

FINAL REPORT

PERFORMANCE OF THE THERMOTUBE PERMAFROST STABILIZATION SYSTEM  
IN THE AIRPORT RUNWAY AT BETHEL, ALASKA

by

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## INTRODUCTION

This report describes the efforts to stabilize the permafrost subsidence in the north end of the airport at Bethel, Alaska. The technique used passive heat transfer devices to freeze the subsurface soil and reinforce the permafrost during the winter. The passive "thermotube" heat transfer units convect heat out of the ground whenever the air temperature is below the condensation temperature of the working fluid inside the tubes (carbon dioxide in this case). This temperature, which is a function of the working fluid and the pressure, is adjusted to approximately 25°F when the tubes are filled during installation in the runway. A similar report was presented to the American Society of Civil Engineer's Technical Council for Cold Regions Research Specialty Conference in Anchorage, Alaska, on February 24-26, 1986. That report concentrated on the stabilization of the permafrost, whereas this report concentrates on the performance of the thermotube system.

During the construction of the extension to the Bethel Airport runway in 1969, it was necessary to construct a fill across a small gully a few hundred feet wide and 20 to 30 feet deep. The subbase material in the gully contained some frozen soils of high water content. The change of the thermal regime, initiated by heat input from an uninsulated culvert placed in the fill and the addition of the black asphalt runway, resulted in melting of some of the ice-rich frozen silt. Upon thawing, the previously ice-rich material slumped and a depression in the runway surface resulted.

The first reports of surface distress were recorded in 1978 and were particularly evident in the vicinity of the culvert that had been placed to allow drainage from the west side of the runway to the natural drainage cut on the east side. Pilots using the airport quickly dubbed the subsidence area the "Bethel Bump" and voiced their concern over safety aspects. Soon the slump became too large to tolerate and was repaired by removing the culvert and cold patching the asphalt surface. The area continued to slump and repair was soon required a second time.

The Alaska Department of Transportation decided that this was an excellent opportunity to try an experimental subbase stabilization method using passive heat transfer devices known as "thermotubes," "thermoprobes" or sometimes "Cryoanchors" herein called "thermoprobes"

(Canadians refer to them generically as "thermosyphons"). The alternative was to excavate all thaw-unstable material and to backfill with a sand embankment. This would have closed the runway for an extended period of time and would have been quite expensive. The firm of Shannon and Wilson, Inc., was retained to design the placement of the thermoprobe array in an attempt to stabilize the fine grained ice-rich subbase. The firm of Arctic Foundations was retained to provide and install the thermoprobe devices according to the Shannon and Wilson design.

Design and installation restrictions imposed by the State of Alaska included the following:

1. the radiator portions of the thermoprobes could not extend above the elevation of the centerline of the runway, and
2. the runway could not be closed to air traffic during installation.

These two restrictions were incorporated into the installation plan. The second restriction (i.e., that the runway could not be closed to air traffic) became a major problem during installation since the thermoprobes had to be drilled into the runway subbase from the side instead of the much easier method of trenching across the runway and laying the thermoprobes in the trench. In addition, any equipment that had to work on the runway, such as the drill used to install thermistor instrumentation, was restricted to working between midnight and 6:00 a.m. Even during this time period several aircraft arrivals each night required that the drilling be stopped, the drill hardware be removed from the hole and the runway cleared.

## DESIGN

The design concept consisted of two rows of thermoprobes. The top row was designed to extend across the runway from the east side to the west side on a slope of approximately 15 horizontal to 1 vertical (15:1). The top row of thermoprobes varied in length from 80 to 185 feet. The thermoprobes in the bottom row were designed to be shorter

and were installed at a steeper angle. They were specifically installed for the purpose of stabilizing the east shoulder of the runway to prevent slumping in this region which could result in the loss of the 15:1 slope of the top thermoprobes. This could result in the formation of a liquid trap in the top row of thermoprobes which would reduce or stop their heat removal action.

Theoretically, spacing of the thermoprobes should be designed so that the heat removal rate of each thermoprobe would just match the amount of heat reaching the soil at the thermoprobe depth. This must include the area of the subsurface over which the thermoprobe had thermal influence. In this manner, all heat reaching that level would be collected by the thermoprobes and carried back to the atmosphere; none would reach the permafrost below to melt it. However, since the thermoprobes do not operate all year long, but only during periods when the air temperature is three to five degrees colder than the soil temperature at the depth of the thermoprobe, the problem which the designer must address is one of removing enough heat during the winter months to compensate for the natural heat input during the summer months. In other words, the thermoprobes remove heat and depress the soil temperature sufficiently in the winter so that the soil between the thermoprobes can survive the summer without significant melting below the level of the thermoprobes. The concept of stabilizing a runway subbase using thermoprobes as well as all of the practical realities of installation and design parameters needed to be tested.

The expected diameter of the frozen bulb of soil around the thermoprobes at the end of winter was calculated using relationships developed by Churchill and Gupta (1977). The heat removal capability of the thermoprobes was also matched to the amount of heat reaching at a plane at the thermoprobe depth. These calculations were done using standard steady-state Fourier equation analysis for multiple layers. Comparing these two calculations, a thermoprobe spacing of ten feet seemed to be optimal. The 11 thermoprobes in the bottom row were also spaced on 10 foot intervals but offset five feet from the spacing of the top row so that they were located between each of the top row thermoprobes. Thermoprobes on the bottom row were at a 10:1 rather than a 15:1 slope and extended only 80 feet into the soil (Fig. 1).

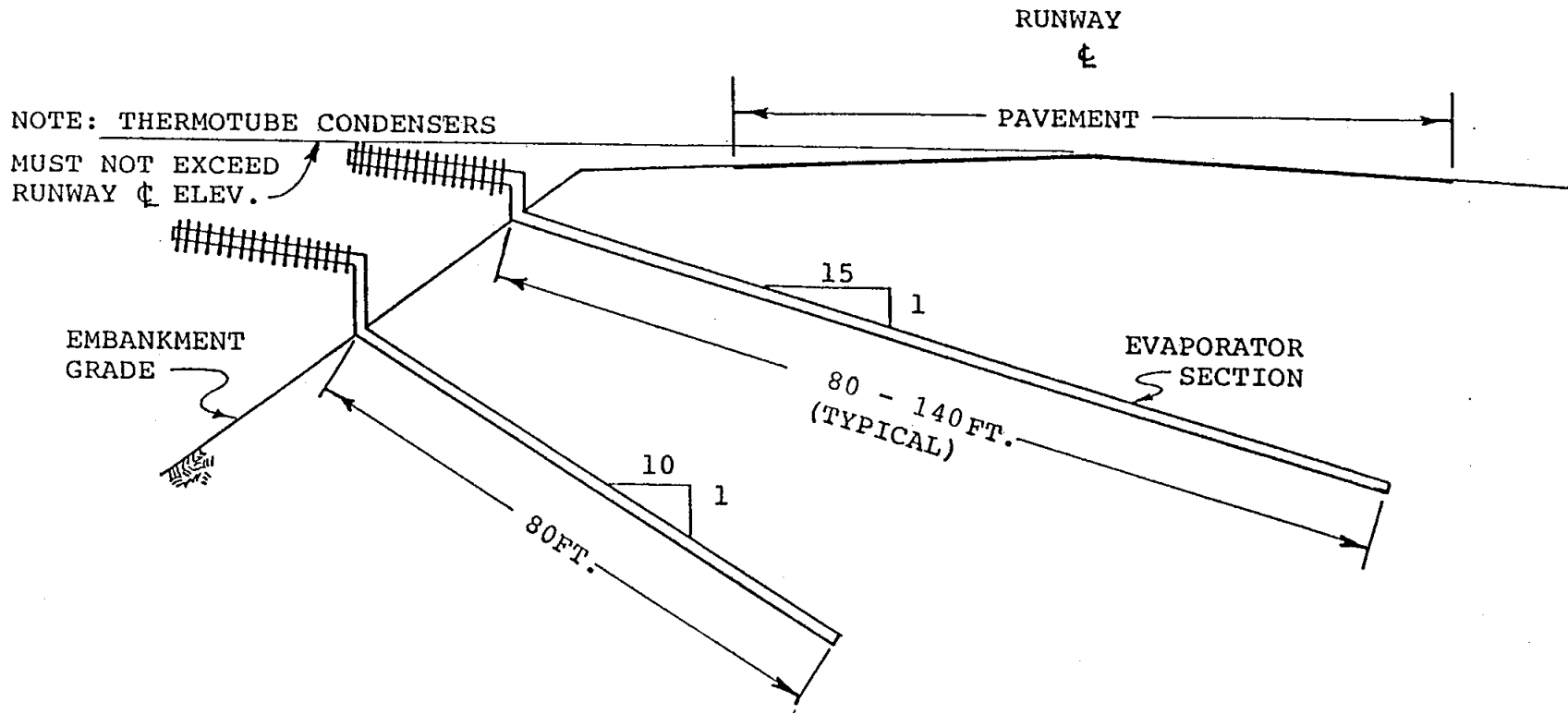


FIGURE 1 TYPICAL RUNWAY EMBANKMENT DESIGN SECTION

Since the amount of heat that can be removed by a thermoprobe is limited by the severity of the winter (i.e., the temperature of the air and the amount of wind present) the only way to increase the amount of heat removed from the soil is to add more thermoprobes. However, should it be necessary to limit the amount of heat each thermoprobe removes that can be done covering a portion of the radiator fins. Needless to say, this is usually not a problem. In order to keep the number of thermoprobes to a minimum it is desirable to limit the amount of heat that is introduced into the soil. This can be done with insulation at the surface of the structure, in this case, insulation underneath the asphalt pavement. Unfortunately, this was not installed during initial construction.

The radiator-condenser section of the thermoprobe is above ground to enable it to dissipate the latent heat released as the gas within the tube condenses. To encourage optimal performance, this portion of the device should be as unimpeded by the local surrounding environment as possible. The more open to winds and weather during the winter season the better the thermoprobe can transfer heat to the atmosphere. However, Federal Aviation Administration regulations require that no structure can extend above the center line of the runway within 500 feet on each side of that center line. Since the top row of thermoprobes entered the ground at approximately the 114 foot elevation and the runway center line was 117 foot elevation, this allowed only a three foot vertical rise to the 10 foot long radiators. In order to meet this restriction, the radiators had to be turned on their side (Fig. 1).

Thermoprobes are essentially a pipe, containing a liquid at a thermodynamic equilibrium such that the liquid will boil at a temperature of approximately 25°F. The boiling temperature can be varied to meet the needs of the application by adjusting the pressure inside the tube. Actually the outside air temperature adjusts the pressure inside the tube by condensing vapor in the condenser section. If the outside air temperature is above the preselected equilibrium temperature, the pressure inside the tube simply rises until the boiling point of the liquid is above the soil temperature and the convection action inside stops. The pressure at which boiling will take place can also be varied by selection of the working fluid. For the Bethel

runway, the liquid chosen was carbon dioxide because of its inert nature, low cost and satisfactory heat transfer characteristics.

When the soil is warmer than the outside air temperature and in the range of the selected operating temperature (25°F in this case), heat flows from the soil and boils the liquid in the bottom of the thermoprobe. Actually an air temperature of two to five degrees colder than the soil is needed to overcome the internal inertia of the gas in the system and to initiate the convective process. The boiling process absorbs the latent heat of evaporation and the CO<sub>2</sub> vapor rises to the top (the condenser portion) of the thermoprobes which extends into the cold winter air. If the air temperature is below 25°F, the gas condenses and releases the latent heat of evaporation to the atmosphere. The condensed gas forms droplets on the side walls of the thermoprobe that then trickle down to the bottom where it is reboiled and the cycle continues. No moving mechanical parts are necessary, and the thermoprobes should last indefinitely unless they leak. During the summer, the temperature in the condenser area rises above the condensation temperature which is regulated by the thermodynamic equilibrium present inside the thermoprobe. Condensation then ceases and the thermoprobe becomes dormant. Heat is not transferred back into the ground during the summer. The thermoprobes merely remain inactive until the air temperature once again drops below the condensation temperature of the gas.

Since one of the purposes of this installation was to experiment to determine if thermoprobes could be used to stabilize conditions like those found here, it was necessary to install temperature instrumentation near the thermoprobes to measure their subsurface performance. Thirteen thermistor strings were ultimately installed (Fig. 2). The thermistor strings were installed in vertical holes which extended from the surface of the runway vertically to several feet below the thermoprobe. A thermistor string was placed in the hole with thermistors located on two foot intervals to within a few inches of the thermoprobe and then on six inch intervals in the immediate vicinity of the thermoprobe. The thermistor strings were 25 feet long and contained 15 thermistors each.

In order to monitor the growth of the frozen cylinder around the thermoprobe, three thermistor strings spaced 2-1/2 feet apart were

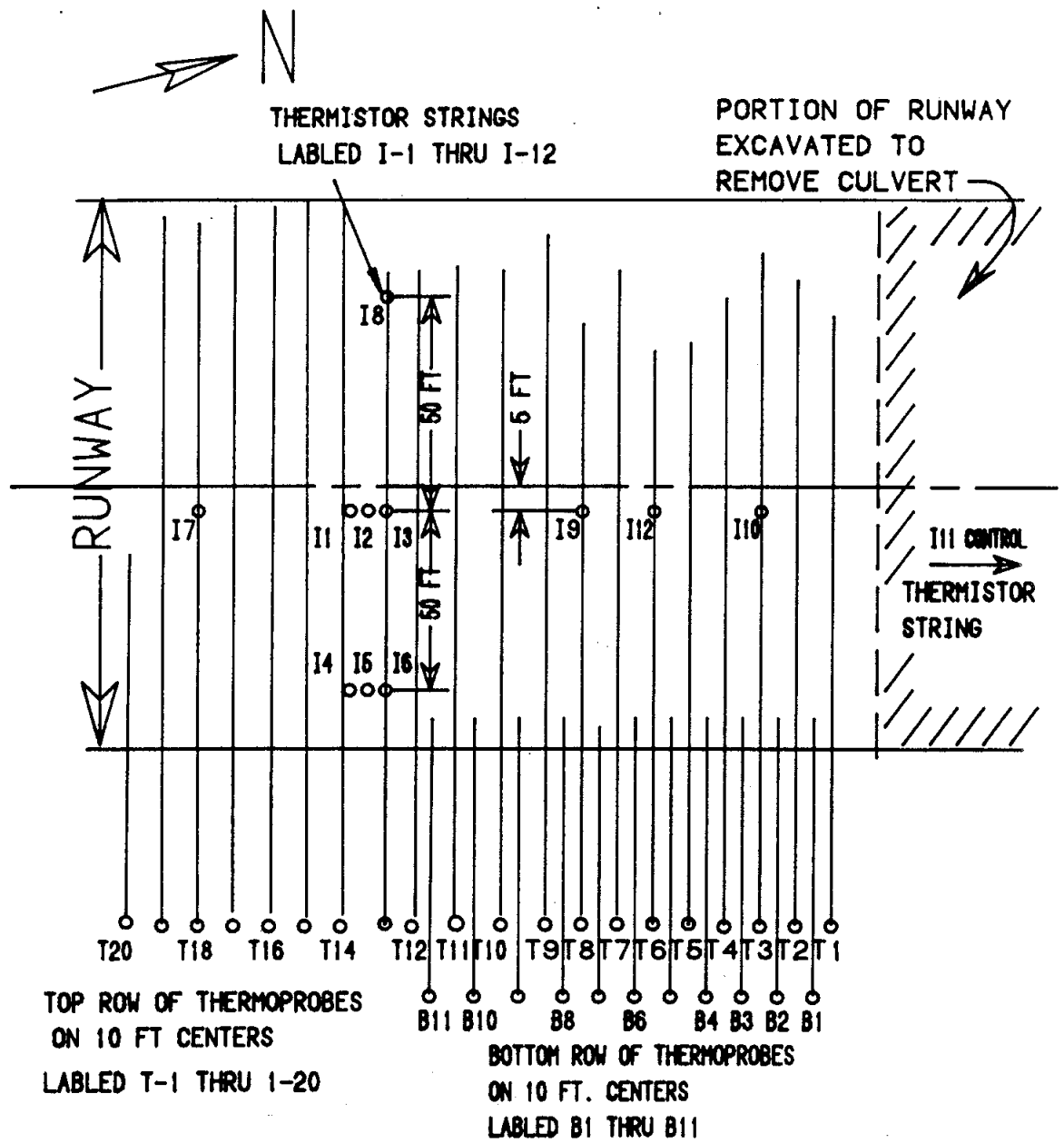


FIGURE 2 LAYOUT  
OF  
THERMOPROBES AND INSTRUMENTATION

installed near thermoprobe number T13. This was done at two locations, five feet east of the centerline and 55 feet east of the centerline. This would allow the monitoring of the frozen cylinder at two locations along the length of the thermoprobe. An additional thermistor string, the seventh one along this thermoprobe, was placed 50 feet west of the centerline. To complement these strings and to provide information on performance in other parts of the test plot, thermistors were placed near thermoprobes No. T3, T6, T8 and T18. A control string was placed 150 feet to the north of the test section to monitor normal soil temperatures under the runway and to provide comparative subsurface data conditions away from the influence of the thermoprobes.

