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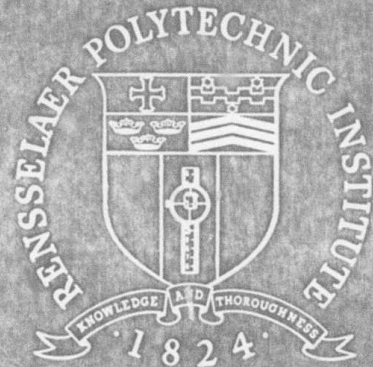
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RPI TECHNICAL REPORT MP-82

A DETAILED EVALUATION OF A LASER
TRIANGULATION RANGING SYSTEM
FOR MOBILE ROBOTS

by

Thomas J. Clement



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School of Engineering
Rensselaer Polytechnic Institute
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Table of Contents

LIST OF FIGURES	iv
ACKNOWLEDGEMENT	vi
ABSTRACT	vii
1. INTRODUCTION AND HISTORICAL REVIEW	1
2. ML/MD VISION SYSTEM THEORY	7
2.1 Laser Triangulation	7
2.1.1 ML/MD Vision System Accuracy Factors	10
2.1.2 Detector "Cone of Vision" Problem	10
2.1.3 Laser Triangulation Justification	13
2.2 Concept of Scanning Laser	17
2.3 ML/MD Vision System Data Interpretation	17
3. OVERVIEW OF VISION SYSTEM	21
3.1 Mast and Associated Electronics	21
3.2 Telem Card	23
3.3 Prime GPIB	25
3.4 Prime Computer Programs	27
3.5 The Modeler	28
3.5.1 What the Modeler Does with the Data	29
3.5.2 Modeler Slope Hazard Equations	30
3.5.3 Modeler Step Hazard Determination	31
3.5.4 Classification of Hazards	32
3.5.4.1 Step Hazards	32
3.5.4.2 Slope Hazards	33

3.5.4.3 Insufficient Data	33
3.5.4.4 Farthest Return Less Than 1.5 Meters Away	35
3.5.4.5 Crosspath Hazards	36
3.5.4.6 Bad Data	36
4. TESTING PROCEDURES	39
4.1 Single Step Tests	41
4.2 Slope Tests	41
4.3 Two Obstacles Tests	45
4.4 Parallel Obstacles Tests	54
4.5 Insufficient Data Returned Tests	58
4.6 Range Tests	58
4.7 Holes Tests	66
5. CONCLUSIONS	77
6. REFERENCES	82
7. APPENDIX	85
7.1 TELEM6.TC - Microprocessor Telemetry Program	86
7.2 Tests	96
7.2.1 Single Step Test Results	97
7.2.2 Slope Test Results	107
7.2.3 Two Steps Test Results	175
7.2.4 Parallel Obstacles Test Results	184
7.2.5 Range Test Results	191
7.2.6 Hole Tests Results	212

LIST OF FIGURES

Figure 1.	Mars Rover with SL/SD Vision System	3
Figure 2.	Laser Scan Pattern of SL/SD Vision System	4
Figure 3.	Triangulation Equations	8
Figure 4.	Laser/Detector Intersections	9
Figure 5.	Effect of Laser Shot Density on Resolution	11
Figure 6.	Laser/Detector Distance Effect on Resolution	12
Figure 7.	"Cone of Vision" Effect on Step Hazard Data	14
Figure 8.	"Cone of Vision" Effect on Slope Hazard Data	15
Figure 9.	Increasing Slope Effect on Step Hazards	19
Figure 10.	Examples of Missing Returns	20
Figure 11.	Block Diagram of Vision System	22
Figure 12.	Multi-Laser/Multi Detector Mast	24
Figure 13.	Output from Telemetry Processor Card	26
Figure 14.	Vehicle Approaching Differing Slope Grades	34
Figure 15.	Cross Path Hazards	37
Figure 16.	Tables of Azimuth and Elevation Angles	40
Figure 17.	20 cm Step Test	42
Figure 18.	25 cm Step Test	43
Figure 19.	30 cm Step Test	44
Figure 20.	20 Degree Slope Test with $B=.90$	46
Figure 21.	25 Degree Slope Test with $B=.90$	47
Figure 22.	30 Degree Slope Test with $B=.90$	48

Figure 23.	35 Degree Slope Test with $B=.90$	49
Figure 24.	20 Degree Slope Test with $B=.85$	50
Figure 25.	25 Degree Slope Test with $B=.85$	51
Figure 26.	30 Degree Slope Test with $B=.85$	52
Figure 27.	35 Degree Slope Test with $B=.85$	53
Figure 28.	Two Obstacles Test: Heights at 0 and 35 cm	55
Figure 29.	Two Obstacles Test: Heights at 20 and 35 cm	56
Figure 30.	Two Obstacles Test: Heights at 35 and 35 cm	57
Figure 31.	Path Obstacle Test with 1 meter Separation	59
Figure 32.	Insufficient Data Test	60
Figure 33.	No Data Beyond 1.5 meters test	61
Figure 34.	40 cm Range Test	63
Figure 35.	70 cm Range Test	64
Figure 36.	230 cm Range Test	65
Figure 37.	Small Square Hole with 30 cm Depth Test	67
Figure 38.	Small Square Hole with 36 cm Depth Test	68
Figure 39.	Rectangular Hole with 25 cm Depth Test	70
Figure 40.	Rectangular Hole with 30 cm Depth Test	71
Figure 41.	Rectangular Hole with 36 cm Depth Test	72
Figure 42.	Large Square Hole with 20 cm Depth Test	73
Figure 43.	False Return Due to Reflection	74
Figure 44.	Large Square Hole with 30 cm Depth Test	76

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ABSTRACT

This report is the culmination of several theoretical and design papers on a low resolution, short range vision system to be used for planetary exploration. Included is a theoretical discussion of the Scanning Laser / Multi-Detector laser triangulation system, designed and built in the Rensselaer Polytechnic Institute Mars Rover Laboratory. Discussed in depth is the actual test performance of the Scanning Laser / Multi-Detector System.

All tests presented were performed in controlled, static, laboratory conditions. To add to the credibility of the tests, the materials used were of the same reflective properties as dirt. The actual tests performed included: single step tests, single slope tests, multiple step tests, and range tests. All of these tests were performed to show the capabilities of the vision system and its ability to detect the presence of terrains hazardous to the safety of the vehicle.

The results showed both the vision system's strengths and weaknesses. Of special interest was that many of the limitations uncovered were software based. The test results are included in the Appendix.

PART 1

INTRODUCTION AND HISTORICAL REVIEW

In the last several years, tremendous advances have been brought about in the field of robotics. This has been due, in part, to advances in vision systems technology and in the development of artificial intelligence for interpreting the data obtained. The Mars Rover Project at Rensselaer Polytechnic Institute has been a product of these advances.

Since 1968, when the effort began under a NASA grant, the project has undergone many changes both in the design goals and in the physical vehicle. In the beginning, the goal was to create a vehicle which could negotiate rocky terrain with little difficulty. Mathematical models were created to determine various stresses and strains due to inertial forces as well as external forces which may be present (see Reference 14). Particular attention was paid to the design of the wheels. The vehicle at one time, was a two wheel drive device which could fold itself into a small package, facilitating transportation to Mars. Because of difficulties the vehicle encountered negotiating certain obstacles, it was later decided to give it four wheel drive.

Once most of the design and construction of the vehicle itself was completed, attention was placed on the design of an onboard vision system. The need for a vision system was prompted by the desire to include a shortrange terrain navigation system on the vehicle. A local navigation system was wanted because the communications time between Earth and Mars varies from 9 to 40 minutes, depending on the distance between them. Obviously, having to transmit a view of the terrain to Earth, process the information, and send a command back would take an exorbitant amount of time and the vehicle wouldn't get very far very fast. The need for a vision system was first filled by a Single-Laser/Single-Detector (SL/SD) mast, Figure 1. The laser fired 15 azimuth pulses per scan and the detector could detect relatively gross hazards at distances of 1.5 meters and heights of 0.25 meters, Figure 2. The addition of the vision system's mast precluded the vehicle's folding ability. Since the vision system was determined to be of greater importance than the ability of the vehicle to fold, this was a more than equitable loss. The testing done was with the vehicle outdoors on terrain very similar to what would have been expected to be encountered on Mars. Extensive testing proved that the system worked as designed (Reference 6).

The simple "hazardous/not hazardous" resolution of the system was determined to be overly conservative and so a new system design was sought. Using what had been learned from the design of the

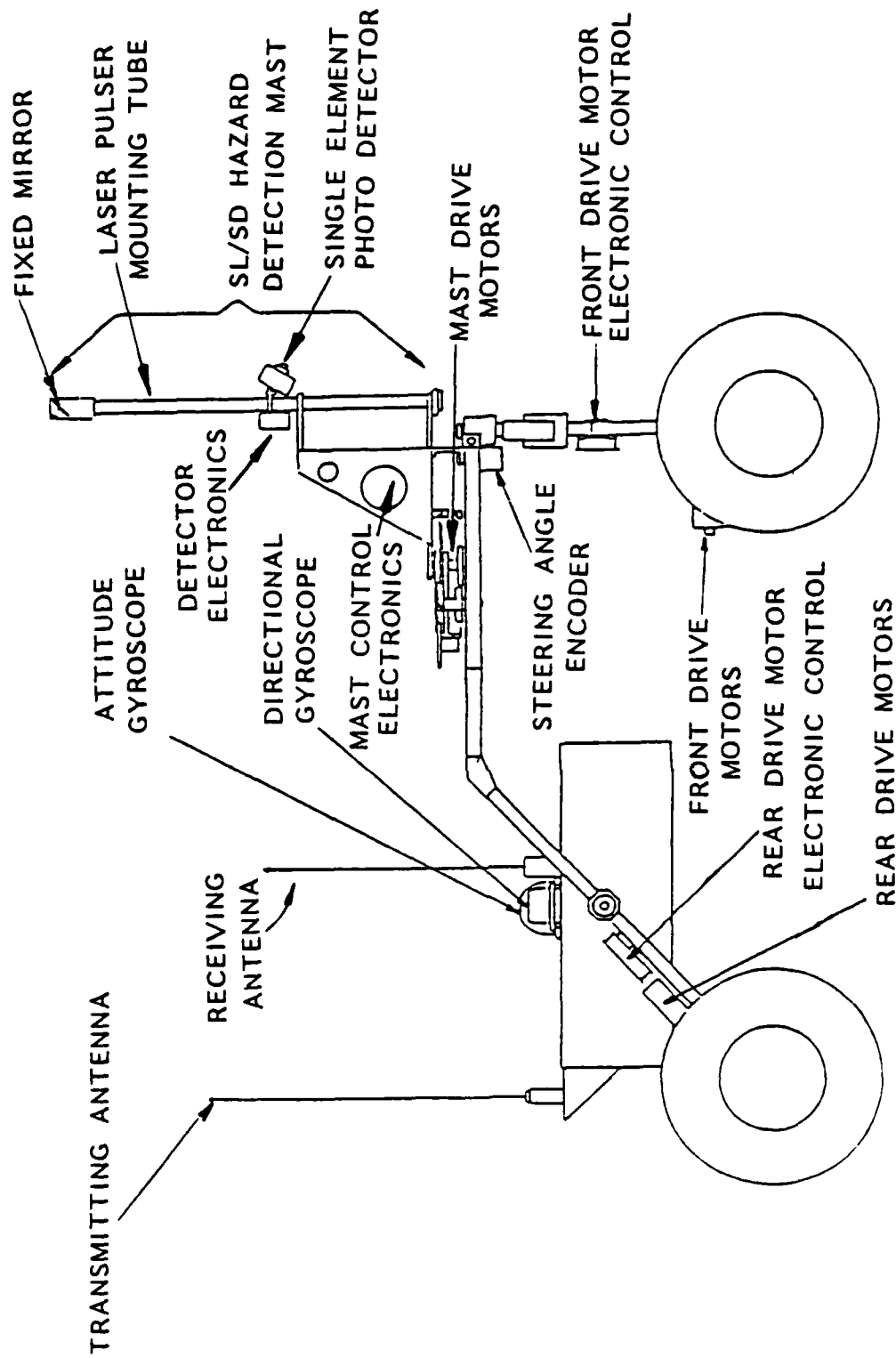


FIGURE 1. MARS ROVER WITH SL/SD SYSTEM

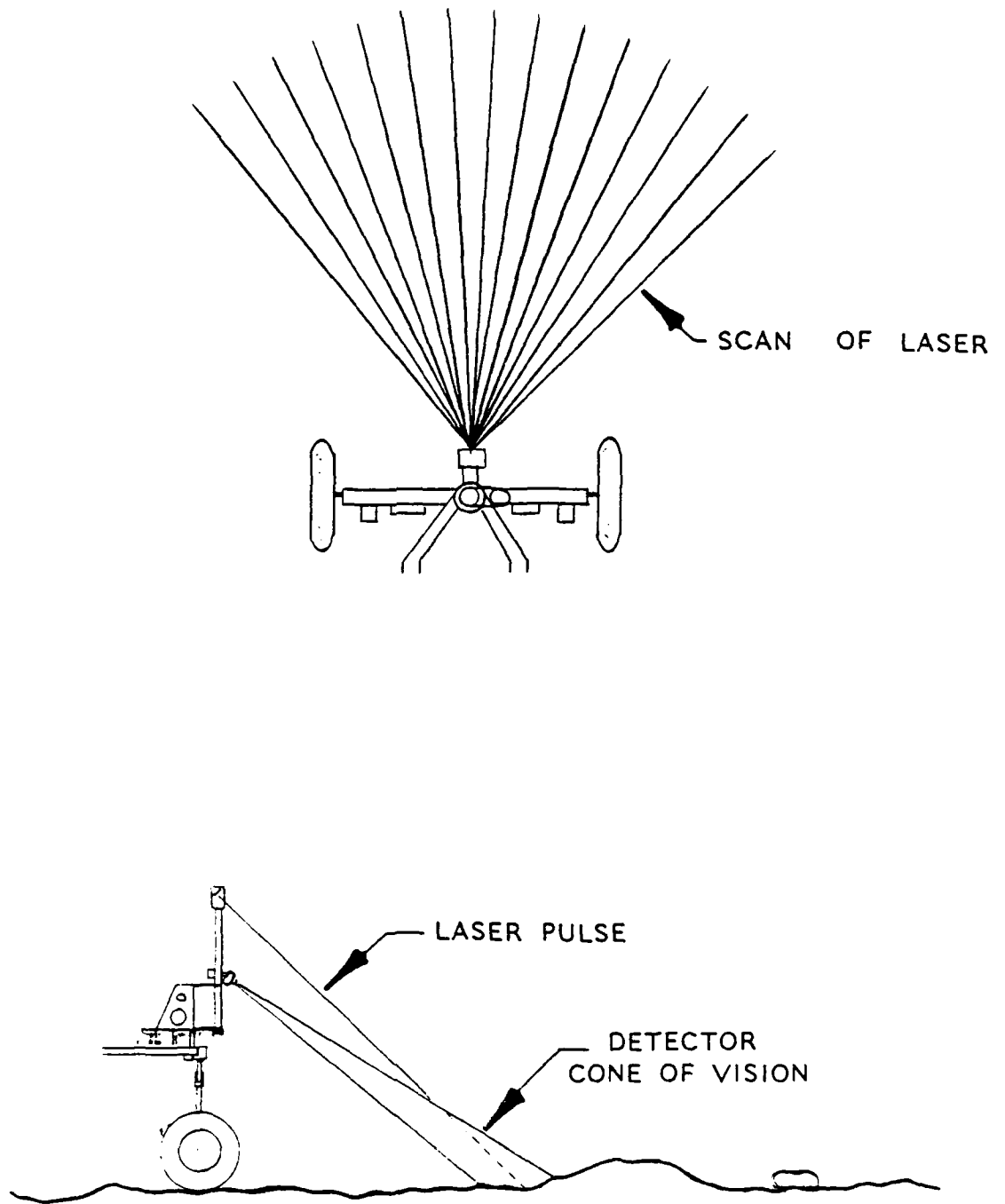


FIGURE 2. LASER SCAN PATTERN OF SL/SD SYSTEM

SL/SD system, a Multi-Laser/Multi-Detector (ML/MD) system was designed and built (see References 1, 3, 5, 7, 11). In addition to the actual hardware that made up the new vision system, there was also simulation as well as realtime software written to interpret the data which the new mast provided (see References 4, 10).

The Mars Rover Vehicle has thus evolved into a dual-microprocessor controlled vehicle able to negotiate rough terrain with a Multi-Laser/Multi-Detector vision system. The development of the new vision system mentioned above included: the design of a new mast with the associated drive electronics and mechanics, the design of a new microprocessor board to control the flow of data to a mainframe computer, and the development of new software to interpret the information obtained by the mast.

Throughout these recent developments, there has been relatively little done to determine whether the modifications were improving the system or making it unnecessarily complicated. For instance, up until very recently there had been very little testing (Reference 9) done to determine how well the new detection hardware works. Some questions that need to be answered include: is this vision system reliable, does it do the assigned task of obtaining reasonably accurate data, do the benefits outweigh the possible problems of the added complexity of the system, and how accurate is the data obtained by the system?

This report will attempt to show some of the strengths and weaknesses of the vision system and should answer the questions raised concerning the accuracy of the obtained data. Since all tests will be performed in the relatively controlled environment of a laboratory, the question of reliability under adverse conditions can not be completely resolved; only obvious reliability problems will be pointed out. Inherent limitations of the system due to the system configuration will be discussed. Finally, suggestions for future modifications to improve upon the system are presented throughout.

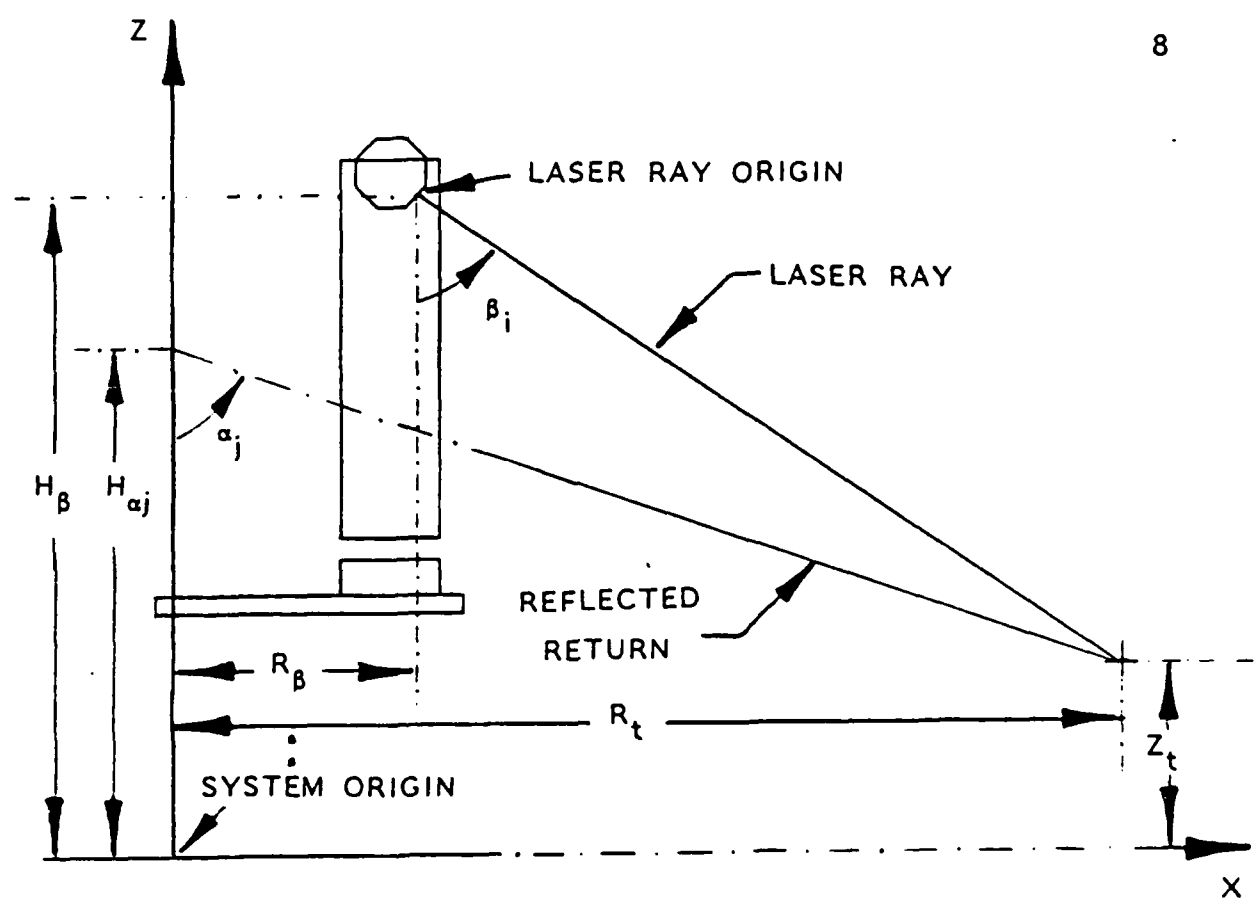
PART 2

ML/MD VISION SYSTEM THEORY

In order for the test results to be understood, it must first be understood how the Multi-Laser/Multi-Detector Vision scanning system works. Therefore, the concepts of Laser Triangulation and of the scanning laser are presented first.

2.1 Laser Triangulation

The idea of laser triangulation is that, given a known angle of a laser being fired and a known angle of a detector receiving the returning light rays, the height and range of the terrain can be determined through applied geometry. This concept and associated equations are shown in Figure 3. By firing the laser at a series of elevation angles at a constant azimuth it is possible to obtain height and range data of the terrain for any particular azimuth (see Reference 15). The heights and ranges are determined from the intersection points of the laser and detector angles. A system with 18 laser elevations and 19 detector angles is shown in Figure 4.



- R_B = FORWARD DISPLACEMENT OF LASER RAY ORIGIN
- H_B = HEIGHT OF LASER RAY ORIGIN
- β_i = ELEVATION ANGLE OF LASER RAY
- α_j = ANGLE OF LASER RETURN "SEEN" BY DETECTOR
- H_{α_j} = EFFECTIVE Z-AXIS INTERCEPT HEIGHT OF REFLECTED RETURN
- Z_t = TERRAIN HEIGHT AT OBSERVED TERRAIN POINT
- R_t = TERRAIN RANGE AT OBSERVED TERRAIN POINT

$$Z_t = \frac{H_B \tan \beta_i - H_{\alpha_j} \tan \alpha_j + R_B}{\tan \beta_i - \tan \alpha_j}$$

$$R_t = \frac{\tan \alpha_j ((H_{\alpha_j} - H_B) \tan \beta_i - R_B)}{\tan \beta_i - \tan \alpha_j}$$

FIGURE 3. TRIANGULATION EQUATIONS

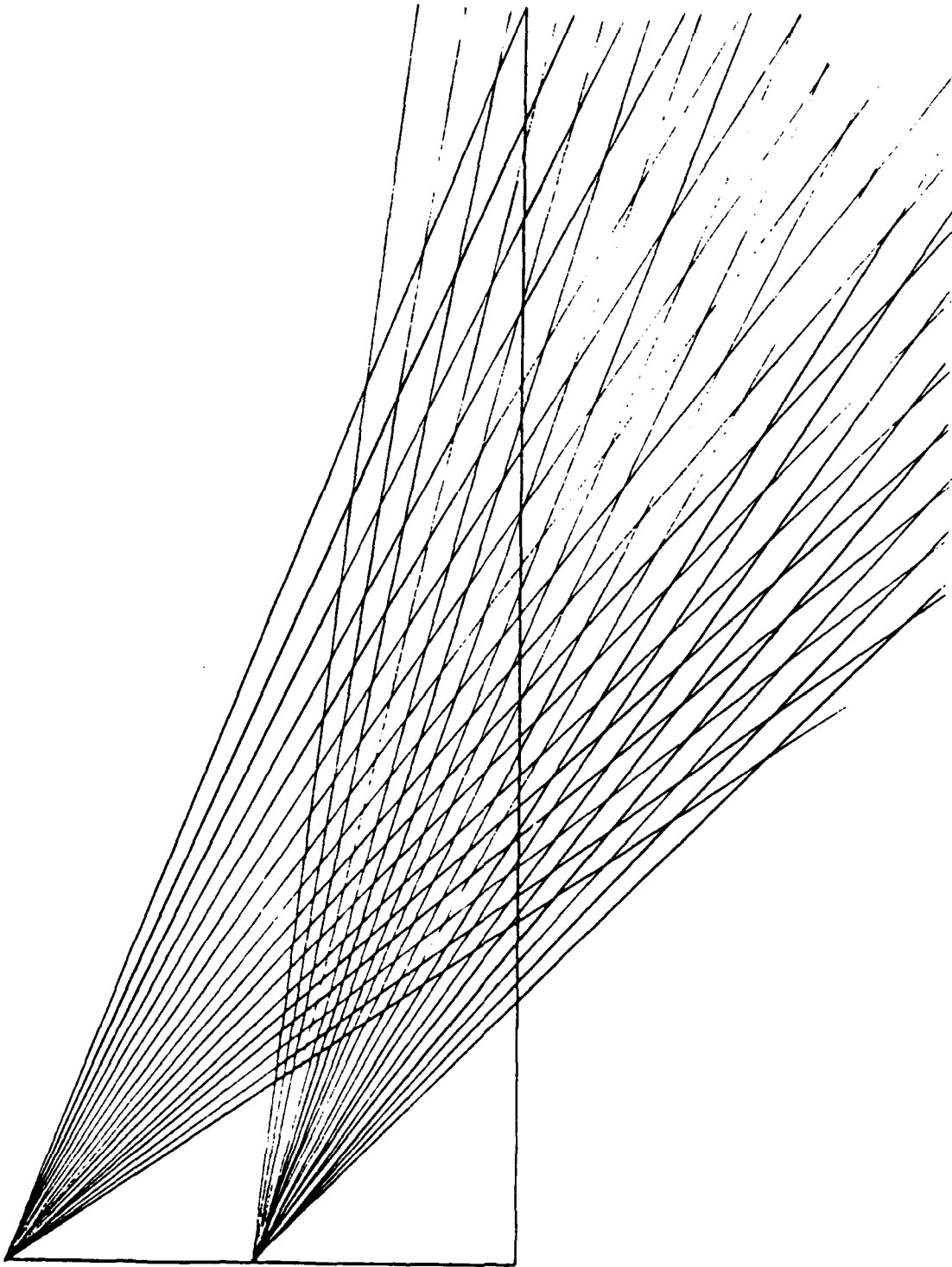


FIGURE 4. LASER/DETECTOR INTERSECTIONS

Assuming the use of a rotating or oscillating mast, which allows for several azimuths, there are at least two ways to produce several laser elevation shots per azimuth. One of these is to use several lasers, each firing at a slightly different elevation. Another method, the one used for the ML/MD system, is to use a single laser firing at multiple elevations to produce the effect of multiple lasers.

2.1.1 ML/MD Vision System Accuracy Factors

The accuracy of the data obtained by triangulation system depends on essentially three independent factors. They are: the laser characteristics, the detector characteristics, and the distance between the lasers and the detectors. The density of laser shots will affect resolution as depicted in Figure 5. The higher density of laser shots produces a more well defined envelope of the terrain. The angular resolution of the detectors is also a factor and is a function of the number of detectors and the desired total angular coverage. Finally, the accuracy is also affected by the distance between the lasers and the detectors as shown in Figure 6. Of these three factors, this one can provide the greatest improvement in accuracy in the easiest possible way, i.e. with just a simple change in component locations.

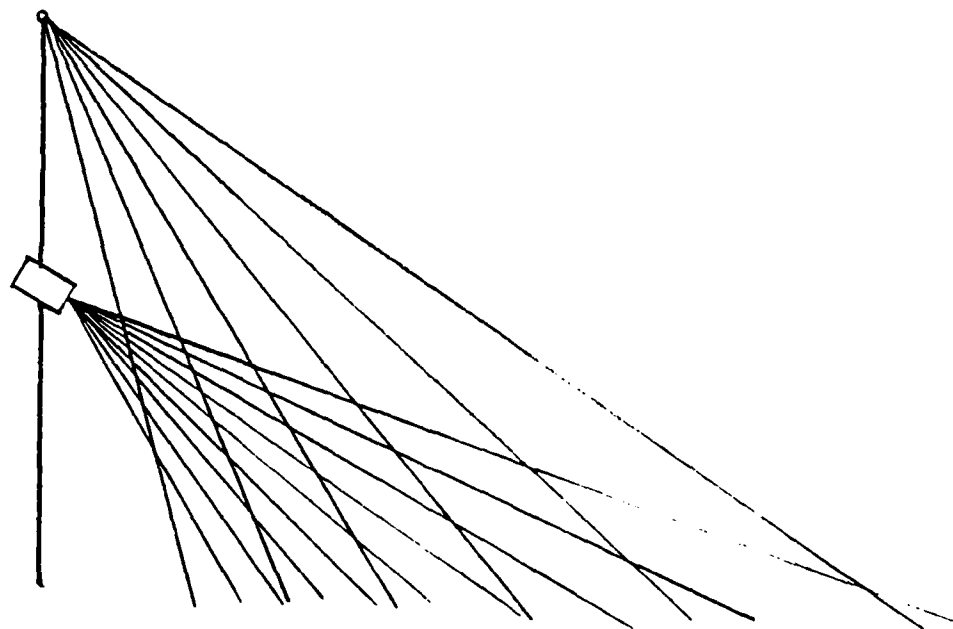
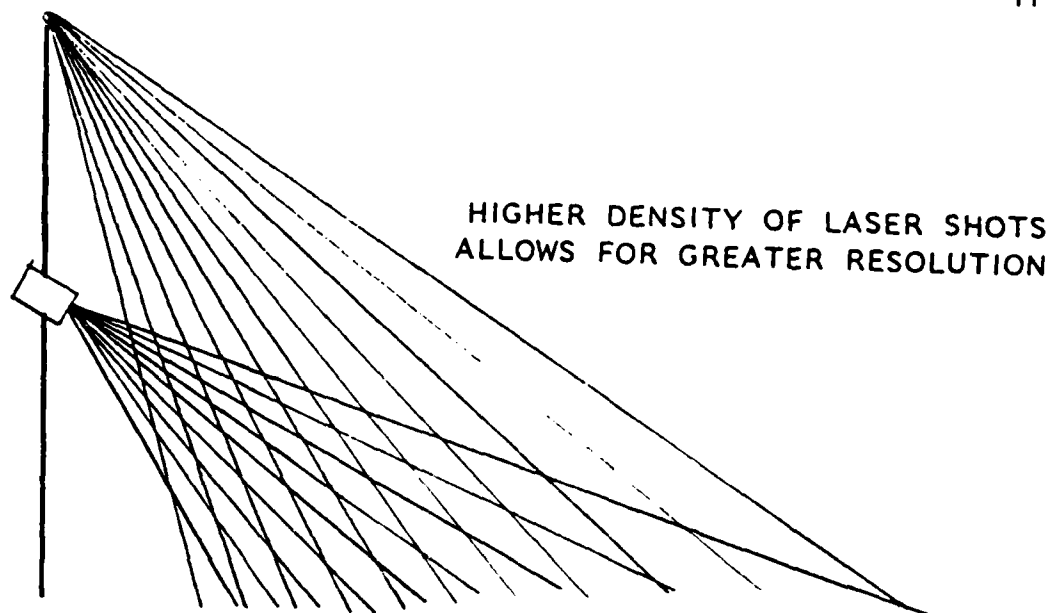


FIGURE 5. EFFECT OF LASER SHOT DENSITY ON RESOLUTION

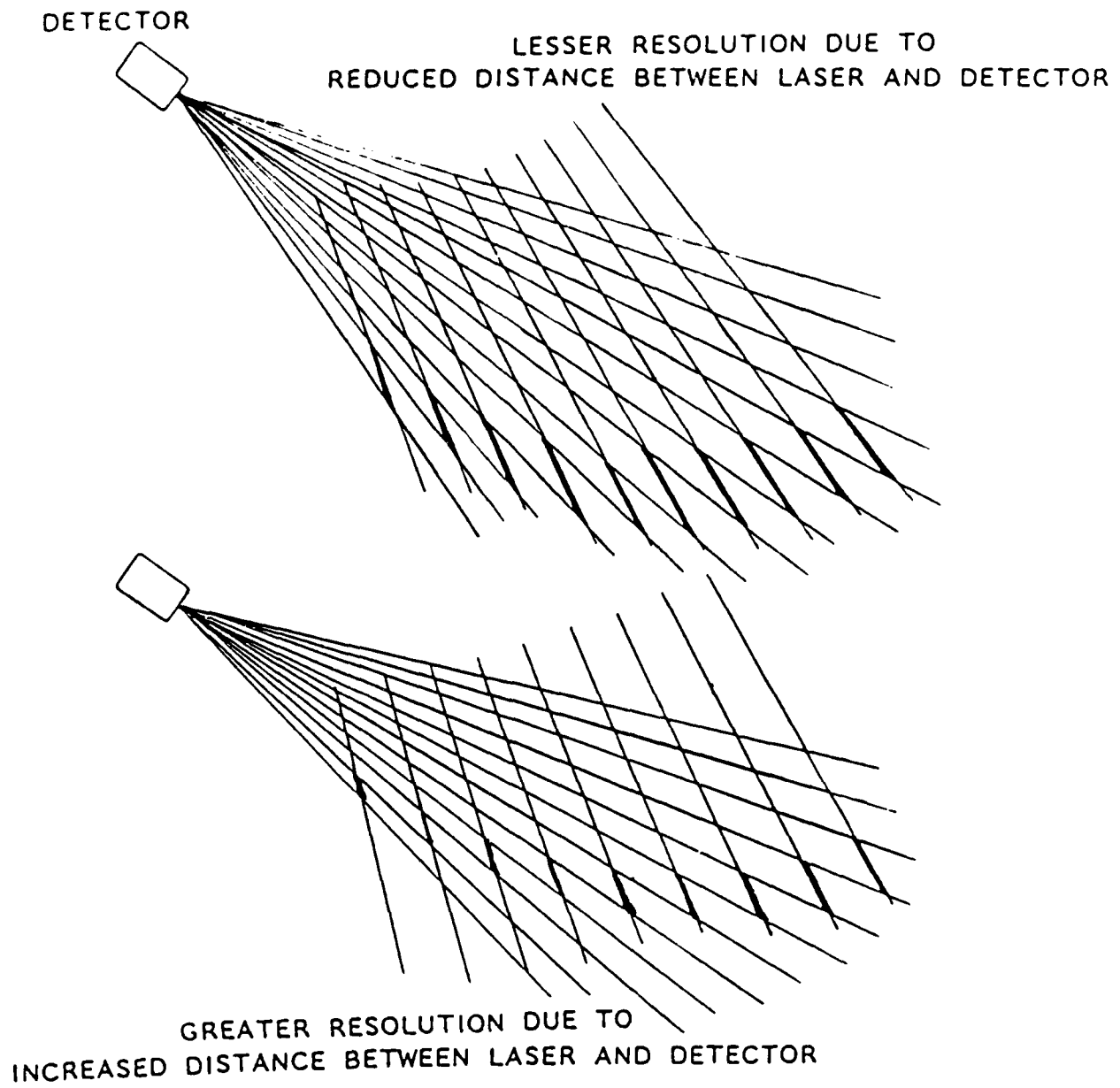


FIGURE 6. LASER/DETECTOR DISTANCE EFFECT ON RESOLUTION

2.1.2 Detector "Cone of Vision" Problem

A problem which arises from the application of this type of system is that the "cone of vision", which each detector possesses, unfortunately causes not a point, but a line segment of data to be considered a return for each detector. This problem, as illustrated in Figure 7 for step hazards and Figure 8 for slope hazards, is considered to be quite important in the determination of what is and what is not a hazard. For instance, if a step hazard is defined to exist whenever a step exceeds 25 cm (10 inches), but the system has a resolution of only 5 cm (2 inches) as a result of the "cone of vision" effect, it would be necessary to treat any hazard greater than 20 cm. (8 inches) as hazardous just to be safe. By the same token, if the system had a 5 degree angular resolution and a slope hazard is defined as any slope grade of greater than 30 degrees, then a slope encountered with a grade of 25 degrees must be treated as a hazard.

2.1.3 Laser Triangulation Justification

The justification for laser triangulation, as opposed to some other method to determine obstacle height and range, is the faster rate at which the obtained data can be analyzed. This is due, partly, to the fact that the single scan bit rate is only:

$$B=N(L) * \text{LOG}_2(N(L)) * \text{LOG}_2(N(D))$$

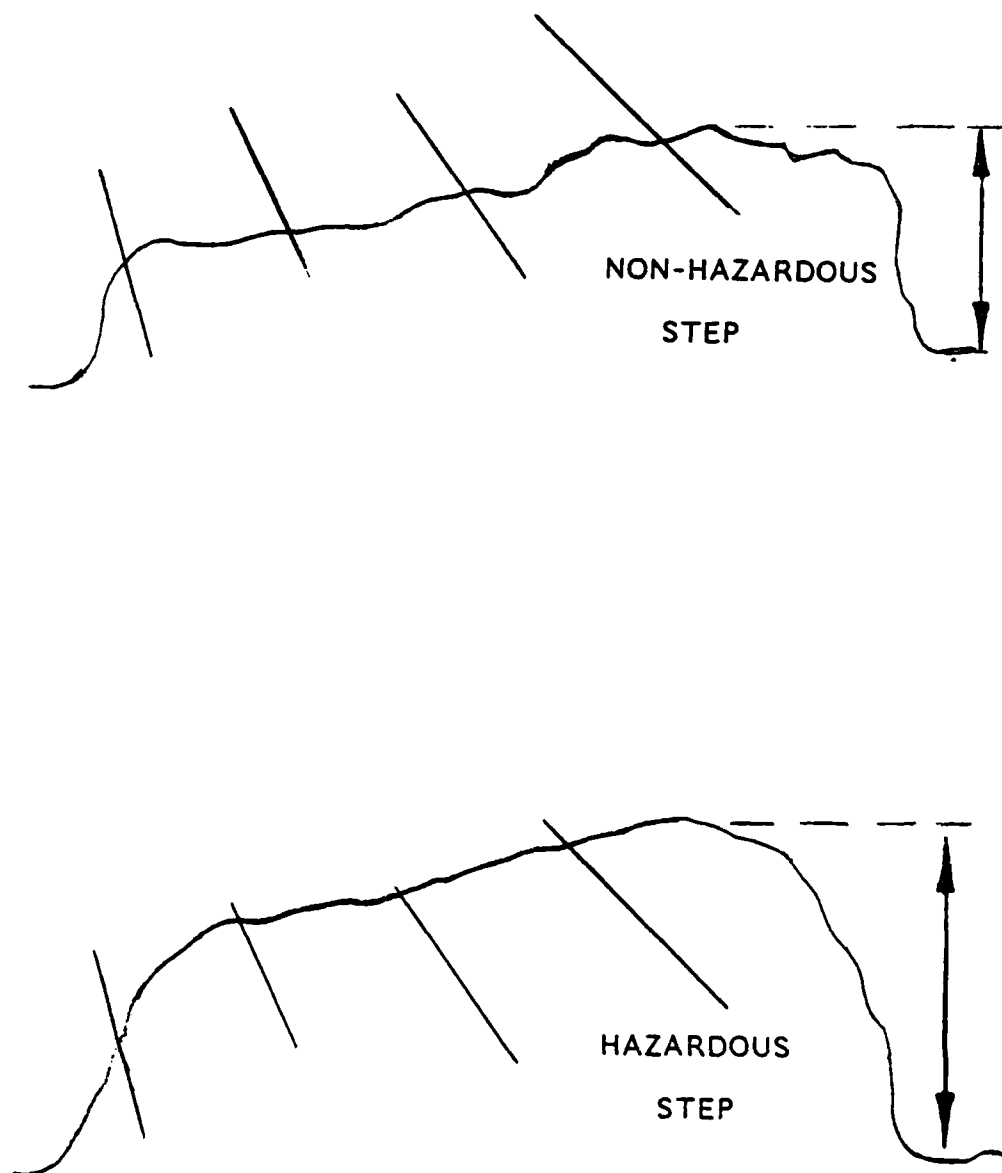


FIGURE 7. "CONE OF VISION" EFFECT ON STEP HAZARDS

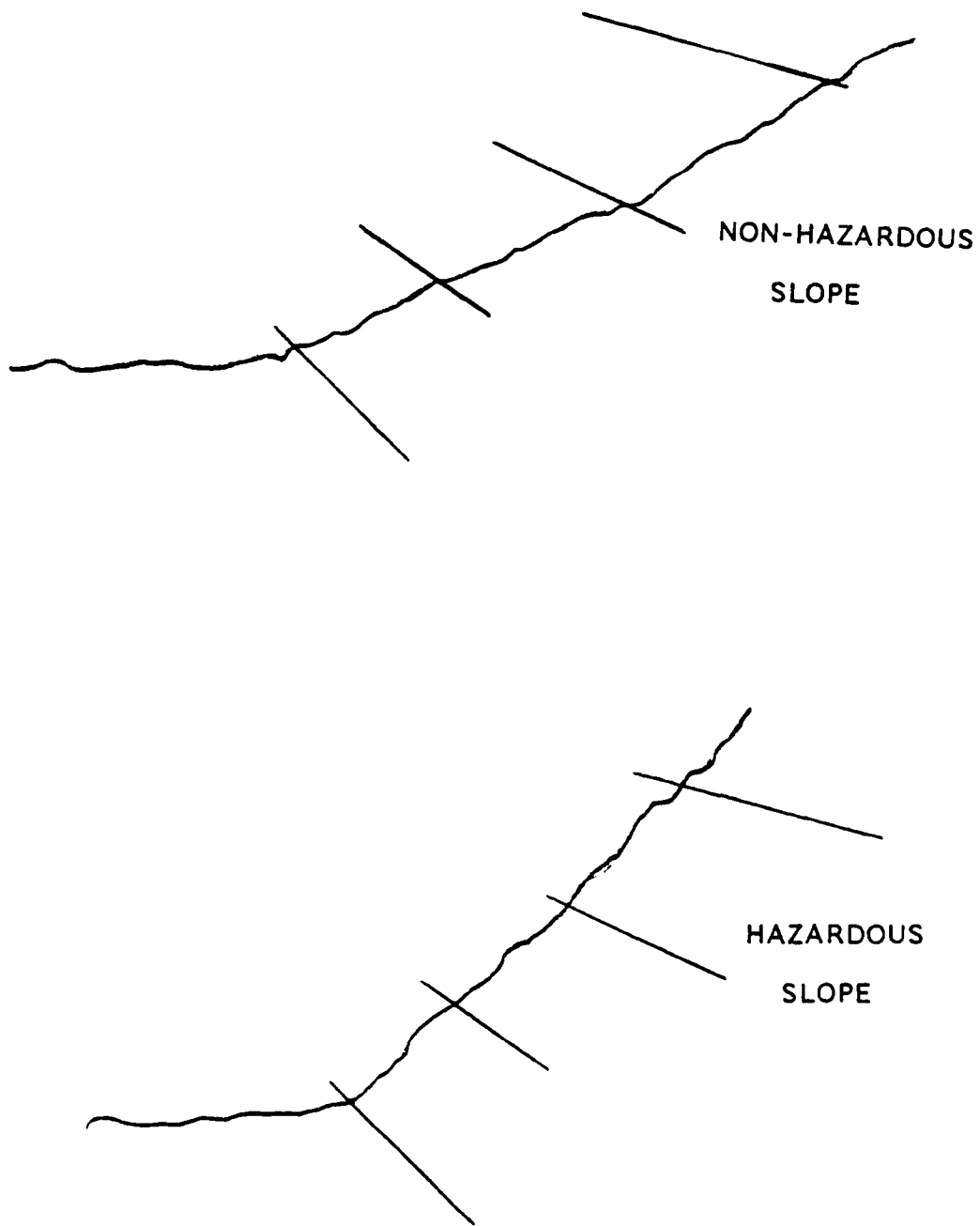


FIGURE 8. "CONE OF VISION" EFFECT ON SLOPE HAZARDS

where:

B is the number of bits per scan

N(L) is the number of laser shots fired

N(D) is the number of detectors used

For instance, if there were 1024 laser shots fired per scan and 64 detectors used, the number of bits required would be $1024 \times 10 \times 6$ or 61440 bits per scan. If a scan were to occur once every 3 seconds, this would require data to be processed at a rate of about 20000 bits per second which can be handled quite easily, even by some microprocessors. For comparison, digitized voice processing requires an even higher rate. Another advantage which a laser triangulation system has over other systems is that each laser shot fired is tagged, meaning that each shot is fired at known azimuth and elevation angles. The advantage that this provides is that with known detector angles the determination of the height and range are a matter of plugging all of this information into a simple geometric equation.

What has not been attacked are the drawbacks which laser triangulation has. For instance, the resolution of a laser triangulation system is usually limited. Increasing the density of laser shots as well as increasing the number of detectors would increase it. Unfortunately, either one of these fixes would also increase the number of bits required to obtain a complete scan. In the case of the

Mars Rover vision system, these problems do not apply because a high resolution is not required.

2.2 Concept of the Scanning Laser

The Multi-Laser/Multi-Detector (ML/MD) vision scanning system works by firing a single laser through a series of elevations and azimuths and then receiving the reflections from the terrain back upon an array of detectors. By using a single fixed position laser firing at a rotating mirror, the cost and weight of the system are greatly held down. Also, the complexity of the drive electronics is reduced as only a single laser need be contended with. In addition, the amount of calibration required for the system is slight. If a rotating mirror is used, as in the case of the RPI Mars Rover, the mirror should be positioned with respect to a shaft encoder. This way, any elevation angle within the resolution of the encoder is available.

2.3 ML/MD Vision System Data Interpretation

The data obtained by an ML/MD vision system must be interpreted somehow. If what was described above with respect to the resolution was enough to completely describe a given terrain, then all that is necessary would have been said. But, there are other factors which have not, as yet, been pointed out. The most obvious of these

is that the information obtained must be interpreted with respect to the orientation of the vehicle. This information could be provided by gyroscopes giving the relative pitch and roll of the vehicle. For instance, if the vehicle were on an up-slope, then steps of lower magnitude than those acceptable when the vehicle is on flat ground would be tolerable. This is illustrated in Figure 9.

Another factor that must be considered is what to do about laser shots fired for which there are no detected returns. Two examples of this are shown in Figure 10. As can be seen in each of these Figures, the unknown terrain may or may not be hazardous. Because of this ambiguity, it must be assumed that whenever there are no returns, the unknown terrain is hazardous. This means that even with no returns, there is information conveyed, specifically that there is a hazard present.

The programs which do these interpretations are not the subject of this paper. They are mentioned merely for completeness. Only the modeler will be discussed later in any detail. Information about how this software works is available in References 4, 9, and 10.

