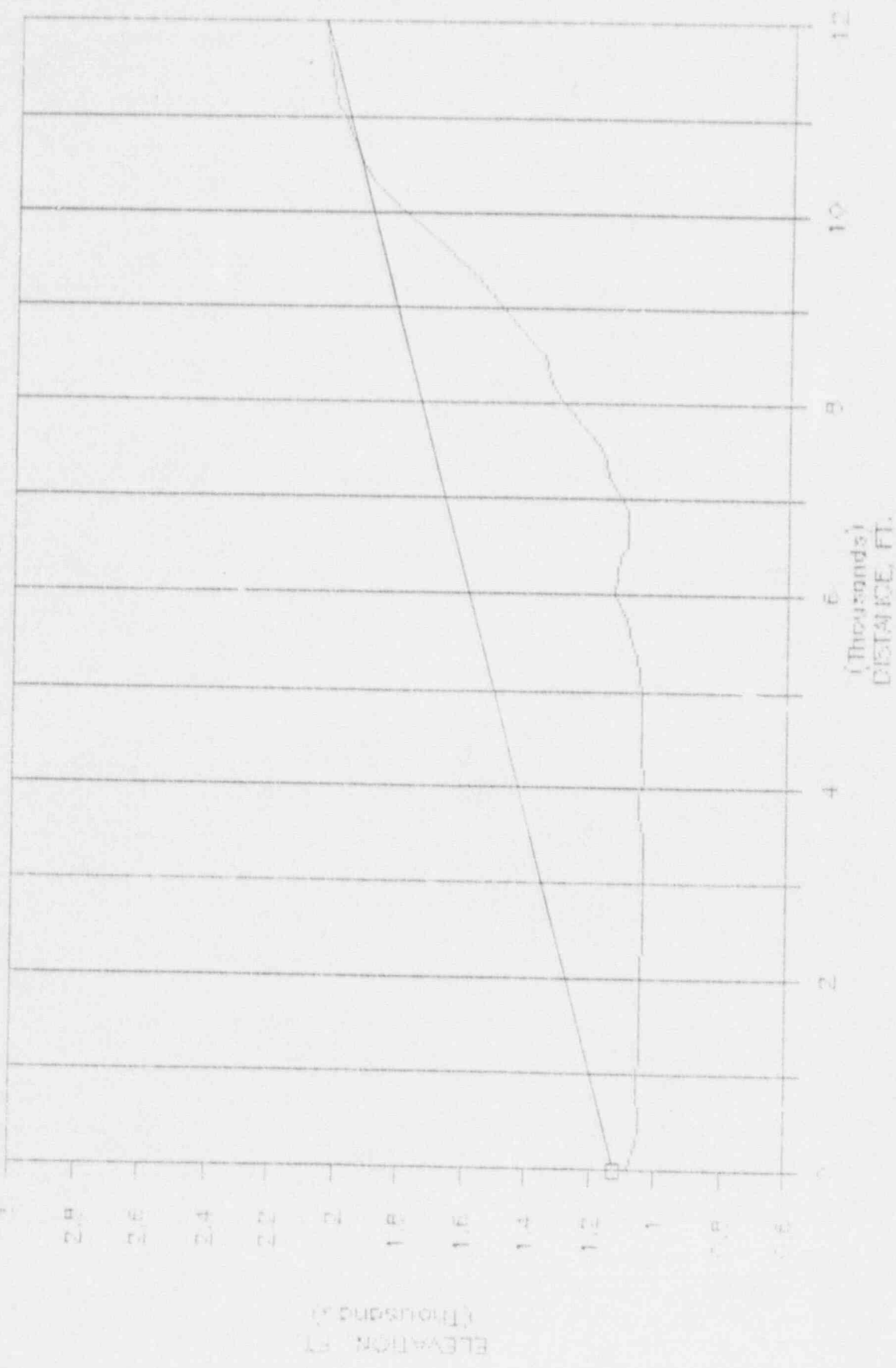
# YANKEE CL-1

AZIMUTH, 111 66



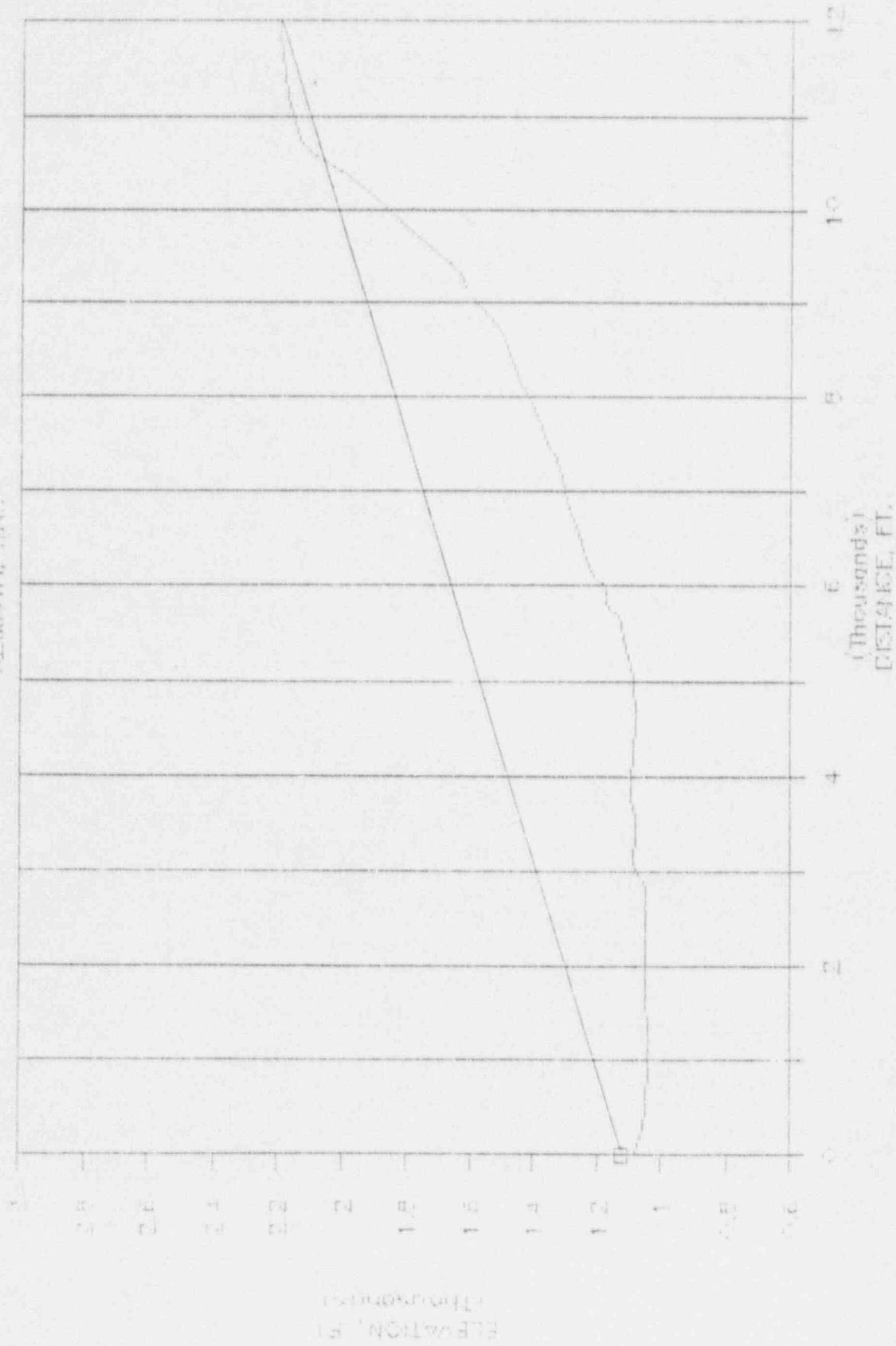
# YANKEE CL-1

AZIMUTH, W



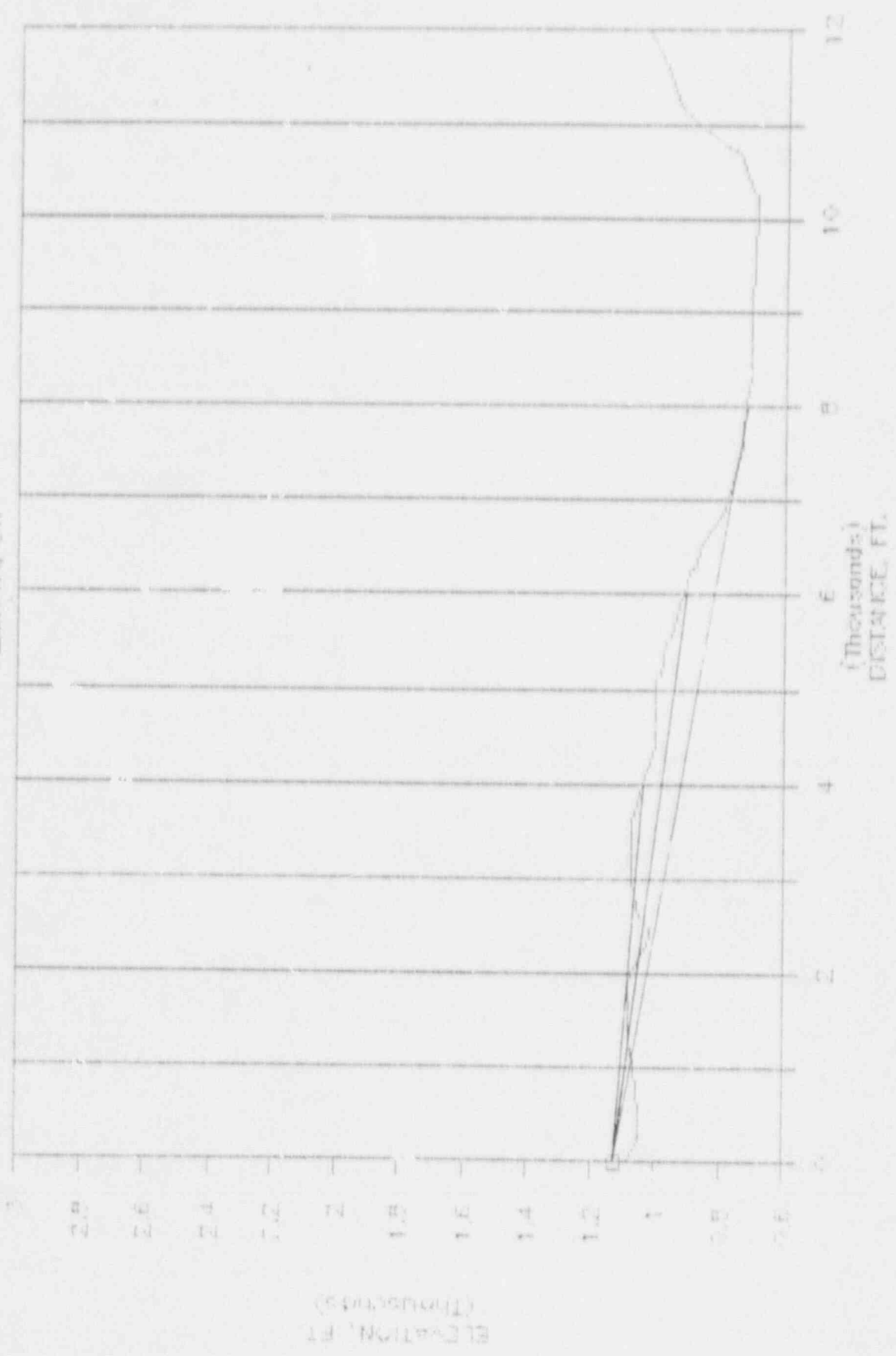
# YANKEE CL-1

AZIMUTH, 方位



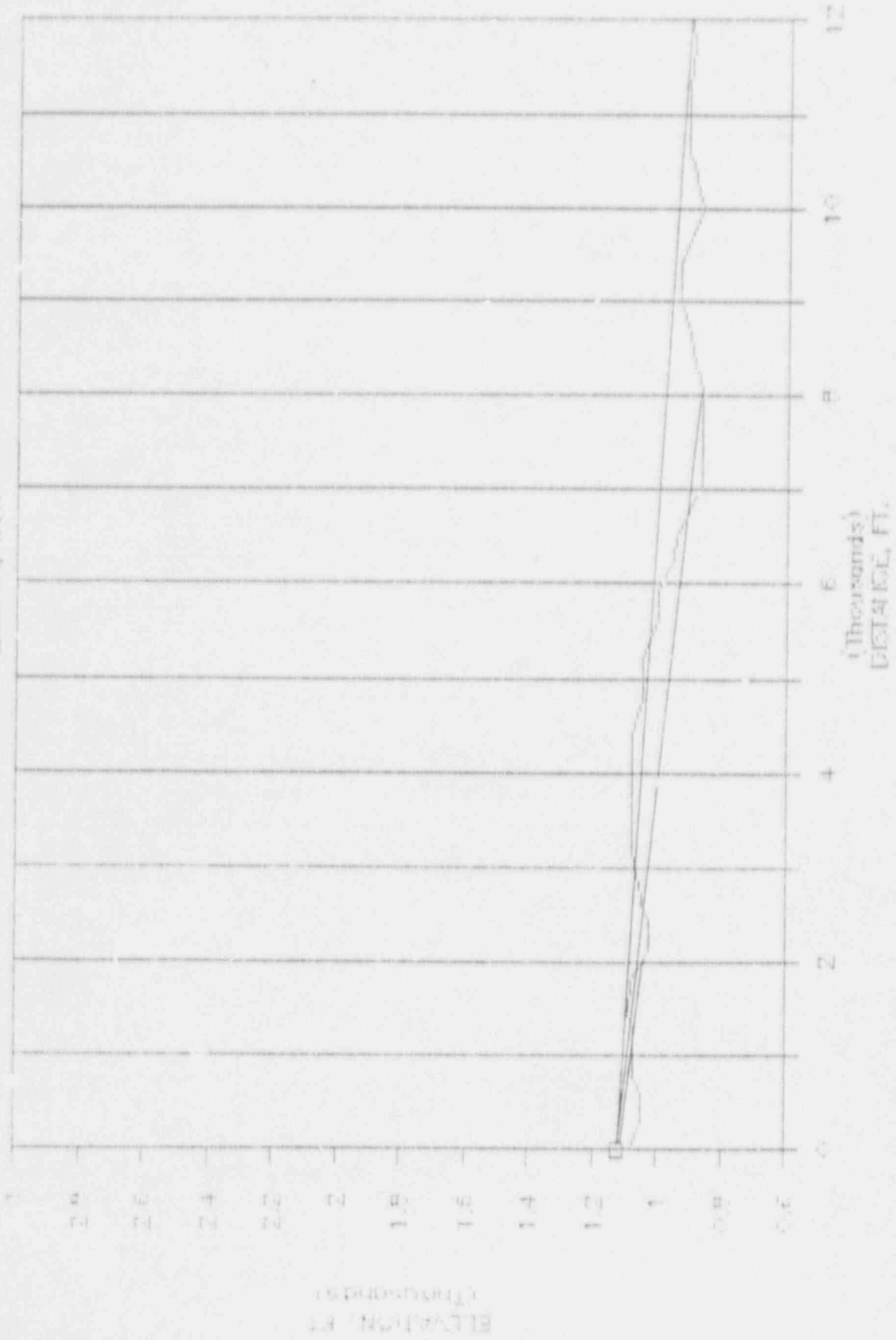
# YANKEE CL-1

AZIMUTH, SW



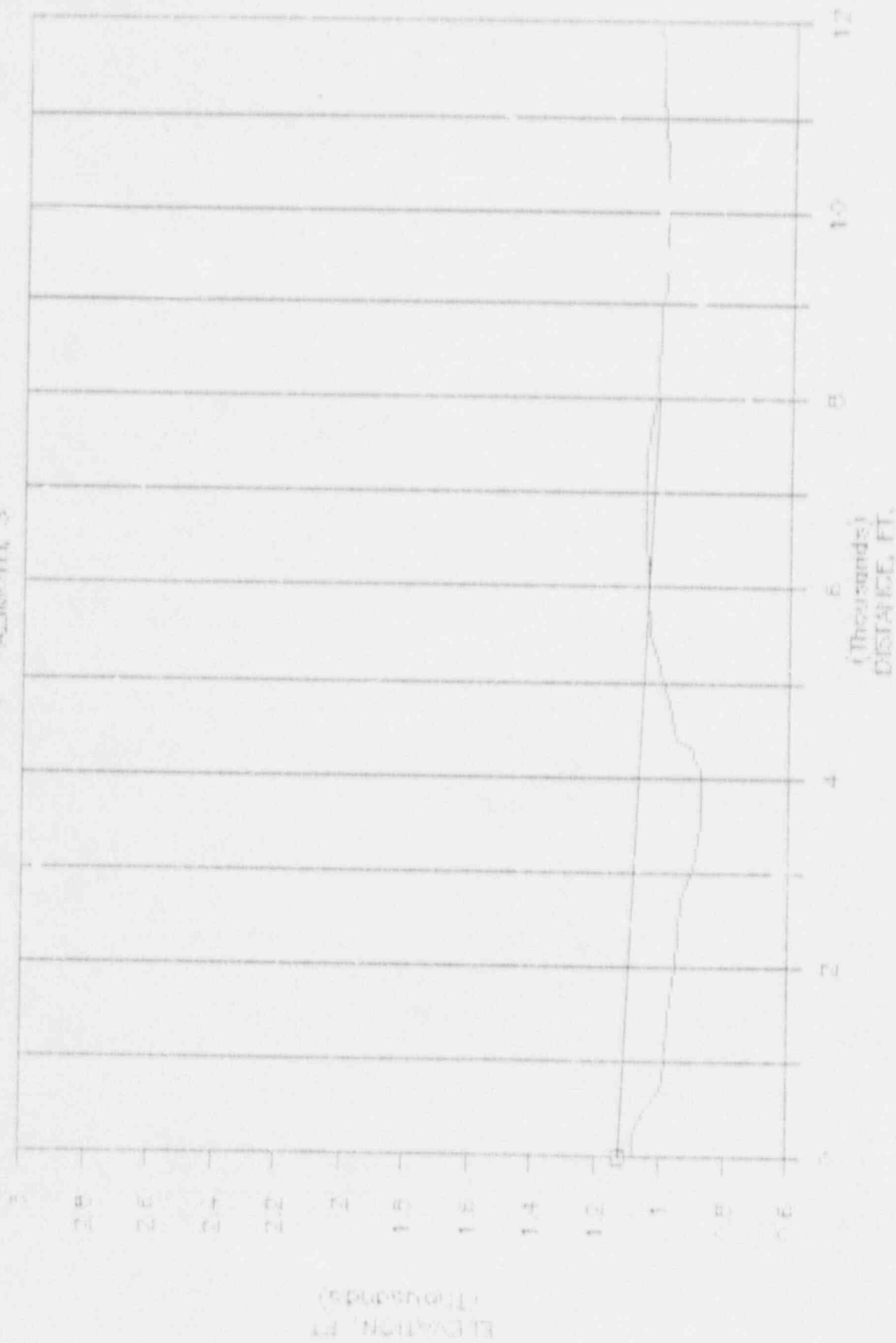
# YANKEE CL-1

AZIMUTH, WSW



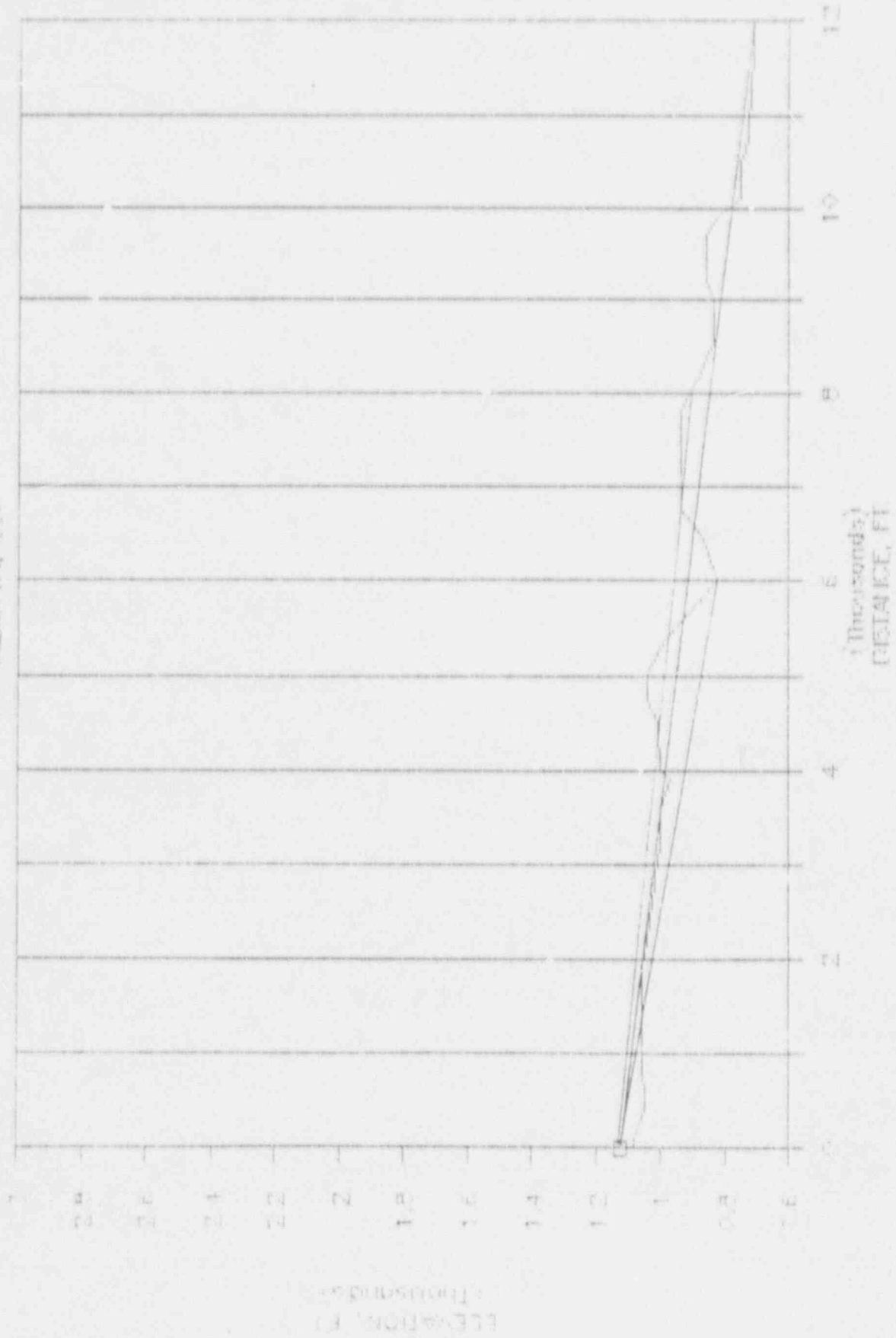
# YANKEE CL-1

AZIMUTH 5



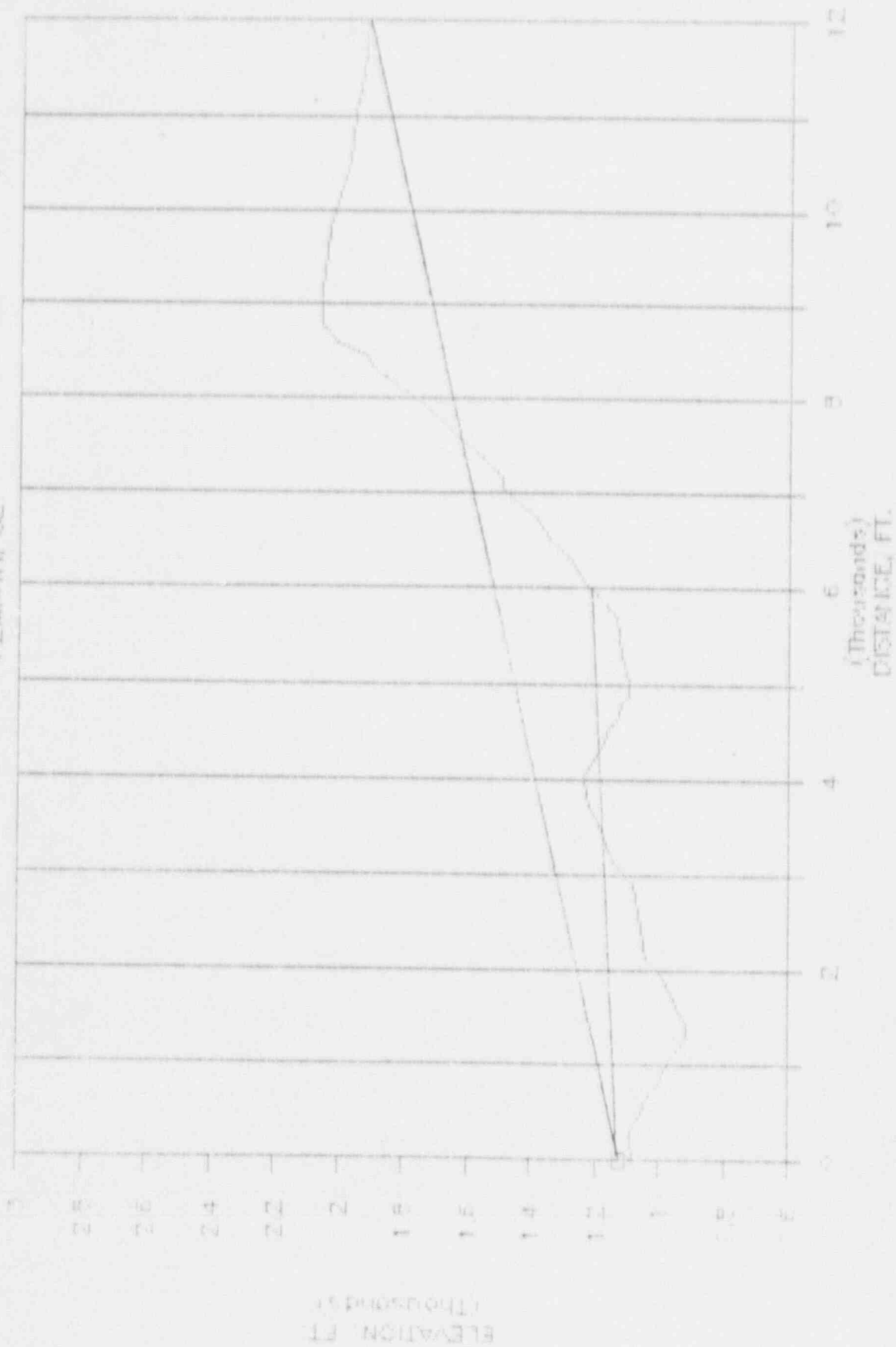
# YANFEE CL-1

AZIMUTH, 55W



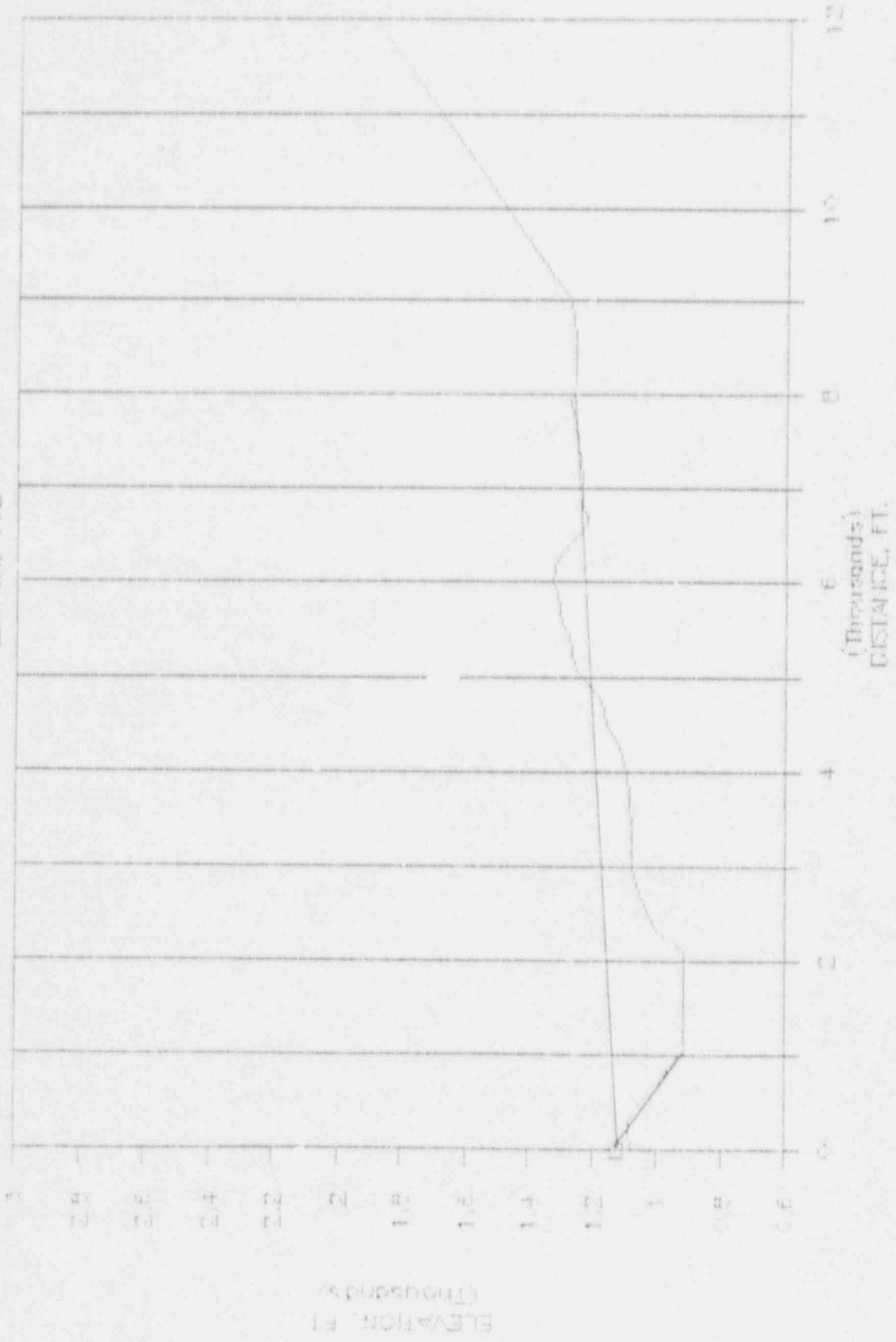
# YANKEE CL-1

AZIMUTH, SE



# YANKEE CL-1

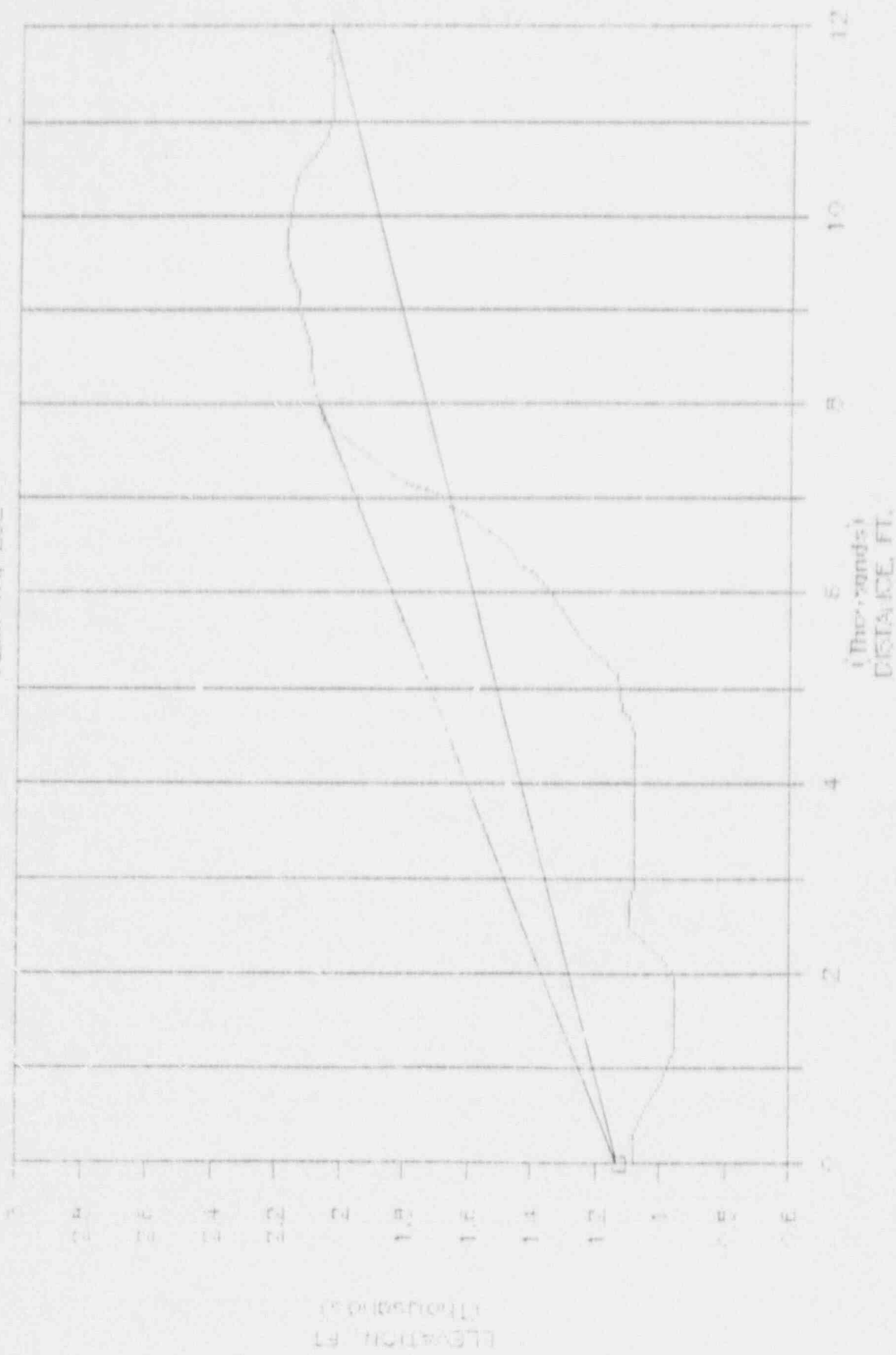
AZIMUTH, SSE





# YANKEE CL-1

AZIMUTH, ESE



GRID POINT	DISTANCE	BEARING	HEIGHT	GROUND TYPE	FOLIAGE PENETRATION	INTERFERING OBSTRUCTIONS	DISTANCE TO HIGHEST OBSTRUCTION FROM SOURCE	HEIGHT OF OBSTRUCTION
73	2000.	225.00	1070.00	SOFT	0.	NO	0.	0.
74	4000.	225.00	1040.00	SOFT	0.	YES	0.	0.
75	6000.	225.00	920.00	HWY	0.	YES	2000.	1070.
76	8000.	225.00	725.00	HWY	0.	YES	2000.	1070.
77	12000.	225.00	2040.00	SOFT	0.	YES	2000.	1070.
78	500.	202.50	1050.00	SOFT	0.	NO	0.	0.
79	1000.	202.50	1080.00	SOFT	0.	NO	0.	0.
80	2000.	192.50	1085.00	SOFT	0.	NO	0.	0.
81	4000.	202.50	1090.00	SOFT	0.	NO	0.	0.
82	6000.	202.50	820.00	SOFT	0.	YES	0.	0.
83	8000.	202.50	820.00	HWY	0.	YES	5000.	1140.
84	12000.	202.50	700.00	SOFT	0.	YES	5000.	1040.
85	500.	180.00	1050.00	SOFT	0.	NO	0.	1040.
86	1000.	180.00	980.00	SOFT	0.	NO	0.	0.
87	2000.	180.00	980.00	SOFT	0.	NO	0.	0.
88	4000.	180.00	880.00	SOFT	0.	NO	0.	0.
89	6000.	180.00	1080.00	SOFT	0.	NO	0.	0.
90	8000.	180.00	1030.00	SOFT	0.	NO	0.	0.
91	12000.	180.00	1070.00	SOFT	0.	YES	7400.	1080.
92	500.	157.50	1060.00	SOFT	0.	NO	0.	0.
93	1000.	157.50	930.00	SOFT	0.	NO	0.	0.
94	2000.	157.50	920.00	SOFT	0.	YES	200.	1090.
95	4000.	157.50	1100.00	SOFT	0.	NO	0.	0.
96	6000.	157.50	1320.00	SOFT	0.	NO	0.	0.
97	8000.	157.50	1270.00	SOFT	0.	NO	0.	0.
98	12000.	157.50	1400.00	SOFT	0.	YES	6000.	1220.
99	500.	135.00	1060.00	SOFT	0.	NO	0.	0.
100	1000.	135.00	980.00	SOFT	0.	NO	0.	0.
101	2000.	135.00	1000.00	SOFT	0.	NO	0.	0.
102	4000.	135.00	1240.00	SOFT	0.	NO	0.	0.
103	6000.	135.00	1220.00	SOFT	0.	YES	0.	0.
104	8000.	135.00	1770.00	SOFT	0.	NO	4000.	1240.
105	12000.	135.00	1820.00	SOFT	0.	NO	0.	0.
106	500.	112.50	1060.00	SOFT	0.	YES	9100.	2080.
107	1000.	112.50	980.00	SOFT	0.	NO	0.	0.
108	2000.	112.50	820.00	SOFT	0.	NO	0.	0.

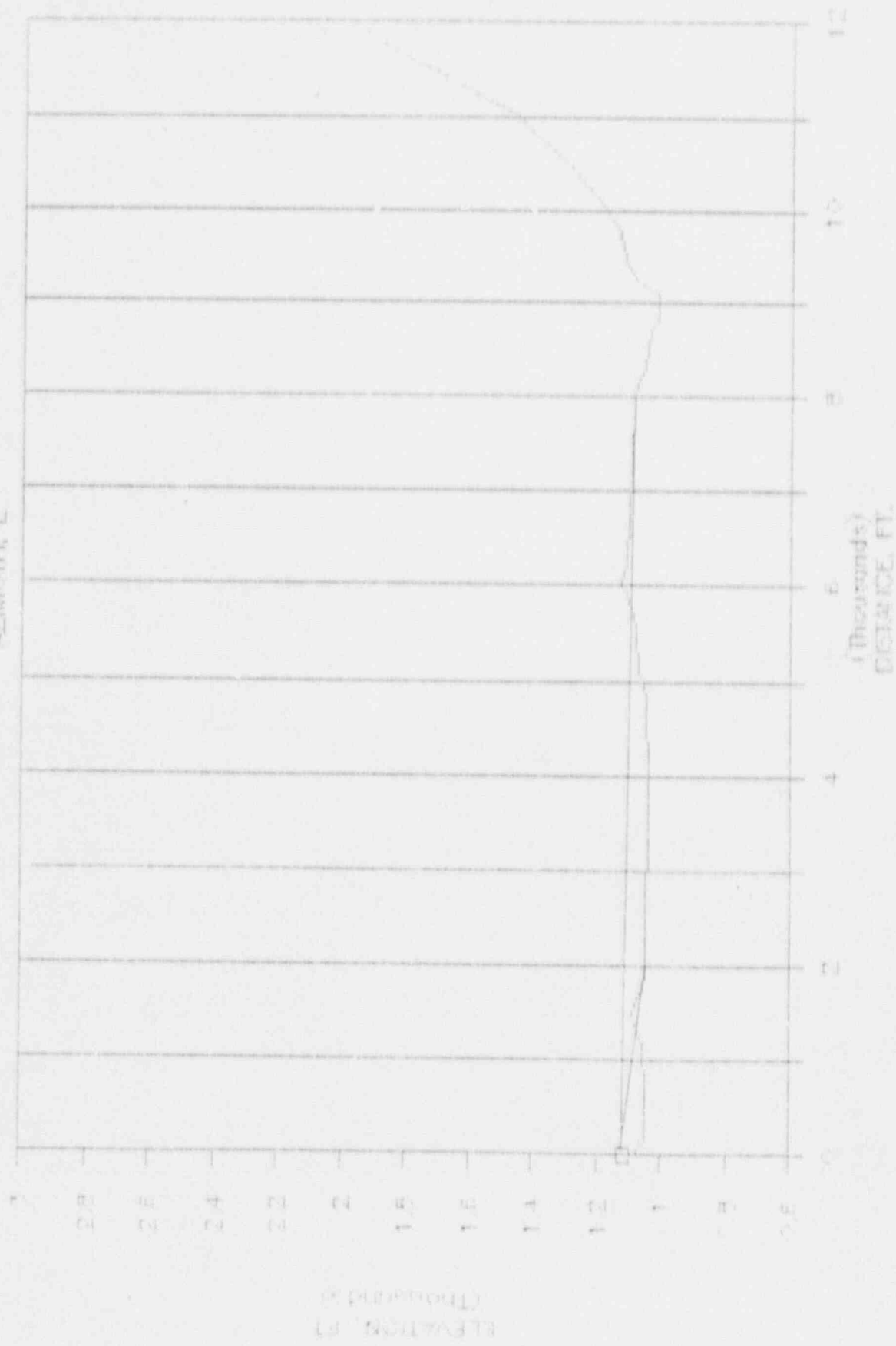
GRID POINT	DISTANCE	BEARING	HEIGHT	GROUND TYPE	FOLIAGE PENETRATION	INTERVENING OBSTRUCTIONS	DISTANCE TO HIGHEST OBSTRUCTION FROM SOURCE	HEIGHT OF OBSTRUCTION
37	1000.	277.50	1050.00	SOFT	0.	NO	0.	0.
38	2000.	277.50	1070.00	SOFT	0.	NO	0.	0.
39	4000.	277.50	1050.00	SOFT	0.	YES	2800.	1100.
40	6000.	277.50	1050.00	SOFT	0.	NO	0.	0.
41	8000.	277.50	1240.00	SOFT	0.	NO	0.	0.
42	12000.	277.50	1440.00	SOFT	0.	NO	0.	0.
43	500.	315.00	1050.00	SOFT	0.	NO	0.	0.
44	1000.	315.00	1045.00	SOFT	0.	NO	0.	0.
45	2000.	315.00	1050.00	SOFT	0.	NO	0.	0.
46	4000.	315.00	1100.00	SOFT	0.	YES	2400.	1100.
47	6000.	315.00	1240.00	SOFT	0.	NO	0.	0.
48	8000.	315.00	1310.00	SOFT	0.	NO	0.	0.
49	12000.	315.00	1700.00	SOFT	0.	YES	4400.	1800.
50	500.	292.50	1050.00	SOFT	0.	NO	0.	0.
51	1000.	292.50	1045.00	SOFT	0.	NO	0.	0.
52	2000.	292.50	1050.00	SOFT	0.	NO	0.	0.
53	4000.	292.50	1100.00	SOFT	0.	NO	0.	0.
54	6000.	292.50	1180.00	SOFT	0.	NO	0.	0.
55	8000.	292.50	1420.00	SOFT	0.	NO	0.	0.
56	12000.	292.50	2200.00	SOFT	0.	YES	1075.	2140.
57	500.	270.00	1050.00	SOFT	0.	NO	0.	0.
58	1000.	270.00	1060.00	SOFT	0.	NO	0.	0.
59	2000.	270.00	1050.00	SOFT	0.	NO	0.	0.
60	4000.	270.00	1050.00	SOFT	0.	NO	0.	0.
61	6000.	270.00	1140.00	SOFT	0.	NO	0.	0.
62	8000.	270.00	1300.00	SOFT	0.	NO	0.	0.
63	12000.	270.00	2060.00	SOFT	0.	YES	11150.	2020.
64	500.	247.50	1050.00	SOFT	0.	NO	0.	0.
65	1000.	247.50	1070.00	SOFT	0.	NO	0.	0.
66	2000.	247.50	1050.00	SOFT	0.	YES	1450.	1050.
67	4000.	247.50	1080.00	SOFT	0.	NO	0.	0.
68	6000.	247.50	990.00	SOFT	0.	YES	4400.	1050.
69	8000.	247.50	870.00	HARD	0.	YES	4400.	1050.
70	12000.	247.50	910.00	SOFT	0.	YES	4400.	1050.
71	500.	225.00	1050.00	SOFT	0.	NO	0.	0.
72	1000.	225.00	1065.00	SOFT	0.	NO	0.	0.



GRID POINT	DISTANCE	BEARING	HEIGHT	SOUND TYPE	FOLIAGE PENETRATION	INTERFERING OBSTRUCTIONS	DISTANCE TO HIGHEST OBSTRUCTION FROM SOURCE	HEIGHT OF OBSTRUCTION
108	4000.	112.30	1080.00	SOFT	0.	NO	0.	0.
110	4000.	112.50	1080.00	SOFT	0.	NO	0.	0.
111	8000.	112.50	2080.00	SOFT	0.	YES	7800.	2080.
112	12000.	112.50	2080.00	SOFT	0.	YES	7800.	2080.
113	4095.79.	89.48	1111.00	SOFT	0.	NO	0.	0.
114	4095.79.	89.48	1111.00	SOFT	0.	NO	0.	0.
115	4095.79.	89.48	1111.00	SOFT	0.	NO	0.	0.
116	4095.79.	89.48	1111.00	SOFT	0.	NO	0.	0.
117	4095.79.	89.48	1111.00	SOFT	0.	NO	0.	0.
118	4095.79.	89.48	1111.00	SOFT	0.	NO	0.	0.
119	4095.79.	89.48	1111.00	SOFT	0.	NO	0.	0.
120	4095.79.	89.48	1111.00	SOFT	0.	NO	0.	0.
121	4095.79.	89.48	1111.00	SOFT	0.	NO	0.	0.