All thermistor strings were placed inside a PVC pipe with the annulus between the thermistor string and the pipe wall filled with a silicone heat transfer fluid. This fluid was chosen because it approximates the thermal properties of the soil, and if the pipe should leak, it would not deteriorate the permafrost as would glycol. The fluid also has an inert nature and will not cause deterioration of the thermistor strings as glycol is known to do over long time exposures.

Originally, the thermistor strings were terminated in a box which had been installed in the surface of the runway. A 1/4 inch thick steel plate was bolted to the box at the surface of the runway. Access to the thermistor strings for monitoring purposes was achieved by removing four bolts from the access plate and pulling the coiled pigtail of the thermistor string out of the hole and connecting it to the monitoring equipment. This was a time consuming operation. However, it was the only option within the budget constraints available at that time.

During the summer of 1984, a reconstruction of the runway in this area allowed the thermistor strings to be routed to the side of the runway and terminated in a protected enclosure so that monitoring of the strings could be done at the edge of the runway without disrupting air traffic or endangering the person reading the temperature of the thermistors. This proved to be a vast improvement and saved considerable time in collecting thermistor readings at this location. During the reconstruction work a foam insulation layer was added below the asphalt to reduce the influx of summer heat into the subbase. This will reduce the amount of heat reaching the thermoprobes and should be a positive

factor in maintaining freezing conditions in the subbase. Initial design considerations did not include this insulation layer.

## INSTALLATION

The length of the thermoprobes was set to cover the area of maximum subsidence as shown in Figure 3. The contour interval in this figure is 1/20th of a foot and the area to be protected was determined to be that area with 2/10ths subsidence and greater, which was assumed to be the maximum roughness allowable for use by the jet aircraft using the runway.<sup>1</sup> To do this the length of the thermoprobes varied from 96 feet to 195 feet. Other than one 96 foot thermoprobe at station T20, all other thermoprobes in the top row were at least 160 feet long. Since the runway could not be closed during thermoprobe installation, the thermoprobes had to be installed horizontally into the runway subbase with equipment working on the shoulder of the runway. Since the material through which the drill must pass was both frozen and thawed, the choice of cutting bit to be used on the point of the drill stem was difficult. Arctic Foundations, Inc., who manufactures the thermoprobes, was contracted to do the installation. They chose to use the thermoprobe pipe as the drill stem. The installation procedure was to weld a cutting bit onto the end of the pipe with an interior tube for supplying air to clear cuttings away from the bit. As the pipe was drilled into the ground, more sections would be attached by welding, and the entire pipe would be left in the ground once it was "drilled in" the desired length. This required a qualified pressure vessel welder to be on the site during the entire drilling operation. The nature of the soils further complicated the matter since the hard frozen soils required a rock type bit. This type of bit

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<sup>1</sup> Boeing Aircraft Company has since been in contact with the State of Alaska. They now have a runway roughness criteria which they can use to determine when a runway becomes too rough for use by their aircraft.

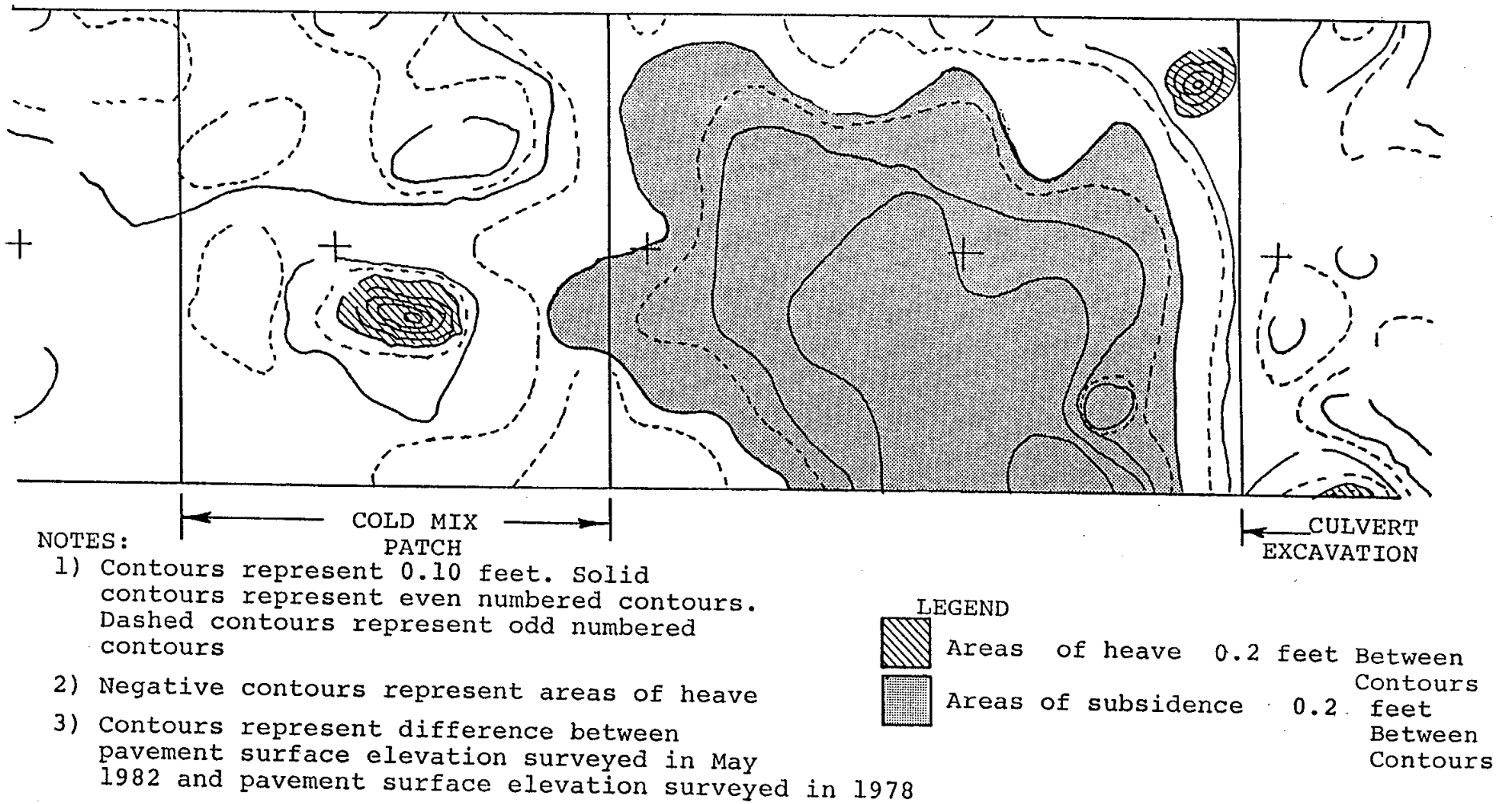


FIGURE 3 - BETHEL RUNWAY SURFACE CONTOURS

quickly "loads up" when encountering the unfrozen peaty soils, making drilling very difficult.

This installation procedure proved to be a difficult way to install the thermoprobes. Nevertheless, thermoprobe installation that was started in November 1982 was finished in December of that year with 20 thermoprobes intalled on the top row and 11 thermoprobes on the bottom row. When the evaporator portion of the thermoprobe was completely installed in the ground, the condenser section was welded on and the thermoprobe installation was complete.

The use of air to clear cuttings from the point of the drill stem produced an unexpected problem. After one thermoprobe had been drilled several feet into the ground, air return was lost. Air was being dissipated into the subbase below the runway. Drilling continued, however, until at some later time, one of the workers noticed a large bulge developing in the asphalt surface. A second bulge very close to it also developed as the accumulated air worked its way to the surface, separated the asphalt from the subbase and actually created an asphalt balloon with two large bumps on the surface of the runway. The asphalt layer was subsequently pierced to release the trapped air. The bumps subsided and no further problem was encountered.

The installation procedure, that of using the thermoprobe pipe itself as the drill stem and drilling the whole unit into the ground, proved to be one of those concepts which looked very good when discussed in the warm atmosphere of the engineering conference room. In the field, however, this turned out to be both too costly and too problem prone to be practical. A better solution for installing thermoprobes will have to be developed before this is a practical technique.

If the runway could have been closed, trenching would have been an easy, viable technique for installing the thermoprobes. Unfortunately, this option was not available. Augering a larger hole was not considered feasible since the thawed material would not remain open long enough to insert the thermoprobe. Casing the larger augered hole and inserting the thermoprobe in the casing results in an insulating air annulus around the thermoprobe which is not desirable. However, if the casing can be sealed at the end and the annulus filled with silicone heat transfer fluid, this might be a viable solution. The silicone

fluid is expensive but not nearly as expensive as problems involved in trying to drill the thermoprobes directly.

## RESULTS

The subbase temperatures have been monitored for two consecutive years. A tabulation of the temperatures over this period is included in Appendix A.

Installation was finished in the middle of December 1982. As soon as the thermoprobes were charged to the proper pressure with carbon dioxide they began to function. However, by this time, virtually half of the winter season was past. This late start somewhat clouded the results for the first year. However, at least in the case of thermoprobe T18, temperature of the soil around the thermoprobe was depressed significantly. Most of the other instrumented thermoprobes, however, did not yield a clear indication as to their performance.

In the case of thermoprobes T8 and T13, there was an indication that the thermoprobes were not operating at all. The installation procedure had been difficult and probably resulted in leaks in some of the pipes, making them unable to hold the pressurized carbon dioxide. An infrared scan and subsequent pressure check of the thermoprobes on December 15, 1983, indicated that 11 of them were not, in fact, operating. Unfortunately, the thermoprobes which had developed leaks and were not operating also turned out to be the same thermoprobes on which thermistors were installed. This was the case for all but thermoprobe T18 which, throughout the entire experiment, remained the star performer of the group and from which the only conclusive data on thermoprobe operation was obtained.

A temporary repair was attempted in March 1983 by filling the leaky thermoprobes with butane. The thermodynamic equilibrium of butane occurs at significantly lower pressure than does carbon dioxide, therefore allowing the thermoprobe to continue to operate at a pressure at which the leak rate would be much less. Although butane is not desirable for a permanent working fluid, this temporary repair was

attempted to salvage as much cooling as possible from the remaining winter.

By fall of 1983, most of the butane filled thermoprobes had lost pressure again. A field repair to seal the leaky thermoprobes was attempted during the fall of 1984. All but one of the "leakers" were put back into operation using carbon dioxide to charge the thermoprobes after the sealing process was complete. A survey of the condensers in April of 1985 indicated that all but seven thermoprobes were now operating. Unfortunately, thermoprobe number T13 on which the bulk of the instrumentation had been installed was not one of the thermoprobes which was successfully repaired. This is most unfortunate since the instrumentation in this thermoprobe was designed to allow the tracking of the temperature profiles around the thermoprobe throughout the winter so that the actual growth of the depressed temperature bulb could be monitored.

Nevertheless, thermoprobe T18 apparently did operate almost perfectly throughout the second winter as well as the first. Figure 4 shows the temperature versus depth of the soil in the vicinity of thermoprobe T18. Figure 5 shows the temperature versus depth in the control area. By the end of the freezing season in the spring of 1985, it can be seen that the influence of the thermoprobe has created a bulb of temperature depression that extends from seven feet above the thermoprobe to nine feet below. Using these two figures, a simulated isotherm of the bulb of influence is shown in Figure 6. This bulb represents the "reservoir of cold" that is available to absorb summer heat before the soil is brought back to the temperature it would have been had the thermoprobe not been influencing its temperature regime. A piecewise double integration of this area with respect to volume and temperature will yield the total thermal mass which is available to be filled by summer heat. This yields approximately 1,237,470 BTUs for thermoprobe T18, or 6,346 BTUs per foot of thermoprobe length that must be transferred from the surface to the soil around the thermoprobe before the soil will reach the temperature at which it would have been if no heat had been removed.