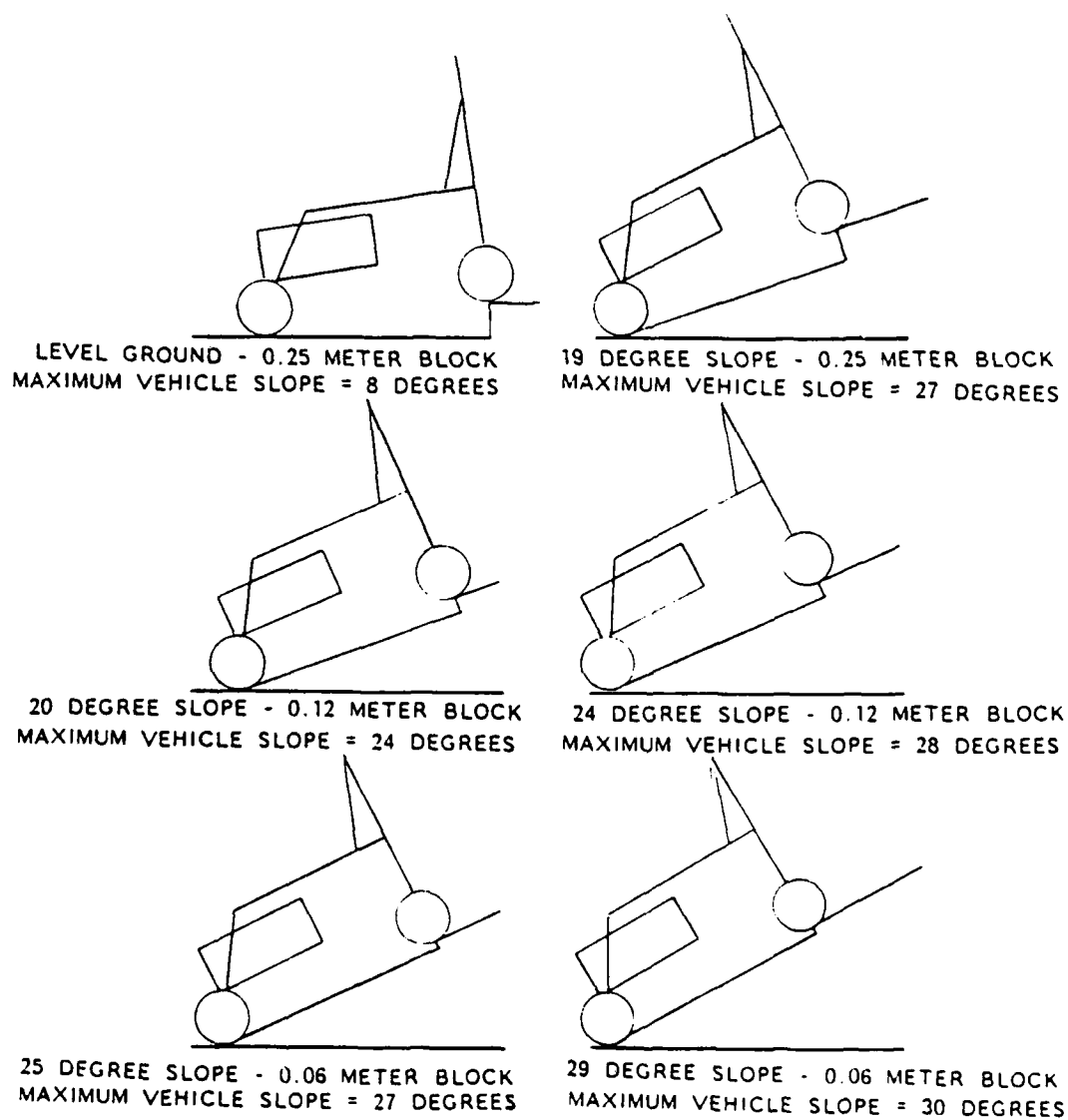
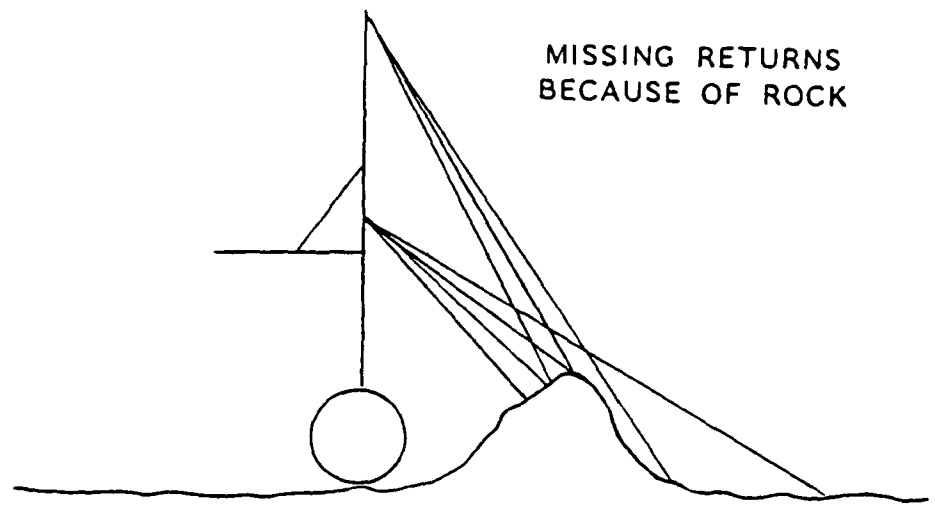


FIGURE 9. INCREASING SLOPE EFFECT ON STEP HAZARDS

MISSING RETURNS
BECAUSE OF ROCK



MISSING RETURNS
BECAUSE OF HILLTOP

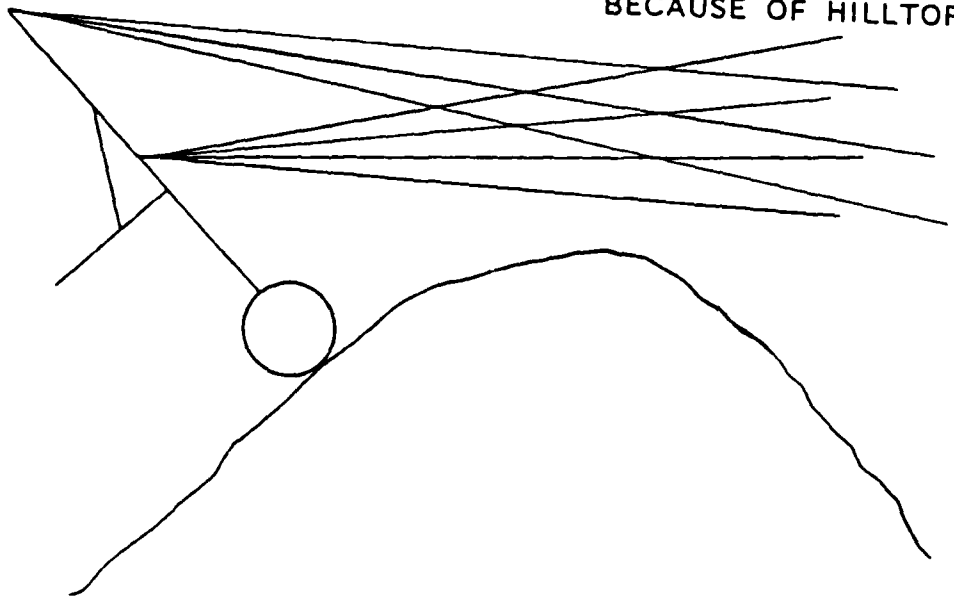


FIGURE 10. EXAMPLES OF MISSING RETURNS

PART 3

OVERVIEW OF VISION SYSTEM

Before the test results of the RPI Mars Rover vision system are discussed, an overview of the vision system's hardware and software components will be given. Figure 11 presents this system in a block diagram form. The separate components are described in detail below.

3.1 Mast and Associated Electronics

The electronic hardware used on the vision system for the Rensselaer Mars Rover consists of several components. The laser and the detector array are housed in the rotatable mast. The semiconductor laser is capable of producing infrared light pulses with a wavelength of 904 nm and a peak power of 100 watts at a 10000 hertz rate with a .04 percent duty cycle. The light from the laser is focused by a lens and then reflected from a rotating 8-sided mirror. This reflected light then hits the terrain. Some portion of whatever light reflected from the terrain passes through the 35 mm camera lens and onto a photodetector diode array. The photodiode array consists of 20 photodiodes with a common cathode mounted in a 20 pin DIP (Dual Inline Pin) package.

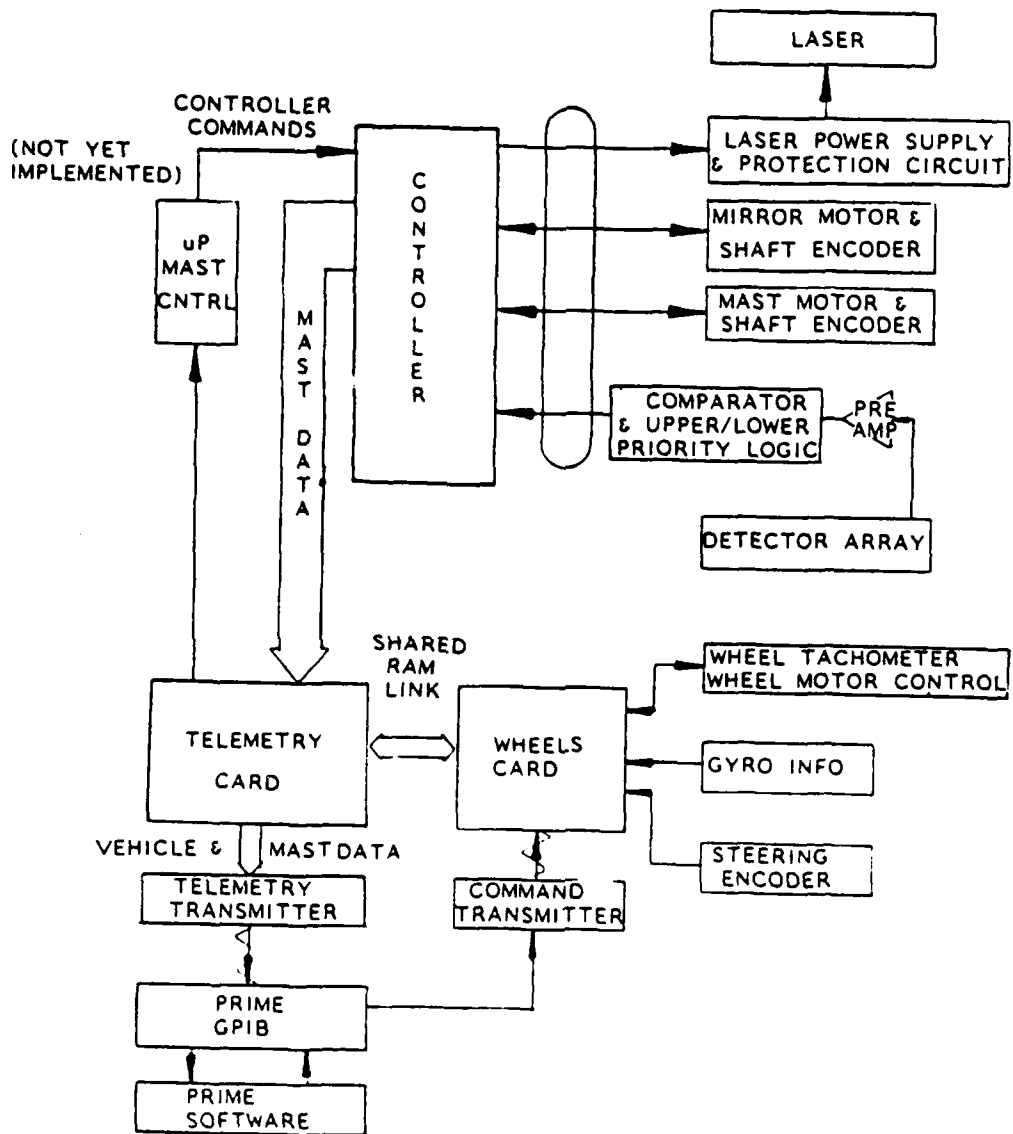


FIGURE 11. BLOCK DIAGRAM OF VISION SYSTEM

Each photodiode is connected to an integrated circuit operational amplifier. Comparators then determine whether or not a particular photo-diode received any of the return light and the upper and lower detector numbers of those hit are determined. These numbers are fed through slip rings to the control circuitry in the non-rotating back of the mast (see Reference 11). The mast is shown in Figure 12.

The rotation of the mast, the rotation of the 8-sided mirror, and the timing for firing the laser are controlled by electronics on five circuit cards located on the back of the mast (see References 3 and 7). These cards are supplied the position of the rotating mirror by a shaft encoder which puts out 2048 pulses per revolution along with a zero pulse. The information makes available 256 different elevation angles between 0 and 90 degrees (8 times per revolution of the mirror). There is also a shaft encoder which identifies the azimuth position of the mast. This encoder allows up to 256 different azimuth angles; some of which cannot be used because they occur in the back of the scan. When a laser pulse is fired, 32 bits of information are shifted into FIFO (First-In-First-Out) memories. These are end of scan, end of azimuth, azimuth number, elevation number, upper detector returned number, and lower detector returned number.

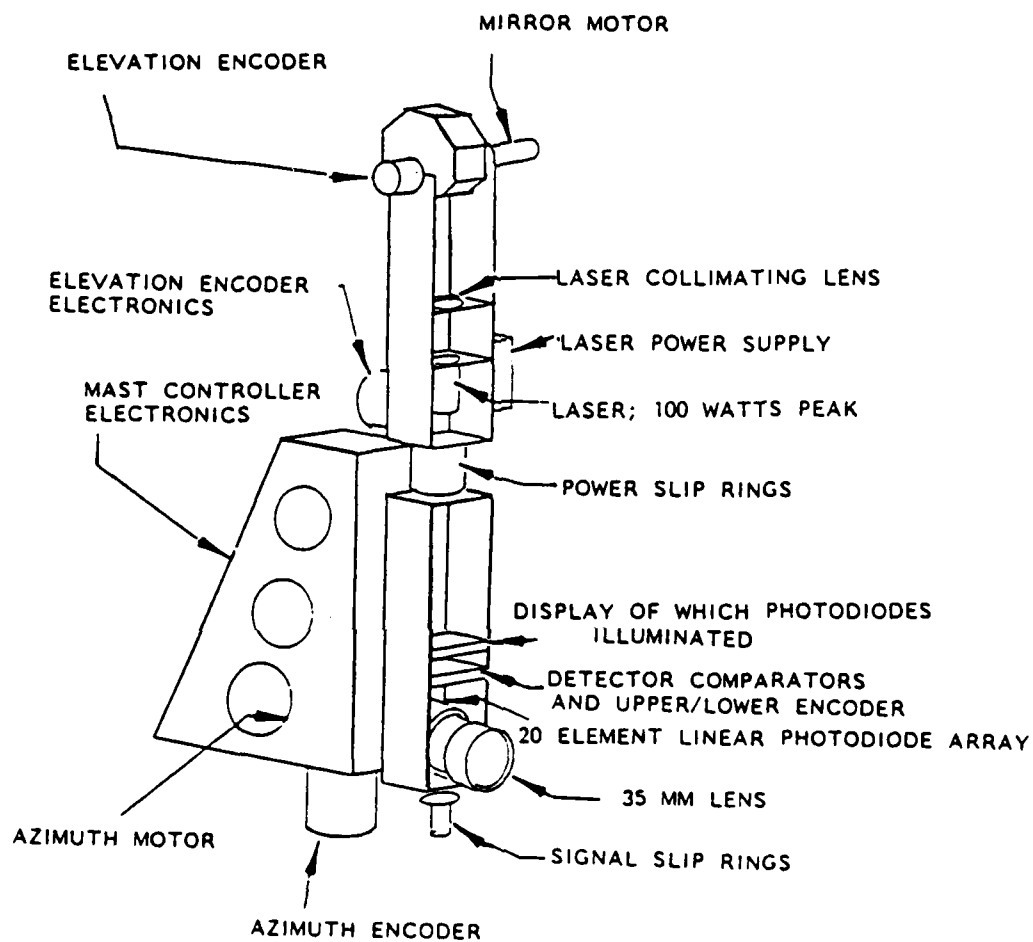


FIGURE 12. MULTI-LASER/MULTI DETECTOR MAST

3.2 Telem card

All of the data shifted into the FIFOs, as well as the data describing the vehicle's current status must be buffered and sent to the computer running the realtime control routines. The vehicle status data includes information on the wheel speeds, the gyro angles, and the steering angle. This is done by the telemetry stand-alone microprocessor board located in the vehicle card cage (see Reference 2). The program TELEM6.TC currently runs the processor. This program acts as both a diagnostic tool as well as a data flow controller. It's output display, shown in Figure 13, tells immediately if there are any major faults with the data coming from the mast. When a period is printed, vehicle data for a particular scan has just been sent. The number shown to the left of each colon is an azimuth number and the number shown to the right of the colon is the number of elevation shots fired for that particular azimuth. At the end of scan 'EOS' is printed, as well as the number of azimuths and the total number of laser shots fired. Any deviation from the defined laser shot numbers can easily be detected from this displayed output. A listing of TELEM6.TC can be found in Appendix Section 7.1.

```
.....00:32.01:32.02:32.03:32.04:32.05:32.06:32.07:32.08:32.09:32.10:32.11:32.
12:32.13:32.14:32.15:32.16:32.17:32.18:32.19:32.20:32.21:32.22:32.23:32.24:32.25
:32.26:32.27:32.28:32.29:32.30:32.31:32
EOS 32 1024

.....00:32.01:32.02:32.03:32.04:32.05:32.06:32.07:32.08:32.09:32.10:32.11:32.
12:32.13:32.14:32.15:32.16:32.17:32.18:32.19:32.20:32.21:32.22:32.23:32.24:32.25
:32.26:32.27:32.28:32.29:32.30:32.31:32
EOS 32 1024

.....00:32.01:32.02:32.03:32.04:32.05:32.06:32.07:32.08:32.09:32.10:32.11:32.
12:32.13:32.14:32.15:32.16:32.17:32.18:32.19:32.20:32.21:32.22:32.23:32.24:32.25
:32.26:32.27:32.28:32.29:32.30:32.31:32
EOS 32 1024
```

FIGURE 13. OUTPUT FROM TELEMETRY PROCESSOR CARD

3.3 Prime GPIB

The data which the telemetry board handles is sent via two coaxial cables to a PRIME 750 in the RPI Image Processing Lab, JEC Room 2318. The data enters the Prime via a GPIB (General Purpose Interface Board) (see Reference 5). This board controls a DMT (Direct Memory Transfer) into the main memory of the Prime computer. The board itself is controlled by the device driver TSROVR (see Reference 12).

3.4 Prime Computer Programs

There are basically three types of routines which use the data once it has made its way into the Prime Computer. The first of these routines are the realtime routines which take given data, determine what hazards exist, and decide what the Rover should do next; stop, turn, go, etc. As of the time this paper was written, the actual path selection routines on what the Rover's next move should be have not been used in realtime. However, they have been used in simulation (see Reference 10). In addition to the realtime routines, there are the post processing routines. These routines allow the user to look at the data. In fact, the various graphs in this paper were produced using the post-processing routines. A descriptive list of the names and particular functions of these routines can be found in the project report MP-80 (Reference 9).

The third type of routines are used for mast calibration. This routine is actually a form of a post-processor, but it is meant to be used only when, for some reason, some mast parameter needs to be changed. The calibration routines are especially useful in calibrating detector angles and elevations. Due to system limitations, it is almost impossible to make the detector's cone of vision identical for every detector, therefore, attempting to measure by hand the cone of vision's precise center for each detector also becomes an almost impossible task. Since the elevation angles at which the laser fires are known, detector calibrations can be achieved by feeding the mast known terrains at known slope angles. Since the only unknowns involved in obtaining this data are information relating to the detectors, these unknowns can be solved for. After several different slopes have been obtained, guaranteeing all detectors have received returns from more than a single laser elevation angle, a table of detector angles and heights can be created through linear regression (see Reference 9).

3.5 The Modeler

The heart of the realtime routines is the modeler. This is a subroutine which takes the given raw laser and detector data and produces a list of hazards for each scan. Then, it divides the hazard analysis into two categories. The first of these is in-path hazard analysis. In-path hazard analysis detects hazards which exist along a

particular azimuth. These types of hazards are step hazards, slope hazards, and insufficient data hazards. The other type of hazard analysis performed is cross-path hazard analysis. These hazards are those created by two adjacent valid azimuths which when next to each other produce a hazard, but do not necessarily constitute hazards when found without the other.

3.5.1 What the Modeler Does with the Data

Although a complete description of how the modeler works will not be given here (see References 9 and 10 for more), a general flowchart as well as equations of particular interest are discussed below. The in-path analysis is done for each azimuth one at a time. The first process is changing the incoming upper/lower detector number inputs to index values. Next, they are placed in the order of increasing range. Points which could be the sources of sensor quantization errors as well as those considered too distant in range are removed. Finally, the actual analysis begins starting with the determination of whether there are enough returns or whether the most distant return is too close. The data used for cross-path hazard analysis is extracted at this time for later use. Slope and step hazard cataloguing follows. After all in-path analysis has been completed, cross-path analysis is applied. The cross-path analysis compares characteristics of adjacent azimuths with valid data to determine the presence of either a cross-slope or a cross-step hazard. Both

cross-slope and cross-step hazards are lumped together as cross-path hazards. When the cross-path analysis is complete, the work of the modeler is finished.

3.5.2 Modeler Slope Hazard Equations

The modeler determines the slopes in an azimuth by taking the arctangent of the height difference divided by the range difference for each pair of valid adjacent elevation shots. The key to the modeler's ability to detect a slope hazard is the following equations:

$$CS=(1-B)*ARCTAN((TZ(J)-TZ(J-1))/(TR(J)-TR(J-1)))+B*OLDCS$$

$$ESTSLOPE=AZSLOPE+CS$$

where for a particular azimuth:

J - counter from 2 to the number of valid laser returns.

CS - the current elevation pair unadjusted slope estimate.

OLDCS - the previously determined value of CS.

TZ() - height (z-axis) coordinate array for each elevation.

TR() - range coordinate array for each elevation.

AZSLOPE - the adjusted zero slope with respect to the planet's coordinates and vehicle orientation. This value is determined using gyro and azimuth number information.

ESTSLOPE - the estimated, adjusted slope determined for the current elevation pair. Whenever this value is greater than the slope threshold, a slope hazard is flagged.

B - a coefficient which determines how much of the previous will be used in the current slope determination. Its values ranges from -1 to 1.

Of the above mentioned parameters, the coefficient B has the greatest impact on the estimated slope value. It determines how much smoothing of the slope occurs by injecting B amount of the previous slope into the current slope. This smoothing action helps to distinguish slope hazards from step hazards since step hazards consist of relatively high frequency variations. This low pass filter effect can be quite dramatic as shown in the testing.

3.5.3 Modeler Step Hazard Determination

The modeler is set up to determine step hazards using three separate pieces of information. These are: actual height variations, vehicle orientation information, and slope information. The reason for the use these last two pieces of information may not seem obvious, but will be explained here. As was stated earlier in THEORY, the vehicle's ability to negotiate a step decreases as the presence of a slope in the same direction as the step increases, but not vice versa. Therefore, it is necessary for the slope values, determined by the above method, to be injected into the step hazard analysis.

3.5.4 Classification of Hazards

There are six types of hazards which are classified by the modeler: step hazards, slope hazards, insufficient data hazards, most distant return to close hazards, cross-path hazards, and bad data hazards. The first four of these are determined by analysis of data returned in a single azimuth. The cross-path hazards are determined by intra-azimuth analysis. A bad data hazard is usually the result of some hardware element of the system failing. A more in-depth description of each of these follows.

3.5.4.1 Step Hazards

A hazard in which wheels of the vehicle cannot properly maneuver is known as a step hazard. Examples of step hazards include protrusions, such as rocks, and depressions, such as holes. Since the wheel radius is 25 cm. (10 in), a height greater than this would not allow the vehicle's wheels to negotiate it. In the case of a hole deeper than 25 cm. (10 in), the wheels could certainly get in, but there would be no guarantee that they could get out again. Also, just because the wheel got into a hole doesn't mean that it did so undamaged.

3.5.4.2 Slope Hazards

A slope hazard is defined as a hazard whose slope is greater than that which the vehicle can properly negotiate. An example of this type of hazard is hilly terrain. The nature of the dangers slope hazards present can be quite complicated. For instance, the vehicle might be on a progressively steeper hillside (as in Figure 14A). If the change is very gradual, the scanning laser, alone, will not notice the change. The other parts of the system, specifically the gyros, would be depended upon to supply the missing information. However, the ML/MD system is necessary for recognizing the presence of a sharp slope hazard before the vehicle actually encounters it. An example of such terrain is shown in Figure 14B.

3.5.4.3 Insufficient Data

When, for some reason, less than one-fourth of the total number of laser shots for an azimuth have returns accounted for, an insufficient data hazard is flagged. The reasons for not enough data being returned range from encountering a terrain with poor reflective properties to hardware failures.

The reflective properties of materials vary from excellent to terrible. As was determined (see Reference 9), the amount of light returned from such materials as black slate was not detected by the

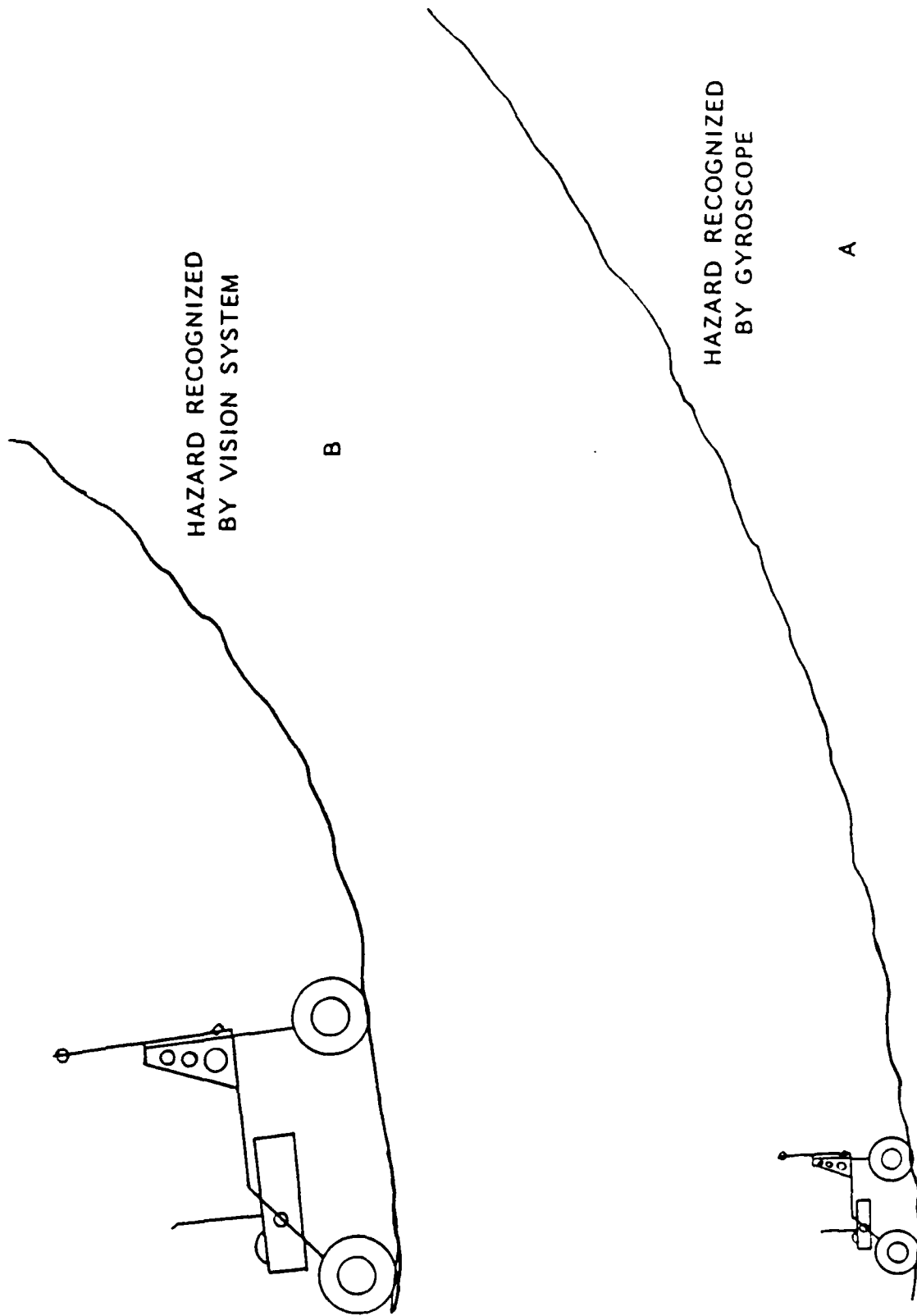


FIGURE 14. VEHICLE APPROACHING DIFFERING SLOPE GRADES

detectors at any range with any aperture settings. The most likely explanation for this occurrence is that the black slate in question simply absorbed all, or almost all, incident infrared light on its surface. On the other hand, a material like brown cork reflected more light than black slate but less than wood. What this indicates is that different materials reflect infrared light differently. A material such as dry garden dirt, whose reflective ability was analyzed this year, reflects slightly better than the light brown cardboard analyzed last year. In any case, the poor reflective properties of a material could certainly account for an insufficient data hazard.

Hardware failures, given the number and complexity of components in a system like this, are almost inevitable. A particular problem which has crept up occasionally has been detector amplifier oscillations. Because returns are considered invalid when the upper and lower detector numbers differ by more than 1, an oscillation in a particular detector amplifier will cause most of the data from that scan to be disqualified resulting in an insufficient data condition.

3.5.4.4 Farthest Return Less Than 1.5 meters Away

When the terrain is such that the furthest laser return in a particular azimuth is less than 1.5 meters, the terrain further than this is classified as unknown and is automatically assumed to be hazardous. The reason this is flagged as a special hazard is that the

vehicle would have to back up to avoid anything that was any closer. Thus, this type of hazard must also be avoided.

3.5.4.5 Crosspath Hazards

A cross path hazard is defined to be an occurrence of 2 adjacent azimuths where, alone, the terrains do not necessarily constitute a hazard. But, when the terrains are next to each other, a hazard results. Both slope and step hazards are classified as crosspath hazards when either is encountered during crosspath analysis. However, the criterion for determining whether or not a slope or step hazard is present is more rigorous than the criterion applied for in-path analysis. This is because of the filtering which takes place before the crosspath analysis. The result is that it is possible for a certain terrain to be flagged with a crosspath hazard if the mast were viewing it from one angle, but would not register with a hazard when viewed from another angle. A typical crosspath hazard would be a boulder edge encountered in one azimuth and a hole encountered in an adjacent azimuth. This is depicted in Figure 15.

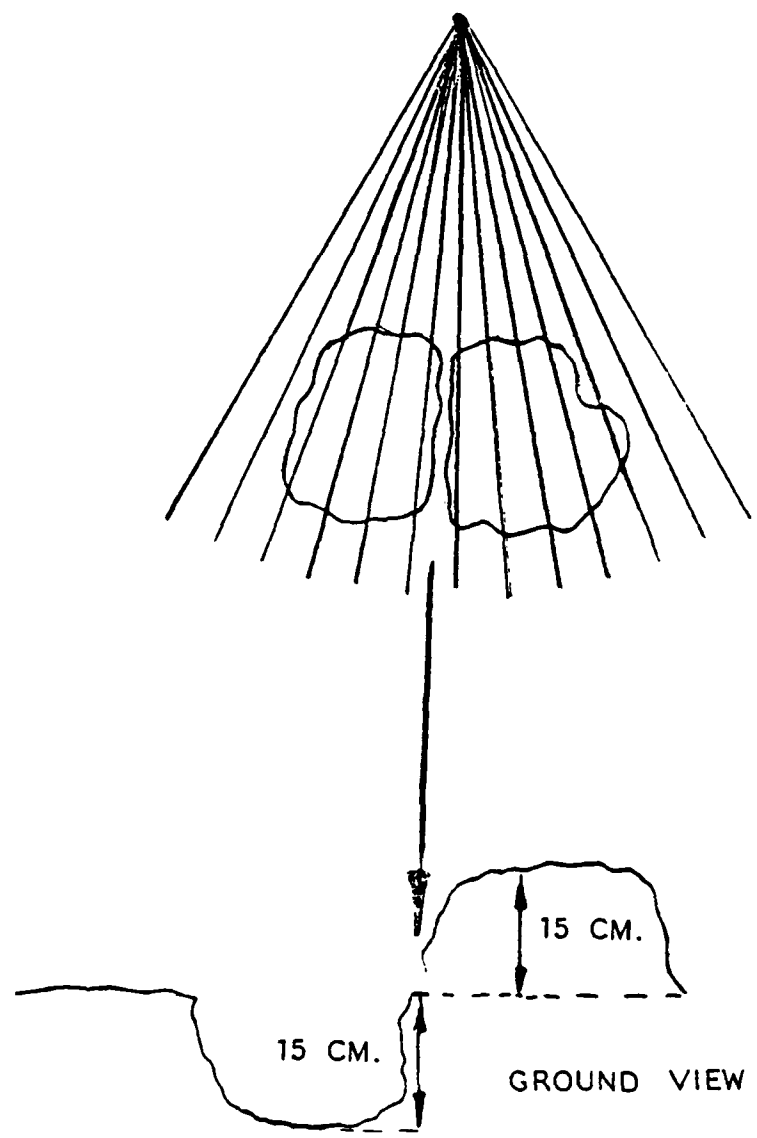


FIGURE 15. CROSS PATH HAZARDS

3.5.4.6 Bad Data

If the data obtained from the mast can not be interpreted, then another type of hazard must be catalogued. This type of hazard would occur if there was illegal or improper information supplied to the modeler compared to what is expected. For instance, there are supposed to be 32 azimuths, but, if for some reason 33 azimuths were fired, a bad data error would be flagged. The same is true if the number elevations fired differed from the number expected for a particular azimuth. A bad data error could be attributed to either a hardware failure, setting up the realtime software parameters with no consideration of the actual hardware used, or both. Bad data also raises questions concerning the reliability of theof the received data. As all bad data is thrown out, consistently bad data means that the Mars Rover vehicle would have to be commanded to stop until the bad data problem is solved.

PART 4

TESTING PROCEDURES

All testing was performed indoors on a concrete floor at a room temperature of approximately 23 degrees Centigrade (74 degrees Fahrenheit). The mast was rotating at approximately 16 revolutions per minute with the laser firing 32 azimuths each with 32 elevations. The azimuth and elevation firing angles used can be found in the tables in Figure 16. For all tests, the lens aperture was opened to 5.6 and the lens focus setting was .45 meters (note that this does not correspond to the settings on a camera since location of the photodiode array does not correspond to where the film would have been). The mast pitch and roll were each 90 degrees. The ground, for all tests except for the hole tests was 36 cm (14 in) below vehicle ground. With this in mind, the effective detector height was 1 meter above vehicle ground and the effective laser height was 2 meters above vehicle ground. The data was collected using the program RECV2, it was run through the modeler using EXEC.POST2, and the graphs were generated using VIEW.MDL (for an explanation of these programs, see Reference 9).

Azimuth Number	Angle (degrees)	Elevation Number	Angle (degrees)
1	-43.56	1	23.56
2	-40.74	2	24.61
3	-37.93	3	25.66
4	-35.13	4	26.71
5	-32.31	5	27.76
6	-29.50	6	28.80
7	-26.69	7	29.85
8	-23.88	8	30.90
9	-21.08	9	31.95
10	-18.26	10	33.00
11	-15.45	11	34.05
12	-12.64	12	35.10
13	-9.84	13	36.15
14	-7.02	14	37.19
15	-4.22	15	38.24
16	-1.41	16	39.29
17	1.40	17	40.34
18	4.21	18	41.39
19	7.02	19	42.44
20	9.83	20	43.49
21	12.64	21	44.54
22	15.45	22	45.59
23	18.26	23	46.63
24	21.07	24	47.68
25	23.88	25	48.73
26	26.69	26	49.78
27	29.50	27	50.83
28	32.31	28	51.88
29	35.12	29	52.93
30	37.93	30	53.98
31	40.74	31	55.03
32	43.55	32	56.07

TABLE OF AZIMUTH ANGLES

TABLE OF ELEVATION ANGLES

FIGURE 16. TABLES OF AZIMUTH AND ELEVATION ANGLES

Terrains were created using cardboard sheets and boxes with reflective properties similar to those of dry dirt. It should be noted that detectors 6 and 11 were not functioning at the time of testing.

4.1 Single Step Tests

The first type of hazards tested for were step hazards. A rectangular (66 by 61 cm (26 by 24 in)) step was placed approximately 1 meter in horizontal distance from the front of the mast. There were 8 different step levels tested using heights from 5 cm to 45 cm (2 to 18 inches) in 5 cm (2 in) increments. The step size which was defined in the modeler to be a step hazard was 25 cm (10 in). The resulting graphs and data descriptors for heights of 20, 25, and 30 cm. (8, 10, and 12 in) are shown in Figures 17, 18, and 19. As can be seen, a step hazard was flagged at the desired step threshold height. Also, the height determined was very close to the actual height of the obstacle.

4.2 Slope Tests

Because the values of the slope coefficient B and the slope threshold determine how the modeler interprets the data, with respect to slope hazards, the parameters were varied to demonstrate the modeler's reactions. The test itself consisted of placing a ramp 183 cm long by 66 cm wide (72 by 26 in) in front of the mast. The distance

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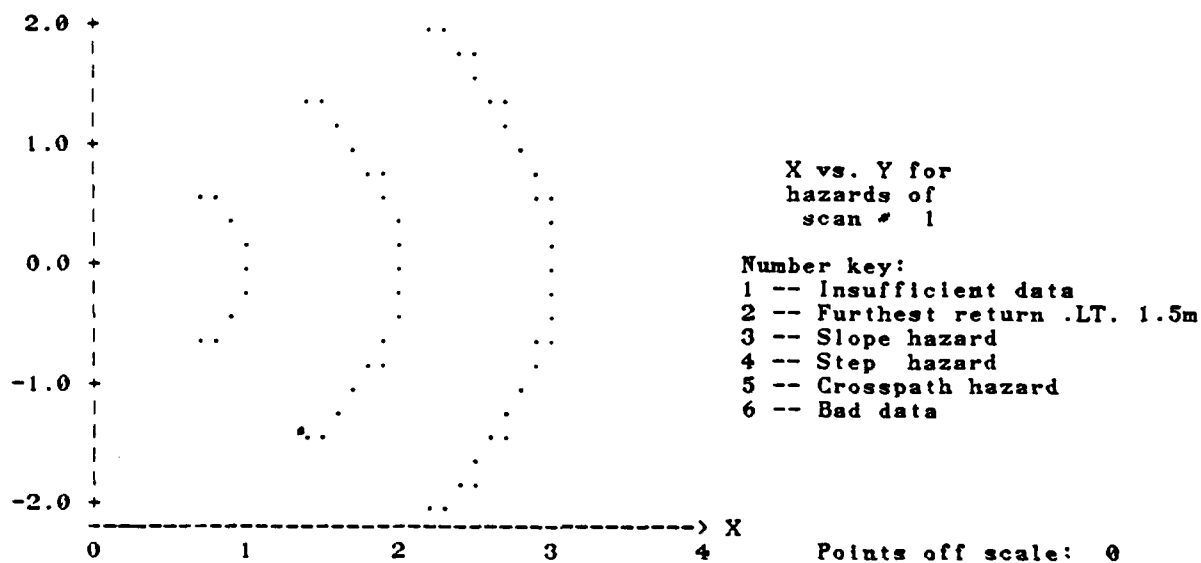
File Creation Date : WED, JUL 27 1983

System time 16:15:17

```

** MODEL1 PARAMETERS **
HEIGHT FILTER COEFFICIENT = 0.25
SLOPE FILTER COEFFICIENT = 0.90
LEVEL GROUND STEP THRESHOLD = 0.25 METERS
SLOPE THRESHOLD = 30.00 DEGREES

```

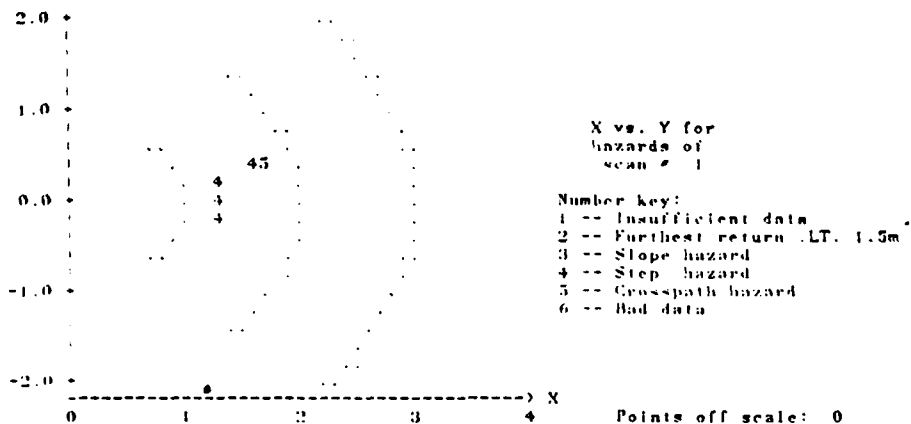


NO HAZARDS CATALOGED THIS SCAN

FIGURE 17. 20 CM STEP TEST

Input file: HDLSTEP.10
 File Creation Date: WED, JUL 27 1983 System Time 16:26:48

** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT : 0.25
 SLOPE FILTER COEFFICIENT : 0.90
 LEVEL GROUND STEP THRESHOLD : 0.25 METERS
 SLOPE THRESHOLD : 30.00 DEGREES

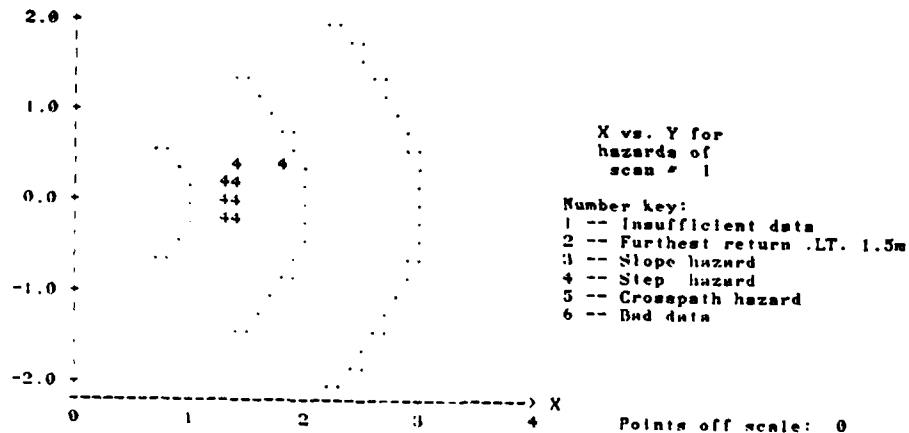


AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S			C A T A L O G E D
2	-40.74	NO	H A Z A R D S			C A T A L O G E D
3	-37.93	NO	H A Z A R D S			C A T A L O G E D
4	-35.13	NO	H A Z A R D S			C A T A L O G E D
5	-32.31	NO	H A Z A R D S			C A T A L O G E D
6	-29.50	NO	H A Z A R D S			C A T A L O G E D
7	-26.69	NO	H A Z A R D S			C A T A L O G E D
8	-23.88	NO	H A Z A R D S			C A T A L O G E D
9	-21.08	NO	H A Z A R D S			C A T A L O G E D
10	-18.26	NO	H A Z A R D S			C A T A L O G E D
11	-15.45	NO	H A Z A R D S			C A T A L O G E D
12	-12.64	NO	H A Z A R D S			C A T A L O G E D
13	-9.84	1.29	1.27	-0.22	-0.37	Step hazard
14	-7.02	NO	H A Z A R D S			C A T A L O G E D
15	-4.22	NO	H A Z A R D S			C A T A L O G E D
16	-1.41	NO	H A Z A R D S			C A T A L O G E D
17	1.40	1.29	1.29	0.03	-0.37	Step hazard
18	4.21	1.29	1.29	0.09	-0.37	Step hazard
19	7.02	1.29	1.23	0.16	-0.37	Step hazard
20	9.83	NO	H A Z A R D S			C A T A L O G E D
21	12.64	1.29	1.26	0.20	-0.37	Step hazard
		1.61	1.57	0.15	-0.44	Step hazard
		1.75	1.71	0.10	-0.10	Crosspath hazard
22	15.45	NO	H A Z A R D S			C A T A L O G E D
23	18.26	NO	H A Z A R D S			C A T A L O G E D
24	21.07	NO	H A Z A R D S			C A T A L O G E D
25	23.88	NO	H A Z A R D S			C A T A L O G E D
26	26.69	NO	H A Z A R D S			C A T A L O G E D
27	29.50	NO	H A Z A R D S			C A T A L O G E D
28	32.31	NO	H A Z A R D S			C A T A L O G E D
29	35.12	NO	H A Z A R D S			C A T A L O G E D
30	37.93	NO	H A Z A R D S			C A T A L O G E D
31	40.74	NO	H A Z A R D S			C A T A L O G E D
32	43.55	NO	H A Z A R D S			C A T A L O G E D

FIGURE 18. 25 CM STEP TEST

Input file: MDL.STEP.1Z
 File Creation Date : WED, JUL 27 1983 System time 14:05:35

** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE	
1	-43.56	NO	H A Z A R D S	C A T A L O G E D		
2	-40.74	NO	H A Z A R D S	C A T A L O G E D		
3	-37.93	NO	H A Z A R D S	C A T A L O G E D		
4	-35.13	NO	H A Z A R D S	C A T A L O G E D		
5	-32.31	NO	H A Z A R D S	C A T A L O G E D		
6	-29.50	NO	H A Z A R D S	C A T A L O G E D		
7	-26.69	NO	H A Z A R D S	C A T A L O G E D		
8	-23.88	NO	H A Z A R D S	C A T A L O G E D		
9	-21.08	NO	H A Z A R D S	C A T A L O G E D		
10	-18.26	NO	H A Z A R D S	C A T A L O G E D		
11	-15.45	NO	H A Z A R D S	C A T A L O G E D		
12	-12.64	NO	H A Z A R D S	C A T A L O G E D		
13	-9.84	1.37	1.35	-0.23	-0.34	Step hazard
		1.43	1.43	-0.25	-0.32	Step hazard
14	-7.02	1.33	1.32	-0.16	-0.36	Step hazard
		1.37	1.36	-0.17	-0.33	Step hazard
		1.43	1.44	-0.18	-0.32	Step hazard
15	-4.22	1.29	1.29	-0.09	-0.37	Step hazard
		1.37	1.36	-0.10	-0.36	Step hazard
		1.43	1.44	-0.11	-0.32	Step hazard
16	-1.41	1.33	1.32	-0.03	-0.36	Step hazard
		1.37	1.37	-0.03	-0.33	Step hazard
		1.41	1.41	-0.03	-0.34	Step hazard
17	1.40	1.37	1.37	0.03	-0.34	Step hazard
		1.41	1.41	0.03	-0.33	Step hazard
18	4.21	1.33	1.32	0.10	-0.36	Step hazard
		1.37	1.36	0.10	-0.33	Step hazard
		1.43	1.44	0.11	-0.32	Step hazard
19	7.02	1.29	1.28	0.16	-0.37	Step hazard
		1.37	1.36	0.17	-0.36	Step hazard
		1.43	1.44	0.18	-0.32	Step hazard
20	9.83	1.37	1.35	0.23	-0.34	Step hazard
		1.41	1.39	0.24	-0.33	Step hazard
21	12.64	1.33	1.29	0.29	-0.36	Step hazard
		1.41	1.37	0.31	-0.34	Step hazard
		1.33	1.33	0.41	-0.30	Step hazard
22	15.45	1.41	1.36	0.37	-0.34	Step hazard
23	18.26	NO	H A Z A R D S	C A T A L O G E D		
24	21.07	NO	H A Z A R D S	C A T A L O G E D		
25	23.88	NO	H A Z A R D S	C A T A L O G E D		
26	26.69	NO	H A Z A R D S	C A T A L O G E D		
27	29.50	NO	H A Z A R D S	C A T A L O G E D		
28	32.31	NO	H A Z A R D S	C A T A L O G E D		
29	35.12	NO	H A Z A R D S	C A T A L O G E D		
30	37.93	NO	H A Z A R D S	C A T A L O G E D		
31	40.74	NO	H A Z A R D S	C A T A L O G E D		
32	43.55	NO	H A Z A R D S	C A T A L O G E D		

FIGURE 19. 30 CM STEP TEST

from the mast to the start of the ramp was 1 meter. The height at one end was held fixed while the height at the other end the height was varied from 16 cm to 118 cm (6 to 46 in) in 7 equal steps. This corresponds to angular variation of from 5 to 40 degrees. Slopes with angles of 20, 25, 30, and 35 degrees are shown in Figures 20, 21, 22, and 23 with the modeler coefficient set to $B=.90$ and a slope threshold set to 30 degrees. Figures 24, 25, 26, and 27 depict the results for the same angles and slope threshold, but with a modeler coefficient of $B=.85$. Results for other values of B as well as different slope thresholds are given in Appendix Section 7.2.2.

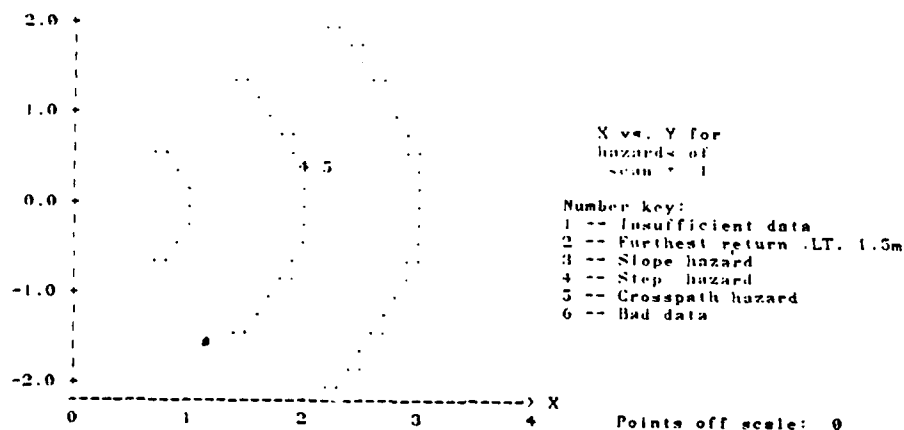
4.3 Two Obstacles Tests

The side to side resolution of the vision system was tested by placing 2 similiar obstacles next to each other at equal distances from the mast. One of these obstacles had a top area of 61 by 61 cm (24 by 24 in) and a fixed height of 36 cm (14 in). The other had a top surface 66 by 61 cm (26 by 24 in) and a height which was adjusted from 0 cm to 40 cm (0 in to 16 in). Both always had their closest edge at a fixed radius of 1 meter from the mast. The purpose of this test was to determine the ability of the system to distinguish between a hazard and a non-hazard right next to it.

When the height of the varying hazard was 10 cm or less, there should be a hazard recorded on both sides of the fixed hazard.