# YANKEE CL-2

AZIMUTH, E



STATION 1000, 1001, 1002, 1003  
 STATION 1004, 1005, 1006, 1007

STATION 1008, 1009, 1010, 1011

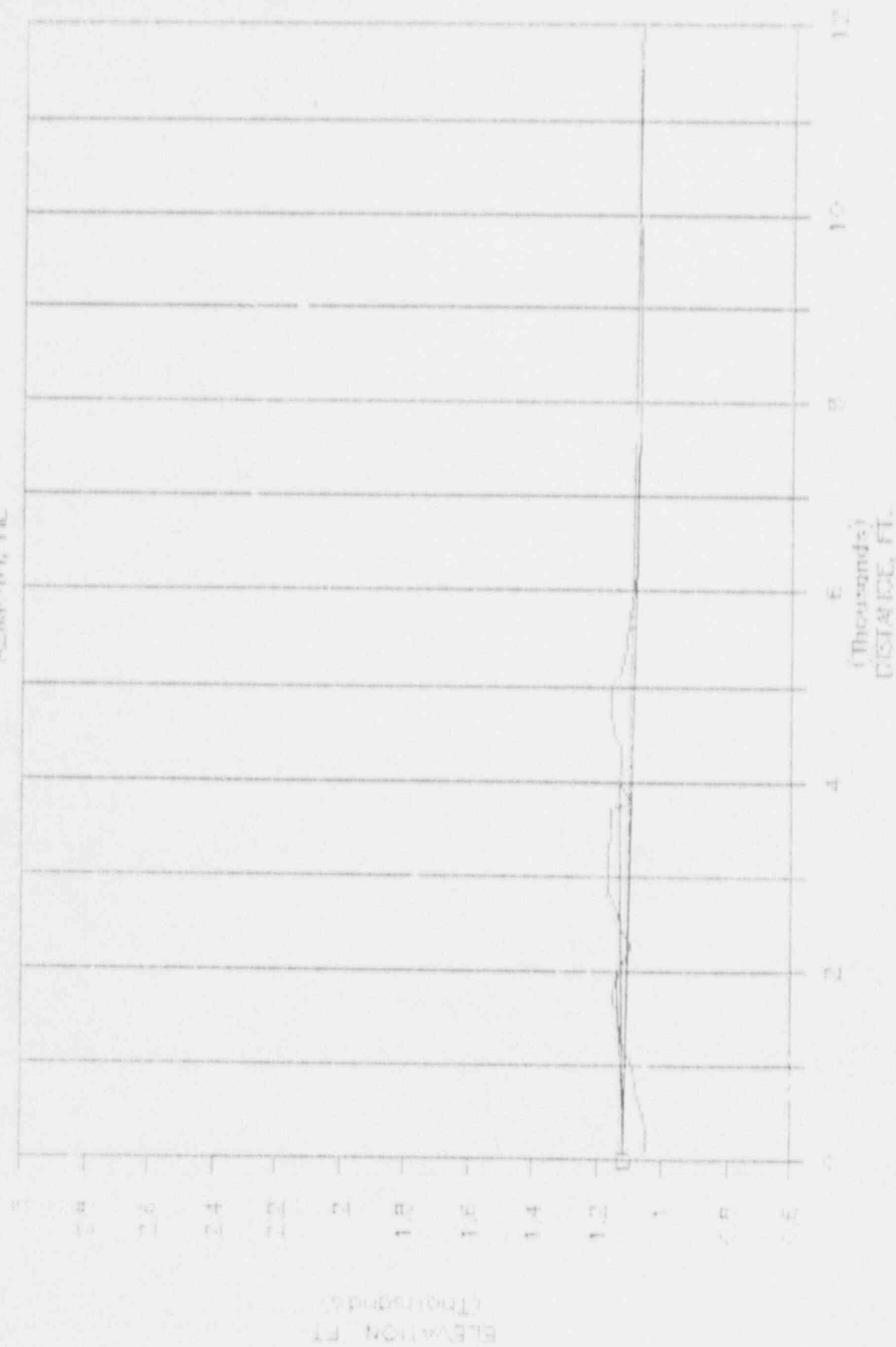
STATION 1012, 1013, 1014, 1015

DISTANCE IN FEET

STATION	1000	1001	1002	1003	1004	1005	1006	1007
1	88	88	71	71	47	45	47	
2	88	88	71	71	47	45	47	
3	100	88	71	71	47	45	47	
4	100	88	71	71	47	45	47	
5	100	88	71	71	47	45	47	
6	100	88	71	71	47	45	47	
7	100	88	71	71	47	45	47	
8	100	88	71	71	47	45	47	
9	100	88	71	71	47	45	47	
10	100	88	71	71	47	45	47	
11	100	88	71	71	47	45	47	
12	100	88	71	71	47	45	47	
13	100	88	71	71	47	45	47	
14	100	88	71	71	47	45	47	
15	100	88	71	71	47	45	47	
16	100	88	71	71	47	45	47	
17	100	88	71	71	47	45	47	
18	100	88	71	71	47	45	47	
19	100	88	71	71	47	45	47	
20	100	88	71	71	47	45	47	
21	100	88	71	71	47	45	47	
22	100	88	71	71	47	45	47	
23	100	88	71	71	47	45	47	
24	100	88	71	71	47	45	47	
25	100	88	71	71	47	45	47	
26	100	88	71	71	47	45	47	
27	100	88	71	71	47	45	47	
28	100	88	71	71	47	45	47	
29	100	88	71	71	47	45	47	
30	100	88	71	71	47	45	47	
31	100	88	71	71	47	45	47	
32	100	88	71	71	47	45	47	
33	100	88	71	71	47	45	47	
34	100	88	71	71	47	45	47	
35	100	88	71	71	47	45	47	
36	100	88	71	71	47	45	47	
37	100	88	71	71	47	45	47	
38	100	88	71	71	47	45	47	
39	100	88	71	71	47	45	47	
40	100	88	71	71	47	45	47	
41	100	88	71	71	47	45	47	
42	100	88	71	71	47	45	47	
43	100	88	71	71	47	45	47	
44	100	88	71	71	47	45	47	
45	100	88	71	71	47	45	47	
46	100	88	71	71	47	45	47	
47	100	88	71	71	47	45	47	
48	100	88	71	71	47	45	47	
49	100	88	71	71	47	45	47	
50	100	88	71	71	47	45	47	

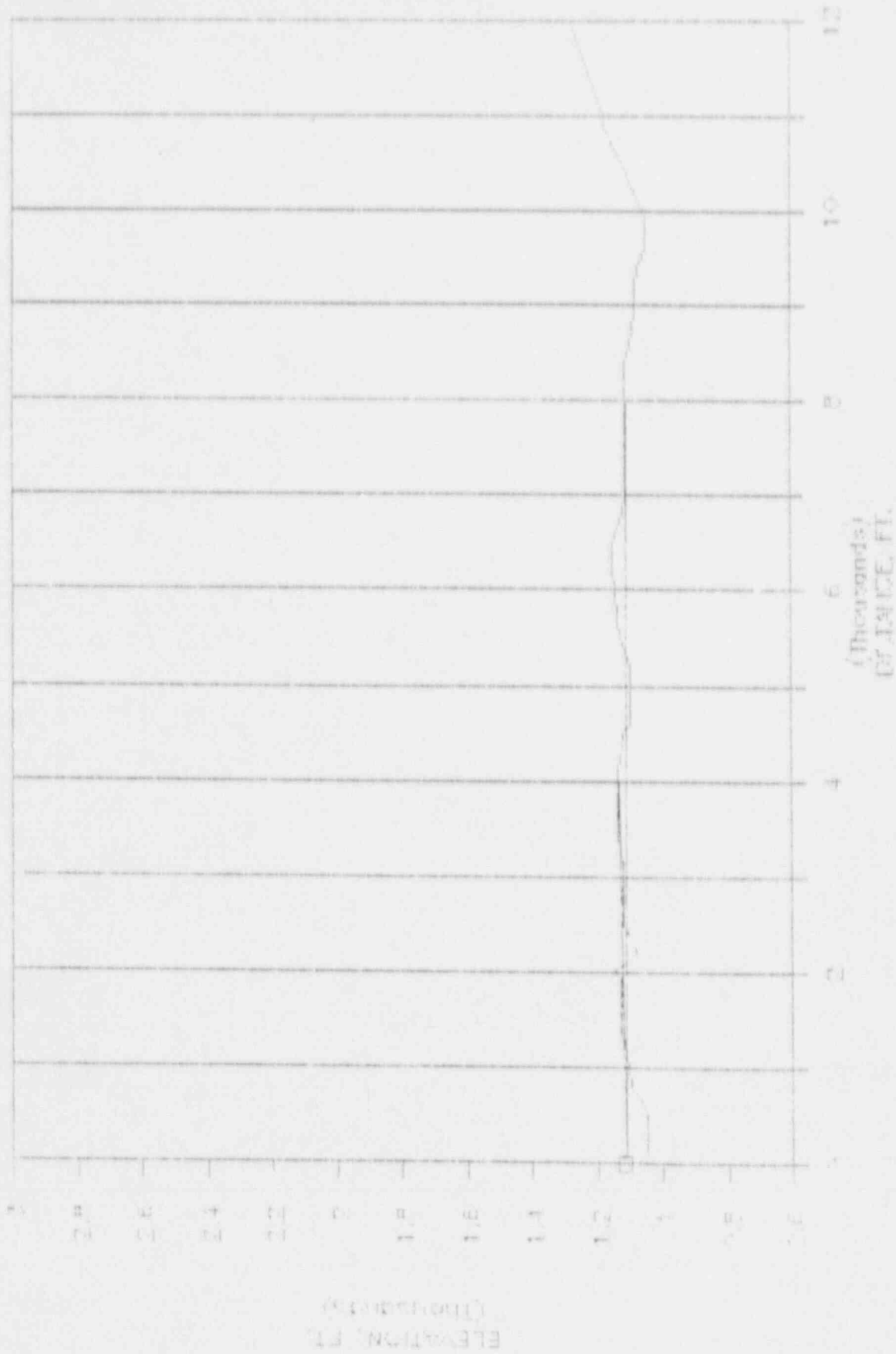
# YANFEE CL-2

ACQUISITION



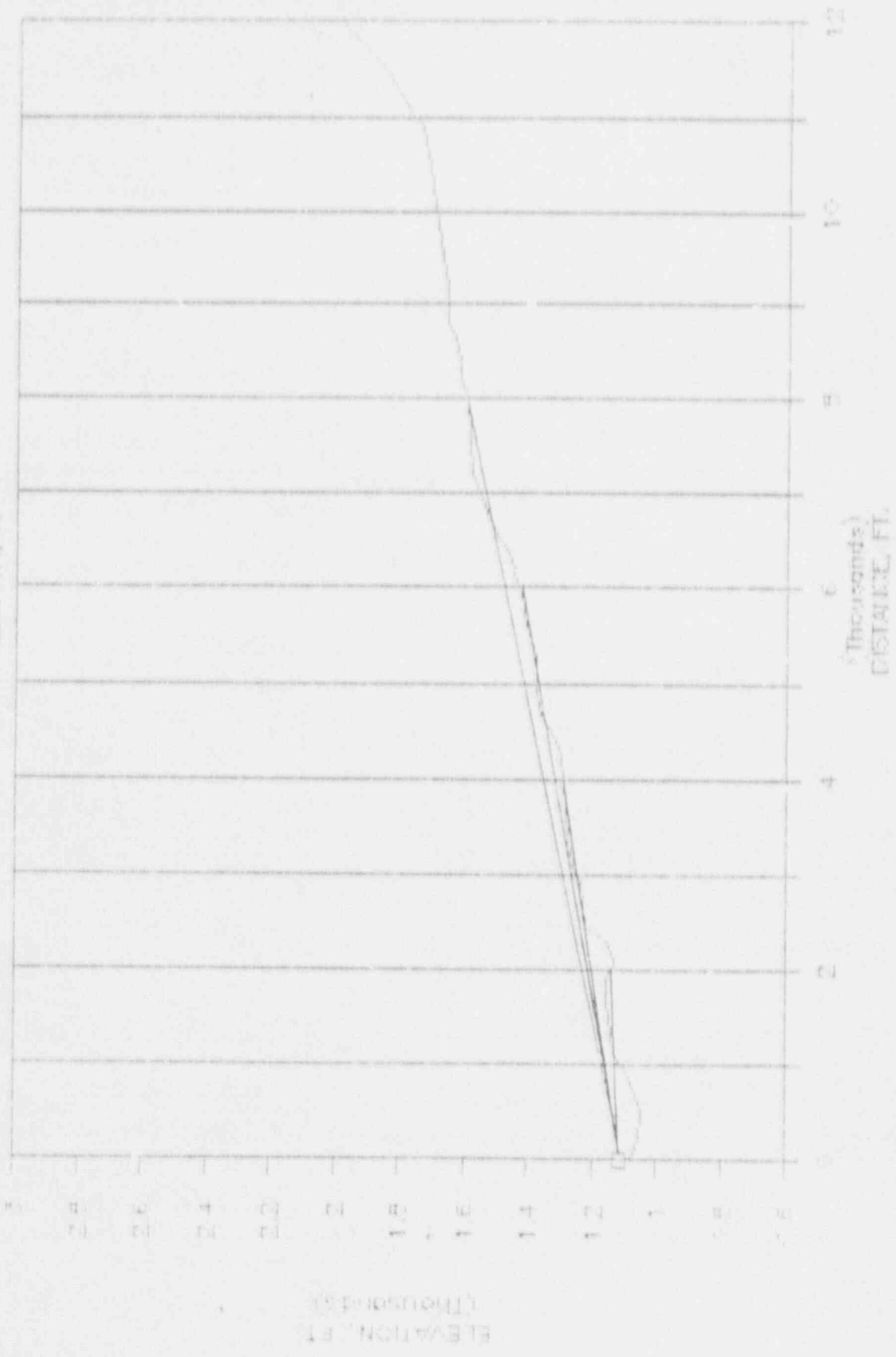
# YANFEE CL-2

AZIMUTH, DIE



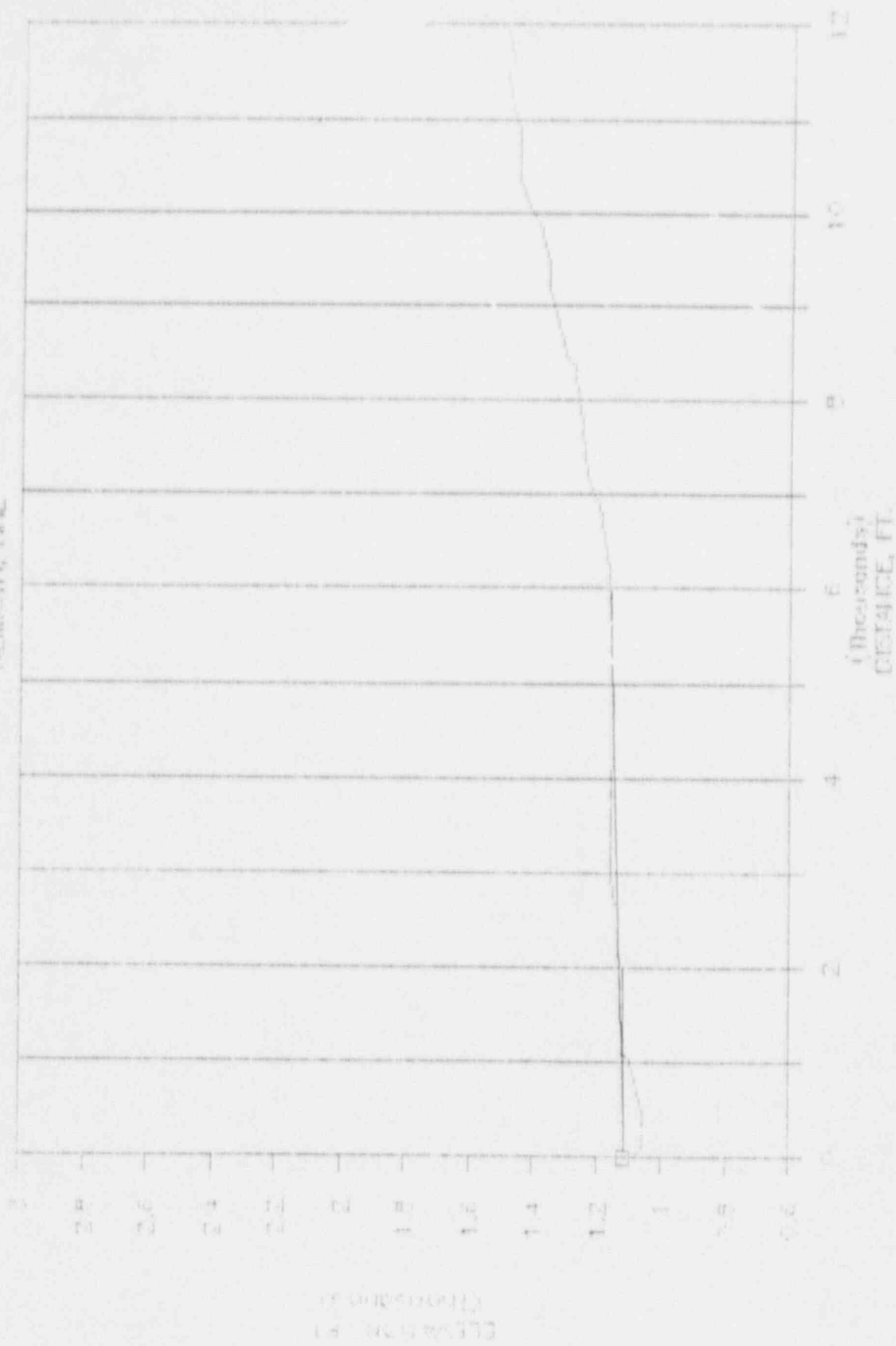
# YANFEE CL-2

AZIMUTH, 11



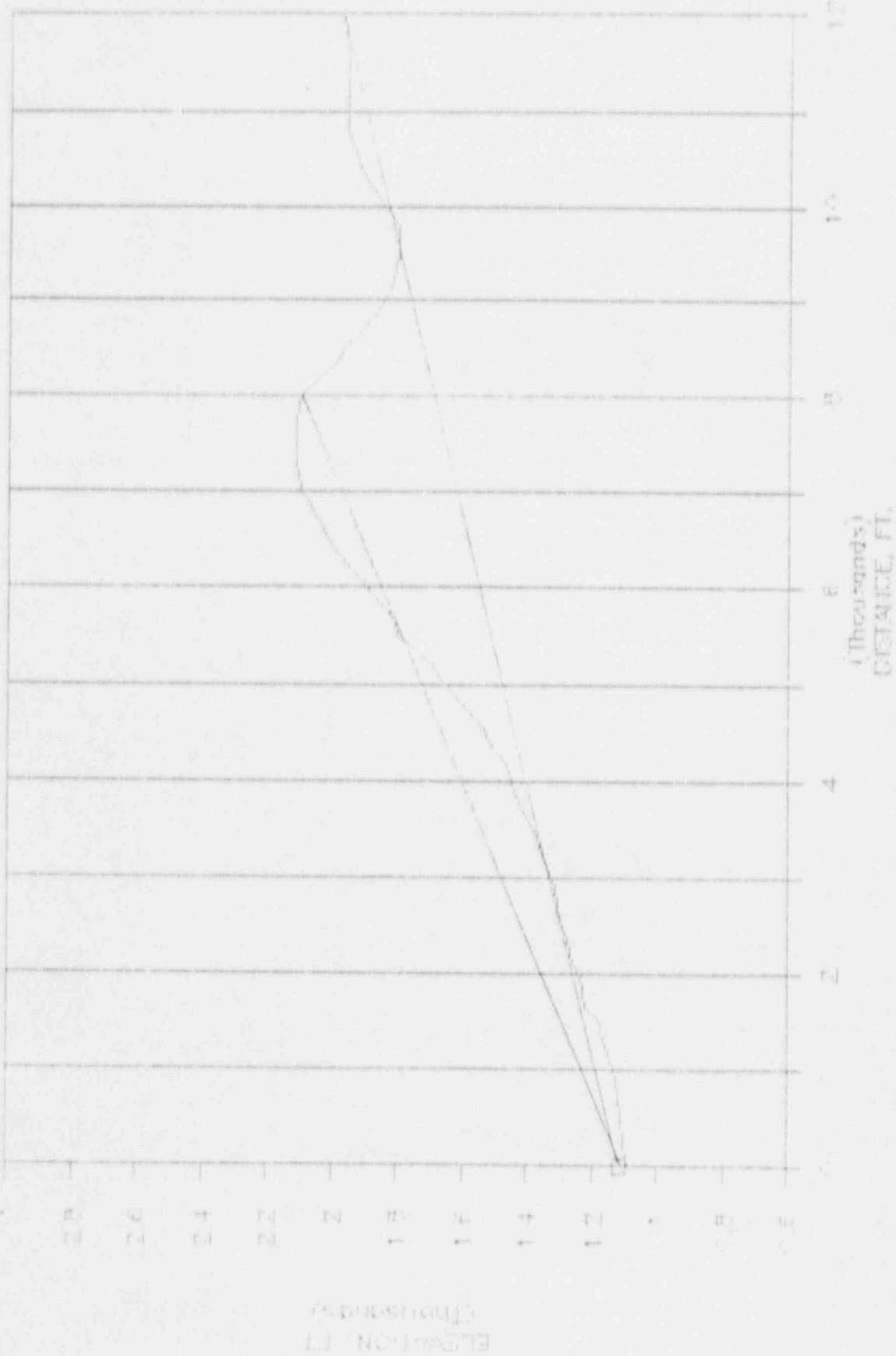
# YANKEE CL-2

ACRIMUTH, IRE



# YANKEE CL-2

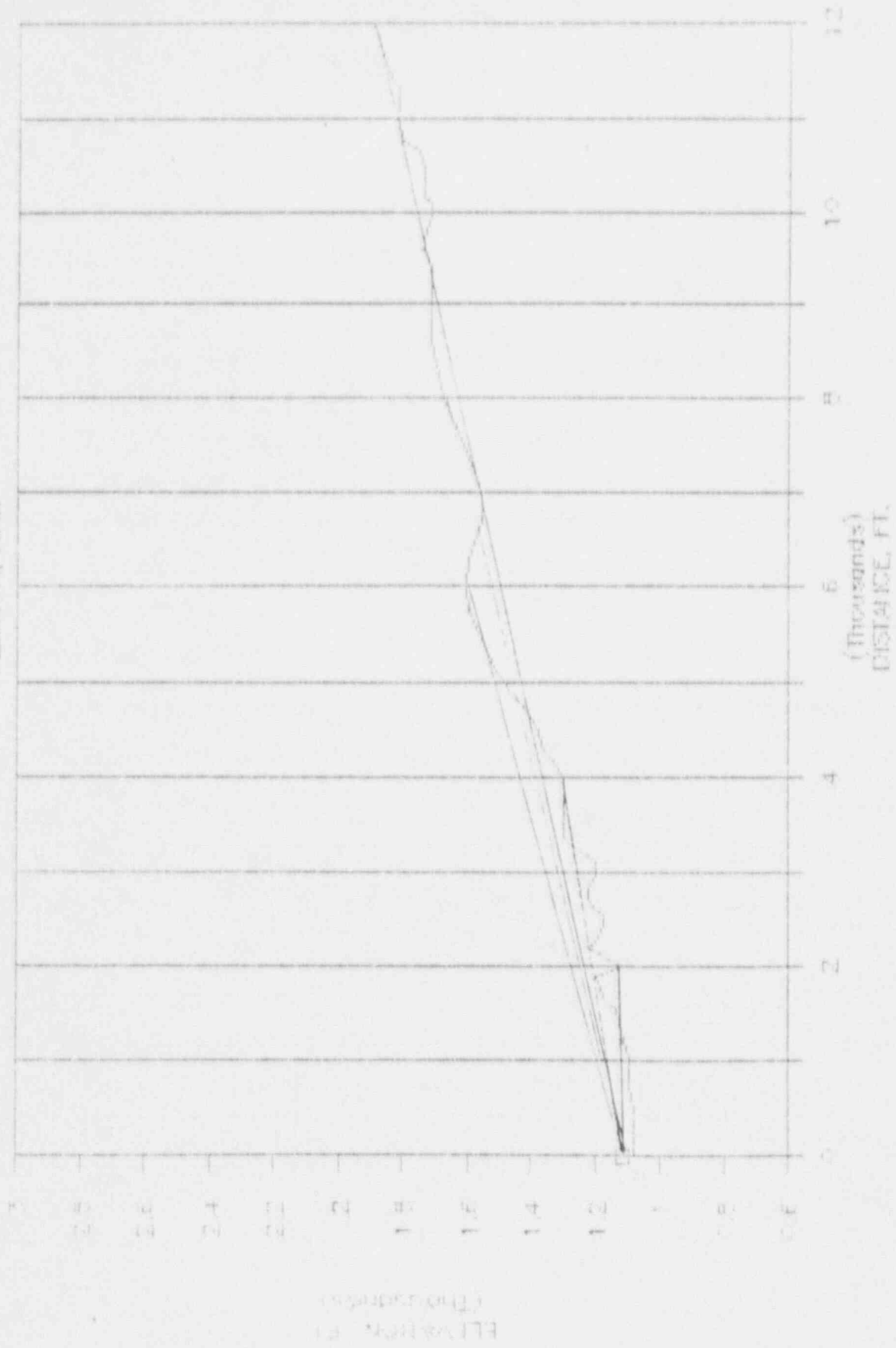
AZIMUTH, DEG



ELEVATION, FT  
(THOUSANDS)

# YANFEE CL-2

AZURE JTH, 11166



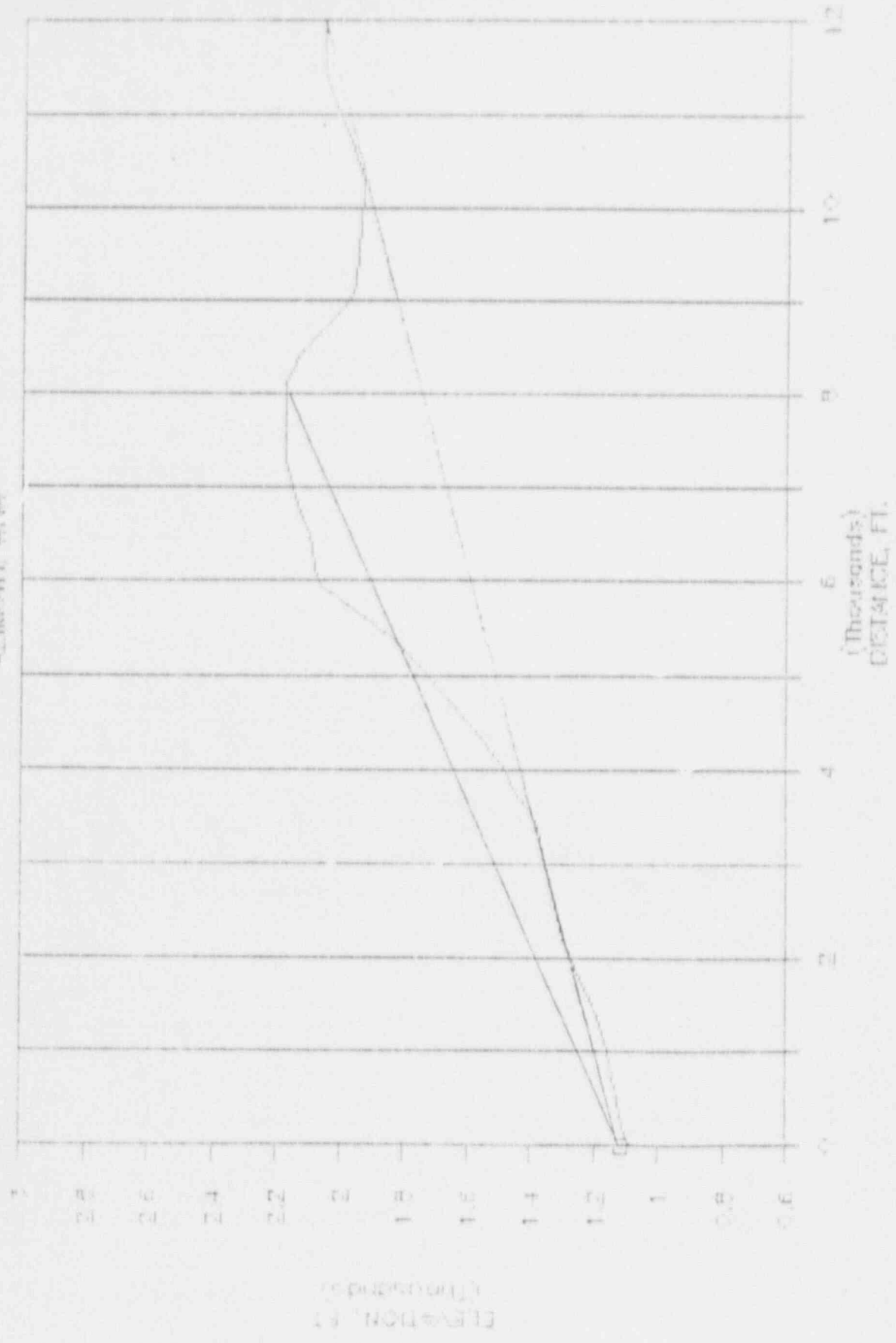
# YANKEE CL--2

AZIMUTH, W



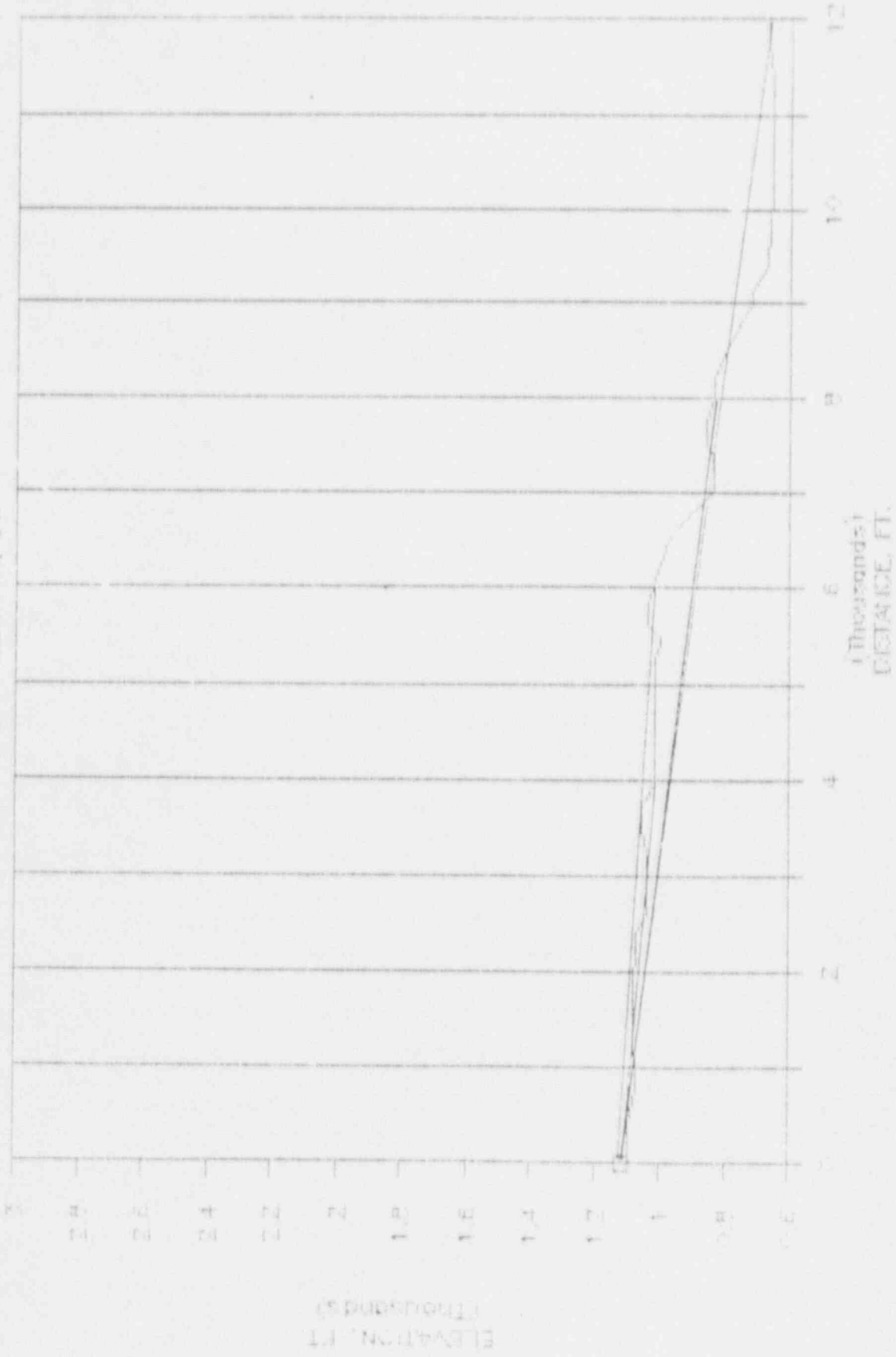
# YANKEE CL-2

42189 JTH 100 600



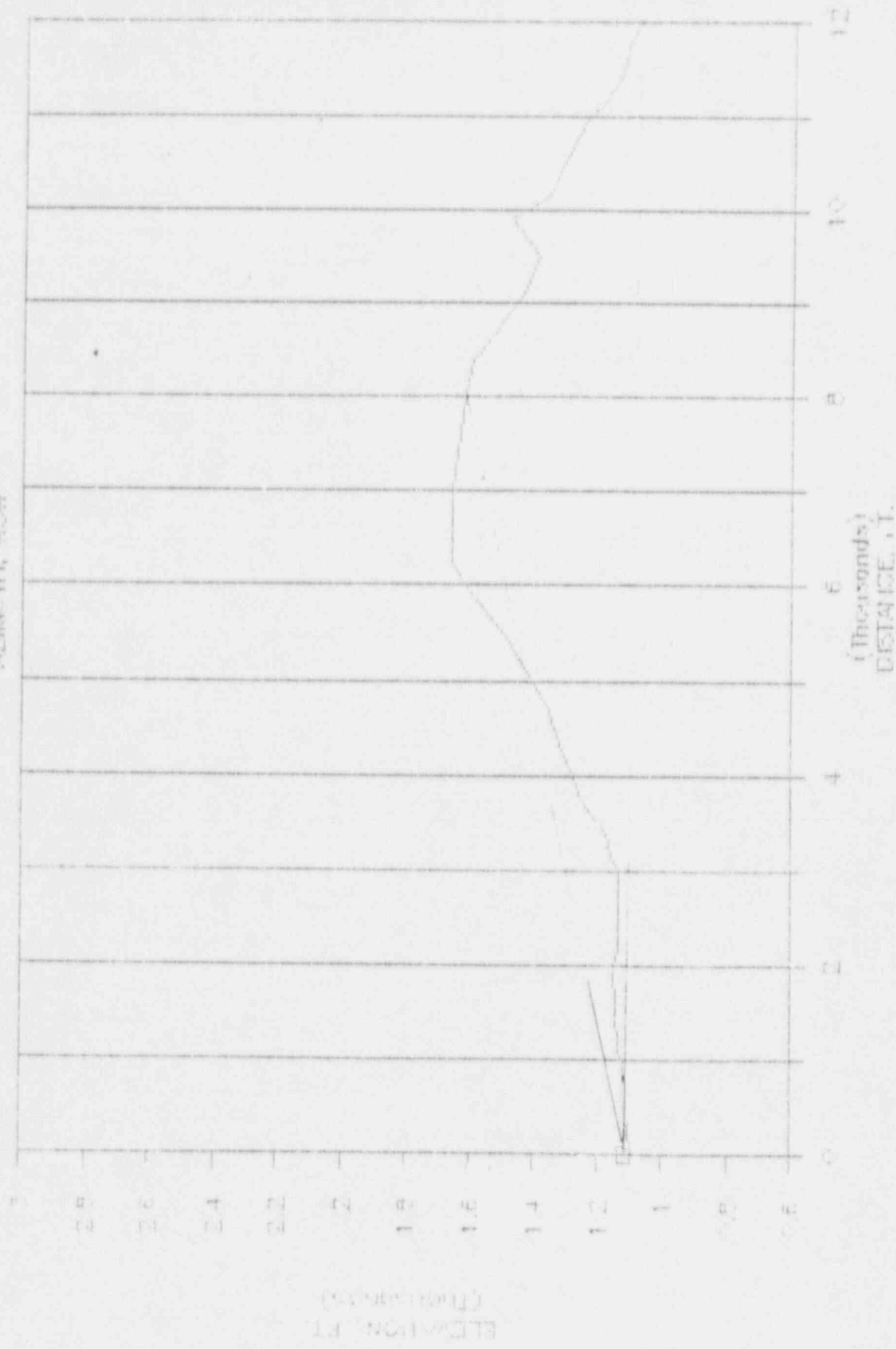
# YANFEE CL-2

AZIMUTH, SW



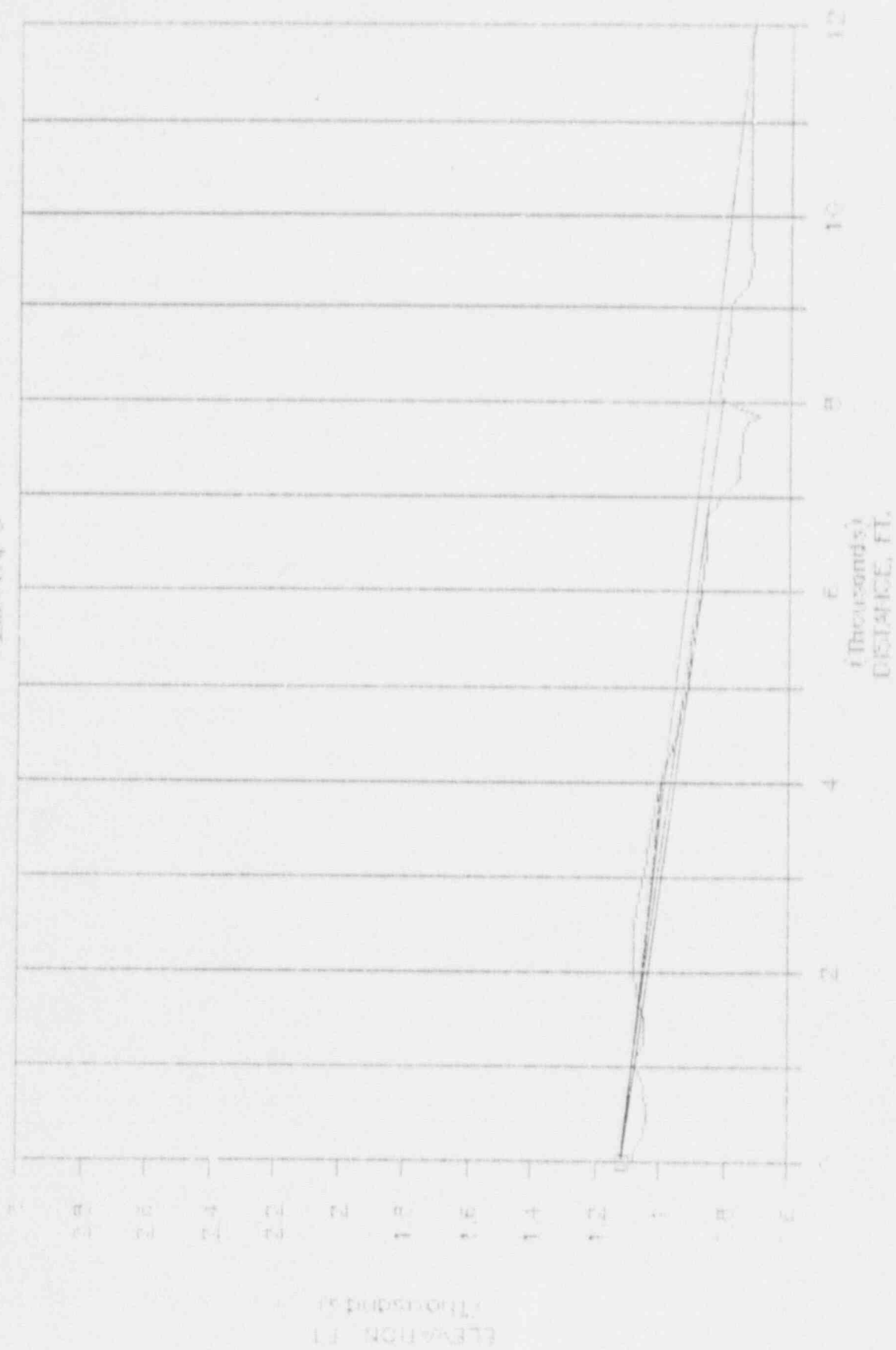
# YANKEE CL-2

AZIMUTH, WSW



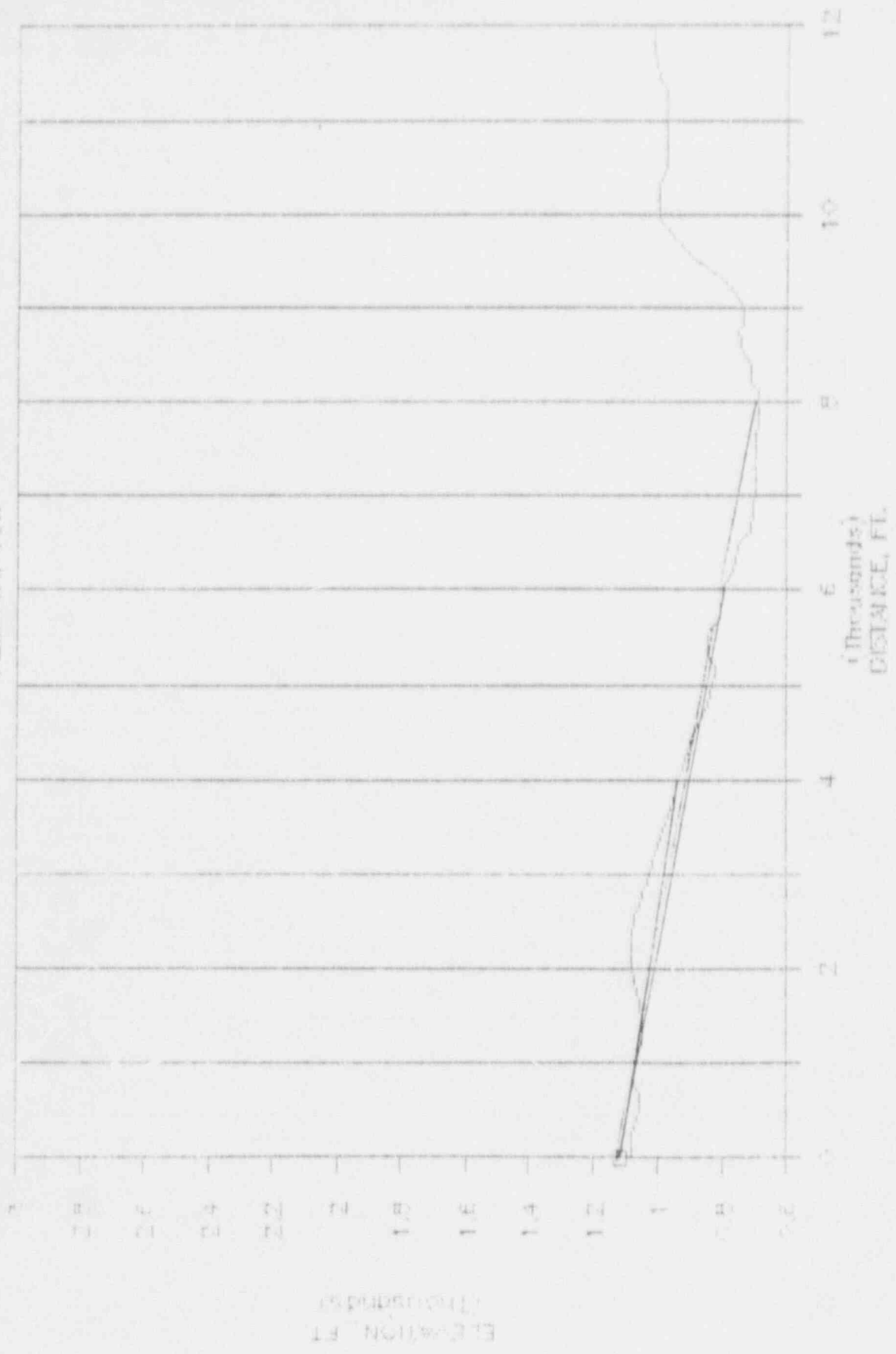
# YANKEE CL-2

AZIMUTH, 5



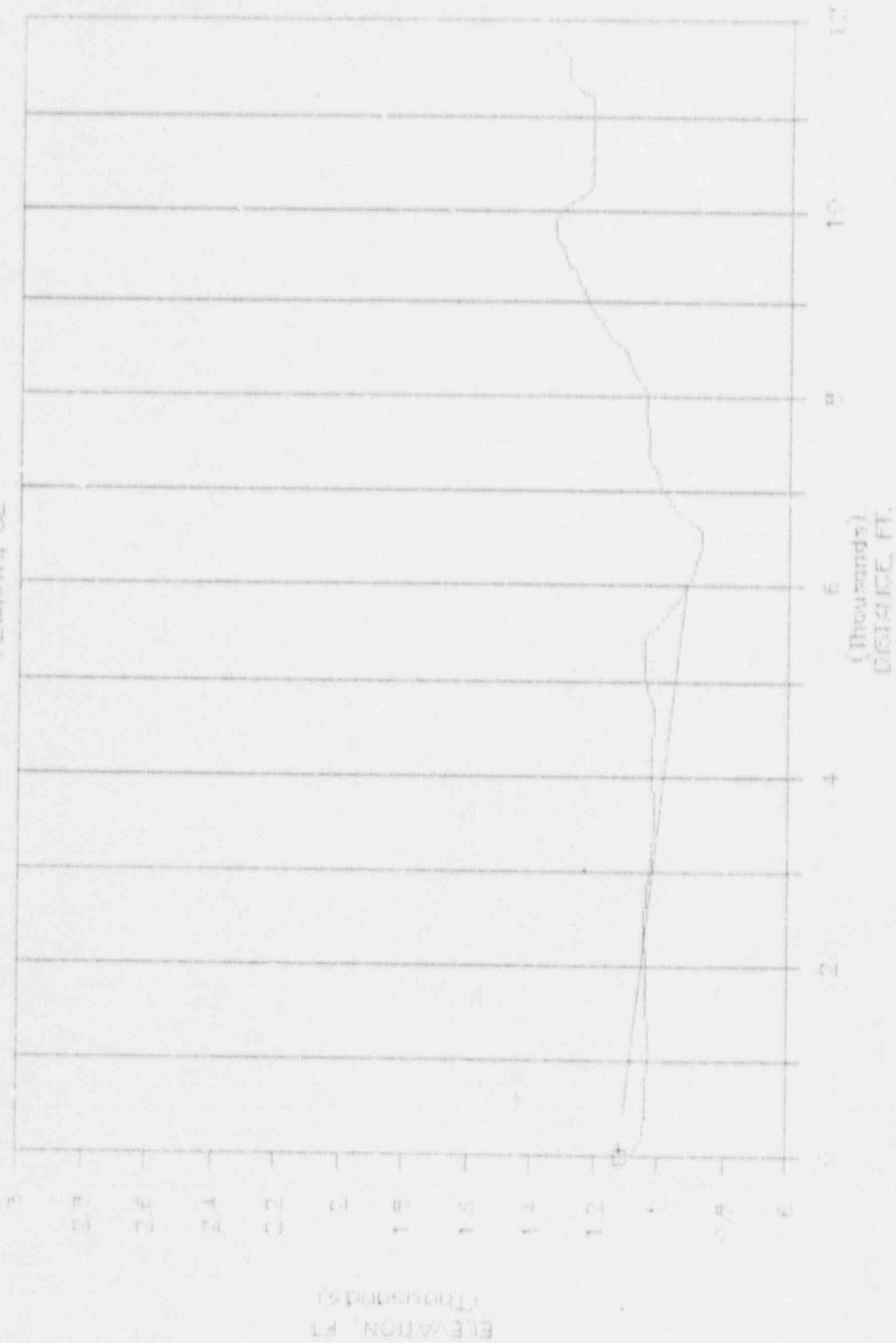
# YANKEE CL-2

ACIM JFH, 55W



# YANFEE CI.-2

AZIMUTH, SE



# YANFEE CL-2

AZIMUTH, SSE



W. E. & C. E. ELECTRIC CORP.  
 JAMES ADAMS AND JOHN KULLSTROM  
 SENDER-RECEIVER TOPOGRAFICAL MAPS

ALL BEARINGS ARE WITH RESPECT TO THE NORTH MEASURING CLOCKWISE

GRID POINT	DISTANCE	BEARING	HEIGHT	GROUND TYPE	FOLIAGE PENETRATION	INTERVENING OBSTRUCTIONS	DISTANCE TO HIGHEST OBSTRUCTION FROM SOURCE	HEIGHT OF OBSTRUCTION
1	500.	90.00	1050.00	SOFT	0.	NO	0.	0.
2	1000.	90.00	1050.00	SOFT	0.	NO	0.	0.
3	2000.	90.00	1050.00	SOFT	0.	NO	0.	0.
4	4000.	90.00	1045.00	HARD	0.	YES	1500.	1040.
5	6000.	90.00	1170.00	SOFT	0.	NO	0.	0.
6	8000.	90.00	1040.00	SOFT	0.	NO	0.	0.
7	12000.	90.00	1170.00	SOFT	0.	YES	6050.	1070.
8	500.	67.50	1057.00	SOFT	0.	NO	0.	0.
9	1000.	67.50	1175.00	SOFT	0.	NO	0.	0.
10	2000.	67.50	1150.00	SOFT	0.	NO	0.	0.
11	4000.	67.50	1140.00	SOFT	0.	NO	0.	0.
12	6000.	67.50	1145.00	SOFT	0.	YES	2000.	1150.
13	8000.	67.50	1115.00	SOFT	0.	NO	0.	0.
14	12000.	67.50	1280.00	SOFT	0.	YES	4500.	1150.
15	500.	45.00	1060.00	SOFT	0.	NO	0.	0.
16	1000.	45.00	1090.00	SOFT	0.	NO	0.	0.
17	2000.	45.00	1175.00	SOFT	0.	YES	1800.	1170.
18	4000.	45.00	1140.00	SOFT	0.	YES	3000.	1170.
19	6000.	45.00	1090.00	SOFT	0.	YES	1000.	1170.
20	8000.	45.00	1074.00	SOFT	0.	YES	3000.	1170.
21	12000.	45.00	1075.00	SOFT	0.	YES	7000.	1170.
22	500.	22.50	1060.00	SOFT	0.	NO	0.	0.
23	1000.	22.50	1095.00	SOFT	0.	NO	0.	0.
24	2000.	22.50	1125.00	SOFT	0.	YES	1500.	1170.
25	4000.	22.50	1110.00	SOFT	0.	NO	0.	0.
26	6000.	22.50	1115.00	SOFT	0.	YES	4000.	1190.
27	8000.	22.50	1270.00	SOFT	0.	NO	0.	0.
28	12000.	22.50	1520.00	SOFT	0.	NO	0.	0.
29	500.	00	1055.00	SOFT	0.	NO	0.	0.
30	1000.	00	1110.00	SOFT	0.	YES	1700.	1050.
31	2000.	00	1150.00	SOFT	0.	NO	0.	0.
32	4000.	00	1290.00	SOFT	0.	YES	2450.	1050.
33	6000.	00	1420.00	SOFT	0.	YES	4500.	1040.
34	8000.	00	1400.00	SOFT	0.	YES	7200.	1050.
35	12000.	00	2000.00	SOFT	0.	NO	0.	0.
36	500.	337.50	1090.00	SOFT	0.	NO	0.	0.

# YANKEE CL-2

AZIMUTH, ESE



PLACEMENT, FT

12  
11  
10  
9  
8  
7  
6  
5  
4  
3  
2  
1  
0

12  
10  
8  
6  
4  
2  
0

CPID POINT	DISTANCE	Bearing	HEIGHT	GROUND TYPE	FOLIAGE PENETRATION	INTERVENING OBSTRUCTIONS	DISTANCE TO HIGHEST OBSTRUCTION FROM SOURCE	HEIGHT OF OBSTRUCTION
73	2000.	222.00	1080.00	SOFT	0.	NO	0.	0.
74	4000.	225.00	1020.00	SOFT	0.	YES	7500.	1000.
75	6000.	225.50	1020.00	SOFT	0.	YES	8500.	1000.
76	8000.	225.00	840.00	SOFT	0.	YES	8500.	1000.
77	12000.	225.00	670.00	SOFT	0.	YES	8500.	1000.
78	500.	202.50	1040.00	SOFT	0.	NO	0.	0.
79	1000.	202.50	1070.00	SOFT	0.	NO	0.	0.
80	2000.	202.50	1080.00	SOFT	0.	NO	0.	0.
81	4000.	202.50	940.00	SOFT	0.	YES	2350.	1070.
82	6000.	202.50	890.00	HARD	0.	YES	2350.	1070.
83	8000.	202.50	690.00	HARD	0.	YES	2350.	1070.
84	12000.	202.50	1020.00	SOFT	0.	NO	0.	0.
85	500.	180.00	1040.00	SOFT	0.	NO	0.	0.
86	1000.	180.00	1070.00	SOFT	0.	NO	0.	0.
87	2000.	180.00	1080.00	SOFT	0.	NO	0.	0.
88	4000.	180.00	1000.00	HARD	0.	YES	2500.	1080.
89	6000.	180.00	880.00	HARD	0.	YES	2500.	1080.
90	8000.	180.00	800.00	HARD	0.	YES	2500.	1080.
91	12000.	180.00	720.00	HARD	0.	YES	2500.	1080.
92	500.	157.50	1045.00	SOFT	0.	NO	0.	0.
93	1000.	157.50	1025.00	SOFT	0.	NO	0.	0.
94	2000.	157.50	1040.00	SOFT	0.	YES	1150.	1000.
95	4000.	157.50	1060.00	SOFT	0.	YES	1150.	1000.
96	6000.	157.50	1035.00	HARD	0.	YES	1150.	1000.
97	8000.	157.50	970.00	SOFT	0.	YES	1150.	1000.
98	12000.	157.50	1015.00	SOFT	0.	YES	1150.	1000.
99	500.	135.00	1045.00	SOFT	0.	NO	0.	0.
100	1000.	135.00	1025.00	SOFT	0.	NO	0.	0.
101	2000.	135.00	1040.00	SOFT	0.	NO	0.	0.
102	4000.	135.00	1025.00	SOFT	0.	NO	0.	0.
103	6000.	135.00	920.00	SOFT	0.	YES	5500.	1040.
104	8000.	135.00	1055.00	SOFT	0.	NO	0.	0.
105	12000.	135.00	1400.00	SOFT	0.	NO	0.	0.
106	500.	112.50	1045.00	SOFT	0.	NO	0.	0.
107	1000.	112.50	1040.00	SOFT	0.	NO	0.	0.
108	2000.	112.50	1040.00	SOFT	0.	NO	0.	0.