This does not necessarily represent that total amount of heat removed by the thermoprobe, only that heat removed by the thermoprobe

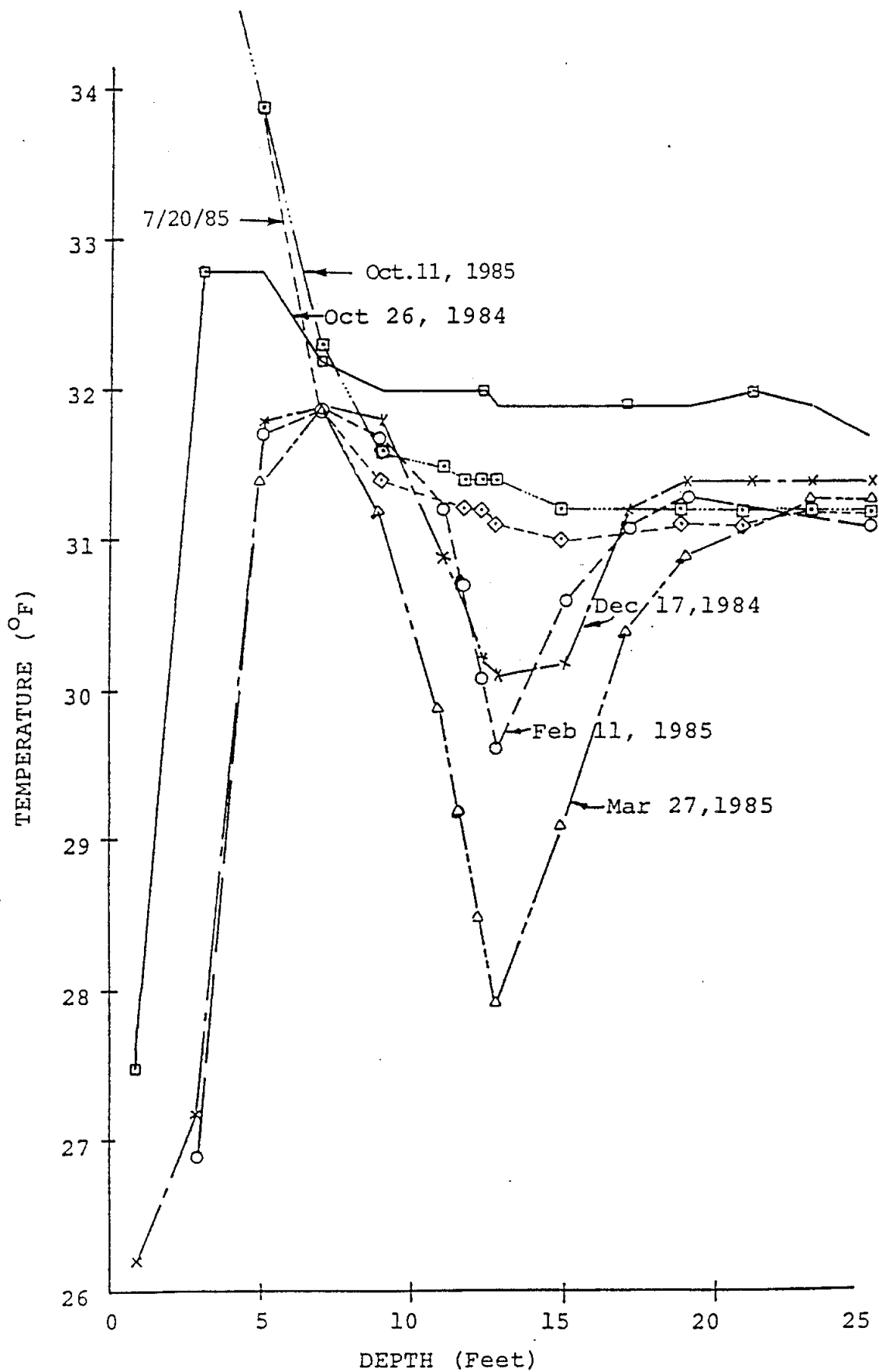


Figure 4 - BETHEL AIRPORT  
Thermistor String No. 7

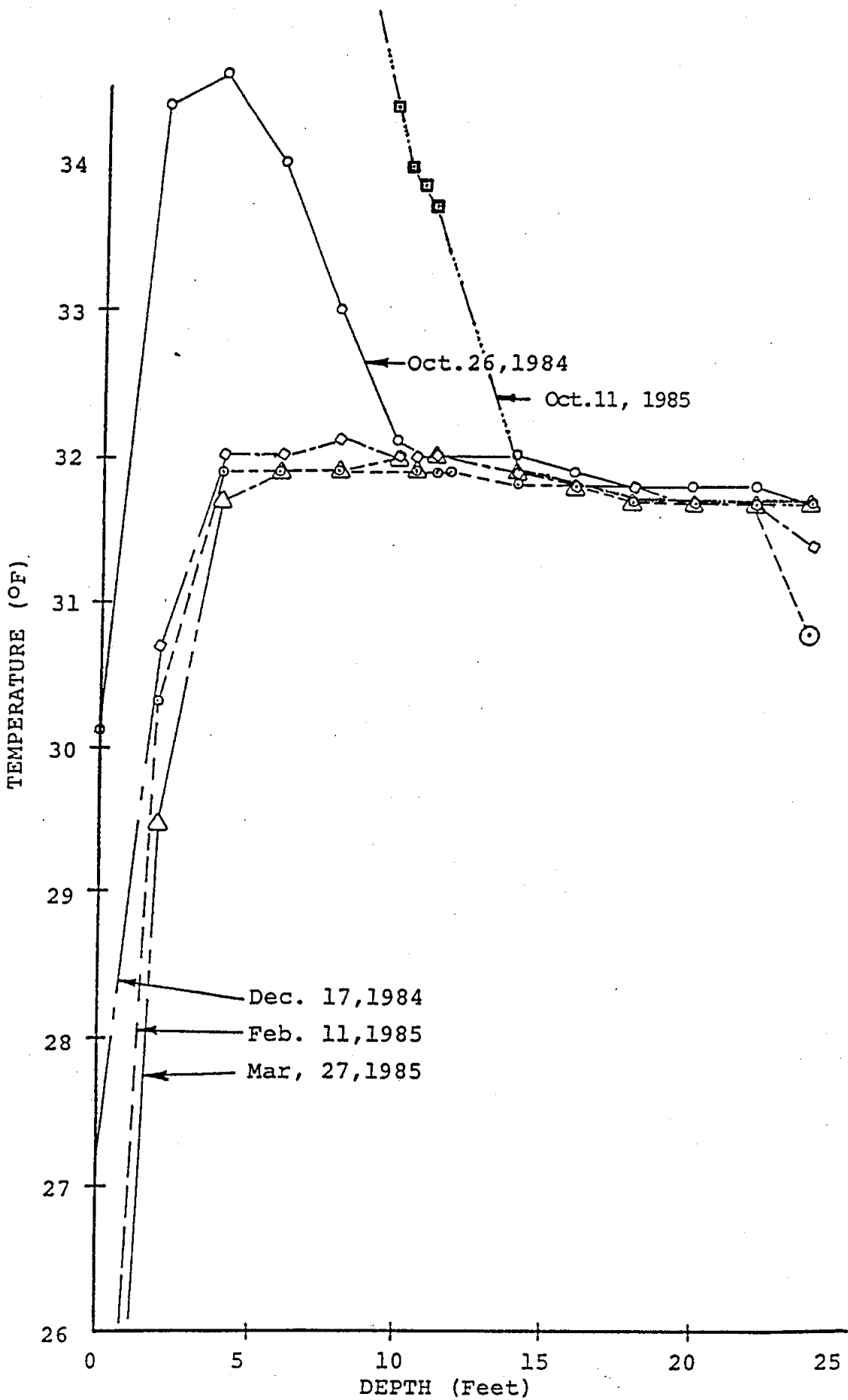


Figure 5 - BETHEL AIRPORT, Thermister String No. 11  
Control Reference

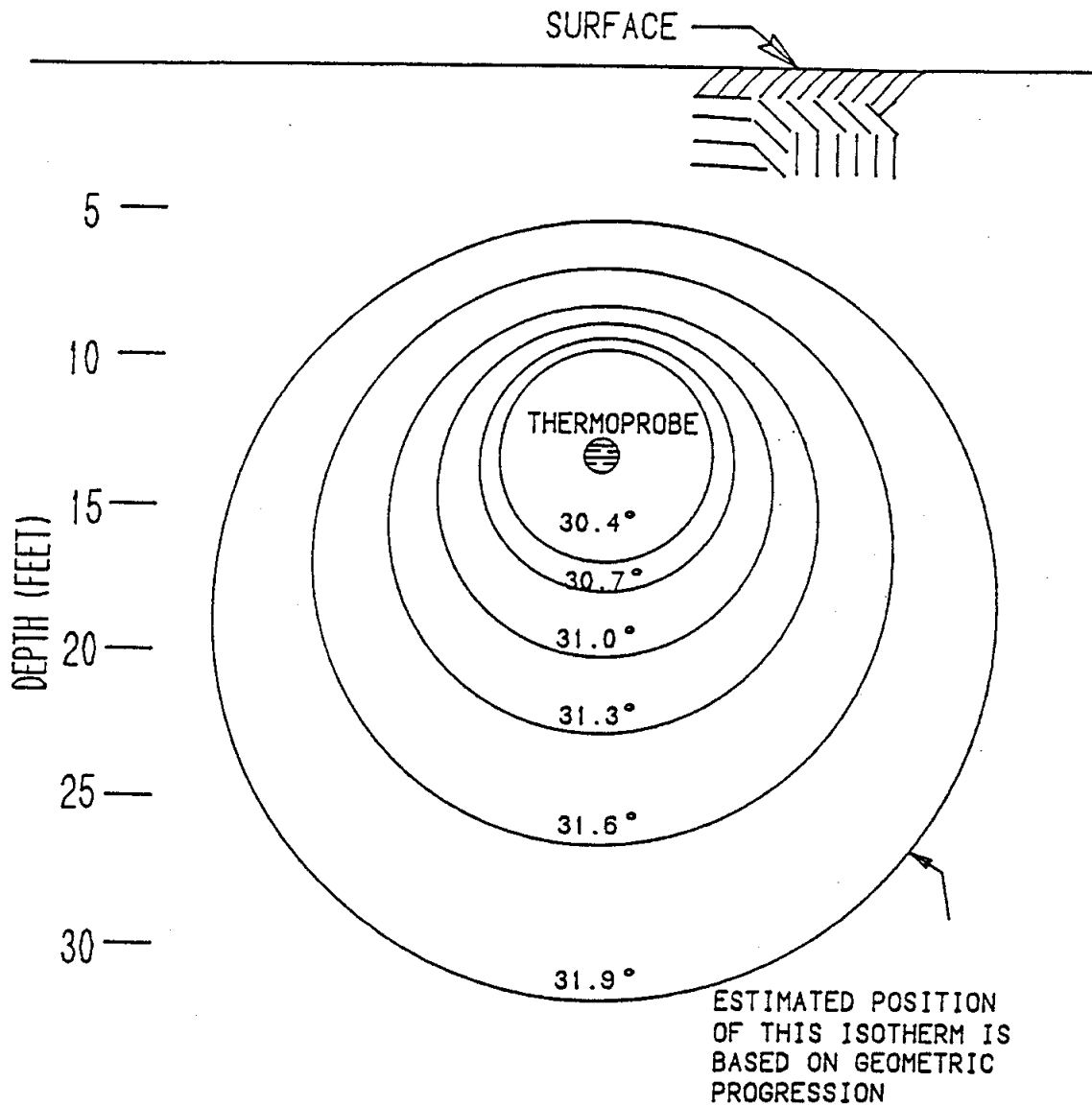


FIGURE 6 TEMPERATURE ISOTHERMS AROUND  
THERMOPROBE NO.T-18

which has not been resupplied from the surface or surrounding soil layers. To put this in perspective, one might consider the thermal volume of the reservoir in tons of refrigeration. In this manner we see the thermoprobe is equivalent to 103 tons of refrigeration.

On October 10, 1985, the final set of temperature readings were collected from the thermistor strings embedded in the airport. It was timed to provide information on the conditions in the subbase at the end of summer.

### DISCUSSION AND CONCLUSIONS

It is obvious that a much better installation procedure is needed before this technique can be used to stabilize the subbase beneath runways or roads. The possibilities that should be investigated are either trenching or using a larger pipe with an annulus filled with silicone fluid. However, during initial construction of a project the installation of the thermoprobes would be a very minor portion of the construction procedure. Once contractors have developed the means for handling and installing the thermoprobes during initial construction, the cost would probably plummet to nearly negligible levels and might well constitute a viable means for stabilizing construction in areas where permafrost degradation is likely to occur.

Since the thermoprobes only operate when the temperature in the air is colder by a few degrees than the soil temperatures around the evaporator portion of the thermoprobe, the thermoprobes do not operate during the summer. The frozen soil must be sufficiently cold and of sufficiently large mass to "coast" through the summer season. If, however, a critical application required that the thermoprobes remain cold all year long, artificial refrigeration around the condenser unit could be supplied at a calculable cost. Compared to a system relying solely on mechanical refrigeration this "hybrid" system should reduce operations and maintenance expense since the refrigeration equipment need not be operated during the cold portion of the year.

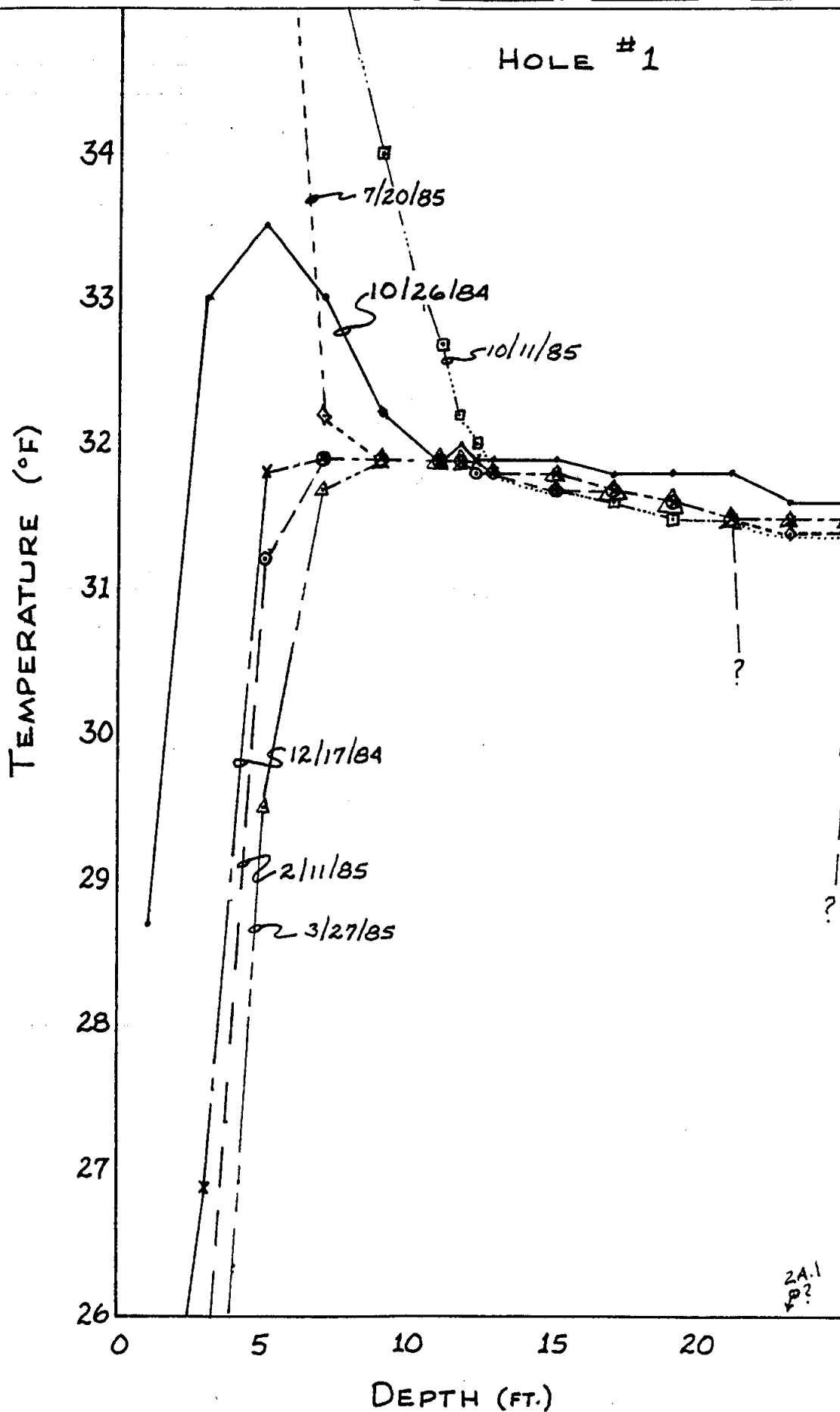
Although lack of data, particularly from thermoprobe T13, is lamentable, it is still obvious that the operation of those thermoprobes

which did function as planned was sufficient to gain a considerable advantage in stabilizing the subbase. Repair costs of the runway subsidence were cut by a considerable margin, and if an economical solution to the installation can be developed, this may well be a viable means for subbase stabilization in thermally fragile areas.