Input file: MDL.SLOPE.20.30.90
 File Creation Date: THU, AUG 11 1983 System Time: 19:26:15

*** MODEL PARAMETERS ***
 HEIGHT FILTER COEFFICIENT: 0.25
 SLOPE FILTER COEFFICIENT: 0.90
 LEVEL GROUND STEP THRESHOLD: 0.25 METERS
 SLOPE THRESHOLD: 30.00 DEGREES

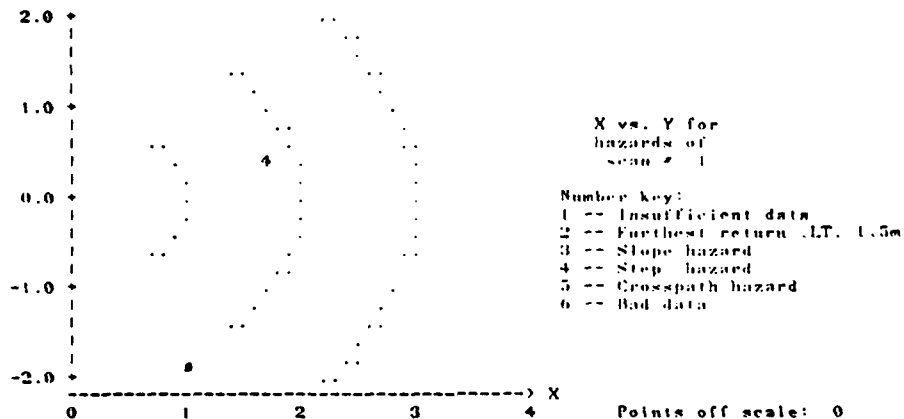


AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	HAZARD	SS	CATA	LOCED
2	-40.74	NO	HAZARD	SS	CATA	LOCED
3	-37.93	NO	HAZARD	SS	CATA	LOCED
4	-35.13	NO	HAZARD	SS	CATA	LOCED
5	-32.31	NO	HAZARD	SS	CATA	LOCED
6	-29.50	NO	HAZARD	SS	CATA	LOCED
7	-26.69	NO	HAZARD	SS	CATA	LOCED
8	-23.88	NO	HAZARD	SS	CATA	LOCED
9	-21.08	NO	HAZARD	SS	CATA	LOCED
10	-18.26	NO	HAZARD	SS	CATA	LOCED
11	-15.45	NO	HAZARD	SS	CATA	LOCED
12	-12.64	NO	HAZARD	SS	CATA	LOCED
13	-9.84	NO	HAZARD	SS	CATA	LOCED
14	-7.02	NO	HAZARD	SS	CATA	LOCED
15	-4.22	NO	HAZARD	SS	CATA	LOCED
16	-1.41	NO	HAZARD	SS	CATA	LOCED
17	1.40	NO	HAZARD	SS	CATA	LOCED
18	4.21	NO	HAZARD	SS	CATA	LOCED
19	7.02	NO	HAZARD	SS	CATA	LOCED
20	9.83	NO	HAZARD	SS	CATA	LOCED
21	12.64	2.04	1.99	0.45	-0.01	Step hazard
		2.25	2.20	0.49	-0.01	Crosspath hazard
22	15.45	NO	HAZARD	SS	CATA	LOCED
23	18.26	NO	HAZARD	SS	CATA	LOCED
24	21.07	NO	HAZARD	SS	CATA	LOCED
25	23.88	NO	HAZARD	SS	CATA	LOCED
26	26.69	NO	HAZARD	SS	CATA	LOCED
27	29.50	NO	HAZARD	SS	CATA	LOCED
28	32.31	NO	HAZARD	SS	CATA	LOCED
29	35.12	NO	HAZARD	SS	CATA	LOCED
30	37.93	NO	HAZARD	SS	CATA	LOCED
31	40.74	NO	HAZARD	SS	CATA	LOCED
32	43.55	NO	HAZARD	SS	CATA	LOCED

FIGURE 20. 20 DEGREE SLOPE TEST WITH B=.90

Input file: MDL.SLOPE.25.30.90
 File Creation Date : THU, AUG 11 1983 System time 19:28:08

** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES

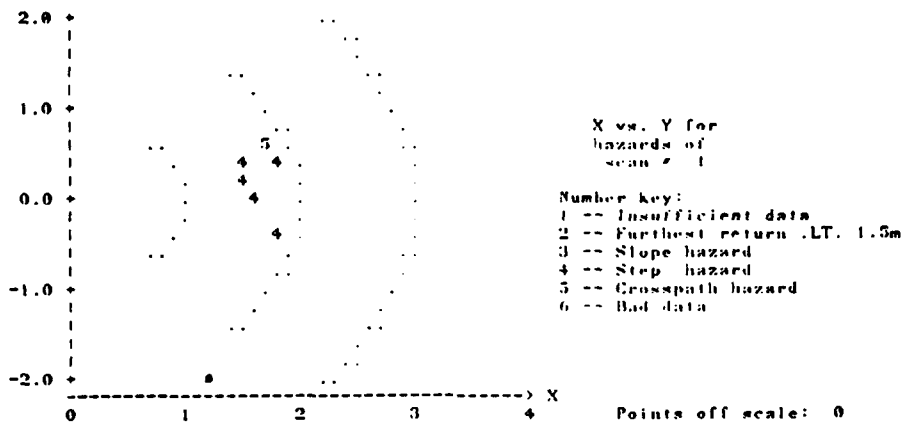


AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	HAZARDS	CATALOG	CEDED
2	-40.74	NO	HAZARDS	CATALOG	CEDED
3	-37.93	NO	HAZARDS	CATALOG	CEDED
4	-35.13	NO	HAZARDS	CATALOG	CEDED
5	-32.31	NO	HAZARDS	CATALOG	CEDED
6	-29.50	NO	HAZARDS	CATALOG	CEDED
7	-26.69	NO	HAZARDS	CATALOG	CEDED
8	-23.88	NO	HAZARDS	CATALOG	CEDED
9	-21.08	NO	HAZARDS	CATALOG	CEDED
10	-18.26	NO	HAZARDS	CATALOG	CEDED
11	-15.45	NO	HAZARDS	CATALOG	CEDED
12	-12.64	NO	HAZARDS	CATALOG	CEDED
13	-9.84	NO	HAZARDS	CATALOG	CEDED
14	-7.02	NO	HAZARDS	CATALOG	CEDED
15	-4.22	NO	HAZARDS	CATALOG	CEDED
16	-1.41	NO	HAZARDS	CATALOG	CEDED
17	1.40	NO	HAZARDS	CATALOG	CEDED
19	7.02	NO	HAZARDS	CATALOG	CEDED
20	9.83	NO	HAZARDS	CATALOG	CEDED
21	12.64	NO	HAZARDS	CATALOG	CEDED
22	15.45	1.72	1.66	0.46	-0.01 Step hazard
23	18.26	NO	HAZARDS	CATALOG	CEDED
24	21.07	NO	HAZARDS	CATALOG	CEDED
25	23.88	NO	HAZARDS	CATALOG	CEDED
26	26.69	NO	HAZARDS	CATALOG	CEDED
27	29.50	NO	HAZARDS	CATALOG	CEDED
28	32.31	NO	HAZARDS	CATALOG	CEDED
29	35.12	NO	HAZARDS	CATALOG	CEDED
30	37.93	NO	HAZARDS	CATALOG	CEDED
31	40.74	NO	HAZARDS	CATALOG	CEDED
32	43.55	NO	HAZARDS	CATALOG	CEDED

FIGURE 21. 25 DEGREE SLOPE TEST WITH B=.90

Input file: MDL.SLOPE.30.30.90
 File Creation Date : THU. AUG 11 1983 System time 19:29:12

** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT : 0.25
 SLOPE FILTER COEFFICIENT : 0.90
 LEVEL GROUND STEP THRESHOLD : 0.25 METERS
 SLOPE THRESHOLD : 30.00 DEGREES

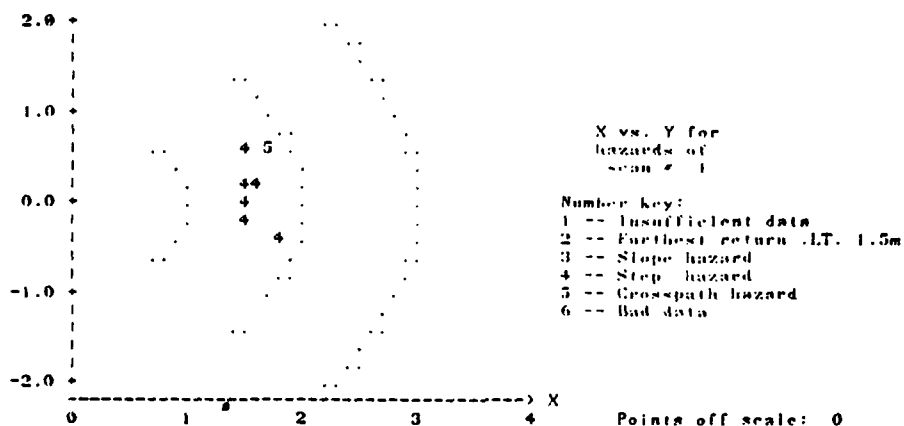


AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	HAZARD	NO	CATALOGUED
2	-40.74	NO	HAZARD	NO	CATALOGUED
3	-37.93	NO	HAZARD	NO	CATALOGUED
4	-35.13	NO	HAZARD	NO	CATALOGUED
5	-32.31	NO	HAZARD	NO	CATALOGUED
6	-29.50	NO	HAZARD	NO	CATALOGUED
7	-26.69	NO	HAZARD	NO	CATALOGUED
8	-23.88	NO	HAZARD	NO	CATALOGUED
9	-21.08	NO	HAZARD	NO	CATALOGUED
10	-18.26	NO	HAZARD	NO	CATALOGUED
11	-15.45	NO	HAZARD	NO	CATALOGUED
12	-12.64	NO	HAZARD	NO	CATALOGUED
13	-9.84	1.84	1.41	-0.31	0.19 Step hazard
14	-7.02	NO	HAZARD	NO	CATALOGUED
15	-4.22	NO	HAZARD	NO	CATALOGUED
16	-1.41	NO	HAZARD	NO	CATALOGUED
17	1.40	1.55	1.55	0.04	-0.00 Step hazard
18	4.21	1.55	1.55	0.11	-0.00 Step hazard
19	7.02	NO	HAZARD	NO	CATALOGUED
20	9.83	NO	HAZARD	NO	CATALOGUED
21	12.64	NO	HAZARD	NO	CATALOGUED
22	15.45	1.82	1.76	0.49	0.15 Step hazard
23	18.26	1.55	1.47	0.49	-0.01 Step hazard
		1.75	1.66	0.55	-0.01 Crosspath hazard
24	21.07	NO	HAZARD	NO	CATALOGUED
25	23.88	NO	HAZARD	NO	CATALOGUED
26	26.69	NO	HAZARD	NO	CATALOGUED
27	29.50	NO	HAZARD	NO	CATALOGUED
28	32.31	NO	HAZARD	NO	CATALOGUED
29	35.12	NO	HAZARD	NO	CATALOGUED
30	37.93	NO	HAZARD	NO	CATALOGUED
31	40.74	NO	HAZARD	NO	CATALOGUED
32	43.55	NO	HAZARD	NO	CATALOGUED

FIGURE 22. 30 DEGREE SLOPE TEST WITH B=.90

Input file: MDL.SLOPE.35.30.90
 File Creation Date : THU, AUG 11 1983 System time 19:31:35

** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES

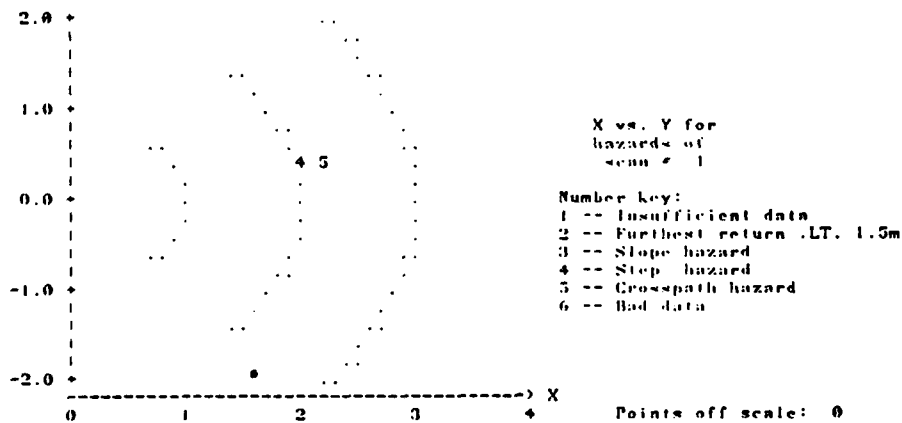


AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	N 0	H A Z A R D S	C A T A L O G E D	
2	-40.74	N 0	H A Z A R D S	C A T A L O G E D	
3	-37.93	N 0	H A Z A R D S	C A T A L O G E D	
4	-35.13	N 0	H A Z A R D S	C A T A L O G E D	
5	-32.31	N 0	H A Z A R D S	C A T A L O G E D	
6	-29.50	N 0	H A Z A R D S	C A T A L O G E D	
7	-26.69	N 0	H A Z A R D S	C A T A L O G E D	
8	-23.88	N 0	H A Z A R D S	C A T A L O G E D	
9	-21.08	N 0	H A Z A R D S	C A T A L O G E D	
10	-18.26	N 0	H A Z A R D S	C A T A L O G E D	
11	-15.45	N 0	H A Z A R D S	C A T A L O G E D	
12	-12.64	N 0	H A Z A R D S	C A T A L O G E D	
13	-9.84	1.82	1.79 -0.31	0.27	Step hazard
14	-7.02	1.51	1.50 -0.19	0.07	Step hazard
15	-4.22	N 0	H A Z A R D S	C A T A L O G E D	
16	-1.41	1.51	1.51 -0.04	0.06	Step hazard
17	1.40	1.51	1.51 0.04	0.07	Step hazard
18	4.21	1.63	1.62 0.12	0.23	Step hazard
19	7.02	N 0	H A Z A R D S	C A T A L O G E D	
20	9.83	1.51	1.49 0.26	0.07	Step hazard
21	12.64	N 0	H A Z A R D S	C A T A L O G E D	
22	15.45	N 0	H A Z A R D S	C A T A L O G E D	
23	18.26	1.61	1.53 0.50	0.07	Step hazard
		1.75	1.66 0.55	0.07	Crosspath hazard
24	21.07	N 0	H A Z A R D S	C A T A L O G E D	
25	23.88	N 0	H A Z A R D S	C A T A L O G E D	
26	26.69	N 0	H A Z A R D S	C A T A L O G E D	
27	29.50	N 0	H A Z A R D S	C A T A L O G E D	
28	32.31	N 0	H A Z A R D S	C A T A L O G E D	
29	35.12	N 0	H A Z A R D S	C A T A L O G E D	
30	37.93	N 0	H A Z A R D S	C A T A L O G E D	
31	40.74	N 0	H A Z A R D S	C A T A L O G E D	
32	43.55	N 0	H A Z A R D S	C A T A L O G E D	

FIGURE 23. 35 DEGREE SLOPE TEST WITH B=.90

Input file: MDL.SLOPE.20.30.85
 File Creation Date : THU, AUG 11 1983 System time 19:41:05

** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT : 0.25
 SLOPE FILTER COEFFICIENT : 0.85
 LEVEL GROUND STEP THRESHOLD : 0.25 METERS
 SLOPE THRESHOLD : 30.00 DEGREES

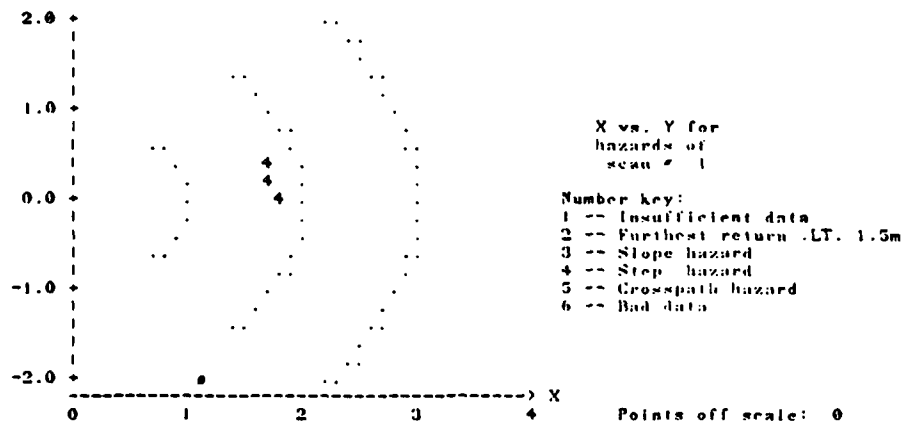


AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S S			C A T A L O G E D
2	-40.74	NO	H A Z A R D S S			C A T A L O G E D
3	-37.93	NO	H A Z A R D S S			C A T A L O G E D
4	-35.13	NO	H A Z A R D S S			C A T A L O G E D
5	-32.31	NO	H A Z A R D S S			C A T A L O G E D
6	-29.50	NO	H A Z A R D S S			C A T A L O G E D
7	-26.69	NO	H A Z A R D S S			C A T A L O G E D
8	-23.88	NO	H A Z A R D S S			C A T A L O G E D
9	-21.08	NO	H A Z A R D S S			C A T A L O G E D
10	-18.26	NO	H A Z A R D S S			C A T A L O G E D
11	-15.45	NO	H A Z A R D S S			C A T A L O G E D
12	-12.64	NO	H A Z A R D S S			C A T A L O G E D
13	-9.84	NO	H A Z A R D S S			C A T A L O G E D
14	-7.02	NO	H A Z A R D S S			C A T A L O G E D
15	-4.22	NO	H A Z A R D S S			C A T A L O G E D
16	-1.41	NO	H A Z A R D S S			C A T A L O G E D
17	1.40	NO	H A Z A R D S S			C A T A L O G E D
18	4.21	NO	H A Z A R D S S			C A T A L O G E D
19	7.02	NO	H A Z A R D S S			C A T A L O G E D
20	9.83	NO	H A Z A R D S S			C A T A L O G E D
21	12.64	2.04	1.99	0.45	-0.01	Step hazard
		2.25	2.20	0.49	-0.01	Crosspath hazard
22	15.45	NO	H A Z A R D S S			C A T A L O G E D
23	18.26	NO	H A Z A R D S S			C A T A L O G E D
24	21.07	NO	H A Z A R D S S			C A T A L O G E D
25	23.88	NO	H A Z A R D S S			C A T A L O G E D
26	26.69	NO	H A Z A R D S S			C A T A L O G E D
27	29.50	NO	H A Z A R D S S			C A T A L O G E D
28	32.31	NO	H A Z A R D S S			C A T A L O G E D
29	35.12	NO	H A Z A R D S S			C A T A L O G E D
30	37.93	NO	H A Z A R D S S			C A T A L O G E D
31	40.74	NO	H A Z A R D S S			C A T A L O G E D
32	43.55	NO	H A Z A R D S S			C A T A L O G E D

FIGURE 24. 20 DEGREE SLOPE TEST WITH B=.85

Input file: MDL.SLOPE.25.30.85
 File Creation Date : THU, AUG 11 1983 System time 19:41:44

** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.85
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES

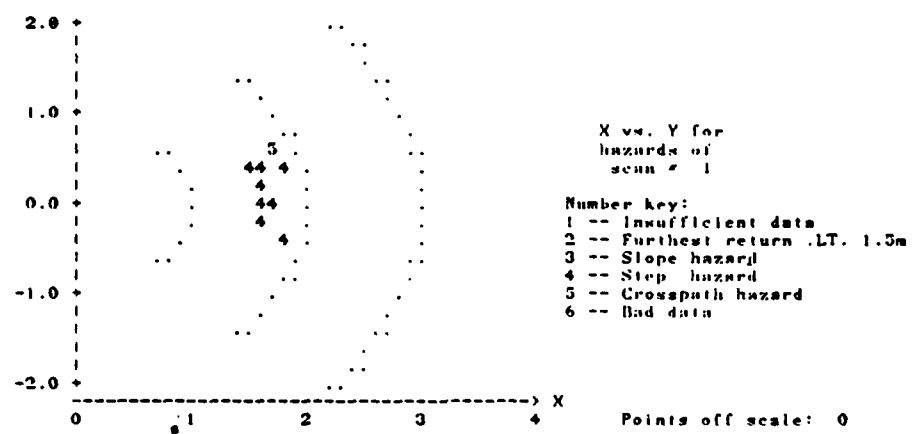


AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	HAZARD	S	CATALOGED
2	-40.74	NO	HAZARD	S	CATALOGED
3	-37.93	NO	HAZARD	S	CATALOGED
4	-35.13	NO	HAZARD	S	CATALOGED
5	-32.31	NO	HAZARD	S	CATALOGED
6	-29.50	NO	HAZARD	S	CATALOGED
7	-26.69	NO	HAZARD	S	CATALOGED
8	-23.88	NO	HAZARD	S	CATALOGED
9	-21.08	NO	HAZARD	S	CATALOGED
10	-18.26	NO	HAZARD	S	CATALOGED
11	-15.43	NO	HAZARD	S	CATALOGED
12	-12.64	NO	HAZARD	S	CATALOGED
13	-9.84	NO	HAZARD	S	CATALOGED
14	-7.02	NO	HAZARD	S	CATALOGED
15	-4.22	NO	HAZARD	S	CATALOGED
16	-1.41	NO	HAZARD	S	CATALOGED
17	1.40	1.84	1.84	0.05	0.12 Step hazard
19	7.02	NO	HAZARD	S	CATALOGED
20	9.83	NO	HAZARD	S	CATALOGED
21	12.64	NO	HAZARD	S	CATALOGED
22	15.45	1.72	1.66	0.46	-0.01 Step hazard
23	18.26	NO	HAZARD	S	CATALOGED
24	21.07	NO	HAZARD	S	CATALOGED
25	23.88	NO	HAZARD	S	CATALOGED
26	26.69	NO	HAZARD	S	CATALOGED
27	29.50	NO	HAZARD	S	CATALOGED
28	32.31	NO	HAZARD	S	CATALOGED
29	35.12	NO	HAZARD	S	CATALOGED
30	37.93	NO	HAZARD	S	CATALOGED
31	40.74	NO	HAZARD	S	CATALOGED
32	43.55	NO	HAZARD	S	CATALOGED

FIGURE 25. 25 DEGREE SLOPE TEST WITH B=.85

Input file: MDL.SLOPE.30.00.85
 File Creation Date : THU, AUG 11 1983 System time 19:42:39

== MODEL PARAMETERS ==
 HEIGHT FILTER COEFFICIENT : 0.25
 SLOPE FILTER COEFFICIENT : 0.85
 LEVEL GROUND STEP THRESHOLD : 0.25 METERS
 SLOPE THRESHOLD : 30.00 DEGREES

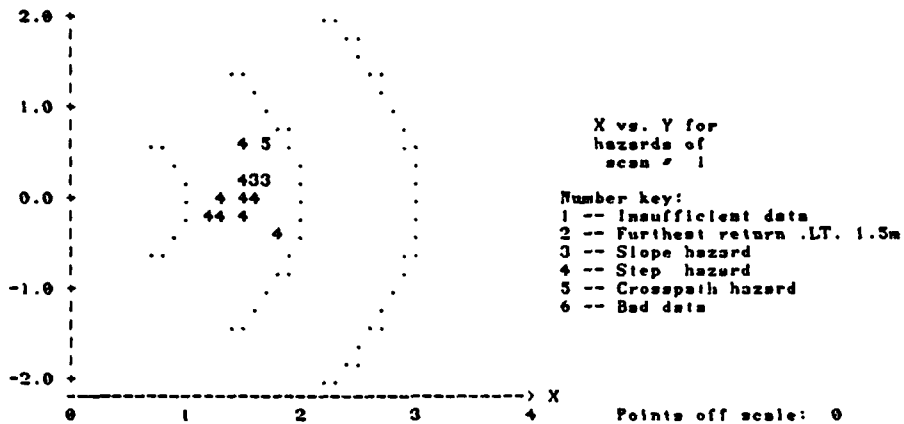


AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	N O	H A Z A R D S	C A T A L O G E D	
2	-40.74	N O	H A Z A R D S	C A T A L O G E D	
3	-37.93	N O	H A Z A R D S	C A T A L O G E D	
4	-35.13	N O	H A Z A R D S	C A T A L O G E D	
5	-32.31	N O	H A Z A R D S	C A T A L O G E D	
6	-29.50	N O	H A Z A R D S	C A T A L O G E D	
7	-26.69	N O	H A Z A R D S	C A T A L O G E D	
8	-23.88	N O	H A Z A R D S	C A T A L O G E D	
9	-21.08	N O	H A Z A R D S	C A T A L O G E D	
10	-18.26	N O	H A Z A R D S	C A T A L O G E D	
11	-15.45	N O	H A Z A R D S	C A T A L O G E D	
12	-12.64	N O	H A Z A R D S	C A T A L O G E D	
13	-9.84	1.04	1.01 -0.31	0.19	Step hazard
14	-7.02	1.61	1.60 -0.20	0.04	Step hazard
15	-4.22	N O	H A Z A R D S	C A T A L O G E D	
16	-1.41	1.61	1.61 -0.04	0.04	Step hazard
17	1.40	1.61	1.61 0.04	0.05	Step hazard
18	4.21	1.73	1.73 0.04	0.10	Step hazard
19	7.02	1.61	1.61 0.12	0.05	Step hazard
20	9.83	N O	H A Z A R D S	C A T A L O G E D	
21	12.64	N O	H A Z A R D S	C A T A L O G E D	
22	15.45	1.61	1.55 0.43	0.04	Step hazard
23	18.26	1.82	1.76 0.49	0.15	Step hazard
24	21.07	1.55	1.47 0.49	-0.01	Step hazard
25	23.88	1.73	1.66 0.55	-0.01	Crosspath hazard
26	26.69	N O	H A Z A R D S	C A T A L O G E D	
27	29.50	N O	H A Z A R D S	C A T A L O G E D	
28	32.31	N O	H A Z A R D S	C A T A L O G E D	
29	35.12	N O	H A Z A R D S	C A T A L O G E D	
30	37.93	N O	H A Z A R D S	C A T A L O G E D	
31	40.74	N O	H A Z A R D S	C A T A L O G E D	
32	43.55	N O	H A Z A R D S	C A T A L O G E D	

FIGURE 26. 30 DEGREE SLOPE TEST WITH B=.85

Input file: MDL.SLOPE.35.30.85
 File Creation Date : THU, AUG 11 1983 System time 19:43:13

** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.85
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



A7	TUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	N0	H A Z A R D S	C A T A L O C E D		
2	-40.74	N0	H A Z A R D S	C A T A L O C E D		
3	-37.93	N0	H A Z A R D S	C A T A L O C E D		
4	-35.13	N0	H A Z A R D S	C A T A L O C E D		
5	-32.31	N0	H A Z A R D S	C A T A L O C E D		
6	-29.50	N0	H A Z A R D S	C A T A L O C E D		
7	-26.69	N0	H A Z A R D S	C A T A L O C E D		
8	-23.88	N0	H A Z A R D S	C A T A L O C E D		
9	-21.08	N0	H A Z A R D S	C A T A L O C E D		
10	-18.26	N0	H A Z A R D S	C A T A L O C E D		
11	-15.45	N0	H A Z A R D S	C A T A L O C E D		
12	-12.64	N0	H A Z A R D S	C A T A L O C E D		
13	-9.34	1.30	1.28 -0.22	-0.05	Step hazard	
		1.51	1.49 -0.26	0.07	Step hazard	
		1.82	1.79 -0.31	0.27	Step hazard	
14	-7.02	1.26	1.25 -0.15	-0.14	Step hazard	
		1.51	1.50 -0.19	0.07	Step hazard	
15	-4.22	1.51	1.51 -0.11	0.04	Step hazard	
		1.51	1.51 -0.11	0.04	Step hazard	
16	-1.41	1.30	1.30 -0.03	-0.05	Step hazard	
		1.51	1.51 -0.04	0.06	Step hazard	
17	1.40	1.51	1.51 0.04	0.07	Step hazard	
		1.63	1.62 0.04	0.23	Step hazard	
18	4.21	1.56	1.56 0.11	0.18	Slope hazard	
		1.63	1.62 0.12	0.23	Slope hazard	
		1.72	1.72 0.13	0.30	Slope hazard	
19	7.02	1.51	1.50 0.19	0.06	Step hazard	
20	9.83	1.51	1.49 0.26	0.07	Step hazard	
21	12.64	N0	H A Z A R D S	C A T A L O C E D		
22	15.45	N0	H A Z A R D S	C A T A L O C E D		
23	18.26	1.61	1.53 0.50	0.07	Step hazard	
		1.75	1.66 0.55	0.07	Crosspath hazard	
24	21.07	N0	H A Z A R D S	C A T A L O C E D		
25	23.88	N0	H A Z A R D S	C A T A L O C E D		
26	26.69	N0	H A Z A R D S	C A T A L O C E D		
27	29.50	N0	H A Z A R D S	C A T A L O C E D		
28	32.31	N0	H A Z A R D S	C A T A L O C E D		
29	35.12	N0	H A Z A R D S	C A T A L O C E D		
30	37.93	N0	H A Z A R D S	C A T A L O C E D		
31	40.74	N0	H A Z A R D S	C A T A L O C E D		
32	43.55	N0	H A Z A R D S	C A T A L O C E D		

FIGURE 27. 35 DEGREE SLOPE TEST WITH B=.85

When the height of the varying height obstacle was between 15 to 20 cm, there should be only step hazards detected on the non-contacting edge of the fixed obstacle. This is because the height difference between the two obstacles does not constitute a hazard. As soon as the height of the varying obstacle was 20 cm (8 in) or greater than the fixed obstacle, there should be step hazards detected on all sides of the large hazard. Some results are given in Figures 28, 29, and 30. Complete results are given in Appendix Section 7.2.3. As expected, with relatively large differences between the fixed and the unfixed hazard, there was a crosspath hazard catalogued by the modeler. When this difference became less than 20 cm (8 in), the crosspath hazard disappeared. As the varying hazard reached a height of 25 cm (10 in), a step hazard was generated. These were exactly the results that were desired.

4.4 Parallel Obstacles Tests

Another test, which uncovered a modeler deficiency, was a test of the modeler's ability to detect the existence of a hazard when the vehicle cannot pass between 2 step hazards. Two obstacles 31 cm (12 in) wide and 185 cm (72 in) long were placed parallel to each other about 1 meter from the mast. The distance between them was varied from 150 to 100 cm in 10 cm steps (59 to 39 in in 4 in steps). This type of hazard would be encountered if the terrain included a narrow pass that had to be traversed.

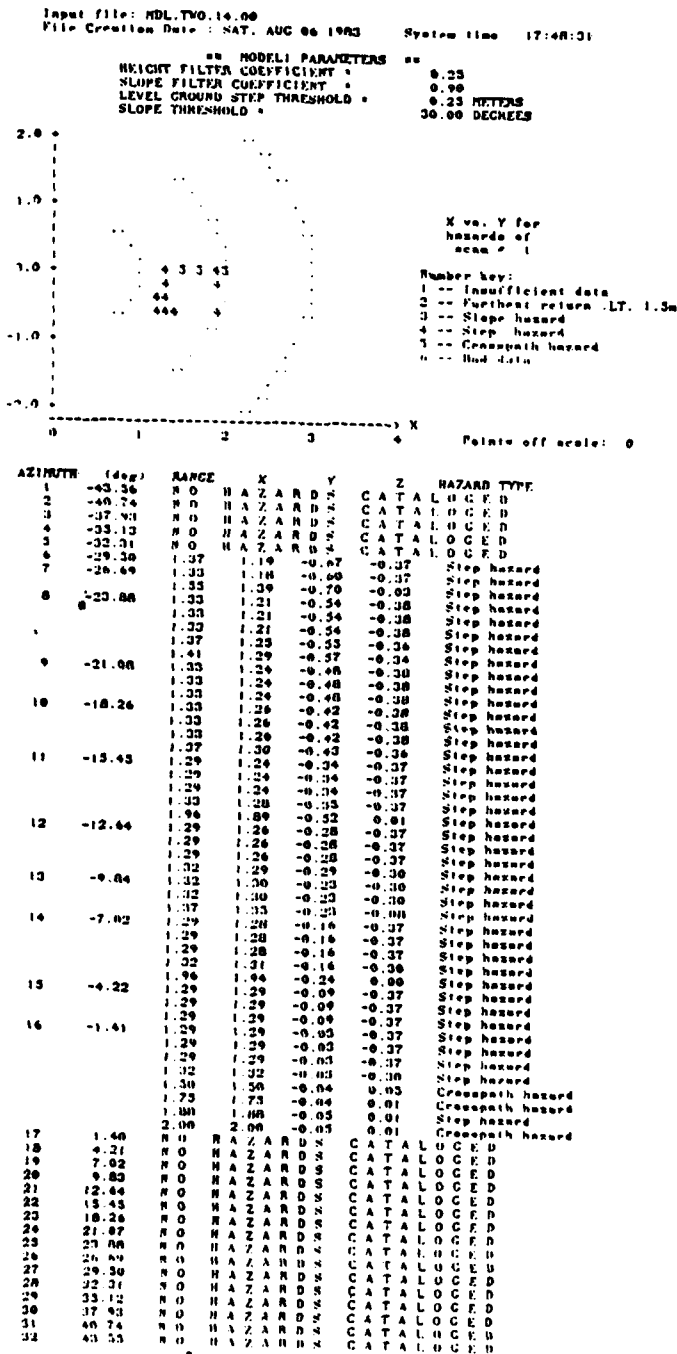


FIGURE 28. TWO OBSTACLES TEST: HEIGHTS AT 0 AND 35 CM

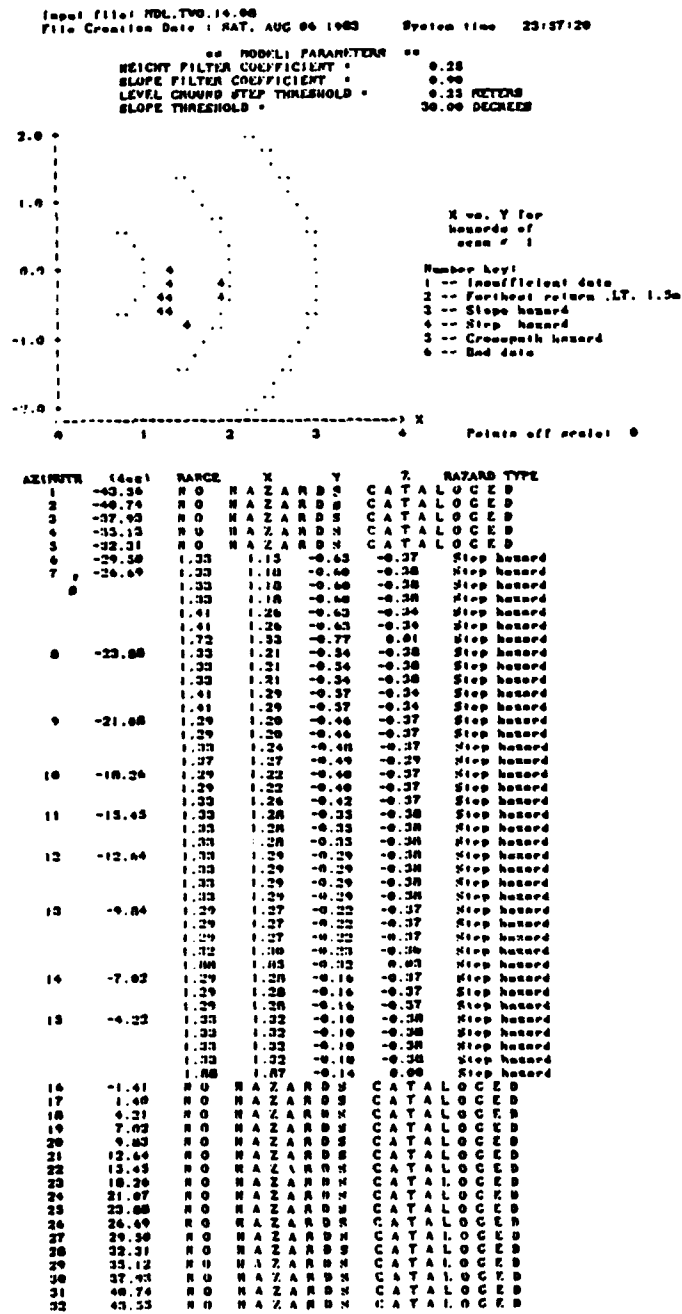


FIGURE 29. TWO OBSTACLES TEST: HEIGHTS AT 20 AND 35 CM

Some of the results are shown in Figure 31 with others found in Appendix Section 7.2.4. Given that the vehicle is 135 cm wide at its widest point, any path created whose width were less than this would have to be declared unsafe. This is something that the modeler does not test for, therefore, a path selection algorithm would have to determine that this situation were a hazard. A path selection algorithm was not used during any of these tests.

4.5 Insufficient Data Returned Tests

To show the modeler's ability to recognize the condition when less than one-fourth of the total number of returns for a particular azimuth are received, a large obstacle was placed in front of the mast which would effectively block most of the returns for several of the azimuths. Similarly, an obstacle was set up to prevent returns from distances greater than 1.5 meters, from the mast, from reaching the detectors. The results of these tests are shown graphically in Figures 32 and 33, and respectively.

4.6 Range Tests

To help determine how well the vision system can determine the range of hazards, ranging tests were performed. A single obstacle 30 by 30 cm was placed at in front of the mast at distances ranging from 40 to 230 cm (16 to 90 in) in 10 cm (4 in) increments. The

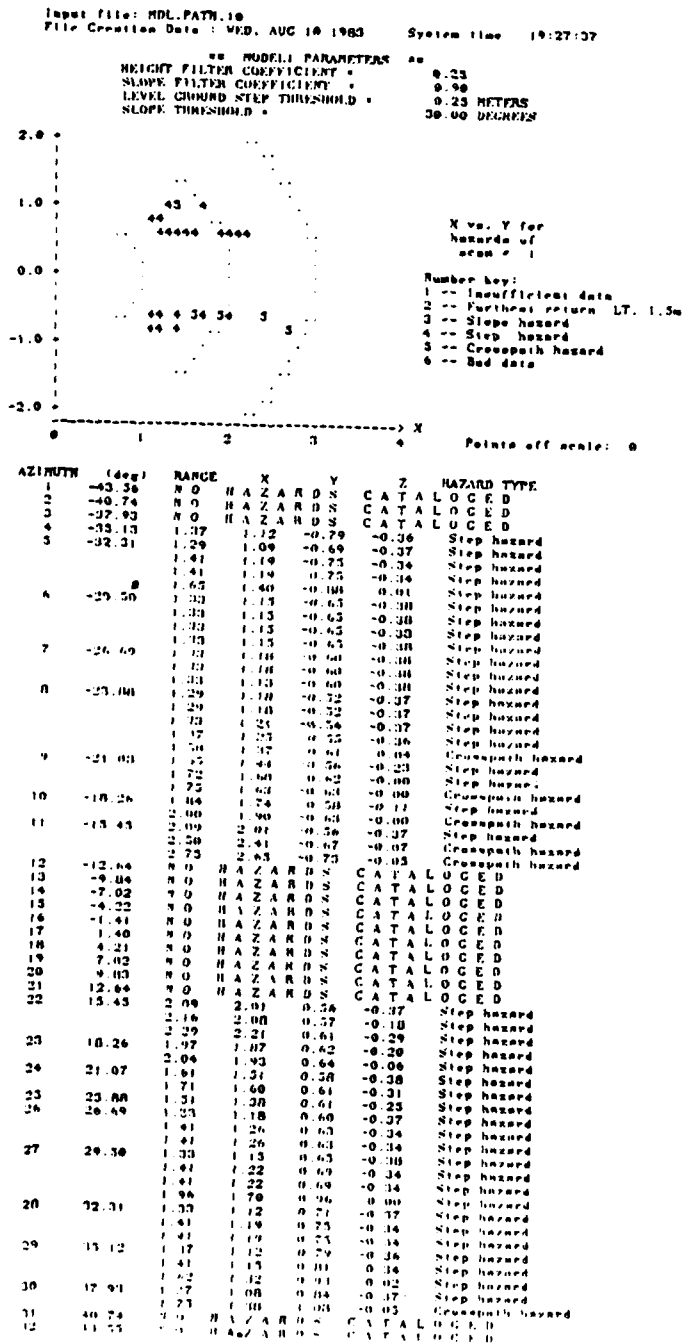
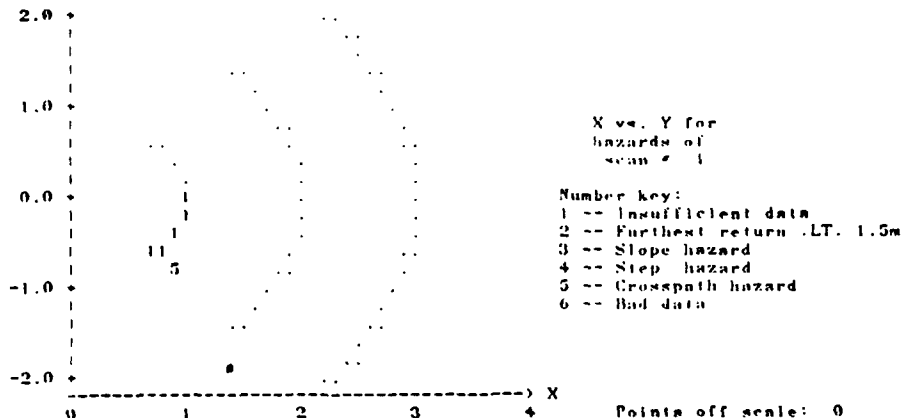


FIGURE 31. PATH OBSTACLE TEST WITH 1 METER SEPARATION

Input file: MDL08/12/83.r00
 File Creation Date: FRI, AUG 12 1983 System time 22:29:46

** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES

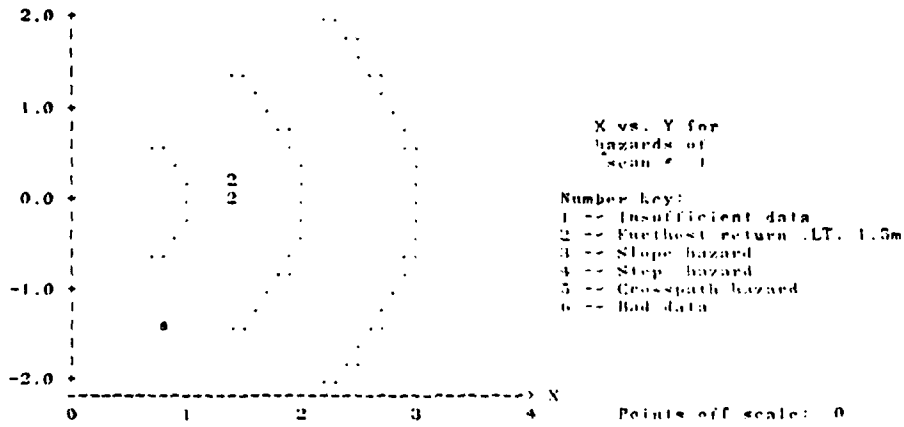


AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	1.00	0.72	-0.69	0.00	Insufficient data
2	-40.74	1.00	0.76	-0.65	0.00	Insufficient data
		1.25	0.95	-0.82	0.60	Crosspath hazard
3	-37.93	1.00	0.79	-0.61	0.00	Insufficient data
4	-35.13	1.00	0.82	-0.58	0.00	Insufficient data
5	-32.31	1.00	0.85	-0.53	0.00	Insufficient data
6	-29.50	1.00	0.87	-0.49	0.00	Insufficient data
7	-26.69	1.00	0.89	-0.43	0.00	Insufficient data
8	-23.88	1.00	0.91	-0.40	0.00	Insufficient data
9	-21.08	1.00	0.93	-0.36	0.00	Insufficient data
10	-18.26	1.00	0.95	-0.31	0.00	Insufficient data
11	-15.45	1.00	0.96	-0.27	0.00	Insufficient data
12	-12.64	1.00	0.98	-0.22	0.00	Insufficient data
13	-9.84	1.00	0.99	-0.17	0.00	Insufficient data
14	-7.02	1.00	0.99	-0.12	0.00	Insufficient data
15	-4.22	1.00	1.00	-0.07	0.00	Insufficient data
16	-1.41	N O	H A Z A R D S	C A T A L O G E D		
17	1.40	N O	H A Z A R D S	C A T A L O G E D		
18	4.21	N O	H A Z A R D S	C A T A L O G E D		
19	7.02	N O	H A Z A R D S	C A T A L O G E D		
20	9.83	N O	H A Z A R D S	C A T A L O G E D		
21	12.64	N O	H A Z A R D S	C A T A L O G E D		
22	15.45	N O	H A Z A R D S	C A T A L O G E D		
23	18.26	N O	H A Z A R D S	C A T A L O G E D		
24	21.07	N O	H A Z A R D S	C A T A L O G E D		
25	23.88	N O	H A Z A R D S	C A T A L O G E D		
26	26.69	N O	H A Z A R D S	C A T A L O G E D		
27	29.50	N O	H A Z A R D S	C A T A L O G E D		
28	32.31	N O	H A Z A R D S	C A T A L O G E D		
29	35.12	N O	H A Z A R D S	C A T A L O G E D		
30	37.93	N O	H A Z A R D S	C A T A L O G E D		
31	40.74	N O	H A Z A R D S	C A T A L O G E D		
32	43.55	N O	H A Z A R D S	C A T A L O G E D		

FIGURE 32. INSUFFICIENT DATA TEST

Input file: MDL00/12/03.000
 File Creation Date : FRI, AUG 12 1983 System time 22:05:44

** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT : 0.25
 SLOPE FILTER COEFFICIENT : 0.90
 LEVEL GROUND STEP THRESHOLD : 0.25 METERS
 SLOPE THRESHOLD : 30.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	HAZARD	0	CATALOGUED
2	-40.74	NO	HAZARD	0	CATALOGUED
3	-37.93	NO	HAZARD	0	CATALOGUED
4	-35.13	NO	HAZARD	0	CATALOGUED
5	-32.31	NO	HAZARD	0	CATALOGUED
6	-29.50	NO	HAZARD	0	CATALOGUED
7	-26.69	NO	HAZARD	0	CATALOGUED
8	-23.88	NO	HAZARD	0	CATALOGUED
9	-21.08	NO	HAZARD	0	CATALOGUED
10	-18.26	NO	HAZARD	0	CATALOGUED
11	-15.45	NO	HAZARD	0	CATALOGUED
12	-12.64	NO	HAZARD	0	CATALOGUED
13	-9.84	NO	HAZARD	0	CATALOGUED
14	-7.02	NO	HAZARD	0	CATALOGUED
15	-4.22	NO	HAZARD	0	CATALOGUED
16	-1.41	1.43	1.43	-0.04	Furthest return LT. 1.5m
17	1.40	1.43	1.43	0.04	Furthest return LT. 1.5m
18	4.21	1.43	1.43	0.11	Furthest return LT. 1.5m
19	7.02	NO	HAZARD	0	CATALOGUED
20	9.83	NO	HAZARD	0	CATALOGUED
21	12.64	NO	HAZARD	0	CATALOGUED
22	15.45	NO	HAZARD	0	CATALOGUED
23	18.26	NO	HAZARD	0	CATALOGUED
24	21.07	NO	HAZARD	0	CATALOGUED
25	23.88	NO	HAZARD	0	CATALOGUED
26	26.69	NO	HAZARD	0	CATALOGUED
27	29.50	NO	HAZARD	0	CATALOGUED
28	32.31	NO	HAZARD	0	CATALOGUED
29	35.12	NO	HAZARD	0	CATALOGUED
30	37.93	NO	HAZARD	0	CATALOGUED
31	40.74	NO	HAZARD	0	CATALOGUED
32	43.55	NO	HAZARD	0	CATALOGUED

FIGURE 33. NO DATA BEYOND 1.5 METERS TEST

results for 3 of these distances appear in Figures 34, 35, and 36 with complete results in Appendix Section 7.2.5.

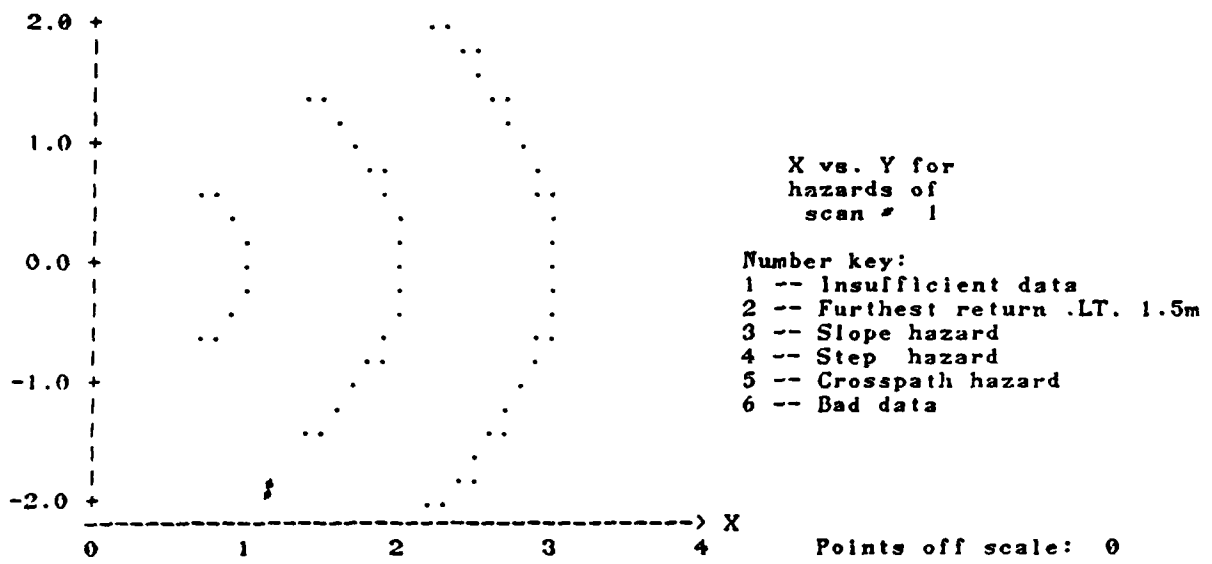
The results for the obstacle when very close to the mast included only the falling edges in each case. As can be seen, the calculated range of all of these falling edges was about 25 cm (10 in) further from the mast than their actual occurrences. This can probably be attributed to a couple of factors. First, the filtering of the data would tend to slow down the variations and the fact that the calculations are made in increasing range would lend support to this argument. The other factor is the orientation of the detectors with respect to the hazard. They cannot "see" directly behind the obstacle and only when they receive returns can a definite hazard determination be made.