GRID POINT	DISTANCE	ELEVATION	WEIGHT	GRIDING TYPE	ROLLING REFRACTION	INTERVENING OBSTRUCTIONS	DISTANCE TO HIGHEST OBSTRUCTION FROM SOURCE	HEIGHT OF OBSTRUCTION
37	1000.	227.50	1100.00	SOFT	0.	NO	0.	0.
38	2000.	227.50	1220.00	SOFT	0.	YES	1400.	1200.
39	4000.	227.50	1300.00	SOFT	0.	YES	1100.	1200.
40	6000.	227.50	1410.00	SOFT	0.	YES	5750.	1400.
41	8000.	227.50	1480.00	1.	0.	YES	5750.	1400.
42	12000.	227.50	1500.00	SOFT	0.	YES	5750.	1800.
43	500.	215.00	1110.00	SOFT	0.	NO	0.	0.
44	1000.	215.00	1140.00	SOFT	0.	NO	0.	0.
45	2000.	215.00	1240.00	SOFT	0.	NO	0.	0.
46	4000.	215.00	1450.00	SOFT	0.	NO	0.	0.
47	6000.	215.00	1500.00	SOFT	0.	NO	0.	0.
48	8000.	215.00	2100.00	SOFT	0.	YES	7050.	2100.
49	12000.	215.00	1500.00	SOFT	0.	YES	7050.	2100.
50	500.	242.50	1170.00	SOFT	0.	NO	0.	0.
51	1000.	242.50	1160.00	SOFT	0.	NO	0.	0.
52	2000.	242.50	1270.00	SOFT	0.	NO	0.	0.
53	4000.	242.50	1480.00	SOFT	0.	NO	0.	0.
54	6000.	242.50	2080.00	SOFT	0.	NO	0.	0.
55	8000.	242.50	2180.00	SOFT	0.	YES	6000.	2080.
56	12000.	242.50	2080.00	SOFT	0.	YES	6000.	2180.
57	500.	270.00	1140.00	SOFT	0.	NO	0.	0.
58	1000.	270.00	1150.00	SOFT	0.	NO	0.	0.
59	2000.	270.00	1200.00	SOFT	0.	YES	1000.	1180.
60	4000.	270.00	1470.00	SOFT	0.	NO	0.	0.
61	6000.	270.00	2020.00	SOFT	0.	NO	0.	0.
62	8000.	270.00	2120.00	SOFT	0.	YES	6250.	2100.
63	12000.	270.00	1650.00	SOFT	0.	YES	6250.	2100.
64	500.	247.50	1110.00	SOFT	0.	NO	0.	0.
65	1000.	247.50	1120.00	SOFT	0.	NO	0.	0.
66	2000.	247.50	1150.00	SOFT	0.	NO	0.	0.
67	4000.	247.50	1280.00	SOFT	0.	NO	0.	0.
68	6000.	247.50	1620.00	SOFT	0.	NO	0.	0.
69	8000.	247.50	1620.00	SOFT	0.	YES	6250.	1600.
70	12000.	247.50	1080.00	SOFT	0.	YES	6250.	1600.
71	500.	225.00	1050.00	SOFT	0.	NO	0.	0.
72	1000.	225.00	1070.00	SOFT	0.	NO	0.	0.

# YANKEE NA-1

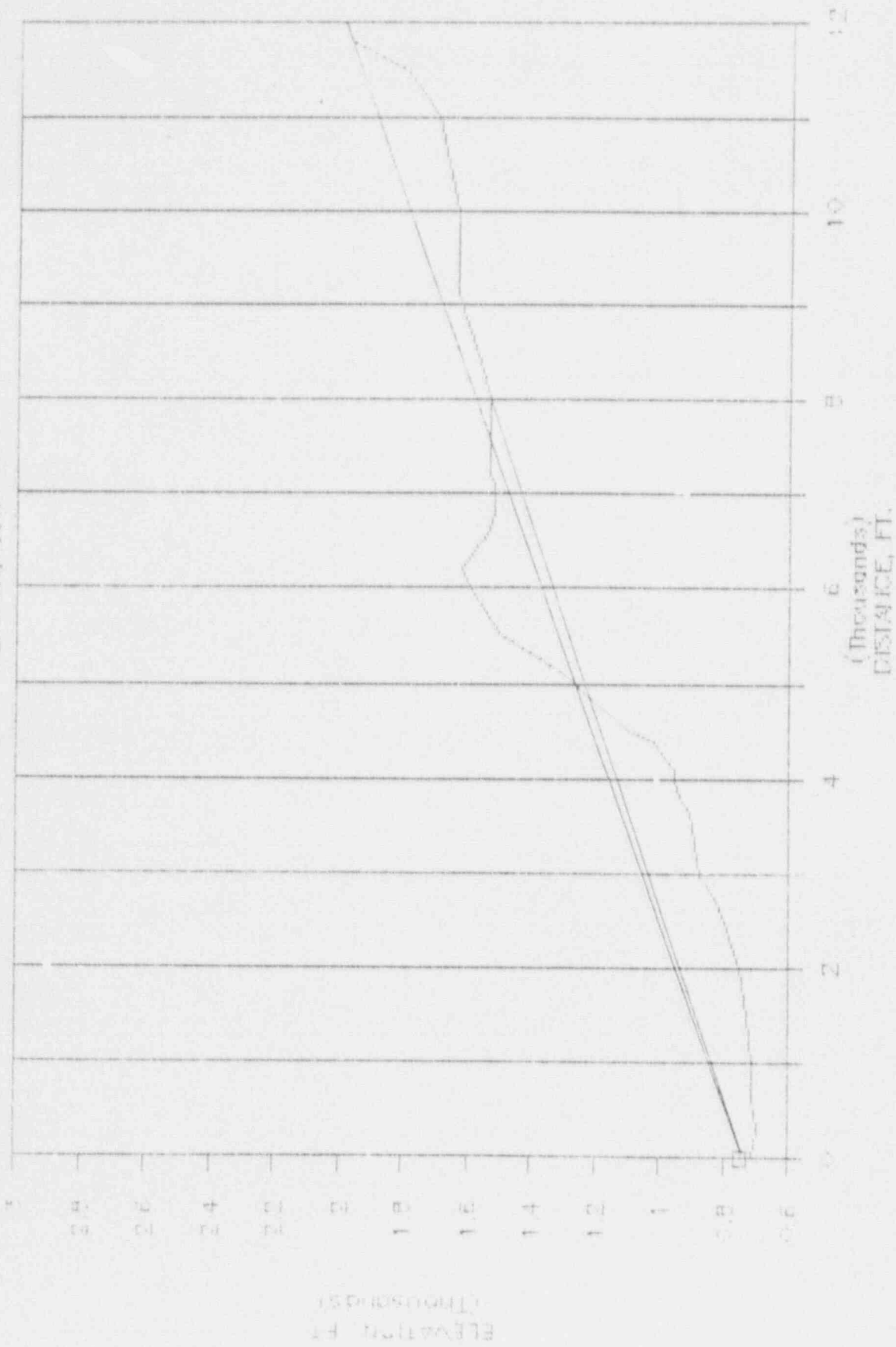
AZIMUTH, S



EL PASO INSTRUMENT CO.  
DALLAS, TEXAS

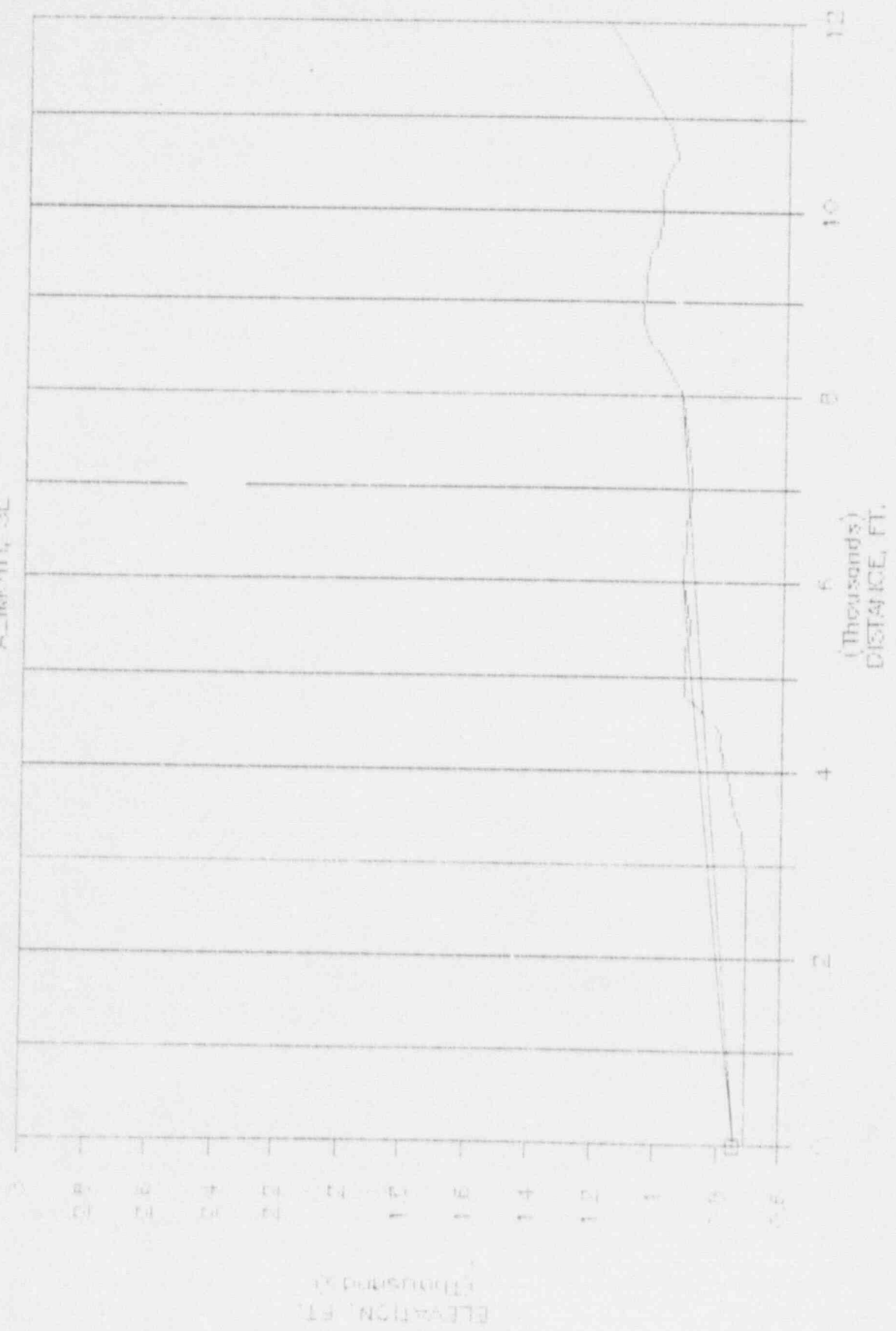
# YANIEE NA-1

AZIMUTH, SSW



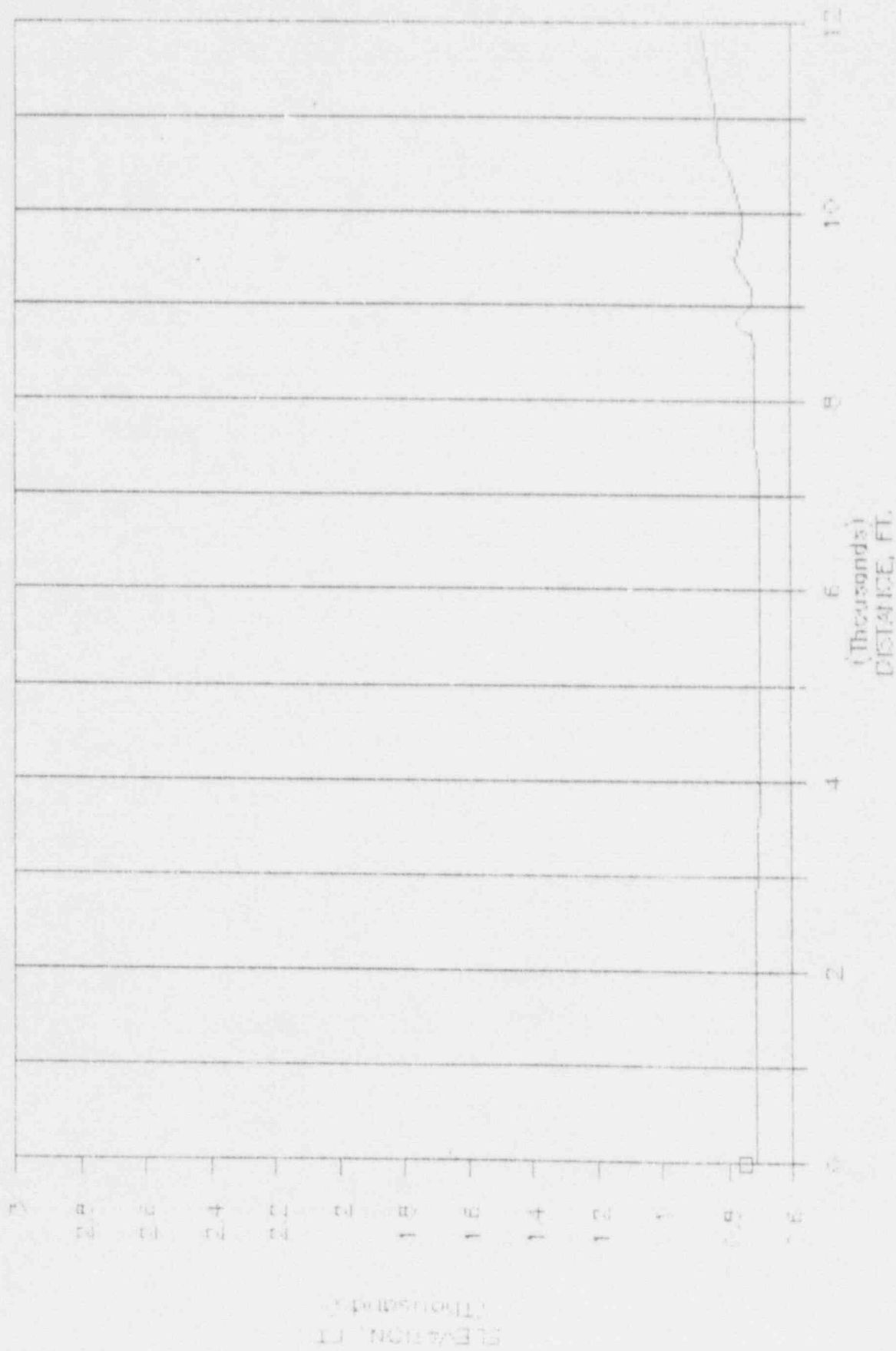
# YANKEE NA-1

AZIMUTH, SE



# YANKEE NA-1

AZIMUTH, 33E



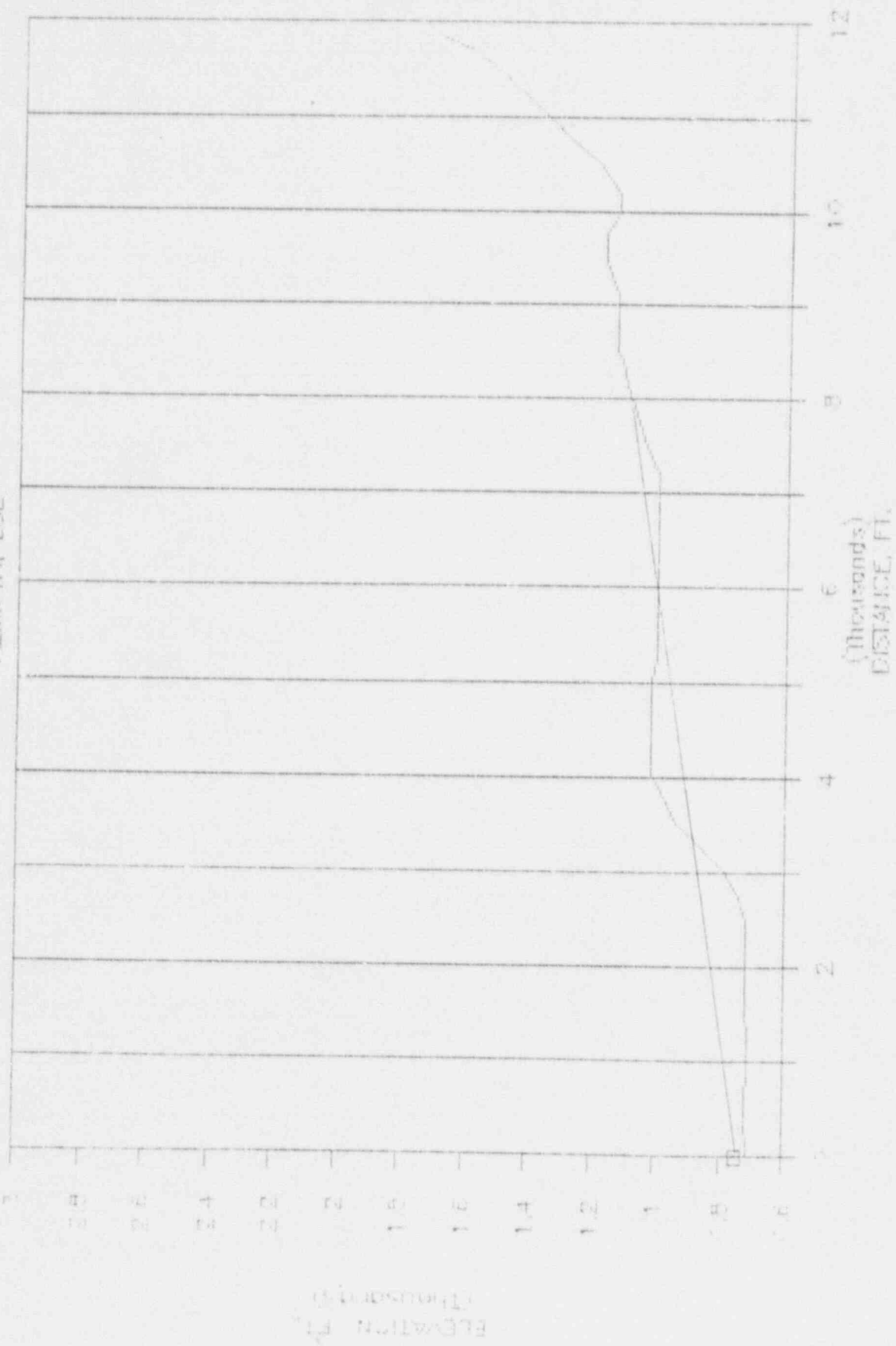
1. 2000 1000 1000  
 2. 1000 1000 1000  
 3. 1000 1000 1000

1. 2000 1000 1000  
 2. 1000 1000 1000

NO.	DATE	AMOUNT	DESCRIPTION	STATUS	REMARKS	DATE	AMOUNT	DESCRIPTION	STATUS	REMARKS
1	1000	1000	1000	HARD						
2	1000	1000	1000	HARD						
3	1000	1000	1000	HARD						
4	1000	1000	1000	HARD						
5	1000	1000	1000	SOFT						
6	1000	1000	1000	SOFT						
7	1000	1000	1000	SOFT						
8	1000	1000	1000	HARD						
9	1000	1000	1000	HARD						
10	1000	1000	1000	HARD						
11	1000	1000	1000	HARD						
12	1000	1000	1000	SOFT						
13	1000	1000	1000	SOFT						
14	1000	1000	1000	SOFT						
15	1000	1000	1000	HARD						
16	1000	1000	1000	HARD						
17	1000	1000	1000	HARD						
18	1000	1000	1000	HARD						
19	1000	1000	1000	SOFT						
20	1000	1000	1000	SOFT						
21	1000	1000	1000	SOFT						
22	1000	1000	1000	HARD						
23	1000	1000	1000	HARD						
24	1000	1000	1000	HARD						
25	1000	1000	1000	HARD						
26	1000	1000	1000	SOFT						
27	1000	1000	1000	SOFT						
28	1000	1000	1000	SOFT						
29	1000	1000	1000	HARD						
30	1000	1000	1000	HARD						
31	1000	1000	1000	HARD						
32	1000	1000	1000	HARD						
33	1000	1000	1000	SOFT						
34	1000	1000	1000	SOFT						
35	1000	1000	1000	SOFT						
36	1000	1000	1000	HARD						

# YANKEE NA-1

AZIMUTH, ESE





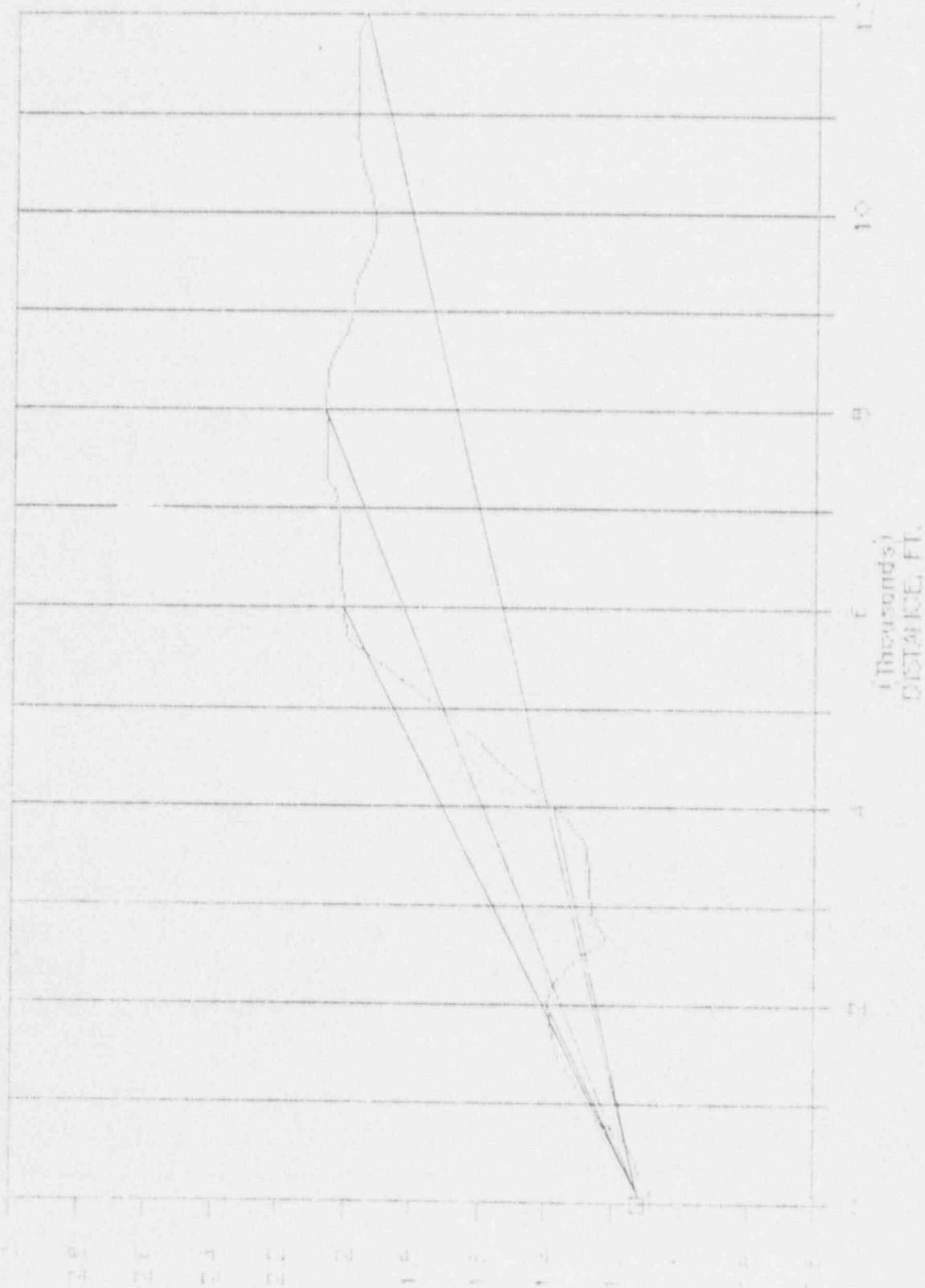
GRID POINT	DISTANCE	BEARING	HEIGHT	GROUND TYPE	VOLTAGE PENETRATION	INTERVENING OBSTRUCTIONS	DISTANCE TO HIGHEST OBSTRUCTION FROM SOURCE	HEIGHT OF OBSTRUCTION
37	1000.	337.50	700.00	HARD	0.	NO	0.	0.
38	2000.	337.50	700.00	HARD	0.	NO	0.	0.
39	4000.	337.50	710.00	HARD	0.	NO	0.	0.
40	6000.	337.50	1000.00	SOFT	0.	NO	0.	0.
41	8000.	337.50	1840.00	SOFT	0.	NO	0.	0.
42	10000.	337.50	2000.00	SOFT	0.	YES	9050.	2040.
43	500.	315.00	715.00	HARD	0.	NO	0.	0.
44	1000.	315.00	730.00	HARD	0.	NO	0.	0.
45	2000.	315.00	790.00	HARD	0.	YES	1700.	730.
46	4000.	315.00	770.00	HARD	0.	NO	0.	0.
47	6000.	315.00	1220.00	SOFT	0.	NO	0.	0.
48	8000.	315.00	1430.00	SOFT	0.	NO	0.	0.
49	10000.	315.00	1740.00	SOFT	0.	YES	8000.	1680.
50	500.	292.50	700.00	HARD	0.	NO	0.	0.
51	1000.	292.50	790.00	HARD	0.	NO	0.	0.
52	2000.	292.50	730.00	HARD	0.	YES	1400.	800.
53	4000.	292.50	870.00	SOFT	0.	YES	1400.	800.
54	6000.	292.50	940.00	SOFT	0.	YES	1400.	800.
55	8000.	292.50	1080.00	SOFT	0.	YES	1400.	800.
56	10000.	292.50	1120.00	SOFT	0.	YES	1400.	800.
57	500.	270.00	700.00	HARD	0.	NO	0.	0.
58	1000.	270.00	710.00	HARD	0.	NO	0.	0.
59	2000.	270.00	940.00	HARD	0.	YES	1550.	920.
60	4000.	270.00	940.00	SOFT	0.	YES	1550.	920.
61	6000.	270.00	645.00	SOFT	0.	YES	1550.	920.
62	8000.	270.00	645.00	SOFT	0.	YES	1550.	920.
63	10000.	270.00	625.00	SOFT	0.	YES	1550.	920.
64	500.	247.50	710.00	HARD	0.	NO	0.	0.
65	1000.	247.50	820.00	HARD	0.	NO	0.	0.
66	2000.	247.50	1010.00	SOFT	0.	NO	0.	0.
67	4000.	247.50	1120.00	SOFT	0.	YES	3600.	1200.
68	6000.	247.50	800.00	SOFT	0.	YES	3600.	1200.
69	8000.	247.50	1000.00	SOFT	0.	YES	3600.	1200.
70	10000.	247.50	1044.00	HARD	0.	YES	3600.	1200.
71	500.	225.00	700.00	HARD	0.	NO	0.	0.
72	1000.	225.00	770.00	HARD	0.	NO	0.	0.



GRID POINT	DISTANCE	BEARING	HEIGHT	GROUND TYPE	FOLIAGE PENETRATION	INTERVENING OBSTRUCTIONS	DISTANCE TO HIGHEST OBSTRUCTION FROM SOURCE	HEIGHT OF OBSTRUCTION
109	4000.	112.50	1020.00	SOFT	0.	NO	0.	0.
110	4000.	112.50	1000.00	SOFT	0.	YES	8000.	1020.
111	8000.	112.50	1000.00	SOFT	0.	YES	8000.	1020.
112	12000.	112.50	1700.00	SOFT	0.	NO	0.	0.
113	4395779.	89.48	1111.00	SOFT	0.	NO	0.	0.
114	4395779.	89.48	1111.00	SOFT	0.	NO	0.	0.
115	4395779.	89.48	1111.00	SOFT	0.	NO	0.	0.
116	4395600.	90.00	1111.00	SOFT	0.	NO	0.	0.
117	4395600.	90.00	1111.00	SOFT	0.	NO	0.	0.
118	4395600.	90.00	1111.00	SOFT	0.	NO	0.	0.
119	4395779.	90.52	1111.00	SOFT	0.	NO	0.	0.
120	4395779.	90.52	1111.00	SOFT	0.	NO	0.	0.
121	4395779.	90.52	1111.00	SOFT	0.	NO	0.	0.

# YANKEE HA-2

AZIMUTH, E



FILE NO. 101  
PLATE NO. 101

UNION PACIFIC ELECTRIC COMPANY  
 1100 22 AVENUE AND 11000 11TH AVENUE

11000 22ND AVENUE 11000 11TH

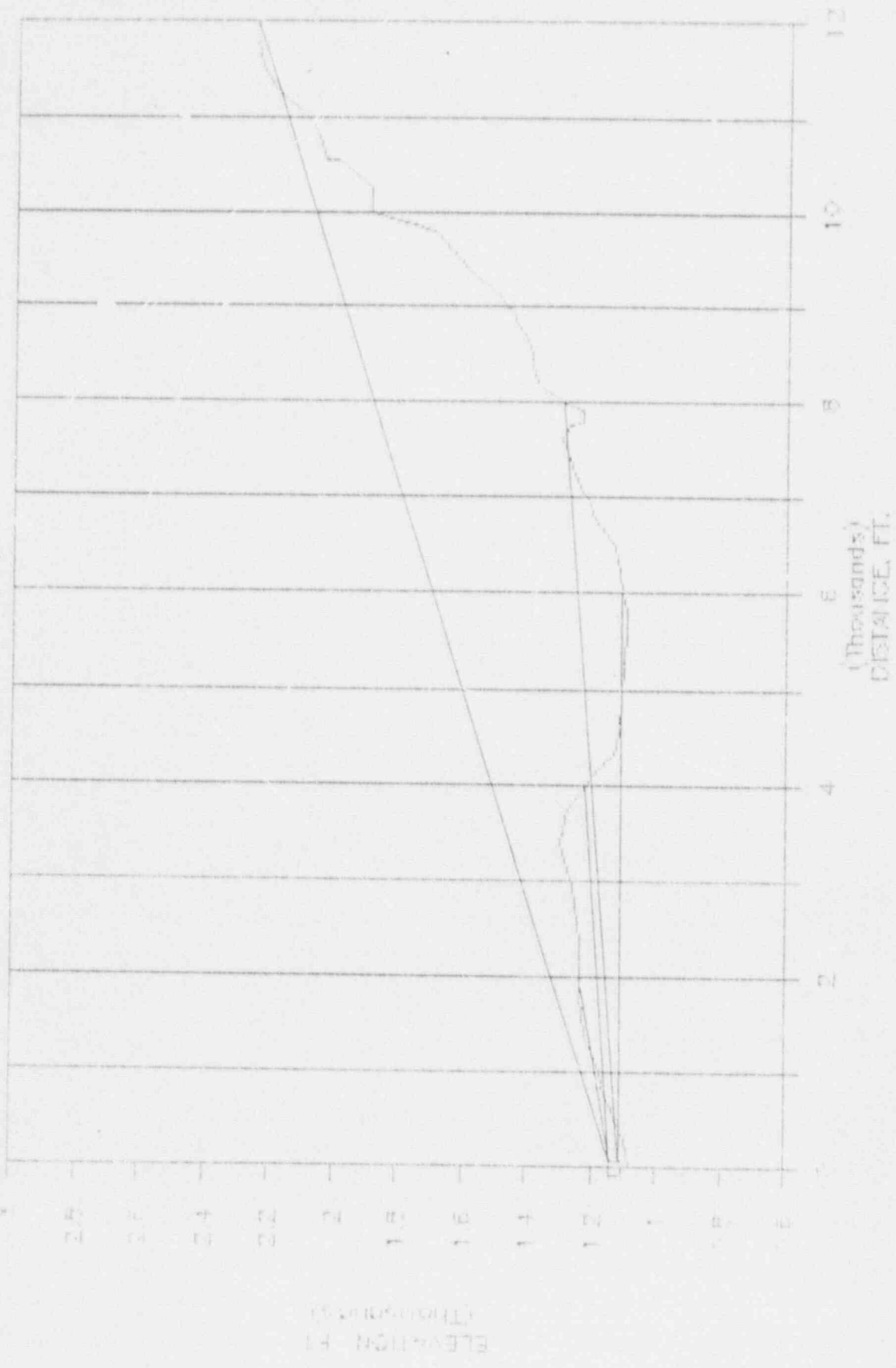
UNDER BEST CONDITIONS

DISTANCE IN FEET

Altitude	100	110	120	130	140	150	160
110	112	114	116	118	120	122	124
111	112	113	115	117	119	121	123
112	112	113	115	117	119	121	123
113	112	113	115	117	119	121	123
114	112	113	115	117	119	121	123
115	112	113	115	117	119	121	123
116	112	113	115	117	119	121	123
117	112	113	115	117	119	121	123
118	112	113	115	117	119	121	123
119	112	113	115	117	119	121	123
120	112	113	115	117	119	121	123
121	112	113	115	117	119	121	123
122	112	113	115	117	119	121	123
123	112	113	115	117	119	121	123
124	112	113	115	117	119	121	123
125	112	113	115	117	119	121	123
126	112	113	115	117	119	121	123
127	112	113	115	117	119	121	123
128	112	113	115	117	119	121	123
129	112	113	115	117	119	121	123
130	112	113	115	117	119	121	123

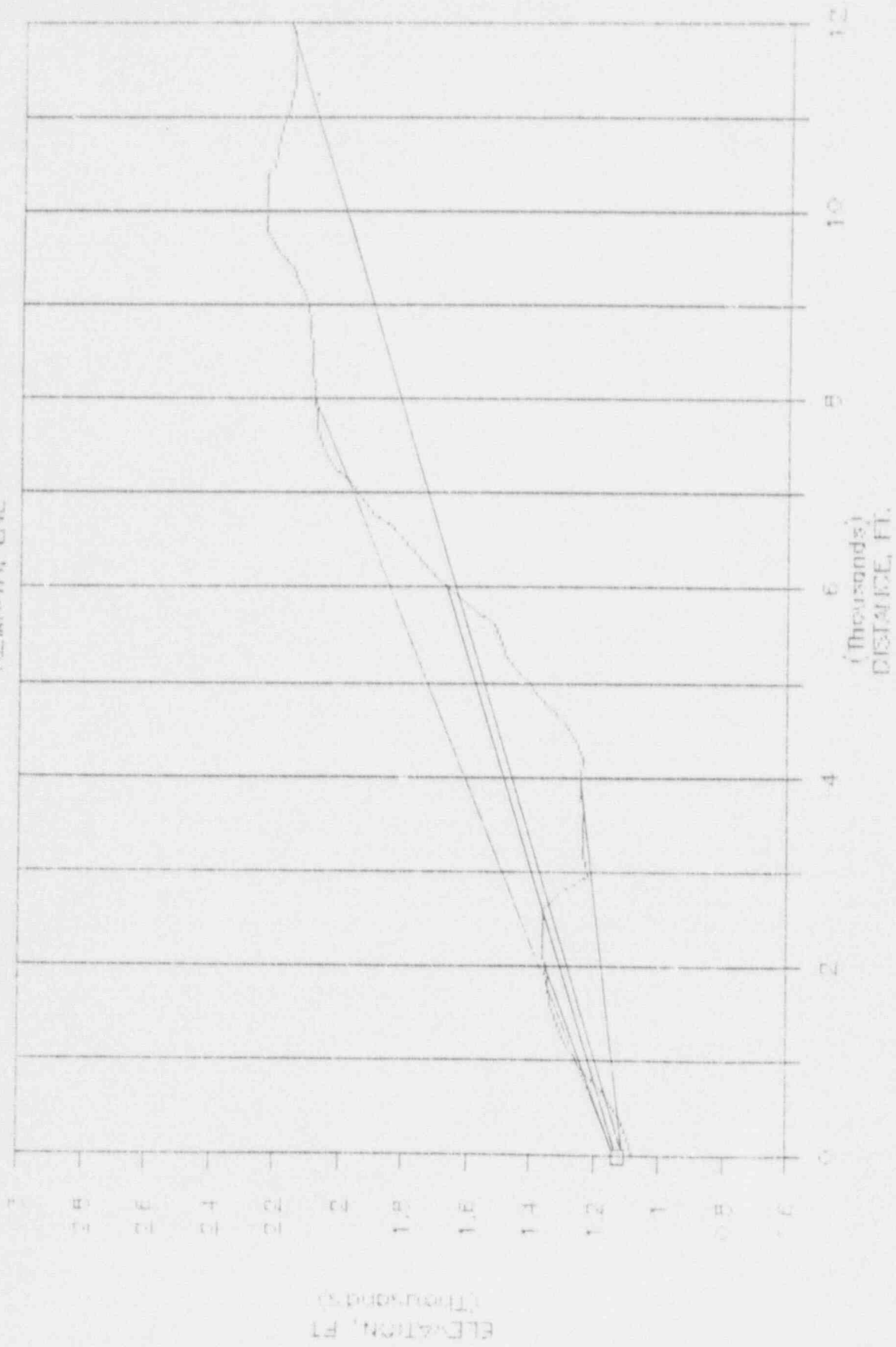
# YANKEE HA-2

AZIMUTH, DE



# YANKEE NA-2

AZIMUTH, DEG

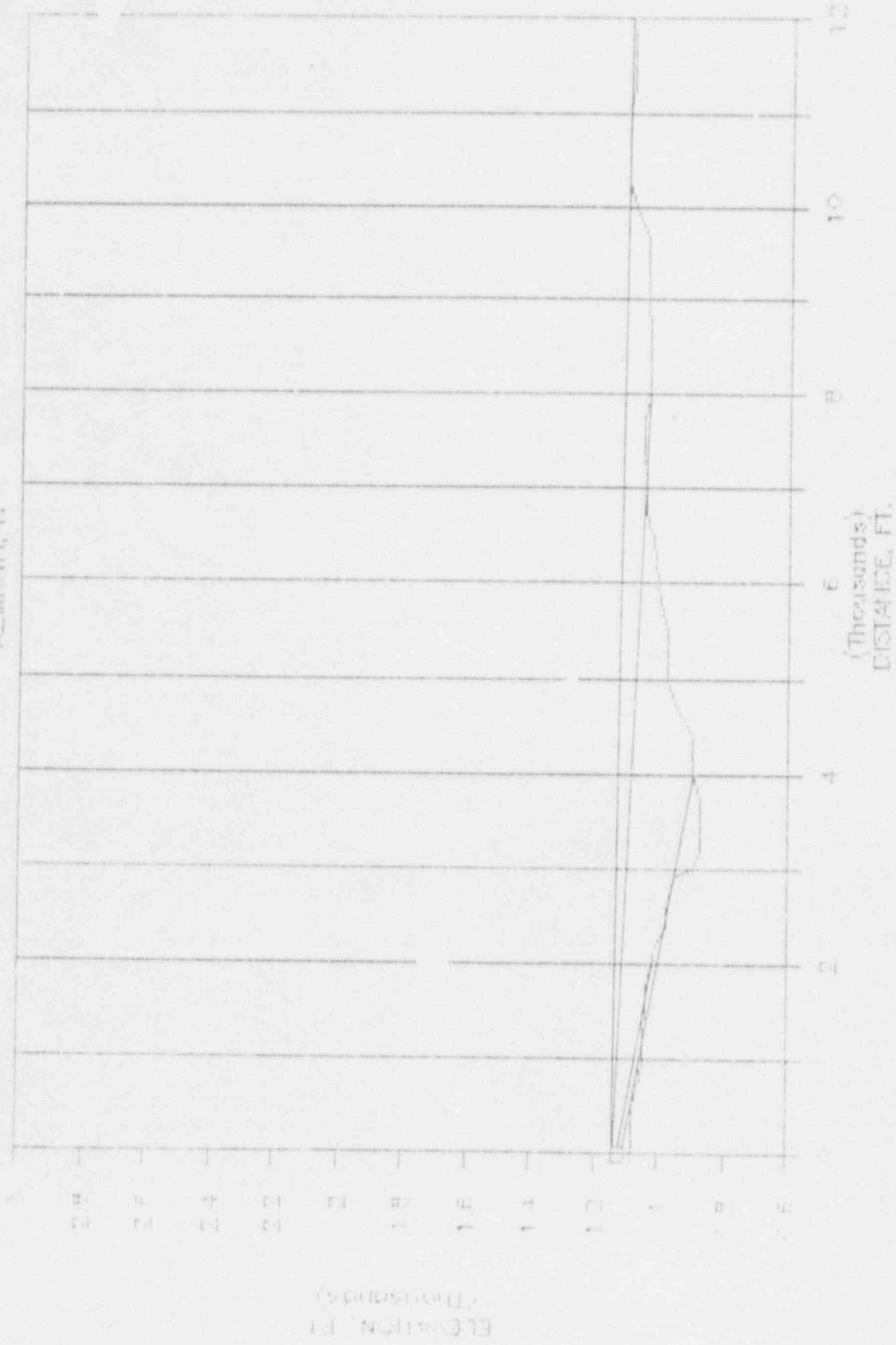


ELEVATION, FT  
(THOUSANDS)

(Thousands)  
DISTANCE, FT.

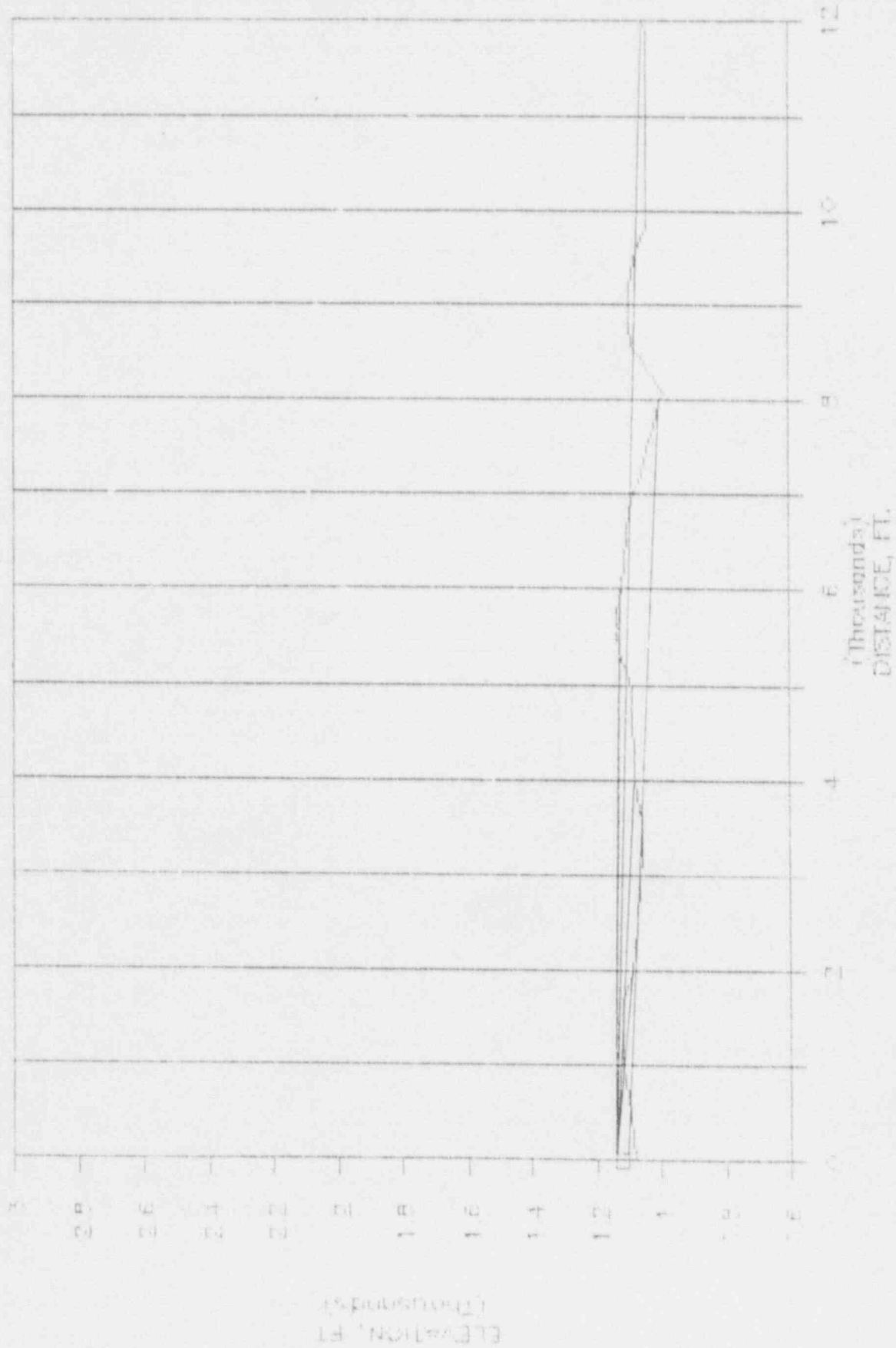
# YANFEE NA-2

AZIMUTH, H



# YANFEE NA-2

AZIMUTH, DPE



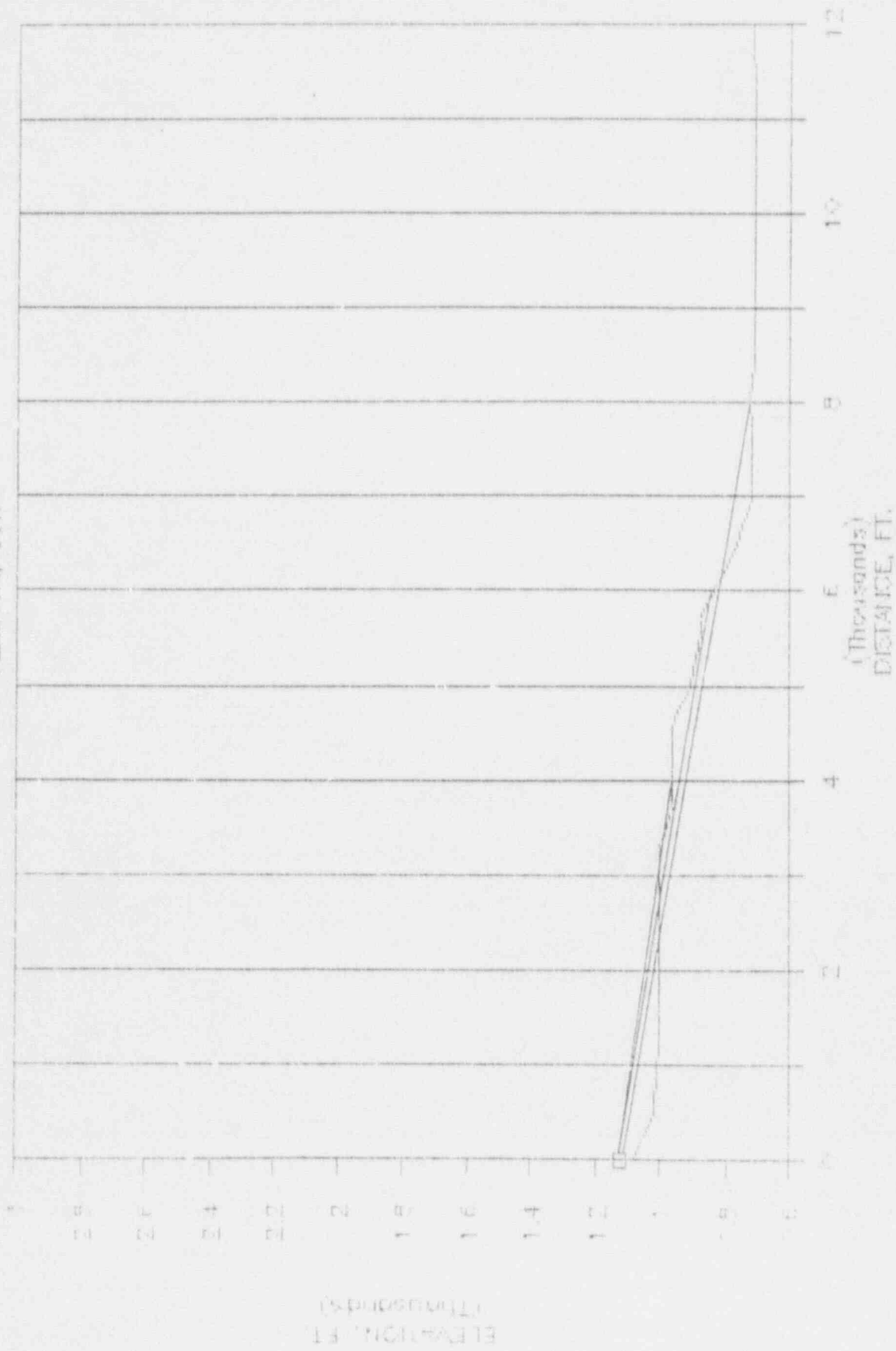
# YANKEE NA-2

AZIMUTH, S



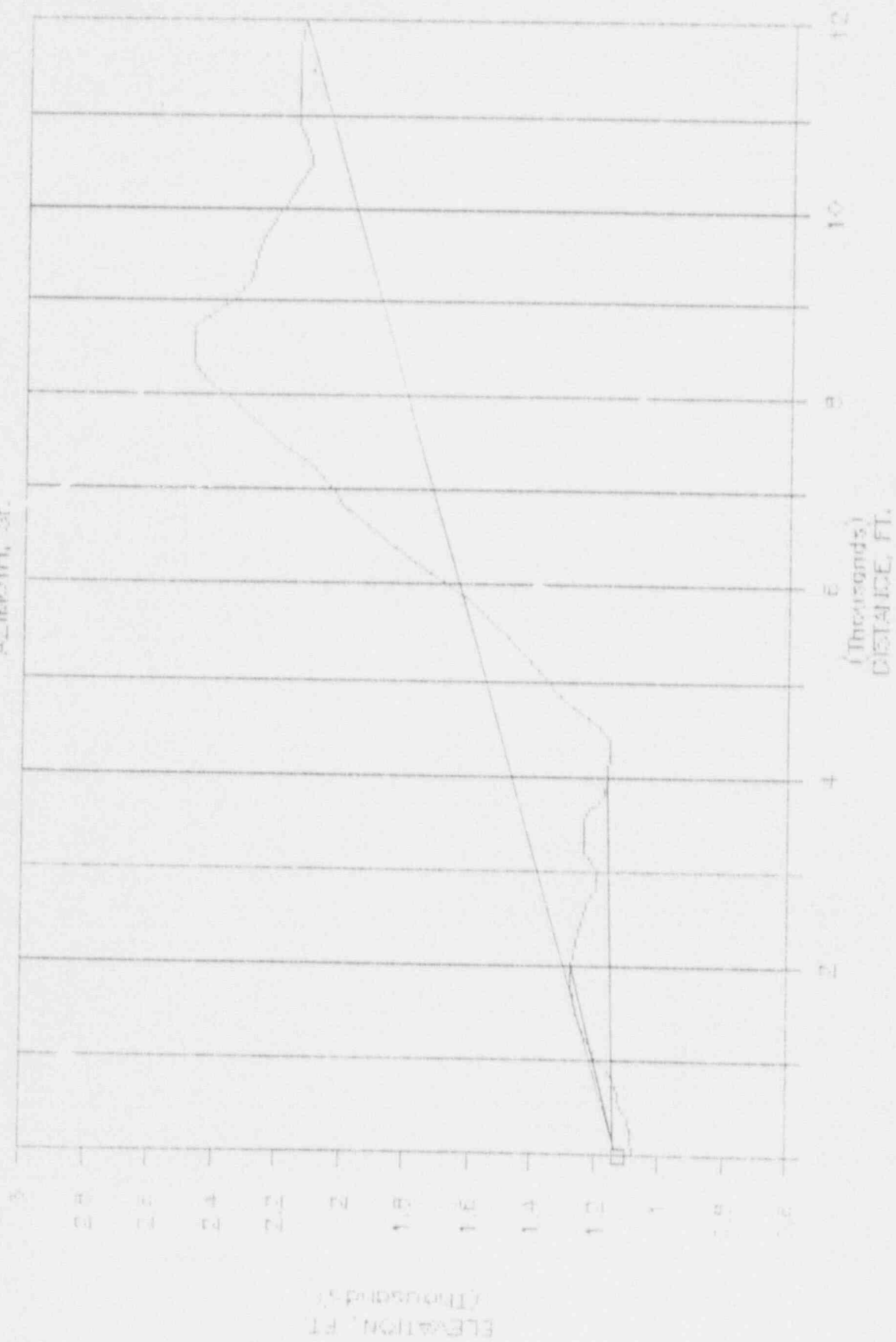
# YANKEE NA-2

AZIMUTH, SSW



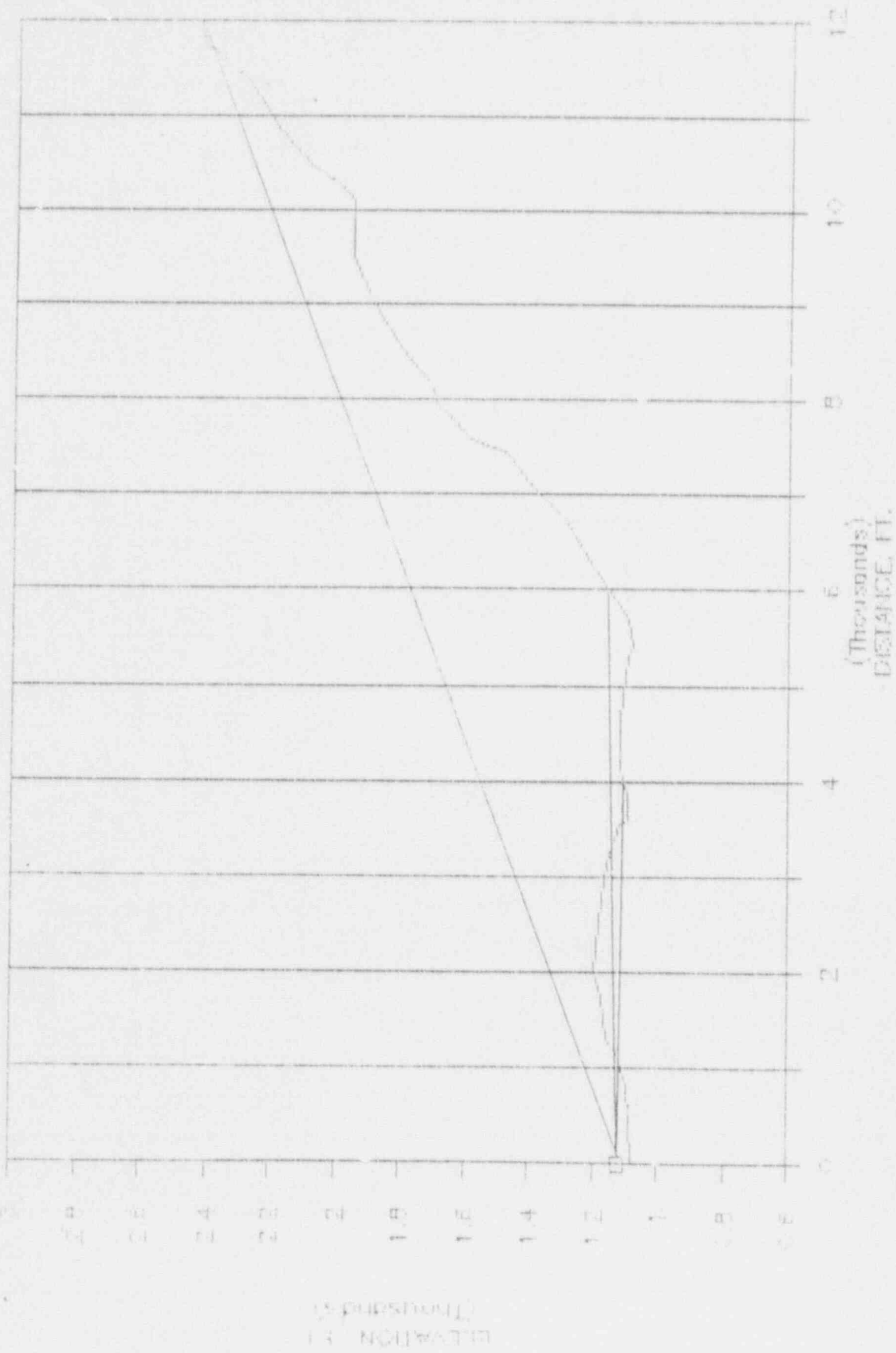
# YANKEE MA-2

AZIMUTH, SE.