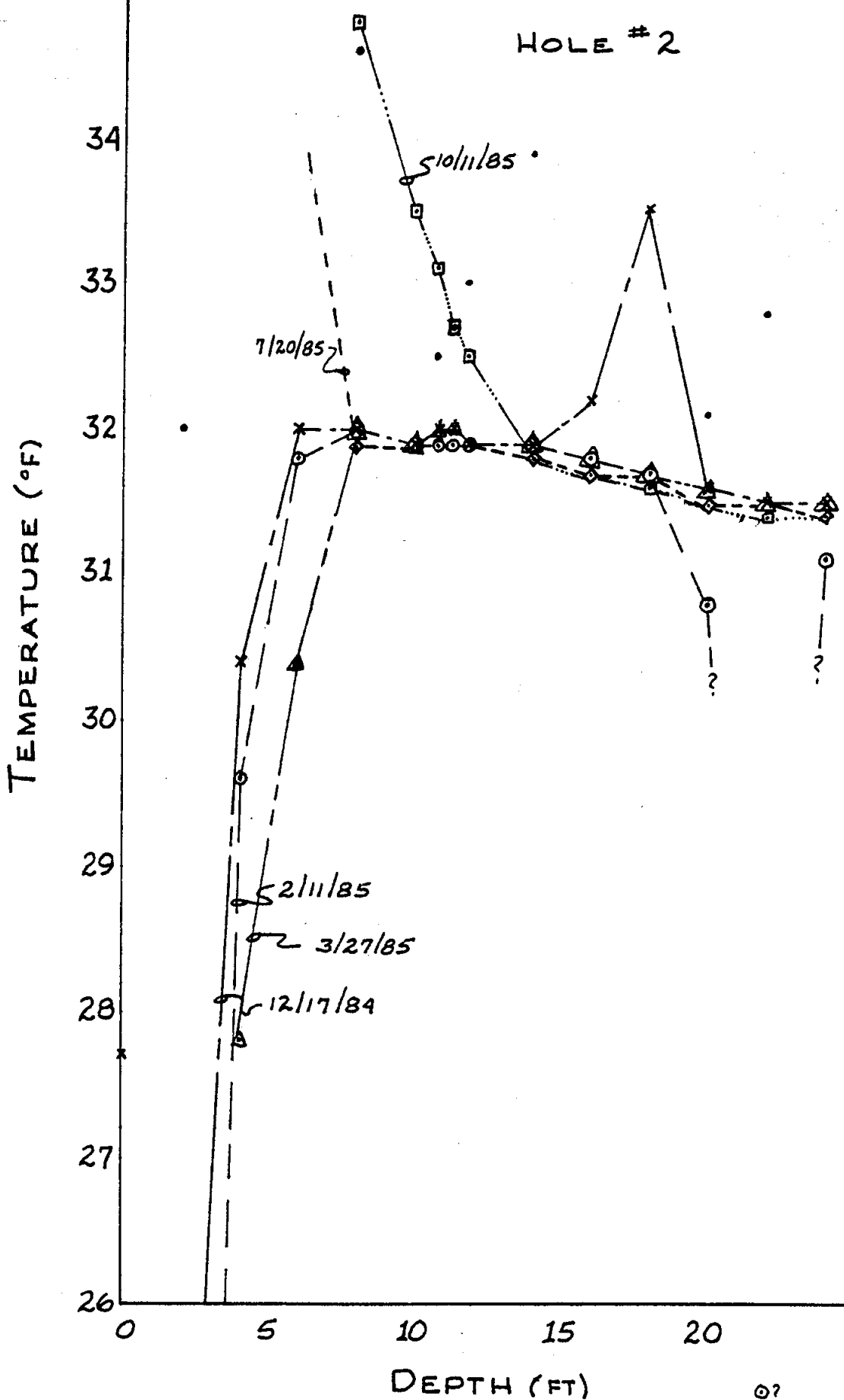
Finally, the question as to whether or not the thermoprobes could provide enough cooling during the winter to last throughout the summer was of considerable concern to many. This was especially troublesome for a location as far south as Bethel with the mitigating influence of a marine weather pattern. This seems to be resolved at least in the case of thermoprobe T18. Although the temperatures in the immediate vicinity of the thermoprobe have risen substantially, this is a normal diffusion of heat from the outer layers of soil as temperatures seek equilibrium. Of more importance is the mass of soil that remains below freezing. The depth to the top of the permafrost provides one qualitative measure of the increased cold thermal mass. The progressive diffusion of temperatures around the thermoprobe and the depth to the freezing isotherm can be followed on July 20 and on October 11 in Figure 4. The temperatures at the end of the summer showed a substantial cooling effect surrounding this thermoprobe as compared with the control area. The depth of the 32°F isotherm was substantially shallower, and the temperature at the thermoprobe depth was much lower. Thus, it appears that there is enough winter cooling, even at this relatively southern latitude, to "coast" through the summer and to protect the permafrost by keeping it frozen.

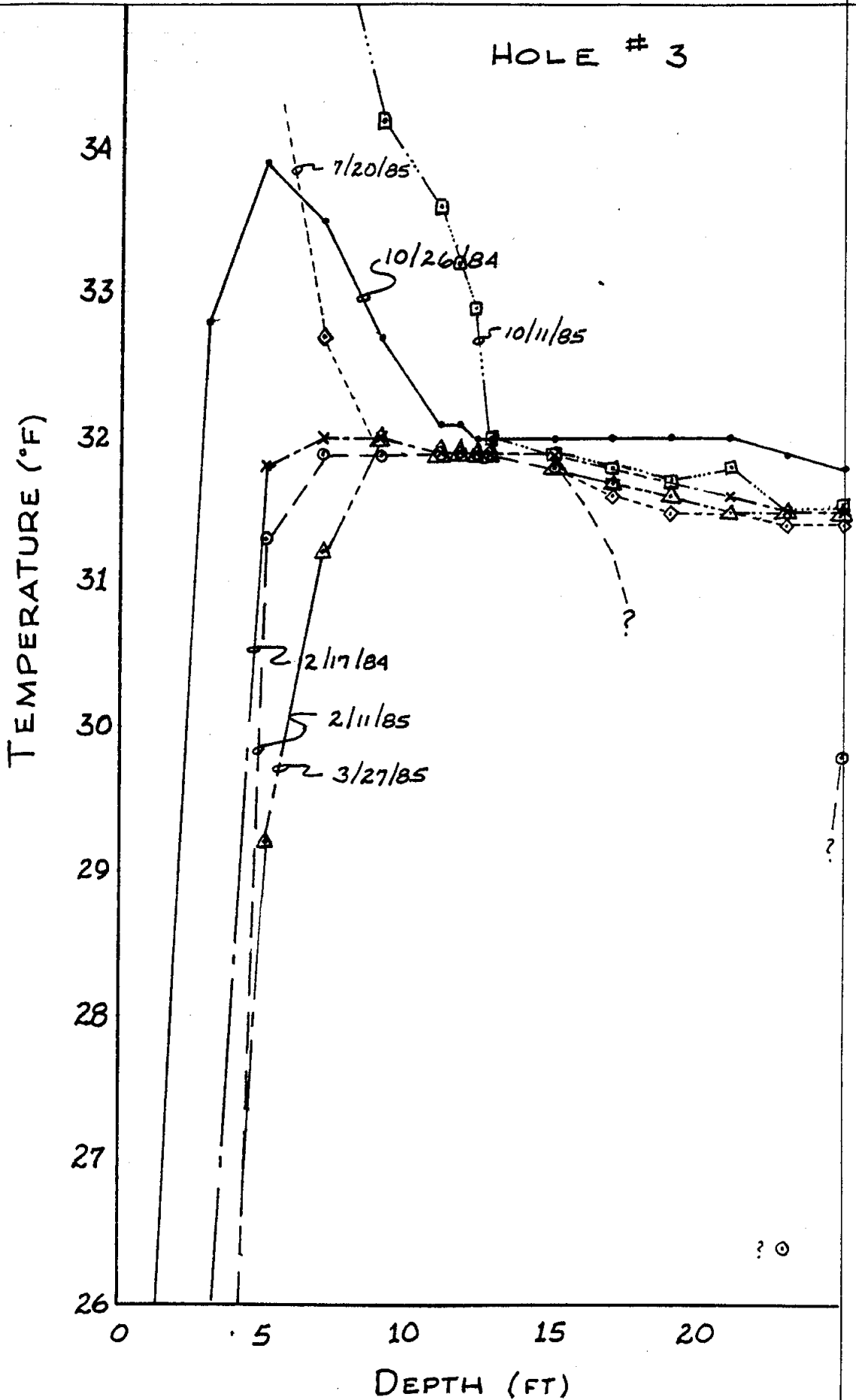
## APPENDIX A

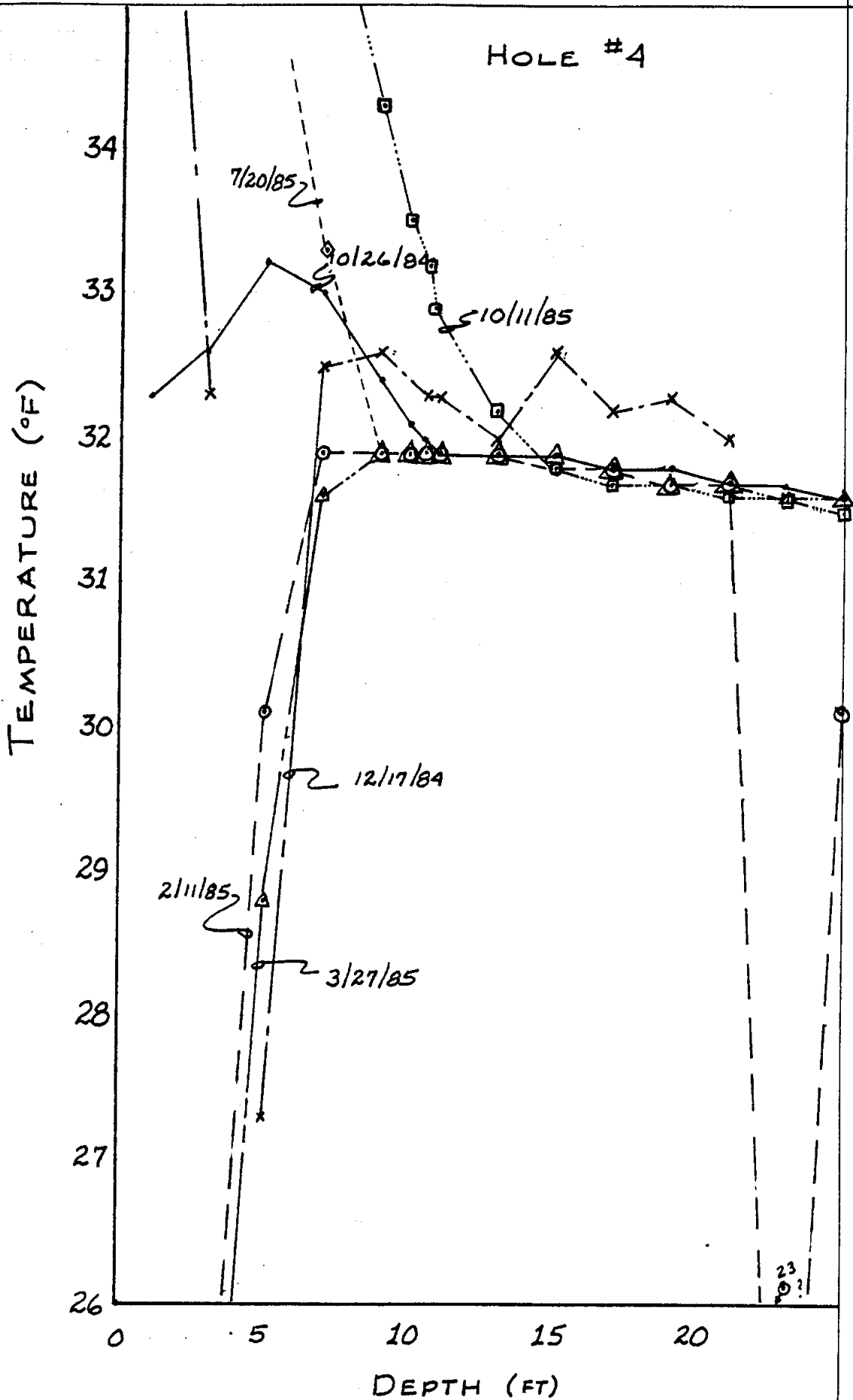
- I. Soil Temperature vs Depth Plots
- II. Temperature Data



2A.1  
P?