As the obstacle was placed further and further away, the rising edge was detected. Like the falling edge, it was also detected to be about 25 cm further than it was. This fact lends support to the idea that the filtering has an effect in the determination of a hazard. The fact that the detected positions were always approximately the same distance from being correct suggests that it should be possible to correct for this effect in software. This, unfortunately, was not attempted.

Finally, once the obstacle was at 230 cm (90 in) or greater, it was no longer detected as a hazard. This implies that the useful

Input file: MDL.RANGE.04
File Creation Date : WED. AUG 10 1983 System time 20:56:29

 ** MODEL1 PARAMETERS **
HEIGHT FILTER COEFFICIENT = 0.25
SLOPE FILTER COEFFICIENT = 0.90
LEVEL GROUND STEP THRESHOLD = 0.25 METERS
SLOPE THRESHOLD = 30.00 DEGREES

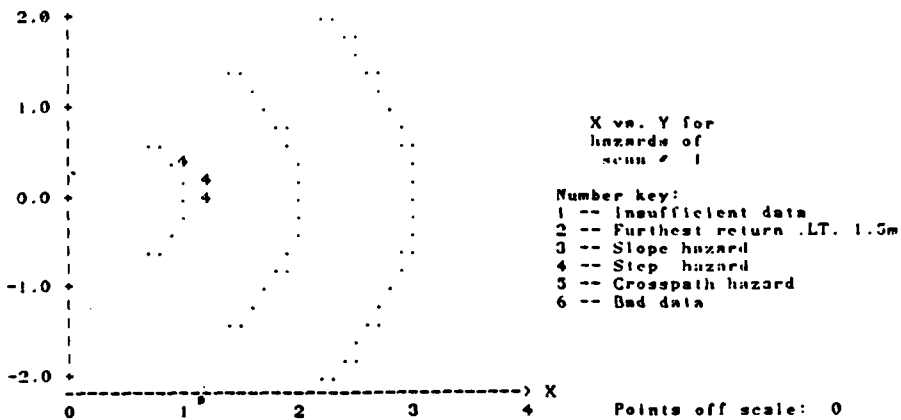


NO HAZARDS CATALOGED THIS SCAN

FIGURE 34. 40 CM RANGE TEST

Input file: MDL.RANGE.07
 File Creation Date : WED. AUG 10 1983 System time 20:47:50

== MODEL PARAMETERS ==
 HEIGHT FILTER COEFFICIENT : 0.25
 SLOPE FILTER COEFFICIENT : 0.90
 LEVEL GROUND STEP THRESHOLD : 0.25 METERS
 SLOPE THRESHOLD : 30.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	HAZARDS	CATALOGED	
2	-40.74	NO	HAZARDS	CATALOGED	
3	-37.93	NO	HAZARDS	CATALOGED	
4	-35.13	NO	HAZARDS	CATALOGED	
5	-32.31	NO	HAZARDS	CATALOGED	
6	-29.50	NO	HAZARDS	CATALOGED	
7	-26.69	NO	HAZARDS	CATALOGED	
8	-23.88	NO	HAZARDS	CATALOGED	
9	-21.08	NO	HAZARDS	CATALOGED	
10	-18.26	NO	HAZARDS	CATALOGED	
11	-15.45	NO	HAZARDS	CATALOGED	
12	-12.64	NO	HAZARDS	CATALOGED	
13	-9.84	NO	HAZARDS	CATALOGED	
14	-7.02	NO	HAZARDS	CATALOGED	
15	-4.22	NO	HAZARDS	CATALOGED	
16	-1.41	NO	HAZARDS	CATALOGED	
17	1.40	NO	HAZARDS	CATALOGED	
18	4.21	1.22	1.22	0.09	0.02 Step hazard
19	7.02	NO	HAZARDS	CATALOGED	
20	9.83	1.26	1.24	0.21	0.02 Step hazard
21	12.64	1.26	1.23	0.28	0.02 Step hazard
22	15.45	NO	HAZARDS	CATALOGED	
23	18.26	1.06	1.00	0.33	0.01 Step hazard
24	21.07	NO	HAZARDS	CATALOGED	
25	23.88	NO	HAZARDS	CATALOGED	
26	26.69	NO	HAZARDS	CATALOGED	
27	29.50	NO	HAZARDS	CATALOGED	
28	32.31	NO	HAZARDS	CATALOGED	
29	35.12	NO	HAZARDS	CATALOGED	
30	37.93	NO	HAZARDS	CATALOGED	
31	40.74	NO	HAZARDS	CATALOGED	
32	43.55	NO	HAZARDS	CATALOGED	

FIGURE 35. 70 CM RANGE TEST

Input file: MDL.RANGE.23

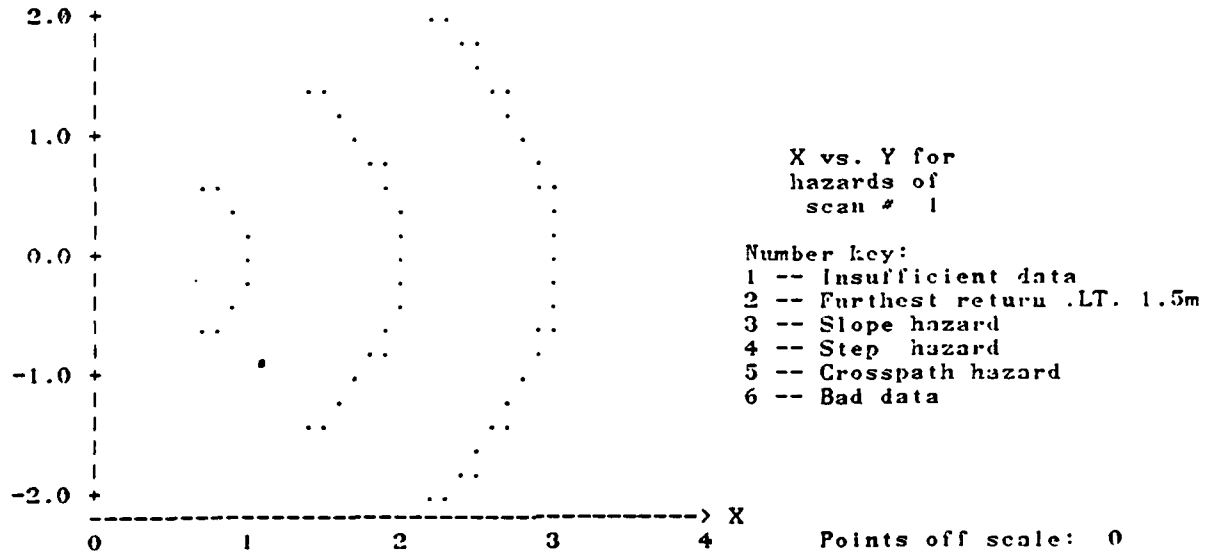
File Creation Date : WED, AUG 10 1983

System time 20:26:51

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** MODEL1 PARAMETERS **
HEIGHT FILTER COEFFICIENT = 0.25
SLOPE FILTER COEFFICIENT = 0.90
LEVEL GROUND STEP THRESHOLD = 0.25 METERS
SLOPE THRESHOLD = 30.00 DEGREES

```



NO HAZARDS CATALOGED THIS SCAN

FIGURE 36. 230 CM RANGE TEST

range for the determination of step hazards was less than this. Also, since the tests were performed with level ground approximately 34 cm (14 in) below what would be vehicle ground, the effective range for the determination of hazards was actually on the order of 200 cm (78 in).

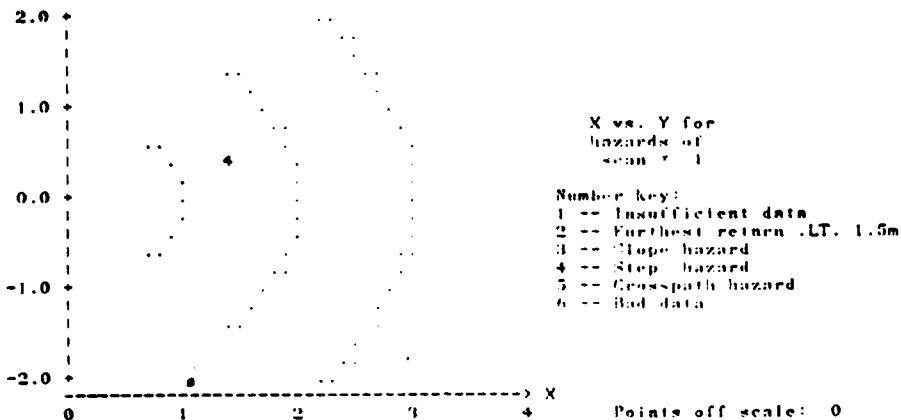
4.7 Holes Tests

All of the above tests ignore a family of obstacles which must be considered: holes. This test consists of creating a hole in an otherwise flat terrain and seeing how well the modeler recognizes the danger. The hole opening was either a small square 30 cm by 30 cm (12 in by 12 in), a rectangle, 30 cm by 60 cm (12 by 24 in), or a large square, 60 cm by 60 cm (24 in by 24 in). For each of these, the depths were set to 0, 10, 20, 25, 30, and 36 cm (0, 4, 8, 10, 12, 14 in). In each case, the distance from the edge of the hole to the mast was 86 cm (34 in). Results from the hole tests are given in Appendix Section 7.2.6. For the discussion that follows, references to the falling edge are to the edge closest to the mast, and references to the rising edge are to the edge furthest from the mast.

As can be seen in Figure 37, with the small hole a hazard was not detected until the hole was 30 cm deep (which was 5 cm greater than the step hazard threshold). The hazard detected with this depth was only at one point in the hole even though there were actually

Input file: MDL.LITTLE.HOLE.12
 File Creation Date : 008, AUG 08 1983 System time 20:15:21

RODDED PARAMETERS
 HEIGHT FILTER COEFFICIENT : 0.25
 SLOPE FILTER COEFFICIENT : 0.90
 LEVEL GROUND STEP DEFS HOLD : 0.25 METERS
 SLOPE TEST HOLD : 30.00 DEGREES



AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S			C A T A L O G E D
2	-40.74	NO	H A Z A R D S			C A T A L O G E D
3	-37.93	NO	H A Z A R D S			C A T A L O G E D
4	-35.13	NO	H A Z A R D S			C A T A L O G E D
5	-32.31	NO	H A Z A R D S			C A T A L O G E D
6	-29.50	NO	H A Z A R D S			C A T A L O G E D
7	-26.69	NO	H A Z A R D S			C A T A L O G E D
8	-23.88	NO	H A Z A R D S			C A T A L O G E D
9	-21.08	NO	H A Z A R D S			C A T A L O G E D
10	-18.26	NO	H A Z A R D S			C A T A L O G E D
11	-15.45	NO	H A Z A R D S			C A T A L O G E D
12	-12.64	NO	H A Z A R D S			C A T A L O G E D
13	-9.84	NO	H A Z A R D S			C A T A L O G E D
14	-7.02	NO	H A Z A R D S			C A T A L O G E D
15	-4.22	NO	H A Z A R D S			C A T A L O G E D
16	-1.41	NO	H A Z A R D S			C A T A L O G E D
17	1.40	NO	H A Z A R D S			C A T A L O G E D
18	4.21	NO	H A Z A R D S			C A T A L O G E D
19	7.02	NO	H A Z A R D S			C A T A L O G E D
20	9.83	NO	H A Z A R D S			C A T A L O G E D
21	12.64	NO	H A Z A R D S			C A T A L O G E D
22	15.45	1.45	1.39	0.39	-0.20	Step hazard
		1.45	1.39	0.39	-0.20	Step hazard
23	18.26	NO	H A Z A R D S			C A T A L O G E D
24	21.07	NO	H A Z A R D S			C A T A L O G E D
25	23.88	NO	H A Z A R D S			C A T A L O G E D
26	26.69	NO	H A Z A R D S			C A T A L O G E D
27	29.50	NO	H A Z A R D S			C A T A L O G E D
28	32.31	NO	H A Z A R D S			C A T A L O G E D
29	35.12	NO	H A Z A R D S			C A T A L O G E D
30	37.93	NO	H A Z A R D S			C A T A L O G E D
31	40.74	NO	H A Z A R D S			C A T A L O G E D
32	43.55	NO	H A Z A R D S			C A T A L O G E D

FIGURE 37. SMALL SQUARE HOLE WITH 30 CM DEPTH TEST

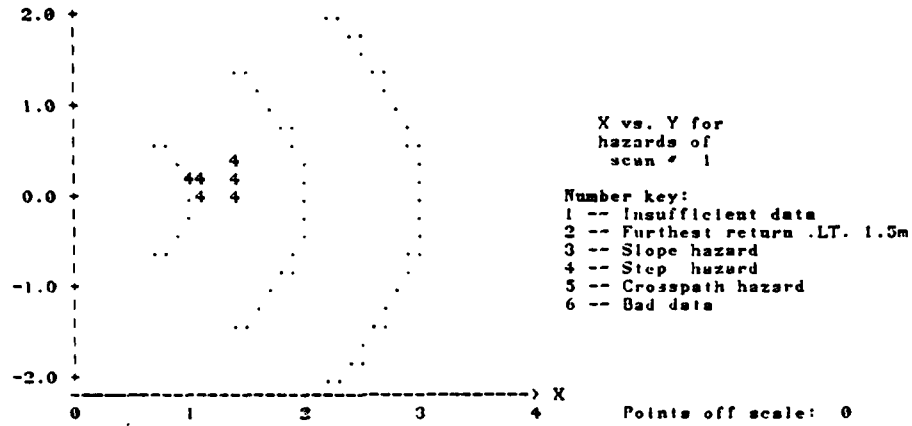
hazards at both the falling and rising edges of the hole. In the case of a 36 cm (14 in) deep hole (see Figure 38), both the falling and rising edges of the hole were detected. Because of the orientation of the detector array, falling edge of the hole was detected several centimeters into the hole. The fact that the hole was not seen until it was 30 cm (12 in) deep brings out an important problem; that a wheel could quite easily get stuck in a hole which went unreported by the vision system. Setting a lower step threshold value, at say 20 centimeters (8 inches), would cure the problem, but would cause the vehicle to be more cautious than necessary most of the time.

For the rectangular hole, a step hazard was first recognized at a hole depth of 25 cm (10 in) (Figure 39). Unfortunately, only the rising edge of the hole was recognized as a hazard. At a depth of 30 cm (12 in) as in Figure 40, the falling edge step was recognized at about the center of the hole. As with the little square hole, this was due to the detector array position. When the hole depth was increased to 36 cm (14 in) (Figure 41), the position of the detected falling edge of the hole was moved closer to its actual position.

The test results using a large hole were quite interesting. For one thing (see Figure 42), a hole 20 cm deep (8 in) produced a hazard at the rising edge of the hole even though the step threshold was 25 cm (10 in). The reason for this is not readily apparent, but it may be due to reflections from the back of the hole hitting the bottom and then reflecting back at the detector array (see Figure 43.

Input file: MDL.LITTLE.HOLE.14
 File Creation Date : MON, AUG 08 1983 System time 20:25:22

** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.36	NO	H A Z A R D S	C A T A L O C E D		
2	-40.74	NO	H A Z A R D S	C A T A L O C E D		
3	-37.93	NO	H A Z A R D S	C A T A L O C E D		
4	-35.13	NO	H A Z A R D S	C A T A L O C E D		
5	-32.31	NO	H A Z A R D S	C A T A L O C E D		
6	-29.50	NO	H A Z A R D S	C A T A L O C E D		
7	-26.69	NO	H A Z A R D S	C A T A L O C E D		
8	-23.88	NO	H A Z A R D S	C A T A L O C E D		
9	-21.08	NO	H A Z A R D S	C A T A L O C E D		
10	-18.26	NO	H A Z A R D S	C A T A L O C E D		
11	-15.45	NO	H A Z A R D S	C A T A L O C E D		
12	-12.64	NO	H A Z A R D S	C A T A L O C E D		
13	-9.84	NO	H A Z A R D S	C A T A L O C E D		
14	-7.02	NO	H A Z A R D S	C A T A L O C E D		
15	-4.22	NO	H A Z A R D S	C A T A L O C E D		
16	-1.41	NO	H A Z A R D S	C A T A L O C E D		
17	1.40	1.06	1.06	0.03	0.01	Step hazard
		1.41	1.41	0.03	-0.25	Step hazard
18	4.21	1.06	1.05	0.08	0.01	Step hazard
		1.41	1.40	0.10	-0.25	Step hazard
		1.41	1.40	0.10	-0.25	Step hazard
		1.41	1.40	0.19	-0.25	Step hazard
19	7.02	1.06	1.05	0.13	0.01	Step hazard
		1.41	1.40	0.17	-0.25	Step hazard
		1.41	1.40	0.17	-0.25	Step hazard
20	9.83	1.06	1.04	0.18	0.01	Step hazard
		1.41	1.39	0.24	-0.25	Step hazard
21	12.64	1.06	1.03	0.23	0.01	Step hazard
		1.41	1.37	0.31	-0.25	Step hazard
22	15.45	1.10	1.06	0.29	0.00	Step hazard
		1.41	1.36	0.37	-0.25	Step hazard
23	18.26	NO	H A Z A R D S	C A T A L O C E D		
24	21.07	NO	H A Z A R D S	C A T A L O C E D		
25	23.88	NO	H A Z A R D S	C A T A L O C E D		
26	26.69	NO	H A Z A R D S	C A T A L O C E D		
27	29.50	NO	H A Z A R D S	C A T A L O C E D		
28	32.31	NO	H A Z A R D S	C A T A L O C E D		
29	35.12	NO	H A Z A R D S	C A T A L O C E D		
30	37.93	NO	H A Z A R D S	C A T A L O C E D		
32	43.55	NO	H A Z A R D S	C A T A L O C E D		

FIGURE 38. SMALL SQUARE HOLE WITH 36 CM DEPTH TEST

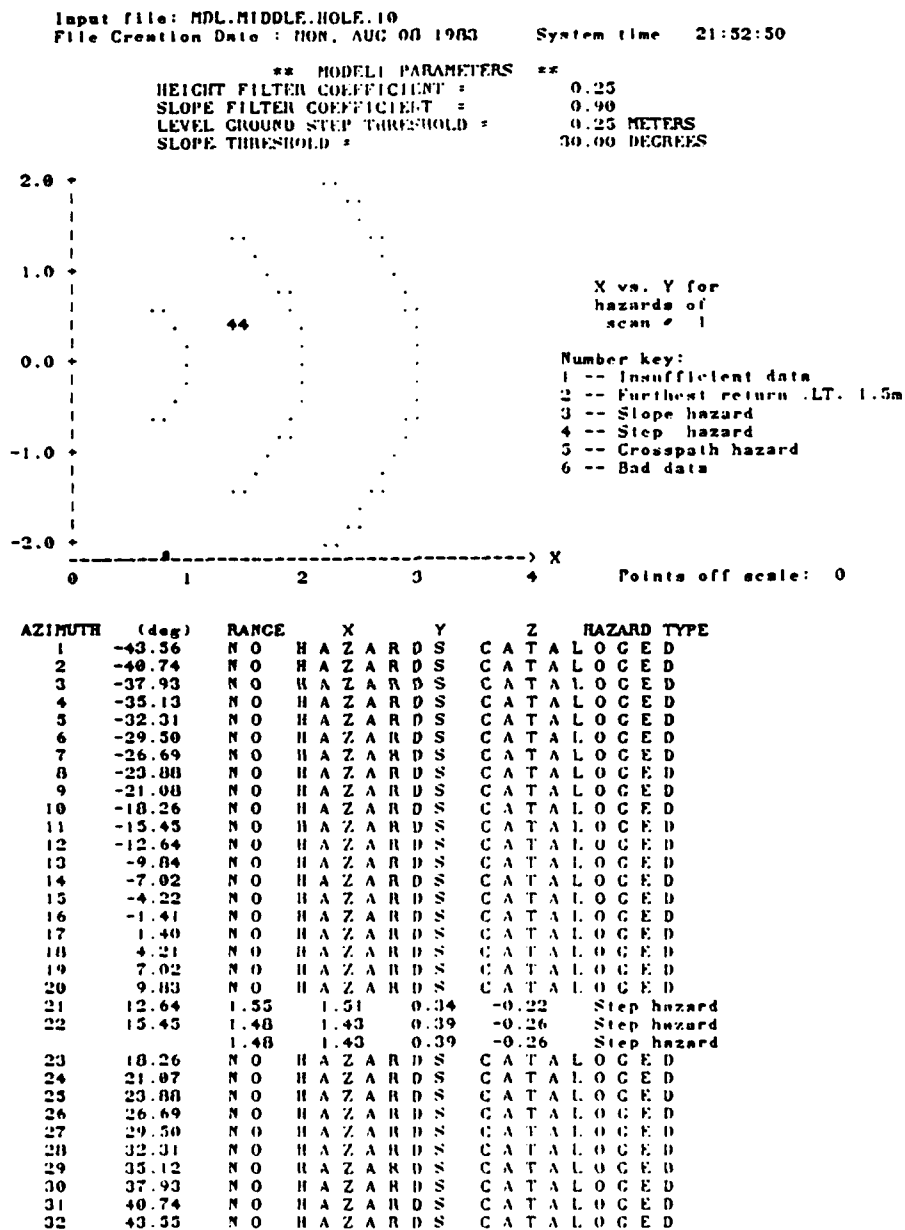
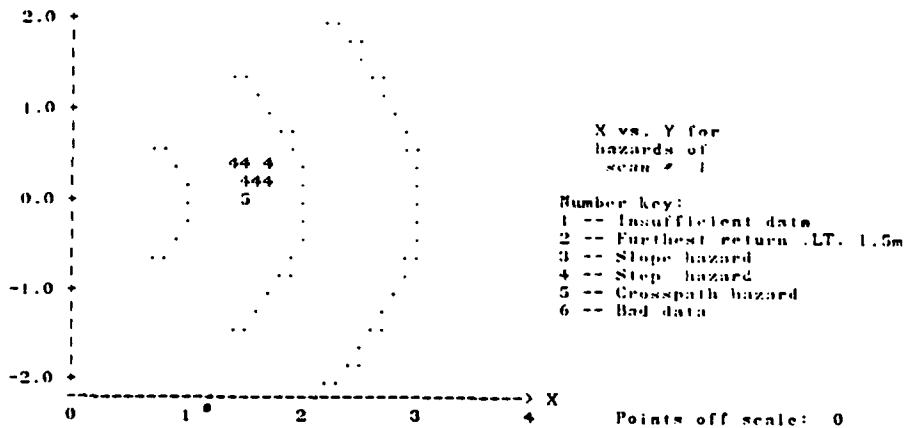


FIGURE 39. RECTANGULAR HOLE WITH 25 CM DEPTH TEST

Input file: MDL.MIDDLE.HOLE.12
 File Creation Date : MON, AUG 08 1983 System time 21:22:45

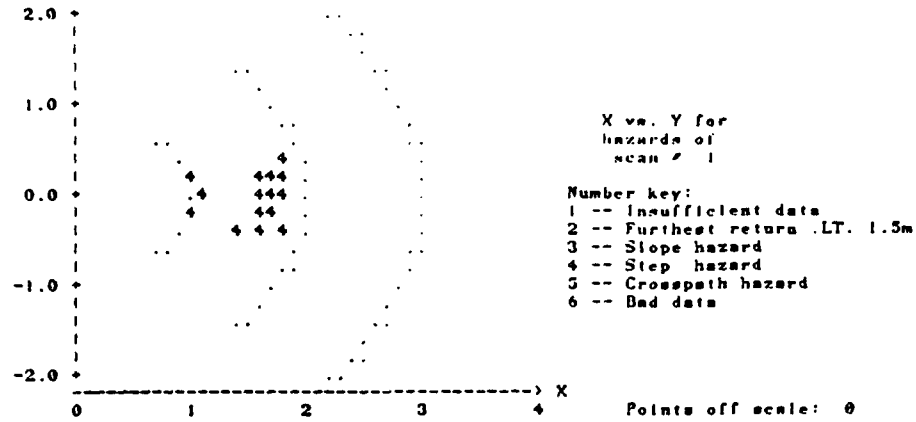
** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	HAZARDS	CATALOGED	
2	-40.74	NO	HAZARDS	CATALOGED	
3	-37.93	NO	HAZARDS	CATALOGED	
4	-35.13	NO	HAZARDS	CATALOGED	
5	-32.31	NO	HAZARDS	CATALOGED	
6	-29.50	NO	HAZARDS	CATALOGED	
7	-26.69	NO	HAZARDS	CATALOGED	
8	-23.88	NO	HAZARDS	CATALOGED	
9	-21.08	NO	HAZARDS	CATALOGED	
10	-18.26	NO	HAZARDS	CATALOGED	
11	-15.45	NO	HAZARDS	CATALOGED	
12	-12.64	NO	HAZARDS	CATALOGED	
13	-9.84	NO	HAZARDS	CATALOGED	
14	-7.02	NO	HAZARDS	CATALOGED	
15	-4.22	NO	HAZARDS	CATALOGED	
16	-1.41	1.50	1.50	-0.04	0.05 Crosspath hazard
17	1.40	NO	HAZARDS	CATALOGED	
18	4.21	NO	HAZARDS	CATALOGED	
19	7.02	1.56	1.53	0.19	-0.32 Step hazard
		1.71	1.70	0.21	-0.29 Step hazard
20	9.83	1.56	1.54	0.27	-0.32 Step hazard
		1.71	1.68	0.29	-0.30 Step hazard
		1.71	1.68	0.29	-0.30 Step hazard
21	12.64	1.59	1.53	0.33	-0.27 Step hazard
		1.71	1.67	0.37	-0.29 Step hazard
22	15.45	1.43	1.39	0.39	-0.28 Step hazard
23	18.26	NO	HAZARDS	CATALOGED	
24	21.07	NO	HAZARDS	CATALOGED	
25	23.88	NO	HAZARDS	CATALOGED	
26	26.69	NO	HAZARDS	CATALOGED	
27	29.50	NO	HAZARDS	CATALOGED	
28	32.31	NO	HAZARDS	CATALOGED	
29	35.12	NO	HAZARDS	CATALOGED	
30	37.93	NO	HAZARDS	CATALOGED	
31	40.74	NO	HAZARDS	CATALOGED	
32	43.55	NO	HAZARDS	CATALOGED	

FIGURE 40. RECTANGULAR HOLE WITH 30 CM DEPTH TEST

** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES

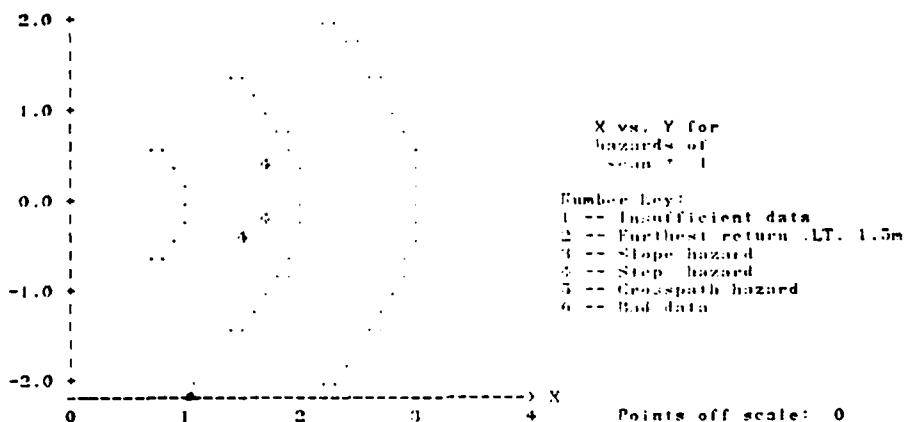


AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE	
1	-43.56	NO	H A Z A R D S	C A T A L O G E D		
2	-40.74	NO	H A Z A R D S	C A T A L O G E D		
3	-37.93	NO	H A Z A R D S	C A T A L O G E D		
4	-35.13	NO	H A Z A R D S	C A T A L O G E D		
5	-32.31	NO	H A Z A R D S	C A T A L O G E D		
6	-29.50	NO	H A Z A R D S	C A T A L O G E D		
7	-26.69	NO	H A Z A R D S	C A T A L O G E D		
8	-23.88	NO	H A Z A R D S	C A T A L O G E D		
9	-21.08	NO	H A Z A R D S	C A T A L O G E D		
10	-18.26	NO	H A Z A R D S	C A T A L O G E D		
11	-15.45	1.41	1.36	-0.37	-0.28	Step hazard
12	-12.64	1.06	1.03	-0.23	0.01	Step hazard
		1.61	1.37	-0.35	-0.38	Step hazard
		1.61	1.37	-0.35	-0.38	Step hazard
		1.61	1.37	-0.35	-0.38	Step hazard
		1.68	1.64	-0.37	-0.35	Step hazard
13	-9.84	1.06	1.04	-0.18	0.01	Step hazard
		1.86	1.83	-0.32	-0.37	Step hazard
14	-7.02	1.06	1.03	-0.13	0.01	Step hazard
		1.61	1.60	-0.20	-0.38	Step hazard
		1.68	1.67	-0.21	-0.35	Step hazard
15	-4.22	1.06	1.03	-0.08	0.01	Step hazard
		1.61	1.61	-0.12	-0.38	Step hazard
		1.61	1.61	-0.12	-0.38	Step hazard
		1.68	1.67	-0.12	-0.35	Step hazard
16	-1.41	1.06	1.06	-0.03	0.01	Step hazard
		1.68	1.68	-0.04	-0.35	Step hazard
		1.77	1.77	-0.04	-0.37	Step hazard
17	1.40	1.64	1.64	0.04	-0.37	Step hazard
18	4.21	1.64	1.64	0.12	-0.37	Step hazard
		1.84	1.83	0.13	-0.13	Step hazard
19	7.02	1.61	1.60	0.20	-0.38	Step hazard
		1.61	1.60	0.20	-0.38	Step hazard
		1.77	1.73	0.22	-0.31	Step hazard
20	9.83	1.06	1.04	0.18	0.01	Step hazard
		1.61	1.59	0.28	-0.38	Step hazard
		1.61	1.59	0.28	-0.38	Step hazard
		1.68	1.63	0.29	-0.35	Step hazard
21	12.64	1.06	1.03	0.23	0.01	Step hazard
		1.86	1.81	0.41	-0.37	Step hazard
22	15.45	1.06	1.02	0.28	0.01	Step hazard
23	18.26	NO	H A Z A R D S	C A T A L O G E D		
24	21.07	NO	H A Z A R D S	C A T A L O G E D		
25	23.88	NO	H A Z A R D S	C A T A L O G E D		
26	26.69	NO	H A Z A R D S	C A T A L O G E D		
27	29.50	NO	H A Z A R D S	C A T A L O G E D		
28	32.31	NO	H A Z A R D S	C A T A L O G E D		
29	35.12	NO	H A Z A R D S	C A T A L O G E D		
30	37.93	NO	H A Z A R D S	C A T A L O G E D		
31	40.74	NO	H A Z A R D S	C A T A L O G E D		
32	43.55	NO	H A Z A R D S	C A T A L O G E D		

FIGURE 41. RECTANGULAR HOLE WITH 36 CM DEPTH TEST

Input file: MDL.BIG.POLE.08
 File Creation Date: SUN, AUG 03 1983 System time 23:00:51

ROBUST PARAMETERS
 HEIGHT FILTER COEFFICIENT 0.25
 SLOPE FILTER COEFFICIENT 0.90
 LEVEL GROUND STEP FILTER THRESHOLD 0.25 METERS
 SLOPE THRESHOLD 30.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	HAZARD	NO	CATALOGUED
2	-40.74	NO	HAZARD	NO	CATALOGUED
3	-37.93	NO	HAZARD	NO	CATALOGUED
4	-35.13	NO	HAZARD	NO	CATALOGUED
5	-32.31	NO	HAZARD	NO	CATALOGUED
6	-29.50	NO	HAZARD	NO	CATALOGUED
7	-26.69	NO	HAZARD	NO	CATALOGUED
8	-23.88	NO	HAZARD	NO	CATALOGUED
9	-21.08	NO	HAZARD	NO	CATALOGUED
10	-18.26	NO	HAZARD	NO	CATALOGUED
11	-15.45	NO	HAZARD	NO	CATALOGUED
12	-12.64	1.55	1.51	-0.34	Step hazard
13	-9.84	NO	HAZARD	NO	CATALOGUED
14	-7.02	NO	HAZARD	NO	CATALOGUED
15	-4.22	1.71	1.71	-0.13	Step hazard
16	-1.41	NO	HAZARD	NO	CATALOGUED
17	1.40	NO	HAZARD	NO	CATALOGUED
18	4.21	NO	HAZARD	NO	CATALOGUED
19	7.02	NO	HAZARD	NO	CATALOGUED
20	9.83	NO	HAZARD	NO	CATALOGUED
21	12.64	1.71	1.67	0.37	Step hazard
22	15.45	NO	HAZARD	NO	CATALOGUED
23	18.26	NO	HAZARD	NO	CATALOGUED
24	21.07	NO	HAZARD	NO	CATALOGUED
25	23.88	NO	HAZARD	NO	CATALOGUED
26	26.69	NO	HAZARD	NO	CATALOGUED
27	29.50	NO	HAZARD	NO	CATALOGUED
28	32.31	NO	HAZARD	NO	CATALOGUED
29	35.12	NO	HAZARD	NO	CATALOGUED
30	37.93	NO	HAZARD	NO	CATALOGUED
31	40.74	NO	HAZARD	NO	CATALOGUED
32	43.55	NO	HAZARD	NO	CATALOGUED

FIGURE 42. LARGE SQUARE HOLE WITH 20 CM DEPTH TEST

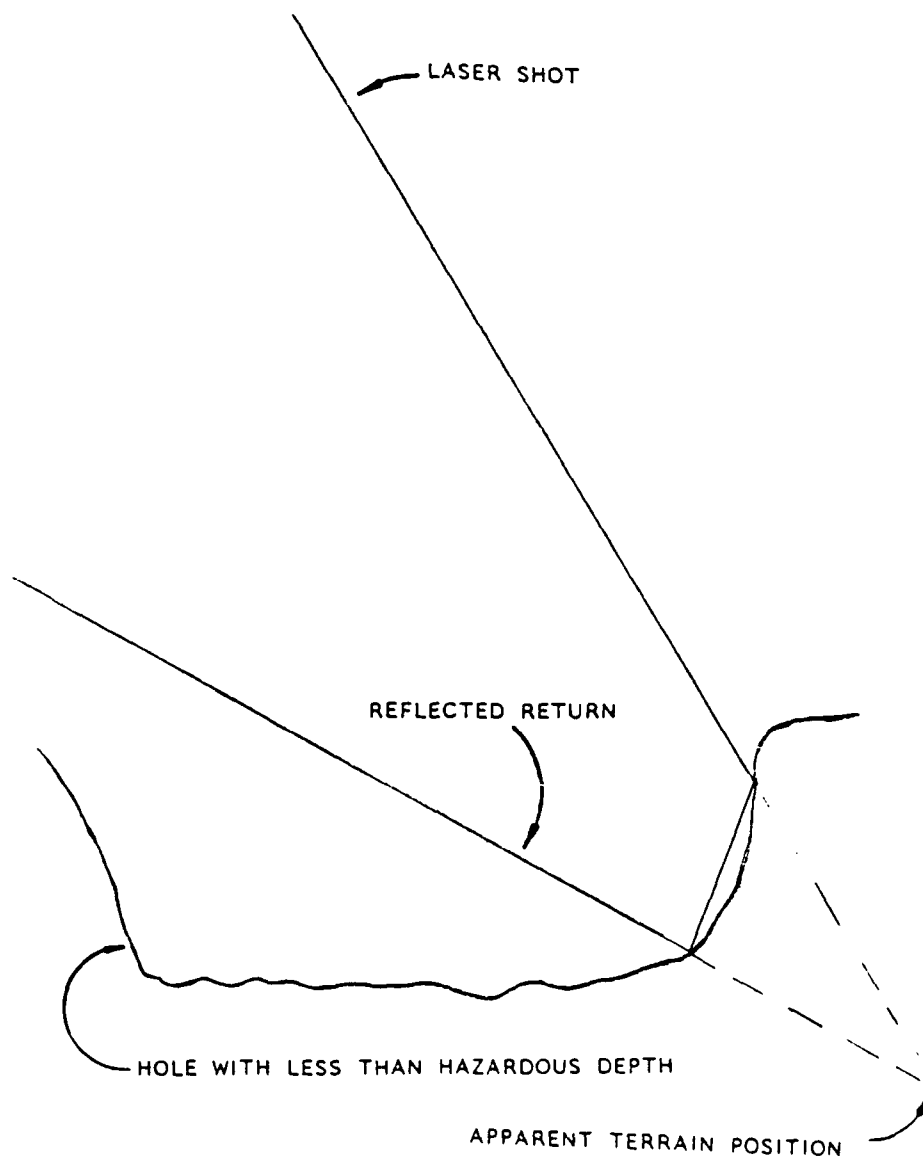


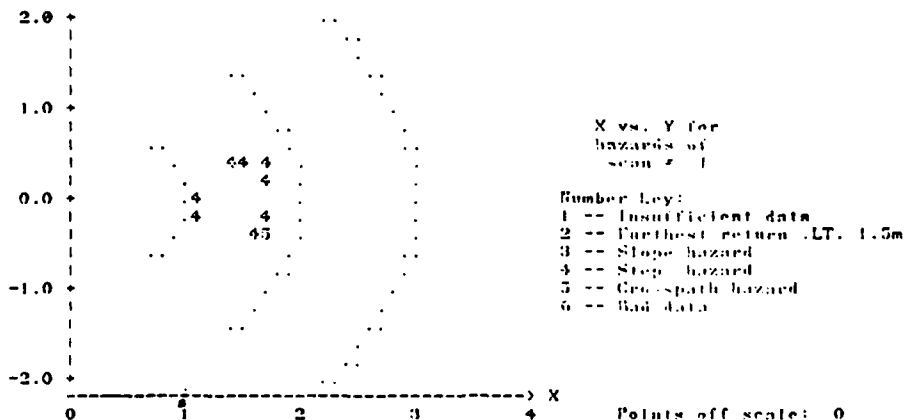
FIGURE 43. FALSE RETURN DUE TO REFLECTION

It may also be due to one of the malfunctioning detectors mentioned above. The falling edge was detected when the depth was increased to 30 cm (12 in) shown in Figure 44. As the depth became deeper, the detected distance to the falling edge became closer to its actual position.

When the results obtained with the large hole are placed next to those obtained for the small hole, a potential problem becomes apparent. Specifically, in order to detect a hazard when the small area top hole was present, the depth had to be 5 cm (2 in) deeper than the threshold level. On the other hand, when the large area top hole was present, a hazard was first detected when the depth was 5 cm (2 in) less than the threshold level although this may have been due to conditions which would not have been present if all detectors were working properly. This implies that for the worst case to be accounted for, the threshold would have to be lowered. Unfortunately, this could create a very conservative system if small holes were rarely the hazard sources. Also, since this type of problem did not exist for positive step hazards, there would be several false alarms if a majority of the obstacles present were positive step. One way to alleviate this problem is to have separate threshold levels for positive and negative steps. To date, however, no testing has been done using that criterion.

Input file: MDL.BIG.HOLE.12
 File Creation Date : MON, AUG 08 1983 System time 22:45:28

MODEL PARAMETERS
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	HAZARD	SS	CATALOGED
2	-40.74	NO	HAZARD	SS	CATALOGED
3	-37.93	NO	HAZARD	SS	CATALOGED
4	-35.13	NO	HAZARD	SS	CATALOGED
5	-32.31	NO	HAZARD	SS	CATALOGED
6	-29.50	NO	HAZARD	SS	CATALOGED
7	-26.69	NO	HAZARD	SS	CATALOGED
8	-23.88	NO	HAZARD	SS	CATALOGED
9	-21.08	NO	HAZARD	SS	CATALOGED
10	-18.26	NO	HAZARD	SS	CATALOGED
11	-15.45	1.75	1.69	-0.47	0.01 Crosspath hazard
12	-12.64	1.68	1.64	-0.37	-0.31 Step hazard
13	-9.84	NO	HAZARD	SS	CATALOGED
14	-7.02	1.10	1.10	-0.13	0.00 Step hazard
		1.68	1.67	-0.21	-0.33 Step hazard
15	-4.22	1.10	1.10	-0.08	0.00 Step hazard
		1.68	1.67	-0.12	-0.33 Step hazard
16	-1.41	NO	HAZARD	SS	CATALOGED
17	1.40	NO	HAZARD	SS	CATALOGED
18	4.21	NO	HAZARD	SS	CATALOGED
19	7.02	1.68	1.67	0.21	-0.29 Step hazard
20	9.83	NO	HAZARD	SS	CATALOGED
21	12.64	1.59	1.55	0.35	-0.28 Step hazard
		1.71	1.67	0.37	-0.29 Step hazard
22	15.45	1.43	1.39	0.39	-0.28 Step hazard
		1.43	1.39	0.39	-0.28 Step hazard
		1.40	1.40	0.39	-0.28 Step hazard
23	18.26	NO	HAZARD	SS	CATALOGED
24	21.07	NO	HAZARD	SS	CATALOGED
25	23.88	NO	HAZARD	SS	CATALOGED
26	26.69	NO	HAZARD	SS	CATALOGED
27	29.50	NO	HAZARD	SS	CATALOGED
28	32.31	NO	HAZARD	SS	CATALOGED
29	35.12	NO	HAZARD	SS	CATALOGED
30	37.93	NO	HAZARD	SS	CATALOGED
31	40.74	NO	HAZARD	SS	CATALOGED
32	43.55	NO	HAZARD	SS	CATALOGED

FIGURE 44. LARGE SQUARE HOLE WITH 30 CM DEPTH TEST

PART 5

CONCLUSIONS

As the results of the tests have shown, the ML/MD vision scanning system has the potential to do an excellent job of supplying hazard data for an autonomous roving vehicle. All height data obtained were within a few centimeters of the actual heights involved. Step hazards were detected without any problems. Cross-path analysis showed that a cross-step hazard is detected when present. The side to side resolution proved to be quite good as shown in the cross-path testing. The obstacle disappeared and a step hazard appeared at the appropriate heights. Also, although some hazards are not cataloged, such as cross-slope hazards, the data obtained by the mast certainly provided enough information for the presence of additional hazards to be derived.

Of course, there are problems. The first of these is that a hazard is not flagged when two obstacles were placed at a width less than the vehicle width.

This problem is not considered an impossible stumbling block since the path selection algorithm could be set up to recognize this as a hazard and the appropriate action could then be taken; specifically, the terrain could be avoided.

Another problem which became obvious was that the ranges determined during the range tests proved to be different from the actual ranges involved. Fortunately, the differences were about the same for both rising and falling edges for all detectable range values. Injecting an offset into the range values obtained would alleviate this problem. Since the values varied by about 5 cm (2 in), it seems that it would be necessary to always assume that a hazard occupies space outside of its detected edges by this amount. This could also be taken care of by the path selection algorithm.

Cross-path hazards is a problem which was not fully explored here but which must be given greater attention in the future. The cross-path results obtained here involved cross-steps between adjacent azimuths. Unfortunately, the ability of the modeler to detect cross-slopes is very limited. This is because the cross-path analysis is performed between adjacent azimuths and a cross-slope hazard would generally occur amongst azimuths much more than 1 apart. Fortunately, the data obtained contains enough information for a proper analysis to be done.

A problem which showed itself during the slope hazard tests was the inability of the modeler to reliably detect a slope hazard. Looking at the data reveals that all of the information is available to perform reasonably accurate slope hazard analysis, but the results which the modeler produced did not reflect this. Specifically, the software lowpass filtering which the data experiences, discussed in Section 3.5.4, all but destroys the data. If the slope filter coefficient is too high, most of the slope information is lost. However, if the coefficient is just slightly lower, almost any terrain produces a slope hazard. What the problem seems to be is that since slopes are determined from information obtained from adjacent valid elevations, the actual envelope of the terrain is distorted. In fact, there is never enough information when a slope starts gradually or when the slope does not occupy the entire view in front of the mast for a detectable slope hazard to materialize. What is proposed to correct this is to fit the data obtained to straight lines, each created by doing a least squares fit of the data on at least one-fourth of the data obtained for any particular azimuth.

In terms of the ML/MD systems's useful range resolution, another comment must be made. In order for a hazard to be detected, enough data for the terrain surrounding that hazard must be obtained. The vision system's ability to detect hazards greater than 2 meters in range is non-existent, at least on what the vehicle would consider level ground. This is because the most distant laser shot is

fired at a point approximately 3 meters away from the mast. This, coupled with the facts that the effective detector height is only 1 meter and at a distance of 2 meters the detectors cannot see anything above about 30 cm over the ground plane precludes the hazard detection ability beyond this. Of course, holes could be detected at a somewhat further distance, but the concern should be with worst case, not best.

All of these problems are not really that bad and for the most part are correctable through changes and additions in the software. The slope hazard detection algorithm will almost certainly have to be looked at and corrections in the modeler is almost inevitable. The problem with detecting cross-slope cross-path hazards is currently being looked at and will probably be corrected within the modeler. The path selection routine could certainly correct for the problem with narrow passages as well as considering an object as larger than it actually is. In terms of the limited range which the vision system possesses, this could be corrected without loss of resolution by increasing the number of detectors and the number of laser shots fired per azimuth. Of course, this would mean an increased load on the interpretation software, but given the advances in computer and microprocessor technology, this would not be a problem.

In conclusion, the data obtained by the Multi-Laser/Multi-Detector mast electronics provides useful information to help in the determination of the hazards on a given terrain. Also,

with just a few changes and additions to the software, a fast but nominally performing, short-range hazard detection system could be made completely functional. Finally, with some additional changes to hardware, the range of this vision system could also be increased.

PART 6

REFERENCES

1. Cipolle, D., "A High Speed Telemetry Data Link for an Autonomous Roving Vehicle." Rensselaer Polytechnic Institute Technical Report MP-72, Troy, N.Y., August 1980.
2. Clement, T., "The New Telemetry Card for the Mars Rover." Rensselaer Polytechnic Institute, Troy, N.Y., May 1982.
3. Craig, J. and Yerazunas, S., "Elevation Scanning Laser Multi-Sensor Hazard Detection System Controller and Mirror/Mast Speed Control Components." Rensselaer Polytechnic Institute Technical Report MP-59, Troy, N.Y., August 1978.
4. Doig, G., "Electronic and Software Subsystems for an Autonomous Roving Vehicle." Rensselaer Polytechnic Institute Technical Report MP-76, Troy, N.Y., October 1978.

5. Donaldson, J., "Laser Optical Appraisal and Design of a PRIME/Rover Interface." Rensselaer Polytechnic Institute Technical Report MP-68, Troy, N.Y., December 1979.
6. Gisser, D., Frederick, D., and Yerazunas, S., "Analysis and Design of a Capsule Landing System and Surface Vehicle Control System for Mars Exploration." Rensselaer Polytechnic Institute Technical Report MP-54, Troy, N.Y., June 30, 1977.
7. Kennedy, W., "Control Electronics for a Multi-Laser/Multi-Detector Scanning System." Rensselaer Polytechnic Institute Technical Report MP-73, Troy, N.Y., August 1980.
8. Markinson, S., "Software and Electronic Subsystems for the Mars Roving Vehicle." Rensselaer Polytechnic Institute Technical Report MP-79, Troy, N.Y., May 1982.
9. McNellis, T., "Evaluation of a Laser Triangulation Ranging System for Mobile Robots." Rensselaer Polytechnic Institute Technical Report MP-80, Troy, N.Y., August 1982.
10. Messing, B., "Interpretation of Laser/Multi-Sensor Data for Short Range Terrain Modeling and Hazard Detection." Rensselaer Polytechnic Institute Technical Report MP-75,

Troy, N.Y., August 1980.

11. Odenthal, J., "A Receiver for Laser Triangulation Rangefinder." Rensselaer Polytechnic Institute Technical Report MP-74, Troy, N.Y., August 1980.
12. Potemsil, M., "T\$ROVR, a Primos I/O Driver for the Rover Vehicle." Rensselaer Polytechnic Institute, Troy, N.Y., July, 1980
13. PRIME Computer, Inc., Reference Guide, Primos Commands. First Printing, PRIME Computer, Inc., July 1978.
14. Ryder, A., "Dynamic Evaluation of RPI's 0.4 Scale Unmanned Martian Roving Vehicle Model." Rensselaer Polytechnic Institute Technical Report MP-38, Troy, N.Y., December 1973.
15. Troiani, N. and Yerazunis, S., "Procedures for the Interpretation and use of Elevation Scanning Laser/Multi-Sensor Data for Short Range Hazard Detection and Avoidance for an Autonomous Planetary Rover." Rensselaer Polytechnic Institute Technical Report MP-57, Troy, N.Y., July 1978.

PART 7

APPENDIX

7.1 TELEM6.TC - Microprocessor Telemetry Program86

7.2 Tests96

 7.2.1 Single Step Test Results.....97

 7.2.2 Slope Test Results.....107

 7.2.3 Two Steps Test Results.....175

 7.2.4 Parallel Obstacles Test Results.....184

 7.2.5 Range Test Results191

 7.2.6 Hole Tests Results.....212

7.1 TELEM6.TC - Microprocessor Telemetry Program

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MOTOROLA M6800 CROSS ASSEMBLER, RELEASE 1.2

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NAM TELEH6.TC M6802 telemetry gathering program
TELEMETRY LASER & VEHICLE DATA TO MICRO TO ADLC
J Clement 21 Sept 1982
Revised: Clears out shared RAM locations before
starting to send data. TJC 06 June 1983
Revised: Prints the number of shots per azimuth,
and total shots per scan. TJC 12 July 1983
Used on Telemetry Board with 6802 Microprocessor
NO data is inverted
*****
Data is printed to the screen as follows:
(1) When End of vehicle is being sent, a period (.) is printed.
(2) When an End of azimuth is received (xx:xx) is printed
where: xx:xx is the number of laser shots fired
(---) is the azimuth number
(3) When End of Scan is sent, (EOS xx xxx) is printed
where: EOS xx xxx is the total number of laser shots fired
(---) is the total number of azimuths
Data should look something like this on the screen:
.....00:32.01:32.02:32.03:32.04:32. (etc)
.25:32.26:32.27:32.28:32.29:32.30:32.31:32
EOS 32 1024
.....00:32. (etc)
*****
A200 START EQU $A200 - Starting address
A0FF STACK EQU SA0FF - Top of stack
5550 ADLC EQU $5550 WRITE - Control register for ADLC
5550 SADR C EQU $5550 READ - Status register for ADLC
5552 DADR C EQU $5552 WRITE - Data register in ADLC
    
```