# YANKEE MA-2

AZIMUTH, SSE



MODEL - TALL ELECTRIC LINE  
 MODEL FOR THE LINE WORKING  
 SOURCE-AGE, OR TOPGRAPHICAL, DATA

ALL DE RINGS ARE WITH RESPECT TO THE NORTH MEASURING CIRCUMFERENCE

SPIN NO.	DISTANCE	SEASONS	HEIGHT	GROUND TYPE	FOLIAGE PENETRATION	INTERFERING OBSTRUCTIONS	DISTANCE TO *10-60' OBSTRUCTION FROM 60-40'	HEIGHT OF OBSTRUCTION
1	500.	40.00	1140.00	SOFT	0.	NO	0.	0.
2	1000.	40.00	1120.00	SOFT	0.	NO	0.	0.
3	2000.	40.00	1090.00	SOFT	0.	YES	1400.	100.
4	4000.	40.00	1060.00	SOFT	0.	YES	1400.	100.
5	6000.	40.00	2010.00	SOFT	0.	YES	3700.	200.
6	8000.	40.00	2070.00	SOFT	0.	YES	3700.	200.
7	12000.	40.00	1850.00	SOFT	0.	YES	3700.	200.
8	500.	47.50	1140.00	SOFT	0.	NO	0.	0.
9	1000.	47.50	1120.00	SOFT	0.	NO	0.	0.
10	2000.	47.50	1080.00	SOFT	0.	YES	1200.	100.
11	4000.	47.50	1050.00	SOFT	0.	YES	1200.	100.
12	6000.	47.50	1070.00	SOFT	0.	YES	1200.	100.
13	8000.	47.50	2090.00	SOFT	0.	YES	1200.	100.
14	12000.	47.50	2170.00	SOFT	0.	YES	1200.	100.
15	500.	45.00	1130.00	SOFT	0.	NO	0.	0.
16	1000.	45.00	1090.00	SOFT	0.	NO	0.	0.
17	2000.	45.00	1040.00	SOFT	0.	YES	1440.	100.
18	4000.	45.00	1020.00	SOFT	0.	YES	1440.	100.
19	6000.	45.00	1110.00	SOFT	0.	YES	1440.	100.
20	8000.	45.00	1040.00	SOFT	0.	YES	1440.	100.
21	12000.	45.00	2140.00	SOFT	0.	YES	1850.	200.
22	500.	21.50	1100.00	SOFT	0.	NO	0.	0.
23	1000.	21.50	1070.00	SOFT	0.	NO	0.	0.
24	2000.	21.50	1090.00	SOFT	0.	YES	1700.	100.
25	4000.	21.50	1090.00	SOFT	0.	YES	1700.	100.
26	6000.	21.50	1100.00	SOFT	0.	YES	3500.	110.
27	8000.	21.50	990.00	SOFT	0.	YES	3500.	110.
28	12000.	21.50	1040.00	SOFT	0.	YES	3500.	110.
29	500.	00	1090.00	SOFT	0.	NO	0.	0.
30	1000.	00	1050.00	SOFT	0.	NO	0.	0.
31	2000.	00	1020.00	SOFT	0.	YES	1800.	100.
32	4000.	00	900.00	SOFT	0.	YES	1800.	100.
33	6000.	00	1010.00	SOFT	0.	NO	0.	0.
34	8000.	00	1040.00	HARD	0.	YES	7000.	100.
35	12000.	00	1100.00	SOFT	0.	YES	11000.	110.
36	500.	217.50	1050.00	SOFT	0.	NO	0.	0.

# YANKEE HA-2

AZIMUTH, ESE





GRID POINT	DISTANCE	BEARING	HEIGHT	GROUND TYPE	VEGETATION PENETRATION	INTERVENING OBSTRUCTIONS	DISTANCE TO HIGHEST OBSTRUCTION FROM SOURCE	HEIGHT OF OBSTRUCTION
37	1000.	117.50	1010.00	SOFT	0.	NO	0.	0.
38	2000.	117.50	840.00	SOFT	0.	YES	1700.	1000.
39	4000.	117.50	870.00	SOFT	0.	NO	0.	0.
40	6000.	117.50	1075.00	SOFT	0.	NO	0.	0.
41	8000.	117.50	1025.00	SOFT	0.	YES	6450.	1080.
42	12000.	117.50	1250.00	SOFT	0.	NO	0.	0.
43	500.	115.00	1640.00	SOFT	0.	NO	0.	0.
44	1000.	115.00	990.00	SOFT	0.	NO	0.	0.
45	2000.	115.00	960.00	SOFT	0.	YES	1800.	950.
46	4000.	115.00	970.00	HARD	0.	NO	0.	0.
47	6000.	115.00	965.00	HARD	0.	NO	0.	0.
48	8000.	115.00	1020.00	HARD	0.	NO	0.	0.
49	12000.	115.00	1440.00	HARD	0.	NO	0.	0.
50	500.	292.50	1010.00	SOFT	0.	NO	0.	0.
51	1000.	292.50	980.00	SOFT	0.	NO	0.	0.
52	2000.	292.50	940.00	HARD	0.	NO	0.	0.
53	4000.	292.50	760.00	HARD	0.	YES	7050.	840.
54	6000.	292.50	750.00	HARD	0.	YES	4800.	850.
55	8000.	292.50	765.00	HARD	0.	NO	0.	0.
56	12000.	292.50	1020.00	SOFT	0.	NO	0.	0.
57	500.	270.00	990.00	SOFT	0.	NO	0.	0.
58	1000.	270.00	970.00	SOFT	0.	NO	0.	0.
59	2000.	270.00	870.00	SOFT	0.	NO	0.	0.
60	4000.	270.00	820.00	HARD	0.	YES	2800.	890.
61	6000.	270.00	720.00	HARD	0.	YES	2800.	880.
62	8000.	270.00	850.00	HARD	0.	NO	0.	0.
63	12000.	270.00	880.00	SOFT	0.	YES	9700.	1020.
64	500.	247.50	1010.00	SOFT	0.	NO	0.	0.
65	1000.	247.50	870.00	SOFT	0.	NO	0.	0.
66	2000.	247.50	880.00	SOFT	0.	NO	0.	0.
67	4000.	247.50	800.00	SOFT	0.	YES	7300.	1000.
68	6000.	247.50	720.00	SOFT	0.	YES	3300.	1000.
69	8000.	247.50	840.00	SOFT	0.	NO	0.	0.
70	12000.	247.50	1140.00	SOFT	0.	YES	10000.	1200.
71	500.	225.00	1010.00	SOFT	0.	NO	0.	0.
72	1000.	225.00	990.00	SOFT	0.	NO	0.	0.

1955 10 11 11:00 AM  
 1000 FT. 1000 FT. 1000 FT.  
 1000 FT. 1000 FT. 1000 FT.

1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

1955 ATOMIC ELECTRIC COMPANY  
 1000 FT. 1000 FT. 1000 FT.  
 METEOROLOGICAL INPUT CONDITIONS

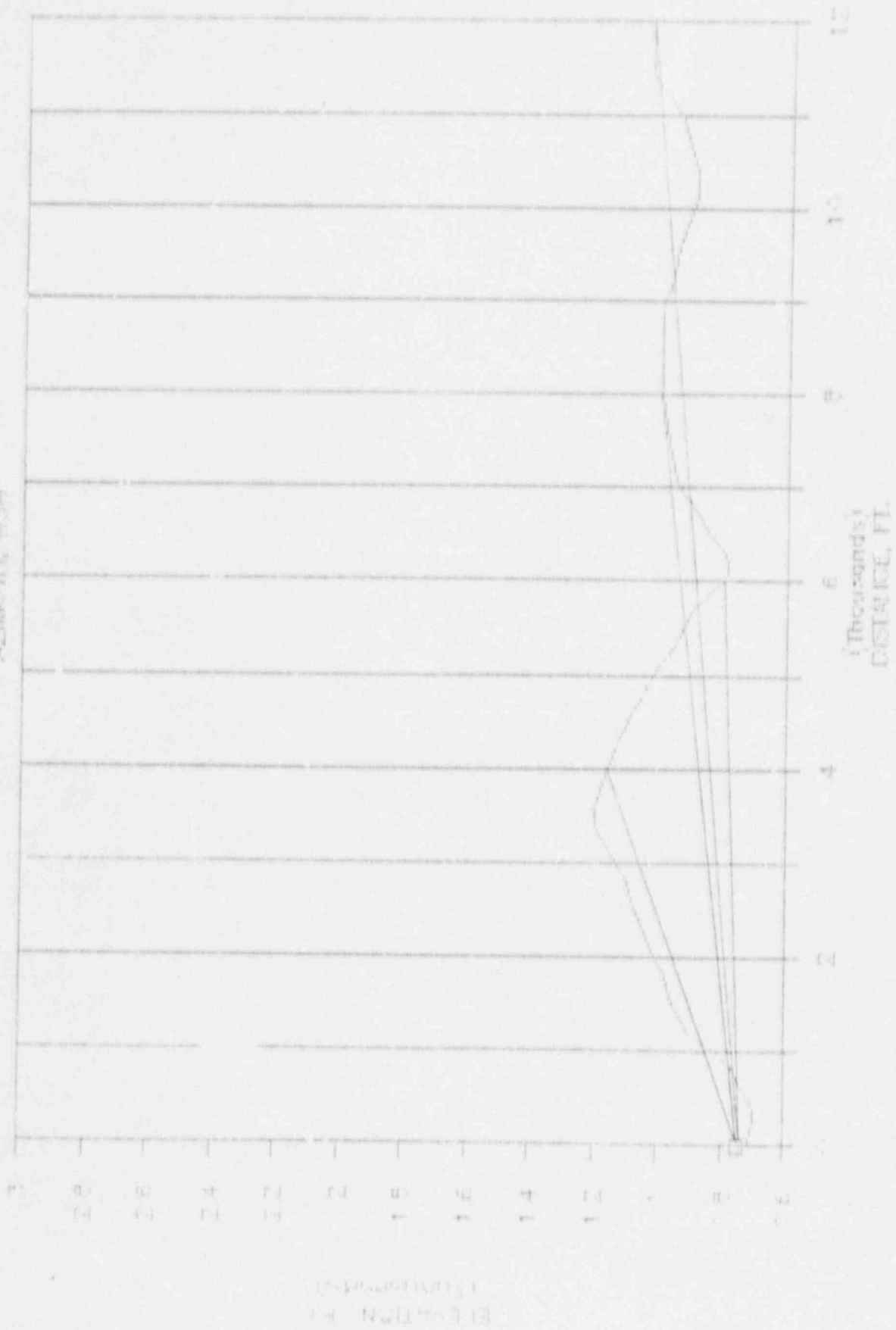
1000 5.72 METERS                      1000 5.74 METERS

DATE	SECTION	MONTH	DATE	HOUR	WIND DIRECTION	WIND SPEED (MPH)		TEMPERATURE (C)		RELATIVE HUMIDITY		BAROMETRIC PRESSURE (MM OF HG)
						M1	M2	M1	M2	M1	M2	
1955			8	12	178.0	1.5	1.5	22.7	22.4	22.0	78.8	1000

GRID POINT	DISTANCE	BEARING	HEIGHT	GROUND TYPE	FOLiage PENETRATION	INTERVENING OBSTACLES	DISTANCE TO HIGHEST OBSTRUCTION FROM SOURCE	HEIGHT OF OBSTRUCTION
109	4000.	112.80	1280.00	SOFT	0.	YES	1700.	1700.
110	4000.	112.80	2100.00	SOFT	0.	NO	0.	0.
111	8000.	112.80	2120.00	SOFT	0.	YES	7000.	2440.
112	12000.	112.80	1810.00	SOFT	0.	YES	7000.	2440.
113	4098779.	89.48	1111.00	SOFT	0.	NO	0.	0.
114	4098779.	89.48	1111.00	SOFT	0.	NO	0.	0.
115	4098779.	89.48	1111.00	SOFT	0.	NO	0.	0.
116	4098700.	90.82	1111.00	SOFT	0.	NO	0.	0.
117	4098700.	90.82	1111.00	SOFT	0.	NO	0.	0.
118	4098600.	90.82	1111.00	SOFT	0.	NO	0.	0.
119	4098779.	90.82	1111.00	SOFT	0.	NO	0.	0.
120	4098779.	90.82	1111.00	SOFT	0.	NO	0.	0.
121	4098779.	90.82	1111.00	SOFT	0.	NO	0.	0.

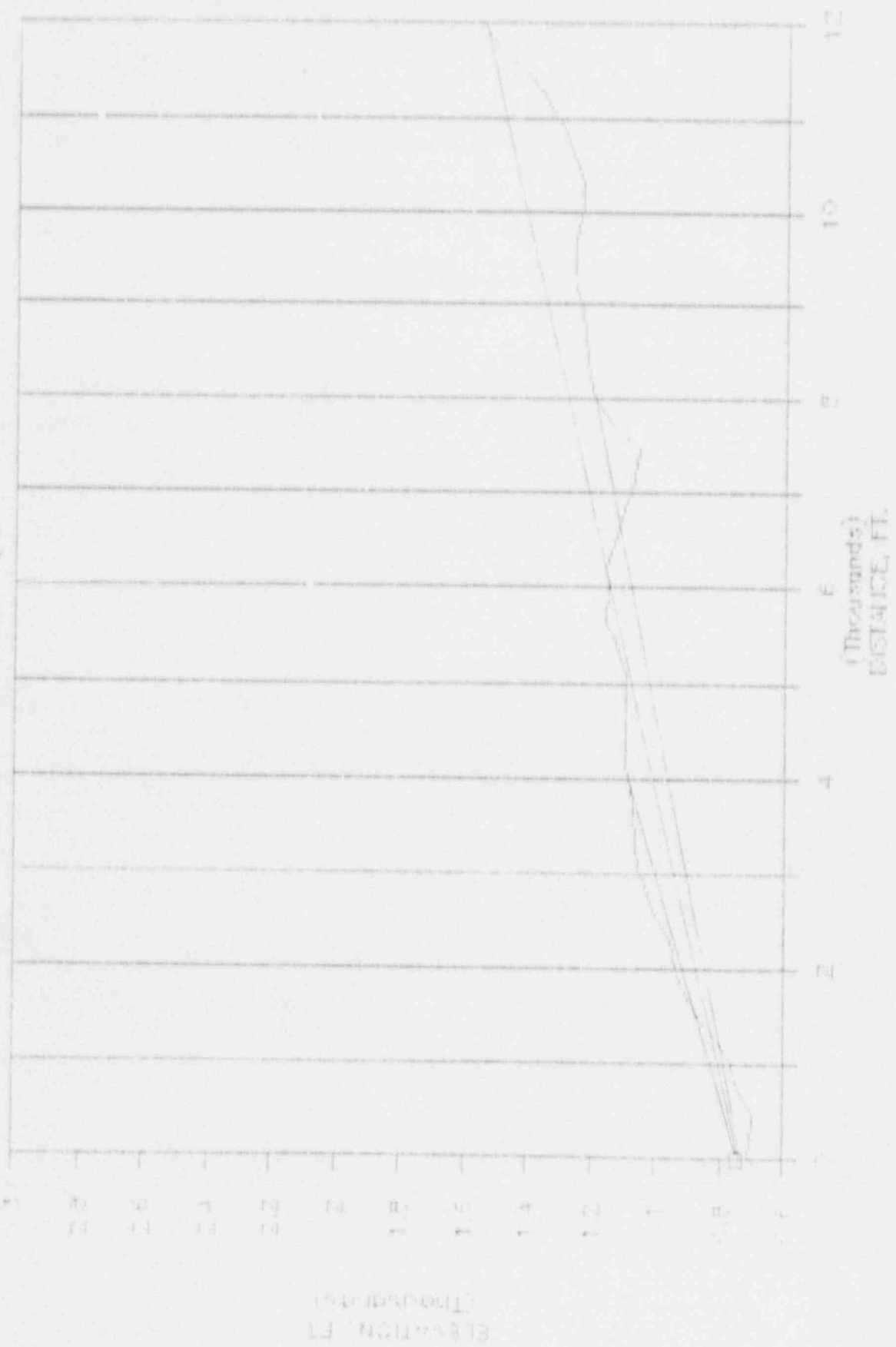
# YANKEE NA-1

AZIMUTH, WGS84



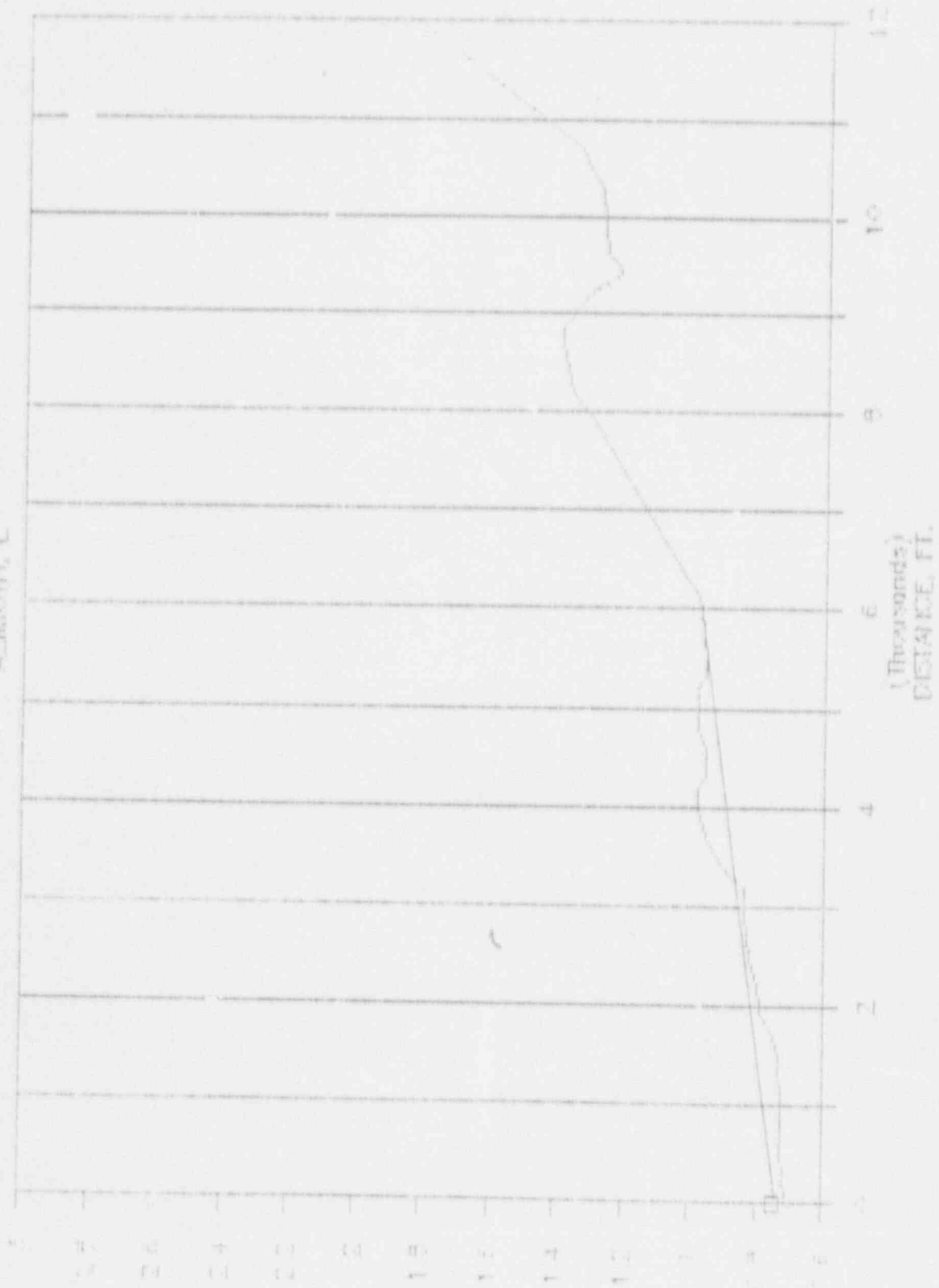
# YANFEE HA-1

AZIMUTH, SW



# YANJIE HA-1

ACRUALTH, E



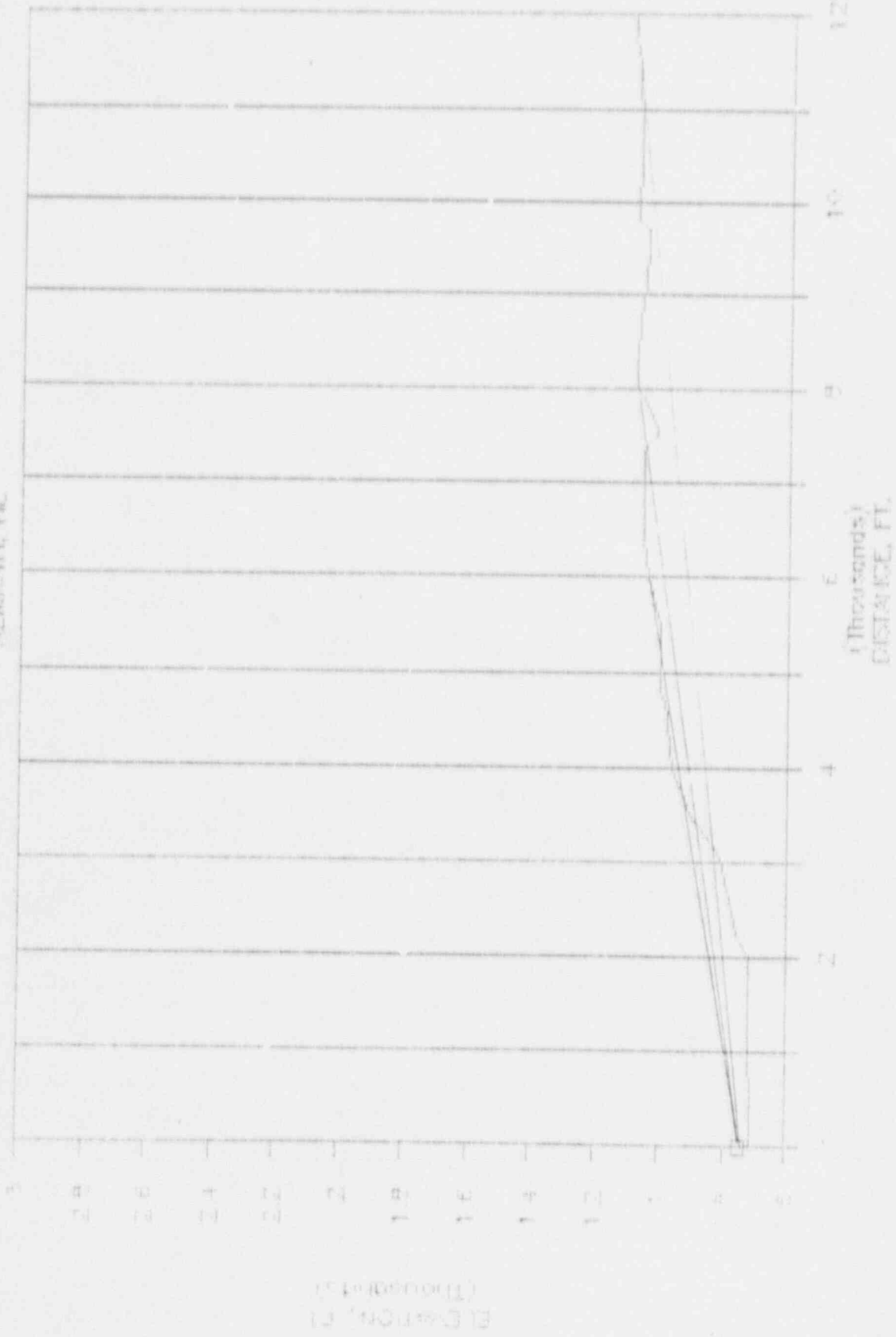
EL. DRAINAGE

1710000000



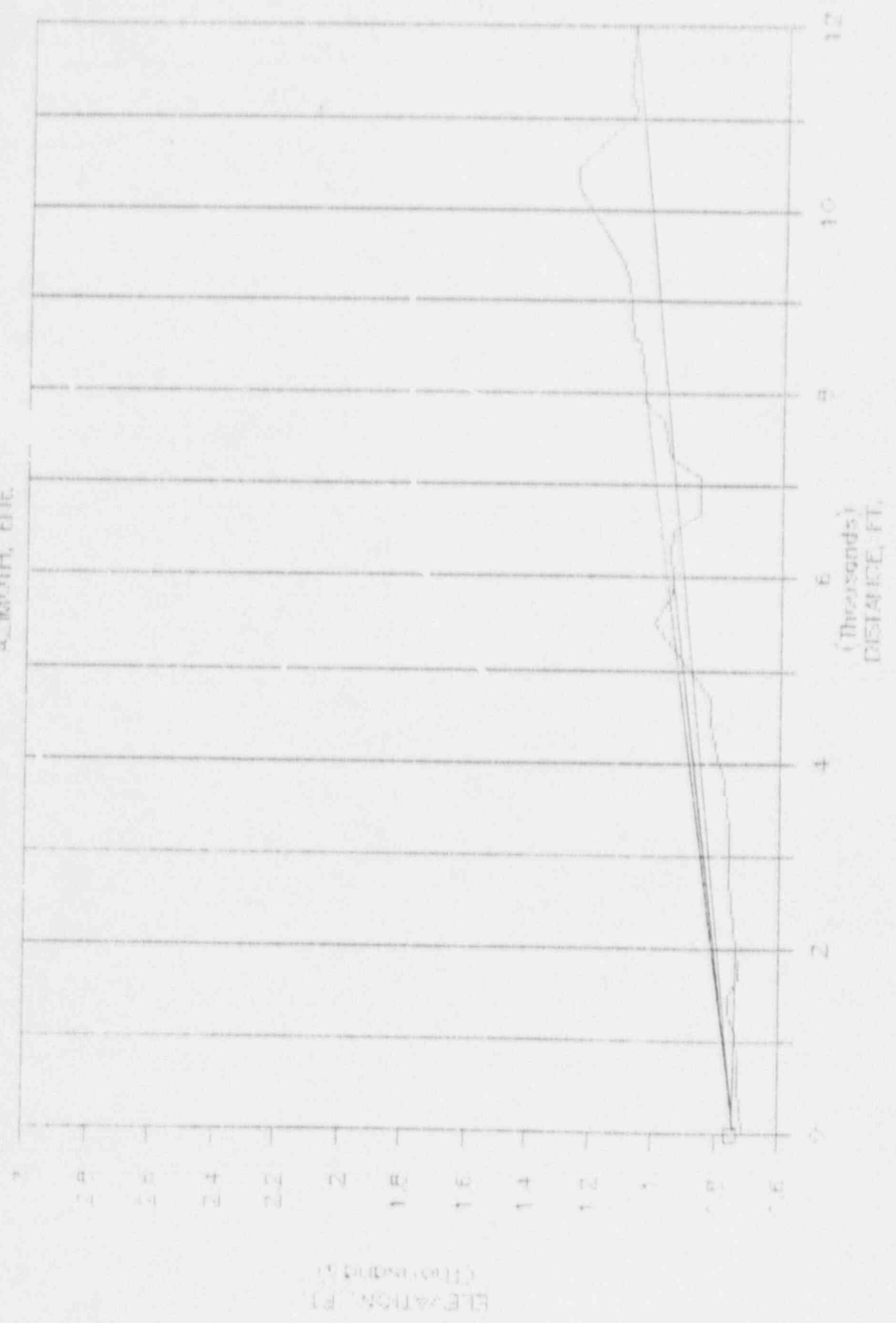
# YAMHEE NA - I

AZIMUTH, DE



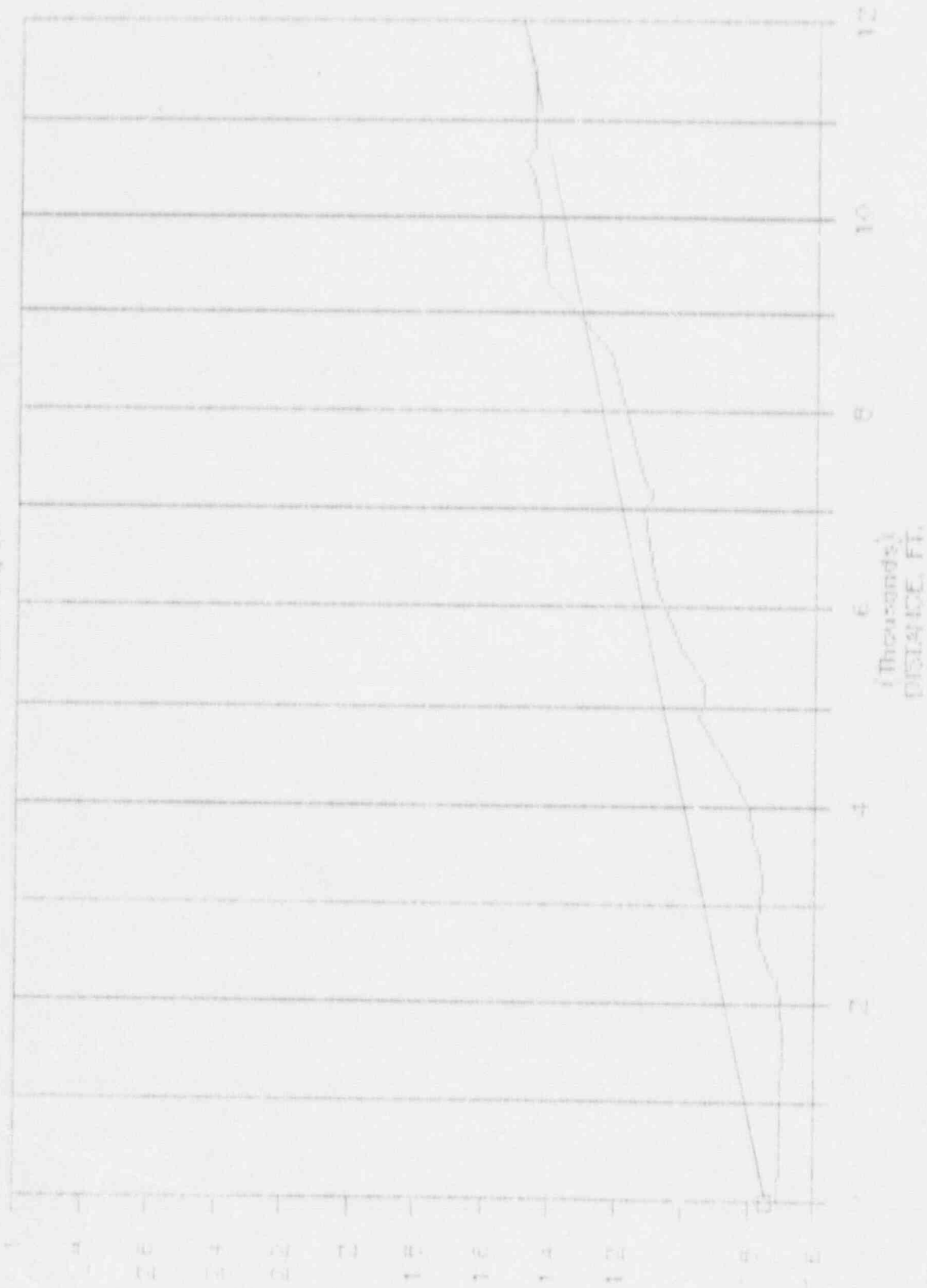
# YANKEE HA-1

ACRUPH, BHE



# YANKEE IIa-1

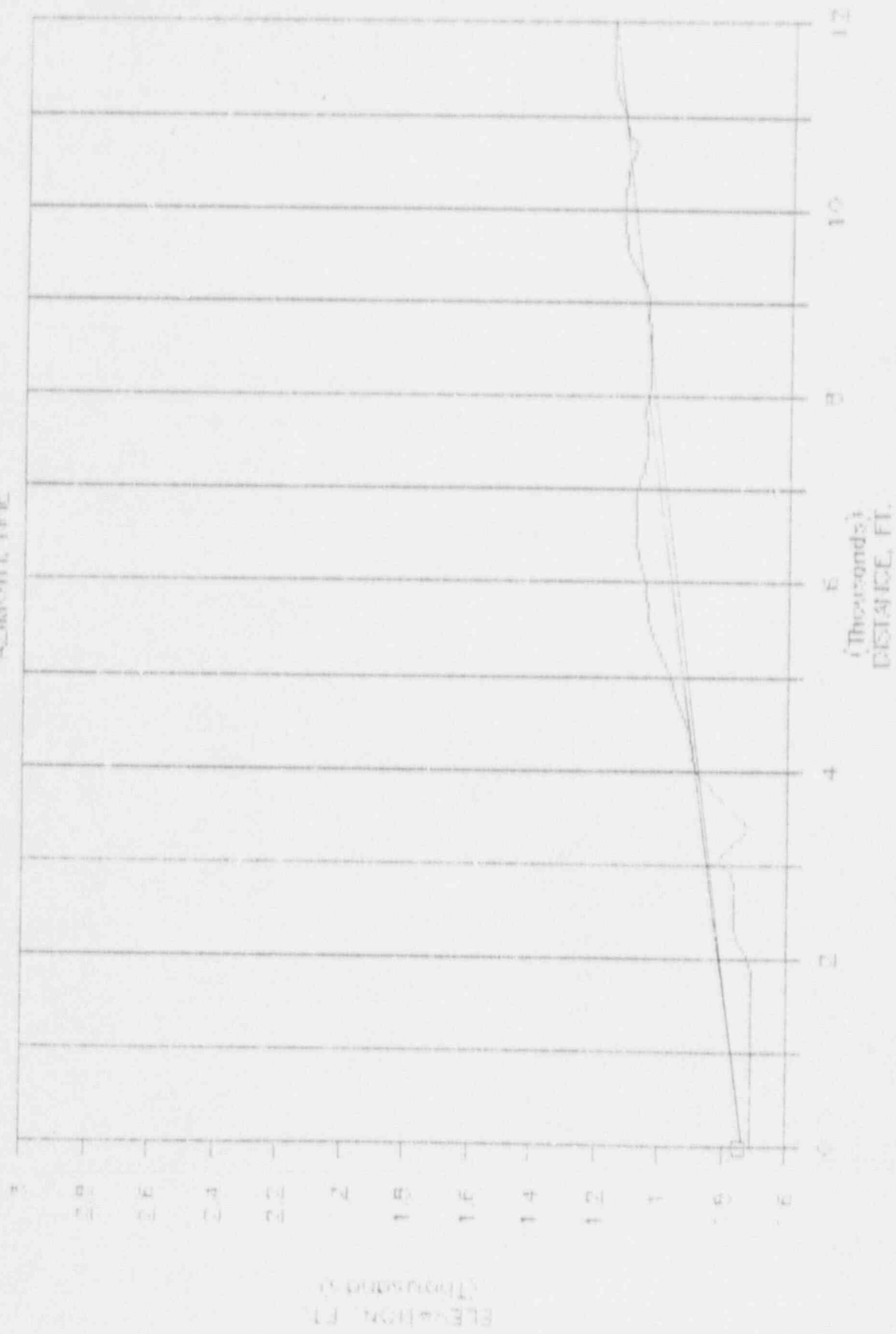
AZIMUTH, 0



ELEVATION, FT.  
ELEVATION, FT.

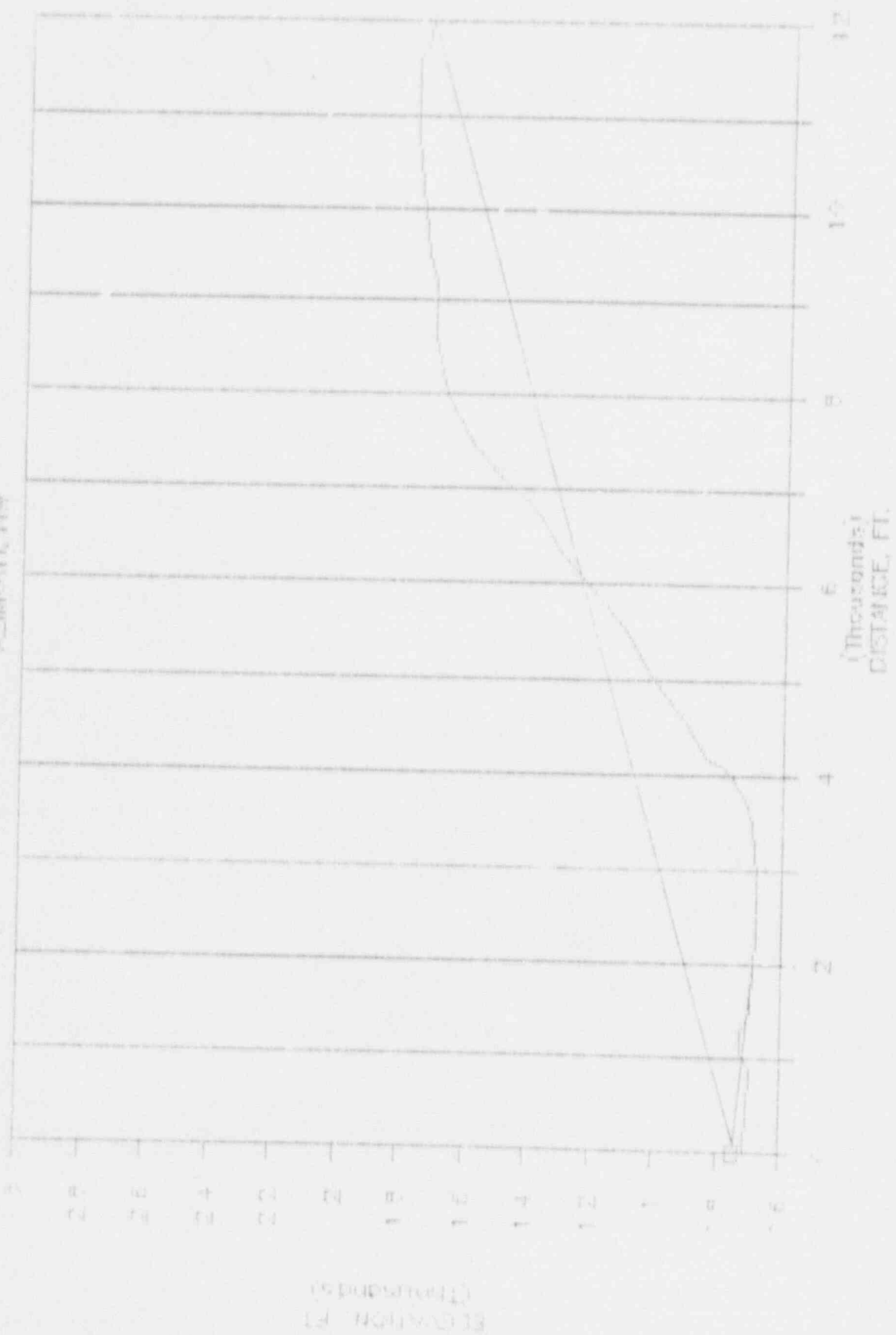
# YANFEE NA-1

ACUMULATED



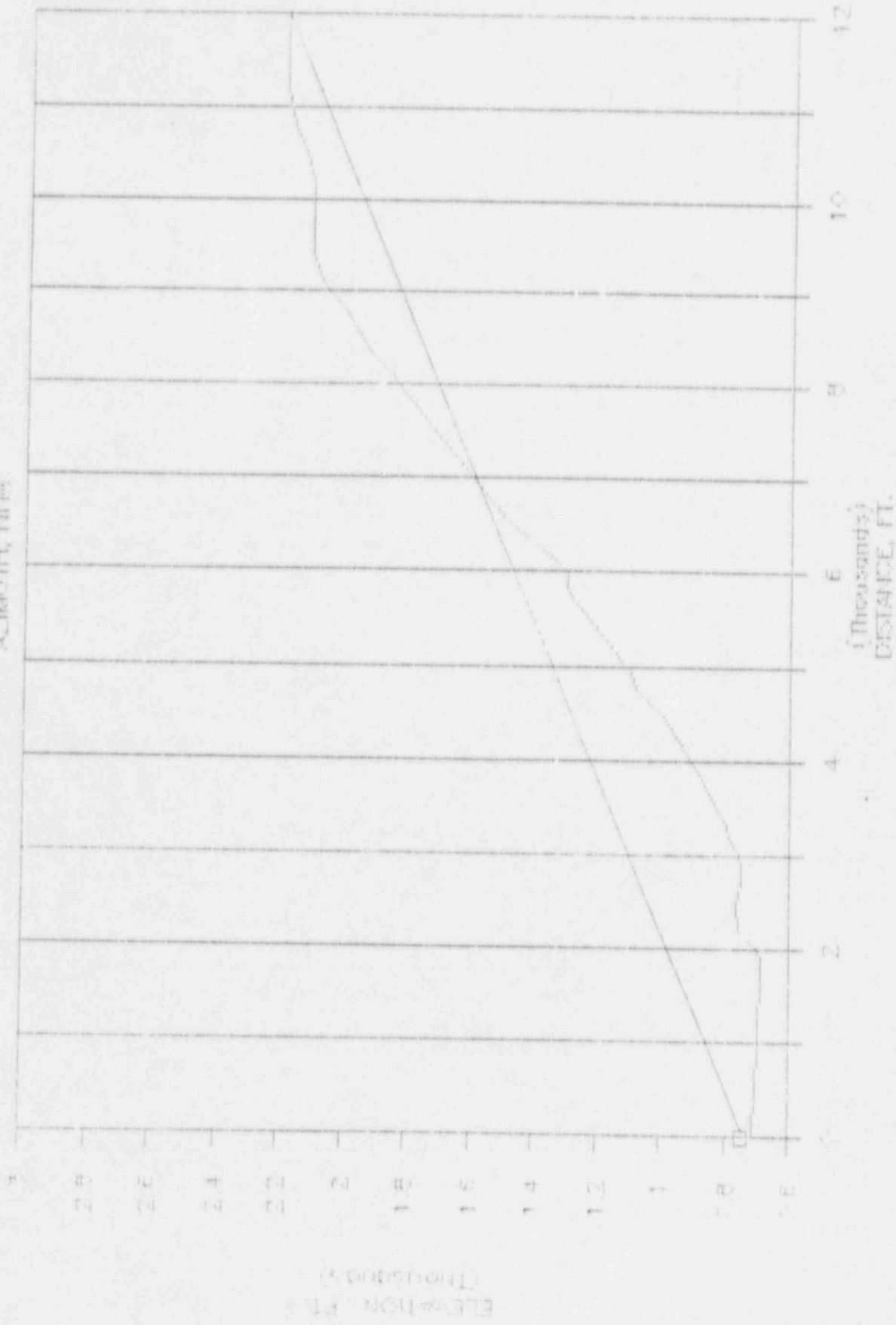
# YAHVEE HA-1

AZIMUTH, DEG



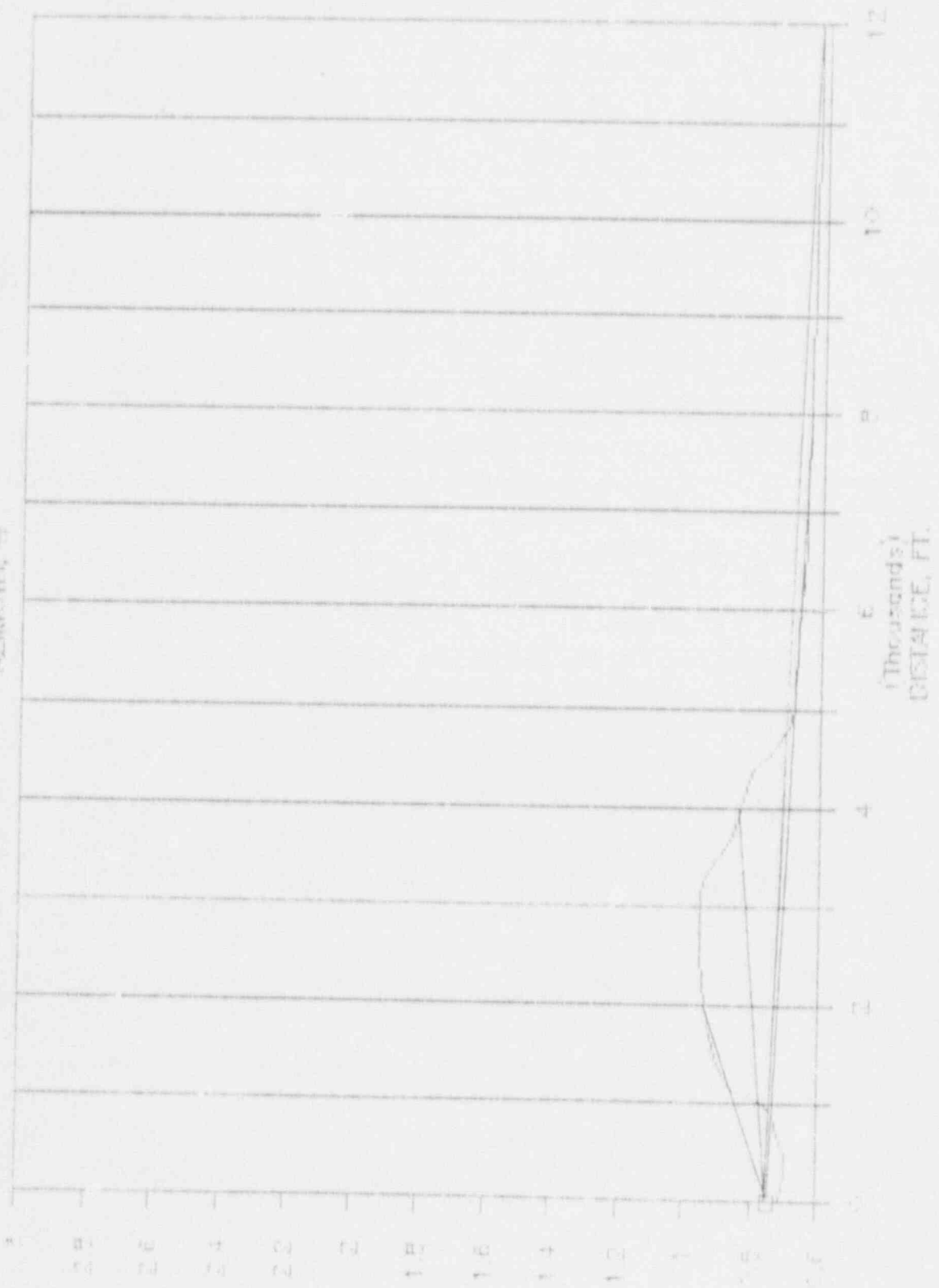
# YANKEE HA-1

ACIMUTU, NBS



# YANFEE NA-1

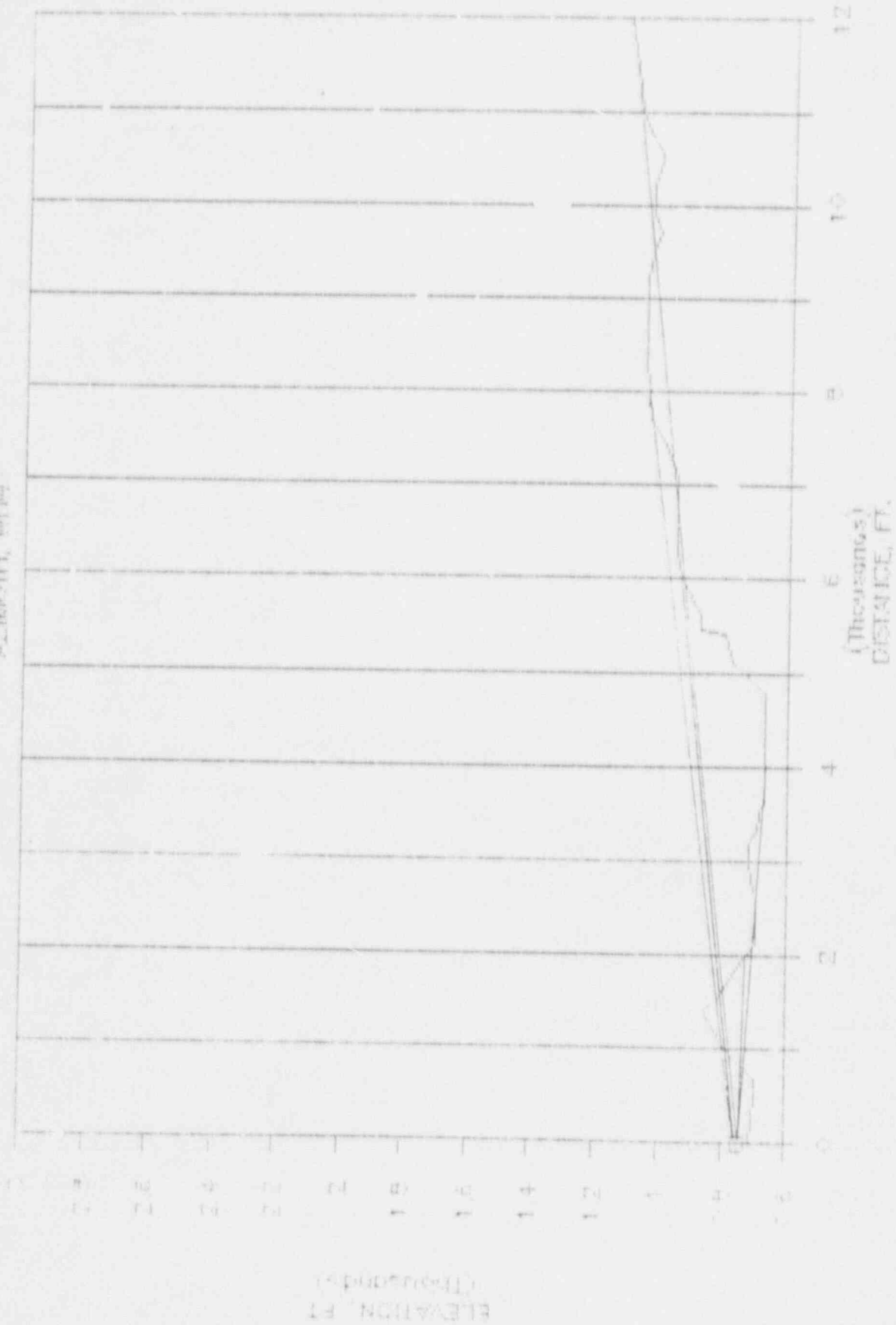
AZIMUTH, W



ELEVATION, FT.  
(THOUSANDS)