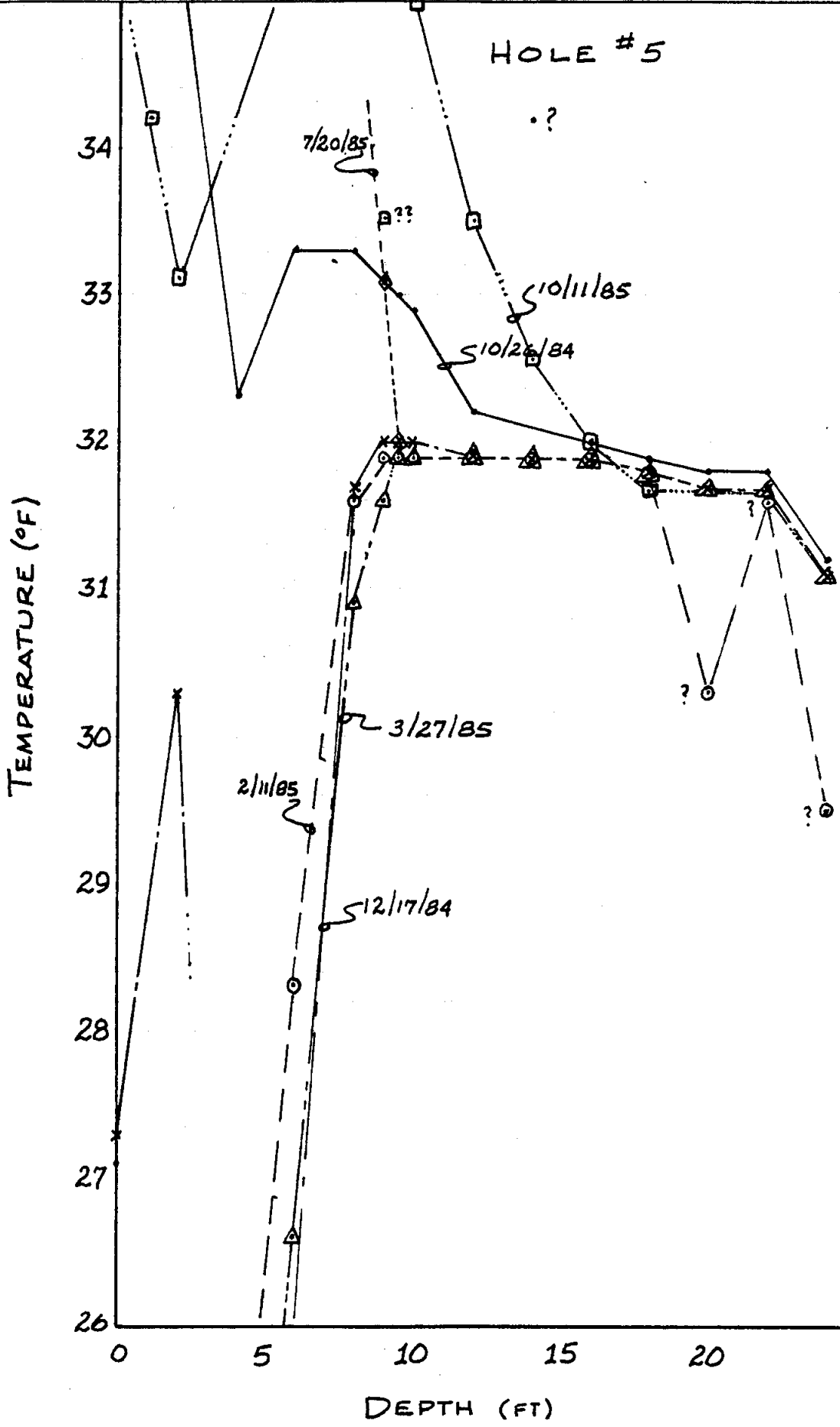


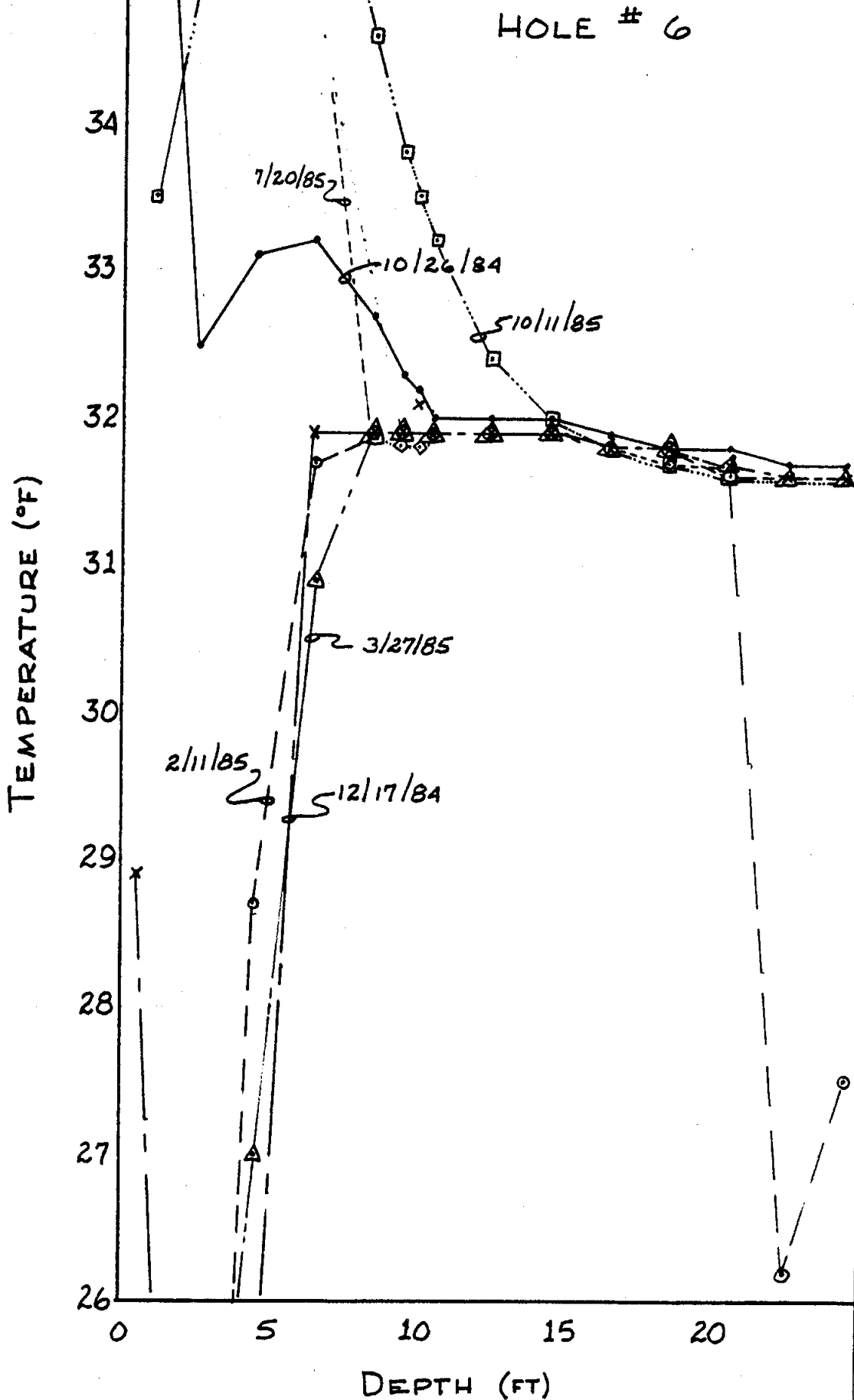


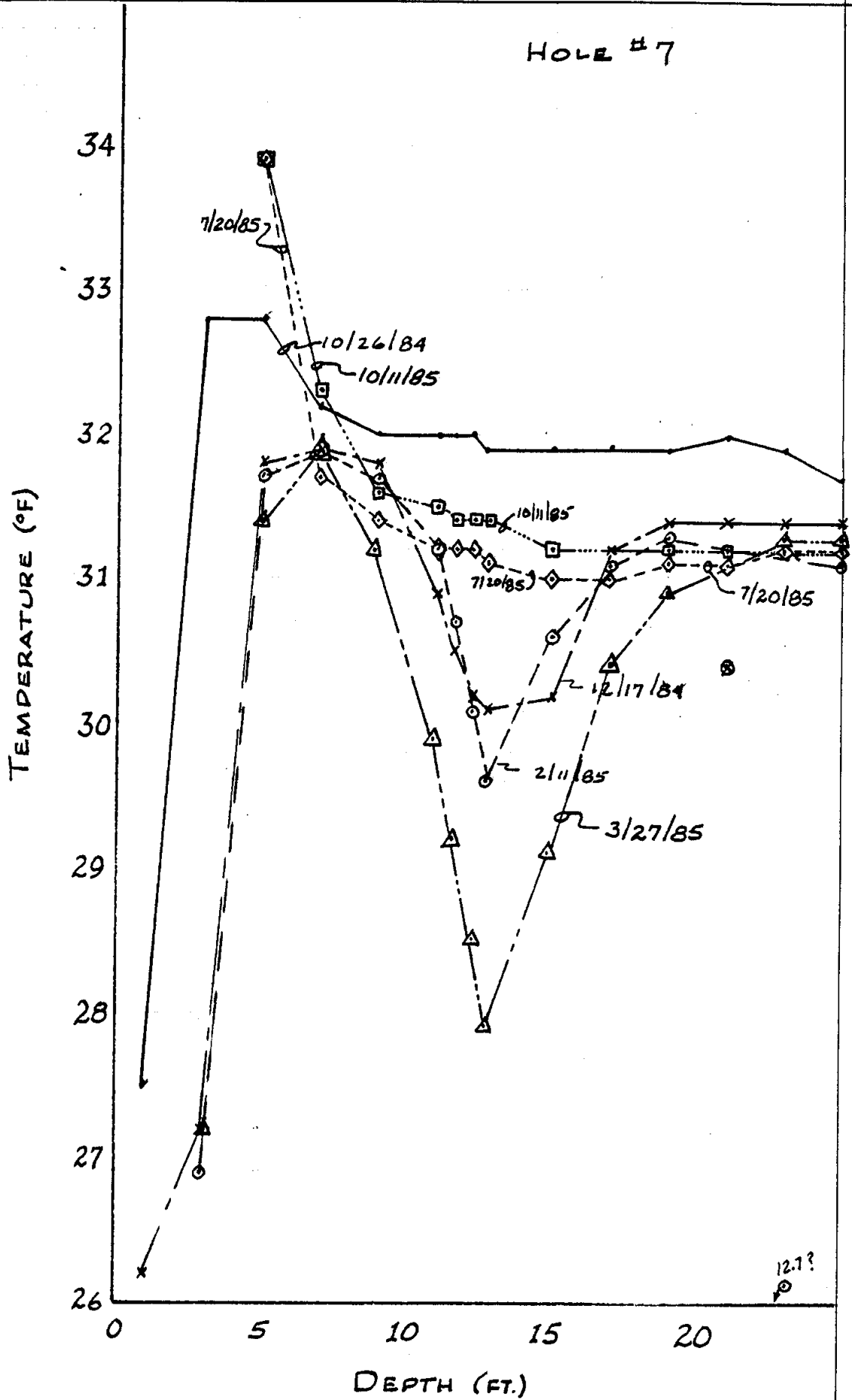


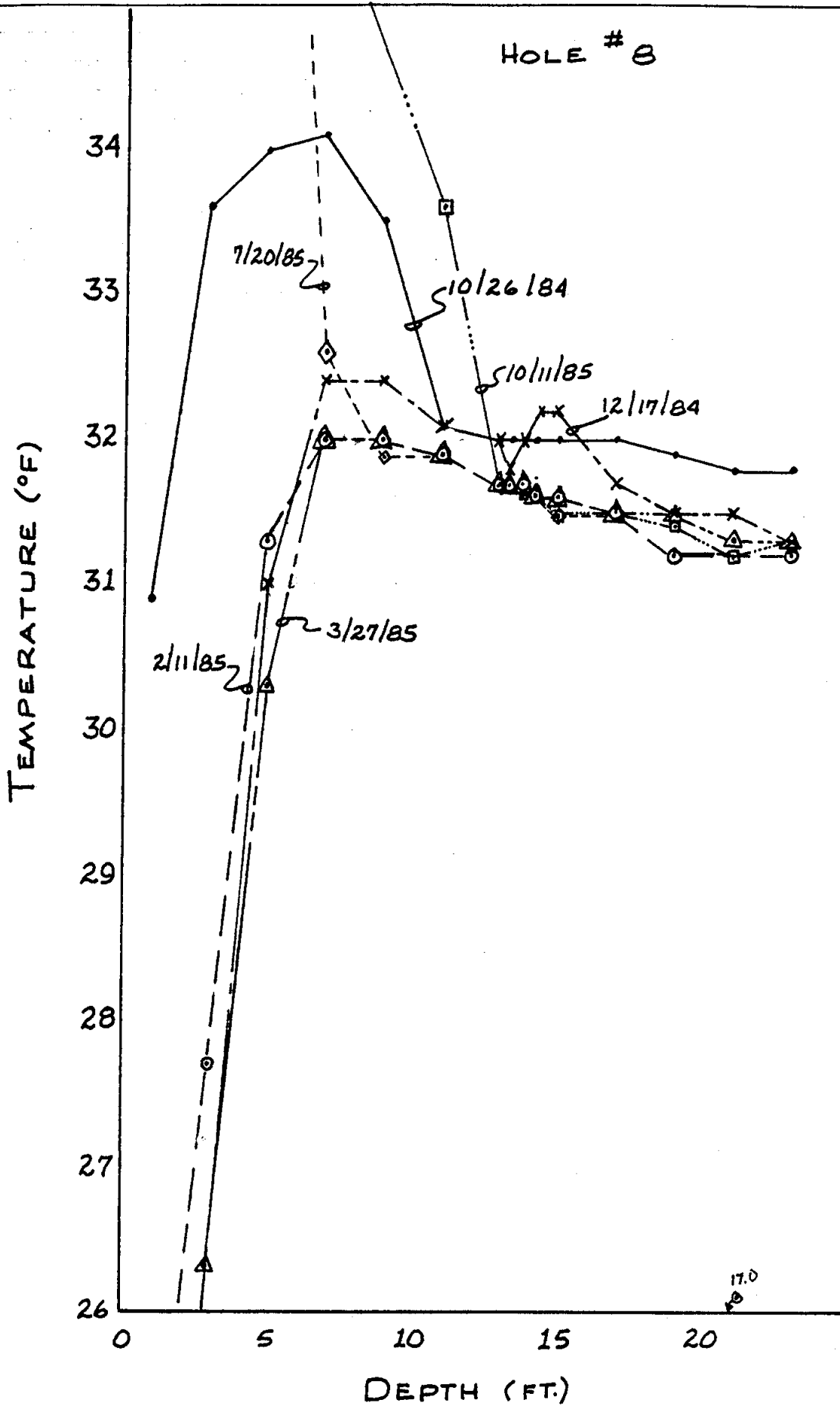
SUBJECT BETHEL AIRPORT

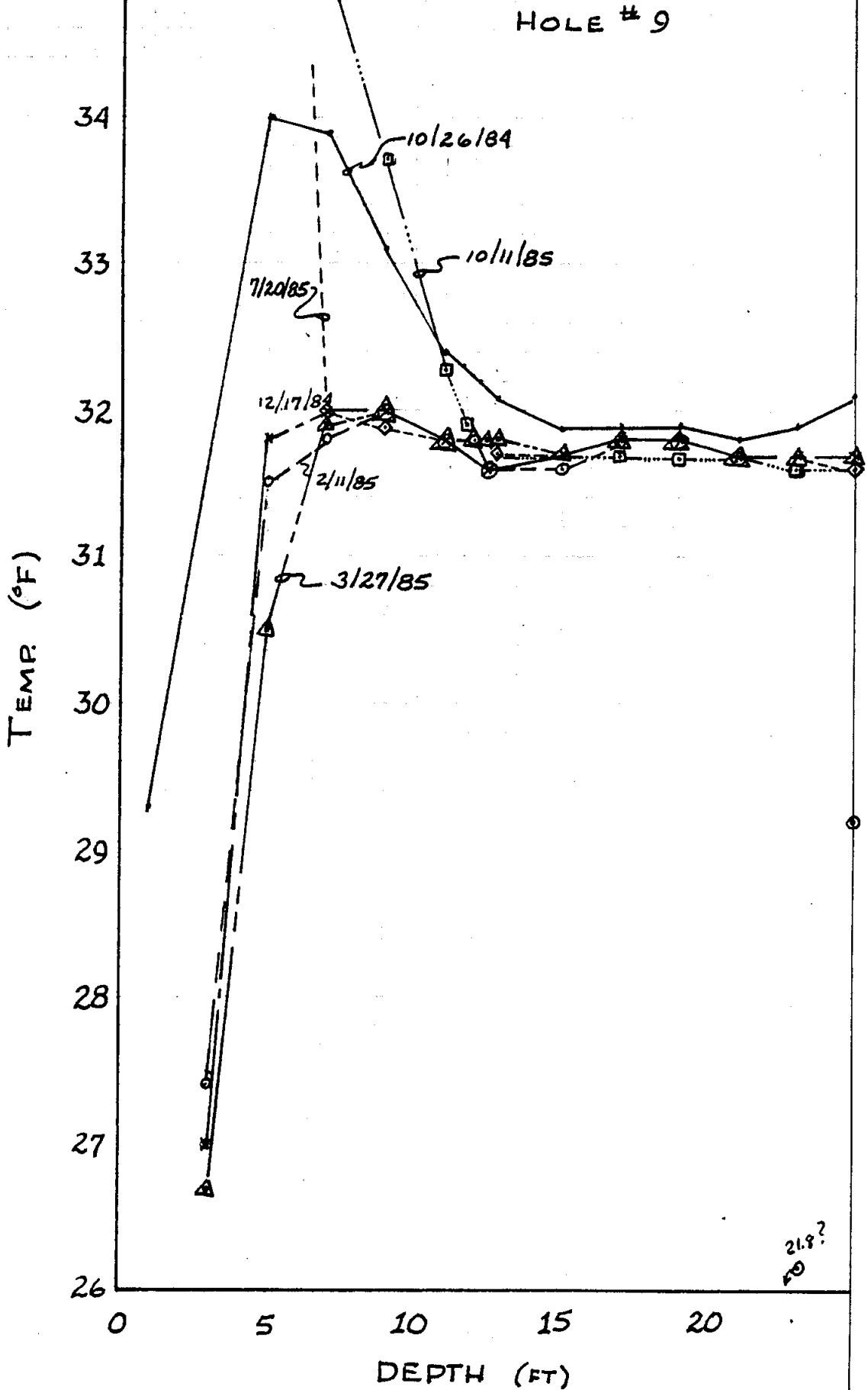
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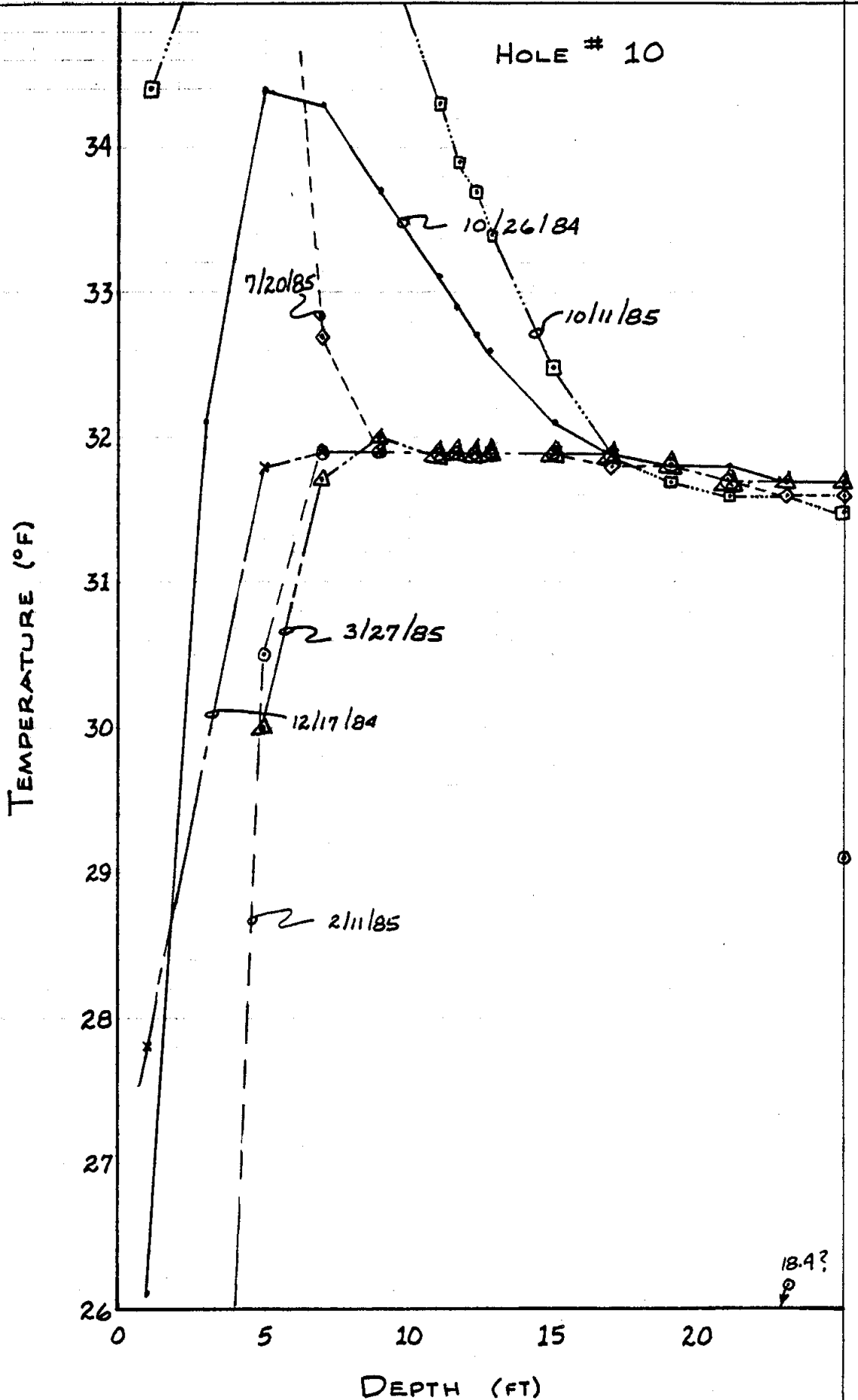