TELEFM6

MOTOROLA M68SAM CROSS-ASSEMBLER

PAGE 2

00045	5553	LOADLC EQU	\$5553	WRITE	- Control and last data registers in ADLC
00046	5554	FIFO EQU	\$5554	WRITE	- Causes release of FIFO latch
00047	5555	HBLANA EQU	\$5555	READ	- Location of high byte of laser address
00048	*		\$5559	READ	- Location of low byte of laser address
00049	555A	HULAND EQU	\$555A	READ	- Location of high byte of laser data
00050	*		\$555B	READ	- Location of low byte of laser data
00051	555C	FIFOT EQU	\$555C	READ	- Location for test for FIFO ready
00052	*				
00053	A1F2	ELEVMT EQU	\$A1F2	R/NR	- Contains number of shots in an Azimuth
00054	A1F3	AZRCNT EQU	\$A1F3	R/NR	- Contains number of Azimuths
00055	A1F4	TUSHOT EQU	\$A1F4	R/NR	- Contains total of number shots as of FOS
00056	A1F6	VORTS EQU	\$A1F6	R/NR	- Vehicle Data Ready To Send Flag
00057	A1F8	HVADDR EQU	\$A1F8	R/NR	- Temp. loc. for high byte of output address
00058	A1F9	HVADDR EQU	\$A1F9	R/NR	- Temp. loc. for low byte of output address
00059	A1FA	HVDATA EQU	\$A1FA	R/NR	- Temp. loc. for high byte of output data
00060	A1FB	LHDATA EQU	\$A1FB	R/NR	- Temp. loc. for low byte of output data
00061	A1FC	TEMP1 EQU	\$A1FC	R/NR	- Location for shared RAM address
00062	A1FE	TEMP2 EQU	\$A1FE	R/NR	- Location for block address
00063	*				
00064	A700	BLESTR EQU	\$A700	R/NR	- Location where block starts
00065	*				
00066	C400	AVDATA EQU	\$C400	R/NR	- Starting location of analog vehicle data
00067	*				- ends at \$C01F
00068	C420	DNDATA EQU	\$C420	R/NR	- Starting location of digital vehicle data
00069	*				- ends at \$C03F
00070	C43E	LDVDA EQU	\$C43E	R/NR	- Location of last word of vehicle data
00071	C440	VDDATAT EQU	\$C440	R/NR	- Location to test if vehicle data ready
00072	*				
00073	00074 A200				
00074		ONC	START		
00075	*				
00076		Set up stack			
00077	*				
00078	A200 BE A0FF	LDS	*STACK		
00079	*				
00080		Set up loop to clear vehicle data.			
00081	*				
00082	A203 CE C400	LDX	*AVDATA		
00083	*				
00084		Clear vehicle data.			
00085	*				
00086	A206 6F 00	CLLOOP	CLR	0,X	
00087	A208 08	INX			
00088	*				
00089	*	Test if done.			
00090	*				
00091	A209 BC C440	CPX	*VDATAT		
00092	*				
00093	*	Branch back if not.			


```

00094      *
00095 A20C 26 F0      *   BNE      CLOOP
00096      *
00097      *   Set vehicle test word to allow vehicle data to be read
00098      *   at least once.
00099      *
00100 A20E 7F C440      CLR      VDATAT
00101 A211 7C C440      INC      VDATAT
00102      *
00103      * Initialize ADLC
00104      *
00105 A214 CE 5550      LDX      #ADLC
00106 A217 B6 D9      LDA      #809
00107 A219 A7 00      STA      A 0,X
00108 A21B 4F      CLR      A
00109 A21C A7 01      STA      A 1,X
00110 A21E B6 1F      LDA      #SIF
00111 A220 A7 03      STA      A 0,X
00112 A222 B6 D8      LDA      #808
00113 A224 A7 00      STA      A 0,X
00114 A226 B6 04      LDA      #804
00115 A228 A7 01      STA      A 1,X
00116 A22A B6 5B      LDA      #85B
00117 A22C A7 00      STA      A 0,X
00118      *
00119      *
00120      * Initialize:
00121 A22E 7F A1F2      CLR      ELVCMT
00122 A231 7F A1F3      CLR      AZHCMT
00123 A234 7F A1F4      CLR      TOSHOT
00124 A237 7F A1F5      CLR      TOSHOT+1
00125      *
00126 A23A 6F 00      CLR      B.X
00127      *
00128 A23C CE 0000      LDX      #0
00129 A23F FF A1F6      STX      VDRYS
00130      *
00131      *
00132      *
00133 A242 F6 535C TOP      LDA      B
00134 A245 54      LSR      B
00135 A246 25 03      BCS      LASER
00136 A248 7E A3DD      JMP      VDRDY
00137      *
00138 A24B FE 5550      LDX      LASER
00139 A24E FF A1F8      STX      HBADDR
00140 A251 FE 5551      LDX      RLASD
00141 A254 FF A1FA      STX      HBDATA
00142      *

```

Starting address for ADLC
Reset TX, RX, TMSN. Disable Interrupts. AC=1
CR1
CR2
CR4
AC=0
Idle ones
CR2
Set TX enable
CR1

Release FIFO latch
Clear VDRYS
Read laser address and data words
Fifos ready
LASER
VDRDY
Read High and low laser address words
Read High and low laser data words

TELETYPE

MOTOROLA M68SAH CROSS-ASSEMBLER

PAGE 4

00143	A257	7F	555B	*	CLR	FIFO	Release FIFO latch
00144	A258	H6	A1F2	*	LDA A	FLVGMT	Increment elevation count.
00145	A259	HD	01		ADD A	#1	
00146	A25F	19			DAI		
00147	A260	H7	A1F2	*	STA A	FLVGMT	
00148	A263	H6	A1FB	*	LDA A	HBADDR	Put high byte of laser address in proper format
00149	A264	H4	7F		AND A	#87F	
00150	A266	HA	1B		ORA A	#81B	
00151	A268	HA	1B		STA A	HBADDR	
00152	A26A	H7	A1FB	*	JSR	SEND	Put address and data in ADLC
00153	A270	H6	A1FB	*	LDA A	HBADDR	
00154	A270	H6	A1FB	*	LDA A	HBADDR	
00155	A270	H6	A1FB	*	LDA A	HBADDR	
00156	A270	H6	A1FB	*	LDA A	HBADDR	
00157	A270	H6	A1FB	*	LDA A	HBADDR	
00158	A270	H6	A1FB	*	LDA A	HBADDR	
00159	A270	H6	A1FB	*	LDA A	HBADDR	
00160	A277	F6	S55C	WAITL1	LDA B	FIFOT	Test if LASER data is ready
00161	A27A	54			LSR B		
00162	A27B	25	CE		HCS	LASER	
00163	A27D	20	F0	*	BRA	WAITL1	
00164	A27F	H6	A1F3	NEXT	LDA A	AZMCNT	Increment number of azimuths.
00165	A282	8B	01		ADD A	#1	
00166	A284	19			DAI		
00167	A285	B7	A1F3	*	STA A	AZMCNT	
00168	A285	B7	A1F3	*	STA A	AZMCNT	
00169	A285	B7	A1F3	*	STA A	AZMCNT	
00170	A285	B7	A1F3	*	STA A	AZMCNT	
00171	A288	H6	A1FB	*	LDA A	HBADDR	Print azimuth #, # of azimuths, & # of elevations
00172	A288	H6	A1FB	*	LDA A	HBADDR	
00173	A288	H6	A1FB	*	LDA A	HBADDR	Load most significant byte of address
00174	A28E	5B			ASL B		Load least significant byte of address
00175	A28F	49			ROL A		
00176	A290	5B			ASL B		
00177	A291	49			ROL A		
00178	A291	49			ROL A		
00179	A291	49			ROL A		
00180	A292	H4	1F	*	AND A	#81F	Pull out data to allow conversion to BCD
00181	A294	16			TAB		
00182	A295	H4	0F	*	AND A	#80F	
00183	A295	H4	0F	*	AND A	#80F	
00184	A297	H1	0A	*	CMR A	#10	
00185	A299	2D	04	*	RLT	NOADJ	
00186	A299	2D	04	*	RLT	NOADJ	
00187	A299	2D	04	*	RLT	NOADJ	
00188	A29B	H0	03	*	SUB A	#10	
00189	A29D	BA	10	*	ORA A	#810	
00190	A29F	C5	10	*	NOADJ	BIT B	#010
00191	A29F	C5	10	*	NOADJ	BIT B	#010

Address	Instruction	Comment
00192	A2A1 27 03	
00193	A2A3 0B 16	Account for bit 577 (As per MAST.TM)
00194	A2A5 19	
00195	A2A6 16	
00196	A2A7 0D E0FA	Print angle number
00197	A2A8 0D E0FE	High nibble
00198	A2A9 17	Low nibble
00199	A2AA 17	Print a separator character to allow
00200	A2AB 0D E0FE	
00201	A2AC 86 3A	
00202	A2AD 8D E108	Add current number of shots to total
00203	A2AE 19	
00204	A2AF 19	
00205	A2B0 86 A1F2	First get the elevation count and add it to the
00206	A2B1 86 A1F3	
00207	A2B2 86 A1F4	Be sure to decimal adjust this.
00208	A2B3 86 A1F5	
00209	A2B4 86 A1F6	Then add the carry to the upper byte.
00210	A2B5 86 A1F7	Be sure to decimal adjust this.
00211	A2B6 86 A1F8	
00212	A2B7 86 A1F9	
00213	A2B8 86 A1FA	Print number of elevation shots
00214	A2B9 86 A1FB	
00215	A2BA 86 A1FC	
00216	A2BB 86 A1FD	
00217	A2BC 86 A1FE	
00218	A2BD 86 A1FF	
00219	A2BE 86 A200	Clear number of elevation shots
00220	A2BF 86 A201	
00221	A2C0 86 A202	
00222	A2C1 86 A203	Test for End of Scan
00223	A2C2 86 A204	
00224	A2C3 86 A205	
00225	A2C4 86 A206	Clear VDRDY
00226	A2C5 86 A207	
00227	A2C6 86 A208	Test for end of scan
00228	A2C7 86 A209	Branch if not
00229	A2C8 86 A20A	
00230	A2C9 86 A20B	Print 'EOS', # of azimuths, and total # of shots
00231	A2CA 86 A20C	Print a line feed.
00232	A2CB 86 A20D	
00233	A2CC 86 A20E	Print an 'E'
00234	A2CD 86 A20F	
00235	A2CE 86 A210	
00236	A2CF 86 A211	
00237	A2D0 86 A212	
00238	A2D1 86 A213	
00239	A2D2 86 A214	
00240	A2D3 86 A215	

00241	*	LDA A	'0'	Print an '0'
00242	A2FC B6 4F	JSR	\$F100	
00243	A2EE BD E100	*		
00244	*	LDA A	'S'	Print an 'S'
00245	A2F1 B6 53	JSR	\$F100	
00246	A2F3 BD E100	*		
00247	*	LDA A	'S0'	Print a space
00248	A2F6 B6 20	JSR	\$F100	
00249	A2F8 BD E100	*		
00250	*	LDA A	AZMCNT	Print number of azimuths fired
00251	A2FB B6 A1F3	JSR	\$E0FA	
00252	A2FE BD E0FA	*		
00253	A301 B6 A1F3	LDA A	AZMCNT	
00254	A304 BD E0FE	JSR	\$E0FE	
00255	*	JSR	\$E100	Print a space
00256	A307 BD E100	*		
00257	*	LDA A	TOSHOT	Print total number of shots
00258	A30A B6 A1F4	JSR	\$E0FA	
00259	A30D BD E0FA	*		
00260	A310 B6 A1F4	LDA A	TOSHOT	
00261	A313 BD E0FE	JSR	\$E0FE	
00262	A316 B6 A1F5	LDA A	TOSHOT+1	
00263	A319 BD E0FA	JSR	\$E0FA	
00264	A31C B6 A1F5	LDA A	TOSHOT+1	
00265	A31F BD E0FE	JSR	\$E0FE	
00266	*			Get ready for a new scene
00267	*			
00268	*	CLR	ELVCNT	Clear all counters
00269	A322 7F A1F2	CLR	AZMCNT	
00270	A325 7F A1F3	CLR	TOSHOT	
00271	A328 7F A1F4	CLR	TOSHOT+1	
00272	A32B 7F A1F5	*		
00273	*	LDA A	'S0A'	Print a line feed.
00274	A32E B6 0A	JSR	\$E100	
00275	A330 BD E100	*		
00276	A333 B6 0A	LDA A	'S0A'	
00277	A335 BD E100	JSR	\$E100	
00278	A338 B6 0D	LDA A	'S0D'	
00279	A33A BD E100	JSR	\$E100	
00280	*			Test if vehicle data is ready to transfer from shared RAM to block storage
00281	*			
00282	*			
00283	*	TST	VDATAT	Branch if not ready
00284	A33D 7D C440	VDRDY	VEJOUT	
00285	A340 27 63	*		Now format and transfer vehicle data to storage
00286	*			
00287	*	LDA	'BLKSTR	Load and Save starting address of storage block
00288	*			
00289	A142 CE A700	*		

TELE6	MOTOROLA	M6801A	CROSS-ASSEMBLER	PAGE	7		
00290	A345	FF	A1FC	STX	TEMP2		
00291	A348	CE	C400	LDX	AVDATA	Load and Save starting address of shared RAM	
00292	A34B	FF	A1FC	STX	TEMP1		
00293			*				
00294			*				
00295	A34F	A6	00	LDA	A	0,X	Start with analog vehicle data
00296	A350	0A	F0	ORA	A	08F0	Load hi byte of analog vehicle data
00297	A352	F6	01	LDA	B	1,X	Format hi byte of analog vehicle data
00298	A354	08		INX			Load to byte of analog vehicle data
00299	A358	08		INX			
00300	A355	08		INX			
00301	A356	FF	A1FC	STX	TEMP1	Save current location in shared RAM	
00302	A359	FE	A1F6	LDX	VDRTS	Adjust flag	
00303	A35C	08		INX			
00304	A35D	08		INX			
00305	A35E	FF	A1F6	STX	VDRTS	Save flag	
00306	A361	FE	A1FE	LDX	TEMP2	Load current location in block storage area	
00307	A364	A7	00	STA	A	0,X	Save hi byte of analog vehicle data
00308	A366	E7	01	STA	B	1,X	Save to byte of analog vehicle data
00309	A368	08		INX			
00310	A369	08		INX			
00311	A36A	FF	A1FE	STX	TEMP2	Save current location in block storage area	
00312	A36B	FE	A1FC	LDX	TEMP1	Load current location in shared RAM	
00313	A370	8C	C420	CPX	AVDATA	Test if done with analog vehicle data	
00314	A373	26	D9	BNE	ALOOP	Branch back if not	
00315			*				
00316			*				
00317			*				
00318	A375	A6	00	LDA	A	0,X	Now transfer digital vehicle data
00319	A377	E6	01	LDA	B	1,X	Load hi byte of digital vehicle data
00320	A379	08		INX			Load to byte of digital vehicle data
00321	A37A	08		INX			
00322	A37B	FF	A1FC	STX	TEMP1	Save current location in shared RAM	
00323	A37E	FE	A1F6	LDX	VDRTS	Adjust flag	
00324	A381	08		INX			
00325	A382	08		INX			
00326	A383	FF	A1F6	STX	VDRTS	Save flag	
00327	A386	FE	A1FE	LDX	TEMP2	Load current location in block storage area	
00328	A389	A7	00	STA	A	0,X	Save hi byte of digital vehicle data
00329	A38B	E7	01	STA	B	1,X	Save to byte of digital vehicle data
00330	A38D	08		INX			
00331	A38E	08		INX			
00332	A38F	FF	A1FE	STX	TEMP2	Save current location in block storage area	
00333	A392	FE	A1FC	LDX	TEMP1	Load current location in shared RAM	
00334	A393	8C	C440	CPX	AVDATAT	Test if done	
00335	A398	26	D8	BNE	DLOOP	Branch if not	
00336	A39A	6F	00	CLR	0,X	Clear data ready flag (i.e....net data taken)	
00337	A39C	B6	A1F6	LDA	A	VDRTS	Test if flag is less than 0
00338	A39F	2B	06	BMI	VEHOUT	Branch if true	

00339	A3A1	CE	0000	LDX	#0	Clear VDRTS flag
00340	A3A4	FF	A1F6	STX	VDRTS	
00341						* Test if vehicle data is to be sent
00342						* VDRTS
00343	A3A7	FE	A1F6	VEROUT	VDRTS	Check if vehicle data ready to send
00344	A3AA	26	34	BNE	BACK	Branch if not to increment flag
00345	A3AC	7F	A1F8	CLR	LRADDR	Set up for vehicle data
00346	A3AC	7F	A1F8	CLR	LRADDR	
00347	A3AF	7F	A1F9			
00348						
00349	A3B2	CE	A700	LDX	#RLKSTR	Load with starting address of block
00350	A3B5	A6	00	LDA	A 0,X	Load high byte of data
00351	A3B7	B7	A1FA	STA	A HRDATA	Save in hi-byte send register
00352	A3BA	A6	01	LDA	A 1,X	Load to byte of data
00353	A3BC	B7	A1FB	STA	A LRDATA	Save in lo-byte data send register
00354	A3BF	BC	A73E	CPX	#RLKSTR+83E	Test for EOV
00355	A3C2	26	0A	BNE	VSEND	Branch if not
00356	A3C4	B6	2E	LDA	A #E108	Put an indication that EOV is being sent....
00357	A3C6	BD	E108	JSR	A #E108	
00358	A3C9	B6	80	LDA	A #E100	Load EOV signal
00359	A3CB	B7	A1FB	STA	A HRADDR	
00360	A3CE	BD	1D	BSR	SEND	Send data
00361	A3D0	08		INX		
00362	A3D1	08		INX		
00363	A3D2	7C	A1F9	INC	LRADDR	Increment address pointer
00364	A3D5	BC	A740	CPX	#RLKSTR+840	Test if done with data
00365	A3D8	26	DB	BNE	OLOOP	Branch if not
00366						Load vehicle data ready to send flag.
00367						
00368						
00369	A3DA	CE	E000	LDX	#EE000	
00370	A3DD	FF	A1F6	STX	VDRTS	
00371						Increment flag register
00372						
00373						
00374	A3E0	FE	A1F6	BACK	VDRTS	
00375	A3E3	08		INX		
00376	A3E4	FF	A1F6	STX	VDRTS	
00377						
00378						Clear reset flag
00379						
00380	A3E7	7F	535F	CLR	8555F	
00381						Branch back to top
00382						
00383						
00384	A3EA	7E	A242	JMP	TOP	
00385						Subroutine SEND will put an address from LRADDR
00386						and HRADDR, and data from LRDATA and HRDATA on
00387						

```

00388 *
00389 *
00390 *
00391 A3E9 B6 A1F9 SEND LDA A LBADDR
00392 A3F0 B0 17 BSR OUT
00393 A3F2 H6 A1FB LDA A HBADDR
00394 A3F5 B0 12 BSR OUT
00395 A3F7 H6 A1FB LDA A LBDATA
00396 A3FA B0 00 BSR OUT
00397 A3FC H6 A1FA LDA A HBDATA
00398 A3FE F6 5550 SFNDL LDA B SBDLC
00399 A402 50 FA BPL SENDL
00400 A403 2A FA STA A
00401 A405 H7 5553 STA A LBADLC
00402 A40B 39 RTS
00403 *
00404 *
00405 *
00406 *
00407 A409 F6 5550 OUT LDA B SBDLC
00408 A40C 50 ASL B
00409 A40B 2A FA BPL OUT
00410 A40F B7 5552 STA A DADLC
00411 A412 39 RTS
00412 END
    
```

the ADLC for transmission.
The routine makes use of subroutine OUT.

Get address, least significant byte
Get address, most significant byte
Get data, least significant byte
Get data, most significant byte
Send last byte to ADLC
Is transmitter data register ready
Branch back if not

Used by SEND to put address and data information
in the ADLC.

Send byte to ADLC
Is transmitter data register available
Branch back if not

SYMBOL TABLE

```

START A200 STACK A0FF ADLC 5550 SBDLC 5550 DADLC 5552 LOADLC 5553 FIFO 5558
HBLAS- 5558 HBLASD 555A FIFO A1F0 AZCRHT A1F3 TOSHOT A1F4 VMITS A1F6
HADDR A1FB LBADDR A1F9 HBDATA A1FA A1EA C43E VBDATA C440 CLOOP A206 TOP A242 LASER A24H
A1DATA C400 BDATA C420 LBVDVA C43E VBDATA C440 CLOOP A206 TOP A242 LASER A24H
WAITL1 A277 NEXT A27F A27F ROADJ A29F ROADJ A2A6 VDRDY A30D A30D ALOOP A34E DLOOP A375
VENOUT A3A7 OLOOP A3B5 VSEND A3CE BACK A3E0 SEND A3ED SENDL A3FF OUT A409
    
```

7.2 Tests

7.2.1 Single Step Test Results

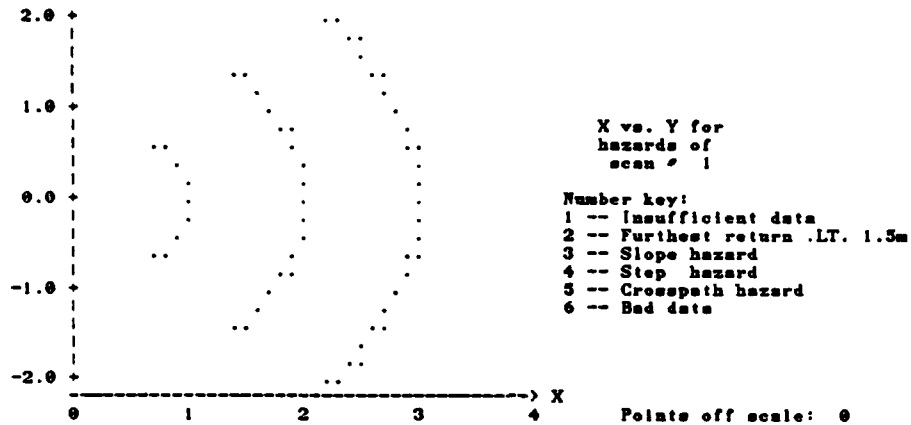
7.2.1.1	0 cm Step	.....	98
7.2.1.2	5 cm Step	.....	98
7.2.1.2	10 cm Step	.....	99
7.2.1.4	15 cm Step	.....	99
7.2.1.3	20 cm Step	.....	100
7.2.1.4	25 cm Step	.....	101
7.2.1.5	30 cm Step	.....	102
7.2.1.6	35 cm Step	.....	103
7.2.1.7	40 cm Step	.....	104
7.2.1.8	45 cm Step	.....	105
7.2.1.9	50 cm Step	.....	106

Input file: MDL.STEP.00
 File Creation Date : WED, JUL 27 1983 System time 13:49:27

```

** MODEL PARAMETERS **
HEIGHT FILTER COEFFICIENT = 0.25
SLOPE FILTER COEFFICIENT = 0.90
LEVEL GROUND STEP THRESHOLD = 0.25 METERS
SLOPE THRESHOLD = 30.00 DEGREES

```



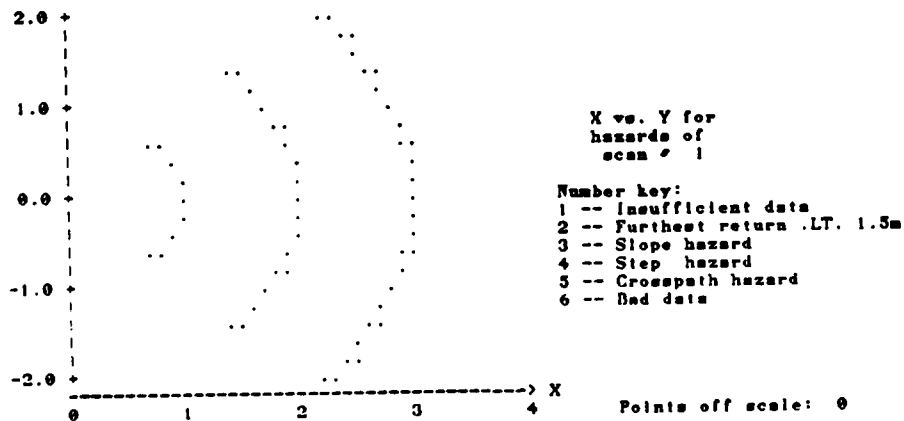
NO HAZARDS CATALOGED THIS SCAN

Input file: MDL.STEP.02
 File Creation Date : WED, JUL 27 1983 System time 13:57:36

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** MODEL PARAMETERS **
HEIGHT FILTER COEFFICIENT = 0.25
SLOPE FILTER COEFFICIENT = 0.90
LEVEL GROUND STEP THRESHOLD = 0.25 METERS
SLOPE THRESHOLD = 30.00 DEGREES

```



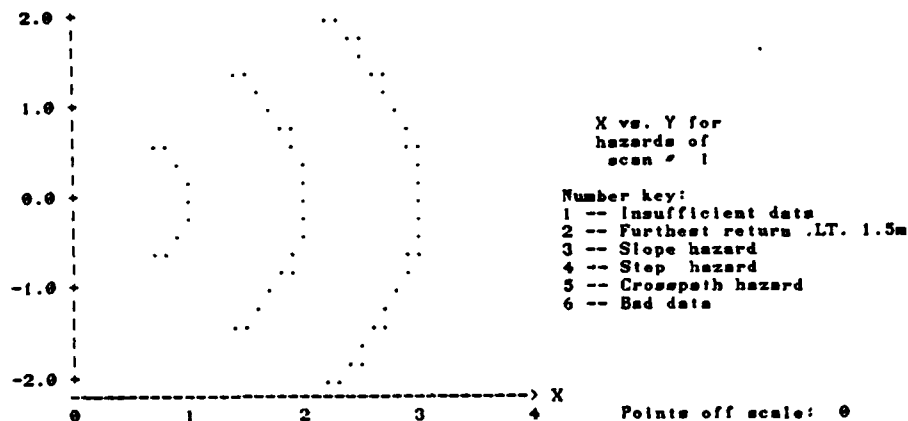
NO HAZARDS CATALOGED THIS SCAN

Input file: MDL.STEP.06
 File Creation Date : WED, JUL 27 1983 System time 16:06:57

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** MODEL1 PARAMETERS **
HEIGHT FILTER COEFFICIENT = 0.25
SLOPE FILTER COEFFICIENT = 0.90
LEVEL GROUND STEP THRESHOLD = 0.25 METERS
SLOPE THRESHOLD = 30.00 DEGREES

```



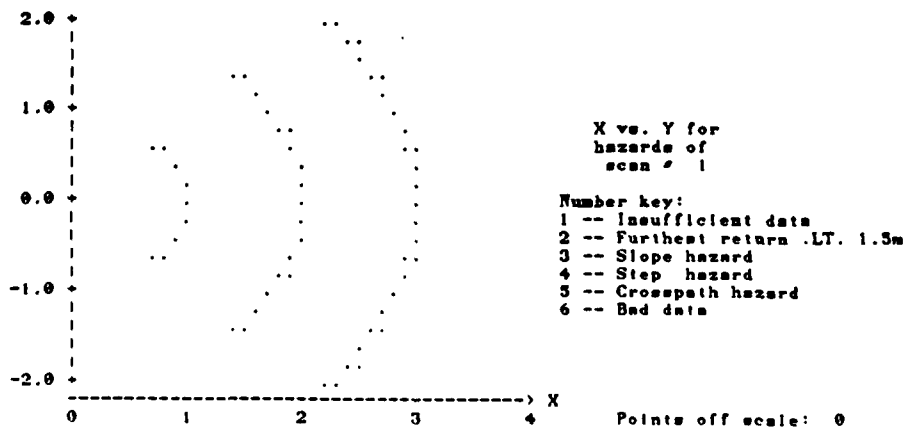
NO HAZARDS CATALOGED THIS SCAN

Input file: MDL.STEP.04
 File Creation Date : WED, JUL 27 1983 System time 14:00:28

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** MODEL1 PARAMETERS **
HEIGHT FILTER COEFFICIENT = 0.25
SLOPE FILTER COEFFICIENT = 0.90
LEVEL GROUND STEP THRESHOLD = 0.25 METERS
SLOPE THRESHOLD = 30.00 DEGREES

```



NO HAZARDS CATALOGED THIS SCAN

Input file: MDL.STEP.08

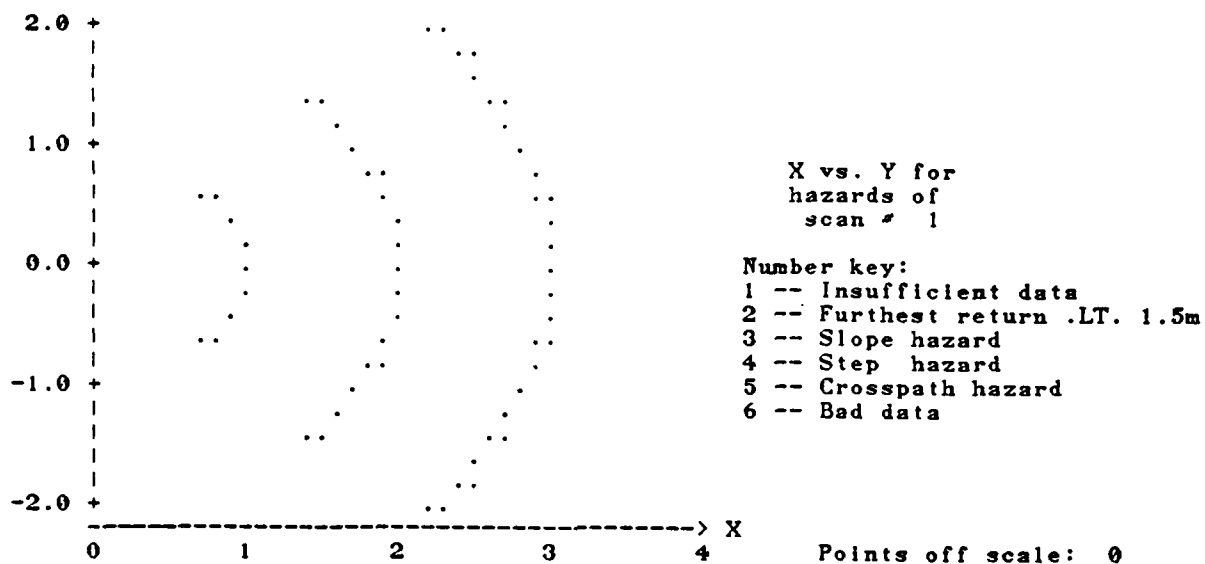
File Creation Date : WED. JUL 27 1983

System time 16:15:17

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** MODEL1 PARAMETERS **
HEIGHT FILTER COEFFICIENT = 0.25
SLOPE FILTER COEFFICIENT = 0.90
LEVEL GROUND STEP THRESHOLD = 0.25 METERS
SLOPE THRESHOLD = 30.00 DEGREES

```



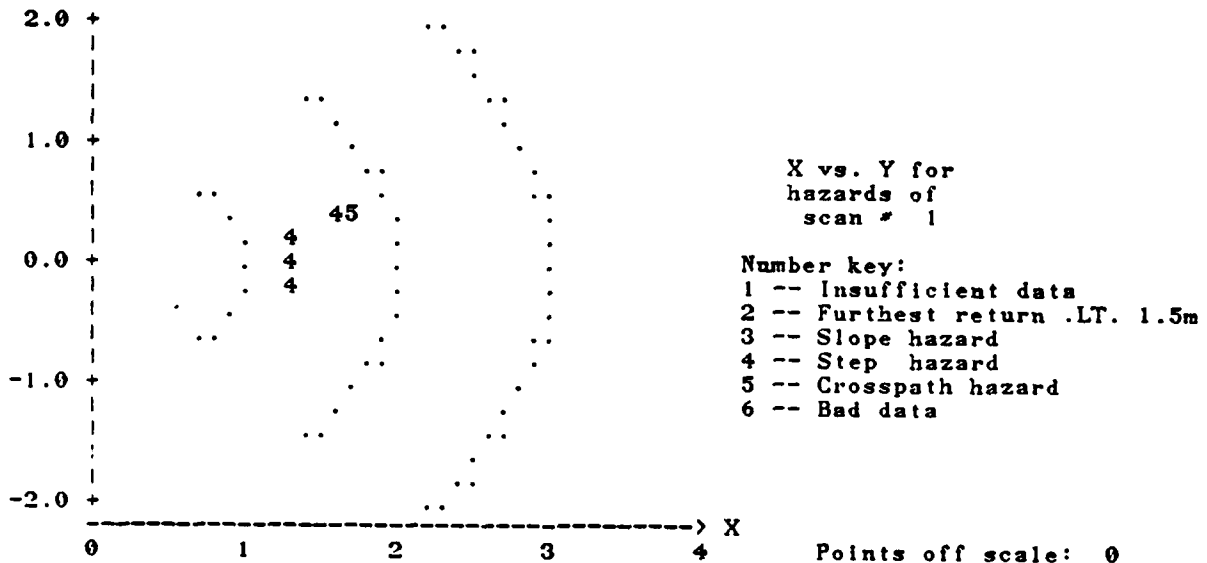
NO HAZARDS CATALOGED THIS SCAN

Input file: MDL.STEP.10

File Creation Date : WED, JUL 27 1983

System time 16:26:48

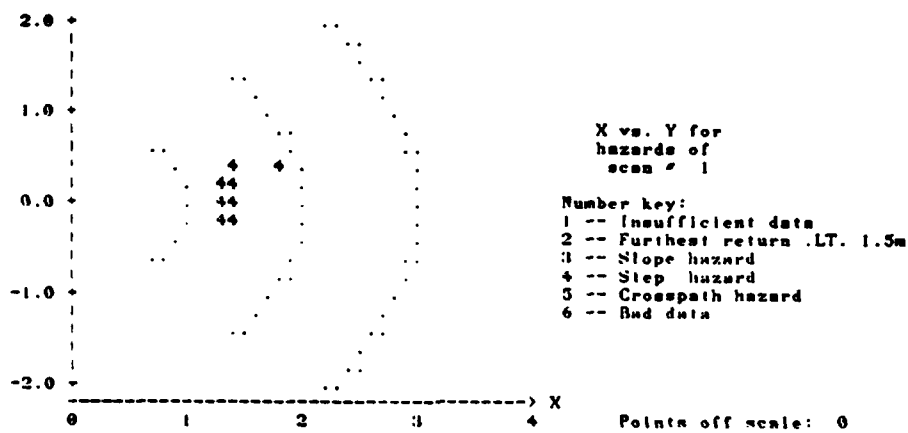
**** MODEL1 PARAMETERS ****
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	HAZARDS	CATALOGED	
2	-40.74	NO	HAZARDS	CATALOGED	
3	-37.93	NO	HAZARDS	CATALOGED	
4	-35.13	NO	HAZARDS	CATALOGED	
5	-32.31	NO	HAZARDS	CATALOGED	
6	-29.50	NO	HAZARDS	CATALOGED	
7	-26.69	NO	HAZARDS	CATALOGED	
8	-23.88	NO	HAZARDS	CATALOGED	
9	-21.08	NO	HAZARDS	CATALOGED	
10	-18.26	NO	HAZARDS	CATALOGED	
11	-15.45	NO	HAZARDS	CATALOGED	
12	-12.64	NO	HAZARDS	CATALOGED	
13	-9.84	1.29	1.27	-0.22	Step hazard
14	-7.02	NO	HAZARDS	CATALOGED	
15	-4.22	NO	HAZARDS	CATALOGED	
16	-1.41	NO	HAZARDS	CATALOGED	
17	1.40	1.29	1.29	0.03	Step hazard
18	4.21	1.29	1.29	0.09	Step hazard
19	7.02	1.29	1.28	0.16	Step hazard
20	9.83	NO	HAZARDS	CATALOGED	
21	12.64	1.29	1.26	0.28	Step hazard
		1.61	1.57	0.35	Step hazard
		1.75	1.71	0.38	Crosspath hazard
22	15.45	NO	HAZARDS	CATALOGED	
23	18.26	NO	HAZARDS	CATALOGED	
24	21.07	NO	HAZARDS	CATALOGED	
25	23.88	NO	HAZARDS	CATALOGED	
26	26.69	NO	HAZARDS	CATALOGED	
27	29.50	NO	HAZARDS	CATALOGED	
28	32.31	NO	HAZARDS	CATALOGED	
29	35.12	NO	HAZARDS	CATALOGED	
30	37.93	NO	HAZARDS	CATALOGED	
31	40.74	NO	HAZARDS	CATALOGED	
32	43.55	NO	HAZARDS	CATALOGED	

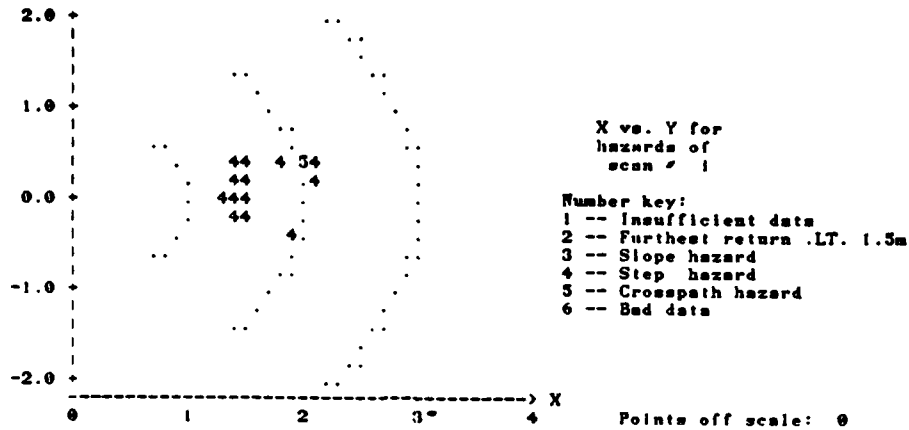
Input file: MDL.STEP.12
 File Creation Date : WED, JUL 27 1983 System time 14:05:35

== MODEL PARAMETERS ==
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



POINT	AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	HAZARD	S	CATALOCED	
2	-40.74	NO	HAZARD	S	CATALOCED	
3	-37.93	NO	HAZARD	S	CATALOCED	
4	-35.13	NO	HAZARD	S	CATALOCED	
5	-32.31	NO	HAZARD	S	CATALOCED	
6	-29.50	NO	HAZARD	S	CATALOCED	
7	-26.69	NO	HAZARD	S	CATALOCED	
8	-23.88	NO	HAZARD	S	CATALOCED	
9	-21.08	NO	HAZARD	S	CATALOCED	
10	-18.26	NO	HAZARD	S	CATALOCED	
11	-15.45	NO	HAZARD	S	CATALOCED	
12	-12.64	NO	HAZARD	S	CATALOCED	
13	-9.84	1.37	1.35	-0.23	-0.34	Step hazard
		1.45	1.43	-0.25	-0.32	Step hazard
14	-7.02	1.33	1.32	-0.16	-0.36	Step hazard
		1.37	1.36	-0.17	-0.35	Step hazard
		1.45	1.44	-0.18	-0.32	Step hazard
15	-4.22	1.29	1.29	-0.09	-0.37	Step hazard
		1.37	1.36	-0.10	-0.36	Step hazard
		1.45	1.44	-0.11	-0.32	Step hazard
16	-1.41	1.33	1.32	-0.03	-0.36	Step hazard
		1.37	1.37	-0.03	-0.35	Step hazard
		1.41	1.41	-0.03	-0.34	Step hazard
17	1.40	1.37	1.37	0.03	-0.34	Step hazard
		1.41	1.41	0.03	-0.33	Step hazard
18	4.21	1.33	1.32	0.10	-0.36	Step hazard
		1.37	1.36	0.10	-0.35	Step hazard
		1.45	1.44	0.11	-0.32	Step hazard
19	7.02	1.29	1.29	0.16	-0.37	Step hazard
		1.37	1.36	0.17	-0.36	Step hazard
		1.45	1.44	0.18	-0.32	Step hazard
20	9.83	1.37	1.35	0.23	-0.34	Step hazard
		1.41	1.39	0.24	-0.33	Step hazard
21	12.64	1.33	1.29	0.29	-0.36	Step hazard
		1.41	1.37	0.31	-0.34	Step hazard
		1.38	1.33	0.41	-0.00	Step hazard
22	15.45	1.41	1.36	0.37	-0.34	Step hazard
23	18.26	NO	HAZARD	S	CATALOCED	
24	21.07	NO	HAZARD	S	CATALOCED	
25	23.88	NO	HAZARD	S	CATALOCED	
26	26.69	NO	HAZARD	S	CATALOCED	
27	29.50	NO	HAZARD	S	CATALOCED	
28	32.31	NO	HAZARD	S	CATALOCED	
29	35.12	NO	HAZARD	S	CATALOCED	
30	37.93	NO	HAZARD	S	CATALOCED	
31	40.74	NO	HAZARD	S	CATALOCED	
32	43.55	NO	HAZARD	S	CATALOCED	

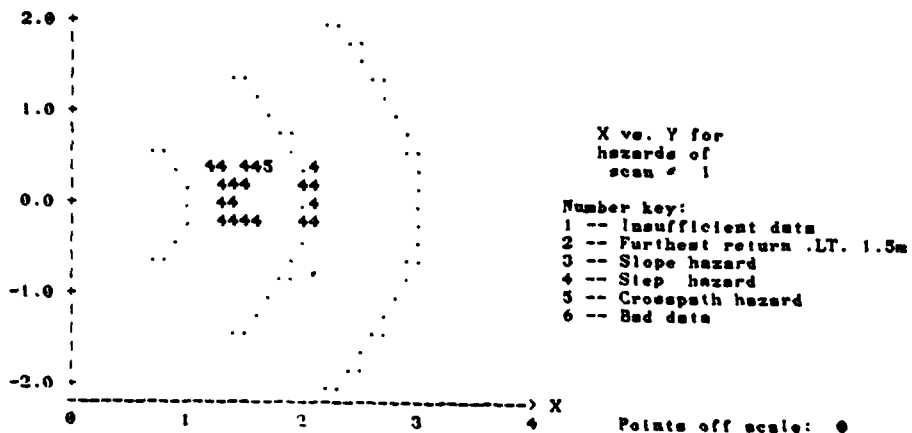
*** MODEL PARAMETERS ***
 HEIGHT FILTER COEFFICIENT * 0.25
 SLOPE FILTER COEFFICIENT * 0.90
 LEVEL GROUND STEP THRESHOLD * 0.25 METERS
 SLOPE THRESHOLD * 30.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE	
1	-43.56	NO	HAZARDS	CATALOGED		
2	-40.74	NO	HAZARDS	CATALOGED		
3	-37.93	NO	HAZARDS	CATALOGED		
4	-35.13	NO	HAZARDS	CATALOGED		
5	-32.31	NO	HAZARDS	CATALOGED		
6	-29.50	NO	HAZARDS	CATALOGED		
7	-26.69	NO	HAZARDS	CATALOGED		
8	-23.88	NO	HAZARDS	CATALOGED		
9	-21.08	NO	HAZARDS	CATALOGED		
10	-18.26	NO	HAZARDS	CATALOGED		
11	-15.45	NO	HAZARDS	CATALOGED		
12	-12.64	NO	HAZARDS	CATALOGED		
13	-9.84	1.41	1.39	-0.24	Step hazard	
		1.41	1.39	-0.24	Step hazard	
		1.32	1.50	-0.26	Step hazard	
		1.96	1.93	-0.33	0.00	Step hazard
14	-7.02	1.37	1.36	-0.17	-0.34	Step hazard
		1.41	1.40	-0.17	-0.33	Step hazard
		1.41	1.40	-0.17	-0.33	Step hazard
15	-4.22	1.33	1.32	-0.10	-0.36	Step hazard
		1.41	1.40	-0.10	-0.34	Step hazard
		1.41	1.40	-0.10	-0.34	Step hazard
16	-1.41	1.33	1.32	-0.03	-0.36	Step hazard
		1.41	1.41	-0.03	-0.34	Step hazard
17	1.40	1.33	1.32	0.03	-0.36	Step hazard
		1.41	1.41	0.03	-0.34	Step hazard
		1.41	1.41	0.03	-0.34	Step hazard
		1.48	1.48	0.04	-0.29	Step hazard
18	4.21	1.37	1.36	0.10	-0.34	Step hazard
		1.41	1.40	0.10	-0.33	Step hazard
		1.41	1.40	0.10	-0.33	Step hazard
19	7.02	1.41	1.40	0.17	-0.34	Step hazard
		1.52	1.51	0.19	-0.35	Step hazard
		1.52	1.51	0.19	-0.35	Step hazard
		2.10	2.09	0.26	-0.01	Step hazard
20	9.83	1.41	1.39	0.24	-0.34	Step hazard
		1.41	1.39	0.24	-0.34	Step hazard
		1.52	1.50	0.26	-0.35	Step hazard
		1.52	1.50	0.26	-0.35	Step hazard
		2.10	2.07	0.36	-0.01	Step hazard
21	12.64	1.41	1.37	0.31	-0.34	Step hazard
		1.41	1.37	0.31	-0.34	Step hazard
		1.52	1.49	0.33	-0.35	Step hazard
		1.52	1.49	0.33	-0.35	Step hazard
		1.88	1.83	0.41	0.01	Step hazard
		2.00	1.95	0.44	0.01	Crosspath hazard
22	15.45	1.41	1.36	0.37	-0.34	Step hazard
23	18.26	NO	HAZARDS	CATALOGED		
24	21.07	NO	HAZARDS	CATALOGED		
25	23.88	NO	HAZARDS	CATALOGED		
26	26.69	NO	HAZARDS	CATALOGED		
27	29.50	NO	HAZARDS	CATALOGED		
28	32.31	NO	HAZARDS	CATALOGED		
29	35.12	NO	HAZARDS	CATALOGED		
30	37.93	NO	HAZARDS	CATALOGED		
31	40.74	NO	HAZARDS	CATALOGED		
32	43.55	NO	HAZARDS	CATALOGED		

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 File Creation Date : WED, JUL 27 1983 System time 16:37:42