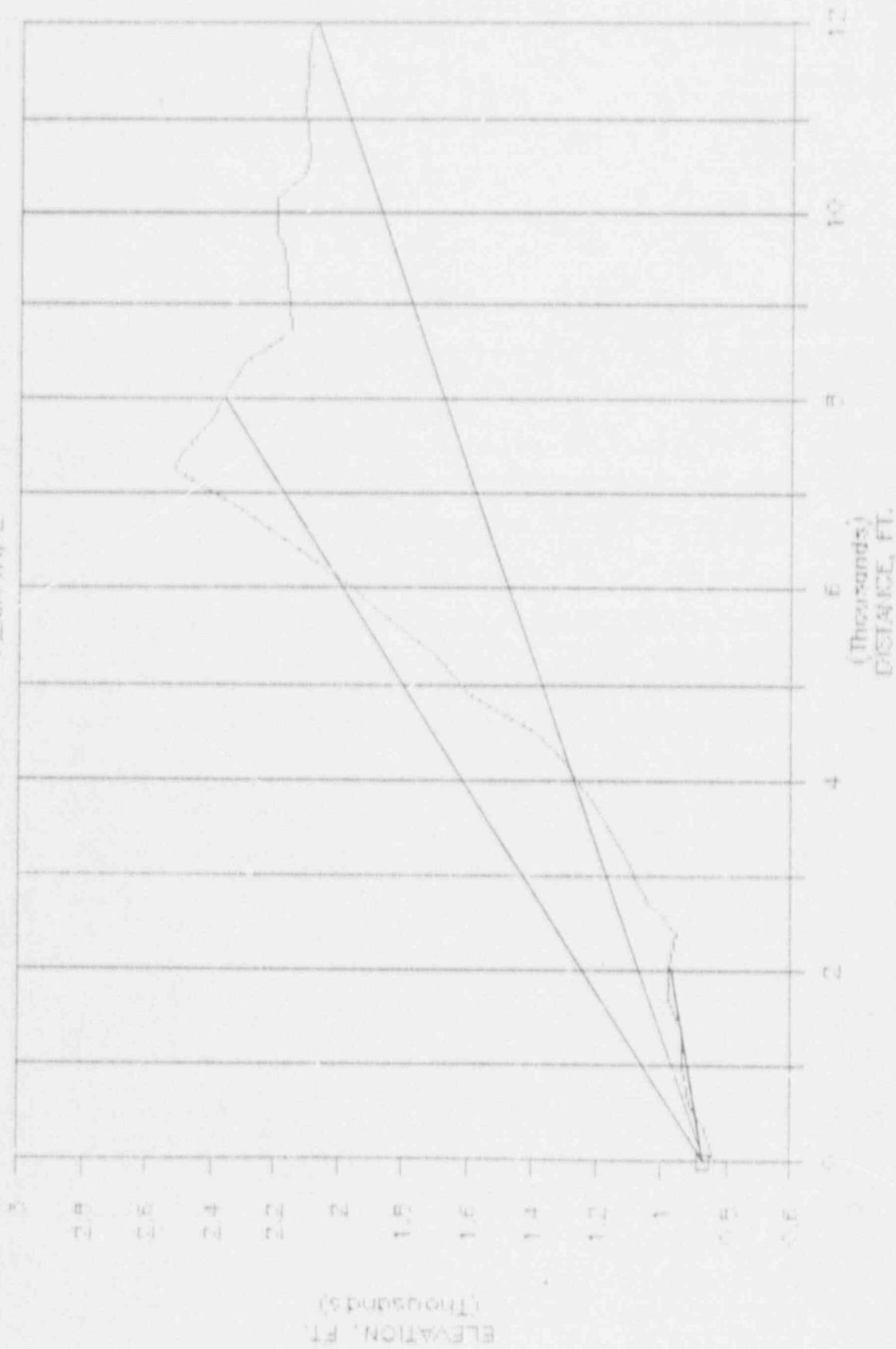
# YANFEE NA-1

紀錄用, 剖面



# YANKEE NA-3

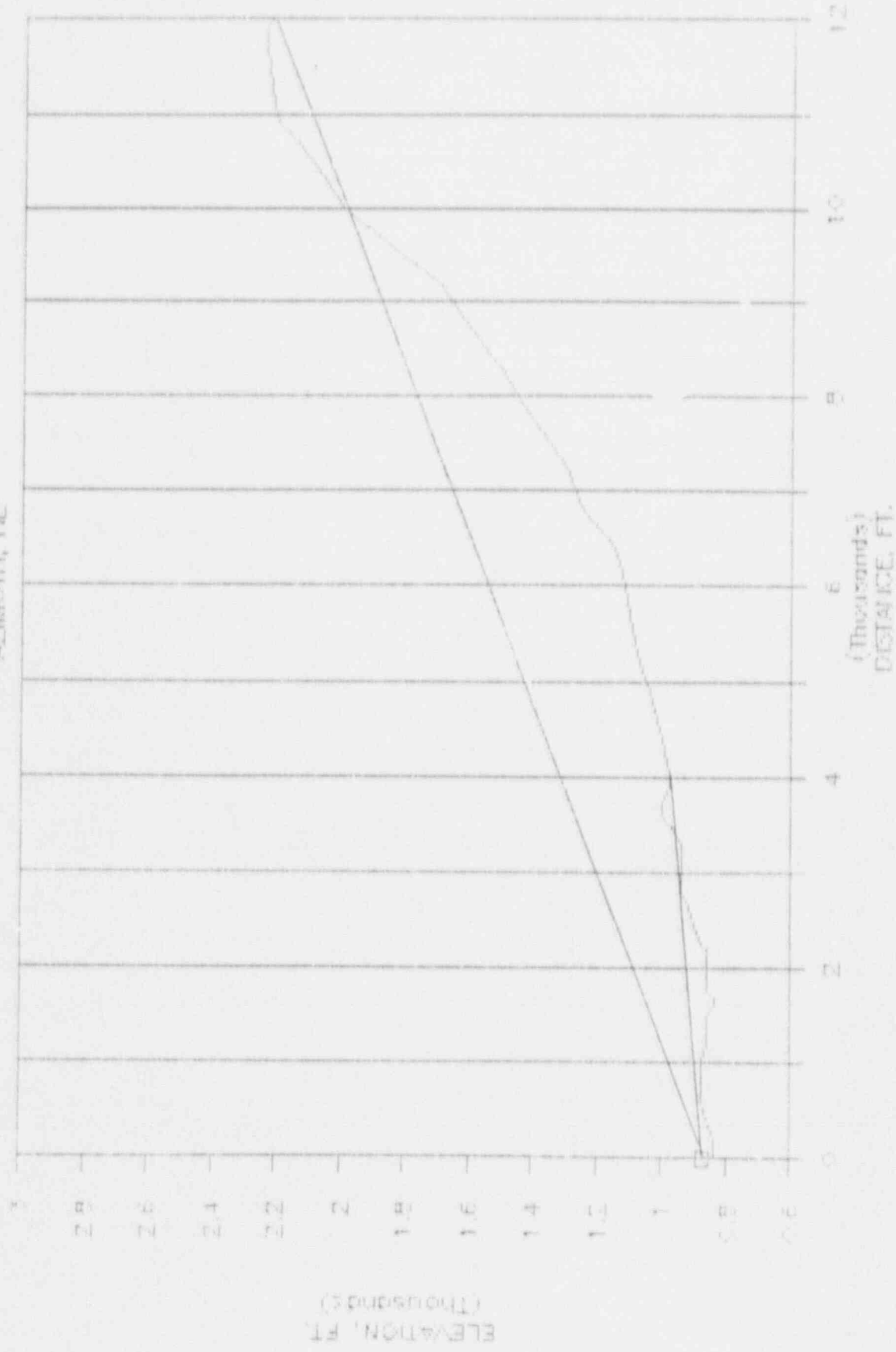
AZMUTH, E





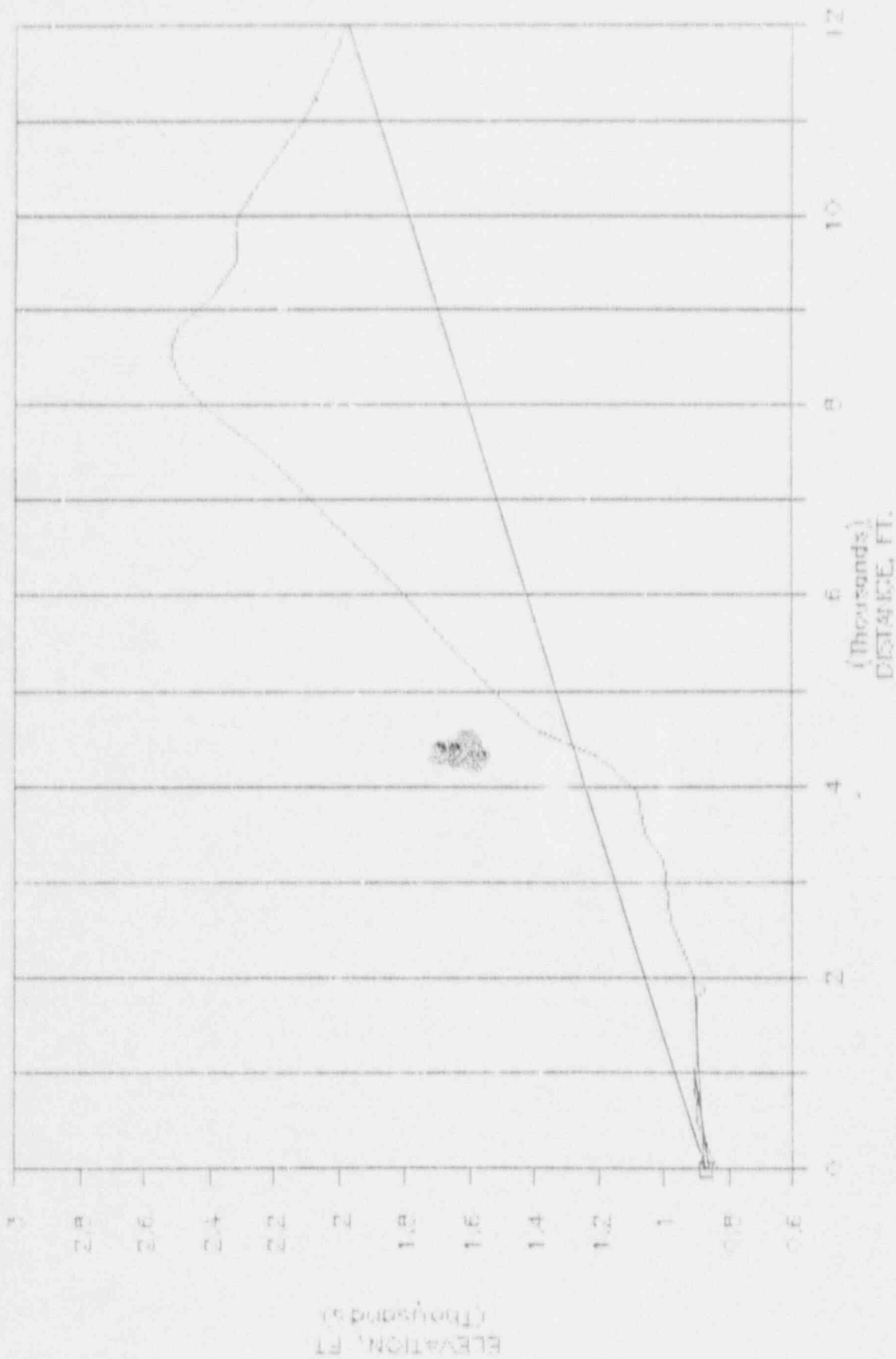
# YANKEE NA-3

AZIMUTH, 11E



# YANFEE NA-3

AZIMUTH, 01E



YAMKES + DALL ELECTRIC COMPANY  
 YAMKES ROAD AND STATION 111-1741  
 YAMKES SOURCE POWER LEVEL 1490

1488	SOURCE	134	131	127	123	119	115	111	107	103	99	95
1	YAMKES ROAD + STN	111.4	101.4	91.4	81.4	71.4	61.4	51.4	41.4	31.4	21.4	11.4
	104	104	104	104	104	104	104	104	104	104	104	104

YAMKES ATOMIC ELECTRIC OF YAMKES  
 YAMKES ROAD AND STATION 111-1741  
 METEOROLOGICAL INPUT CONDIT...

H1\* 9.75 METERS

H2\* 59.74 METERS

YEAR	SEASON	MONTH	DATE	HOUR	WIND DIRECTION	WIND SPEED (MPH)	TEMPERATURE (C)	RELATIVE HUMIDITY	BAROMETRIC PRESSURE (MM HG)
1981				10	175.0	1.8	23.7	23.4	52.0



# YANFEE CL-3

AZIMUTH, E

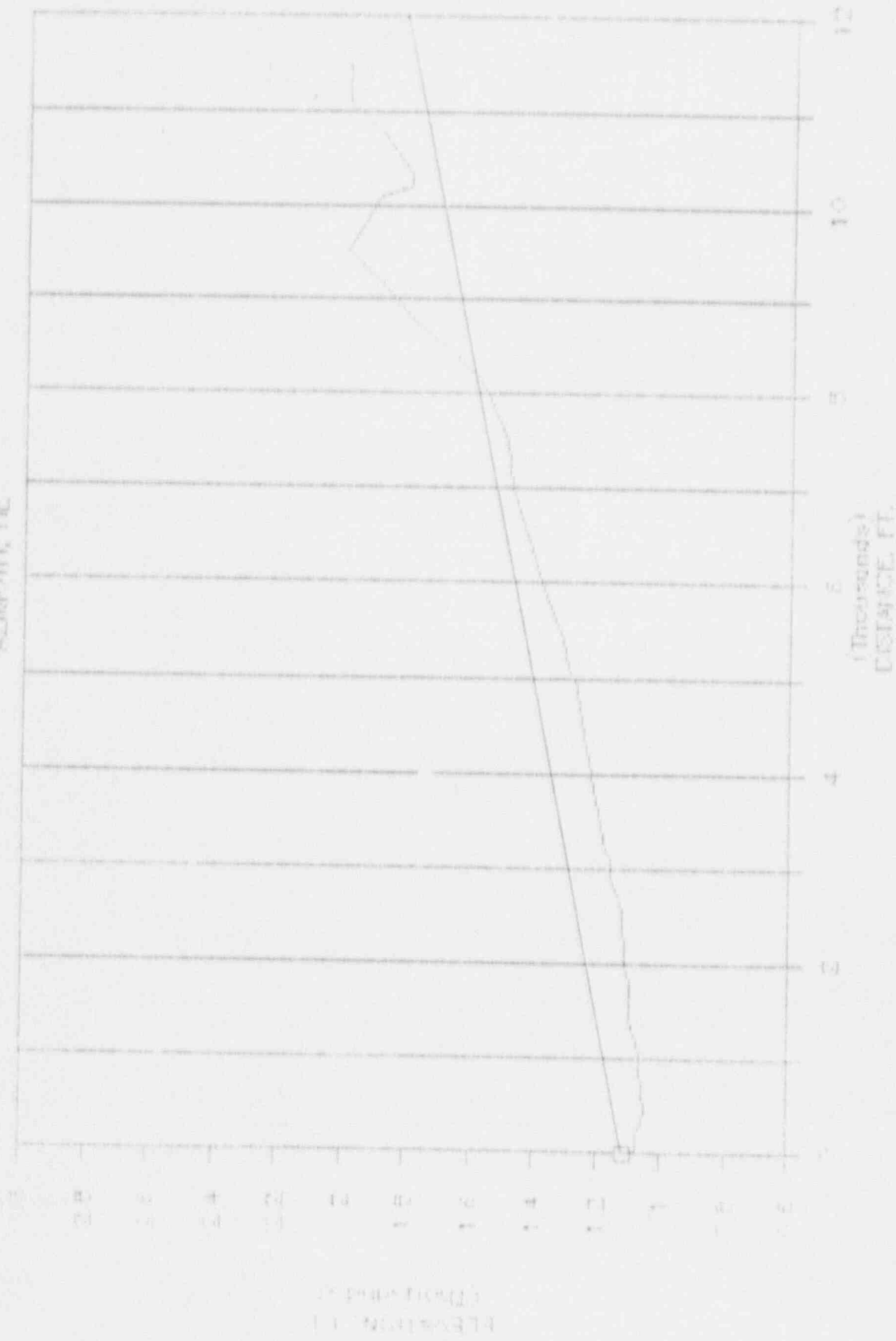


Elevation, FT  
(Thousands)



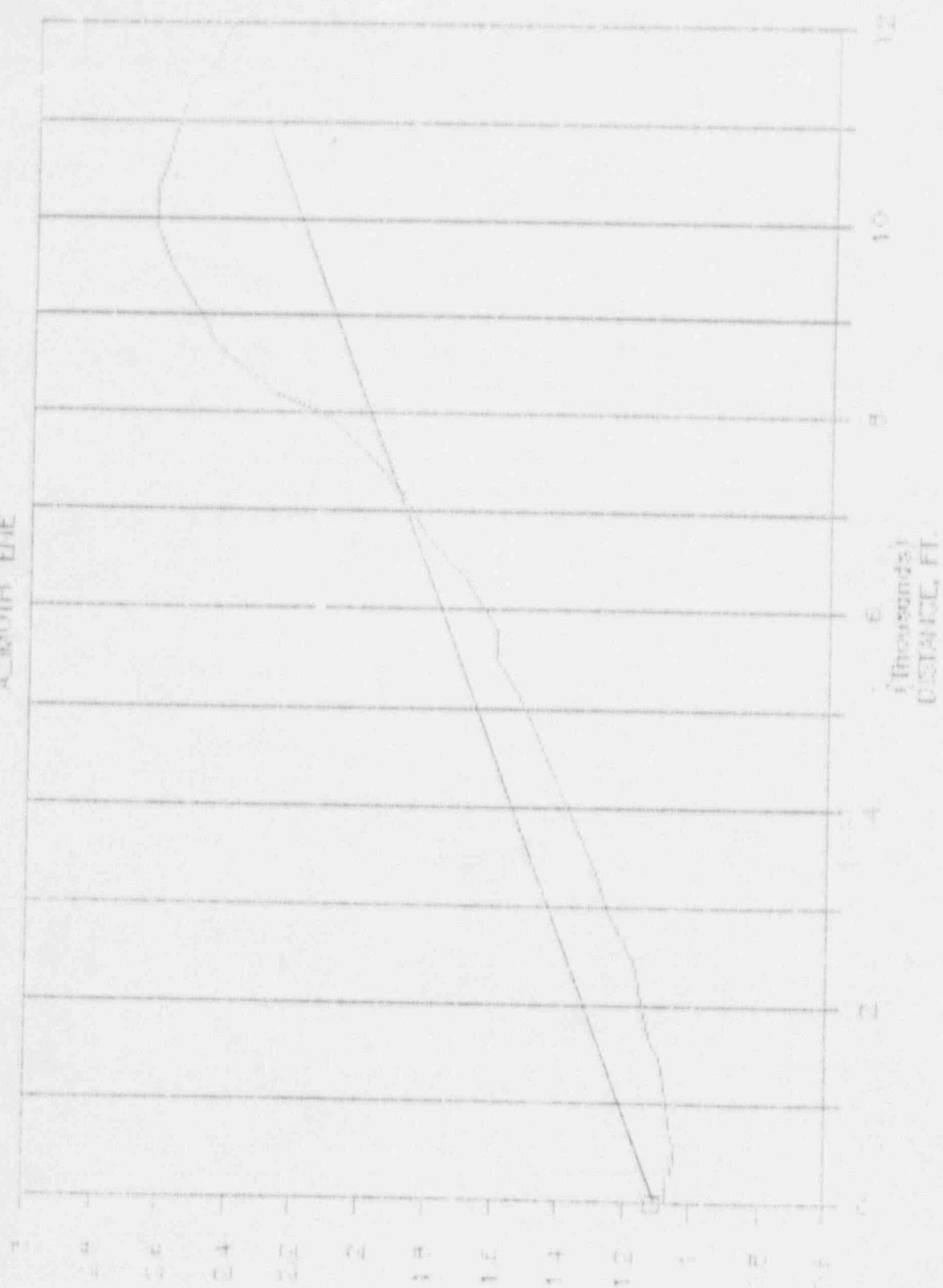
# YAH/EE CL-3

ADMP/TH, IE



# YANKEE CL-3

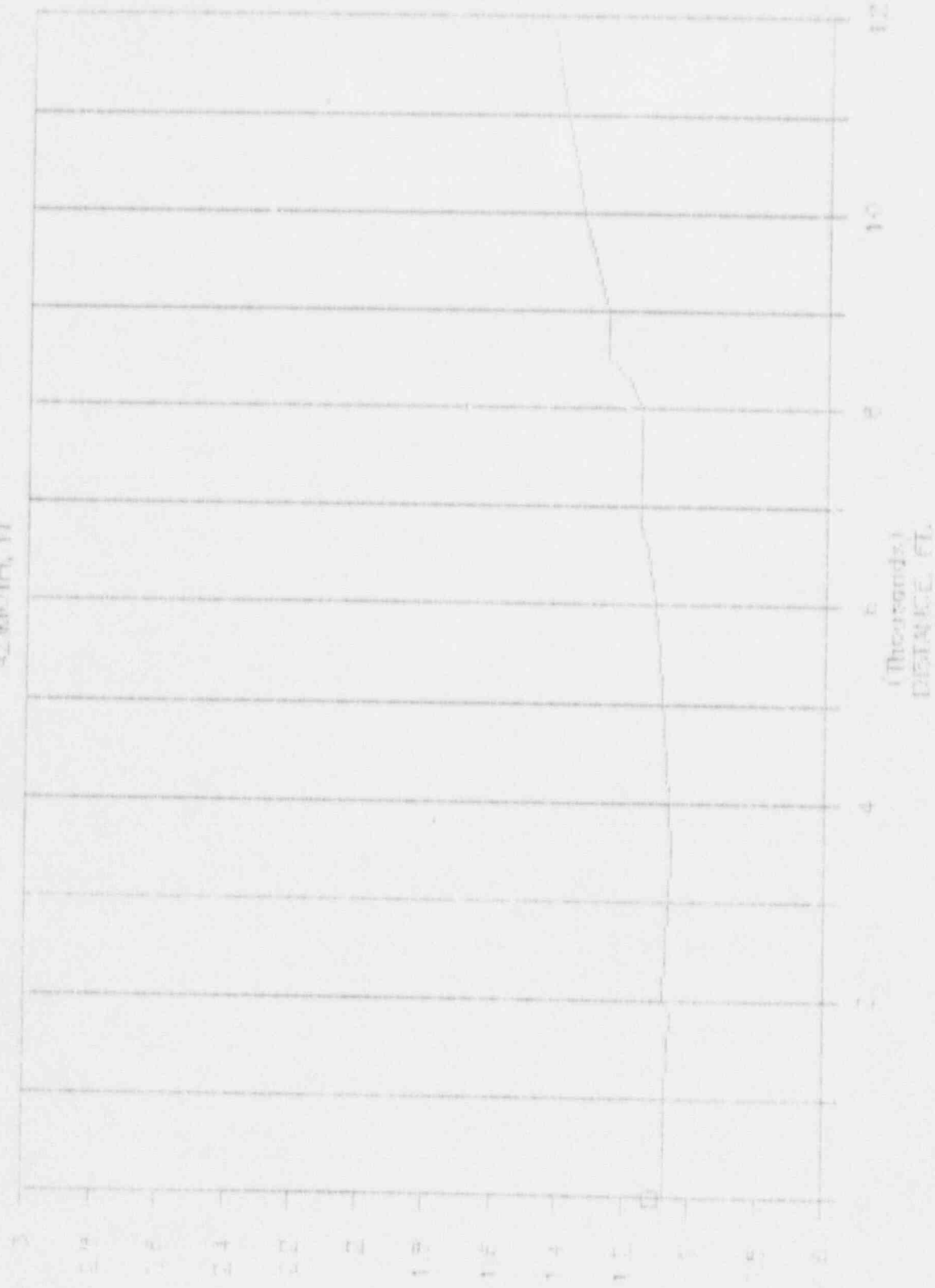
AZIMUTH B/E



EL. W. 1000, 11  
(Thousands)

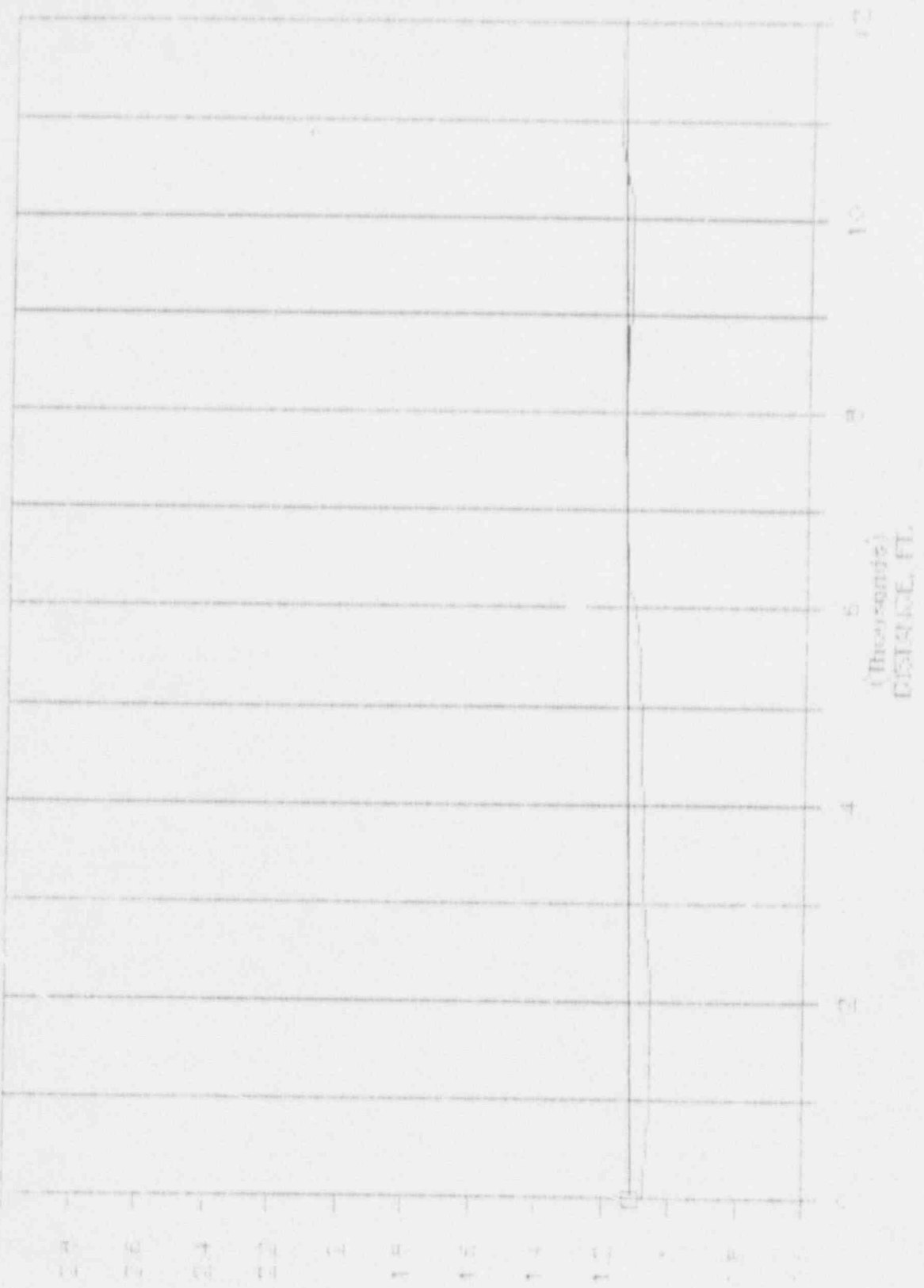
# YANFEE CL-3

AZIMUTH, M



ELEVATION, FT.  
(Thousands)