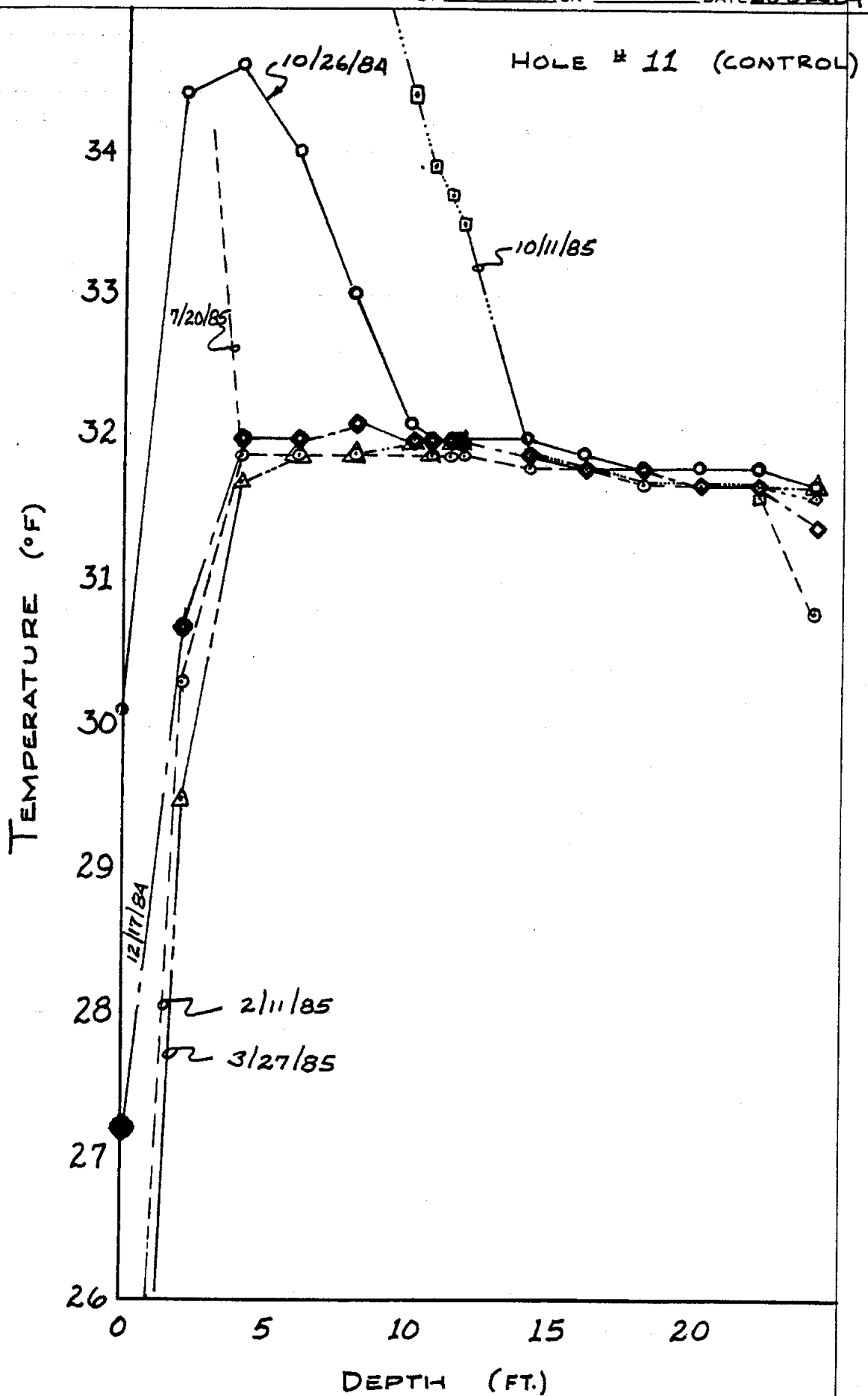


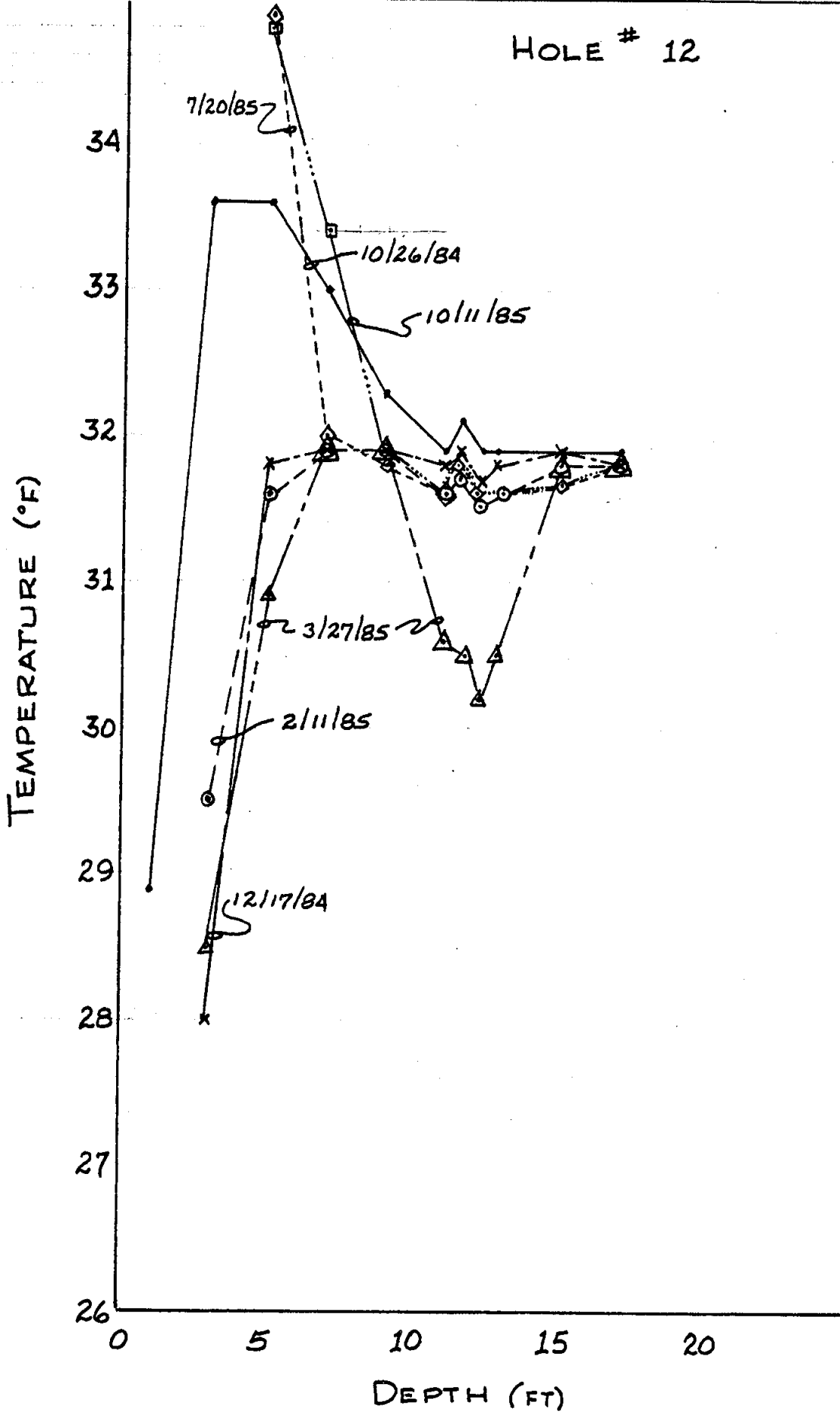




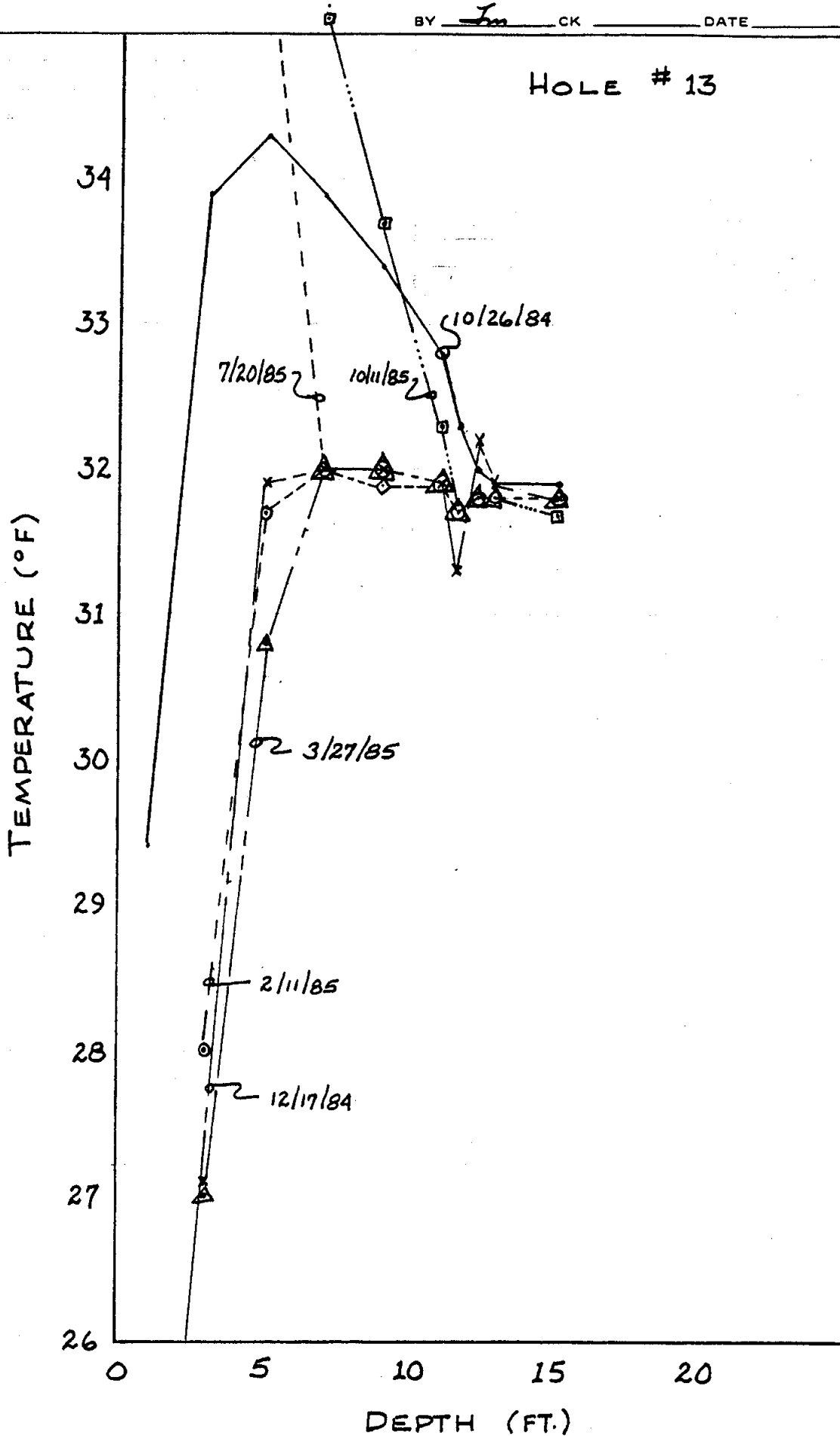








HOLE # 13



File: 100.THM

THERMISTOR DATA REPORT  
 Strings No. > 100  
 Temperature, Degrees Farenheit

LOCATION:

BORING B-1

Point No.	Depth ft.	Calib. Const.	10/26/84	Change	12/17/84	Change	02/11/85	Change	03/27/85	Change	07/20/85	Change	10/11/85
1	1.0	16309	28.7	-4.8	23.9	-17.4	6.5	4.0	10.5	64.8	75.2	-38.5	36.7
2	3.0	16289	33.0	-6.1	26.9	-1.6	25.3	-0.6	24.8	26.3	51.0	-12.4	38.6
3	5.0	16338	33.5	-1.7	31.8	-0.6	31.2	-1.7	29.5	8.4	38.0	-1.0	36.9
4	7.0	16281	33.0	-1.1	31.9	0.0	31.9	-0.2	31.7	0.4	32.2	3.4	35.6
5	9.0	16300	32.2	-0.3	31.9	0.0	31.9	0.0	31.9	-0.0	31.9	2.2	34.1
6	11.0	16355	31.9	-0.0	31.9	-0.0	31.9	0.0	31.9	-0.0	31.9	0.8	32.7
7	11.7	16364	32.0	-0.1	31.9	0.0	31.9	0.0	31.9	-0.0	31.9	0.4	32.2
8	12.2	16286	31.9	-0.1	31.9	-0.0	31.8	0.0	31.9	-0.0	31.8	0.1	32.0
9	12.7	16303	31.9	-0.1	31.8	-0.0	31.8	0.0	31.8	-0.0	31.8	0.0	31.8
10	15.0	16396	31.9	-0.1	31.8	-0.0	31.7	0.0	31.8	-0.0	31.7	-0.1	31.7
11	17.0	16331	31.8	-0.1	31.7	-0.0	31.7	0.0	31.7	-0.0	31.6	-0.0	31.6
12	19.0	16358	31.8	-0.2	31.6	-0.0	31.6	0.0	31.6	-0.0	31.6	-0.0	31.5
13	21.0	16357	31.8	-0.2	31.5	-0.0	31.5	0.0	31.5	0.0	31.5	-0.1	31.5
14	23.0	16320	31.6	-0.1	31.5	-7.4	24.1	7.4	31.5	-0.1	31.4	-0.0	31.4
15	25.0	16325	31.6	-0.1	31.5	-1.5	29.9	1.5	31.5	-0.0	31.4	-0.0	31.4
AIR TEMPERATURE					33.0		-5.0		-6.0		65.0		0.0

File: 200.THM

THERMISTOR DATA REPORT  
 String No. > 200  
 Temperature, Degrees Farenheit

LOCATION:  
 BORING B-2

Point No.	Depth ft.	Calib. Const.	10/26/84	Change	12/17/84	Change	02/11/85	Change	03/27/85	Change	07/20/85	Change	10/11/85
1	0.0	16357			27.7	-26.6	1.2	5.8	7.0	77.6	84.6	-49.8	34.7
2	2.0	16371	32.0	-9.9	22.1	-10.6	11.5	3.3	14.7	54.7	69.4	-30.7	38.7
3	4.0	16345	35.4	-5.0	30.4	-0.9	29.6	-1.8	27.8	14.8	42.6	-4.9	37.7
4	6.0	16278	36.1	-4.1	32.0	-0.2	31.8	-1.4	30.4	5.3	35.7	0.5	36.2
5	8.0	16310	34.6	-2.6	32.0	-0.0	32.0	-0.0	32.0	-0.0	31.9	2.9	34.8
6	10.0	16292	35.1	-3.2	31.9	0.0	31.9	0.0	32.0	-0.0	31.9	1.6	33.5
7	10.7	16369	32.5	-0.5	32.0	-0.1	31.9	0.0	32.0	-0.0	31.9	1.1	33.1
8	11.2	16277	32.7	-0.7	32.0	-0.0	31.9	0.0	31.9	-0.0	31.9	0.8	32.7
9	11.7	16307	33.0	-1.1	31.9	-0.0	31.9	0.0	31.9	-0.0	31.9	0.6	32.5
10	14.0	16345	33.9	-2.0	31.9	-0.0	31.9	0.0	31.9	-0.0	31.8	-0.0	31.8
11	16.0	16357	40.2	-8.0	32.2	-0.5	31.8	0.0	31.8	-0.0	31.7	-0.1	31.7
12	18.0	16298	39.7	-6.1	33.5	-1.9	31.7	0.0	31.7	-0.0	31.7	-0.0	31.6
13	20.0	16327	32.1	-0.5	31.6	-0.8	30.8	0.8	31.6	-0.1	31.5	-0.1	31.5
14	22.0	16290	32.8	-1.3	31.5	-6.1	25.4	6.1	31.5	-0.1	31.5	-0.0	31.4
15	24.0	16318	36.5	-4.9	31.5	-0.4	31.1	0.4	31.5	-0.1	31.4	-0.0	31.4
AIR TEMPERATURE					33.0		-5.0		-6.0		65.0		0.0

File: 300.THM

THERMISTOR DATA REPORT  
 String No. > 300  
 Temperature, Degrees Fahrenheit

LOCATION:  
 BORING B-3

Point No.	Depth ft.	Calib. Const.	10/27/84	Change	12/17/84	Change	02/11/85	Change	03/27/85	Change	07/20/85	Change	10/11/85
1	1.0	16294	24.9	1.5	26.4	-23.0	3.4	5.2	8.7	72.2	80.9	-45.1	35.8
2	3.0	16321	32.8	-7.6	25.2	-6.5	18.7	3.7	22.4	34.8	57.2	-17.7	39.5
3	5.0	16283	33.9	-2.2	31.8	-0.5	31.3	-2.1	29.2	109.3	138.6	-100.7	37.8
4	7.0	16337	33.5	-1.5	32.0	-0.0	31.9	-0.7	31.2	1.5	32.7	3.4	36.1
5	9.0	16304	32.7	-0.8	32.0	-0.0	31.9	0.0	32.0	-0.0	31.9	2.3	34.2
6	11.0	16309	32.1	-0.2	31.9	-0.0	31.9	0.0	31.9	-0.0	31.9	1.7	33.6
7	11.7	16294	32.1	-0.1	31.9	-0.0	31.9	0.0	31.9	-0.0	31.9	1.3	33.2
8	12.2	16353	32.0	-0.1	31.9	0.0	31.9	0.0	31.9	-0.0	31.9	1.1	32.9
9	12.7	16331	32.0	-0.1	31.9	-0.0	31.9	0.0	31.9	-0.0	31.9	0.2	32.0
10	15.0	16353	32.0	-0.1	31.9	-0.0	31.8	0.0	31.8	-0.0	31.8	0.2	31.9
11	17.0	16369	32.0						31.7	-0.1	31.6	0.2	31.8
12	19.0	16352	32.0						31.6	-0.1	31.5	0.2	31.7
13	21.0	16368	32.0	-0.4	31.6				31.5	-0.1	31.5	0.4	31.8
14	23.0	16290	31.9	-0.4	31.5	-5.1	26.4	5.1	31.5	-0.1	31.4	0.1	31.5
15	25.0	16306	31.8	-0.3	31.5	-1.7	29.8	1.7	31.5	-0.1	31.4	0.1	31.5
AIR TEMPERATURE						33.0		-5.0		-6.0		65.0	0.0

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File: 400.THM

THERMISTOR DATA REPORT  
 String No. > 400  
 Temperature, Degrees Farenheit

LOCATION:  
 BORING B-4

Point No.	Depth ft.	Calib. Const.	10/26/84	Change	12/17/84	Change	02/11/85	Change	03/27/85	Change	07/20/85	Change	10/11/85
1	1.0	16315	32.3	5.2	37.5	-30.4	7.1	3.1	10.2	60.7	70.9	-35.1	35.8
2	3.0	16377	32.6	-0.3	32.3	-8.6	23.7	-0.9	22.8	30.4	53.2	-13.5	39.6
3	5.0	16380	33.2	-5.9	27.3	2.8	30.1	-1.3	28.8	13.1	41.9	-3.9	38.0
4	7.0	16286	33.0	-0.5	32.5	-0.6	31.9	-0.3	31.6	1.7	33.3	2.7	36.0
5	9.0	16343	32.4	0.2	32.6	-0.7	31.9	0.0	31.9	-0.0	31.9	2.4	34.3
6	10.0	16285	32.1	3.3	35.4	-3.5	31.9	0.0	31.9	-0.0	31.9	1.7	33.5
7	10.5	16304	32.0	0.4	32.3	-0.5	31.9	0.0	31.9	-0.0	31.9	1.4	33.2
8	11.0	16341	31.9	0.4	32.3	-0.5	31.9	0.0	31.9	-0.0	31.9	1.1	32.9
9	13.0	16404	31.9	0.0	32.0	-0.1	31.9	0.0	31.9	0.0	31.9	0.3	32.2
10	15.0	16296	31.9	0.7	32.6	-0.8	31.8	0.0	31.9	-0.0	31.8	-0.0	31.8
11	17.0	16314	31.8	0.4	32.2	-0.5	31.8	0.0	31.8	-0.0	31.8	-0.0	31.7
12	19.0	16323	31.8	0.5	32.3	-0.6	31.7	0.0	31.7	-0.0	31.7	-0.0	31.7
13	21.0	16272	31.7	0.3	32.0	-0.3	31.7	0.0	31.7	0.0	31.7	-0.0	31.6
14	23.0	16305	31.7	9.6	41.3	-18.3	23.0	8.7	31.6	-0.0	31.6	-0.0	31.6
15	25.0	16304	31.6	8.5	40.1	-10.0	30.1	1.5	31.6	0.0	31.6	-0.1	31.5
AIR TEMPERATURE					33.0	-5.0	-6.0	65.0	0.0				

File: 500.THM

THERMISTOR DATA REPORT  
 Strins No. > 500  
 Temperature, Degrees Farenheit

LOCATION:  
 BORING B-5

Point No.	Depth ft.	Calib. Const.	10/26/84	Change	12/17/84	Change	02/11/85	Change	03/27/85	Change	07/20/85	Change	10/11/85
1	0.0	16292	27.1	0.2	27.3	-22.6	4.7	3.3	8.0	67.0	75.0	-40.8	34.2
2	2.0	16343	35.5	-5.1	30.3	-28.2	2.2	4.6	6.8	75.1	81.9	-48.8	33.1
3	4.0	16308	32.3	-11.3	21.0	-3.0	18.0	0.3	18.3	40.7	59.0	-19.8	39.3
4	6.0	16302	33.3	-9.8	23.5	4.8	28.3	-1.7	26.6	20.3	46.8	-8.0	38.9
5	8.0	16364	33.3	-1.6	31.7	-0.1	31.6	-0.7	30.9	5.6	36.5	0.2	36.7
6	9.0	16337	33.1	-1.1	32.0	-0.0	31.9	-0.3	31.6	1.5	33.1	0.4	33.5
7	9.5	16290	33.0	-1.0	32.0	-0.0	31.9	-0.1	31.9	0.2	32.0	3.4	35.4
8	10.0	16389	32.9	-0.9	32.0	-0.0	31.9	0.0	31.9	-0.0	31.9	3.1	35.0
9	12.0	16320	32.2	-0.3	31.9	-0.0	31.9	0.0	31.9	-0.0	31.9	1.7	33.5
10	14.0	16401	34.2	-2.3	31.9	0.0	31.9	0.0	31.9	-0.0	31.9	0.7	32.6
11	16.0	16341	32.0	-0.1	31.9	-0.0	31.9	0.0	31.9	-0.0	31.9	0.2	32.0
12	18.0	16362	31.9	-0.0	31.8	-0.0	31.8	0.0	31.8	-0.0	31.8	-0.0	31.7
13	20.0	16185	31.8	-0.1	31.7	-1.4	30.3	1.4	31.7	-0.0	31.7	-0.0	31.7
14	22.0	16356	31.8	-0.1	31.7	-0.1	31.6	0.1	31.7	-0.0	31.7	-0.0	31.6
15	24.0	16076	31.2	-0.1	31.1	-1.7	29.5	1.7	31.1	-0.0	31.1	-0.0	31.1
AIR TEMPERATURE					33.0	-5.0	-6.0	65.0	0.0				

File: 600.THM

THERMISTOR DATA REPORT  
 Strins No. > 600  
 Temperature, Degrees Farenheit

LOCATION:

BORING B-6

Point No.	Depth ft.	Calib. Const.	10/26/84	Chanse	12/17/84	Chanse	02/11/85	Chanse	03/27/85	Chanse	07/20/85	Chanse	10/11/85
1	0.5	16336	37.2	-8.3	28.9	-26.7	2.2	6.3	8.5	73.9	82.4	-48.9	33.5
2	2.5	16486	32.5	-11.8	20.7	-1.7	19.0	0.1	19.1	39.3	58.4	-18.8	39.7
3	4.5	16299	33.1	-9.0	24.1	4.6	28.7	-1.7	27.0	18.7	45.7	-7.2	38.6
4	6.5	16384	33.2	-1.3	31.9	-0.1	31.7	-0.8	30.9	4.7	35.7	0.6	36.3
5	8.5	16336	32.7	-0.8	31.9	0.0	31.9	0.0	31.9	-0.1	31.9	2.7	34.6
6	9.5	16306	32.3	-0.4	31.9	-0.0	31.9	0.0	31.9	-0.1	31.8	2.0	33.8
7	10.0	16330	32.2	-0.1	32.1	-0.2	31.9	0.0	31.9	-0.0	31.8	1.6	33.5
8	10.5	16357	32.0	-0.1	31.9	-0.0	31.9	0.0	31.9	-0.0	31.9	1.3	33.2
9	12.5	16404	32.0	-0.1	31.9	-0.0	31.9	0.0	31.9	-0.0	31.9	0.6	32.4
10	14.5	16285	32.0	-0.1	31.9	-0.0	31.9	0.0	31.9	-0.0	31.9	0.2	32.0
11	16.5	16326	31.9	-0.0	31.8	-0.0	31.8	0.0	31.8	-0.0	31.8	-0.0	31.8
12	18.5	16357	31.8	-0.1	31.8	0.0	31.8	0.0	31.8	-0.0	31.7	-0.0	31.7
13	20.5	16357	31.8	-0.1	31.7	-0.1	31.6	0.1	31.7	-0.0	31.7	-0.0	31.6
14	22.5	16376	31.7	-0.1	31.6	-5.4	26.2	5.4	31.6	0.0	31.6	-0.0	31.6
15	24.5	16353	31.7	-0.1	31.6	-4.2	27.5	4.2	31.6	-0.0	31.6	-0.0	31.6
AIR TEMPERATURE					33.0	-5.0	-6.0	65.0	0.0				