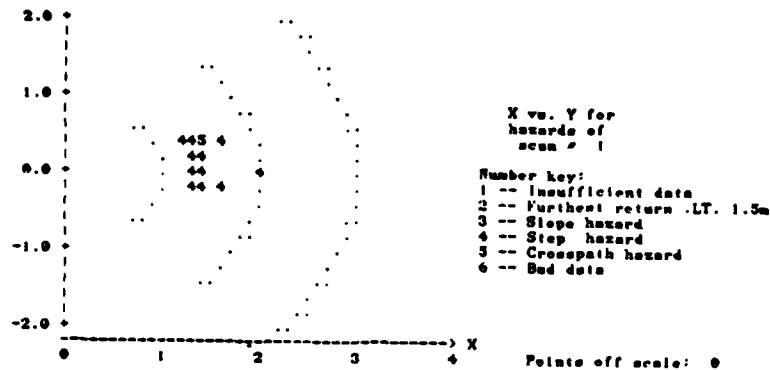
== MODEL PARAMETERS ==
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.36	N O	H A Z A R D S	C A T A L O C E D	
2	-40.74	N O	H A Z A R D S	C A T A L O C E D	
3	-37.93	N O	H A Z A R D S	C A T A L O C E D	
4	-35.13	N O	H A Z A R D S	C A T A L O C E D	
5	-32.31	N O	H A Z A R D S	C A T A L O C E D	
6	-29.50	N O	H A Z A R D S	C A T A L O C E D	
7	-26.69	N O	H A Z A R D S	C A T A L O C E D	
8	-23.88	N O	H A Z A R D S	C A T A L O C E D	
9	-21.00	N O	H A Z A R D S	C A T A L O C E D	
10	-18.26	N O	H A Z A R D S	C A T A L O C E D	
11	-15.45	N O	H A Z A R D S	C A T A L O C E D	
12	-12.64	N O	H A Z A R D S	C A T A L O C E D	
13	-9.84	1.33	1.31	-0.23	Step hazard
		1.37	1.35	-0.23	Step hazard
		1.60	1.57	-0.27	Step hazard
14	-7.02	1.37	1.36	-0.17	Step hazard
		1.49	1.48	-0.18	Step hazard
		2.06	2.03	-0.23	Step hazard
15	-4.22	1.29	1.29	-0.09	Step hazard
		1.37	1.36	-0.10	Step hazard
		2.06	2.06	-0.13	Step hazard
16	-1.41	1.33	1.32	-0.03	Step hazard
		1.37	1.37	-0.03	Step hazard
		1.41	1.41	-0.03	Step hazard
		2.06	2.06	-0.03	Step hazard
17	1.40	1.29	1.29	0.03	Step hazard
		1.37	1.37	0.03	Step hazard
		1.41	1.41	0.03	Step hazard
		2.06	2.06	0.03	Step hazard
18	4.21	1.29	1.29	0.09	Step hazard
		1.37	1.36	0.10	Step hazard
		2.06	2.06	0.13	Step hazard
19	7.02	1.29	1.28	0.16	Step hazard
		1.37	1.36	0.17	Step hazard
		2.06	2.03	0.23	Step hazard
20	9.83	1.37	1.35	0.23	Step hazard
		1.41	1.39	0.24	Step hazard
		1.49	1.47	0.23	Step hazard
		2.13	2.10	0.36	Step hazard
21	12.64	1.37	1.33	0.30	Step hazard
		1.49	1.45	0.33	Step hazard
22	15.45	1.29	1.24	0.34	Step hazard
		1.37	1.32	0.36	Step hazard
		1.61	1.55	0.43	Step hazard
		1.73	1.69	0.47	Step hazard
23	18.26	N O	H A Z A R D S	C A T A L O C E D	
24	21.07	N O	H A Z A R D S	C A T A L O C E D	
25	23.88	N O	H A Z A R D S	C A T A L O C E D	
26	26.69	N O	H A Z A R D S	C A T A L O C E D	
27	29.50	N O	H A Z A R D S	C A T A L O C E D	
28	32.31	N O	H A Z A R D S	C A T A L O C E D	
29	35.12	N O	H A Z A R D S	C A T A L O C E D	
30	37.93	N O	H A Z A R D S	C A T A L O C E D	
31	40.74	N O	H A Z A R D S	C A T A L O C E D	
32	43.55	N O	H A Z A R D S	C A T A L O C E D	

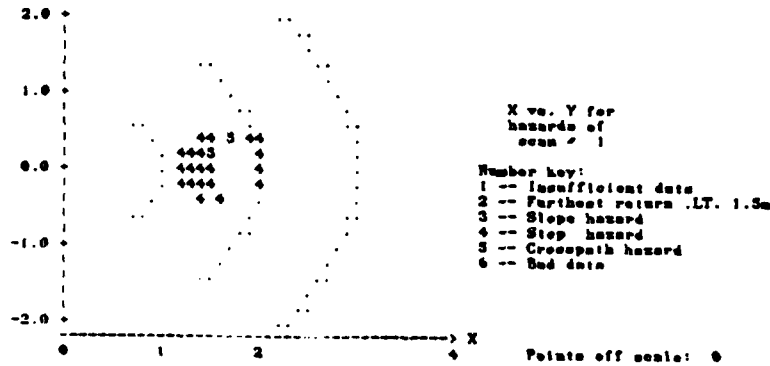
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 File Creation Date: WED. JUL 27 1983 System time 18:48:42

== MODEL PARAMETERS ==
 HEIGHT FILTER COEFFICIENT * 0.25
 SLOPE FILTER COEFFICIENT * 0.90
 LEVEL GROUND STEP THRESHOLD * 0.25 METERS
 SLOPE THRESHOLD * 30.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE	
1	-43.36	NO	HAZARDS	CATALOGED		
2	-40.74	NO	HAZARDS	CATALOGED		
3	-37.93	NO	HAZARDS	CATALOGED		
4	-35.13	NO	HAZARDS	CATALOGED		
5	-32.31	NO	HAZARDS	CATALOGED		
6	-29.50	NO	HAZARDS	CATALOGED		
7	-26.69	NO	HAZARDS	CATALOGED		
8	-23.88	NO	HAZARDS	CATALOGED		
9	-21.08	NO	HAZARDS	CATALOGED		
10	-18.26	NO	HAZARDS	CATALOGED		
11	-15.43	NO	HAZARDS	CATALOGED		
12	-12.64	NO	HAZARDS	CATALOGED		
13	-9.84	1.29	1.27	-0.22	-0.37	Step hazard
		1.29	1.27	-0.22	-0.37	Step hazard
		1.29	1.27	-0.22	-0.37	Step hazard
		1.33	1.31	-0.23	-0.37	Step hazard
		1.37	1.33	-0.23	-0.29	Step hazard
		1.61	1.39	-0.28	0.08	Step hazard
14	-7.02	1.29	1.28	-0.16	-0.37	Step hazard
		1.29	1.28	-0.16	-0.37	Step hazard
		1.29	1.28	-0.16	-0.37	Step hazard
		1.33	1.32	-0.16	-0.37	Step hazard
		1.37	1.34	-0.17	-0.29	Step hazard
15	-4.22	1.33	1.32	-0.10	-0.38	Step hazard
		1.40	1.40	-0.10	-0.25	Step hazard
16	-1.41	1.29	1.29	-0.03	-0.37	Step hazard
		1.29	1.29	-0.03	-0.37	Step hazard
		1.29	1.29	-0.03	-0.37	Step hazard
		1.33	1.32	-0.03	-0.37	Step hazard
		1.37	1.34	-0.03	-0.29	Step hazard
17	1.40	1.29	1.29	0.03	-0.37	Step hazard
		1.29	1.29	0.03	-0.37	Step hazard
		1.33	1.32	0.03	-0.37	Step hazard
		1.37	1.34	0.03	-0.29	Step hazard
		2.00	2.00	0.05	0.09	Step hazard
18	4.21	1.33	1.32	0.10	-0.38	Step hazard
		1.33	1.32	0.10	-0.38	Step hazard
		1.33	1.32	0.10	-0.38	Step hazard
		1.37	1.34	0.10	-0.36	Step hazard
19	7.02	1.33	1.32	0.16	-0.38	Step hazard
		1.37	1.34	0.17	-0.29	Step hazard
		1.37	1.34	0.17	-0.29	Step hazard
		1.40	1.39	0.17	-0.11	Step hazard
20	9.83	1.29	1.27	0.22	-0.37	Step hazard
		1.29	1.27	0.22	-0.37	Step hazard
		1.29	1.27	0.22	-0.37	Step hazard
		1.33	1.31	0.23	-0.37	Step hazard
		1.37	1.33	0.23	-0.29	Step hazard
21	12.64	1.29	1.26	0.28	-0.37	Step hazard
		1.29	1.26	0.28	-0.37	Step hazard
		1.33	1.29	0.29	-0.37	Step hazard
		1.37	1.30	0.30	-0.29	Step hazard
22	15.43	1.29	1.24	0.34	-0.37	Step hazard
		1.29	1.24	0.34	-0.37	Step hazard
		1.33	1.28	0.33	-0.37	Step hazard
		1.41	1.36	0.37	-0.34	Step hazard
		1.50	1.43	0.40	0.06	Crosspath hazard
		1.61	1.33	0.43	0.08	Step hazard
23	18.26	NO	HAZARDS	CATALOGED		
24	21.07	NO	HAZARDS	CATALOGED		
25	23.88	NO	HAZARDS	CATALOGED		
26	26.69	NO	HAZARDS	CATALOGED		
27	29.50	NO	HAZARDS	CATALOGED		
28	32.31	NO	HAZARDS	CATALOGED		
29	35.12	NO	HAZARDS	CATALOGED		
30	37.93	NO	HAZARDS	CATALOGED		
31	40.74	NO	HAZARDS	CATALOGED		
32	43.55	NO	HAZARDS	CATALOGED		

== MODEL PARAMETERS ==
 HEIGHT FILTER COEFFICIENT * 0.25
 SLOPE FILTER COEFFICIENT * 0.90
 LEVEL GROUND STEP THRESHOLD * 0.25 METERS
 SLOPE THRESHOLD * 30.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE	
1	-43.54	NO	HAZARDS	CATA	LOGED	
2	-40.74	NO	HAZARDS	CATA	LOGED	
3	-37.93	NO	HAZARDS	CATA	LOGED	
4	-35.13	NO	HAZARDS	CATA	LOGED	
5	-32.31	NO	HAZARDS	CATA	LOGED	
6	-29.50	NO	HAZARDS	CATA	LOGED	
7	-26.69	NO	HAZARDS	CATA	LOGED	
8	-23.88	NO	HAZARDS	CATA	LOGED	
9	-21.08	NO	HAZARDS	CATA	LOGED	
10	-18.26	NO	HAZARDS	CATA	LOGED	
11	-15.43	NO	HAZARDS	CATA	LOGED	
12	-12.64	1.33	1.29	-0.29	-0.36	Step hazard
		1.33	1.29	-0.29	-0.36	Step hazard
		1.37	1.33	-0.30	-0.35	Step hazard
		1.45	1.41	-0.32	-0.32	Step hazard
		1.45	1.41	-0.32	-0.32	Step hazard
		1.49	1.45	-0.37	-0.16	Step hazard
13	-9.04	1.33	1.31	-0.23	-0.36	Step hazard
		1.33	1.31	-0.23	-0.36	Step hazard
		1.37	1.35	-0.23	-0.35	Step hazard
		1.43	1.41	-0.24	-0.23	Step hazard
		1.49	1.47	-0.25	-0.34	Step hazard
14	-7.02	1.24	1.24	-0.15	-0.30	Step hazard
		1.33	1.32	-0.16	-0.36	Step hazard
		1.33	1.32	-0.16	-0.36	Step hazard
		1.37	1.36	-0.17	-0.35	Step hazard
		1.43	1.42	-0.18	-0.24	Step hazard
		1.49	1.48	-0.18	-0.20	Step hazard
15	4.22	1.24	1.24	-0.09	-0.30	Step hazard
		1.26	1.26	-0.09	-0.29	Step hazard
		1.46	1.46	-0.11	0.06	Step hazard
		2.00	1.99	-0.15	0.16	Step hazard
16	-1.41	1.24	1.24	-0.03	-0.30	Step hazard
		1.33	1.32	-0.03	-0.36	Step hazard
		1.37	1.37	-0.03	-0.35	Step hazard
		1.43	1.43	-0.04	-0.21	Step hazard
		1.46	1.46	-0.04	0.06	Step hazard
		2.00	2.00	-0.03	0.16	Step hazard
17	1.40	1.33	1.32	0.03	-0.36	Step hazard
		1.33	1.32	0.03	-0.36	Step hazard
		1.37	1.37	0.03	-0.35	Step hazard
		1.43	1.43	0.04	-0.32	Step hazard
		2.00	2.00	0.05	0.16	Step hazard
18	4.21	1.24	1.24	0.09	-0.30	Step hazard
		1.33	1.32	0.10	-0.36	Step hazard
		1.37	1.36	0.10	-0.35	Step hazard
		1.43	1.43	0.11	-0.21	Step hazard
		1.46	1.46	0.11	0.06	Step hazard
		2.00	1.99	0.15	0.16	Step hazard
19	7.02	1.24	1.24	0.15	-0.30	Step hazard
		1.26	1.27	0.16	-0.29	Step hazard
		1.37	1.36	0.17	-0.34	Step hazard
		1.43	1.42	0.18	-0.21	Step hazard
		1.46	1.45	0.18	0.06	Step hazard
		2.00	1.98	0.24	0.16	Step hazard
20	9.83	1.24	1.23	0.21	-0.30	Step hazard
		1.33	1.31	0.23	-0.36	Step hazard
		1.37	1.35	0.23	-0.35	Step hazard
		1.43	1.41	0.24	-0.21	Step hazard
		1.46	1.44	0.25	0.06	Step hazard
		1.50	1.48	0.26	0.06	Crosspath hazard
		2.00	1.97	0.34	0.16	Step hazard
21	12.64	1.33	1.29	0.29	-0.37	Step hazard
		1.37	1.33	0.30	-0.36	Step hazard
		1.43	1.40	0.31	-0.24	Step hazard
		1.49	1.45	0.33	-0.34	Step hazard
		1.75	1.71	0.38	0.13	Crosspath hazard
		1.95	1.90	0.43	0.14	Step hazard
22	15.45	NO	HAZARDS	CATA	LOGED	
23	18.26	NO	HAZARDS	CATA	LOGED	
24	21.07	NO	HAZARDS	CATA	LOGED	
25	23.88	NO	HAZARDS	CATA	LOGED	
26	26.69	NO	HAZARDS	CATA	LOGED	
27	29.50	NO	HAZARDS	CATA	LOGED	
28	32.31	NO	HAZARDS	CATA	LOGED	
29	35.12	NO	HAZARDS	CATA	LOGED	
30	37.93	NO	HAZARDS	CATA	LOGED	
31	40.74	NO	HAZARDS	CATA	LOGED	
32	43.54	NO	HAZARDS	CATA	LOGED	

7.2.2 Slope Test Results

7.2.2.1	B ¹ =0.90; Slope Threshold ² =30	108
7.2.2.2	B=0.85; Slope Threshold=30	116
7.2.2.3	B=0.80; Slope Threshold=30	124
7.2.2.4	B=0.75; Slope Threshold=30	132
7.2.2.5	B=0.90; Slope Threshold=25	141
7.2.2.6	B=0.85; Slope Threshold=25	149
7.2.2.7	B=0.80; Slope Threshold=25	157
7.2.2.8	B=0.75; Slope Threshold=25	166

¹Slope Coefficient

²Slope Threshold in degrees

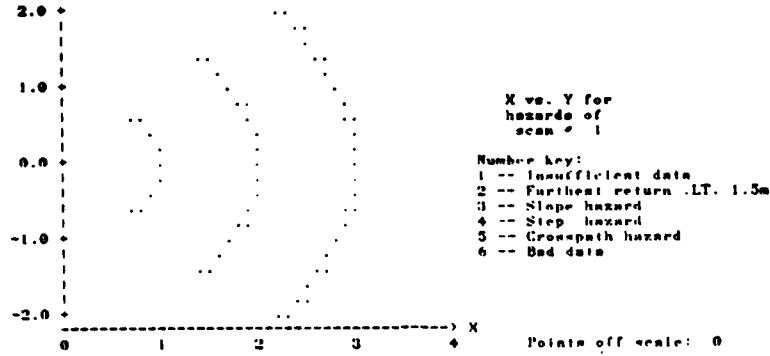
7.2.2.1 B=0.90; Slope Threshold=30

7.2.2.1.1	5 Degree Slope	.....	109
7.2.2.1.1	10 Degree Slope	.....	109
7.2.2.1.2	15 Degree Slope	.....	110
7.2.2.1.3	20 Degree Slope	.....	111
7.2.2.1.4	25 Degree Slope	.....	112
7.2.2.1.5	30 Degree Slope	.....	113
7.2.2.1.6	35 Degree Slope	.....	114
7.2.2.1.7	40 Degree Slope	.....	115

Input file: MDL.SLOPE.05.30.90
 File Creation Date : THU, AUG 11 1983 System time 19:11:26

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** MODEL PARAMETERS **
HEIGHT FILTER COEFFICIENT * 0.25
SLOPE FILTER COEFFICIENT * 0.90
LEVEL GROUND STEP THRESHOLD * 0.25 METERS
SLOPE THRESHOLD * 30.00 DEGREES
  
```

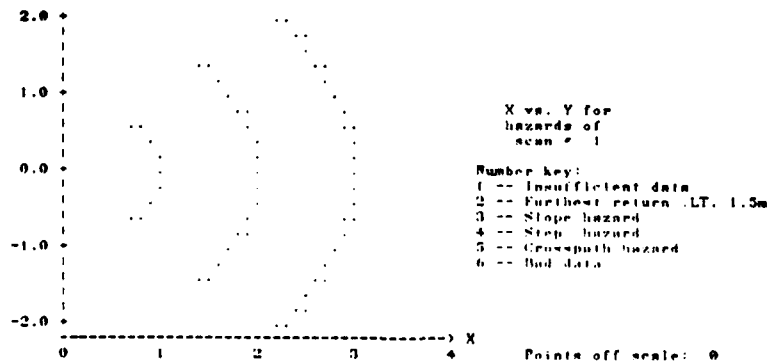


NO HAZARDS CATALOGED THIS SCAN

Input file: MDL.SLOPE.10.30.90
 File Creation Date : THU, AUG 11 1983 System time 19:17:01

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** MODEL PARAMETERS **
HEIGHT FILTER COEFFICIENT * 0.25
SLOPE FILTER COEFFICIENT * 0.90
LEVEL GROUND STEP THRESHOLD * 0.25 METERS
SLOPE THRESHOLD * 30.00 DEGREES
  
```



NO HAZARDS CATALOGED THIS SCAN

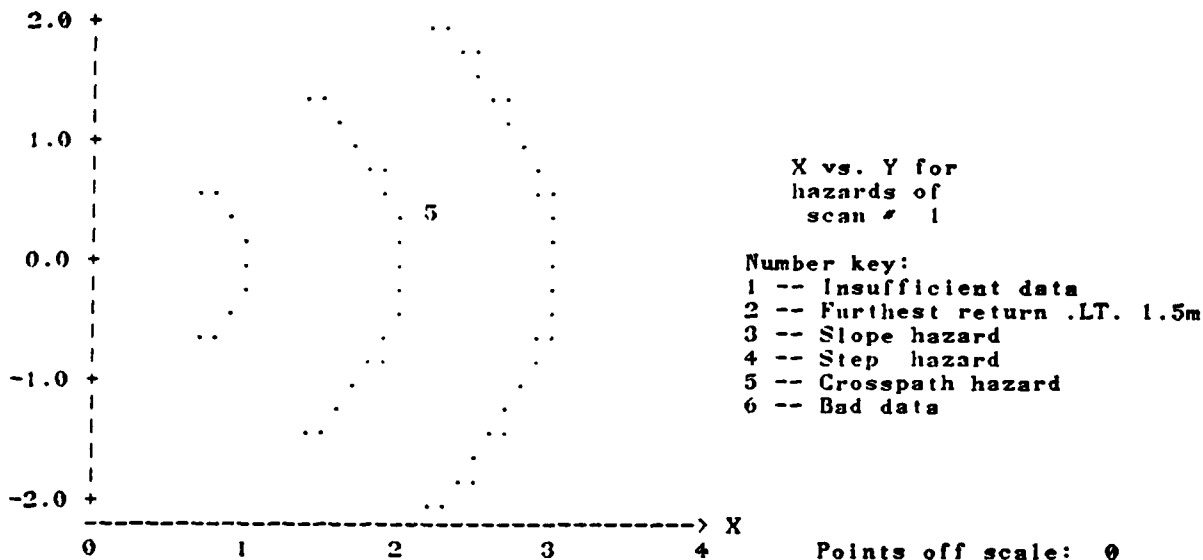
Input file: MDL.SLOPE.15.30.90

File Creation Date : THU, AUG 11 1983

System time 19:23:55

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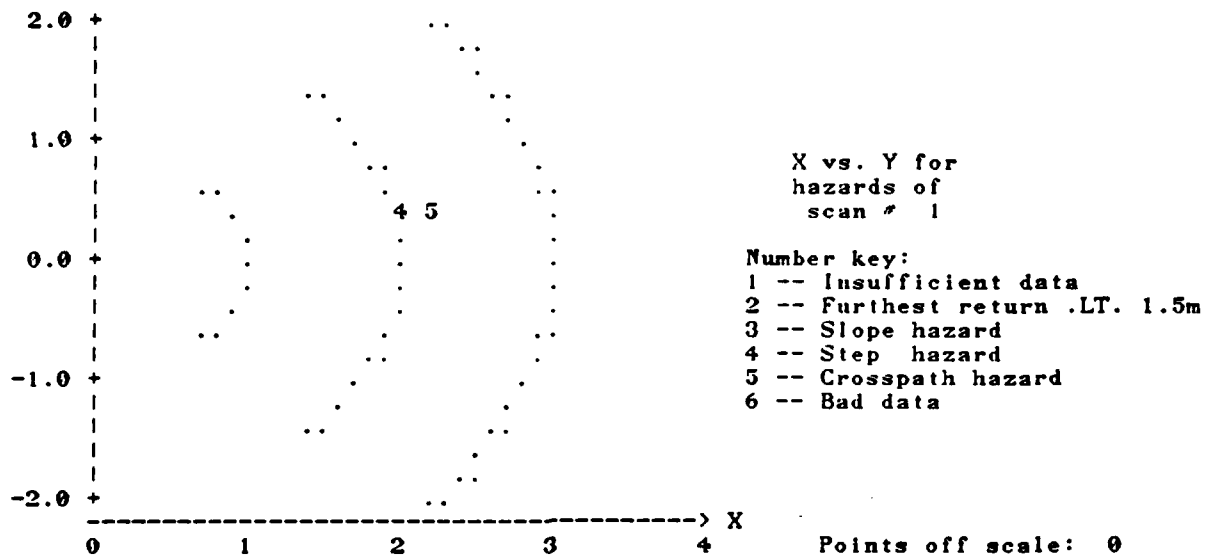
** MODEL1 PARAMETERS **
HEIGHT FILTER COEFFICIENT = 0.25
SLOPE FILTER COEFFICIENT = 0.90
LEVEL GROUND STEP THRESHOLD = 0.25 METERS
SLOPE THRESHOLD = 30.00 DEGREES
    
```



AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S	S	C A T A L O G E D	
2	-40.74	NO	H A Z A R D S	S	C A T A L O G E D	
3	-37.93	NO	H A Z A R D S	S	C A T A L O G E D	
4	-35.13	NO	H A Z A R D S	S	C A T A L O G E D	
5	-32.31	NO	H A Z A R D S	S	C A T A L O G E D	
6	-29.50	NO	H A Z A R D S	S	C A T A L O G E D	
7	-26.69	NO	H A Z A R D S	S	C A T A L O G E D	
8	-23.88	NO	H A Z A R D S	S	C A T A L O G E D	
9	-21.08	NO	H A Z A R D S	S	C A T A L O G E D	
10	-18.26	NO	H A Z A R D S	S	C A T A L O G E D	
11	-15.45	NO	H A Z A R D S	S	C A T A L O G E D	
12	-12.64	NO	H A Z A R D S	S	C A T A L O G E D	
13	-9.84	NO	H A Z A R D S	S	C A T A L O G E D	
14	-7.02	NO	H A Z A R D S	S	C A T A L O G E D	
15	-4.22	NO	H A Z A R D S	S	C A T A L O G E D	
16	-1.41	NO	H A Z A R D S	S	C A T A L O G E D	
17	1.40	NO	H A Z A R D S	S	C A T A L O G E D	
18	4.21	NO	H A Z A R D S	S	C A T A L O G E D	
19	7.02	NO	H A Z A R D S	S	C A T A L O G E D	
20	9.83	NO	H A Z A R D S	S	C A T A L O G E D	
21	12.64	2.25	2.20	0.49	-0.04	Crosspath hazard
22	15.45	NO	H A Z A R D S	S	C A T A L O G E D	
23	18.26	NO	H A Z A R D S	S	C A T A L O G E D	
24	21.07	NO	H A Z A R D S	S	C A T A L O G E D	
25	23.88	NO	H A Z A R D S	S	C A T A L O G E D	
26	26.69	NO	H A Z A R D S	S	C A T A L O G E D	
27	29.50	NO	H A Z A R D S	S	C A T A L O G E D	
28	32.31	NO	H A Z A R D S	S	C A T A L O G E D	
29	35.12	NO	H A Z A R D S	S	C A T A L O G E D	
30	37.93	NO	H A Z A R D S	S	C A T A L O G E D	
31	40.74	NO	H A Z A R D S	S	C A T A L O G E D	
32	43.55	NO	H A Z A R D S	S	C A T A L O G E D	

Input file: MDL.SLOPE.20.30.90
 File Creation Date : THU, AUG 11 1983 System time 19:26:15

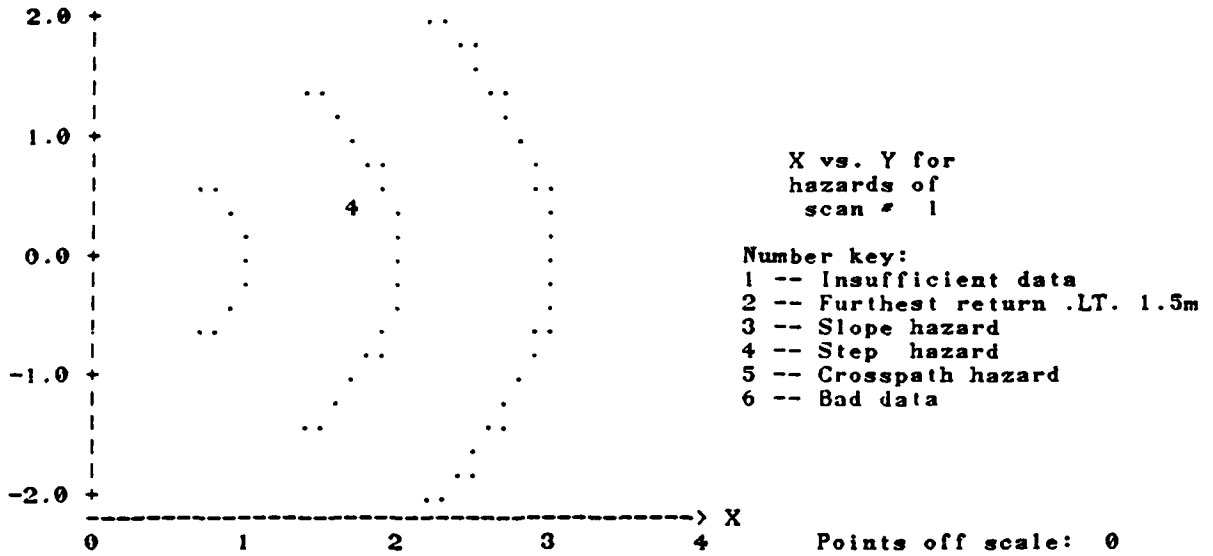
** MODEL1 PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S	C A T A L O G E D	
2	-40.74	NO	H A Z A R D S	C A T A L O G E D	
3	-37.93	NO	H A Z A R D S	C A T A L O G E D	
4	-35.13	NO	H A Z A R D S	C A T A L O G E D	
5	-32.31	NO	H A Z A R D S	C A T A L O G E D	
6	-29.50	NO	H A Z A R D S	C A T A L O G E D	
7	-26.69	NO	H A Z A R D S	C A T A L O G E D	
8	-23.88	NO	H A Z A R D S	C A T A L O G E D	
9	-21.08	NO	H A Z A R D S	C A T A L O G E D	
10	-18.26	NO	H A Z A R D S	C A T A L O G E D	
11	-15.45	NO	H A Z A R D S	C A T A L O G E D	
12	-12.64	NO	H A Z A R D S	C A T A L O G E D	
13	-9.84	NO	H A Z A R D S	C A T A L O G E D	
14	-7.02	NO	H A Z A R D S	C A T A L O G E D	
15	-4.22	NO	H A Z A R D S	C A T A L O G E D	
16	-1.41	NO	H A Z A R D S	C A T A L O G E D	
17	1.40	NO	H A Z A R D S	C A T A L O G E D	
18	4.21	NO	H A Z A R D S	C A T A L O G E D	
19	7.02	NO	H A Z A R D S	C A T A L O G E D	
20	9.83	NO	H A Z A R D S	C A T A L O G E D	
21	12.64	2.04	1.99	0.45	-0.01 Step hazard
		2.25	2.20	0.49	-0.01 Crosspath hazard
22	15.45	NO	H A Z A R D S	C A T A L O G E D	
23	18.26	NO	H A Z A R D S	C A T A L O G E D	
24	21.07	NO	H A Z A R D S	C A T A L O G E D	
25	23.88	NO	H A Z A R D S	C A T A L O G E D	
26	26.69	NO	H A Z A R D S	C A T A L O G E D	
27	29.50	NO	H A Z A R D S	C A T A L O G E D	
28	32.31	NO	H A Z A R D S	C A T A L O G E D	
29	35.12	NO	H A Z A R D S	C A T A L O G E D	
30	37.93	NO	H A Z A R D S	C A T A L O G E D	
31	40.74	NO	H A Z A R D S	C A T A L O G E D	
32	43.55	NO	H A Z A R D S	C A T A L O G E D	

Input file: MDL.SLOPE.25.30.90
 File Creation Date : THU, AUG 11 1983 System time 19:28:08

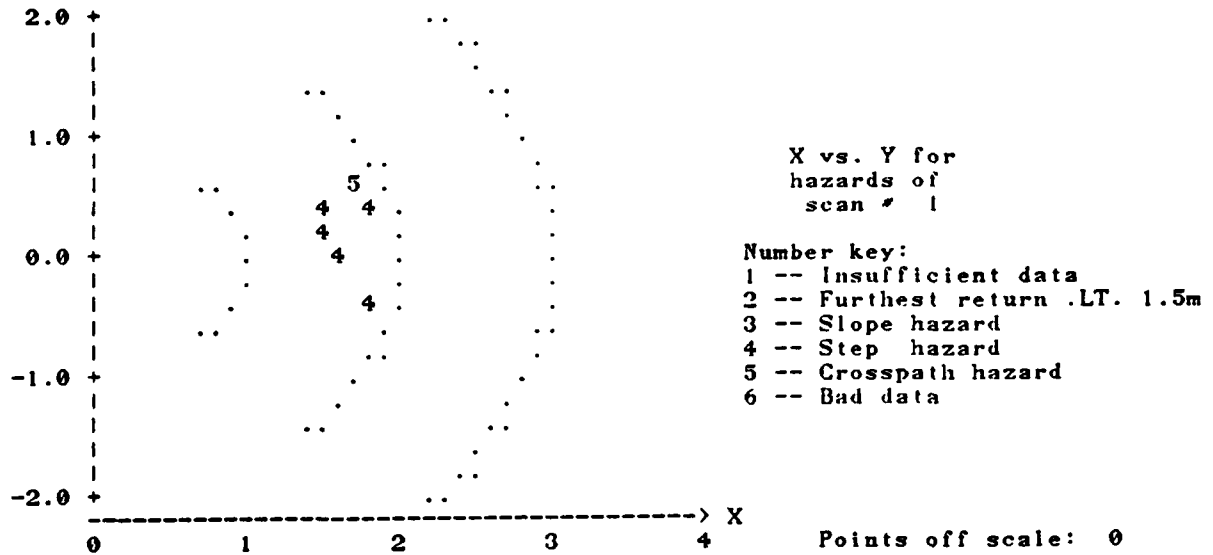
** MODEL1 PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S		C A T A L O G E D	
2	-40.74	NO	H A Z A R D S		C A T A L O G E D	
3	-37.93	NO	H A Z A R D S		C A T A L O G E D	
4	-35.13	NO	H A Z A R D S		C A T A L O G E D	
5	-32.31	NO	H A Z A R D S		C A T A L O G E D	
6	-29.50	NO	H A Z A R D S		C A T A L O G E D	
7	-26.69	NO	H A Z A R D S		C A T A L O G E D	
8	-23.88	NO	H A Z A R D S		C A T A L O G E D	
9	-21.08	NO	H A Z A R D S		C A T A L O G E D	
10	-18.26	NO	H A Z A R D S		C A T A L O G E D	
11	-15.45	NO	H A Z A R D S		C A T A L O G E D	
12	-12.64	NO	H A Z A R D S		C A T A L O G E D	
13	-9.84	NO	H A Z A R D S		C A T A L O G E D	
14	-7.02	NO	H A Z A R D S		C A T A L O G E D	
15	-4.22	NO	H A Z A R D S		C A T A L O G E D	
16	-1.41	NO	H A Z A R D S		C A T A L O G E D	
17	1.40	NO	H A Z A R D S		C A T A L O G E D	
19	7.02	NO	H A Z A R D S		C A T A L O G E D	
20	9.83	NO	H A Z A R D S		C A T A L O G E D	
21	12.64	NO	H A Z A R D S		C A T A L O G E D	
22	15.45	1.72	1.66	0.46	-0.01	Step hazard
23	18.26	NO	H A Z A R D S		C A T A L O G E D	
24	21.07	NO	H A Z A R D S		C A T A L O G E D	
25	23.88	NO	H A Z A R D S		C A T A L O G E D	
26	26.69	NO	H A Z A R D S		C A T A L O G E D	
27	29.50	NO	H A Z A R D S		C A T A L O G E D	
28	32.31	NO	H A Z A R D S		C A T A L O G E D	
29	35.12	NO	H A Z A R D S		C A T A L O G E D	
30	37.93	NO	H A Z A R D S		C A T A L O G E D	
31	40.74	NO	H A Z A R D S		C A T A L O G E D	
32	43.55	NO	H A Z A R D S		C A T A L O G E D	

Input file: MDL.SLOPE.30.30.90
 File Creation Date : THU, AUG 11 1983 System time 19:29:12

 ** MODEL1 PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES

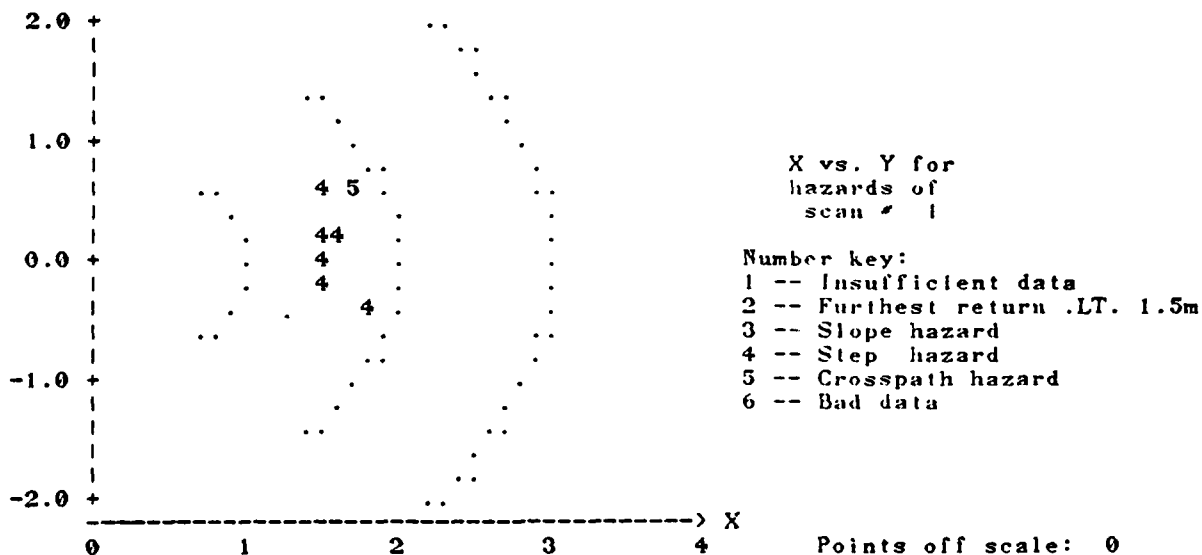


AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	HAZARDS	NO	CATALOGED
2	-40.74	NO	HAZARDS	NO	CATALOGED
3	-37.93	NO	HAZARDS	NO	CATALOGED
4	-35.13	NO	HAZARDS	NO	CATALOGED
5	-32.31	NO	HAZARDS	NO	CATALOGED
6	-29.50	NO	HAZARDS	NO	CATALOGED
7	-26.69	NO	HAZARDS	NO	CATALOGED
8	-23.88	NO	HAZARDS	NO	CATALOGED
9	-21.08	NO	HAZARDS	NO	CATALOGED
10	-18.26	NO	HAZARDS	NO	CATALOGED
11	-15.45	NO	HAZARDS	NO	CATALOGED
12	-12.64	NO	HAZARDS	NO	CATALOGED
13	-9.84	1.84	1.81	-0.31	0.19 Step hazard
14	-7.02	NO	HAZARDS	NO	CATALOGED
15	-4.22	NO	HAZARDS	NO	CATALOGED
16	-1.41	NO	HAZARDS	NO	CATALOGED
17	1.40	1.55	1.55	0.04	-0.00 Step hazard
18	4.21	1.55	1.55	0.11	-0.00 Step hazard
19	7.02	NO	HAZARDS	NO	CATALOGED
20	9.83	NO	HAZARDS	NO	CATALOGED
21	12.64	NO	HAZARDS	NO	CATALOGED
22	15.45	1.82	1.76	0.49	0.15 Step hazard
23	18.26	1.55	1.47	0.49	-0.01 Step hazard
		1.75	1.66	0.55	-0.01 Crosspath hazard
24	21.07	NO	HAZARDS	NO	CATALOGED
25	23.88	NO	HAZARDS	NO	CATALOGED
26	26.69	NO	HAZARDS	NO	CATALOGED
27	29.50	NO	HAZARDS	NO	CATALOGED
28	32.31	NO	HAZARDS	NO	CATALOGED
29	35.12	NO	HAZARDS	NO	CATALOGED
30	37.93	NO	HAZARDS	NO	CATALOGED
31	40.74	NO	HAZARDS	NO	CATALOGED
32	43.55	NO	HAZARDS	NO	CATALOGED

Input file: MDL.SLOPE.35.30.90
 File Creation Date : THU, AUG 11 1983

System time 19:31:35

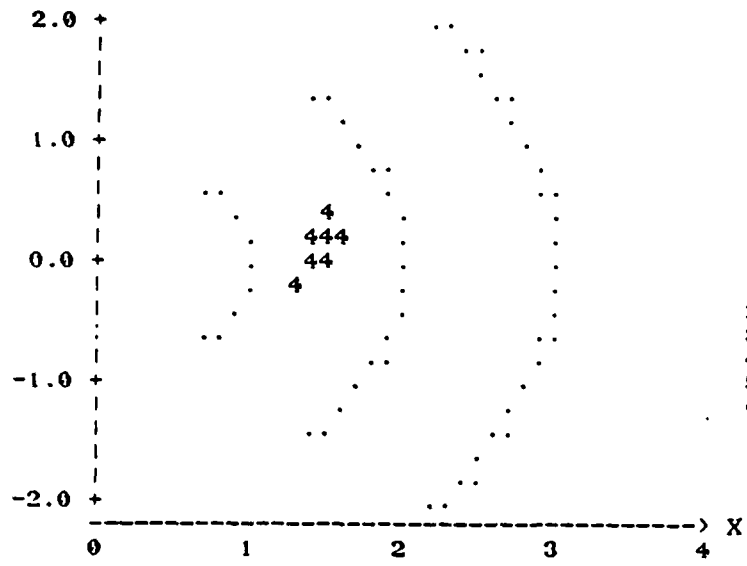
**** MODEL PARAMETERS ****
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	HAZARDS		CATALOGED	
2	-40.74	NO	HAZARDS		CATALOGED	
3	-37.93	NO	HAZARDS		CATALOGED	
4	-35.13	NO	HAZARDS		CATALOGED	
5	-32.31	NO	HAZARDS		CATALOGED	
6	-29.50	NO	HAZARDS		CATALOGED	
7	-26.69	NO	HAZARDS		CATALOGED	
8	-23.88	NO	HAZARDS		CATALOGED	
9	-21.08	NO	HAZARDS		CATALOGED	
10	-18.26	NO	HAZARDS		CATALOGED	
11	-15.45	NO	HAZARDS		CATALOGED	
12	-12.64	NO	HAZARDS		CATALOGED	
13	-9.84	1.82	1.79	-0.31	0.27	Step hazard
14	-7.02	1.51	1.50	-0.19	0.07	Step hazard
15	-4.22	NO	HAZARDS		CATALOGED	
16	-1.41	1.51	1.51	-0.04	0.06	Step hazard
17	1.40	1.51	1.51	0.04	0.07	Step hazard
18	4.21	1.63	1.62	0.12	0.23	Step hazard
19	7.02	NO	HAZARDS		CATALOGED	
20	9.83	1.51	1.49	0.26	0.07	Step hazard
21	12.64	NO	HAZARDS		CATALOGED	
22	15.45	NO	HAZARDS		CATALOGED	
23	18.26	1.61	1.53	0.50	0.07	Step hazard
		1.75	1.66	0.53	0.07	Crosspath hazard
24	21.07	NO	HAZARDS		CATALOGED	
25	23.88	NO	HAZARDS		CATALOGED	
26	26.69	NO	HAZARDS		CATALOGED	
27	29.50	NO	HAZARDS		CATALOGED	
28	32.31	NO	HAZARDS		CATALOGED	
29	35.12	NO	HAZARDS		CATALOGED	
30	37.93	NO	HAZARDS		CATALOGED	
31	40.74	NO	HAZARDS		CATALOGED	
32	43.55	NO	HAZARDS		CATALOGED	

Input file: MDL.SLOPE.40.30.90
 File Creation Date : THU, AUG 11 1983 System time 19:33:39

**** MODEL1 PARAMETERS ****
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



X vs. Y for
 hazards of
 scan # 1

- Number key:
 1 -- Insufficient data
 2 -- Furthest return .LT. 1.5m
 3 -- Slope hazard
 4 -- Step hazard
 5 -- Crosspath hazard
 6 -- Bad data

Points off scale: 0

AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	HAZARDS			CATALOGED
2	-40.74	NO	HAZARDS			CATALOGED
3	-37.93	NO	HAZARDS			CATALOGED
4	-35.13	NO	HAZARDS			CATALOGED
5	-32.31	NO	HAZARDS			CATALOGED
6	-29.50	NO	HAZARDS			CATALOGED
7	-26.69	NO	HAZARDS			CATALOGED
8	-23.88	NO	HAZARDS			CATALOGED
9	-21.08	NO	HAZARDS			CATALOGED
10	-18.26	NO	HAZARDS			CATALOGED
11	-15.45	NO	HAZARDS			CATALOGED
12	-12.64	1.34	1.31	-0.29	0.07	Step hazard
13	-9.84	NO	HAZARDS			CATALOGED
14	-7.02	NO	HAZARDS			CATALOGED
15	-4.22	NO	HAZARDS			CATALOGED
16	-1.41	NO	HAZARDS			CATALOGED
17	1.40	1.42	1.42	0.03	0.13	Step hazard
		1.51	1.51	0.04	0.16	Step hazard
18	4.21	1.42	1.42	0.10	0.13	Step hazard
		1.51	1.51	0.11	0.16	Step hazard
19	7.02	1.59	1.57	0.19	0.28	Step hazard
20	9.83	NO	HAZARDS			CATALOGED
21	12.64	NO	HAZARDS			CATALOGED
22	15.45	NO	HAZARDS			CATALOGED
23	18.26	1.60	1.51	0.50	0.23	Step hazard
24	21.07	NO	HAZARDS			CATALOGED
25	23.88	NO	HAZARDS			CATALOGED
26	26.69	NO	HAZARDS			CATALOGED
27	29.50	NO	HAZARDS			CATALOGED
28	32.31	NO	HAZARDS			CATALOGED
29	35.12	NO	HAZARDS			CATALOGED
30	37.93	NO	HAZARDS			CATALOGED
31	40.74	NO	HAZARDS			CATALOGED
32	43.55	NO	HAZARDS			CATALOGED

7.2.2.2 B=0.85; Slope Threshold=30

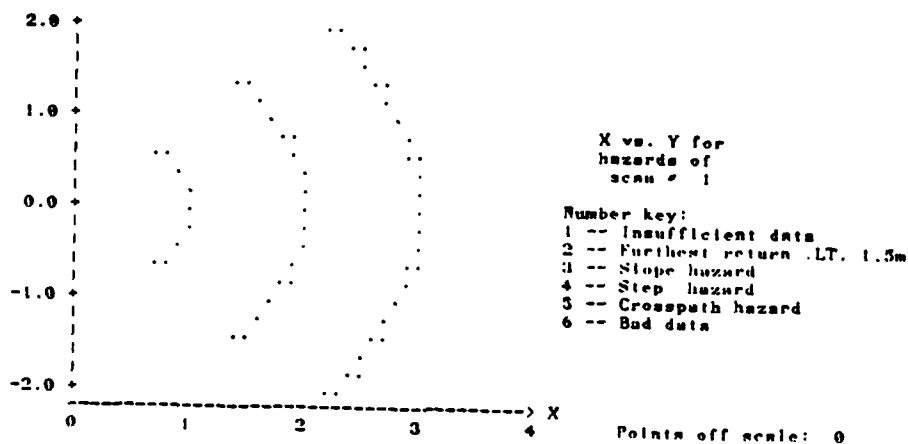
7.2.2.2.1	5 Degree Slope	117
7.2.2.2.1	10 Degree Slope	117
7.2.2.2.2	15 Degree Slope	118
7.2.2.2.3	20 Degree Slope	119
7.2.2.2.4	25 Degree Slope	120
7.2.2.2.5	30 Degree Slope	121
7.2.2.2.6	35 Degree Slope	122
7.2.2.2.7	40 Degree Slope	123

Input file: MDL.SLOPE.05.30.85
 File Creation Date : THU, AUG 11 1983 System time 19:39:15

```

** MODEL1 PARAMETERS **
HEIGHT FILTER COEFFICIENT * 0.25
SLOPE FILTER COEFFICIENT * 0.85
LEVEL GROUND STEP THRESHOLD * 0.25 METERS
SLOPE THRESHOLD * 30.00 DEGREES

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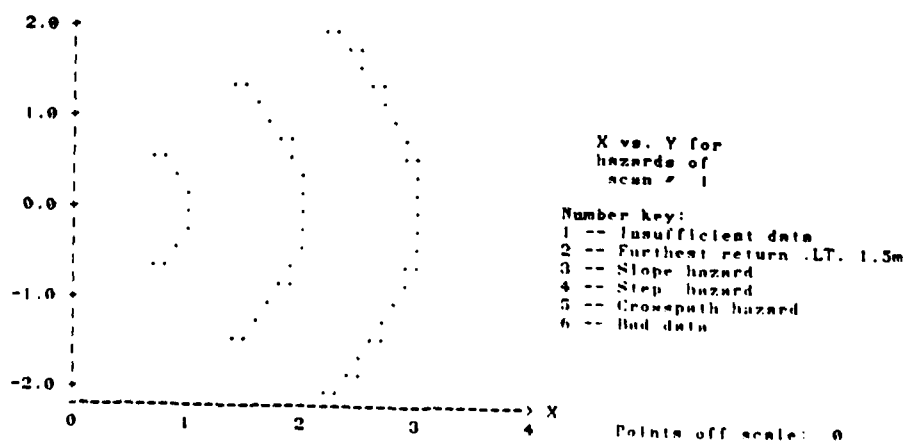
NO HAZARDS CATALOGED THIS SCAN

Input file: MDL.SLOPE.10.30.85
 File Creation Date : THU, AUG 11 1983 System time 19:39:49

```

** MODEL1 PARAMETERS **
HEIGHT FILTER COEFFICIENT * 0.25
SLOPE FILTER COEFFICIENT * 0.85
LEVEL GROUND STEP THRESHOLD * 0.25 METERS
SLOPE THRESHOLD * 30.00 DEGREES

```



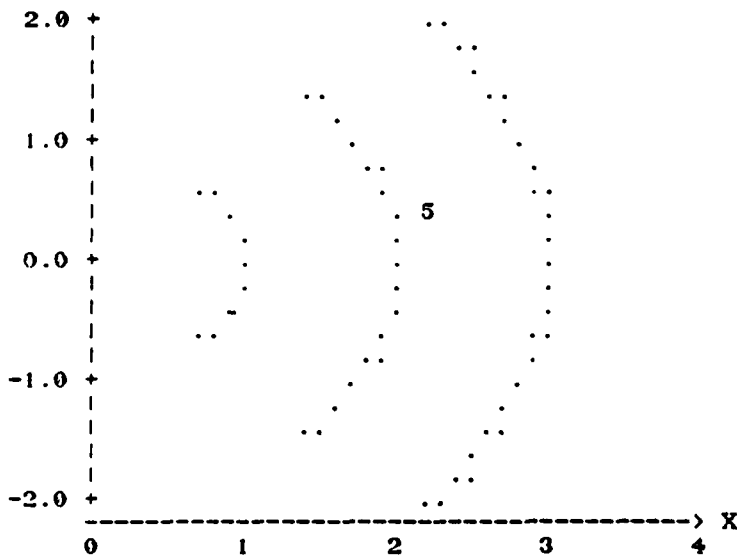
NO HAZARDS CATALOGED THIS SCAN

Input file: MDL.SLOPE.15.30.85

File Creation Date : THU, AUG 11 1983

System time 19:40:30

**** MODEL1 PARAMETERS ****
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.85
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



X vs. Y for
 hazards of
 scan # 1

- Number key:
 1 -- Insufficient data
 2 -- Furthest return .LT. 1.5m
 3 -- Slope hazard
 4 -- Step hazard
 5 -- Crosspath hazard
 6 -- Bad data