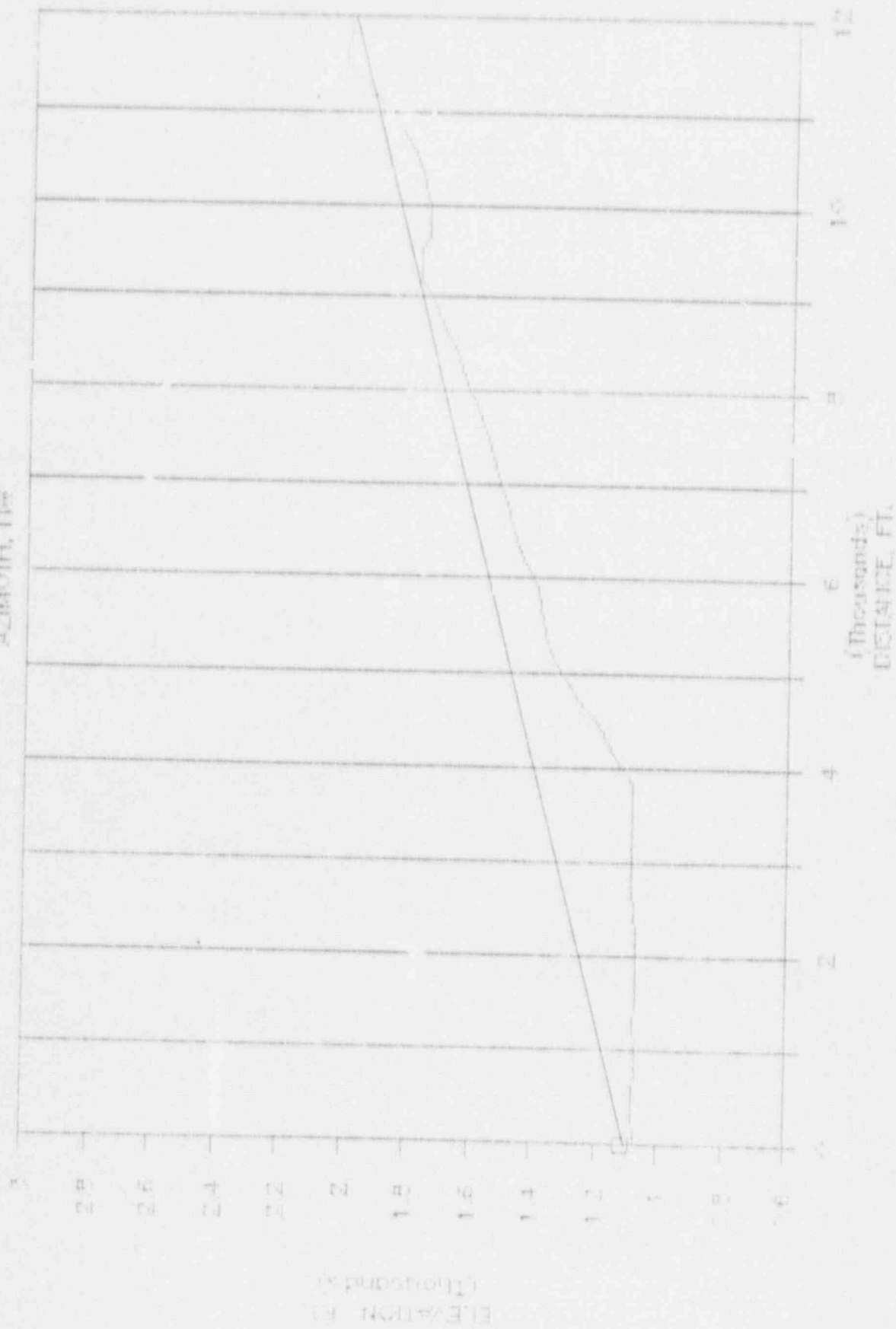
YANFEE CL-3  
ACIMATH, THE



11.5  
11.5

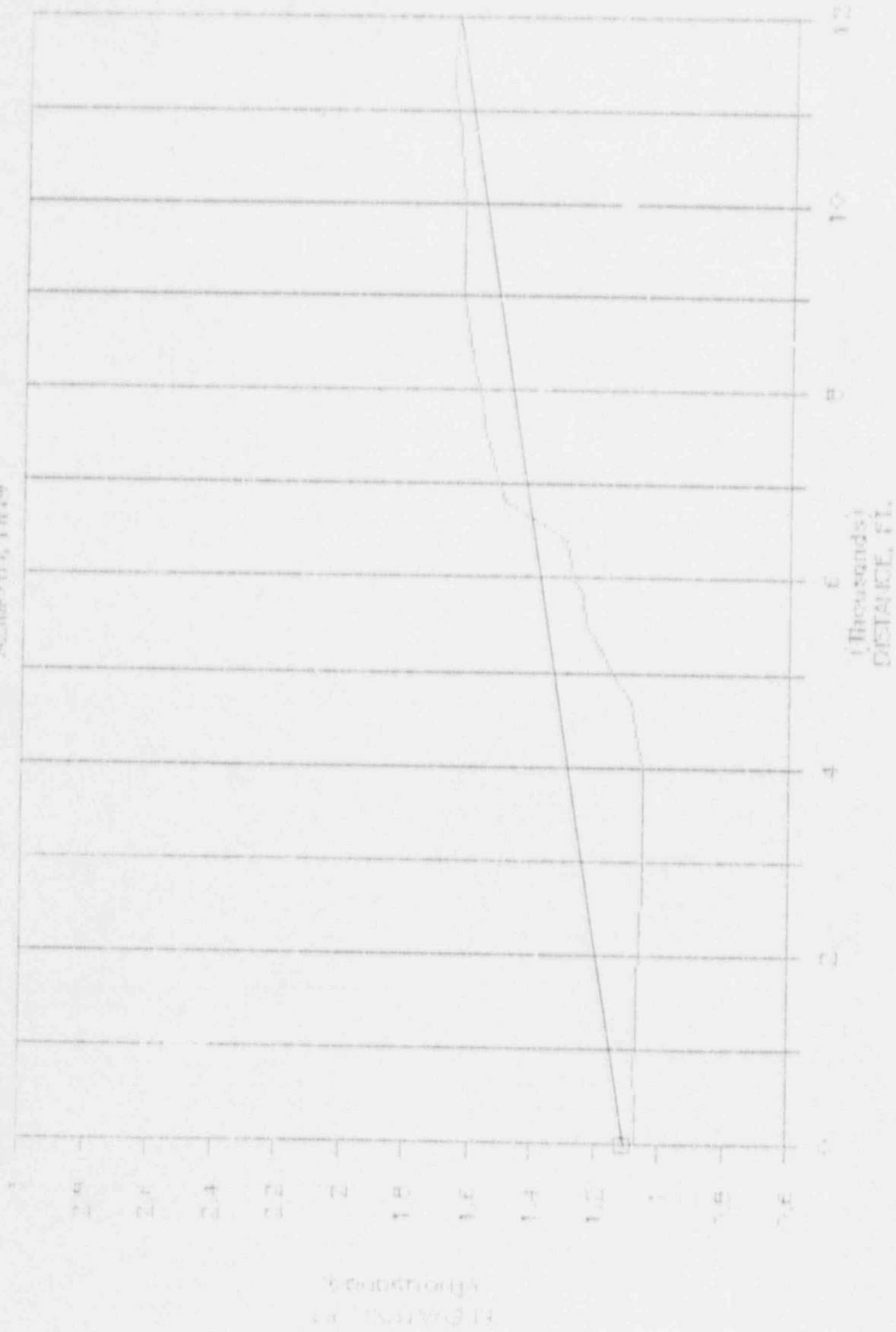
# YANHEE CL-3

AZIMUTH, 110°

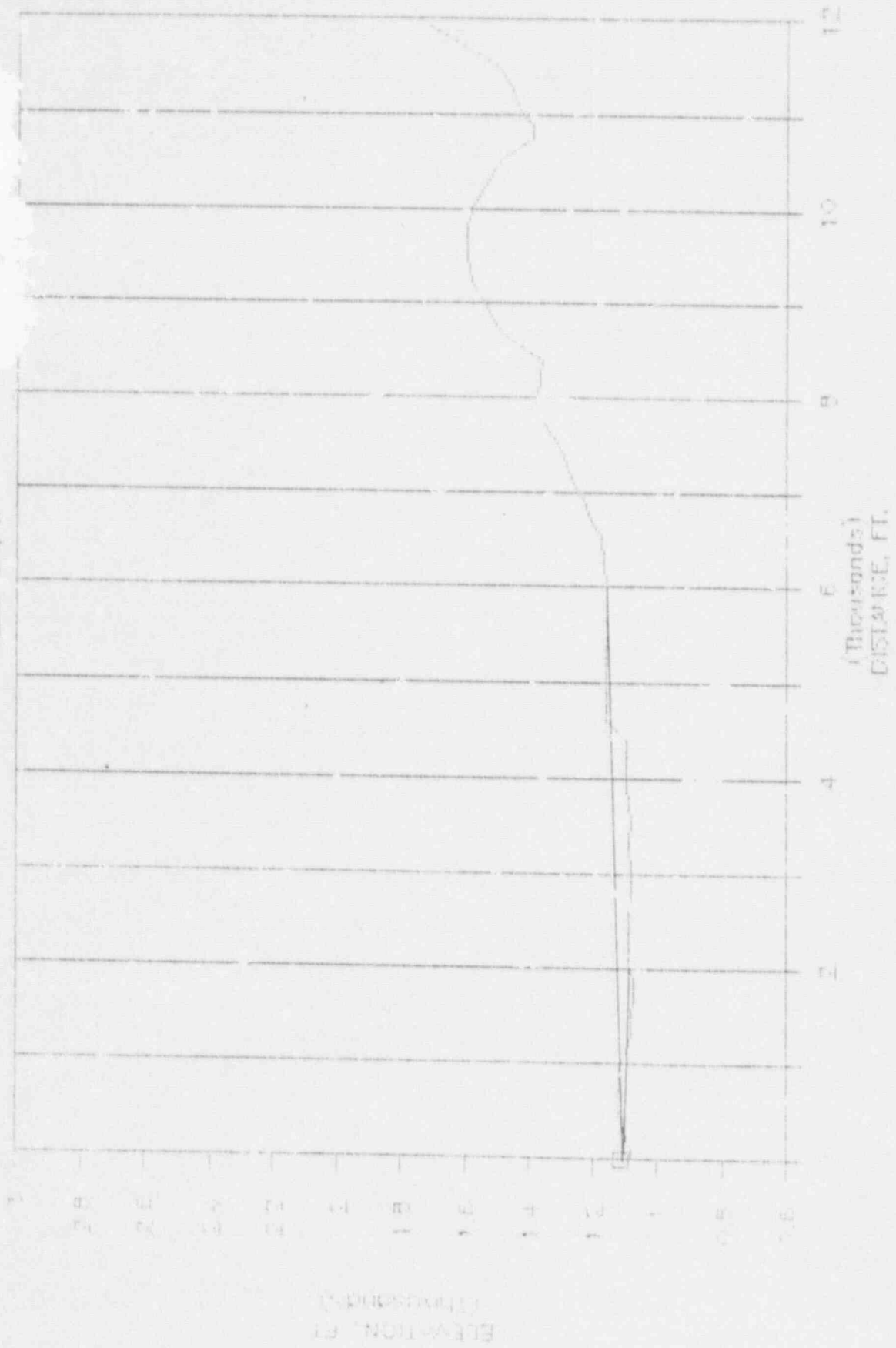


# YANFEE CL-3

ACRIFITH, 11/19/68

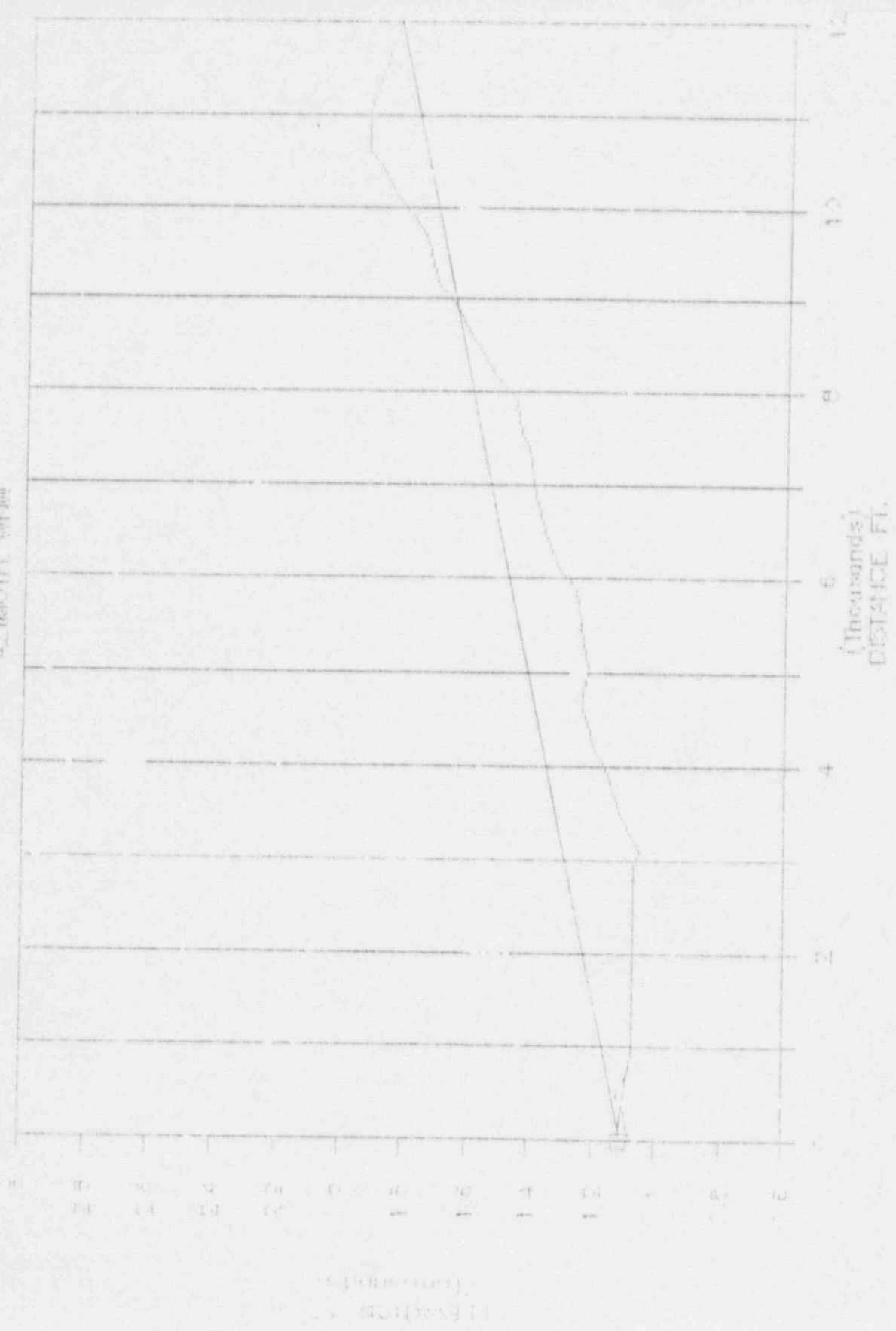


YANKEE CL  
AZIMUTH, W



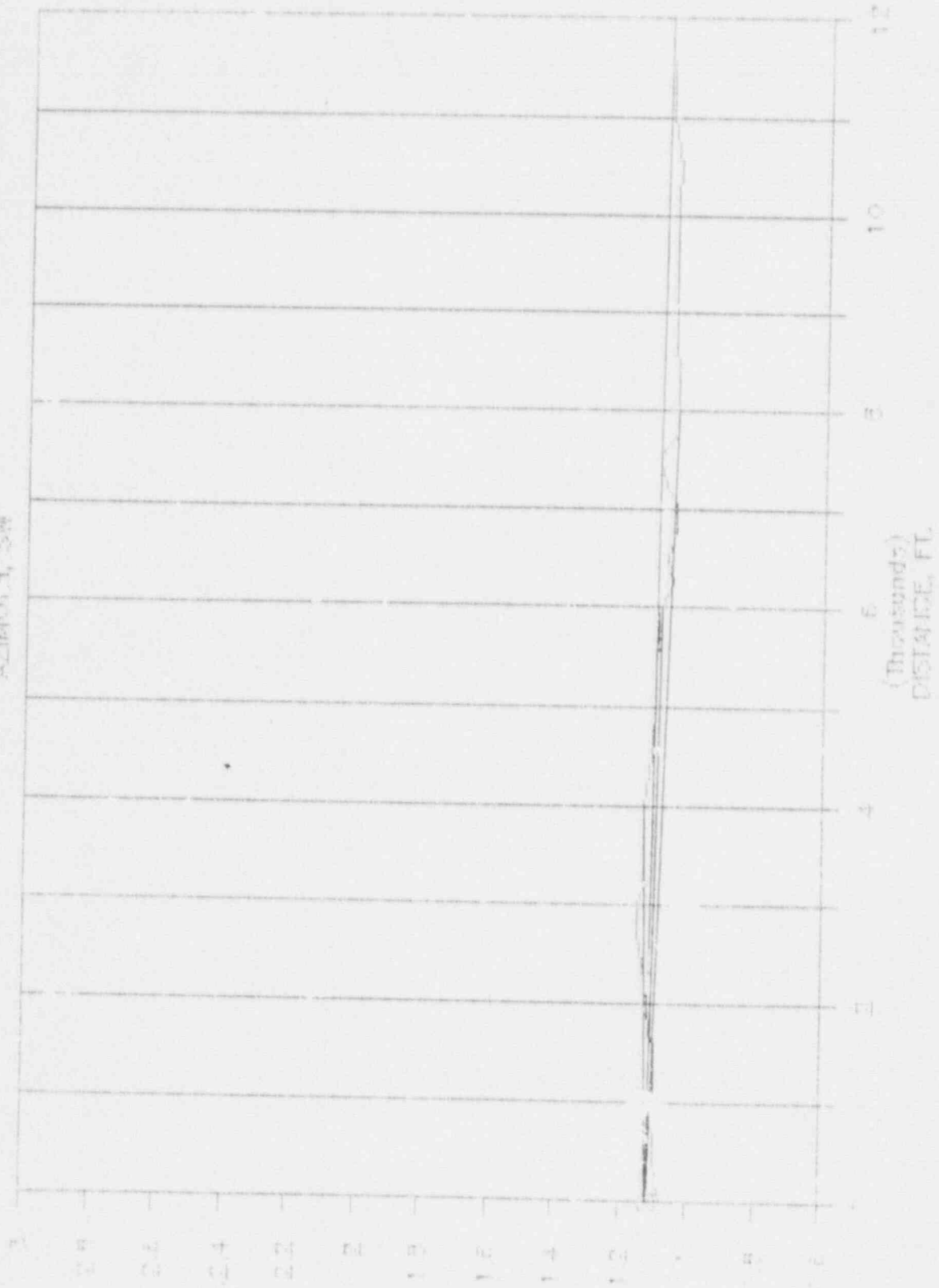
# YANKEE CL-3

AZIMUTH WIRE



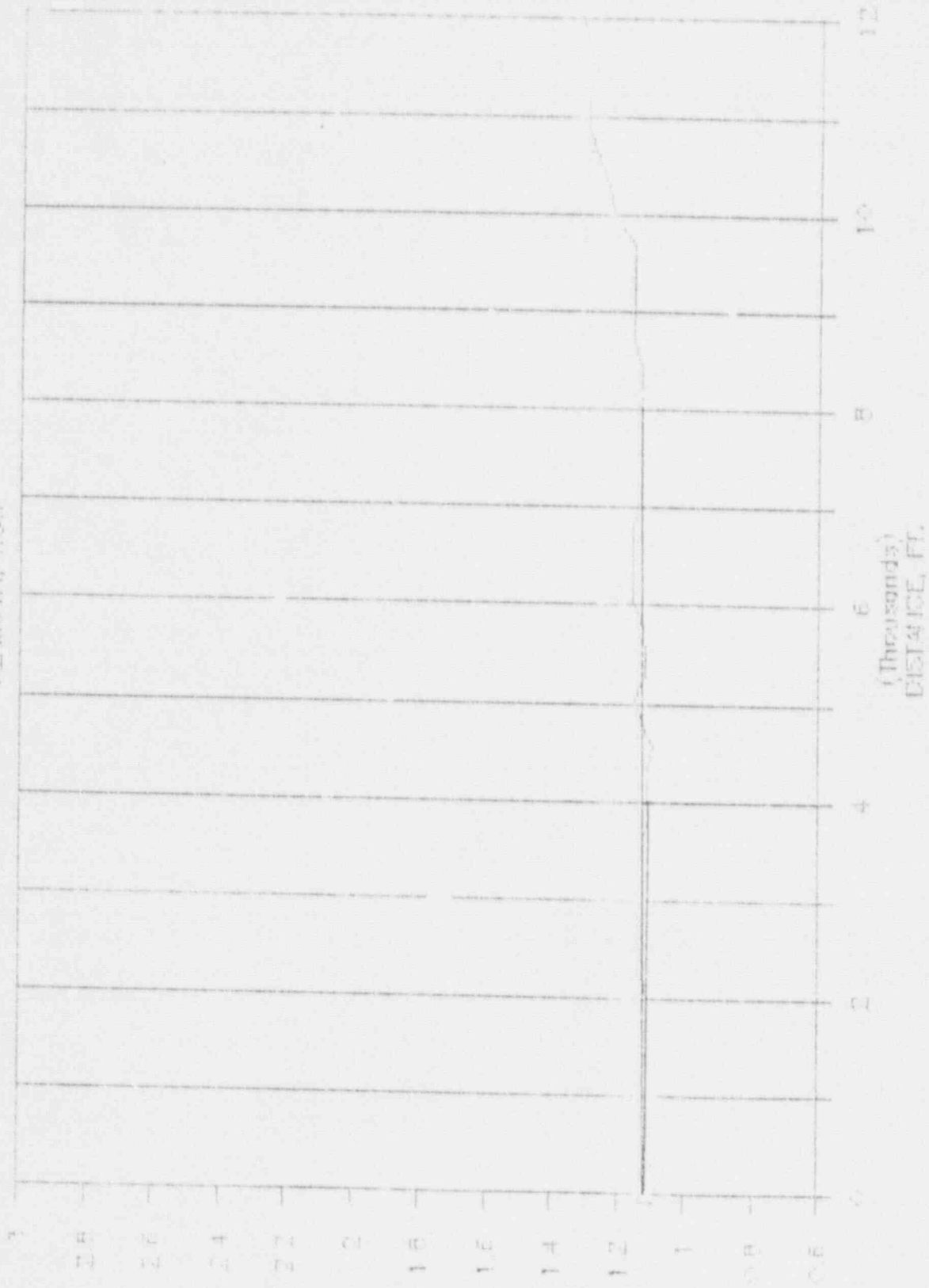
# YANKEE CL-3

AZIMUTH, 1, SW



# YANKEE CL-3

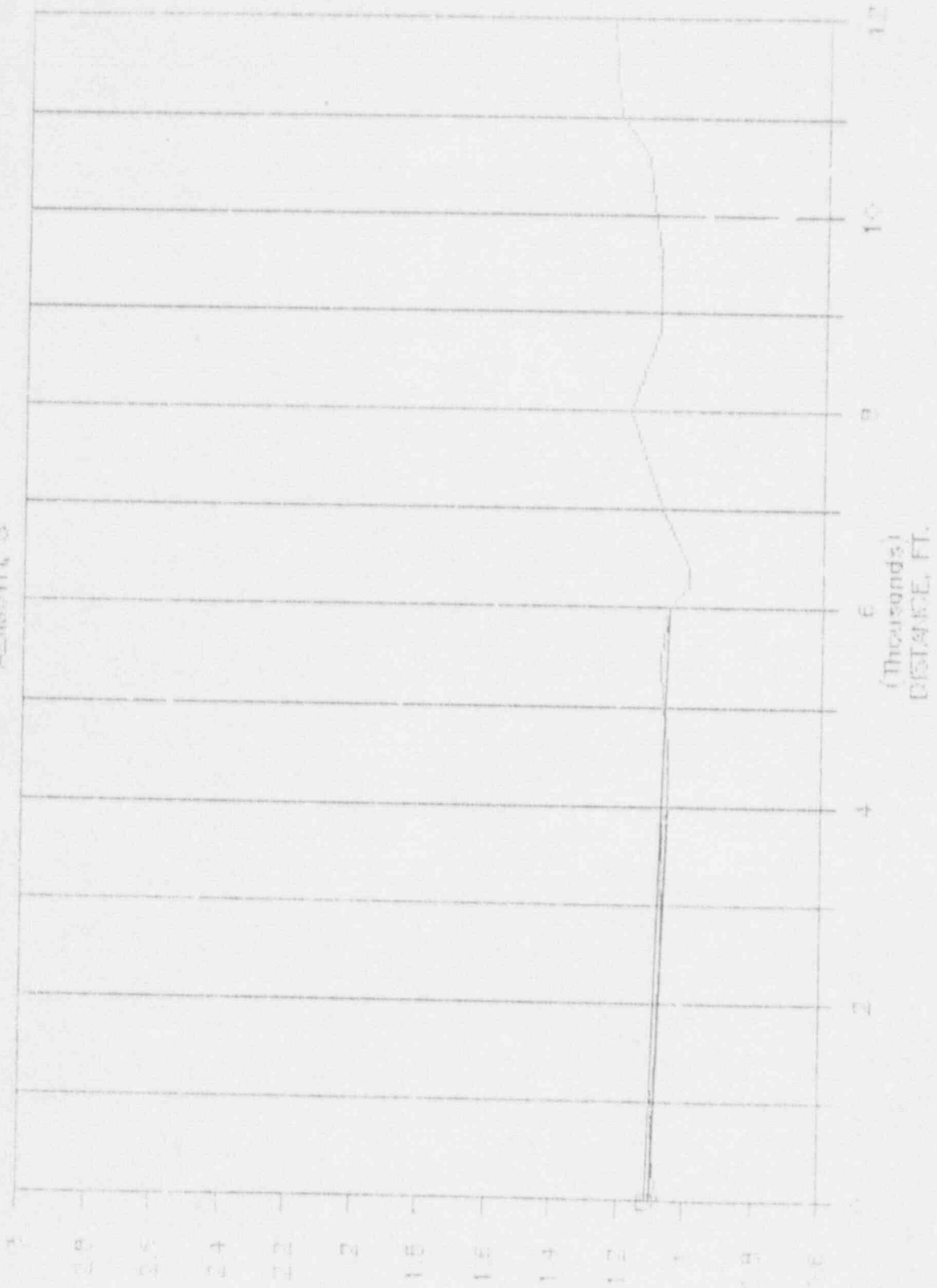
AZIMUTH, WGSW



ELEVATION (THOUSANDS)

# YANKEE CL-3

AZIMUTH, S



YANKEE CL-3  
AZIMUTH, S

# YANKEE CL-3

AZIMUTH, 550M



PL ENR 1177, 1178  
1179, 1180, 1181, 1182, 1183, 1184, 1185, 1186, 1187, 1188, 1189, 1190, 1191, 1192, 1193, 1194, 1195, 1196, 1197, 1198, 1199, 1200

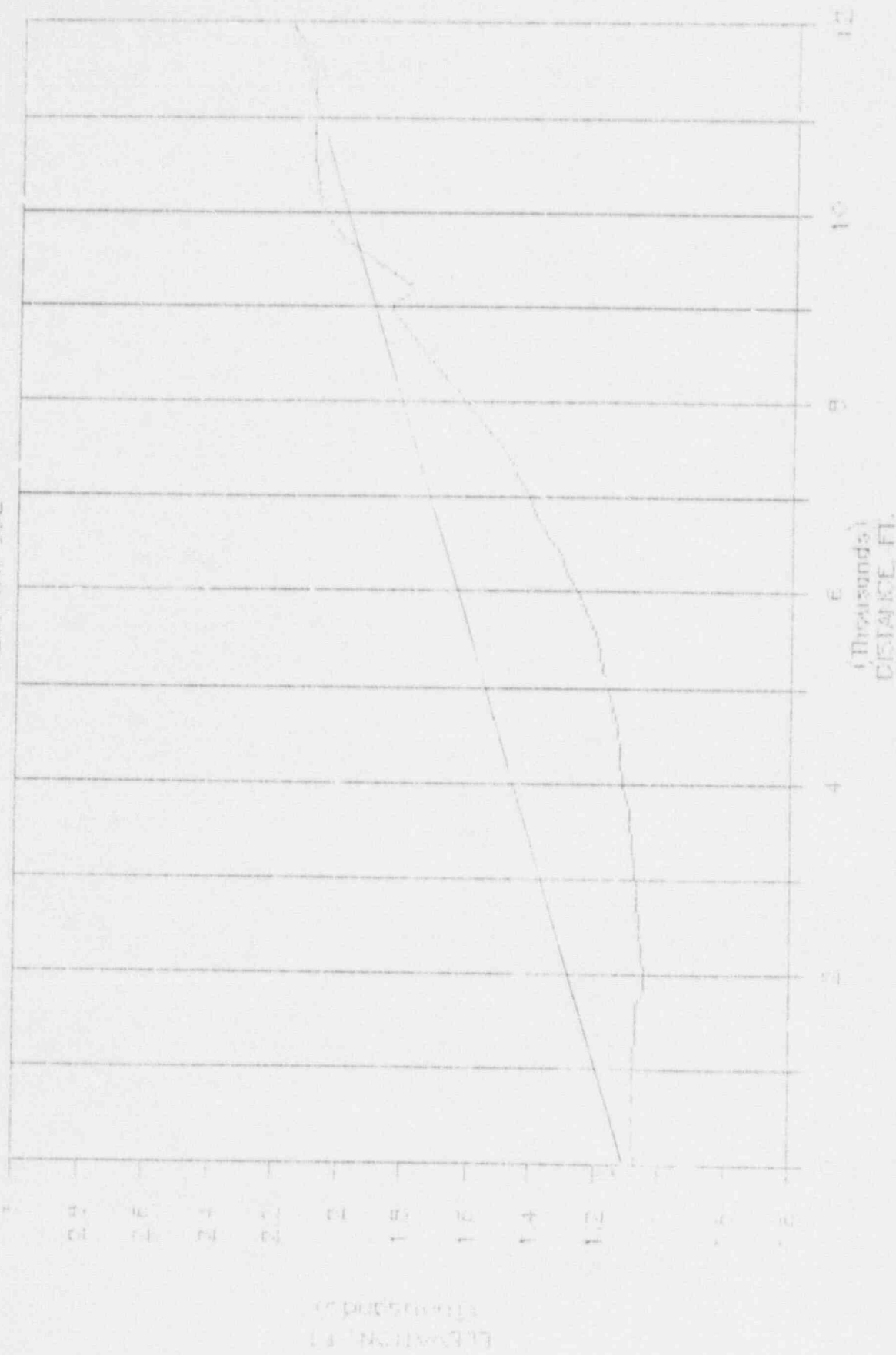
# YAFKEE CL-3

AZIMUTH, SE



# YANKEE CL-3

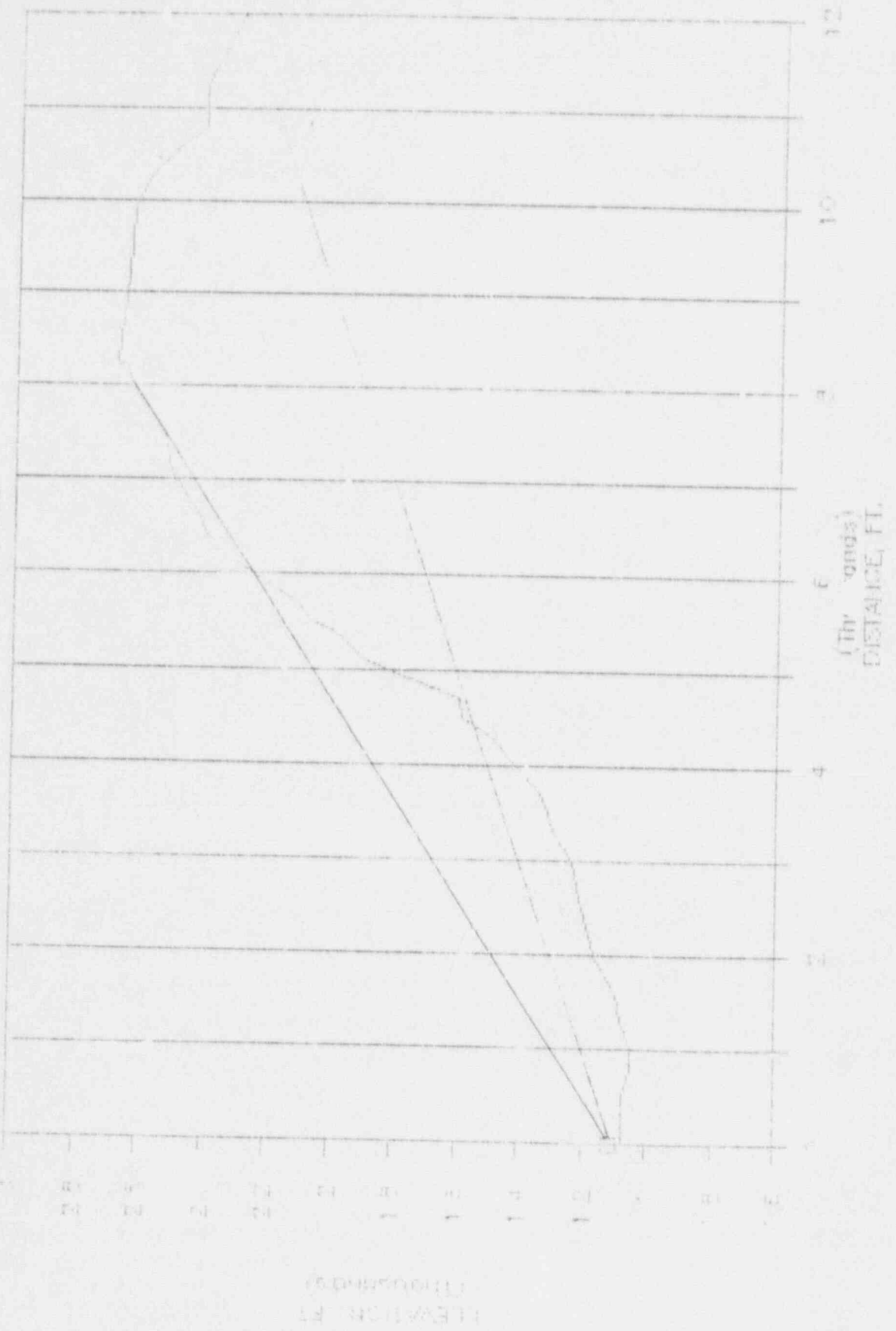
AZIMUTH, SSE





# YANKEE CL-3

AZIMUTH, ESE



RFID POINT	DISTANCE	BEARING	HEIGHT	GROUND TYPE	FOLIAGE TRANSLATION	INTERVENING OBSTRUCTIONS	DISTANCE TO HIGHEST OBSTRUCTION FROM SOURCE	HEIGHT OF OBSTRUCTION
73	2000.	202.00	1120.00	SOFT	0.	NO	0.	0.
74	4000.	202.00	1120.00	SOFT	0.	NO	0.	0.
75	6000.	202.00	1090.00	SOFT	0.	YES	2700.	1120.
76	8000.	202.00	1090.00	SOFT	0.	YES	2700.	1120.
77	12000.	202.00	1090.00	SOFT	0.	YES	2700.	1120.
78	500.	202.50	1095.00	SOFT	0.	NO	0.	0.
79	1000.	202.50	1100.00	SOFT	0.	NO	0.	0.
80	2000.	202.50	1110.00	SOFT	0.	NO	0.	0.
81	4000.	202.50	1110.00	SOFT	0.	NO	0.	0.
82	6000.	202.50	1090.00	SOFT	0.	YES	0.	0.
83	8000.	202.50	1090.00	SOFT	0.	YES	4900.	1120.
84	12000.	202.50	1070.00	SOFT	0.	YES	4900.	1120.
85	500.	180.00	1100.00	SOFT	0.	NO	0.	0.
86	1000.	180.00	1095.00	SOFT	0.	NO	0.	0.
87	2000.	180.00	1085.00	SOFT	0.	NO	0.	0.
88	4000.	180.00	1080.00	SOFT	0.	NO	0.	0.
89	6000.	180.00	1080.00	SOFT	0.	YES	3800.	1085.
90	8000.	180.00	1080.00	SOFT	0.	YES	5500.	1085.
91	12000.	180.00	1045.00	SOFT	0.	NO	0.	0.
92	500.	157.50	1085.00	SOFT	0.	NO	0.	0.
93	1000.	157.50	1085.00	SOFT	0.	NO	0.	0.
94	2000.	157.50	1085.00	SOFT	0.	NO	0.	0.
95	4000.	157.50	1120.00	SOFT	0.	NO	0.	0.
96	6000.	157.50	1200.00	SOFT	0.	NO	0.	0.
97	8000.	157.50	1420.00	SOFT	0.	NO	0.	0.
98	12000.	157.50	2180.00	SOFT	0.	NO	0.	0.
99	500.	135.00	1075.00	SOFT	0.	YES	10000.	2070.
100	1000.	135.00	1050.00	SOFT	0.	NO	0.	0.
101	2000.	135.00	1110.00	SOFT	0.	NO	0.	0.
102	4000.	135.00	1290.00	SOFT	0.	NO	0.	0.
103	6000.	135.00	1540.00	SOFT	0.	NO	0.	0.
104	8000.	135.00	2300.00	SOFT	0.	NO	0.	0.
105	12000.	135.00	2220.00	SOFT	0.	YES	7000.	2200.
106	500.	112.50	1070.00	SOFT	0.	YES	7000.	2200.
107	1000.	112.50	1030.00	SOFT	0.	NO	0.	0.
108	2000.	112.50	1170.00	SOFT	0.	NO	0.	0.

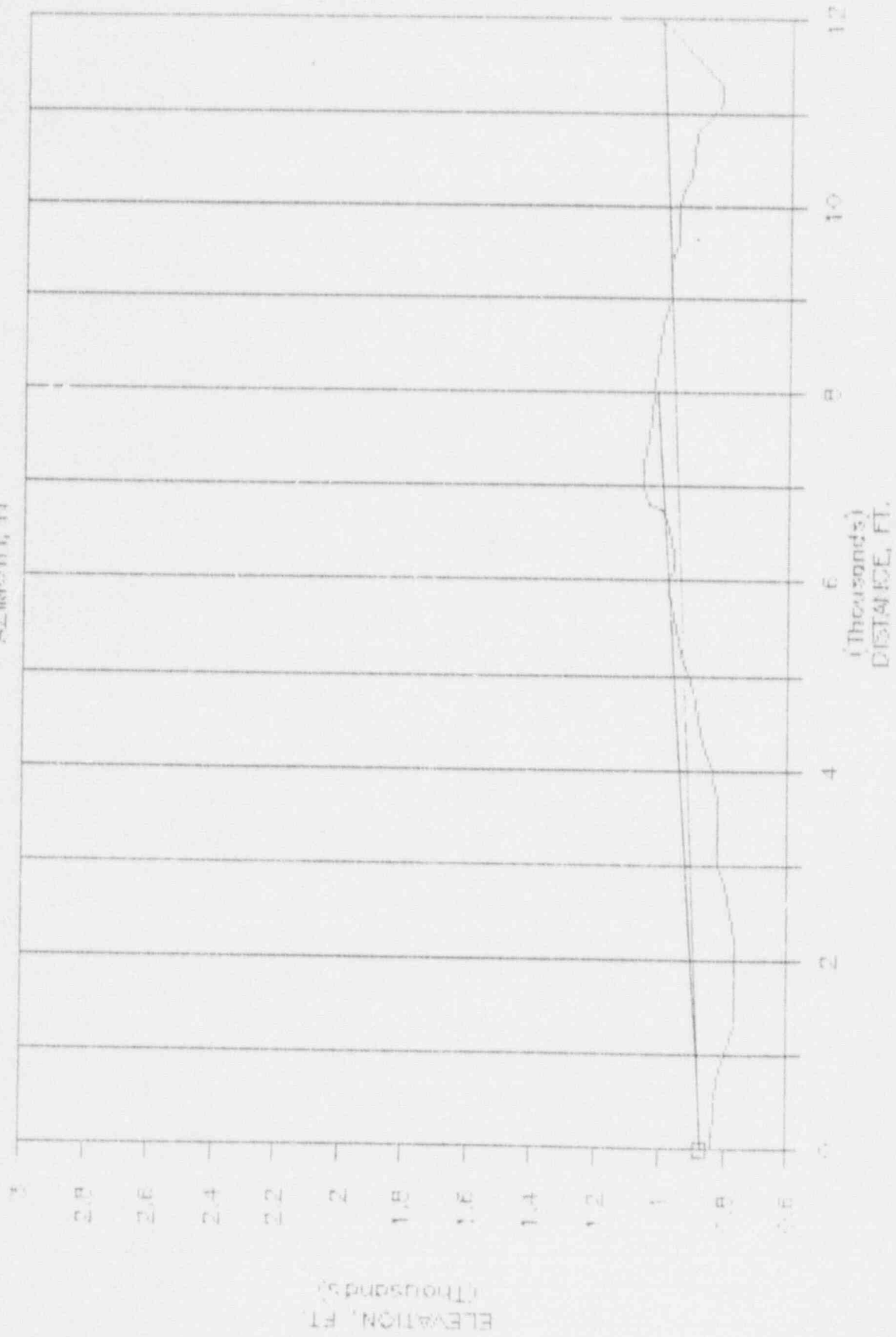
GRID POINT	DISTANCE	BEARING	HEIGHT	GROUND TYPE	VOLTAGE PENETRATION	INTERVENING OBSTRUCTIONS	DISTANCE TO HIGHEST OBSTRUCTION FROM SOURCE	HEIGHT OF OBSTRUCTION
37	3000.	227.50	1070.00	SOFT	0.	NO	0.	0.
38	2000.	227.50	1085.00	SOFT	0.	NO	0.	0.
39	4000.	227.50	1080.00	SOFT	0.	NO	0.	0.
40	3000.	227.50	1080.00	SOFT	0.	NO	0.	0.
41	8000.	227.50	1080.00	SOFT	0.	NO	0.	0.
42	12000.	227.50	1080.00	SOFT	0.	YES	8000.	1080.
43	500.	215.00	1080.00	SOFT	0.	NO	0.	0.
44	1000.	215.00	1074.00	SOFT	0.	NO	0.	0.
45	2000.	215.00	1074.00	HARD	0.	NO	0.	0.
46	4000.	215.00	1070.00	SOFT	0.	NO	0.	0.
47	6000.	215.00	1074.00	SOFT	0.	NO	0.	0.
48	8000.	215.00	1070.00	SOFT	0.	NO	0.	0.
49	12000.	215.00	2000.00	SOFT	0.	YES	1050.	2000.
50	500.	292.50	1120.00	SOFT	0.	NO	0.	0.
51	1000.	292.50	1074.00	SOFT	0.	YES	500.	1120.
52	2000.	292.50	1074.00	HARD	0.	NO	0.	0.
53	4000.	292.50	1170.00	SOFT	0.	NO	0.	0.
54	6000.	292.50	1290.00	SOFT	0.	NO	0.	0.
55	8000.	292.50	1480.00	SOFT	0.	NO	0.	0.
56	12000.	292.50	1840.00	SOFT	0.	YES	11000.	1840.
57	500.	270.00	1120.00	SOFT	0.	NO	0.	0.
58	1000.	270.00	1120.00	SOFT	0.	NO	0.	0.
59	2000.	270.00	1090.00	HARD	0.	YES	1000.	1120.
60	4000.	270.00	1100.00	SOFT	0.	NO	0.	0.
61	6000.	270.00	1180.00	SOFT	0.	YES	4500.	1180.
62	9000.	270.00	1780.00	SOFT	0.	NO	0.	0.
63	12000.	270.00	1780.00	SOFT	0.	NO	0.	0.
64	500.	247.50	1110.00	SOFT	0.	NO	0.	0.
65	1000.	247.50	1110.00	SOFT	0.	NO	0.	0.
66	2000.	247.50	1110.00	SOFT	0.	NO	0.	0.
67	4000.	247.50	1110.00	SOFT	0.	YES	3500.	1100.
68	6000.	247.50	1180.00	SOFT	0.	NO	0.	0.
69	8000.	247.50	1140.00	SOFT	0.	YES	4800.	1140.
70	12000.	247.50	1320.00	SOFT	0.	NO	0.	0.
71	500.	225.00	1100.00	SOFT	0.	NO	0.	0.
72	1000.	225.00	1110.00	SOFT	0.	NO	0.	0.



RFID POINT	DISTANCE	BEARING	HEIGHT	GROUND TYPE	FOLIAGE PENETRATION	INTERVENING OBSTRUCTIONS	DISTANCE TO HIGHEST OBSTRUCTION FROM SOURCE	HEIGHT OF OBSTRUCTION
109	4000.	112.50	1420.00	SOFT	0.	NO	0.	0.
110	4000.	112.50	1420.00	SOFT	0.	NO	0.	0.
111	4000.	112.50	1440.00	SOFT	0.	YES	4400.	2400.
112	12000.	112.50	2200.00	SOFT	0.	YES	4400.	2400.
113	4000779.	90.48	1111.00	SOFT	0.	NO	0.	0.
114	4000779.	90.48	1111.00	SOFT	0.	NO	0.	0.
115	4000779.	90.48	1111.00	SOFT	0.	NO	0.	0.
116	4000800.	90.60	1111.00	SOFT	0.	NO	0.	0.
117	4000800.	90.60	1111.00	SOFT	0.	NO	0.	0.
118	4000800.	90.60	1111.00	SOFT	0.	NO	0.	0.
119	4000779.	90.52	1111.00	SOFT	0.	NO	0.	0.
120	4000779.	90.52	1111.00	SOFT	0.	NO	0.	0.
121	4000779.	90.52	1111.00	SOFT	0.	NO	0.	0.