File: 700.THM

THERMISTOR DATA REPORT  
 Strings No. > 700  
 Temperature, Degrees Fahrenheit

LOCATION:  
 BORING B-7

Point No.	Depth ft.	Calib. Const.	10/26/84	Change	12/17/84	Change	02/11/85	Change	03/27/85	Change	07/20/85	Change	10/11/85
1	1.0	16292	27.5	-1.2	26.2	-21.0	5.3	4.6	9.9	64.2	74.1	-38.0	36.1
2	3.0	16275	32.8	-5.5	27.2	-0.3	26.9	0.3	27.2	17.2	44.4	-8.5	35.9
3	5.0	16325	32.8	-1.0	31.8	-0.1	31.7	-0.3	31.4	2.5	33.9	-0.0	33.9
4	7.0	16361	32.2	-0.3	31.9	-0.0	31.9	-0.0	31.9	-0.2	31.7	0.6	32.3
5	9.0	16400	32.0	-0.2	31.8	-0.1	31.7	-0.5	31.2	0.3	31.4	0.2	31.6
6	11.0	16363	32.0	-1.1	30.9	0.3	31.2	-1.3	29.9	1.4	31.2	0.2	31.5
7	11.7	16289	32.0	-1.5	30.5	0.2	30.7	-1.5	29.2	2.0	31.2	0.2	31.4
8	12.2	16383	32.0	-1.7	30.2	-0.1	30.1	-1.6	28.5	2.6	31.2	0.2	31.4
9	12.7	16350	31.9	-1.9	30.1	-0.4	29.6	-1.7	27.9	3.2	31.1	0.2	31.4
10	15.0	16274	31.9	-1.7	30.2	0.4	30.6	-1.5	29.1	1.9	31.0	0.2	31.2
11	17.0	16381	31.9	-0.8	31.2	-0.0	31.1	-0.8	30.4	0.7	31.0	0.1	31.2
12	19.0	16374	31.9	-0.5	31.4	-0.1	31.3	-0.4	30.9	0.1	31.1	0.1	31.2
13	21.0	16395	32.0	-0.5	31.4	-1.0	30.4				31.1	0.1	31.2
14	23.0	16423	31.9	-0.5	31.4	-18.7	12.7	18.6	31.3	-0.1	31.2	0.0	31.2
15	25.0	16348	31.7	-0.3	31.4	-0.3	31.1	0.2	31.3	-0.1	31.2	0.0	31.2
AIR TEMPERATURE					33.0		-5.0		-6.0		65.0		0.0

File: 800.THM

THERMISTOR DATA REPORT  
 String No. > 800  
 Temperature, Degrees Farenheit

LOCATION:  
 BORING B-B

Point No.	Depth ft.	Calib. Const.	10/26/84	Change	12/17/84	Change	02/11/85	Change	03/27/85	Change	07/20/85	Change	10/11/85
1	1.0	16384	30.9	-6.6	24.3	-9.7	14.6	1.0	15.7	47.9	63.6	-24.7	38.9
2	3.0	16378	33.6	-9.6	24.0	3.7	27.7	-1.4	26.3	24.8	51.1	-9.9	41.2
3	5.0	16349	34.0	-2.2	31.8	-0.5	31.3	-1.0	30.3	10.3	40.6	-0.7	39.8
4	7.0	16356	34.1	-1.7	32.4	-0.3	32.0	-0.0	32.0	0.6	32.6	5.6	38.2
5	9.0	16339	33.5	-1.1	32.4	-0.4	32.0	0.0	32.0	-0.1	31.9	4.4	36.3
6	11.0	16408	32.1	-0.0	32.1	-0.2	31.9	0.0	31.9	-0.0	31.9	1.7	33.6
7	13.0	16388	32.0	-0.0	32.0	-0.3	31.7	0.0	31.7	-0.0	31.7	-0.0	31.7
8	13.3	16432	32.0	-0.2	31.8	-0.1	31.7	0.0	31.7	-0.0	31.7	0.0	31.7
9	13.8	16350	32.0	-0.0	32.0	-0.3	31.7	0.0	31.7	-0.0	31.6	-0.0	31.6
10	14.3	16392	32.0	0.2	32.2	-0.5	31.8	0.0	31.6	-0.0	31.6	-0.0	31.6
11	15.0	16356	32.0	0.2	32.2	-0.6	31.6	0.0	31.6	-0.1	31.5	-0.1	31.5
12	17.0	16343	32.0	-0.3	31.7	-0.1	31.5	0.0	31.5	-0.0	31.5	-0.0	31.5
13	19.0	16376	31.9	-0.4	31.5	-0.3	31.2	0.3	31.5	-0.0	31.5	-0.0	31.4
14	21.0	16338	31.8	-0.3	31.5	-14.5	17.0	14.3	31.3	-0.0	31.3	-0.1	31.2
15	23.0	16340	31.8	-0.5	31.3	-0.1	31.2	0.1	31.3	-0.0	31.3	-0.1	31.3
AIR TEMPERATURE					33.0	-5.0	-6.0	65.0	0.0				

File: 900.THM

THERMISTOR DATA REPORT  
 Strins No. > 900  
 Temperature, Degrees Farenheit

LOCATION:

BORING B-9

Point No.	Depth ft.	Calib. Const.	10/26/84	Change	12/17/84	Change	02/11/85	Change	03/27/85	Change	07/20/85	Change	10/11/85
1	1.0	16314	29.3	-6.9	22.4	-14.2	8.2	3.5	11.7	60.6	72.4	-34.8	37.6
2	3.0	16297	31.4	-4.4	27.0	0.2	27.2	-0.6	26.7	19.2	45.9	-8.2	37.7
3	5.0	16338	34.0	-2.3	31.8	-0.3	31.5	-1.0	30.5	50.9	81.4	-45.3	36.1
4	7.0	16297	33.9	-1.9	32.0	-0.0	31.9	-0.0	31.9	0.1	32.0	3.0	35.0
5	9.0	16317	33.1	-1.1	32.0	0.0	32.0	0.0	32.0	-0.0	31.9	1.7	33.7
6	11.0	16286	32.4	-0.6	31.8	-0.0	31.8	0.0	31.8	0.0	31.8	0.5	32.3
7	11.7	16300	32.3	-0.6	31.7	0.1	31.8	0.0	31.8	-0.0	31.8	0.2	31.9
8	12.2	16309	32.2	-0.7	31.5	0.2	31.7	0.1	31.8	-0.0	31.8	0.0	31.8
9	12.7	16337	32.1	-0.7	31.4	0.3	31.7	0.1	31.8	-0.0	31.7	0.0	31.7
10	15.0	16320	31.9	-0.2	31.7	-0.0	31.7	0.0	31.7	-0.0	31.7	-0.0	31.7
11	17.0	16326	31.9	-0.1	31.8	0.0	31.8	0.0	31.8	-0.0	31.8	-0.0	31.7
12	19.0	16334	31.9	-0.1	31.8	-0.0	31.8	0.0	31.8	-0.0	31.8	-0.0	31.7
13	21.0	16381	31.8	-0.0	31.7	-0.1	31.7	0.1	31.7	-0.0	31.7	-0.0	31.7
14	23.0	16362	31.9	-0.2	31.7	-9.9	21.8	9.9	31.7	-0.0	31.7	-0.0	31.6
15	25.0	16374	32.1	-0.5	31.7	-2.4	29.2	2.4	31.7	-0.0	31.6	-0.0	31.6
AIR TEMPERATURE							-5.0		-6.0		65.0		0.0

File: 1000.THM

THERMISTOR DATA REPORT  
 String No. > 1000  
 Temperature, Degrees Farenheit

LOCATION:  
 BORING B-10

Point No.	Depth ft.	Calib. Const.	10/26/84	Change	12/17/84	Change	02/11/85	Change	03/27/85	Change	07/20/85	Change	10/11/85
1	1.0	16328	26.1	1.8	27.8	-25.3	2.6	8.1	10.6	67.9	78.5	-44.1	34.4
2	3.0	16348	32.1	-9.4	22.8	-9.8	13.0	4.1	17.1	47.7	64.8	-25.9	38.9
3	5.0	16330	34.4	-3.4	31.0	-0.5	30.5	-0.5	30.0	7.9	37.9	-0.3	37.6
4	7.0	16349	34.3	-2.4	31.9	-0.0	31.9	-0.2	31.7	1.0	32.7	3.9	36.6
5	9.0	16405	33.7	-1.8	31.9	-0.0	31.9	0.0	32.0	-0.1	31.9	3.6	35.5
6	11.0	16344	33.1	-1.2	31.9	-0.0	31.9	0.0	31.9	-0.0	31.9	2.4	34.3
7	11.7	16316	32.9	-1.0	31.9	-0.0	31.9	0.0	31.9	-0.0	31.9	2.0	33.9
8	12.2	16293	32.7	-0.8	31.9	-0.0	31.9	0.0	31.9	-0.0	31.9	1.8	33.7
9	12.7	16303	32.6	-0.7	31.9	-0.0	31.9	0.0	31.9	-0.0	31.9	1.5	33.4
10	15.0	16312	32.1	-0.2	31.9	0.0	31.9	0.0	31.9	-0.0	31.9	0.7	32.5
11	17.0	16491	31.9	-0.1	31.9	-0.0	31.8	0.0	31.9	-0.0	31.8	-0.0	31.8
12	19.0	16327	31.8	-0.1	31.8	0.0	31.8	0.0	31.8	-0.0	31.8	-0.1	31.7
13	21.0	16297	31.8	-0.0	31.7	-0.0	31.7	0.0	31.7	-0.1	31.7	-0.1	31.6
14	23.0	16361	31.7	-0.0	31.7	-13.3	18.4	13.3	31.7	-0.1	31.6	-0.0	31.6
15	25.0	16294	31.7	-0.1	31.7	-2.5	29.1	2.5	31.7	-0.1	31.6	-0.0	31.5
AIR TEMPERATURE					33.0	-5.0	-6.0	165.0	0.0				

File: 1100.THM

THERMISTOR DATA REPORT  
 String No. > 1100  
 Temperature, Degrees Farenheit

LOCATION:

BORING-11

Point No.	Depth ft.	Calib. Const.	10/26/84	Change	12/17/84	Change	02/11/85	Change	03/27/85	Change	07/20/85	Change	10/11/85
1	0.0	16325	30.1	-2.9	27.2	-17.6	9.6	4.1	13.7	55.9	69.6	-31.8	37.8
2	2.0	16316	34.4	-3.7	30.7	-0.4	30.3	-0.8	29.5	9.7	39.2	-0.0	39.2
3	4.0	16381	34.6	-2.6	32.0	-0.1	31.9	-0.1	31.7	0.2	31.9	6.0	38.0
4	6.0	16306	34.0	-1.9	32.0	-0.2	31.9	-0.0	31.9	0.0	31.9	4.9	36.7
5	8.0	16406	33.0	-0.9	32.1	-0.2	31.9	0.0	31.9	-0.0	31.9	3.6	35.5
6	10.0	16340	32.1	-0.0	32.0	-0.1	32.0	0.0	32.0	-0.0	32.0	2.4	34.4
7	10.7	16328	32.0	-0.0	32.0	-0.1	31.9	0.0	31.9	0.0	31.9	2.0	33.9
8	11.2	16335	32.0	-0.0	32.0	-0.0	31.9	0.0	32.0	-0.0	31.9	1.7	33.7
9	11.7	16309	32.0	-0.0	32.0	-0.0	31.9	0.0	32.0	-0.0	31.9	1.5	33.5
10	14.0	16333	32.0	-0.1	31.9	-0.0	31.8	0.0	31.9	-0.0	31.8	0.1	31.9
11	16.0	16328	31.9	-0.1	31.8	0.0	31.8	0.0	31.8	-0.0	31.8	-0.0	31.8
12	18.0	16338	31.8	-0.1	31.8	-0.0	31.7	0.0	31.8	0.0	31.8	-0.0	31.7
13	20.0	16295	31.8	-0.1	31.7	0.0	31.7	0.0	31.7	-0.0	31.7	-0.0	31.7
14	22.0	16404	31.8	-0.1	31.7	0.0	31.7	0.0	31.7	-0.0	31.7	-0.0	31.6
15	24.0	16328	31.7	-0.1	31.6	-0.8	30.8	0.9	31.7	-0.0	31.6	-0.0	31.6
AIR TEMPERATURE					33.0	-5.0	-6.0	65.0	0.0				

File: 1200.THM

THERMISTOR DATA REPORT  
Strins No. > 1200  
Temperature, Degrees Farenheit

LOCATION:  
BORING B-12

Point No.	Depth ft.	Calib. Const.	10/26/84	Change	12/17/84	Change	02/11/85	Change	03/27/85	Change	07/20/85	Change	10/11/85
1	1.0	16323	29.9	-8.0	21.9	-12.9	9.0	3.3	12.2	58.8	71.1	-33.3	37.8
2	3.0	16350	33.6	-5.6	28.0	1.5	29.5	-1.0	28.5	13.0	41.5	-5.4	36.2
3	5.0	16320	33.6	-1.7	31.8	-0.2	31.6	-0.7	30.9	4.0	34.9	-0.2	34.8
4	7.0	16283	33.0	-1.1	31.9	0.0	31.9	-0.0	31.9	0.0	32.0	1.4	33.4
5	9.0	16339	32.3	-0.3	31.9	0.0	31.9	0.0	31.9	-0.2	31.8	0.2	31.9
6	11.0	16391	31.9	-0.1	31.8	-0.2	31.6	-1.1	30.6	1.0	31.6	0.0	31.6
7	11.7	16496	32.1	-0.2	31.9	-0.2	31.7	-1.2	30.5	1.3	31.8	0.0	31.8
8	12.2	16374	31.9	-0.3	31.7	-0.2	31.5	-1.2	30.2	1.4	31.6	0.0	31.6
9	12.7	16280	31.9	-0.1	31.8	-0.2	31.6	-1.1	30.5	1.1	31.6	0.0	31.6
10	15.0	16386	31.9	-0.1	31.9	-0.0	31.8	-0.1	31.8	-0.1	31.7	-0.0	31.7
11	17.0	16366	31.9	-0.1	31.8	0.0	31.8	0.0	31.8	-0.0	31.8	-0.1	31.7
AIR TEMPERATURE							-5.0		-6.0		65.0		0.0

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File: 1300.THM

THERMISTOR DATA REPORT  
String No. > 1300  
Temperature, Degrees Farenheit

LOCATION:  
BORING B-13

Point No.	Depth ft.	Calib. Const.	10/26/84	Change	12/17/84	Change	02/11/85	Change	03/27/85	Change	07/20/85	Change	10/11/85
1	1.0	16350	29.4	-7.5	21.9	-11.8	10.1	2.7	12.7	56.7	69.4	-31.2	38.2
2	3.0	16330	33.9	-6.9	27.1	0.9	28.0	-1.0	27.0	17.4	44.5	-6.6	37.9
3	5.0	16285	34.3	-2.4	31.9	-0.2	31.7	-0.9	30.8	4.4	35.2	1.2	36.3
4	7.0	16292	33.9	-1.9	32.0	0.0	32.0	-0.0	32.0	0.0	32.0	3.1	35.1
5	9.0	16329	33.4	-1.4	32.0	-0.0	32.0	0.0	32.0	-0.0	31.9	1.8	33.7
6	11.0	16315	32.8	-0.9	31.9	-0.0	31.9	0.0	31.9	0.0	31.9	0.4	32.3
7	11.7	16347	32.3	-1.2	31.1	0.5	31.7	0.1	31.7	-0.0	31.7	0.0	31.7
8	12.2	16363	32.0	0.2	32.2	-0.4	31.8	0.0	31.9	-0.0	31.8	-0.0	31.8
9	12.7	16309	31.9	-0.1	31.9	-0.0	31.8	0.0	31.9	-0.0	31.8	-0.0	31.8
10	15.0	16363	31.9	-0.1	31.8	-0.0	31.8	0.0	31.8	-0.0	31.8	-0.0	31.7
AIR TEMPERATURE					33.0	-5.0	-6.0	65.0	0.0				