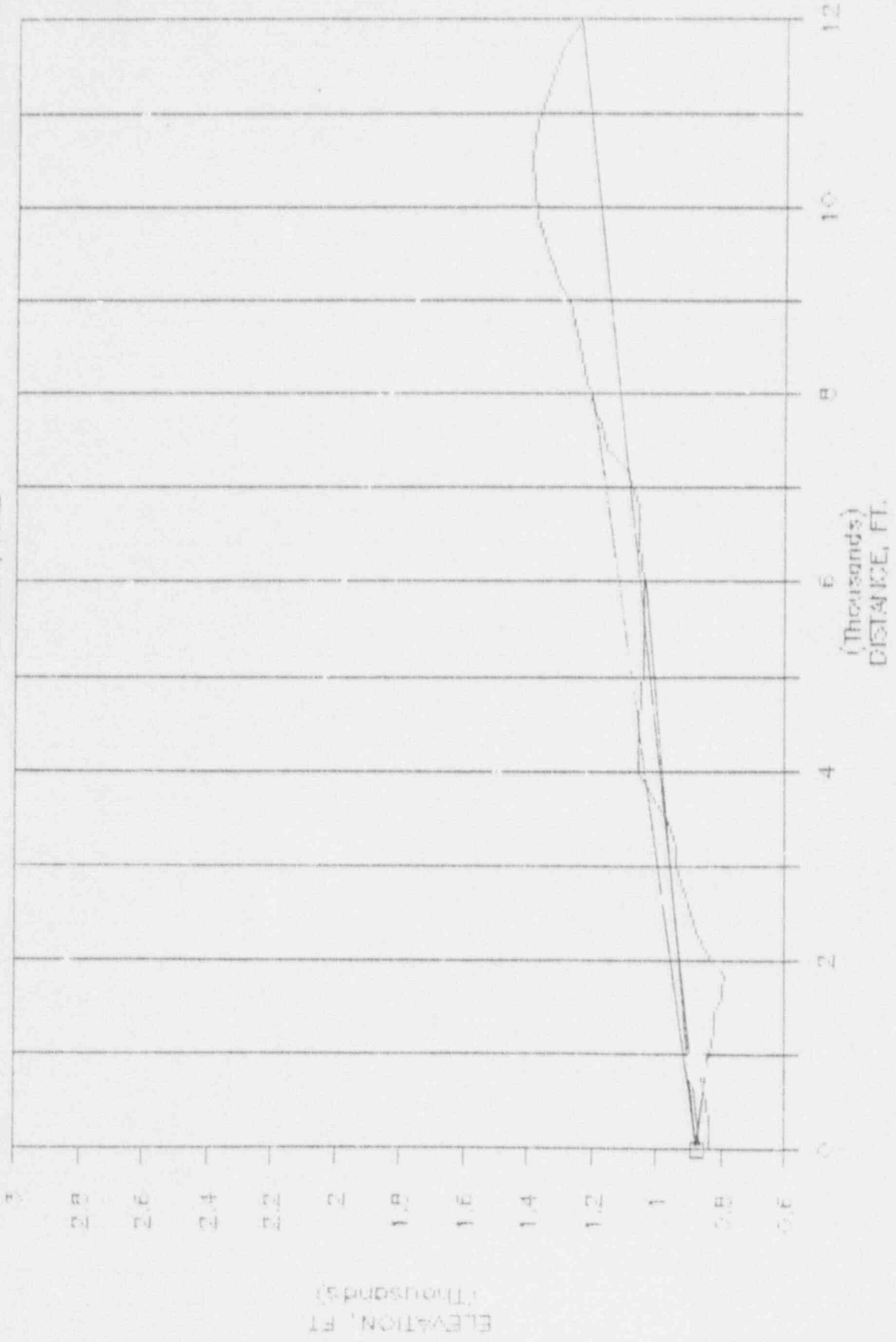
# YANKEE NA-3

AZIMUTH, FI



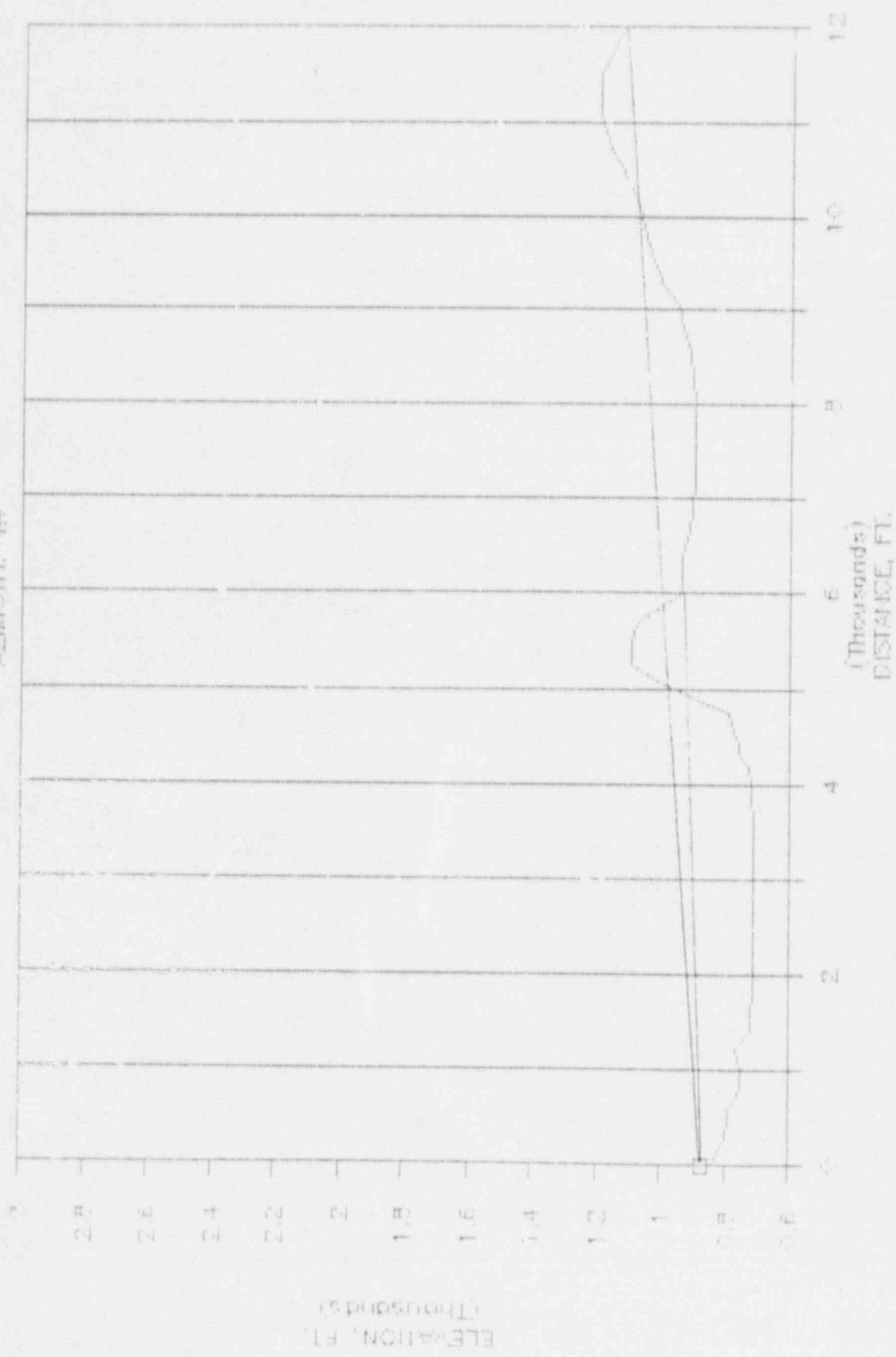
# YANKEE NA-3

AZIMUTH, TRUE



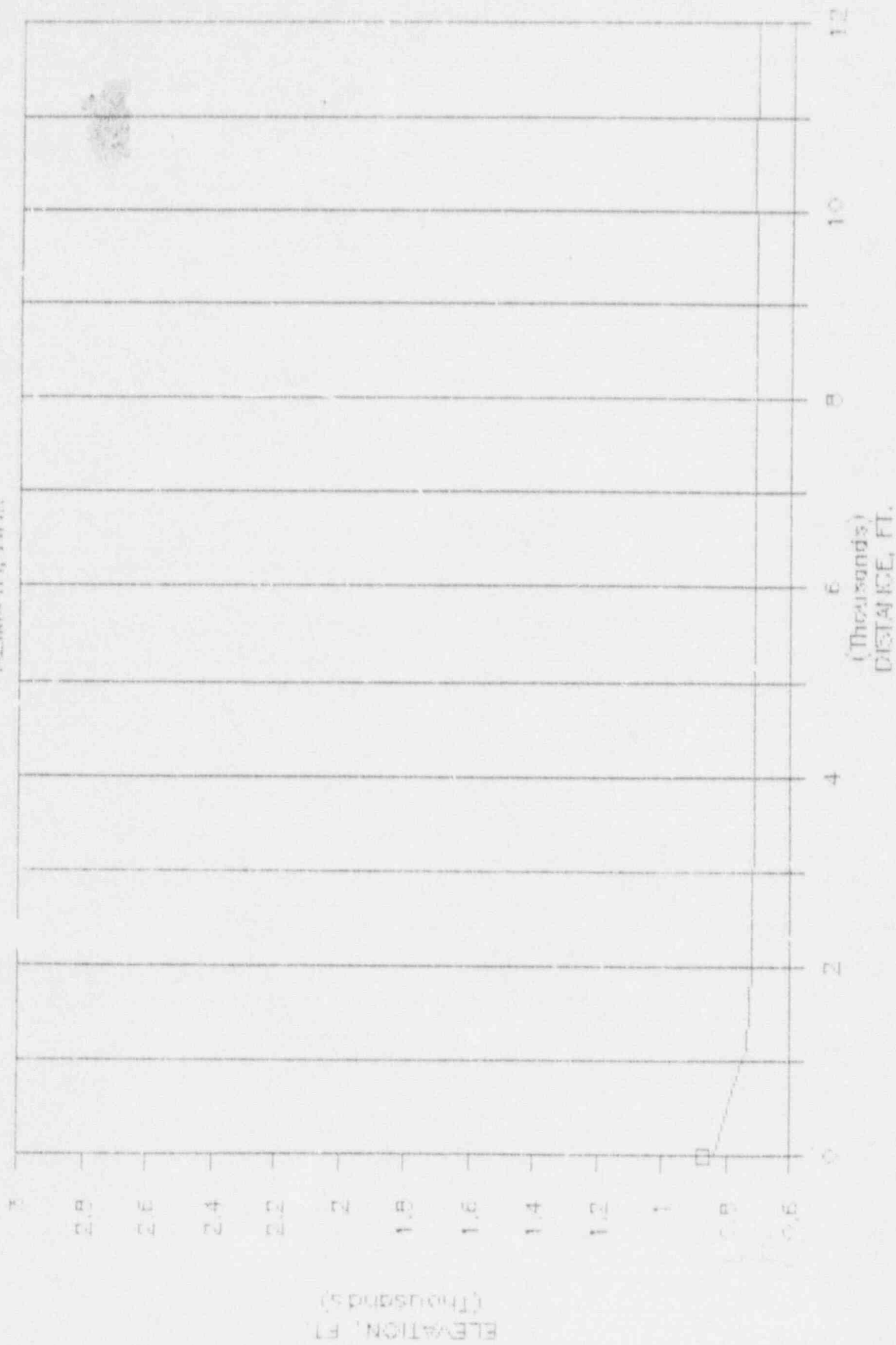
# YANKEE HA-3

AZIMUTH, NW



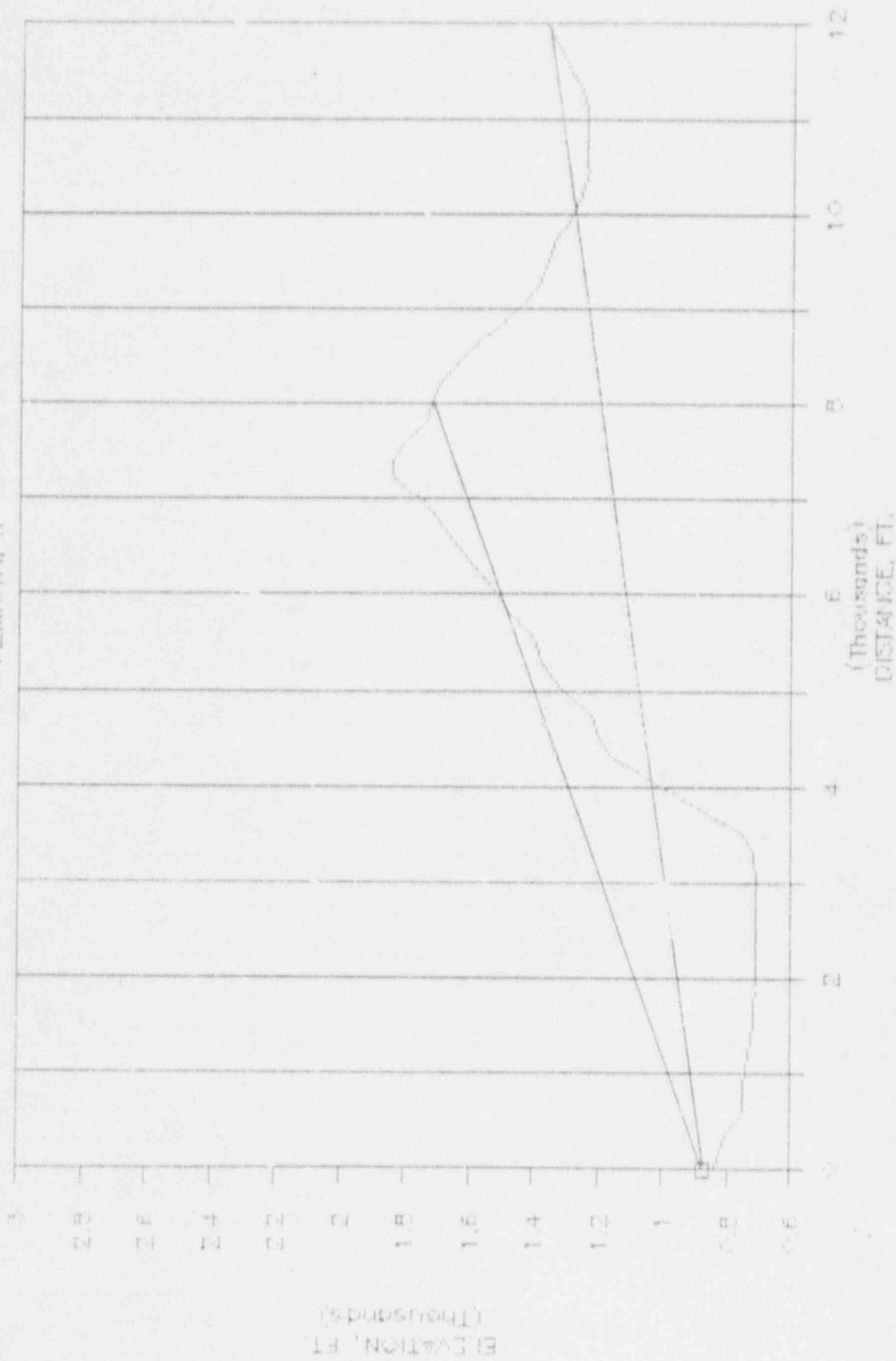
# YANKEE NA-3

AZIMUTH, 111°W



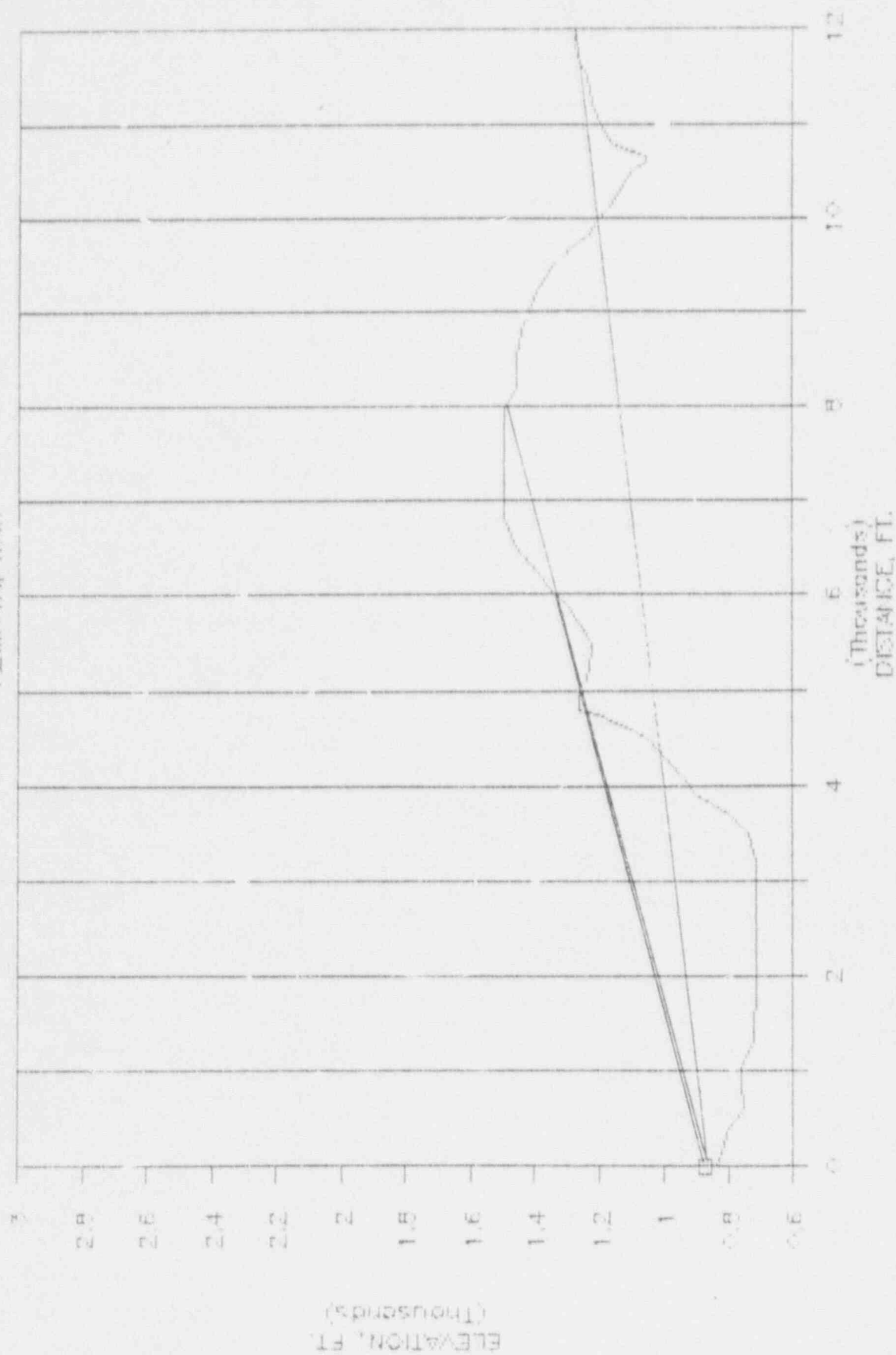
# YANKEE NA-3

AZIMUTH, W



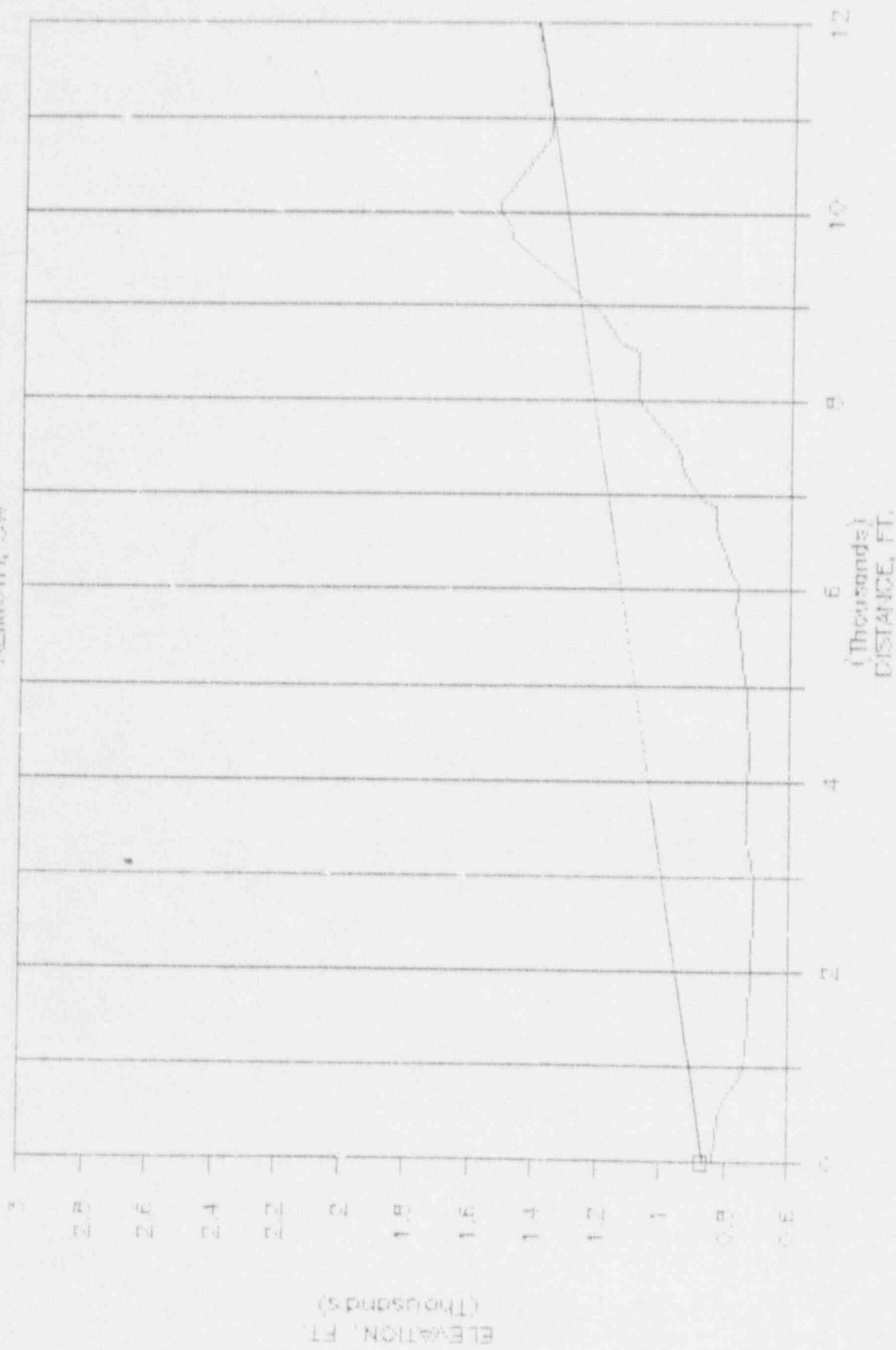
# YANKEE HA-3

AZIMUTH, 000°



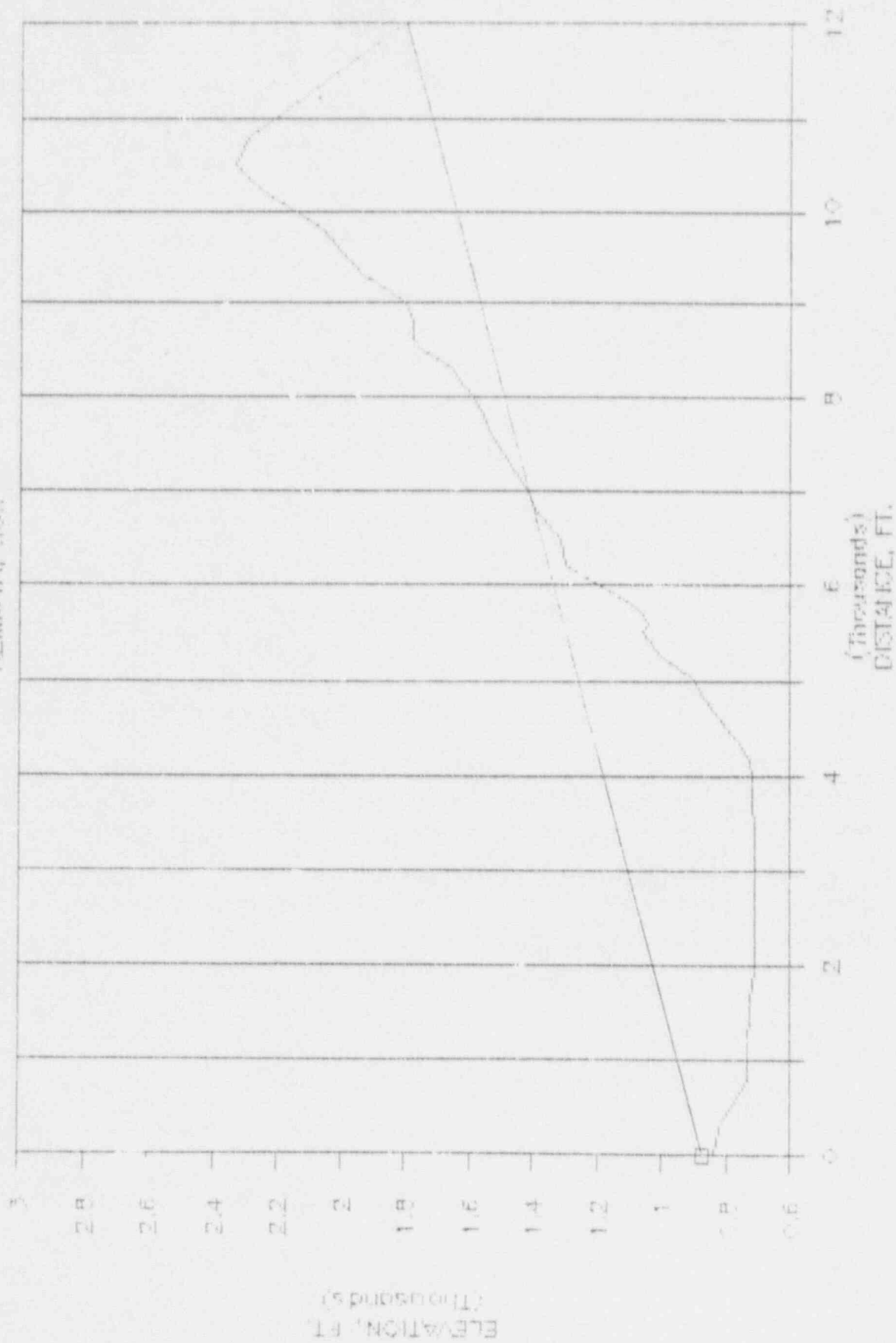
# YANKEE NA-3

AZIMUTH, SW



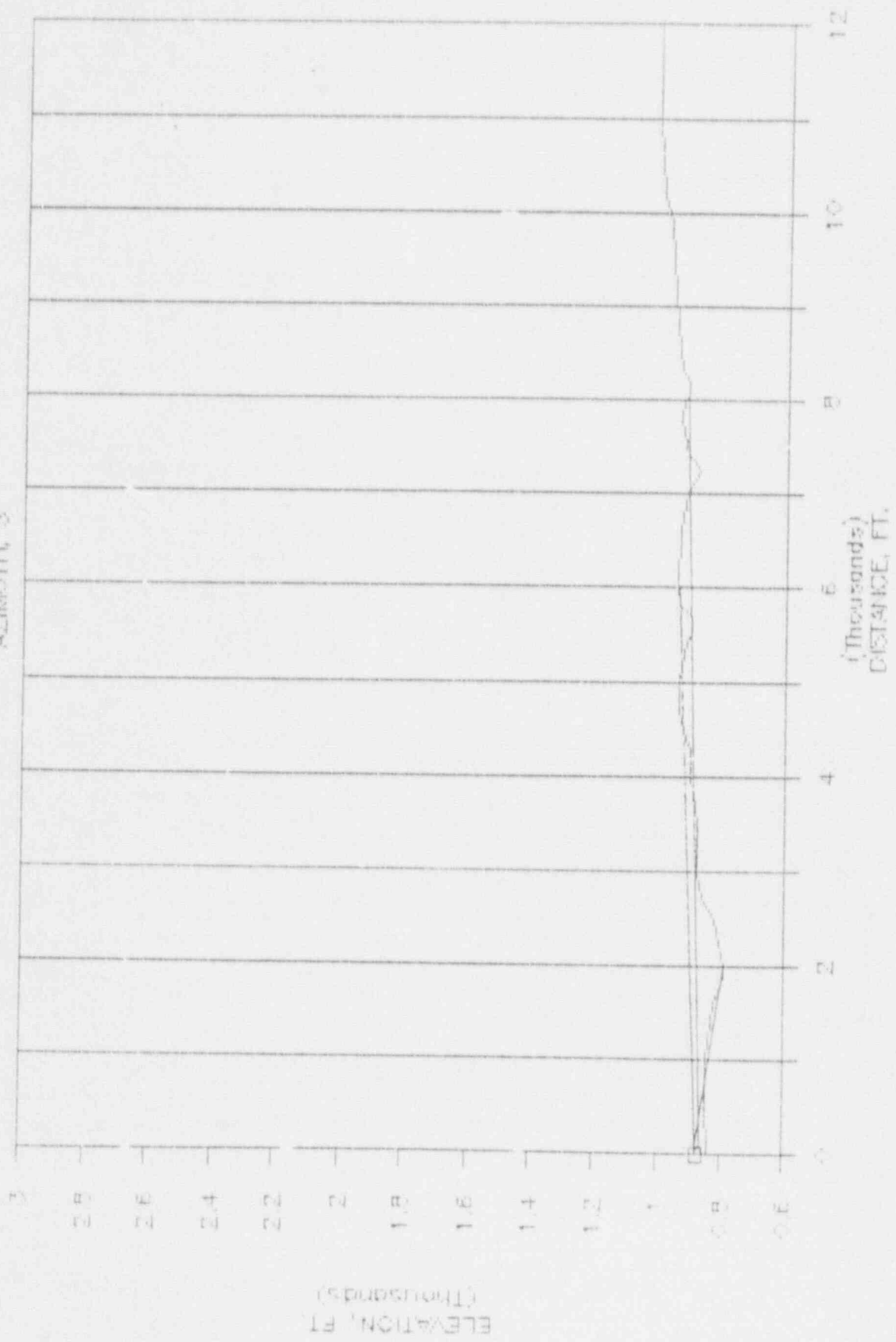
# YANKEE NA-3

AZIMUTH, WSW



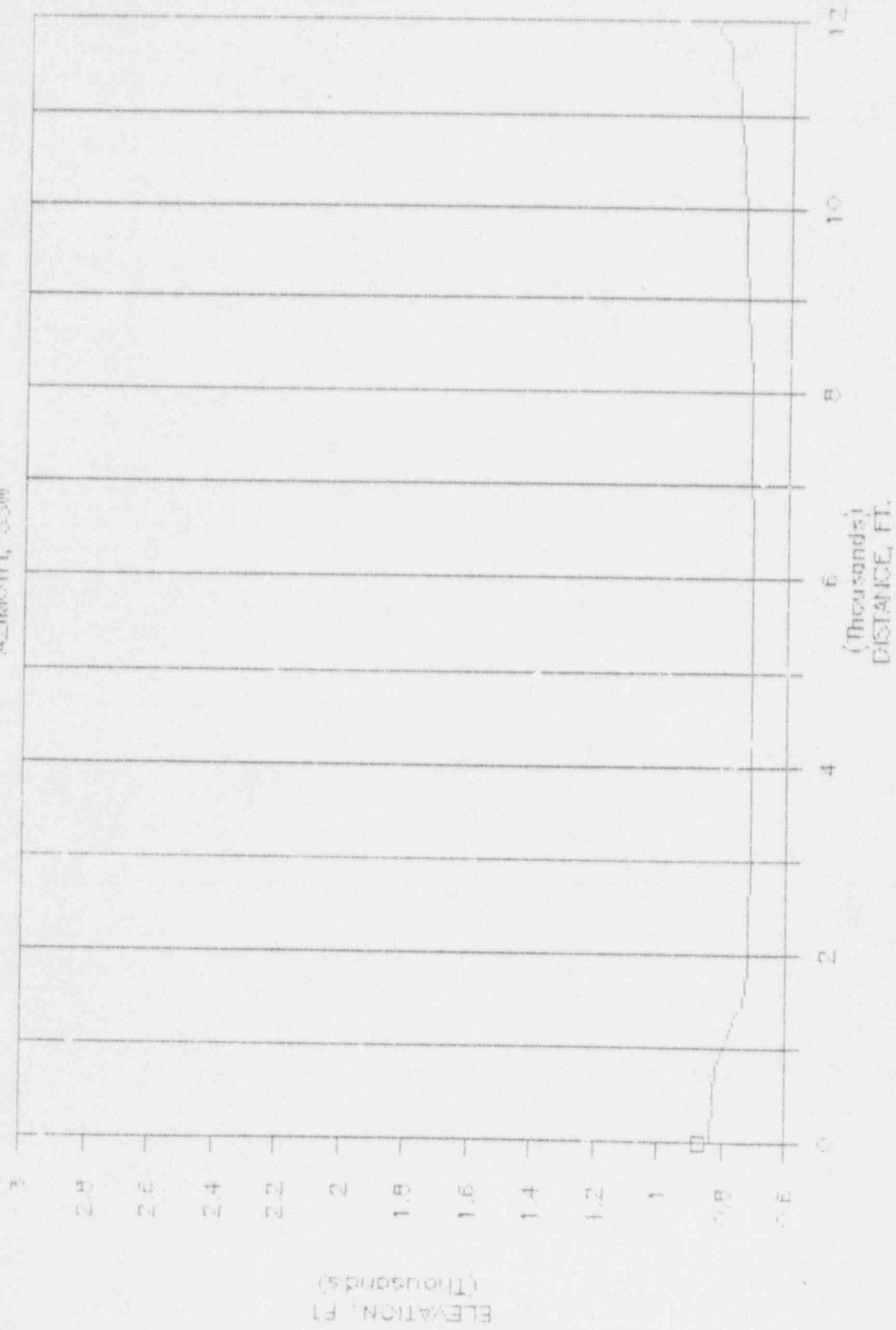
# YANKEE NA-3

AZIMUTH 5



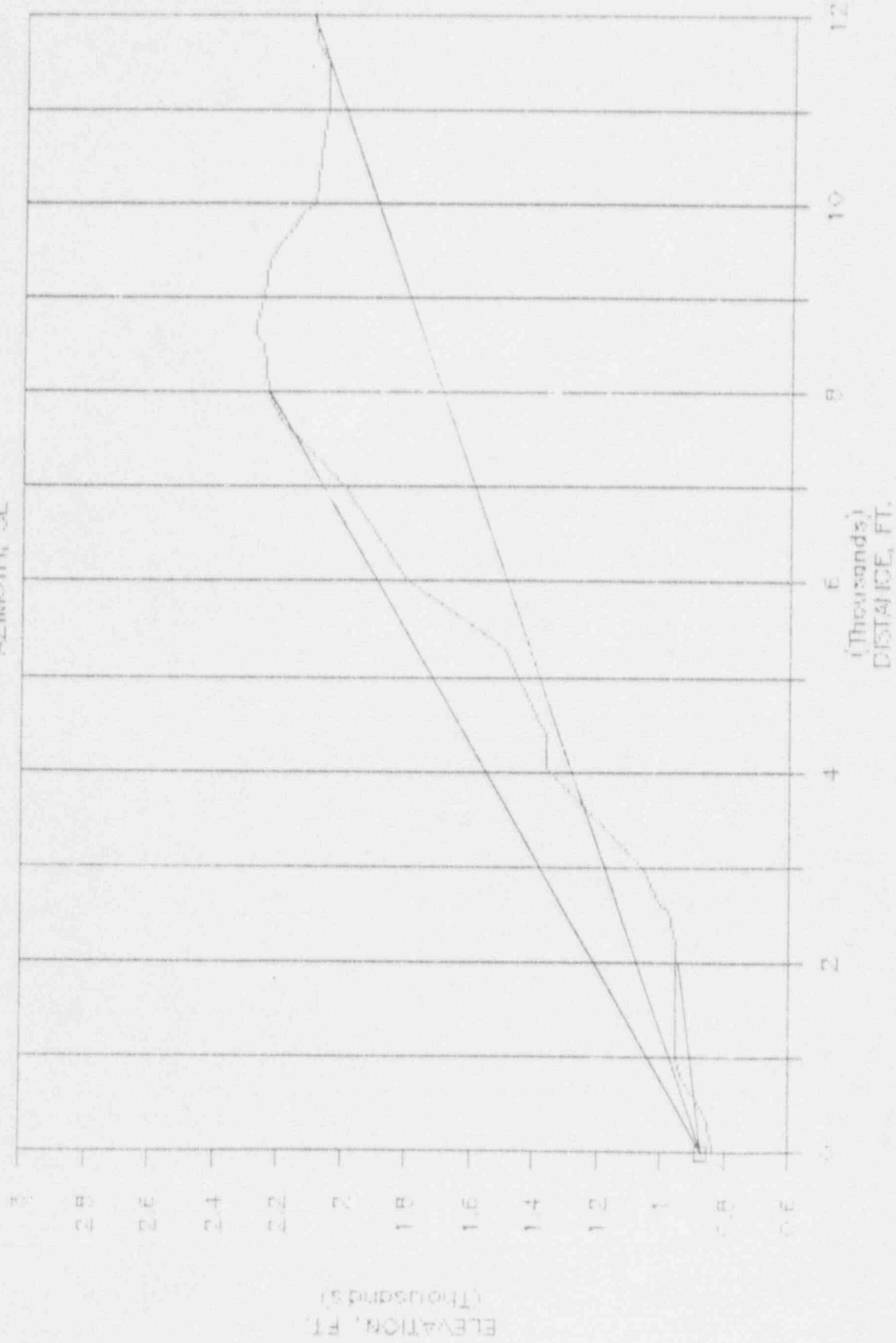
# YANKEE NA-3

AZIMUTH, 55W



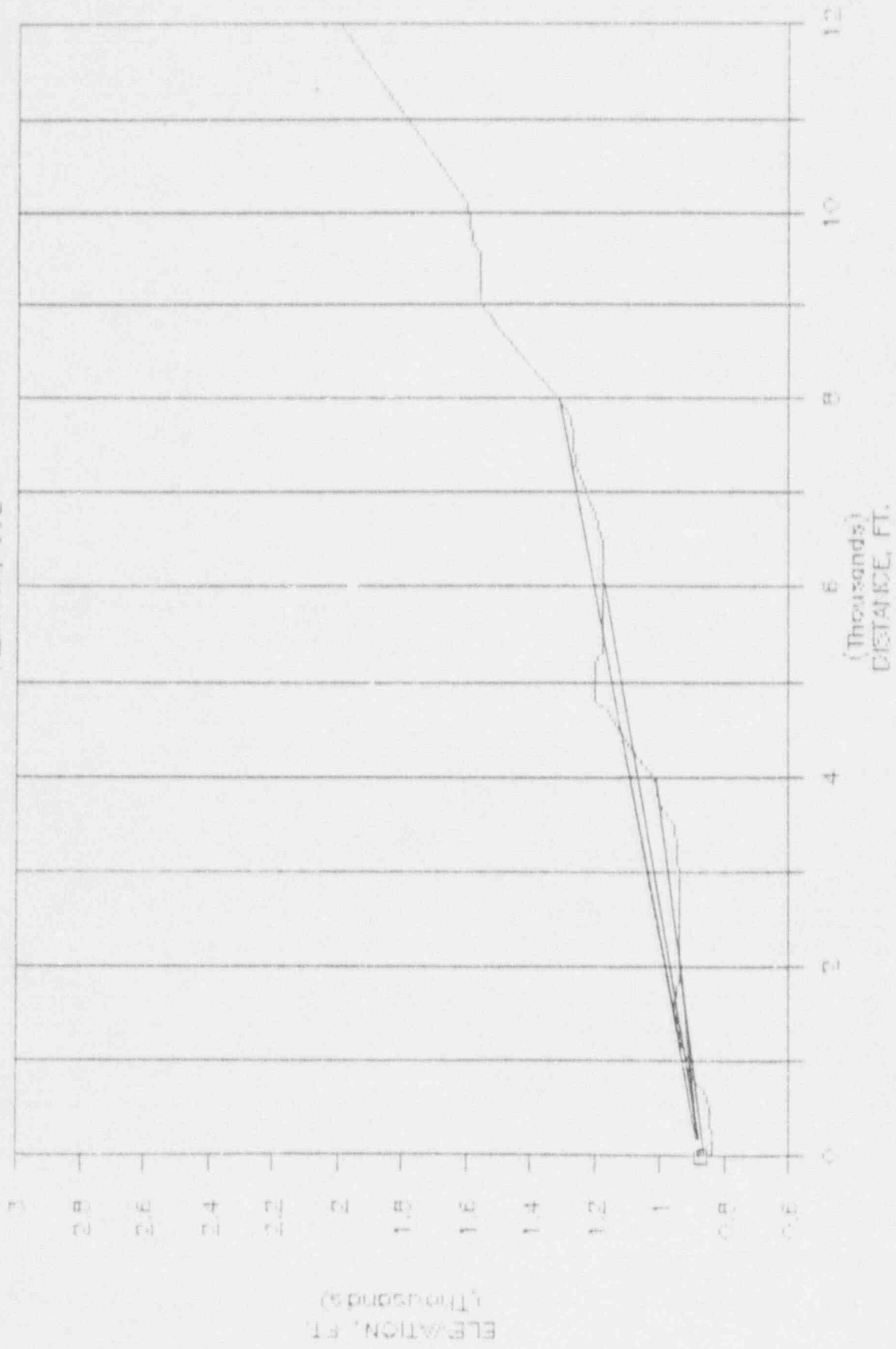
# YANKEE NA-3

AZIMUTH, SE



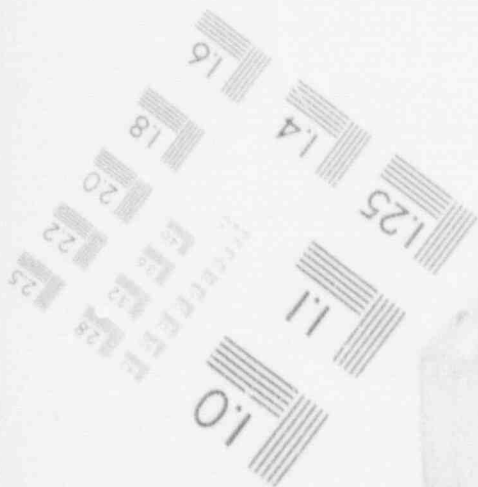
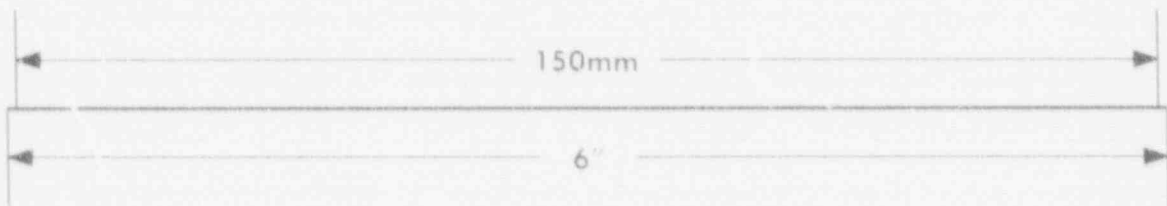
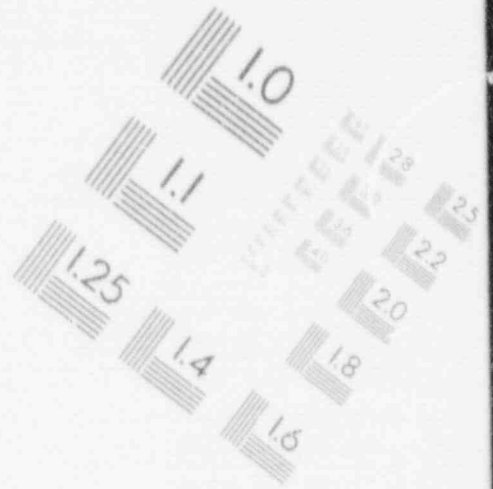
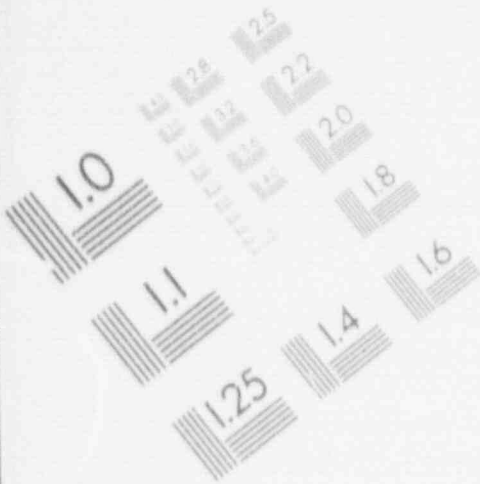
# YANKEE NA-3

AZIMUTH, SSE



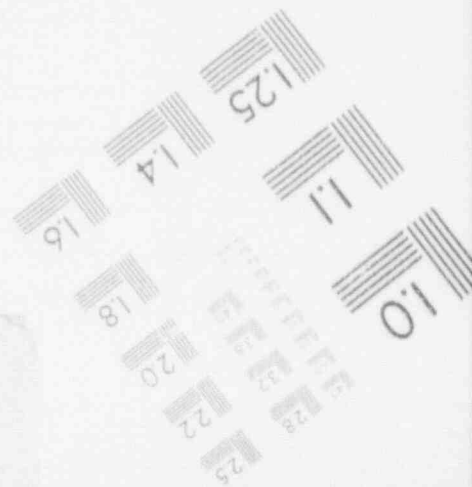
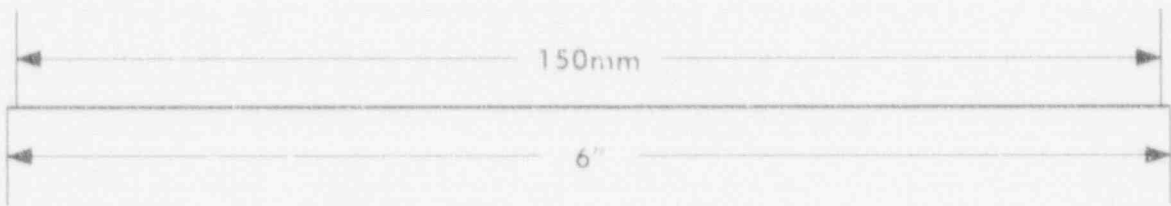
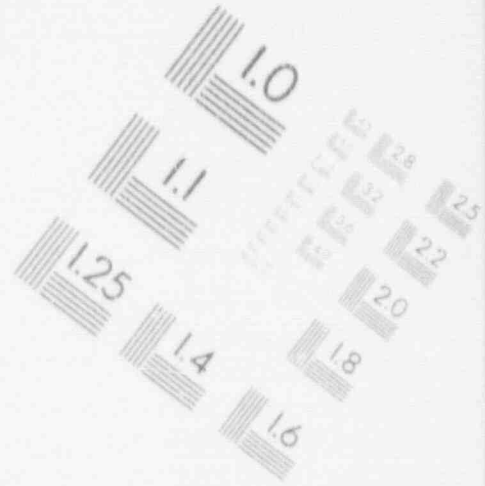
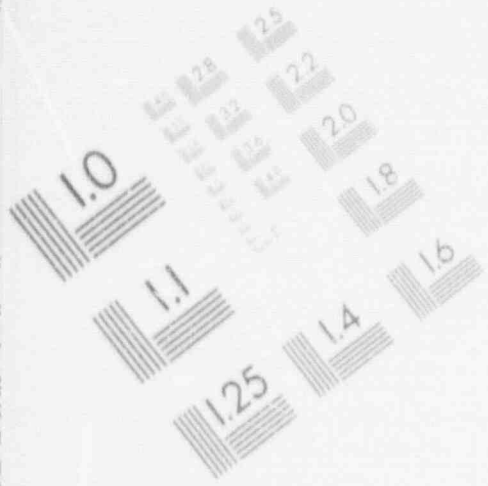
# 1

## IMAGE EVALUATION TEST TARGET (MT-3)



# 1

## IMAGE EVALUATION TEST TARGET (MT-3)



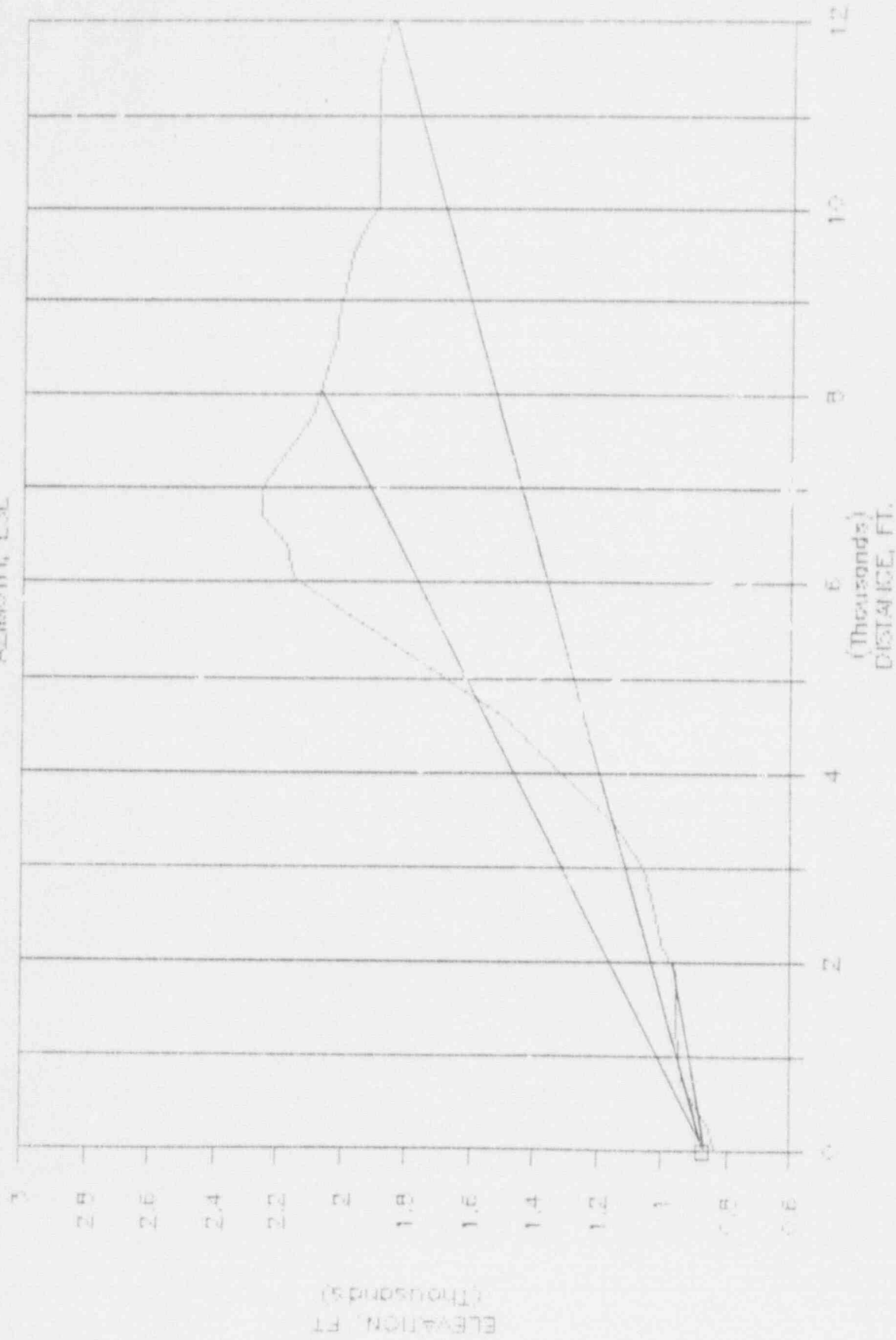
W-11-170411 SUBSTATION COMPANY  
 200000 POUNDS AND 500000 MINT-PERSON  
 SOURCE-RECEIVER TOPOGRAPHICAL INPUTS

ALL BEARINGS ARE WITH RESPECT TO THE NORTH MEASURING CLOCKWISE

GRID POINT	DISTANCE	BEARING	HEIGHT	GROUND TYPE	FOLIAGE PENETRATION	INTERVENING DESTRUCTIONS	DISTANCE TO HIGHEST DESTRUCTION FROM SOURCE	HEIGHT OF DESTRUCTION
1	500.	90.00	900.00	SOFT	0.			
2	1000.	90.00	840.00	SOFT	0.	NO	0.	0.
3	2000.	90.00	880.00	SOFT	0.	NO	0.	0.
4	4000.	90.00	1200.00	SOFT	0.	YES	1700.	900.
5	6000.	90.00	1900.00	SOFT	0.	NO	0.	0.
6	8000.	90.00	2700.00	SOFT	0.	NO	0.	0.
7	12000.	90.00	2090.00	SOFT	0.	YES	7200.	2500.
8	500.	67.50	900.00	SOFT	0.	YES	7200.	2500.
9	1000.	67.50	885.00	SOFT	0.	NO	0.	0.
10	2000.	67.50	907.00	SOFT	0.	YES	500.	500.
11	4000.	67.50	1100.00	SOFT	0.	YES	500.	800.
12	6000.	67.50	1800.00	SOFT	0.	NO	0.	0.
13	8000.	67.50	2420.00	SOFT	0.	NO	0.	0.
14	12000.	67.50	1985.00	SOFT	0.	NO	0.	0.
15	500.	45.00	870.00	SOFT	0.	YES	5000.	2420.
16	1000.	45.00	880.00	SOFT	0.	NO	0.	0.
17	2000.	45.00	880.00	SOFT	0.	NO	0.	0.
18	4000.	45.00	950.00	SOFT	0.	NO	0.	0.
19	6000.	45.00	1120.00	SOFT	0.	YES	2700.	1000.
20	2000.	45.00	1160.00	SOFT	0.	NO	0.	0.
21	12000.	45.00	1000.00	SOFT	0.	NO	0.	0.
22	500.	22.50	850.00	SOFT	0.	YES	8500.	1020.
23	1000.	22.50	840.00	SOFT	0.	NO	0.	0.
24	2000.	22.50	830.00	SOFT	0.	YES	800.	800.
25	4000.	22.50	1060.00	SOFT	0.	NO	0.	0.
26	6000.	22.50	1245.00	SOFT	0.	NO	0.	0.
27	8000.	22.50	1210.00	SOFT	0.	YES	4000.	1060.
28	12000.	22.50	1240.00	SOFT	0.	YES	4000.	1000.
29	500.	.00	800.00	SOFT	0.	YES	4800.	1280.
30	1000.	.00	800.00	SOFT	0.	NO	0.	0.
31	2000.	.00	710.00	SOFT	0.	NO	0.	0.
32	4000.	.00	850.00	SOFT	0.	NO	0.	0.
33	6000.	.00	880.00	SOFT	0.	NO	0.	0.
34	8000.	.00	1070.00	SOFT	0.	NO	0.	0.
35	12000.	.00	1020.00	SOFT	0.	YES	6800.	1040.
36	500.	307.50	800.00	SOFT	0.	YES	6800.	1040.
						NO	0.	0.

# YANKEE NA-3

AZIMUTH, ESE



GRID POINT	DISTANCE	BEARING	HEIGHT	GROUND TYPE	FOLIAGE PENETRATION	INTERFERING OBSTRUCTIONS	DISTANCE TO HIGHEST OBSTRUCTION FROM SOURCE	HEIGHT OF OBSTRUCTION
73	2000.	225.00	720.00	SOFT	0.	NO	0.	0.
74	4000.	225.00	740.00	SOFT	0.	NO	0.	0.
75	6000.	225.00	770.00	SOFT	0.	NO	0.	0.
76	8000.	225.00	1080.00	SOFT	0.	NO	0.	0.
77	12000.	225.00	1410.00	SOFT	0.	NO	0.	0.
78	500.	202.50	830.00	SOFT	0.	YES	19900.	1320.
79	1000.	202.50	*****	SOFT	0.	NO	0.	0.
80	2000.	202.50	720.00	SOFT	0.	NO	0.	0.
81	4000.	202.50	710.00	SOFT	0.	NO	0.	0.
82	6000.	202.50	710.00	SOFT	0.	NO	0.	0.
83	8000.	202.50	720.00	SOFT	0.	NO	0.	0.
84	12000.	202.50	830.00	SOFT	0.	NO	0.	0.
85	500.	180.00	845.00	SOFT	0.	NO	0.	0.
86	1000.	180.00	845.00	SOFT	0.	NO	0.	0.
87	2000.	180.00	795.00	SOFT	0.	NO	0.	0.
88	4000.	180.00	900.00	SOFT	0.	YES	1000.	845.
89	6000.	180.00	950.00	SOFT	0.	NO	0.	0.
90	8000.	180.00	930.00	SOFT	0.	YES	4400.	920.
91	12000.	180.00	1020.00	SOFT	0.	YES	6000.	950.
92	500.	157.50	850.00	SOFT	0.	NO	0.	0.
93	1000.	157.50	920.00	SOFT	0.	NO	0.	0.
94	2000.	157.50	940.00	SOFT	0.	NO	0.	0.
95	4000.	157.50	1020.00	SOFT	0.	YES	1800.	960.
96	6000.	157.50	1180.00	SOFT	0.	YES	1800.	960.
97	8000.	157.50	1320.00	SOFT	0.	YES	4700.	1180.
98	12000.	157.50	2000.00	SOFT	0.	YES	4700.	1180.
99	500.	135.00	850.00	SOFT	0.	NO	0.	0.
100	1000.	135.00	960.00	SOFT	0.	NO	0.	0.
101	2000.	135.00	960.00	SOFT	0.	NO	0.	0.
102	4000.	135.00	1750.00	SOFT	0.	YES	1000.	960.
103	6000.	135.00	1800.00	SOFT	0.	NO	0.	0.
104	8000.	135.00	2240.00	SOFT	0.	NO	0.	0.
105	12000.	135.00	2110.00	SOFT	0.	YES	7700.	2200.
106	500.	112.50	990.00	SOFT	0.	YES	7700.	2200.
107	1000.	112.50	950.00	SOFT	0.	NO	0.	0.
108	2000.	112.50	970.00	SOFT	0.	NO	0.	0.
						YES	750.	940.

GRID POINT	DISTANCE	BEARING	HEIGHT	GROUND TYPE	FOLIAGE PENETRATION	INTERVENING OBSTRUCTIONS	DISTANCE TO HIGHEST OBSTRUCTION FROM SOURCE	HEIGHT OF OBSTRUCTION
37	1000.	337.50	750.00	SOFT	0.	NO	0.	0.
38	2000.	337.50	720.00	SOFT	0.	NO	0.	0.
39	4000.	337.50	710.00	SOFT	0.	NO	0.	0.
40	6000.	337.50	710.00	SOFT	0.	NO	0.	0.
41	8000.	337.50	710.00	HARD	0.	NO	0.	0.
42	12000.	337.50	710.00	HARD	0.	NO	0.	0.
43	500.	315.00	745.00	SOFT	0.	NO	0.	0.
44	1000.	315.00	730.00	SOFT	0.	NO	0.	0.
45	2000.	315.00	715.00	SOFT	0.	NO	0.	0.
46	4000.	315.00	720.00	SOFT	0.	NO	0.	0.
47	6000.	315.00	440.00	SOFT	0.	YES	0.	0.
48	8000.	315.00	410.00	SOFT	0.	YES	5250.	1100.
49	12000.	315.00	1120.00	SOFT	0.	YES	5250.	1100.
50	500.	292.50	780.00	SOFT	0.	NO	0.	1100.
51	1000.	292.50	760.00	SOFT	0.	NO	0.	0.
52	2000.	292.50	710.00	SOFT	0.	NO	0.	0.
53	4000.	292.50	820.00	SOFT	0.	NO	0.	0.
54	6000.	292.50	1040.00	SOFT	0.	YES	0.	0.
55	8000.	292.50	1500.00	SOFT	0.	YES	4800.	1200.
56	12000.	292.50	1280.00	SOFT	0.	YES	6500.	1400.
57	500.	270.00	775.00	SOFT	0.	NO	6500.	1400.
58	1000.	270.00	745.00	SOFT	0.	NO	0.	0.
59	2000.	270.00	710.00	SOFT	0.	NO	0.	0.
60	4000.	270.00	1000.00	SOFT	0.	NO	0.	0.
61	6000.	270.00	1320.00	SOFT	0.	NO	0.	0.
62	8000.	270.00	1725.00	SOFT	0.	YES	0.	0.
63	12000.	270.00	1370.00	SOFT	0.	YES	7250.	1840.
64	500.	247.50	790.00	SOFT	0.	NO	7250.	1840.
65	1000.	247.50	735.00	SOFT	0.	NO	0.	0.
66	2000.	247.50	710.00	SOFT	0.	NO	0.	0.
67	4000.	247.50	720.00	SOFT	0.	NO	0.	0.
68	6000.	247.50	1200.00	SOFT	0.	NO	0.	0.
69	8000.	247.50	1590.00	SOFT	0.	NO	0.	0.
70	12000.	247.50	1800.00	SOFT	0.	NO	0.	0.
71	500.	225.00	820.00	SOFT	0.	YES	10500.	2340.
72	1000.	225.00	745.00	SOFT	0.	NO	0.	0.
						NO	0.	0.

YANKEE ATOMIC ELECTRIC COMPANY  
 YANKEE ROWE SIREN STATION WNAE-FS1000  
 NOISE SOURCE POWER LEVEL INPUT

INDEX	SOURCE	DBA	DBC	21.3	42	125	250	500	1000	2000	4000	8000 (Hz)
1	YANK ROWE - FS1000	159.7	147.7	140	135	130	122.0	114.0	104.0	93.0	84.0	74.0
		10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*
		100	100	100	100	100	100	100	100	100	100	100
							877.00		HEIGHT ABOVE GROUND=	35.00		

YANKEE ATOMIC ELECTRIC COMPANY  
 YANKEE ROWE SIREN STATION WNAE-FS1000  
 METEOROLOGICAL INPUT CONDITIONS

H1= 9.75 METERS

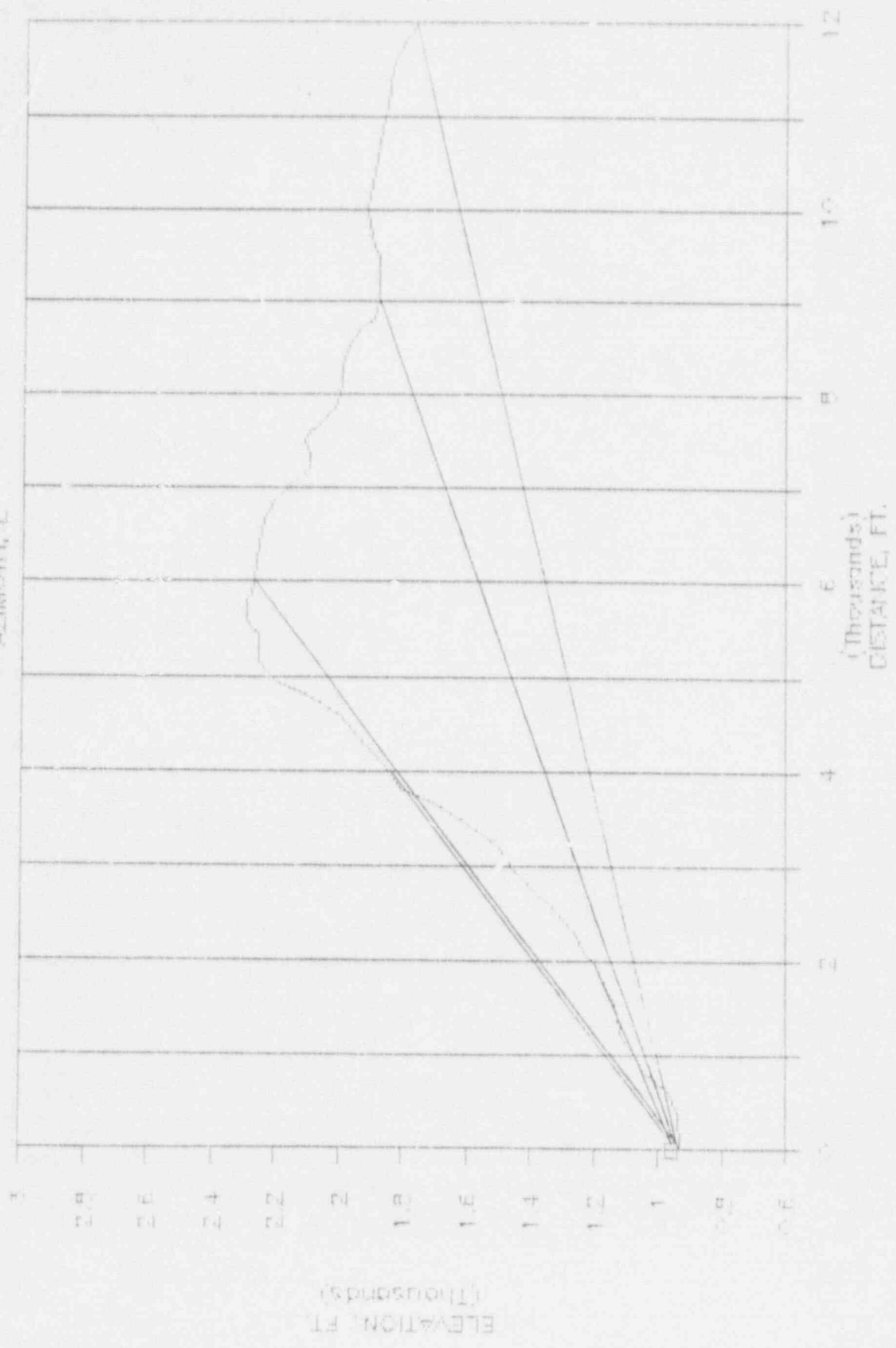
H2= 59.74 METERS

YEAR	SEASON	MONTH	DATE	HOUR	WIND DIRECTION	WIND SPEED (MPS)		TEMPERATURE (C)		RELATIVE BAROMETRIC HUMIDITY PRESSURE (MM OF HG)	
						H1	H2	H1	H2	HUMIDITY	PRESSURE
1980		7	5	12	175.0	1.5	1.8	22.7	22.4	50.0	755.0

GRID POINT	DISTANCE	BEARING	HEIGHT	GROUND TYPE	FOLiage PENETRATION	INTERVENING OBSTRUCTIONS	DISTANCE TO HIGHEST OBSTRUCTION FROM SOURCE	HEIGHT OF OBSTRUCTION
109	4000.	112.50	1320.00	SOFT	0.	NO		
110	8000.	112.50	2140.00	SOFT	0.	NO	0.	0.
111	8000.	112.50	2080.00	SOFT	0.	YES	0.	0.
112	12000.	112.50	1980.00	SOFT	0.	YES	3050.	2180.
113	4395779.	89.48	1111.00	SOFT	0.	NO	8050.	2180.
114	4395779.	89.48	1111.00	SOFT	0.	NO	0.	0.
115	4395779.	89.48	1111.00	SOFT	0.	NO	0.	0.
116	4395800.	90.00	1111.00	SOFT	0.	NO	0.	0.
117	4395800.	90.00	1111.00	SOFT	0.	NO	0.	0.
118	4395800.	90.00	1111.00	SOFT	0.	NO	0.	0.
119	4395779.	90.52	1111.00	SOFT	0.	NO	0.	0.
120	4395779.	90.52	1111.00	SOFT	0.	NO	0.	0.
121	4395779.	90.52	1111.00	SOFT	0.	NO	0.	0.

# YANFEE NA-4

AZIMUTH, E



KANISSE ATOMIC ELECTRIC COMPANY  
 KANISSE ROAD AND SIREN #NH7-201000

SIREN SOUND LEVELS IN DB

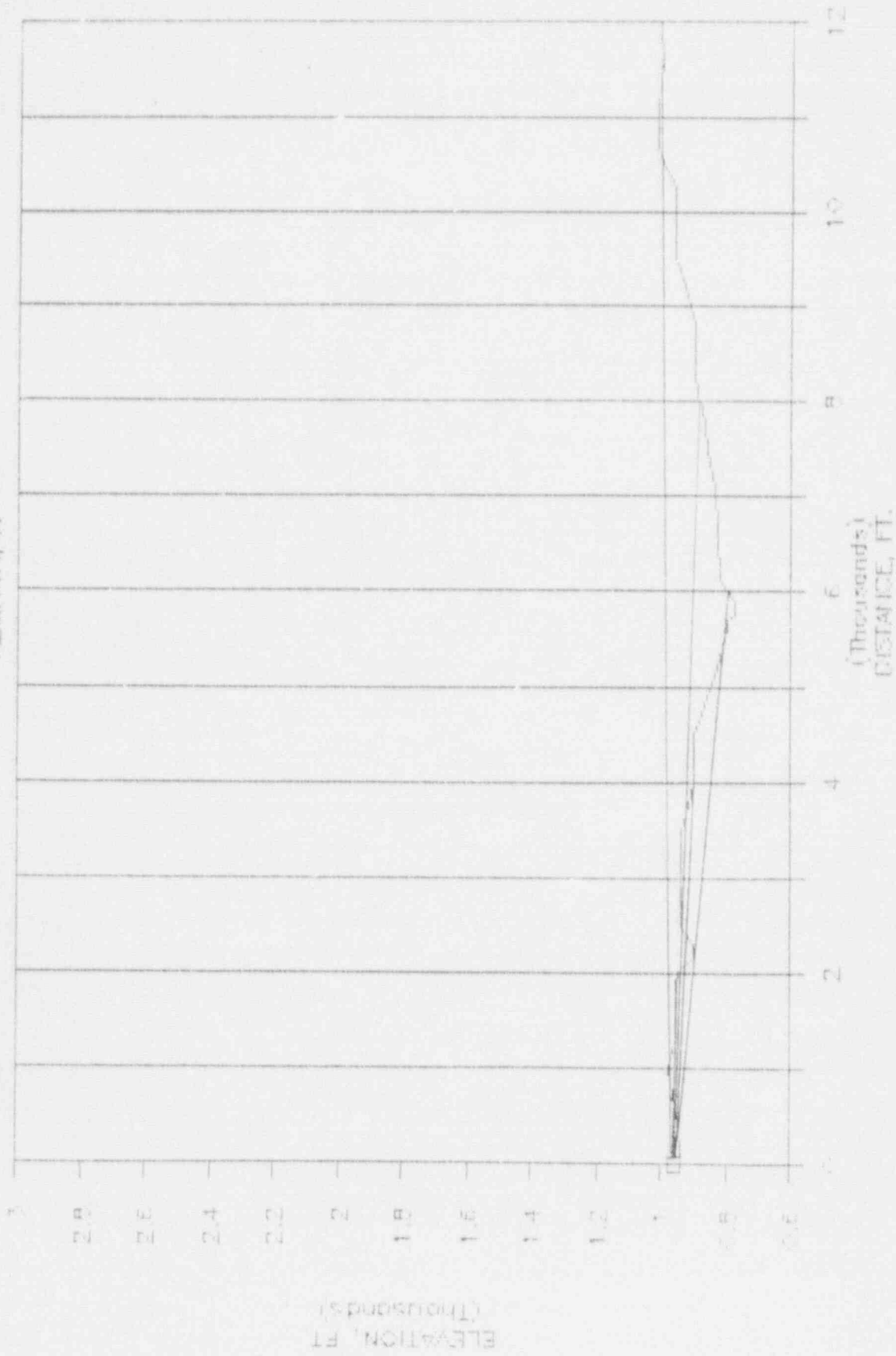
UNDER NET CONDITION :

DISTANCE IN FEET

AZIMUTH	500.	1000.	2000.	4000.	6000.	8000.	12000.
E	112.	105.	98.	91.	84.	78.	72.
ENE	112.	98.	90.	80.	74.	67.	62.
NE	111.	102.	95.	79.	73.	67.	60.
NNE	110.	90.	85.	80.	77.	73.	68.
N	110.	102.	95.	89.	85.	77.	68.
NNW	111.	103.	95.	89.	85.	80.	76.
NW	111.	100.	95.	89.	85.	80.	77.
WNW	112.	103.	95.	88.	80.	71.	65.
W	112.	107.	96.	89.	86.	80.	71.
WSW	111.	103.	95.	80.	70.	61.	47.
SW	110.	103.	91.	77.	68.	54.	46.
SSW	110.	90.	90.	75.	62.	51.	46.
S	110.	101.	87.	74.	61.	51.	46.
SSE	110.	102.	84.	75.	62.	52.	48.
SE	111.	103.	83.	78.	65.	57.	48.
ESE	112.	100.	84.	80.	68.	56.	47.

# YANKEE NA-4

AZMUTH, II



# YANKEE NA-4

AZIMUTH, TRUE



ELEVATION, FT  
(Thousands)

(Thousands)  
DISTANCE, FT.

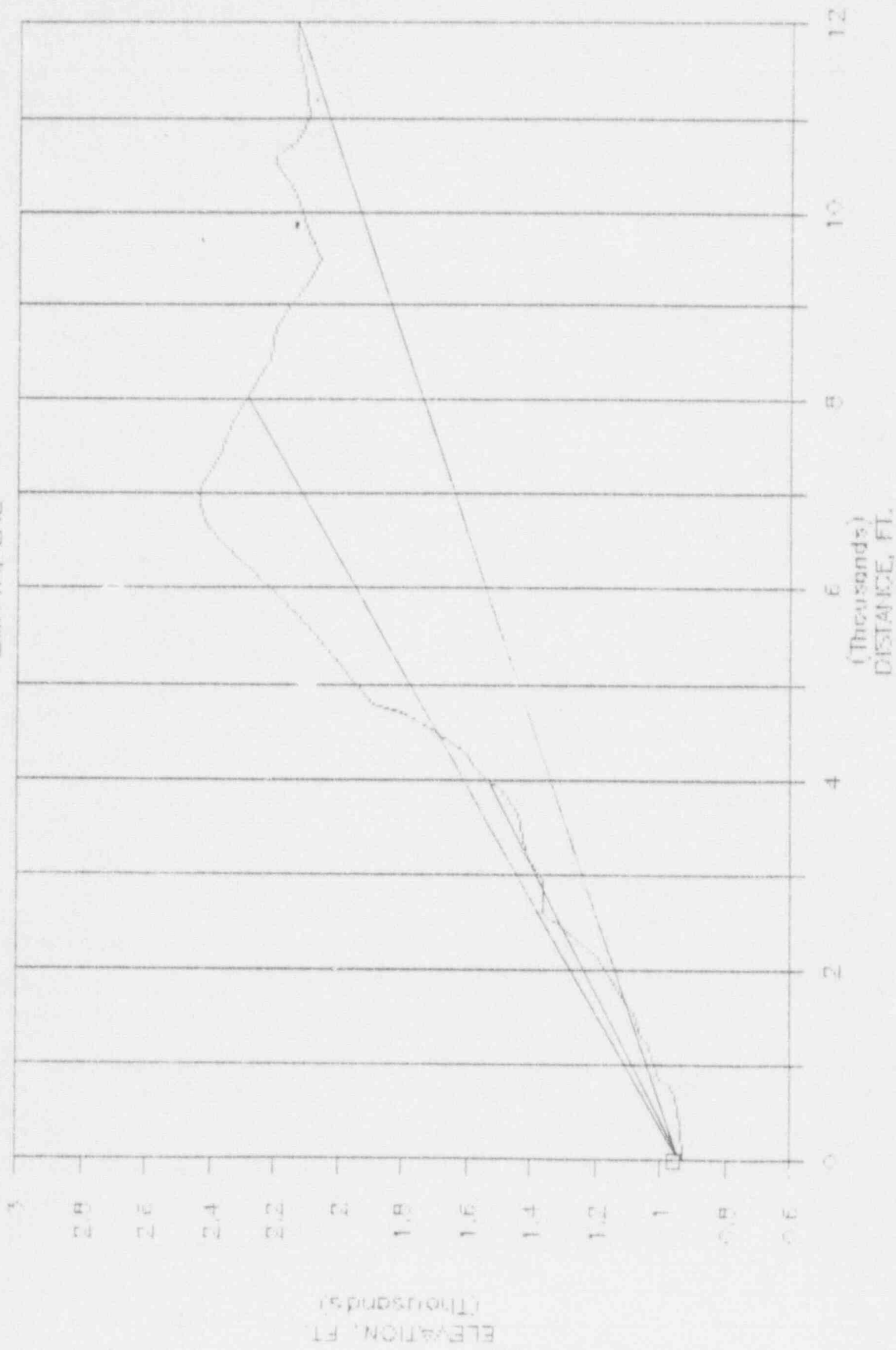
# YANFEE NA-4

AZIMUTH, DE



# YANFEE NA-4

AZIMUTH, 01E



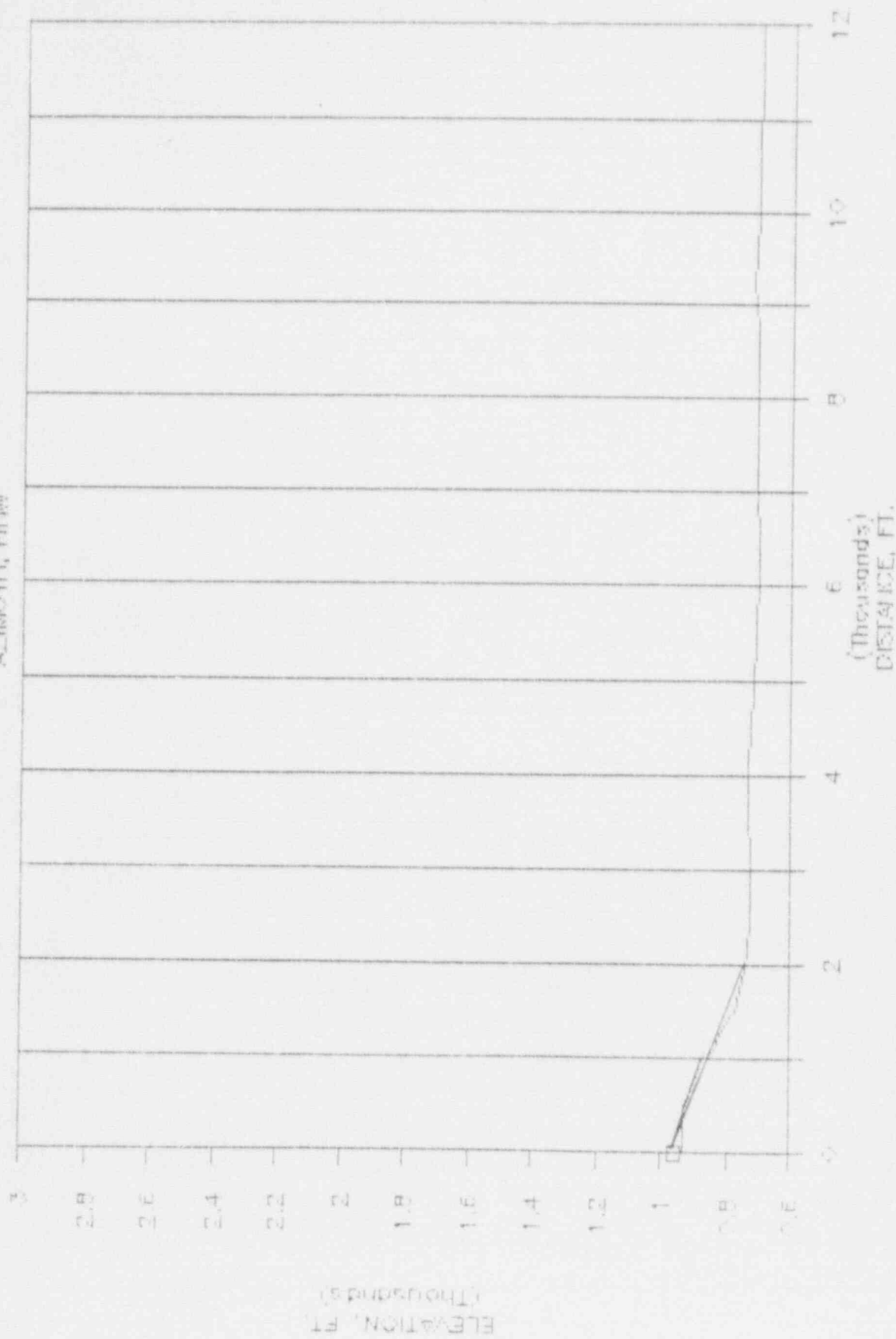
# YANKEE NA-4

AZIMUTH, 110°



# YANKEE NA-4

AZIMUTH, 111°



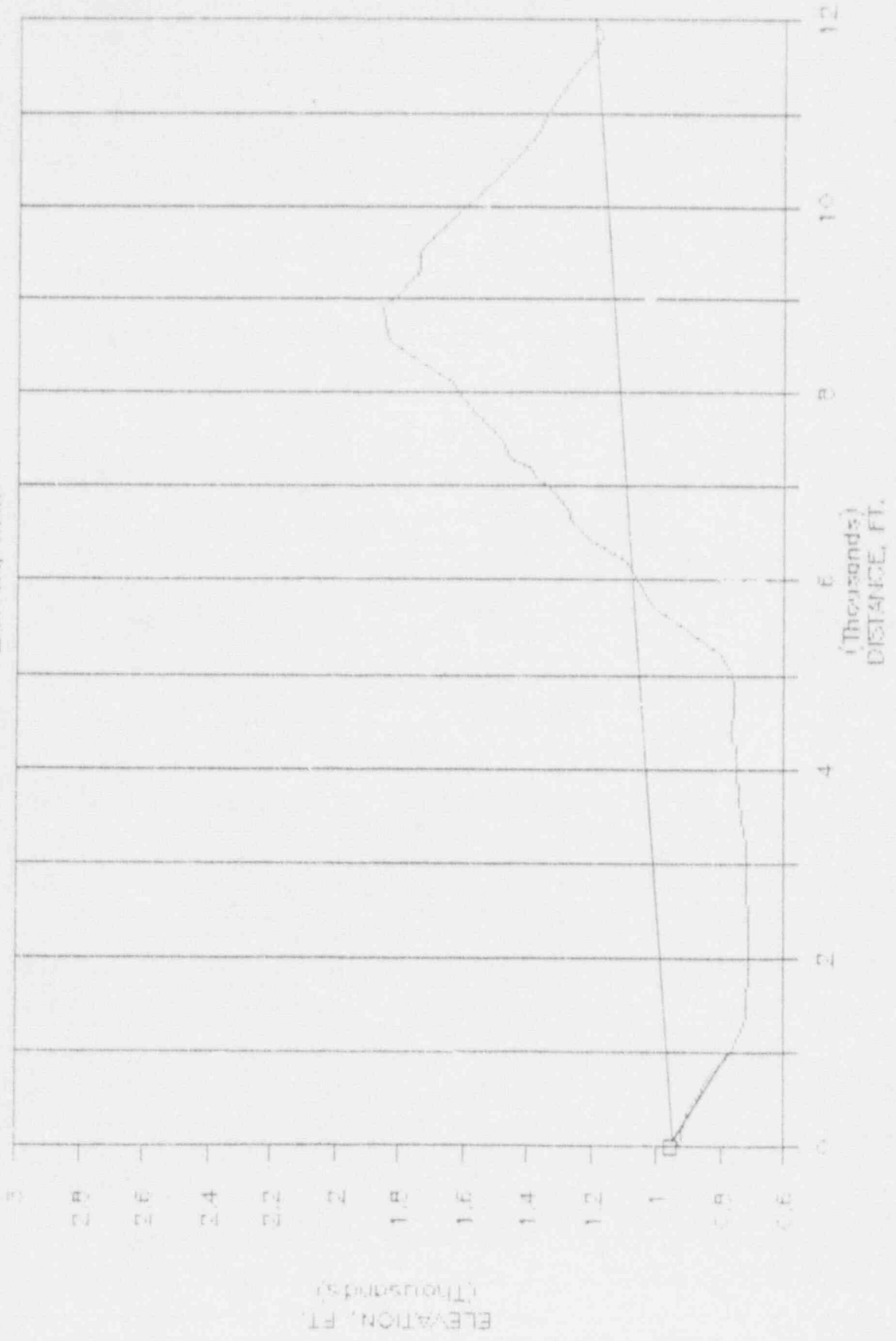
# YANFEE NA-4

AZIMUTH, W



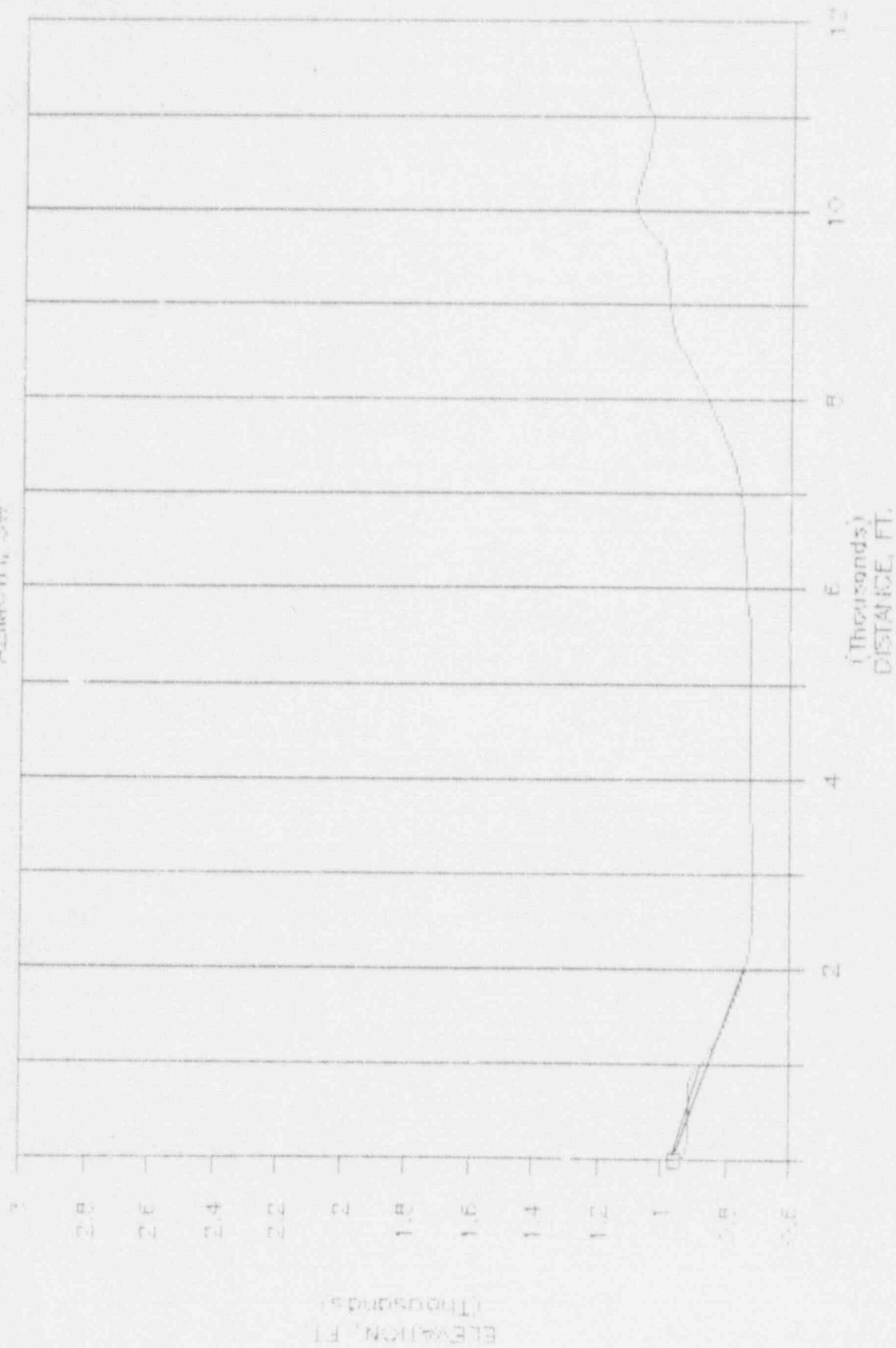
# YANKEE NA-4

AZIMUTH,  $101^{\circ}$



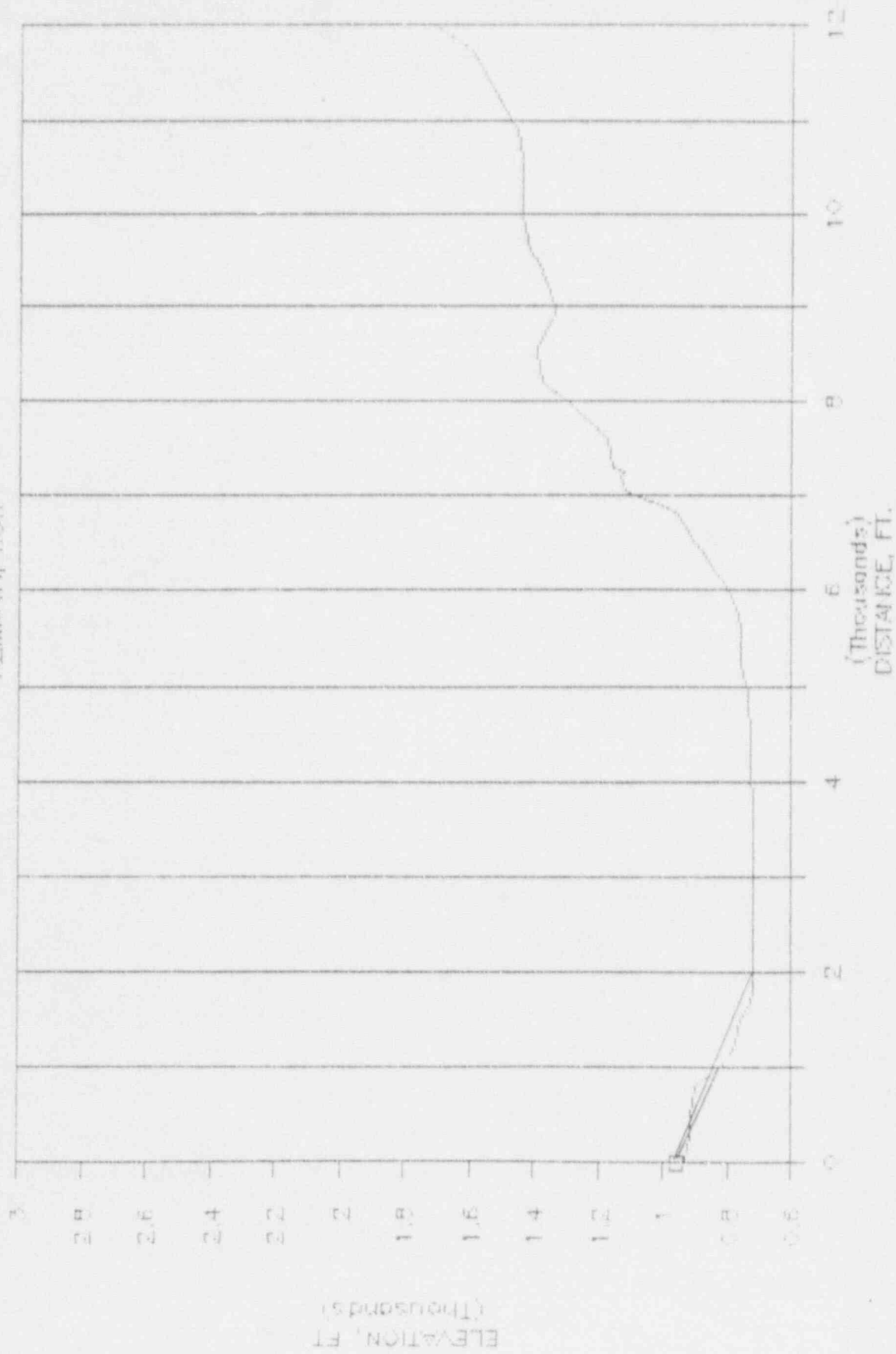
# YANKEE NA-4

AZIMUTH, SW



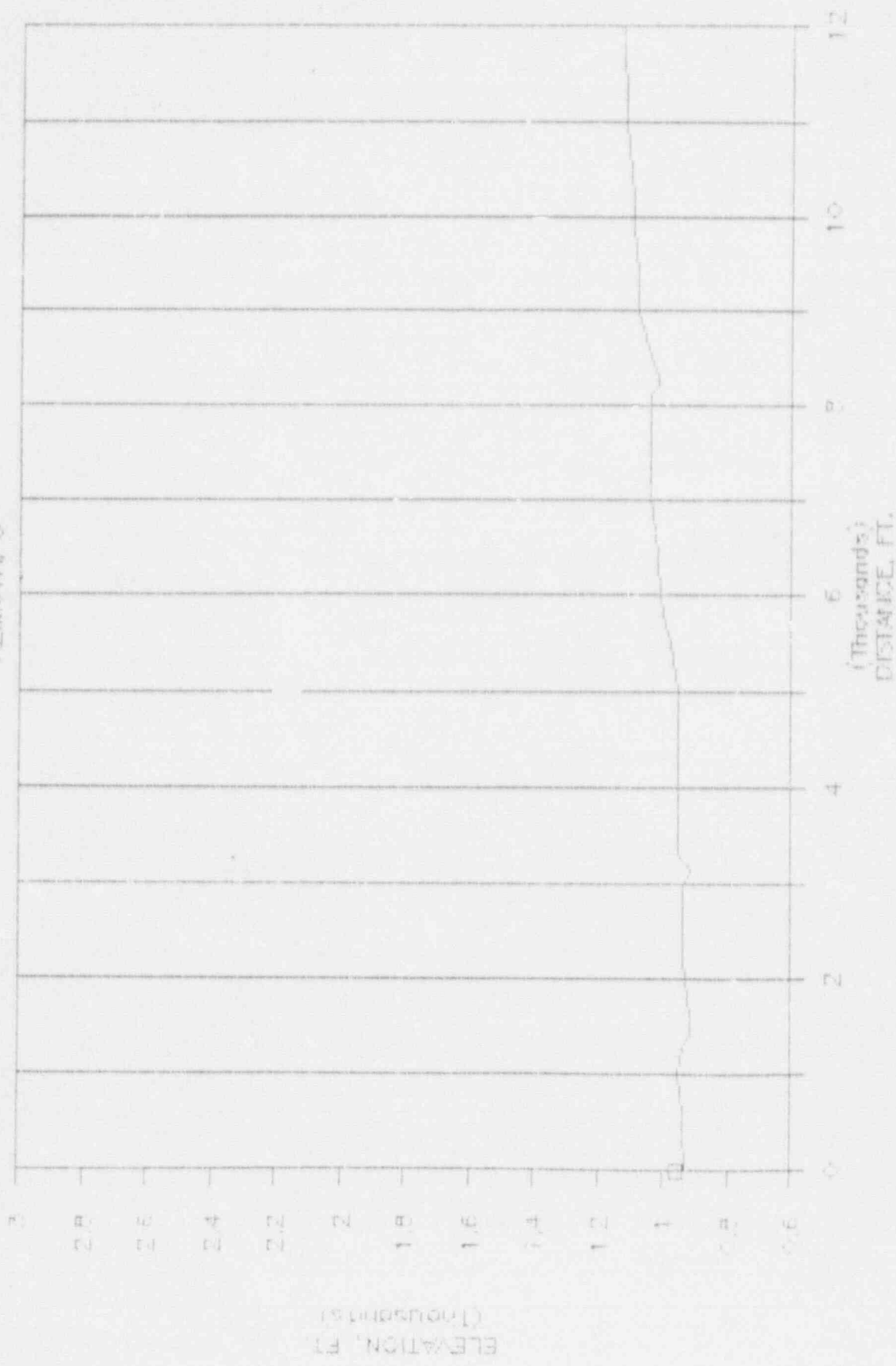
# YANKEE NA-4

AZIMUTH, WGS84



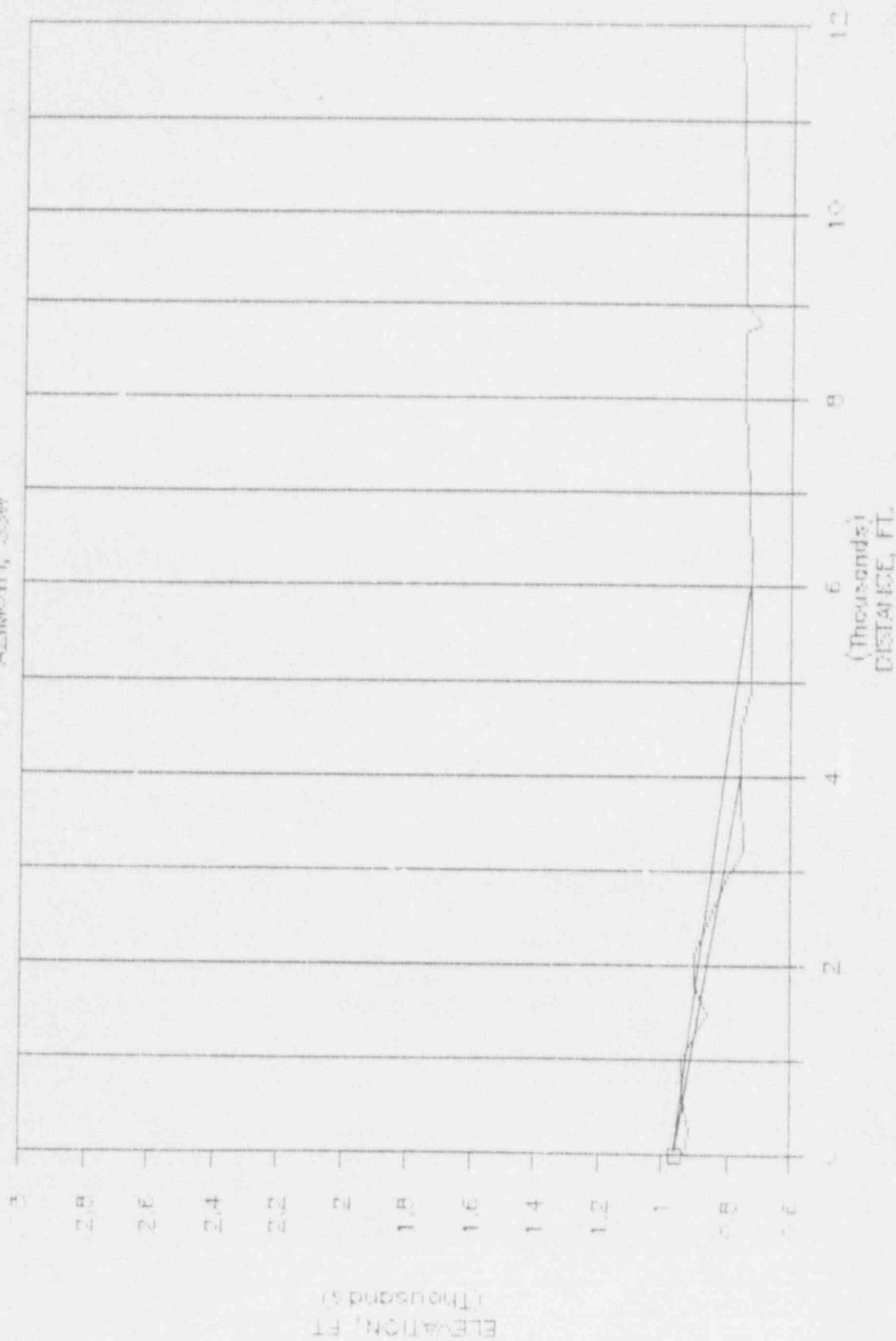
# YANKEE NA-4

AZIMUTH 5



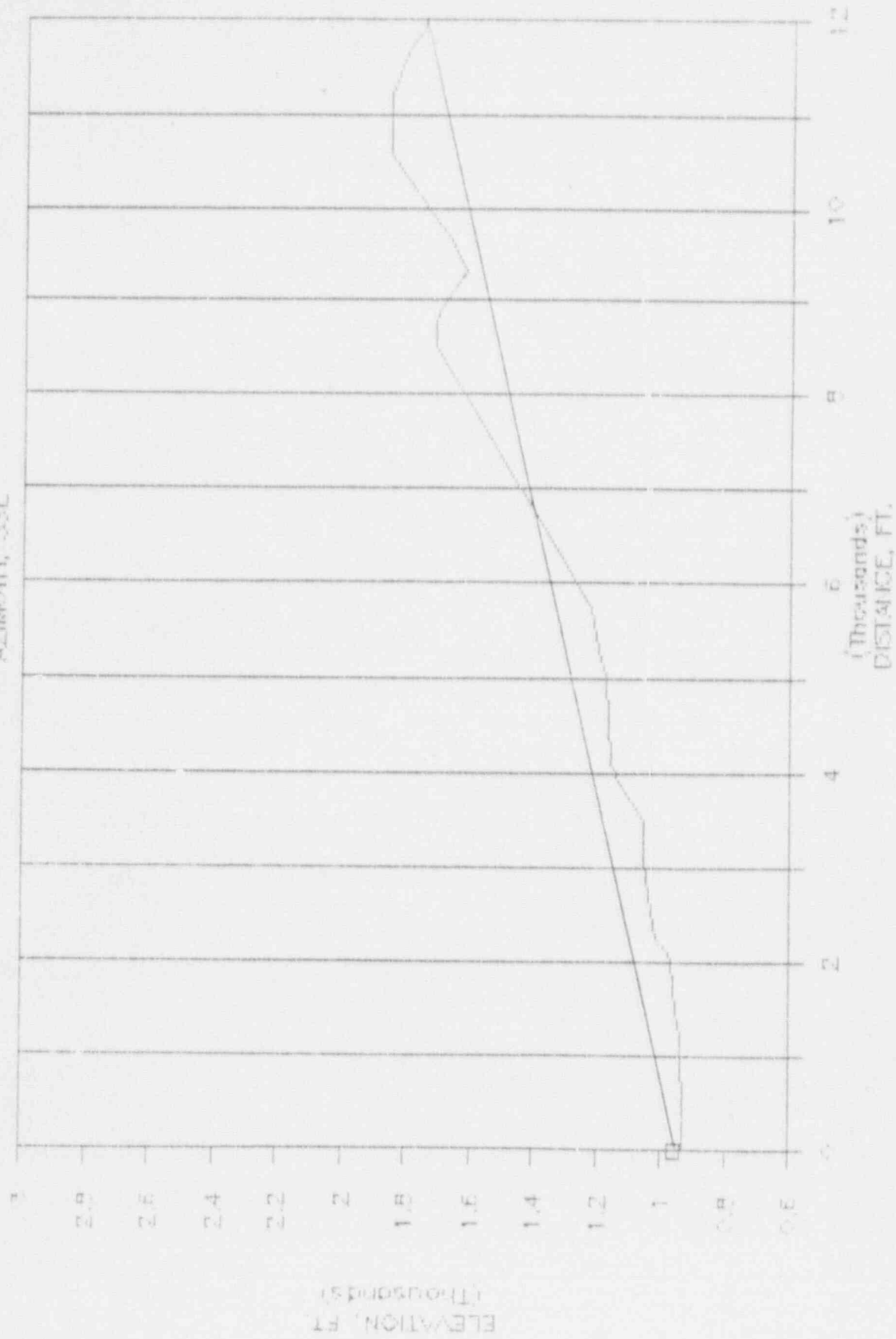
# YANKEE HA-4

AZIMUTH, SSW



# YANKEE HA-4

AZIMUTH, SSE



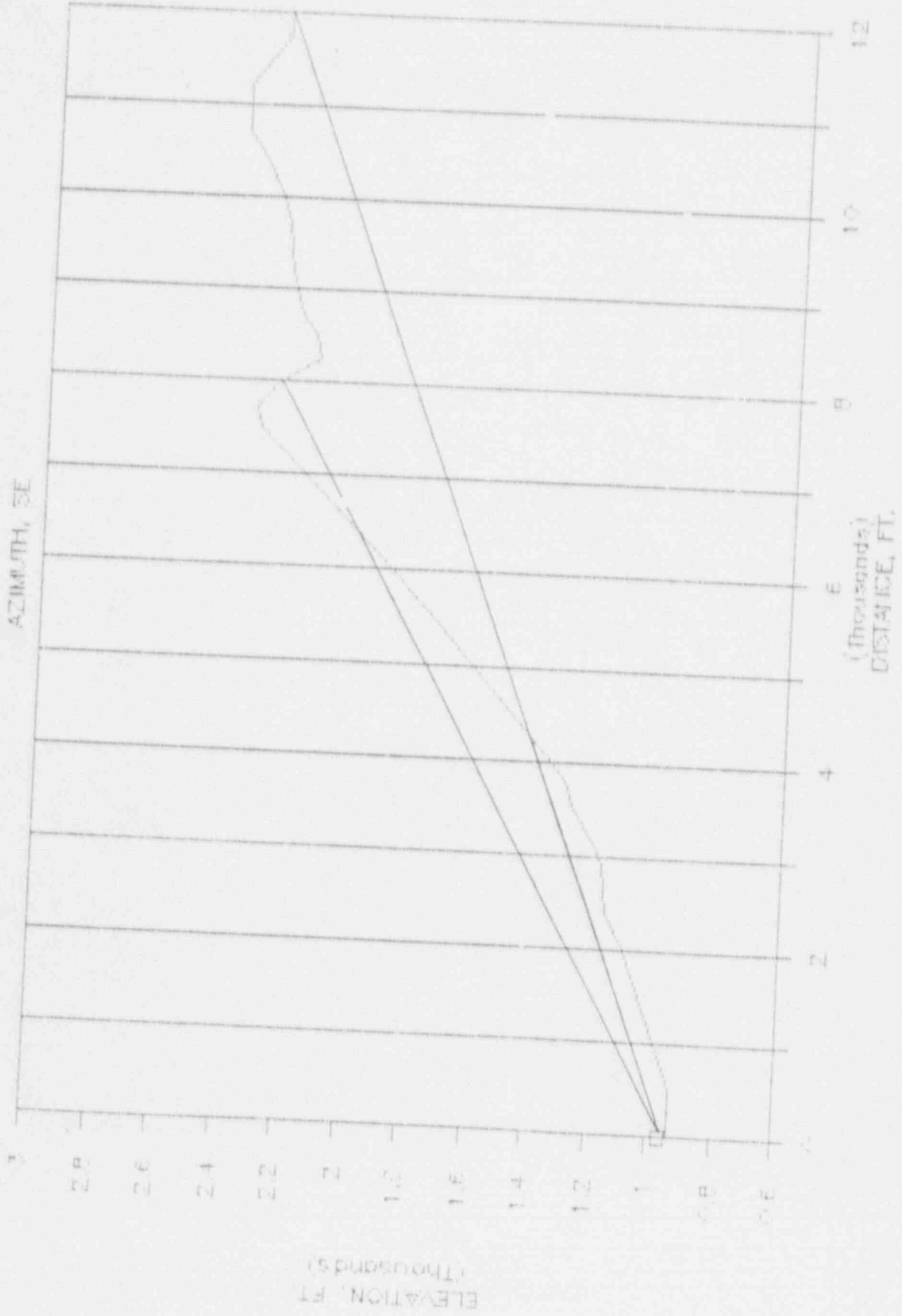
YANKEE ATOMIC ELECTRIC COMPANY  
 YANKEE A0W6 AND B12EN #1044-MODEL 1  
 SOURCE-RECEIVER TOPOGRAPHICAL INPUTS

ALL BEARINGS ARE WITH RESPECT TO THE NORTH MEASURING CLOCKWISE

GRID POINT	DISTANCE	BEARING	HEIGHT	GROUND TYPE	FOLIAGE PENETRATION	INTERVENING OBSTRUCTIONS	DISTANCE TO HIGHEST OBSTRUCTION FROM SOURCE	HEIGHT OF OBSTRUCTION
1	500.	90.00	950.00	SOFT	0.	NO	0.	0.
2	1000.	90.00	1070.00	SOFT	0.	NO	0.	0.
3	2000.	90.00	1200.00	SOFT	0.	YES	1250.	1120.
4	4000.	90.00	1540.00	SOFT	0.	YES	3800.	1800.
5	6000.	90.00	2270.00	SOFT	0.	YES	5150.	2100.
6	8000.	90.00	2010.00	SOFT	0.	YES	5150.	2000.
7	12000.	90.00	1770.00	SOFT	0.	YES	5150.	2200.
8	500.	87.50	950.00	SOFT	0.	NO	0.	0.
9	1000.	87.50	1020.00	SOFT	0.	NO	0.	0.
10	2000.	87.50	1170.00	SOFT	0.	NO	0.	0.
11	4000.	87.50	1540.00	SOFT	0.	YES	2950.	1700.
12	6000.	87.50	2020.00	SOFT	0.	NO	0.	0.
13	8000.	87.50	2700.00	SOFT	0.	YES	6700.	2420.
14	12000.	87.50	2140.00	SOFT	0.	YES	6700.	2420.
15	500.	45.00	950.00	SOFT	0.	NO	0.	0.
16	1000.	45.00	980.00	SOFT	0.	NO	0.	0.
17	2000.	45.00	1040.00	SOFT	0.	NO	0.	0.
18	4000.	45.00	1160.00	SOFT	0.	YES	2100.	1100.
19	6000.	45.00	1500.00	SOFT	0.	NO	0.	0.
20	8000.	45.00	2020.00	SOFT	0.	NO	0.	0.
21	12000.	45.00	2270.00	SOFT	0.	YES	10550.	2820.
22	500.	22.50	950.00	SOFT	0.	NO	0.	0.
23	1000.	22.50	980.00	SOFT	0.	NO	0.	0.
24	2000.	22.50	930.00	SOFT	0.	NO	0.	0.
25	4000.	22.50	980.00	SOFT	0.	NO	0.	0.
26	6000.	22.50	990.00	SOFT	0.	YES	4200.	1000.
27	8000.	22.50	1030.00	SOFT	0.	NO	0.	0.
28	12000.	22.50	1200.00	SOFT	0.	NO	0.	0.
29	500.	.00	950.00	SOFT	0.	NO	0.	0.
30	1000.	.00	980.00	SOFT	0.	NO	0.	0.
31	2000.	.00	950.00	SOFT	0.	YES	1000.	950.
32	4000.	.00	900.00	SOFT	0.	YES	1000.	980.
33	6000.	.00	800.00	SOFT	0.	YES	1000.	980.
34	8000.	.00	690.00	SOFT	0.	YES	1000.	950.
35	12000.	.00	1010.00	SOFT	0.	YES	1000.	980.
36	500.	177.50	920.00	SOFT	0.	NO	0.	0.

# YANKEE NA-4

AZIMUTH, SE

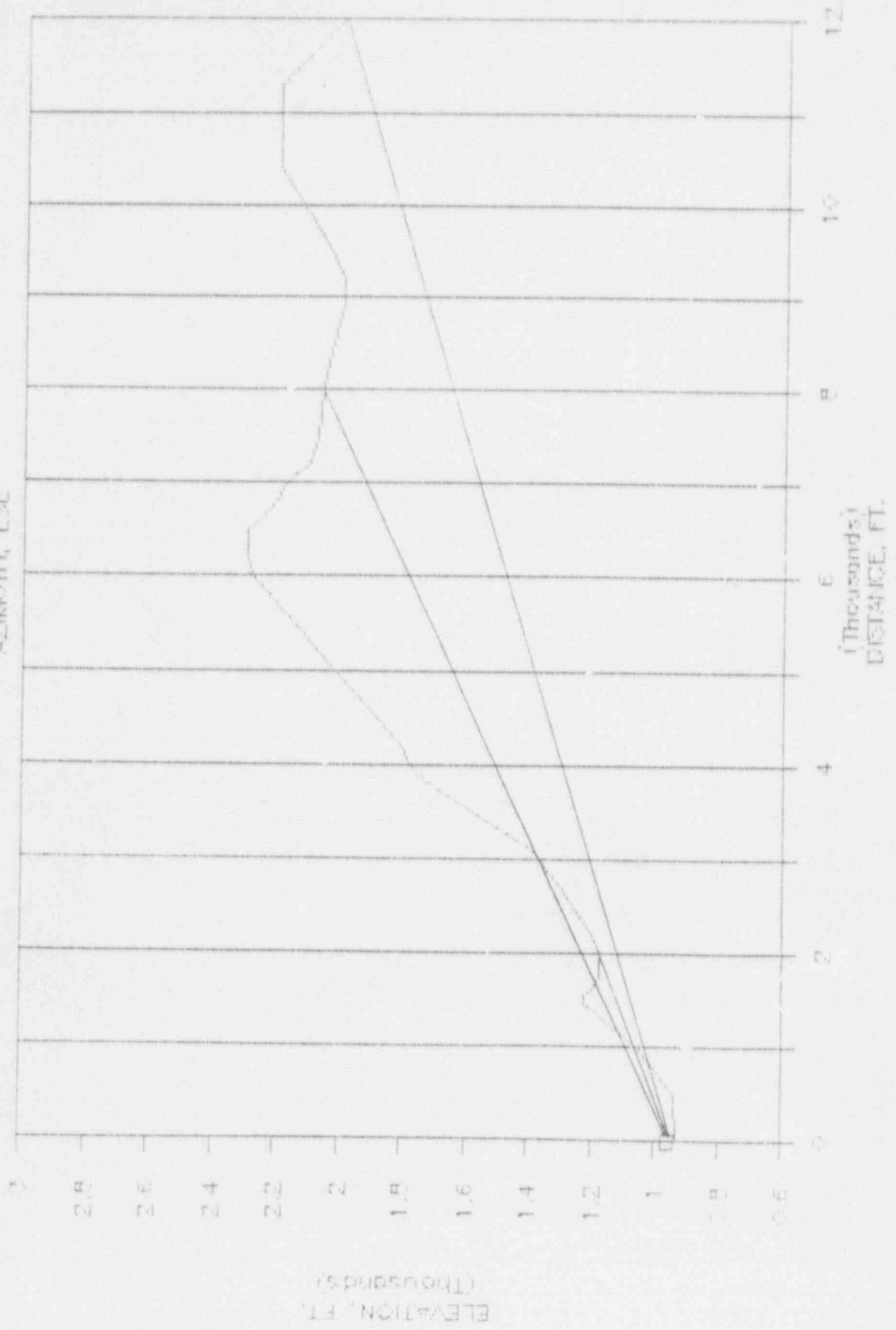


GRID POINT	DISTANCE	BEARING	HEIGHT	GROUND TYPE	VOLTAGE PENETRATION	INTERVENING OBSTRUCTIONS	DISTANCE TO HIGHEST OBSTRUCTION FROM SOURCE	HEIGHT OF OBSTRUCTION
37	1000.	337.50	880.00	SOFT	0.	YES	500.	935.
38	2000.	337.50	745.00	SOFT	0.	YES	500.	935.
39	4000.	337.50	705.00	SOFT	0.	NO	0.	0.
40	6000.	337.50	705.00	SOFT	0.	NO	0.	0.
41	8000.	337.50	710.00	SOFT	0.	NO	0.	0.
42	12000.	337.50	705.00	SOFT	0.	NO	0.	0.
43	500.	315.00	900.00	SOFT	0.	NO	0.	0.
44	1000.	315.00	790.00	SOFT	0.	YES	500.	900.
45	2000.	315.00	705.00	SOFT	0.	NO	0.	0.
46	4000.	315.00	715.00	SOFT	0.	NO	0.	0.
47	6000.	315.00	920.00	SOFT	0.	NO	0.	0.
48	8000.	315.00	1280.00	SOFT	0.	YES	7500.	940.
49	12000.	315.00	1440.00	SOFT	0.	YES	10500.	1540.
50	500.	292.50	880.00	SOFT	0.	NO	0.	0.
51	1000.	292.50	770.00	SOFT	0.	YES	800.	820.
52	2000.	292.50	715.00	SOFT	0.	NO	0.	0.
53	4000.	292.50	750.00	SOFT	0.	NO	0.	0.
54	6000.	292.50	1060.00	SOFT	0.	NO	0.	0.
55	8000.	292.50	1620.00	SOFT	0.	NO	0.	0.
56	12000.	292.50	1200.00	SOFT	0.	NO	0.	0.
57	500.	270.00	900.00	SOFT	0.	YES	8900.	1850.
58	1000.	270.00	780.00	SOFT	0.	NO	0.	0.
59	2000.	270.00	715.00	SOFT	0.	YES	500.	900.
60	4000.	270.00	740.00	SOFT	0.	NO	0.	0.
61	6000.	270.00	1090.00	SOFT	0.	NO	0.	0.
62	8000.	270.00	1670.00	SOFT	0.	YES	0.	0.
63	12000.	270.00	1440.00	SOFT	0.	YES	7300.	1680.
64	500.	247.50	920.00	SOFT	0.	YES	10250.	2340.
65	1000.	247.50	820.00	SOFT	0.	NO	0.	0.
66	2000.	247.50	720.00	SOFT	0.	YES	800.	900.
67	4000.	247.50	725.00	SOFT	0.	NO	0.	0.
68	6000.	247.50	800.00	SOFT	0.	NO	0.	0.
69	8000.	247.50	1300.00	SOFT	0.	NO	0.	0.
70	12000.	247.50	1720.00	SOFT	0.	NO	0.	0.
71	500.	225.00	920.00	SOFT	0.	NO	0.	0.
72	1000.	225.00	880.00	SOFT	0.	YES	800.	920.

GRID POINT	DISTANCE	BEARING	HEIGHT	GROUND TYPE	FOLIAGE PENETRATION	INTERVENING OBSTRUCTIONS	DISTANCE TO HIGHEST OBSTRUCTION FROM EDGE	HEIGHT OF OBSTRUCTION
73	2000.	225.00	745.00	SOFT	0.	YES	500.	420.
74	4000.	225.00	725.00	SOFT	0.	NO	0.	0.
75	6000.	225.00	745.00	SOFT	0.	NO	0.	0.
76	8000.	225.00	860.00	SOFT	0.	NO	0.	0.
77	12000.	225.00	1130.00	SOFT	0.	NO	0.	0.
78	500.	202.50	935.00	SOFT	0.	NO	0.	0.
79	1000.	202.50	940.00	SOFT	0.	NO	0.	0.
80	2000.	202.50	960.00	SOFT	0.	NO	0.	0.
81	4000.	202.50	760.00	SOFT	0.	YES	2100.	900.
82	6000.	202.50	730.00	SOFT	0.	YES	2100.	900.
83	8000.	202.50	750.00	SOFT	0.	NO	0.	0.
84	12000.	202.50	765.00	HARD	0.	NO	0.	0.
85	500.	180.00	939.00	SOFT	0.	NO	0.	0.
86	1000.	180.00	955.00	SOFT	0.	NO	0.	0.
87	2000.	180.00	930.00	SOFT	0.	NO	0.	0.
88	4000.	180.00	960.00	SOFT	0.	NO	0.	0.
89	6000.	180.00	1010.00	SOFT	0.	NO	0.	0.
90	8000.	180.00	1040.00	SOFT	0.	NO	0.	0.
91	12000.	180.00	1130.00	SOFT	0.	NO	0.	0.
92	500.	157.50	930.00	SOFT	0.	NO	0.	0.
93	1000.	157.50	940.00	SOFT	0.	NO	0.	0.
94	2000.	157.50	970.00	SOFT	0.	NO	0.	0.
95	4000.	157.50	1145.00	SOFT	0.	NO	0.	0.
96	6000.	157.50	1270.00	SOFT	0.	NO	0.	0.
97	8000.	157.50	1430.00	SOFT	0.	NO	0.	0.
98	12000.	157.50	1760.00	SOFT	0.	YES	0.	0.
99	500.	135.00	935.00	SOFT	0.	NO	5750.	1720.
100	1000.	135.00	990.00	SOFT	0.	NO	0.	0.
101	2000.	135.00	1300.00	SOFT	0.	NO	0.	0.
102	4000.	135.00	1380.00	SOFT	0.	NO	0.	0.
103	6000.	135.00	1880.00	SOFT	0.	NO	0.	0.
104	8000.	135.00	2260.00	SOFT	0.	YES	7700.	2040.
105	12000.	135.00	2280.00	SOFT	0.	YES	7700.	2040.
106	500.	112.50	940.00	SOFT	0.	NO	0.	0.
107	1000.	112.50	1060.00	SOFT	0.	NO	0.	0.
108	2000.	112.50	1180.00	SOFT	0.	YES	1850.	1220.

# YANFEE NA-4

AZIMUTH, ESE





GRID POINT	DISTANCE	BEARING	HEIGHT	GROUND TYPE	FOLYAGE PENETRATION	INTERVENING OBSTRUCTIONS	DISTANCE TO HIGHEST OBSTRUCTION FROM SOURCE	HEIGHT OF OBSTRUCTION
109	4000.	112.50	1780.00	SOFT	0.	NO	0.	0.
110	6000.	112.50	2280.00	SOFT	0.	NO	0.	0.
111	8000.	112.50	2680.00	SOFT	0.	YES	0.	0.
112	12000.	112.5	2000.00	SOFT	0.	YES	6500.	2300.
113	4395779.	89.48	1111.00	SOFT	0.	NO	6500.	2700.
114	4395779.	89.48	1111.00	SOFT	0.	NO	0.	0.
115	4395779.	89.48	1111.00	SOFT	0.	NO	0.	0.
116	4395600.	90.00	1111.00	SOFT	0.	NO	0.	0.
117	4395600.	90.00	1111.00	SOFT	0.	NO	0.	0.
118	4395600.	90.00	1111.00	SOFT	0.	NO	0.	0.
119	4395779.	90.52	1111.00	SOFT	0.	NO	0.	0.
120	4395779.	90.52	1111.00	SOFT	0.	NO	0.	0.
121	4395779.	90.52	1111.00	SOFT	0.	NO	0.	0.

APPENDIX B

Sample Size Determination

## APPENDIX B

### SAMPLE SIZE DETERMINATION

The number of households that need to be surveyed is determined based upon the need to obtain a sample size sufficient to obtain a 95% confidence interval with precision (half-width) of 0.05 for the estimate of the proportion alerted. The exact number of households to be surveyed can be derived from the following statistical considerations. For relatively large sample sizes ( $n \geq 30$ ), taken without replacement from a population ( $N$ ), the sampling distribution for proportions (e.g., the proportion of the population alerted) is nearly a normal distribution, the mean of which is the proportion ( $p$ ) of the population alerted and the variance of which is

$$p(1-p)/n \left( \frac{N-n}{N-1} \right)$$

If  $P$  is the observed sample proportion, then for a particular confidence level with confidence coefficient  $Z_c$ ,

$$(P - p)^2 \leq Z_c^2 p(1-p)/n \left( \frac{N-n}{N-1} \right)$$

Thus, for this confidence level, the actual proportion of the population alerted satisfies the following inequalities:

$$p = \frac{P \pm Z_c \sqrt{\frac{P(1-P)}{n} \left( \frac{N-n}{N-1} \right)}}{1 \pm \frac{Z_c^2}{4n} \left( \frac{N-n}{N-1} \right)} \leq P \text{ and}$$

$$p \geq \frac{P - Z_c \sqrt{\frac{P(1-P)}{n} \left( \frac{N-n}{N-1} \right)}}{1 - \frac{Z_c^2}{4n} \left( \frac{N-n}{N-1} \right)}$$

$$W = \frac{\frac{Z^2 p(1-p)}{n} \left( \frac{N-n}{N-1} \right) + \frac{Z^2 p^2}{4n^2} \left( \frac{N-n}{N-1} \right)^2}{1 + \frac{Z^2 p^2}{n} \left( \frac{N-n}{N-1} \right)}$$

Thus, the precision (W) is simply given by

$$W = \frac{\frac{Z^2 p(1-p)}{n} \left( \frac{N-n}{N-1} \right) + \frac{Z^2 p^2}{4n^2} \left( \frac{N-n}{N-1} \right)^2}{1 + \frac{Z^2 p^2}{n} \left( \frac{N-n}{N-1} \right)}$$

This equation can be solved to determine the sample size (n) required to yield a given precision (W) with a given observed sample proportion (P) as follows:

$$n = \frac{\frac{Z^2 p(1-p)}{2W^2} \left[ p(1-p) - 2W^2 + \sqrt{W^2 \left[ 1 - 4p(1-p) \right] + p^2(1-p)^2} \right]}{1 - \frac{Z^2 p^2}{2W^2 N} \left[ p(1-p) - 2W^2 \left( 1 + \frac{1}{\frac{Z^2 p^2}{n}} \right) + \sqrt{W^2 \left[ 1 - 4p(1-p) \right] + p^2(1-p)^2} \right]}$$

Although this expression for n can be used directly, it is customary to make several approximations. First, since the term in N in the denominator (the finite population term) is positive definite for all reasonable values of W ( $0 < W < 0.5$ ), omitting this term will result in an approximation to n that is slightly larger than its true value. This is an acceptable practice in sizing the sample since a larger sample gives greater precision.