Points off scale: 0

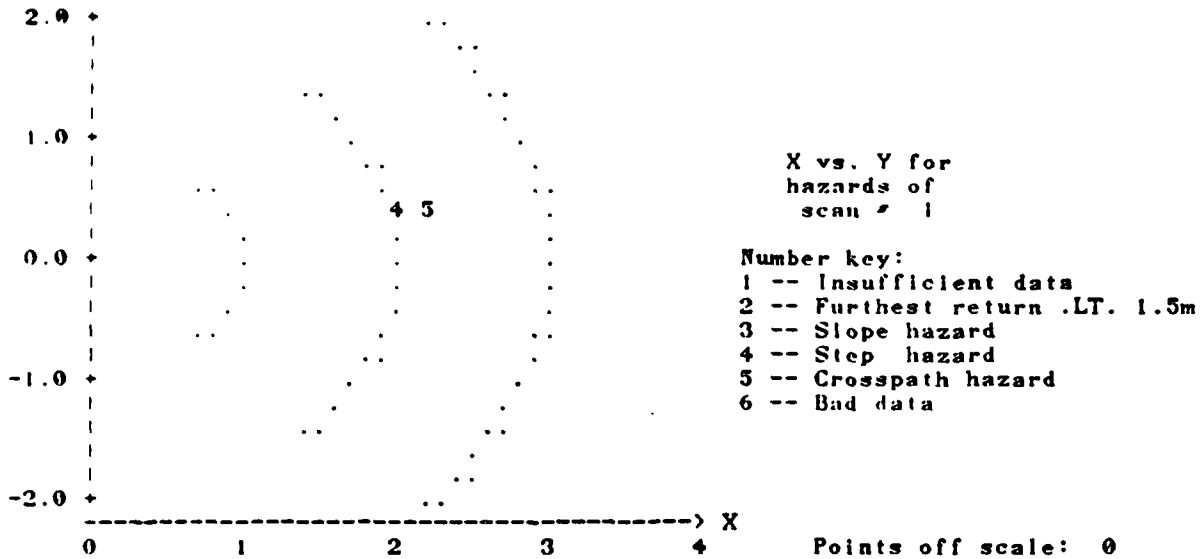
AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S			C A T A L O G E D
2	-40.74	NO	H A Z A R D S			C A T A L O G E D
3	-37.93	NO	H A Z A R D S			C A T A L O G E D
4	-35.13	NO	H A Z A R D S			C A T A L O G E D
5	-32.31	NO	H A Z A R D S			C A T A L O G E D
6	-29.50	NO	H A Z A R D S			C A T A L O G E D
7	-26.69	NO	H A Z A R D S			C A T A L O G E D
8	-23.88	NO	H A Z A R D S			C A T A L O G E D
9	-21.08	NO	H A Z A R D S			C A T A L O G E D
10	-18.26	NO	H A Z A R D S			C A T A L O G E D
11	-15.45	NO	H A Z A R D S			C A T A L O G E D
12	-12.64	NO	H A Z A R D S			C A T A L O G E D
13	-9.84	NO	H A Z A R D S			C A T A L O G E D
14	-7.02	NO	H A Z A R D S			C A T A L O G E D
15	-4.22	NO	H A Z A R D S			C A T A L O G E D
16	-1.41	NO	H A Z A R D S			C A T A L O G E D
17	1.40	NO	H A Z A R D S			C A T A L O G E D
18	4.21	NO	H A Z A R D S			C A T A L O G E D
19	7.02	NO	H A Z A R D S			C A T A L O G E D
20	9.83	NO	H A Z A R D S			C A T A L O G E D
21	12.64	2.25	2.20	0.49	-0.04	Crosspath hazard
22	15.45	NO	H A Z A R D S			C A T A L O G E D
23	18.26	NO	H A Z A R D S			C A T A L O G E D
24	21.07	NO	H A Z A R D S			C A T A L O G E D
25	23.88	NO	H A Z A R D S			C A T A L O G E D
26	26.69	NO	H A Z A R D S			C A T A L O G E D
27	29.50	NO	H A Z A R D S			C A T A L O G E D
28	32.31	NO	H A Z A R D S			C A T A L O G E D
29	35.12	NO	H A Z A R D S			C A T A L O G E D
30	37.93	NO	H A Z A R D S			C A T A L O G E D
31	40.74	NO	H A Z A R D S			C A T A L O G E D
32	43.55	NO	H A Z A R D S			C A T A L O G E D

Input file: MDL.SLOPE.20.30.85

File Creation Date : THU, AUG 11 1983

System time 19:41:05

**** MODEL1 PARAMETERS ****
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.85
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES

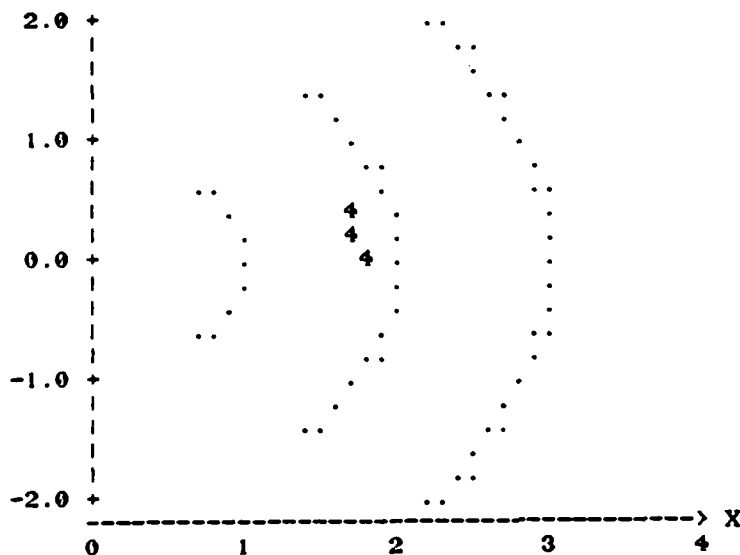


AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S		C A T A L O C E D	
2	-40.74	NO	H A Z A R D S		C A T A L O C E D	
3	-37.93	NO	H A Z A R D S		C A T A L O C E D	
4	-35.13	NO	H A Z A R D S		C A T A L O C E D	
5	-32.31	NO	H A Z A R D S		C A T A L O C E D	
6	-29.50	NO	H A Z A R D S		C A T A L O C E D	
7	-26.69	NO	H A Z A R D S		C A T A L O C E D	
8	-23.88	NO	H A Z A R D S		C A T A L O C E D	
9	-21.08	NO	H A Z A R D S		C A T A L O C E D	
10	-18.26	NO	H A Z A R D S		C A T A L O C E D	
11	-15.45	NO	H A Z A R D S		C A T A L O C E D	
12	-12.64	NO	H A Z A R D S		C A T A L O C E D	
13	-9.84	NO	H A Z A R D S		C A T A L O C E D	
14	-7.02	NO	H A Z A R D S		C A T A L O C E D	
15	-4.22	NO	H A Z A R D S		C A T A L O C E D	
16	-1.41	NO	H A Z A R D S		C A T A L O C E D	
17	1.40	NO	H A Z A R D S		C A T A L O C E D	
18	4.21	NO	H A Z A R D S		C A T A L O C E D	
19	7.02	NO	H A Z A R D S		C A T A L O C E D	
20	9.83	NO	H A Z A R D S		C A T A L O C E D	
21	12.64	2.04	1.99	0.45	-0.01	Step hazard
		2.25	2.20	0.49	-0.01	Crosspath hazard
22	15.45	NO	H A Z A R D S		C A T A L O C E D	
23	18.26	NO	H A Z A R D S		C A T A L O C E D	
24	21.07	NO	H A Z A R D S		C A T A L O C E D	
25	23.88	NO	H A Z A R D S		C A T A L O C E D	
26	26.69	NO	H A Z A R D S		C A T A L O C E D	
27	29.50	NO	H A Z A R D S		C A T A L O C E D	
28	32.31	NO	H A Z A R D S		C A T A L O C E D	
29	35.12	NO	H A Z A R D S		C A T A L O C E D	
30	37.93	NO	H A Z A R D S		C A T A L O C E D	
31	40.74	NO	H A Z A R D S		C A T A L O C E D	
32	43.55	NO	H A Z A R D S		C A T A L O C E D	

Input file: MDL.SLOPE.25.30.85
 File Creation Date : THU, AUG 11 1983

System time 19:41:44

**** MODEL1 PARAMETERS ****
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.85
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



X vs. Y for
 hazards of
 scan # 1

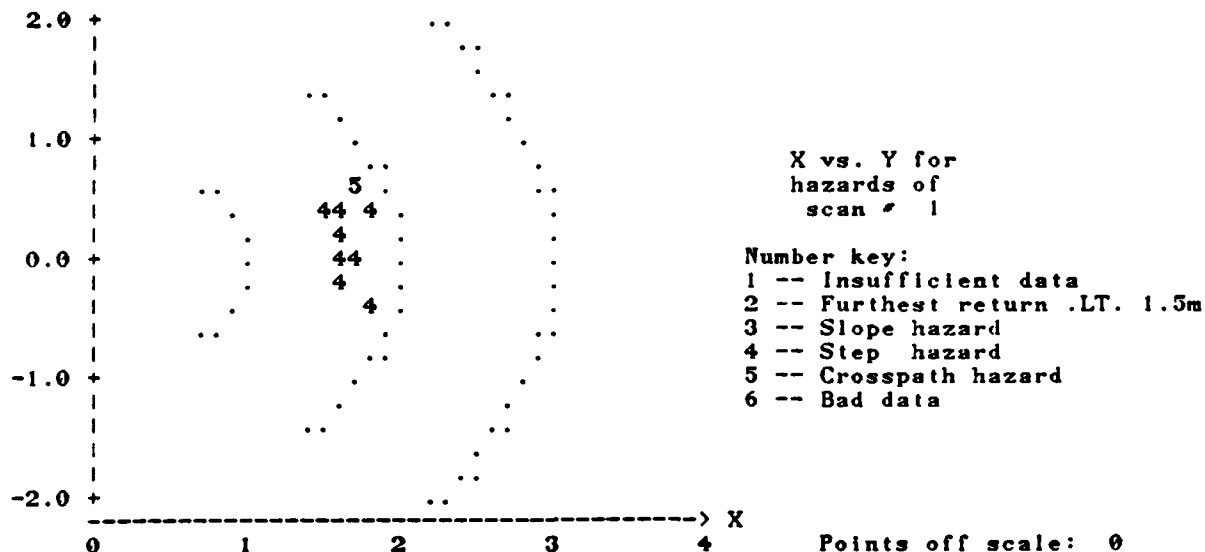
Number key:
 1 -- Insufficient data
 2 -- Furthest return .LT. 1.5m
 3 -- Slope hazard
 4 -- Step hazard
 5 -- Crosspath hazard
 6 -- Bad data

Points off scale: 0

AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S		C A T A L O C E D	
2	-40.74	NO	H A Z A R D S		C A T A L O C E D	
3	-37.93	NO	H A Z A R D S		C A T A L O C E D	
4	-35.13	NO	H A Z A R D S		C A T A L O C E D	
5	-32.31	NO	H A Z A R D S		C A T A L O C E D	
6	-29.50	NO	H A Z A R D S		C A T A L O C E D	
7	-26.69	NO	H A Z A R D S		C A T A L O C E D	
8	-23.88	NO	H A Z A R D S		C A T A L O C E D	
9	-21.08	NO	H A Z A R D S		C A T A L O C E D	
10	-18.26	NO	H A Z A R D S		C A T A L O C E D	
11	-15.45	NO	H A Z A R D S		C A T A L O C E D	
12	-12.64	NO	H A Z A R D S		C A T A L O C E D	
13	-9.84	NO	H A Z A R D S		C A T A L O C E D	
14	-7.02	NO	H A Z A R D S		C A T A L O C E D	
15	-4.22	NO	H A Z A R D S		C A T A L O C E D	
16	-1.41	NO	H A Z A R D S		C A T A L O C E D	
17	1.40	1.84	1.84	0.05	0.12	Step hazard
19	7.02	NO	H A Z A R D S		C A T A L O C E D	
20	9.83	NO	H A Z A R D S		C A T A L O C E D	
21	12.64	NO	H A Z A R D S		C A T A L O C E D	
22	15.45	1.72	1.66	0.46	-0.01	Step hazard
23	18.26	NO	H A Z A R D S		C A T A L O C E D	
24	21.07	NO	H A Z A R D S		C A T A L O C E D	
25	23.88	NO	H A Z A R D S		C A T A L O C E D	
26	26.69	NO	H A Z A R D S		C A T A L O C E D	
27	29.50	NO	H A Z A R D S		C A T A L O C E D	
28	32.31	NO	H A Z A R D S		C A T A L O C E D	
29	35.12	NO	H A Z A R D S		C A T A L O C E D	
30	37.93	NO	H A Z A R D S		C A T A L O C E D	
31	40.74	NO	H A Z A R D S		C A T A L O C E D	
32	43.55	NO	H A Z A R D S		C A T A L O C E D	

Input file: MDL.SLOPE.30.30.85
 File Creation Date : THU, AUG 11 1983 System time 19:42:39

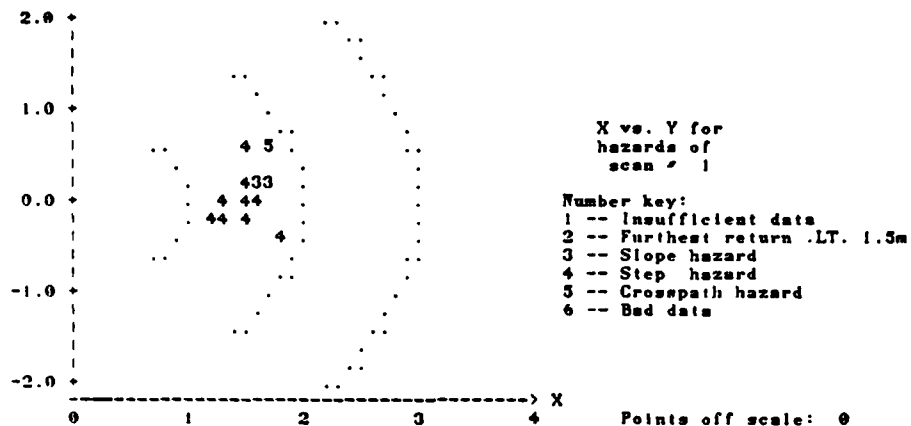
**** MODEL1 PARAMETERS ****
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.85
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



AZIMUT.	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	HAZARDS			CATALOGED
2	-40.74	NO	HAZARDS			CATALOGED
3	-37.93	NO	HAZARDS			CATALOGED
4	-35.13	NO	HAZARDS			CATALOGED
5	-32.31	NO	HAZARDS			CATALOGED
6	-29.50	NO	HAZARDS			CATALOGED
7	-26.69	NO	HAZARDS			CATALOGED
8	-23.88	NO	HAZARDS			CATALOGED
9	-21.08	NO	HAZARDS			CATALOGED
10	-18.26	NO	HAZARDS			CATALOGED
11	-15.45	NO	HAZARDS			CATALOGED
12	-12.64	NO	HAZARDS			CATALOGED
13	-9.84	1.84	1.81	-0.31	0.19	Step hazard
14	-7.02	1.61	1.60	-0.20	0.04	Step hazard
15	-4.22	NO	HAZARDS			CATALOGED
16	-1.41	1.61	1.61	-0.04	0.04	Step hazard
17	1.40	1.61	1.61	0.04	0.05	Step hazard
		1.73	1.73	0.04	0.18	Step hazard
18	4.21	1.61	1.61	0.12	0.05	Step hazard
19	7.02	NO	HAZARDS			CATALOGED
20	9.83	NO	HAZARDS			CATALOGED
21	12.64	NO	HAZARDS			CATALOGED
22	15.45	1.61	1.55	0.43	0.04	Step hazard
		1.82	1.76	0.49	0.15	Step hazard
23	18.26	1.55	1.47	0.49	-0.01	Step hazard
		1.75	1.66	0.55	-0.01	Crosspath hazard
24	21.07	NO	HAZARDS			CATALOGED
25	23.88	NO	HAZARDS			CATALOGED
26	26.69	NO	HAZARDS			CATALOGED
27	29.50	NO	HAZARDS			CATALOGED
28	32.31	NO	HAZARDS			CATALOGED
29	35.12	NO	HAZARDS			CATALOGED
30	37.93	NO	HAZARDS			CATALOGED
31	40.74	NO	HAZARDS			CATALOGED
32	43.55	NO	HAZARDS			CATALOGED

Input file: MDL.SLOPE.35.30.85
 File Creation Date : THU, AUG 11 1983 System time 19:43:13

** MODFLI PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.85
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



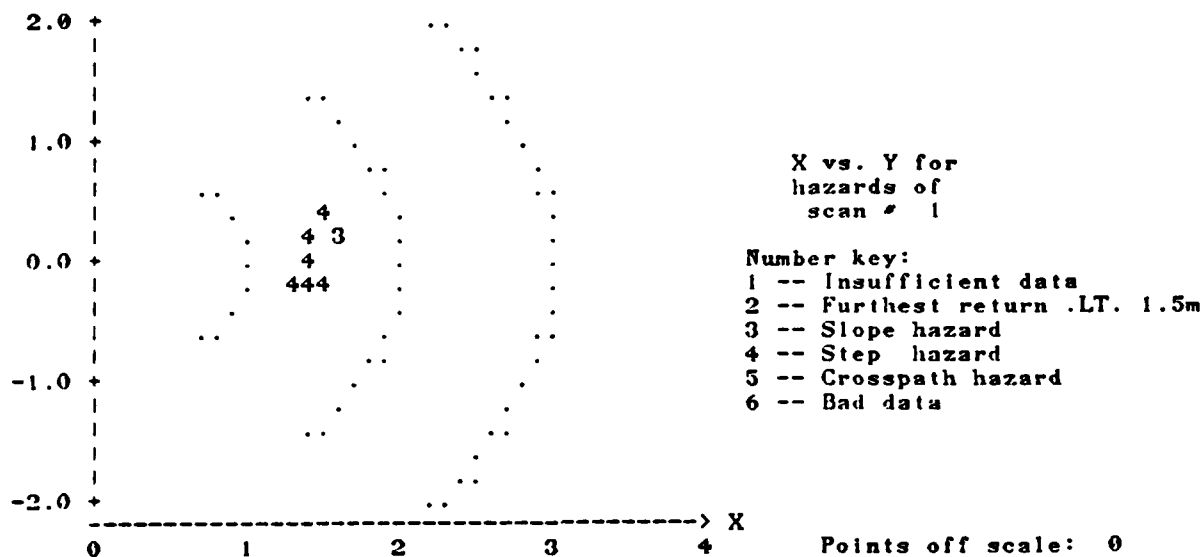
AZ	UTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.36	NO	HAZARDS		CATALOGED	
2	-40.74	NO	HAZARDS		CATALOGED	
3	-37.93	NO	HAZARDS		CATALOGED	
4	-35.13	NO	HAZARDS		CATALOGED	
5	-32.31	NO	HAZARDS		CATALOGED	
6	-29.50	NO	HAZARDS		CATALOGED	
7	-26.69	NO	HAZARDS		CATALOGED	
8	-23.88	NO	HAZARDS		CATALOGED	
9	-21.08	NO	HAZARDS		CATALOGED	
10	-18.26	NO	HAZARDS		CATALOGED	
11	-15.45	NO	HAZARDS		CATALOGED	
12	-12.64	NO	HAZARDS		CATALOGED	
13	-9.84	1.30	1.28	-0.22	-0.05	Step hazard
		1.51	1.49	-0.26	0.07	Step hazard
		1.82	1.79	-0.31	0.27	Step hazard
14	-7.02	1.26	1.25	-0.15	-0.14	Step hazard
		1.51	1.50	-0.19	0.07	Step hazard
15	-4.22	1.51	1.51	-0.11	0.04	Step hazard
		1.51	1.51	-0.11	0.04	Step hazard
16	-1.41	1.30	1.30	-0.03	-0.05	Step hazard
		1.51	1.51	-0.04	0.06	Step hazard
17	1.40	1.51	1.51	0.04	0.07	Step hazard
		1.62	1.62	0.04	0.23	Step hazard
18	4.21	1.56	1.56	0.11	0.18	Slope hazard
		1.63	1.62	0.12	0.23	Slope hazard
		1.72	1.72	0.13	0.30	Slope hazard
19	7.02	1.51	1.50	0.19	0.06	Step hazard
20	9.83	1.51	1.49	0.26	0.07	Step hazard
21	12.64	NO	HAZARDS		CATALOGED	
22	15.45	NO	HAZARDS		CATALOGED	
23	18.26	1.61	1.53	0.50	0.07	Step hazard
		1.75	1.66	0.53	0.07	Crosspath hazard
24	21.07	NO	HAZARDS		CATALOGED	
25	23.88	NO	HAZARDS		CATALOGED	
26	26.69	NO	HAZARDS		CATALOGED	
27	29.50	NO	HAZARDS		CATALOGED	
28	32.31	NO	HAZARDS		CATALOGED	
29	35.12	NO	HAZARDS		CATALOGED	
30	37.93	NO	HAZARDS		CATALOGED	
31	40.74	NO	HAZARDS		CATALOGED	
32	43.55	NO	HAZARDS		CATALOGED	

Input file: MDL.SLOPE.40.30.85

File Creation Date : THU, AUG 11 1983

System time 19:44:10

**** MODEL1 PARAMETERS ****
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.85
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	HAZARDS		CATALOGED	
2	-40.74	NO	HAZARDS		CATALOGED	
3	-37.93	NO	HAZARDS		CATALOGED	
4	-35.13	NO	HAZARDS		CATALOGED	
5	-32.31	NO	HAZARDS		CATALOGED	
6	-29.50	NO	HAZARDS		CATALOGED	
7	-26.69	NO	HAZARDS		CATALOGED	
8	-23.88	NO	HAZARDS		CATALOGED	
9	-21.08	NO	HAZARDS		CATALOGED	
10	-18.26	NO	HAZARDS		CATALOGED	
11	-15.45	NO	HAZARDS		CATALOGED	
12	-12.64	1.34	1.31	-0.29	0.07	Step hazard
13	-9.84	1.37	1.35	-0.23	0.12	Step hazard
14	-7.02	1.42	1.41	-0.17	0.13	Step hazard
15	-4.22	1.37	1.37	-0.10	0.12	Step hazard
		1.47	1.47	-0.11	0.22	Step hazard
16	-1.41	1.42	1.42	-0.03	0.13	Step hazard
17	1.40	1.42	1.42	0.03	0.13	Step hazard
18	4.21	1.42	1.42	0.10	0.13	Step hazard
19	7.02	1.42	1.41	0.17	0.13	Step hazard
		1.63	1.62	0.20	0.34	Slope hazard
		1.42	1.40	0.24	0.13	Step hazard
20	9.83	NO	HAZARDS		CATALOGED	
21	12.64	NO	HAZARDS		CATALOGED	
22	15.45	NO	HAZARDS		CATALOGED	
23	18.26	1.60	1.51	0.50	0.23	Step hazard
24	21.07	NO	HAZARDS		CATALOGED	
25	23.88	NO	HAZARDS		CATALOGED	
26	26.69	NO	HAZARDS		CATALOGED	
27	29.50	NO	HAZARDS		CATALOGED	
28	32.31	NO	HAZARDS		CATALOGED	
29	35.12	NO	HAZARDS		CATALOGED	
30	37.93	NO	HAZARDS		CATALOGED	
31	40.74	NO	HAZARDS		CATALOGED	
32	43.55	NO	HAZARDS		CATALOGED	

7.2.2.3 B=0.80; Slope Threshold=30

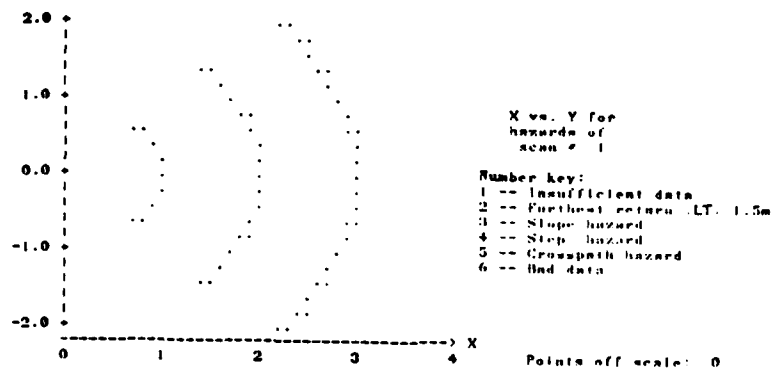
7.2.2.3.1	5 Degree Slope	.....	125
7.2.2.3.1	10 Degree Slope	.....	125
7.2.2.3.2	15 Degree Slope	.....	126
7.2.2.3.3	20 Degree Slope	.....	127
7.2.2.3.4	25 Degree Slope	.....	128
7.2.2.3.5	30 Degree Slope	.....	129
7.2.2.3.6	35 Degree Slope	.....	130
7.2.2.3.7	40 Degree Slope	.....	131

Input file: MDL.SLOPE.03.30.80
 File Creation Date : THU, AUG 11 1983 System time 20:00:19

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** MODEL PARAMETERS **
HEIGHT FILTER COEFFICIENT * 0.25
SLOPE FILTER COEFFICIENT * 0.80
LEVEL GROUND STEP THRESHOLD * 0.25 METERS
SLOPE THRESHOLD * 30.00 DEGREES

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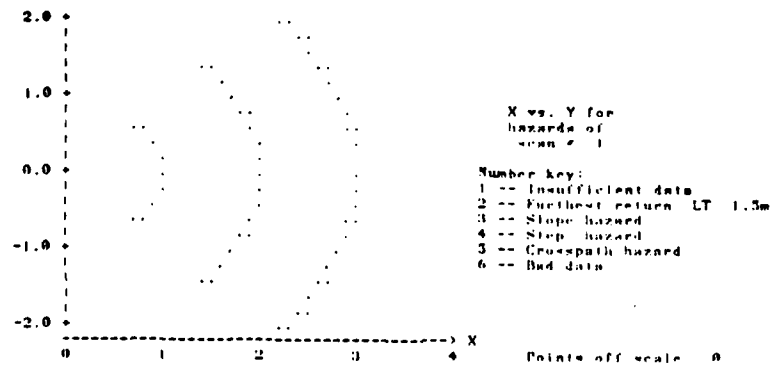
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Input file: MDL.SLOPE.10.30.80
 File Creation Date : THU, AUG 11 1983 System time 20:01:16

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** MODEL PARAMETERS **
HEIGHT FILTER COEFFICIENT * 0.25
SLOPE FILTER COEFFICIENT * 0.80
LEVEL GROUND STEP THRESHOLD * 0.25 METERS
SLOPE THRESHOLD * 30.00 DEGREES

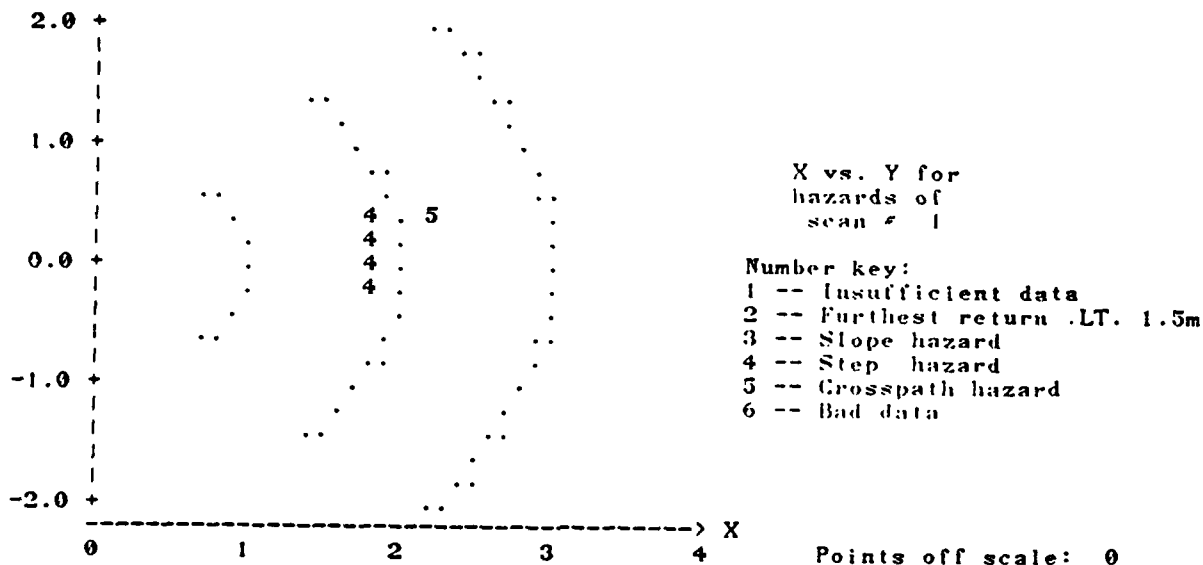
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NO HAZARDS CATALOGED THIS SCAN

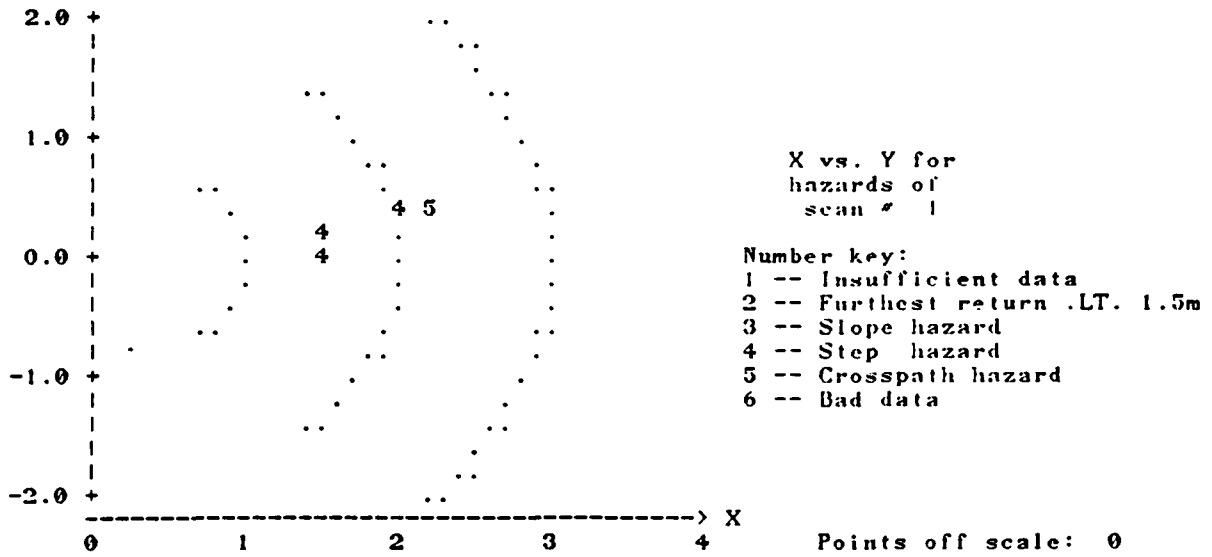
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 File Creation Date : THU, AUG 11 1983 System time 20:01:47

** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.80
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S		C A T A L O G E D	
2	-40.74	NO	H A Z A R D S		C A T A L O G E D	
3	-37.93	NO	H A Z A R D S		C A T A L O G E D	
4	-35.13	NO	H A Z A R D S		C A T A L O G E D	
5	-32.31	NO	H A Z A R D S		C A T A L O G E D	
6	-29.50	NO	H A Z A R D S		C A T A L O G E D	
7	-26.69	NO	H A Z A R D S		C A T A L O G E D	
8	-23.88	NO	H A Z A R D S		C A T A L O G E D	
9	-21.08	NO	H A Z A R D S		C A T A L O G E D	
10	-18.26	NO	H A Z A R D S		C A T A L O G E D	
11	-15.45	NO	H A Z A R D S		C A T A L O G E D	
12	-12.64	NO	H A Z A R D S		C A T A L O G E D	
13	-9.84	NO	H A Z A R D S		C A T A L O G E D	
14	-7.02	NO	H A Z A R D S		C A T A L O G E D	
15	-4.22	1.84	1.83	-0.13	-0.08	Step hazard
16	-1.41	1.84	1.84	-0.05	-0.08	Step hazard
17	1.40	1.84	1.84	0.05	-0.08	Step hazard
18	4.21	NO	H A Z A R D S		C A T A L O G E D	
19	7.02	1.84	1.82	0.22	-0.08	Step hazard
20	9.83	1.84	1.81	0.31	-0.08	Step hazard
21	12.64	2.25	2.20	0.49	-0.04	Crosspath hazard
22	15.45	NO	H A Z A R D S		C A T A L O G E D	
23	18.26	NO	H A Z A R D S		C A T A L O G E D	
24	21.07	NO	H A Z A R D S		C A T A L O G E D	
25	23.88	NO	H A Z A R D S		C A T A L O G E D	
26	26.69	NO	H A Z A R D S		C A T A L O G E D	
27	29.50	NO	H A Z A R D S		C A T A L O G E D	
28	32.31	NO	H A Z A R D S		C A T A L O G E D	
29	35.12	NO	H A Z A R D S		C A T A L O G E D	
30	37.93	NO	H A Z A R D S		C A T A L O G E D	
31	40.74	NO	H A Z A R D S		C A T A L O G E D	
32	43.55	NO	H A Z A R D S		C A T A L O G E D	

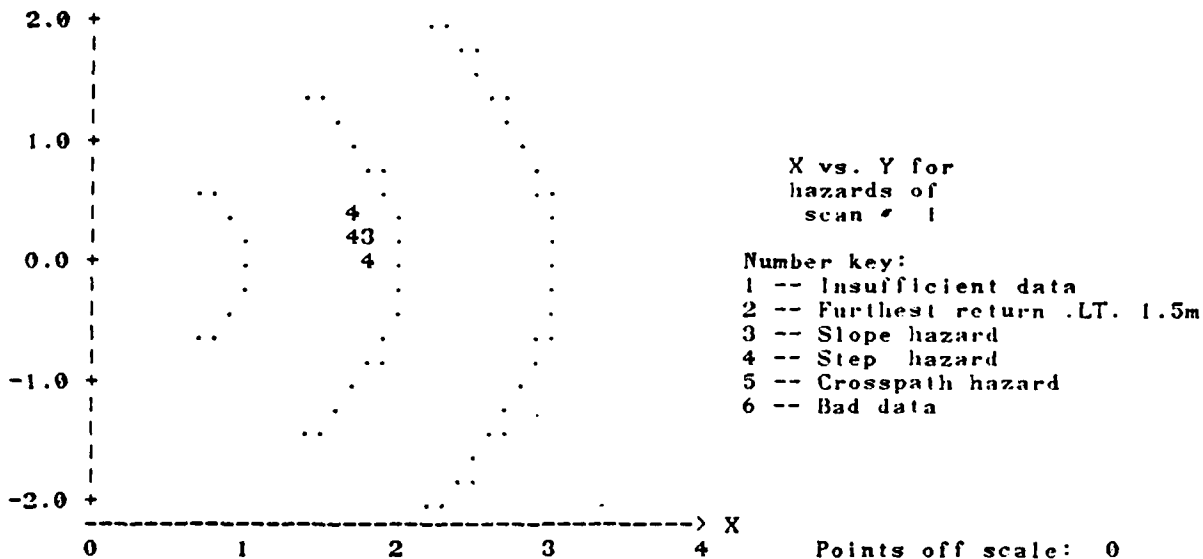
** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.80
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	HAZARDS	CATALOGED	
2	-40.74	NO	HAZARDS	CATALOGED	
3	-37.93	NO	HAZARDS	CATALOGED	
4	-35.13	NO	HAZARDS	CATALOGED	
5	-32.31	NO	HAZARDS	CATALOGED	
6	-29.50	NO	HAZARDS	CATALOGED	
7	-26.69	NO	HAZARDS	CATALOGED	
8	-23.88	NO	HAZARDS	CATALOGED	
9	-21.08	NO	HAZARDS	CATALOGED	
10	-18.26	NO	HAZARDS	CATALOGED	
11	-15.45	NO	HAZARDS	CATALOGED	
12	-12.64	NO	HAZARDS	CATALOGED	
13	-9.84	NO	HAZARDS	CATALOGED	
14	-7.02	NO	HAZARDS	CATALOGED	
15	-4.22	NO	HAZARDS	CATALOGED	
16	-1.41	1.51	1.51	-0.04	Step hazard
17	1.40	1.51	1.51	0.04	Step hazard
18	4.21	NO	HAZARDS	CATALOGED	
19	7.02	1.51	1.50	0.18	Step hazard
20	9.83	1.51	1.48	0.26	Step hazard
21	12.64	2.04	1.99	0.45	Step hazard
		2.25	2.20	0.49	Crosspath hazard
22	15.45	NO	HAZARDS	CATALOGED	
23	18.26	NO	HAZARDS	CATALOGED	
24	21.07	NO	HAZARDS	CATALOGED	
25	23.88	NO	HAZARDS	CATALOGED	
26	26.69	NO	HAZARDS	CATALOGED	
27	29.50	NO	HAZARDS	CATALOGED	
28	32.31	NO	HAZARDS	CATALOGED	
29	35.12	NO	HAZARDS	CATALOGED	
30	37.93	NO	HAZARDS	CATALOGED	
31	40.74	NO	HAZARDS	CATALOGED	
32	43.55	NO	HAZARDS	CATALOGED	

Input file: MDL.SLOPE.25.30.80
 File Creation Date : THU, AUG 11 1983 System time 20:03:15

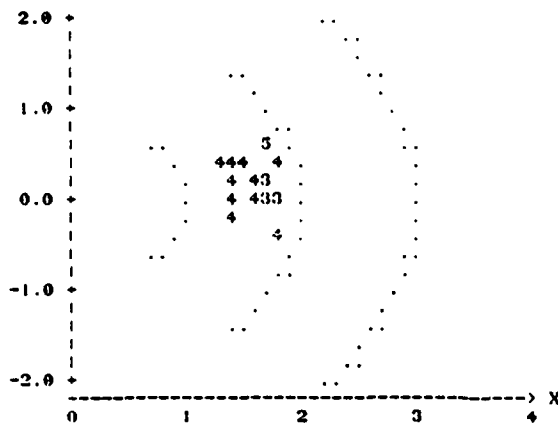
** MODEL1 PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.80
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S		C A T A L O G E D	
2	-40.74	NO	H A Z A R D S		C A T A L O G E D	
3	-37.93	NO	H A Z A R D S		C A T A L O G E D	
4	-35.13	NO	H A Z A R D S		C A T A L O G E D	
5	-32.31	NO	H A Z A R D S		C A T A L O G E D	
6	-29.50	NO	H A Z A R D S		C A T A L O G E D	
7	-26.69	NO	H A Z A R D S		C A T A L O G E D	
8	-23.88	NO	H A Z A R D S		C A T A L O G E D	
9	-21.08	NO	H A Z A R D S		C A T A L O G E D	
10	-18.26	NO	H A Z A R D S		C A T A L O G E D	
11	-15.45	NO	H A Z A R D S		C A T A L O G E D	
12	-12.64	NO	H A Z A R D S		C A T A L O G E D	
14	-7.02	NO	H A Z A R D S		C A T A L O G E D	
15	-4.22	NO	H A Z A R D S		C A T A L O G E D	
16	-1.41	NO	H A Z A R D S		C A T A L O G E D	
17	1.40	1.84	1.84	0.05	0.12	Step hazard
18	4.21	1.72	1.71	0.13	0.60	Step hazard
19	7.02	1.84	1.82	0.22	0.11	Slope hazard
20	9.83	NO	H A Z A R D S		C A T A L O G E D	
21	12.64	NO	H A Z A R D S		C A T A L O G E D	
22	15.45	1.72	1.66	0.46	-0.01	Step hazard
23	18.26	NO	H A Z A R D S		C A T A L O G E D	
24	21.07	NO	H A Z A R D S		C A T A L O G E D	
25	23.88	NO	H A Z A R D S		C A T A L O G E D	
26	26.69	NO	H A Z A R D S		C A T A L O G E D	
27	29.50	NO	H A Z A R D S		C A T A L O G E D	
28	32.31	NO	H A Z A R D S		C A T A L O G E D	
29	35.12	NO	H A Z A R D S		C A T A L O G E D	
30	37.93	NO	H A Z A R D S		C A T A L O G E D	
31	40.74	NO	H A Z A R D S		C A T A L O G E D	
32	43.55	NO	H A Z A R D S		C A T A L O G E D	

Input file: MDL.SLOPE.30.30.80
 File Creation Date : THU, AUG 11 1983 System time 20:03:41

** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT * 0.25
 SLOPE FILTER COEFFICIENT * 0.80
 LEVEL GROUND STEP THRESHOLD * 0.23 METERS
 SLOPE THRESHOLD * 30.00 DEGREES



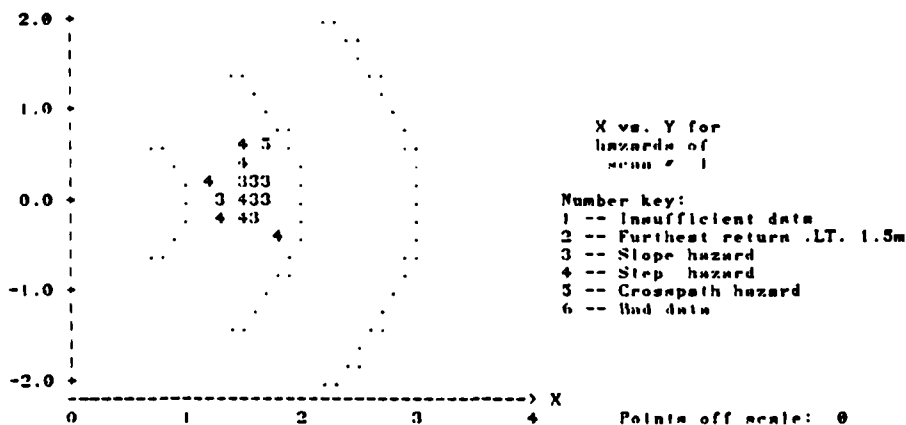
X vs. Y for hazards of scan # 1
 Number key:
 1 -- Insufficient data
 2 -- Furthest return .LT. 1.5m
 3 -- Slope hazard
 4 -- Step hazard
 5 -- Crosspath hazard
 6 -- Red data

Points off scale: 0

AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S	C A T A L O G E D		
2	-40.74	NO	H A Z A R D S	C A T A L O G E D		
3	-37.93	NO	H A Z A R D S	C A T A L O G E D		
4	-35.13	NO	H A Z A R D S	C A T A L O G E D		
5	-32.31	NO	H A Z A R D S	C A T A L O G E D		
6	-29.50	NO	H A Z A R D S	C A T A L O G E D		
7	-26.69	NO	H A Z A R D S	C A T A L O G E D		
8	-23.88	NO	H A Z A R D S	C A T A L O G E D		
9	-21.08	NO	H A Z A R D S	C A T A L O G E D		
10	-18.26	NO	H A Z A R D S	C A T A L O G E D		
11	-15.45	NO	H A Z A R D S	C A T A L O G E D		
12	-12.64	NO	H A Z A R D S	C A T A L O G E D		
13	-9.84	1.40	1.30	-0.24	-0.06	Step hazard
		1.84	1.81	-0.31	0.19	Step hazard
14	-7.02	1.40	1.39	-0.17	-0.06	Step hazard
15	-4.22	1.40	1.40	-0.10	-0.06	Step hazard
16	-1.41	1.40	1.40	-0.03	-0.06	Step hazard
17	1.40	1.40	1.40	0.03	-0.06	Step hazard
		1.61	1.61	0.04	0.05	Step hazard
		1.73	1.73	0.04	0.10	Slope hazard
		1.82	1.82	0.04	0.23	Slope hazard
18	4.21	1.40	1.40	0.10	-0.06	Step hazard
		1.61	1.61	0.12	0.05	Step hazard
		1.73	1.72	0.13	0.18	Slope hazard
19	7.02	1.40	1.39	0.17	-0.06	Step hazard
20	9.83	1.40	1.38	0.24	-0.06	Step hazard
21	12.64	1.40	1.37	0.31	-0.06	Step hazard
22	15.45	1.40	1.35	0.37	-0.06	Step hazard
		1.82	1.76	0.49	0.15	Step hazard
23	18.26	1.55	1.57	0.49	-0.01	Step hazard
		1.75	1.66	0.55	-0.01	Crosspath hazard
24	21.07	NO	H A Z A R D S	C A T A L O G E D		
25	23.88	NO	H A Z A R D S	C A T A L O G E D		
26	26.69	NO	H A Z A R D S	C A T A L O G E D		
27	29.50	NO	H A Z A R D S	C A T A L O G E D		
28	32.31	NO	H A Z A R D S	C A T A L O G E D		
29	35.12	NO	H A Z A R D S	C A T A L O G E D		
30	37.93	NO	H A Z A R D S	C A T A L O G E D		
31	40.74	NO	H A Z A R D S	C A T A L O G E D		
32	43.55	NO	H A Z A R D S	C A T A L O G E D		

Input file: MDL.SLOPE.35.30.80
 File Creation Date : THU, AUG 11 1983 System time 20:04:08

== MODEL PARAMETERS ==
 HEIGHT FILTER COEFFICIENT * 0.25
 SLOPE FILTER COEFFICIENT * 0.80
 LEVEL GROUND STEP THRESHOLD * 0.25 METERS
 SLOPE THRESHOLD * 30.00 DEGREES

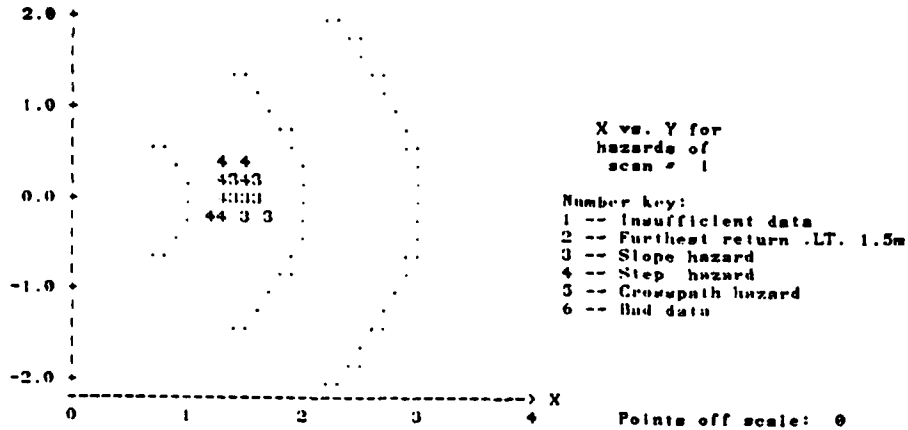


AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE	
1	-43.56	NO	HAZARDS	CATALOGED		
2	-40.74	NO	HAZARDS	CATALOGED		
3	-37.93	NO	HAZARDS	CATALOGED		
4	-35.13	NO	HAZARDS	CATALOGED		
5	-32.31	NO	HAZARDS	CATALOGED		
6	-29.50	NO	HAZARDS	CATALOGED		
7	-26.69	NO	HAZARDS	CATALOGED		
8	-23.88	NO	HAZARDS	CATALOGED		
9	-21.08	NO	HAZARDS	CATALOGED		
10	-18.26	NO	HAZARDS	CATALOGED		
11	-15.45	NO	HAZARDS	CATALOGED		
12	-12.64	NO	HAZARDS	CATALOGED		
13	-9.84	1.34	1.32	-0.23	0.07	Slope hazard
		1.56	1.54	-0.27	0.17	Slope hazard
		1.82	1.79	-0.31	0.27	Step hazard
14	-7.02	1.30	1.29	-0.16	-0.06	Step hazard
		1.36	1.55	-0.19	0.17	Slope hazard
		1.63	1.61	-0.20	0.23	Slope hazard
15	-4.22	1.51	1.51	-0.11	0.04	Step hazard
16	-1.41	1.34	1.34	-0.03	0.07	Slope hazard
		1.51	1.51	-0.04	0.06	Step hazard
		1.63	1.62	-0.04	0.23	Slope hazard
17	1.40	1.56	1.56	0.04	0.17	Slope hazard
		1.63	1.62	0.04	0.23	Slope hazard
		1.72	1.72	0.04	0.30	Slope hazard
18	4.21	1.51	1.51	0.11	0.12	Slope hazard
		1.56	1.56	0.11	0.18	Slope hazard
		1.63	1.62	0.12	0.23	Slope hazard
		1.72	1.72	0.13	0.30	Slope hazard
19	7.02	1.23	1.22	0.15	-0.10	Step hazard
20	9.83	1.20	1.13	0.21	-0.06	Step hazard
		1.26	1.24	0.21	0.01	Step hazard
		1.55	1.54	0.27	0.17	Slope hazard
		1.63	1.60	0.28	0.23	Slope hazard
21	12.64	NO	HAZARDS	CATALOGED		
22	15.45	1.51	1.46	0.40	0.07	Step hazard
23	18.26	1.61	1.53	0.50	0.07	Step hazard
		1.73	1.66	0.55	0.07	Crosspath hazard
24	21.07	NO	HAZARDS	CATALOGED		
25	23.88	NO	HAZARDS	CATALOGED		
26	26.69	NO	HAZARDS	CATALOGED		
27	29.50	NO	HAZARDS	CATALOGED		
28	32.31	NO	HAZARDS	CATALOGED		
29	35.12	NO	HAZARDS	CATALOGED		
30	37.93	NO	HAZARDS	CATALOGED		
31	40.74	NO	HAZARDS	CATALOGED		
32	43.55	NO	HAZARDS	CATALOGED		

Points off scale: 0

Input file: MDL.SLOPE.40.30.80
 File Creation Date : THU, AUG 11 1983 System time 20:04:40

** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT * 0.25
 SLOPE FILTER COEFFICIENT * 0.80
 LEVEL GROUND STEP THRESHOLD * 0.25 METERS
 SLOPE THRESHOLD * 30.00 DEGREES



AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	HAZARD	S	CATALOGUE	D
2	-40.74	NO	HAZARD	S	CATALOGUE	D
3	-37.93	NO	HAZARD	S	CATALOGUE	D
4	-35.13	NO	HAZARD	S	CATALOGUE	D
5	-32.31	NO	HAZARD	S	CATALOGUE	D
6	-29.50	NO	HAZARD	S	CATALOGUE	D
7	-26.69	NO	HAZARD	S	CATALOGUE	D
8	-23.88	NO	HAZARD	S	CATALOGUE	D
9	-21.08	NO	HAZARD	S	CATALOGUE	D
10	-18.26	NO	HAZARD	S	CATALOGUE	D
11	-15.45	NO	HAZARD	S	CATALOGUE	D
12	-12.64	1.26	1.23	-0.28	-0.07	Step hazard
		1.34	1.31	-0.29	0.07	Step hazard
13	-9.84	1.47	1.45	-0.25	0.22	Slope hazard
		1.67	1.65	-0.29	0.29	Slope hazard
14	-7.02	1.47	1.46	-0.18	0.22	Slope hazard
15	-4.22	1.47	1.47	-0.11	0.22	Step hazard
		1.47	1.47	-0.11	0.22	Slope hazard
16	-1.41	1.30	1.30	-0.03	0.03	Step hazard
		1.37	1.37	-0.03	0.12	Slope hazard
		1.47	1.47	-0.04	0.22	Slope hazard
		1.39	1.38	-0.04	0.28	Slope hazard
17	1.40	1.30	1.30	0.03	0.03	Step hazard
		1.37	1.37	0.03	0.12	Slope hazard
		1.47	1.47	0.04	0.22	Slope hazard
		1.63	1.63	0.04	0.34	Slope hazard
18	4.21	1.30	1.30	0.10	0.03	Step hazard
		1.37	1.37	0.10	0.12	Slope hazard
		1.47	1.47	0.11	0.22	Slope hazard
		1.63	1.63	0.12	0.34	Slope hazard
19	7.02	1.30	1.29	0.16	0.03	Step hazard
		1.37	1.36	0.17	0.12	Slope hazard
		1.47	1.46	0.18	0.22	Slope hazard
		1.59	1.57	0.19	0.28	Slope hazard
		1.63	1.62	0.20	0.34	Slope hazard
20	9.83	1.30	1.29	0.22	0.03	Step hazard
		1.37	1.35	0.23	0.12	Slope hazard
		1.47	1.45	0.25	0.22	Slope hazard
		1.54	1.51	0.26	0.22	Step hazard
		1.54	1.50	0.34	0.23	Step hazard
22	15.45	1.54	1.48	0.41	0.23	Step hazard
23	18.26	1.57	1.51	0.43	0.11	Step hazard
		1.59	1.51	0.50	0.23	Step hazard
24	21.07	NO	HAZARD	S	CATALOGUE	D
25	23.88	NO	HAZARD	S	CATALOGUE	D
26	26.69	NO	HAZARD	S	CATALOGUE	D
27	29.50	NO	HAZARD	S	CATALOGUE	D
28	32.31	NO	HAZARD	S	CATALOGUE	D
29	35.12	NO	HAZARD	S	CATALOGUE	D
30	37.93	NO	HAZARD	S	CATALOGUE	D
31	40.74	NO	HAZARD	S	CATALOGUE	D
32	43.55	NO	HAZARD	S	CATALOGUE	D

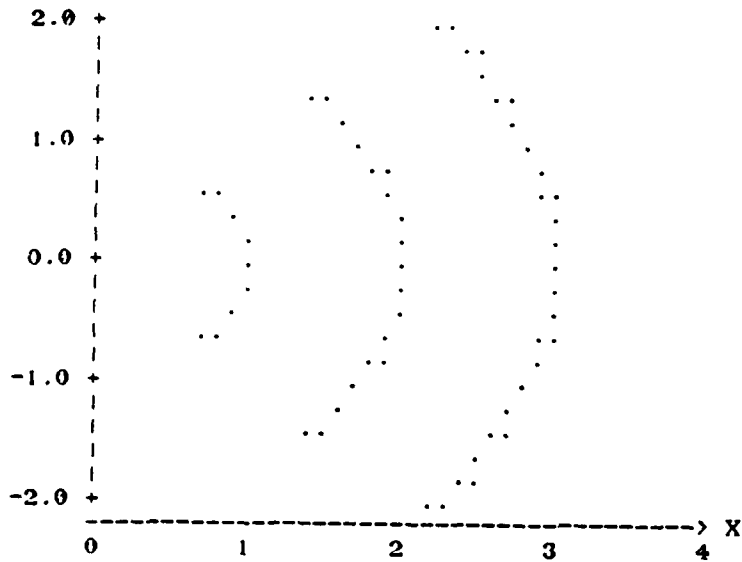
7.2.2.4 B=0.75; Slope Threshold=30

7.2.2.4.1	5 Degree Slope	133
7.2.2.4.2	10 Degree Slope	134
7.2.2.4.3	15 Degree Slope	135
7.2.2.4.4	20 Degree Slope	136
7.2.2.4.5	25 Degree Slope	137
7.2.2.4.6	30 Degree Slope	138
7.2.2.4.7	35 Degree Slope	139
7.2.2.4.8	40 Degree Slope	140

Input file: MDL.SLOPE.05.30.75
 File Creation Date : THU, AUG 11 1983

System time 20:18:23

**** MODEL1 PARAMETERS ****
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.75
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES

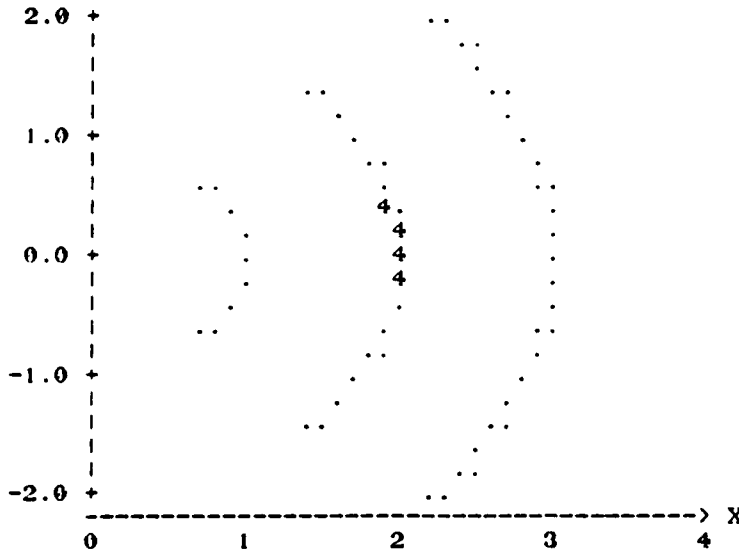


Number key:
 1 -- Insufficient data
 2 -- Furthest return .LT. 1.5m
 3 -- Slope hazard
 4 -- Step hazard
 5 -- Crosspath hazard
 6 -- Bad data

Points off scale: 0

NO HAZARDS CATALOGED THIS SCAN

** MODEL1 PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.75
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



X vs. Y for
 hazards of
 scan # 1

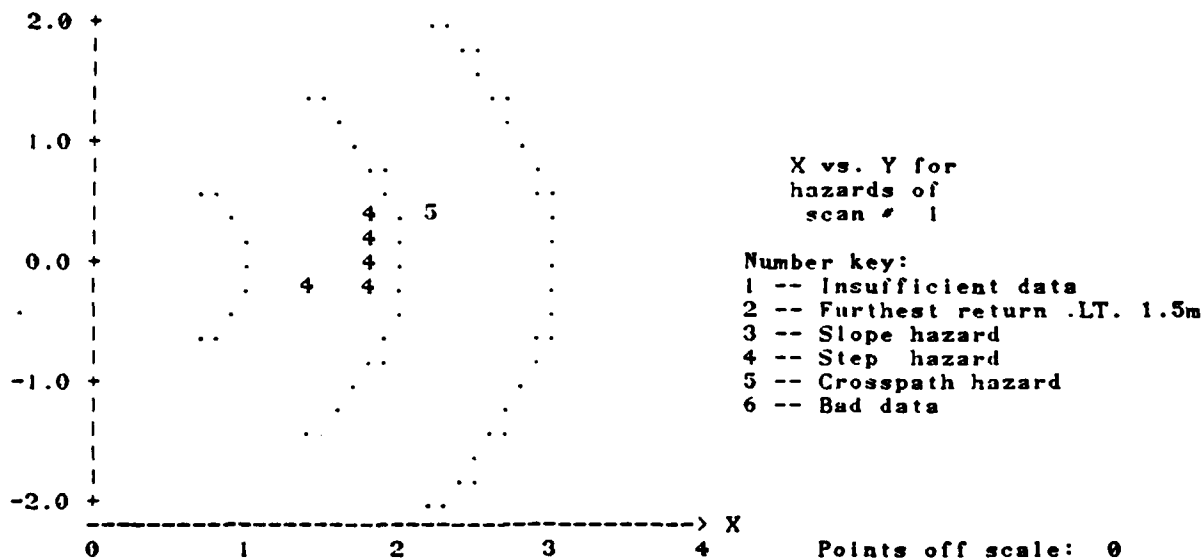
Number key:
 1 -- Insufficient data
 2 -- Furthest return .LT. 1.5m
 3 -- Slope hazard
 4 -- Step hazard
 5 -- Crosspath hazard
 6 -- Bad data

Points off scale: 0

AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S	C A T A L O G E D		
2	-40.75	NO	H A Z A R D S	C A T A L O G E D		
3	-37.93	NO	H A Z A R D S	C A T A L O G E D		
4	-35.13	NO	H A Z A R D S	C A T A L O G E D		
5	-32.31	NO	H A Z A R D S	C A T A L O G E D		
6	-29.50	NO	H A Z A R D S	C A T A L O G E D		
7	-26.69	NO	H A Z A R D S	C A T A L O G E D		
8	-23.88	NO	H A Z A R D S	C A T A L O G E D		
9	-21.08	NO	H A Z A R D S	C A T A L O G E D		
10	-18.26	NO	H A Z A R D S	C A T A L O G E D		
11	-15.45	NO	H A Z A R D S	C A T A L O G E D		
12	-12.64	NO	H A Z A R D S	C A T A L O G E D		
13	-9.84	NO	H A Z A R D S	C A T A L O G E D		
14	-7.02	1.97	1.96	-0.24	-0.17	Step hazard
15	-4.22	1.97	1.96	-0.14	-0.17	Step hazard
16	-1.41	1.97	1.97	-0.05	-0.17	Step hazard
17	1.40	1.97	1.97	0.05	-0.17	Step hazard
18	4.21	1.97	1.96	0.14	-0.17	Step hazard
19	7.02	1.97	1.96	0.24	-0.17	Step hazard
20	9.83	1.97	1.94	0.34	-0.17	Step hazard
21	12.64	1.97	1.92	0.43	-0.17	Step hazard
22	15.45	NO	H A Z A R D S	C A T A L O G E D		
23	18.26	NO	H A Z A R D S	C A T A L O G E D		
24	21.07	NO	H A Z A R D S	C A T A L O G E D		
25	23.88	NO	H A Z A R D S	C A T A L O G E D		
26	26.69	NO	H A Z A R D S	C A T A L O G E D		
27	29.50	NO	H A Z A R D S	C A T A L O G E D		
28	32.31	NO	H A Z A R D S	C A T A L O G E D		
29	35.12	NO	H A Z A R D S	C A T A L O G E D		
30	37.93	NO	H A Z A R D S	C A T A L O G E D		
31	40.74	NO	H A Z A R D S	C A T A L O G E D		
32	43.55	NO	H A Z A R D S	C A T A L O G E D		

Input file: MDL.SLOPE.15.30.75
 File Creation Date : THU, AUG 11 1983 System time 20:20:13

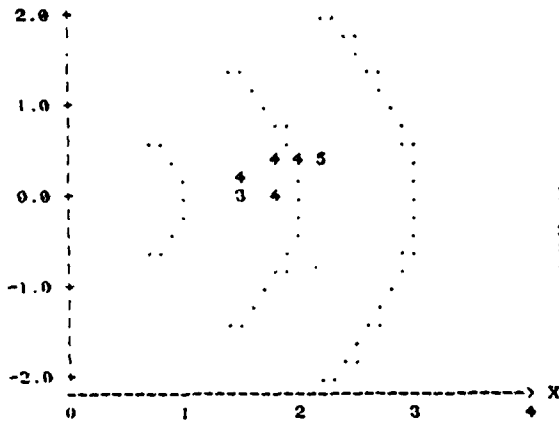
**** MODEL1 PARAMETERS ****
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.75
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S		C A T A L O G E D	
2	-40.74	NO	H A Z A R D S		C A T A L O G E D	
3	-37.93	NO	H A Z A R D S		C A T A L O G E D	
4	-35.13	NO	H A Z A R D S		C A T A L O G E D	
5	-32.31	NO	H A Z A R D S		C A T A L O G E D	
6	-29.50	NO	H A Z A R D S		C A T A L O G E D	
7	-26.69	NO	H A Z A R D S		C A T A L O G E D	
8	-23.88	NO	H A Z A R D S		C A T A L O G E D	
9	-21.08	NO	H A Z A R D S		C A T A L O G E D	
10	-18.26	NO	H A Z A R D S		C A T A L O G E D	
11	-15.45	NO	H A Z A R D S		C A T A L O G E D	
12	-12.64	NO	H A Z A R D S		C A T A L O G E D	
13	-9.84	NO	H A Z A R D S		C A T A L O G E D	
14	-7.02	1.40	1.39	-0.17	-0.24	Step hazard
15	-4.22	1.84	1.83	-0.13	-0.08	Step hazard
16	-1.41	1.84	1.84	-0.05	-0.08	Step hazard
17	1.40	1.84	1.84	0.05	-0.08	Step hazard
18	4.21	NO	H A Z A R D S		C A T A L O G E D	
19	7.02	1.84	1.82	0.22	-0.08	Step hazard
20	9.83	1.84	1.81	0.31	-0.08	Step hazard
21	12.64	2.25	2.20	0.49	-0.04	Crosspath hazard
22	15.45	NO	H A Z A R D S		C A T A L O G E D	
23	18.26	NO	H A Z A R D S		C A T A L O G E D	
24	21.07	NO	H A Z A R D S		C A T A L O G E D	
25	23.88	NO	H A Z A R D S		C A T A L O G E D	
26	26.69	NO	H A Z A R D S		C A T A L O G E D	
27	29.50	NO	H A Z A R D S		C A T A L O G E D	
28	32.31	NO	H A Z A R D S		C A T A L O G E D	
29	35.12	NO	H A Z A R D S		C A T A L O G E D	
30	37.93	NO	H A Z A R D S		C A T A L O G E D	
31	40.74	NO	H A Z A R D S		C A T A L O G E D	
32	43.55	NO	H A Z A R D S		C A T A L O G E D	

Input file: MDL.SLOPE.20.30.75
 File Creation Date : THU, AUG 11 1983 System time 20:20:48

** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.75
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



X vs. Y for
 hazards of
 scan # 1

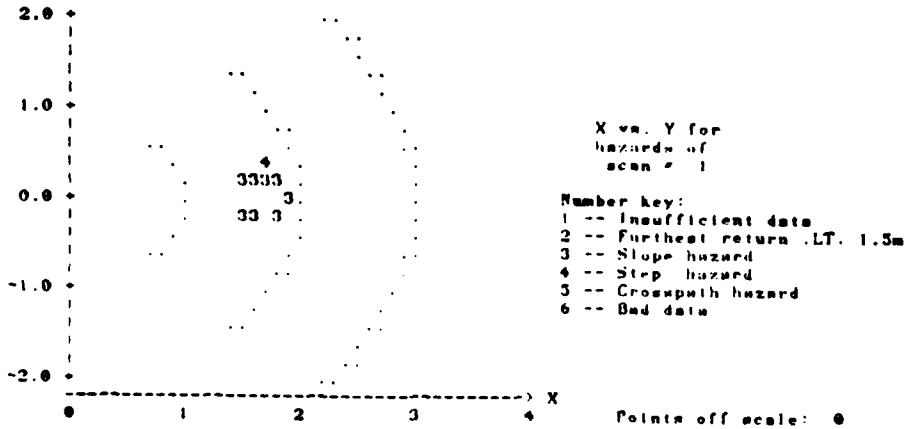
Number key:
 1 -- Insufficient data
 2 -- Furthest return .LT. 1.5m
 3 -- Slope hazard
 4 -- Step hazard
 5 -- Crosspath hazard
 6 -- Bad data

Points off scale: 0

AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.36	NO	HAZARDS	CATALOGED		
2	-40.74	NO	HAZARDS	CATALOGED		
3	-37.11	NO	HAZARDS	CATALOGED		
4	-35.13	NO	HAZARDS	CATALOGED		
5	-32.31	NO	HAZARDS	CATALOGED		
6	-29.50	NO	HAZARDS	CATALOGED		
7	-26.69	NO	HAZARDS	CATALOGED		
8	-23.88	NO	HAZARDS	CATALOGED		
9	-21.08	NO	HAZARDS	CATALOGED		
10	-18.26	NO	HAZARDS	CATALOGED		
11	-15.45	NO	HAZARDS	CATALOGED		
12	-12.64	NO	HAZARDS	CATALOGED		
13	-9.84	NO	HAZARDS	CATALOGED		
14	-7.02	NO	HAZARDS	CATALOGED		
15	-4.22	NO	HAZARDS	CATALOGED		
16	-1.41	1.31	1.31	-0.04	-0.15	Step hazard
		1.84	1.84	-0.05	-0.07	Step hazard
18	4.21	1.33	1.33	0.11	-0.05	Slope hazard
19	7.02	1.51	1.50	0.18	-0.14	Step hazard
20	9.83	1.31	1.48	0.26	-0.15	Step hazard
		1.84	1.81	0.31	-0.07	Step hazard
21	12.64	1.84	1.79	0.40	-0.07	Step hazard
		2.04	1.99	0.45	-0.01	Step hazard
		2.25	2.20	0.49	-0.01	Crosspath hazard
22	15.45	NO	HAZARDS	CATALOGED		
23	18.26	NO	HAZARDS	CATALOGED		
24	21.07	NO	HAZARDS	CATALOGED		
25	23.88	NO	HAZARDS	CATALOGED		
26	26.69	NO	HAZARDS	CATALOGED		
27	29.50	NO	HAZARDS	CATALOGED		
28	32.31	NO	HAZARDS	CATALOGED		
29	35.12	NO	HAZARDS	CATALOGED		
30	37.93	NO	HAZARDS	CATALOGED		
31	40.74	NO	HAZARDS	CATALOGED		
32	43.55	NO	HAZARDS	CATALOGED		

Input file: MDL.SLOPE.25.30.75
 File Creation Date : THU, AUG 11 1983 System time 20:21:22

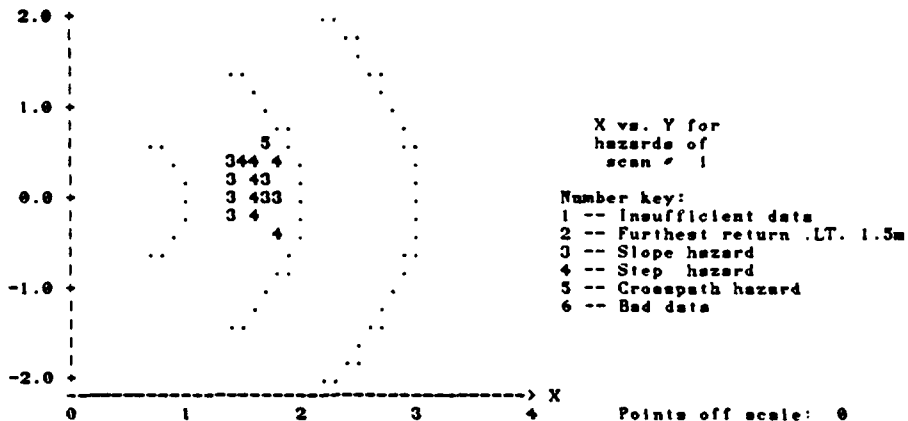
** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT * 0.25
 SLOPE FILTER COEFFICIENT * 0.75
 LEVEL GROUND STEP THRESHOLD * 0.25 METERS
 SLOPE THRESHOLD * 30.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.36	NO	HAZARDS	CATALOGUED	
2	-40.74	NO	HAZARDS	CATALOGUED	
3	-37.93	NO	HAZARDS	CATALOGUED	
4	-35.13	NO	HAZARDS	CATALOGUED	
5	-32.31	NO	HAZARDS	CATALOGUED	
6	-29.50	NO	HAZARDS	CATALOGUED	
7	-26.69	NO	HAZARDS	CATALOGUED	
8	-23.88	NO	HAZARDS	CATALOGUED	
9	-21.08	NO	HAZARDS	CATALOGUED	
10	-18.26	NO	HAZARDS	CATALOGUED	
11	-15.45	NO	HAZARDS	CATALOGUED	
12	-12.64	NO	HAZARDS	CATALOGUED	
13	-9.84	NO	HAZARDS	CATALOGUED	
14	-7.02	NO	HAZARDS	CATALOGUED	
15	-4.22	1.53	1.53	-0.11	Slope hazard
		1.65	1.65	-0.12	Slope hazard
		1.76	1.76	-0.13	Slope hazard
		1.84	1.83	-0.14	Slope hazard
16	-1.41	NO	HAZARDS	CATALOGUED	
17	1.40	1.93	1.93	0.05	Slope hazard
18	4.21	1.53	1.53	0.11	Slope hazard
		1.76	1.76	0.13	Slope hazard
		1.84	1.83	0.14	Slope hazard
19	7.02	1.53	1.52	0.19	Slope hazard
		1.65	1.64	0.20	Slope hazard
		1.76	1.75	0.22	Slope hazard
		1.84	1.82	0.22	Slope hazard
20	9.83	NO	HAZARDS	CATALOGUED	
21	12.64	NO	HAZARDS	CATALOGUED	
22	15.45	1.72	1.66	0.46	Step hazard
23	18.26	NO	HAZARDS	CATALOGUED	
24	21.07	NO	HAZARDS	CATALOGUED	
25	23.88	NO	HAZARDS	CATALOGUED	
26	26.69	NO	HAZARDS	CATALOGUED	
27	29.50	NO	HAZARDS	CATALOGUED	
28	32.31	NO	HAZARDS	CATALOGUED	
29	35.12	NO	HAZARDS	CATALOGUED	
30	37.93	NO	HAZARDS	CATALOGUED	
31	40.74	NO	HAZARDS	CATALOGUED	
32	43.55	NO	HAZARDS	CATALOGUED	

Input file: MDL.SLOPE.30.30.75
 File Creation Date : THU, AUG 11 1983 System time 20:22:04

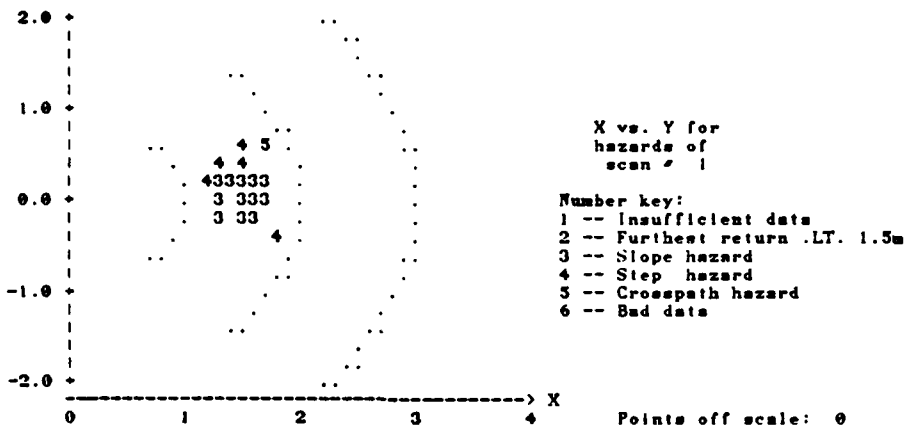
** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT * 0.25
 SLOPE FILTER COEFFICIENT * 0.75
 LEVEL GROUND STEP THRESHOLD * 0.25 METERS
 SLOPE THRESHOLD * 30.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE	
1	-43.56	NO	HAZARDS	CATALOGED		
2	-40.74	NO	HAZARDS	CATALOGED		
3	-37.93	NO	HAZARDS	CATALOGED		
4	-35.13	NO	HAZARDS	CATALOGED		
5	-32.31	NO	HAZARDS	CATALOGED		
6	-29.50	NO	HAZARDS	CATALOGED		
7	-26.69	NO	HAZARDS	CATALOGED		
8	-23.88	NO	HAZARDS	CATALOGED		
9	-21.08	NO	HAZARDS	CATALOGED		
10	-18.26	NO	HAZARDS	CATALOGED		
11	-15.45	NO	HAZARDS	CATALOGED		
12	-12.64	NO	HAZARDS	CATALOGED		
13	-9.84	1.43	1.41	-0.24	0.02	Slope hazard
		1.84	1.61	-0.31	0.19	Step hazard
14	-7.02	1.43	1.42	-0.18	0.02	Slope hazard
		1.61	1.60	-0.20	0.04	Step hazard
15	-4.22	1.43	1.43	-0.11	0.02	Slope hazard
		1.60	1.59	-0.12	0.00	Step hazard
16	-1.41	1.43	1.43	-0.04	0.02	Slope hazard
		1.61	1.61	-0.04	0.04	Step hazard
17	1.40	1.43	1.43	0.04	0.02	Slope hazard
		1.66	1.66	0.04	0.13	Slope hazard
		1.73	1.73	0.04	0.18	Slope hazard
		1.82	1.82	0.04	0.25	Slope hazard
18	4.21	1.43	1.43	0.11	0.02	Slope hazard
		1.66	1.65	0.12	0.13	Slope hazard
		1.73	1.72	0.13	0.18	Slope hazard
19	7.02	1.43	1.42	0.10	0.02	Slope hazard
		1.60	1.59	0.20	0.00	Step hazard
20	9.83	1.43	1.41	0.24	0.02	Slope hazard
		1.60	1.57	0.27	0.00	Step hazard
21	12.64	1.43	1.40	0.31	0.02	Slope hazard
		1.60	1.56	0.33	0.00	Step hazard
22	15.45	1.43	1.38	0.38	0.02	Slope hazard
		1.61	1.55	0.43	0.04	Step hazard
		1.82	1.76	0.49	0.15	Step hazard
23	18.26	1.35	1.47	0.49	-0.01	Step hazard
		1.75	1.66	0.55	-0.01	Crosspath hazard
24	21.07	NO	HAZARDS	CATALOGED		
25	23.88	NO	HAZARDS	CATALOGED		
26	26.69	NO	HAZARDS	CATALOGED		
27	29.50	NO	HAZARDS	CATALOGED		
28	32.31	NO	HAZARDS	CATALOGED		
29	35.12	NO	HAZARDS	CATALOGED		
30	37.93	NO	HAZARDS	CATALOGED		
31	40.74	NO	HAZARDS	CATALOGED		
32	43.55	NO	HAZARDS	CATALOGED		

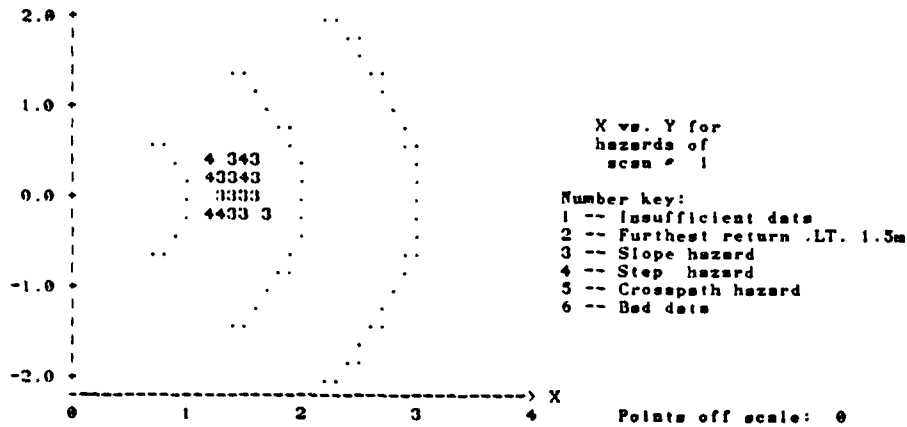
Input file: MDL.SLOPE.35.30.75
 File Creation Date : THU, AUG 11 1983 System time 20:22:32

** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.75
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.36	N 0	H A Z A R D S	C A T A L O G E D	
2	-40.74	N 0	H A Z A R D S	C A T A L O G E D	
3	-37.93	N 0	H A Z A R D S	C A T A L O G E D	
4	-35.13	N 0	H A Z A R D S	C A T A L O G E D	
5	-32.31	N 0	H A Z A R D S	C A T A L O G E D	
6	-29.50	N 0	H A Z A R D S	C A T A L O G E D	
7	-26.69	N 0	H A Z A R D S	C A T A L O G E D	
8	-23.88	N 0	H A Z A R D S	C A T A L O G E D	
9	-21.08	N 0	H A Z A R D S	C A T A L O G E D	
10	-18.26	N 0	H A Z A R D S	C A T A L O G E D	
11	-15.45	N 0	H A Z A R D S	C A T A L O G E D	
12	-12.64	N 0	H A Z A R D S	C A T A L O G E D	
13	-9.84	1.34	1.32 -0.23	0.07	Slope hazard
		1.36	1.34 -0.27	0.17	Slope hazard
		1.63	1.60 -0.28	0.18	Slope hazard
		1.82	1.79 -0.31	0.27	Step hazard
14	-7.02	1.34	1.33 -0.16	0.07	Slope hazard
		1.36	1.35 -0.19	0.17	Slope hazard
		1.63	1.61 -0.20	0.23	Slope hazard
15	-4.22	1.36	1.36 -0.11	0.16	Slope hazard
16	-1.41	1.34	1.34 -0.03	0.07	Slope hazard
		1.36	1.36 -0.04	0.17	Slope hazard
		1.63	1.62 -0.04	0.23	Slope hazard
17	1.40	1.45	1.45 0.04	0.07	Slope hazard
		1.36	1.36 0.04	0.17	Slope hazard
		1.63	1.62 0.04	0.23	Slope hazard
		1.72	1.72 0.04	0.30	Slope hazard
18	4.21	1.45	1.45 0.11	0.07	Slope hazard
		1.31	1.31 0.11	0.12	Slope hazard
		1.36	1.36 0.11	0.18	Slope hazard
		1.63	1.62 0.12	0.23	Slope hazard
		1.72	1.72 0.13	0.30	Slope hazard
19	7.02	1.23	1.22 0.15	-0.10	Step hazard
		1.31	1.30 0.19	0.06	Step hazard
		1.63	1.61 0.20	0.23	Slope hazard
20	9.83	1.26	1.24 0.21	0.01	Slope hazard
		1.34	1.32 0.23	0.09	Slope hazard
		1.36	1.34 0.27	0.17	Slope hazard
		1.63	1.60 0.28	0.23	Slope hazard
21	12.64	1.20	1.17 0.26	-0.07	Step hazard
		1.31	1.48 0.33	0.07	Step hazard
22	15.45	1.30	1.26 0.35	0.02	Step hazard
		1.31	1.46 0.40	0.07	Step hazard
23	18.26	1.61	1.33 0.50	0.07	Step hazard
		1.75	1.66 0.53	0.07	Crosspath hazard
24	21.07	N 0	H A Z A R D S	C A T A L O G E D	
25	23.88	N 0	H A Z A R D S	C A T A L O G E D	
26	26.69	N 0	H A Z A R D S	C A T A L O G E D	
27	29.50	N 0	H A Z A R D S	C A T A L O G E D	
28	32.31	N 0	H A Z A R D S	C A T A L O G E D	
29	35.12	N 0	H A Z A R D S	C A T A L O G E D	
30	37.93	N 0	H A Z A R D S	C A T A L O G E D	
31	40.74	N 0	H A Z A R D S	C A T A L O G E D	
32	43.35	N 0	H A Z A R D S	C A T A L O G E D	

** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.75
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



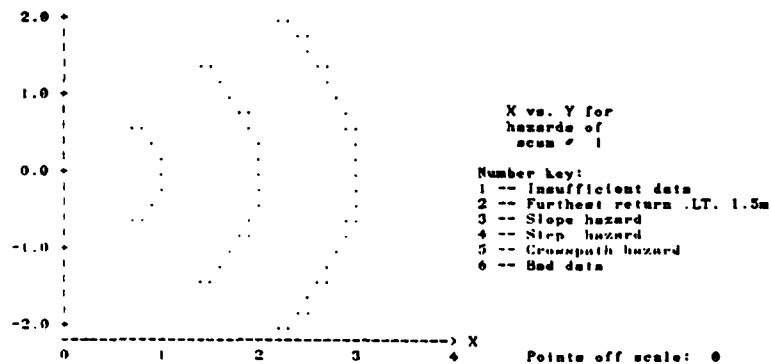
AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	N 0	H A Z A R D S	C A T A L O G E D	
2	-40.74	N 0	H A Z A R D S	C A T A L O G E D	
3	-37.93	N 0	H A Z A R D S	C A T A L O G E D	
4	-35.13	N 0	H A Z A R D S	C A T A L O G E D	
5	-32.31	N 0	H A Z A R D S	C A T A L O G E D	
6	-29.50	N 0	H A Z A R D S	C A T A L O G E D	
7	-26.69	N 0	H A Z A R D S	C A T A L O G E D	
8	-23.88	N 0	H A Z A R D S	C A T A L O G E D	
9	-21.08	N 0	H A Z A R D S	C A T A L O G E D	
10	-18.26	N 0	H A Z A R D S	C A T A L O G E D	
11	-15.45	N 0	H A Z A R D S	C A T A L O G E D	
12	-12.64	1.26	1.23	-0.28	0.07 Step hazard
		1.34	1.31	-0.29	0.07 Step hazard
13	-9.84	1.30	1.28	-0.22	0.02 Step hazard
		1.37	1.35	-0.23	0.12 Slope hazard
		1.47	1.45	-0.25	0.22 Slope hazard
		1.67	1.65	-0.29	0.29 Slope hazard
		1.72	1.70	-0.29	0.31 Slope hazard
14	-7.02	1.30	1.29	-0.16	0.03 Step hazard
		1.37	1.36	-0.17	0.12 Slope hazard
		1.47	1.46	-0.18	0.22 Slope hazard
15	-4.22	1.30	1.30	-0.10	0.02 Step hazard
		1.37	1.37	-0.10	0.12 Slope hazard
		1.47	1.47	-0.11	0.22 Slope hazard
		1.67	1.67	-0.12	0.29 Slope hazard
16	-1.41	1.34	1.34	-0.03	0.09 Slope hazard
		1.37	1.37	-0.03	0.12 Slope hazard
		1.47	1.47	-0.04	0.22 Slope hazard
		1.59	1.58	-0.04	0.28 Slope hazard
17	1.40	1.34	1.34	0.03	0.09 Slope hazard
		1.37	1.37	0.03	0.12 Slope hazard
		1.47	1.47	0.04	0.22 Slope hazard
		1.63	1.63	0.04	0.34 Slope hazard
18	4.21	1.34	1.34	0.10	0.09 Slope hazard
		1.37	1.37	0.10	0.12 Slope hazard
		1.47	1.47	0.11	0.22 Slope hazard
		1.63	1.63	0.12	0.34 Slope hazard
19	7.02	1.20	1.19	0.15	-0.04 Step hazard
		1.34	1.33	0.16	0.09 Slope hazard
		1.37	1.36	0.17	0.12 Slope hazard
		1.47	1.46	0.18	0.22 Slope hazard
		1.59	1.57	0.19	0.28 Slope hazard
		1.63	1.62	0.20	0.34 Slope hazard
20	9.83	1.34	1.32	0.23	0.09 Slope hazard
		1.37	1.35	0.23	0.12 Slope hazard
		1.47	1.45	0.25	0.22 Slope hazard
		1.54	1.51	0.26	0.22 Step hazard
21	12.64	1.42	1.38	0.31	0.11 Step hazard
		1.63	1.59	0.36	0.33 Slope hazard
22	15.45	1.42	1.37	0.38	0.11 Step hazard
		1.63	1.57	0.43	0.33 Slope hazard
23	18.26	1.30	1.24	0.41	0.02 Step hazard
		1.47	1.40	0.46	0.22 Slope hazard
		1.60	1.51	0.50	0.23 Step hazard
24	21.07	N 0	H A Z A R D S	C A T A L O G E D	
25	23.88	N 0	H A Z A R D S	C A T A L O G E D	
26	26.69	N 0	H A Z A R D S	C A T A L O G E D	
27	29.50	N 0	H A Z A R D S	C A T A L O G E D	
28	32.31	N 0	H A Z A R D S	C A T A L O G E D	
29	35.12	N 0	H A Z A R D S	C A T A L O G E D	
30	37.93	N 0	H A Z A R D S	C A T A L O G E D	
31	40.74	N 0	H A Z A R D S	C A T A L O G E D	
32	43.55	N 0	H A Z A R D S	C A T A L O G E D	

7.2.2.5 B=0.90; Slope Threshold=25

7.2.2.5.1	5 Degree Slope	.....	142
7.2.2.5.1	10 Degree Slope	.....	142
7.2.2.5.2	15 Degree Slope	.....	143
7.2.2.5.3	20 Degree Slope	.....	144
7.2.2.5.4	25 Degree Slope	.....	145
7.2.2.5.5	30 Degree Slope	.....	146
7.2.2.5.6	35 Degree Slope	.....	147
7.2.2.5.7	40 Degree Slope	.....	148

Input file: MDL.SLOPE.05.25.90
 File Creation Date : THU, AUG 11 1983 System time 20:27:16

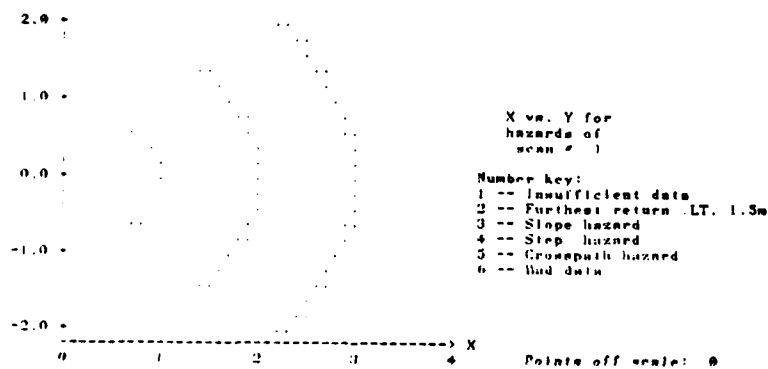
** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT : 0.25
 SLOPE FILTER COEFFICIENT : 0.90
 LEVEL GROUND STEP THRESHOLD : 0.25 METERS
 SLOPE THRESHOLD : 25.00 DEGREES



NO HAZARDS CATALOGED THIS SCAN

Input file: MDL.SLOPE.10.25.90
 File Creation Date : THU, AUG 11 1983 System time 20:27:49

** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT : 0.25
 SLOPE FILTER COEFFICIENT : 0.90
 LEVEL GROUND STEP THRESHOLD : 0.25 METERS
 SLOPE THRESHOLD : 25.00 DEGREES



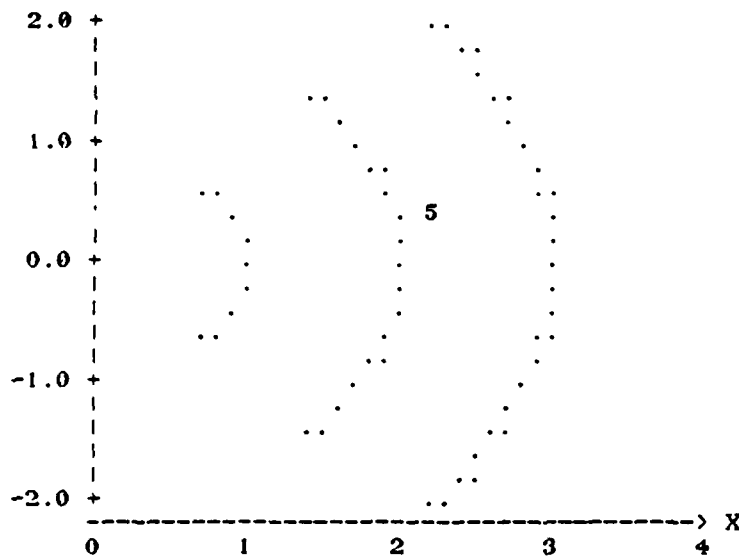
NO HAZARDS CATALOGED THIS SCAN

Input file: MDL.SLOPE.15.25.90

File Creation Date : THU, AUC 11 1983

System time 20:28:17

** MODEL1 PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 25.00 DEGREES



X vs. Y for
hazards of
scan # 1

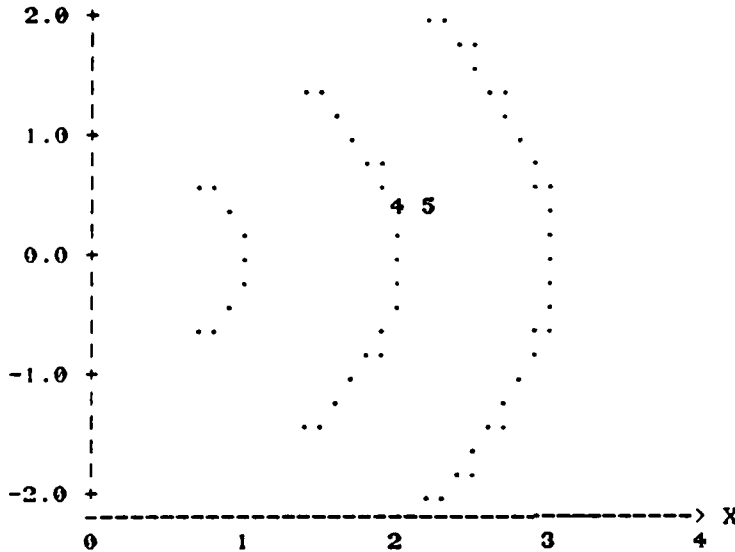
Number key:
 1 -- Insufficient data
 2 -- Furthest return LT. 1.5m
 3 -- Slope hazard
 4 -- Step hazard
 5 -- Crosspath hazard
 6 -- Bad data

Points off scale: 0

AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	HAZARD	S	CATALOGED	
2	-40.74	NO	HAZARD	S	CATALOGED	
3	-37.93	NO	HAZARD	S	CATALOGED	
4	-35.13	NO	HAZARD	S	CATALOGED	
5	-32.31	NO	HAZARD	S	CATALOGED	
6	-29.50	NO	HAZARD	S	CATALOGED	
7	-26.69	NO	HAZARD	S	CATALOGED	
8	-23.88	NO	HAZARD	S	CATALOGED	
9	-21.08	NO	HAZARD	S	CATALOGED	
10	-18.26	NO	HAZARD	S	CATALOGED	
11	-15.45	NO	HAZARD	S	CATALOGED	
12	-12.64	NO	HAZARD	S	CATALOGED	
13	-9.84	NO	HAZARD	S	CATALOGED	
14	-7.02	NO	HAZARD	S	CATALOGED	
15	-4.22	NO	HAZARD	S	CATALOGED	
16	-1.41	NO	HAZARD	S	CATALOGED	
17	1.40	NO	HAZARD	S	CATALOGED	
18	4.21	NO	HAZARD	S	CATALOGED	
19	7.02	NO	HAZARD	S	CATALOGED	
20	9.83	NO	HAZARD	S	CATALOGED	
21	12.64	2.25	2.20	0.49	-0.04	Crosspath hazard
22	15.45	NO	HAZARD	S	CATALOGED	
23	18.26	NO	HAZARD	S	CATALOGED	
24	21.07	NO	HAZARD	S	CATALOGED	
25	23.88	NO	HAZARD	S	CATALOGED	
26	26.69	NO	HAZARD	S	CATALOGED	
27	29.50	NO	HAZARD	S	CATALOGED	
28	32.31	NO	HAZARD	S	CATALOGED	
29	35.12	NO	HAZARD	S	CATALOGED	
30	37.93	NO	HAZARD	S	CATALOGED	
31	40.74	NO	HAZARD	S	CATALOGED	
32	43.55	NO	HAZARD	S	CATALOGED	

Input file: MDL.SLOPE.20.25.90
 File Creation Date : THU, AUG 11 1983 System time 20:28:45

**** MODEL1 PARAMETERS ****
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 25.00 DEGREES



X vs. Y for
 hazards of
 scan # 1

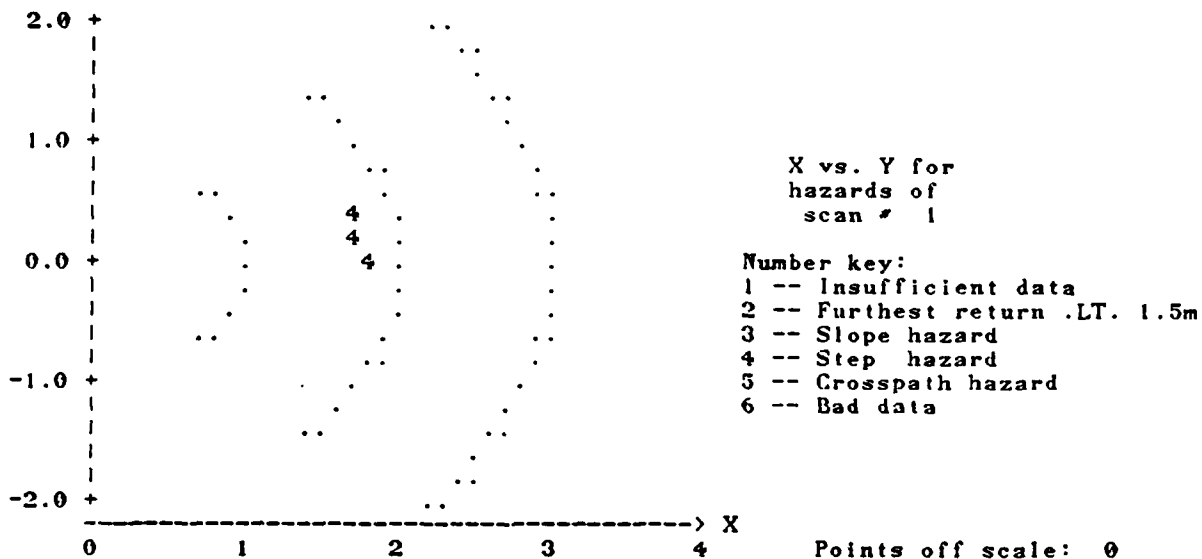
- Number key:
 1 -- Insufficient data
 2 -- Furthest return .LT. 1.5m
 3 -- Slope hazard
 4 -- Step hazard
 5 -- Crosspath hazard
 6 -- Bad data

Points off scale: 0

AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S	C A T A L O G E D		
2	-40.74	NO	H A Z A R D S	C A T A L O G E D		
3	-37.93	NO	H A Z A R D S	C A T A L O G E D		
4	-35.13	NO	H A Z A R D S	C A T A L O G E D		
5	-32.31	NO	H A Z A R D S	C A T A L O G E D		
6	-29.50	NO	H A Z A R D S	C A T A L O G E D		
7	-26.69	NO	H A Z A R D S	C A T A L O G E D		
8	-23.88	NO	H A Z A R D S	C A T A L O G E D		
9	-21.08	NO	H A Z A R D S	C A T A L O G E D		
10	-18.26	NO	H A Z A R D S	C A T A L O G E D		
11	-15.45	NO	H A Z A R D S	C A T A L O G E D		
12	-12.64	NO	H A Z A R D S	C A T A L O G E D		
13	-9.84	NO	H A Z A R D S	C A T A L O G E D		
14	-7.02	NO	H A Z A R D S	C A T A L O G E D		
15	-4.22	NO	H A Z A R D S	C A T A L O G E D		
16	-1.41	NO	H A Z A R D S	C A T A L O G E D		
17	1.40	NO	H A Z A R D S	C A T A L O G E D		
18	4.21	NO	H A Z A R D S	C A T A L O G E D		
19	7.02	NO	H A Z A R D S	C A T A L O G E D		
20	9.83	NO	H A Z A R D S	C A T A L O G E D		
21	12.64	2.04	1.99	0.45	-0.01	Step hazard
		2.25	2.20	0.49	-0.01	Crosspath hazard
22	15.45	NO	H A Z A R D S	C A T A L O G E D		
23	18.26	NO	H A Z A R D S	C A T A L O G E D		
24	21.07	NO	H A Z A R D S	C A T A L O G E D		
25	23.88	NO	H A Z A R D S	C A T A L O G E D		
26	26.69	NO	H A Z A R D S	C A T A L O G E D		
27	29.50	NO	H A Z A R D S	C A T A L O G E D		
28	32.31	NO	H A Z A R D S	C A T A L O G E D		
29	35.12	NO	H A Z A R D S	C A T A L O G E D		
30	37.93	NO	H A Z A R D S	C A T A L O G E D		
31	40.74	NO	H A Z A R D S	C A T A L O G E D		
32	43.55	NO	H A Z A R D S	C A T A L O G E D		

Input file: MDL.SLOPE.25.25.90
 File Creation Date : THU, AUG 11 1983 System time 20:29:06

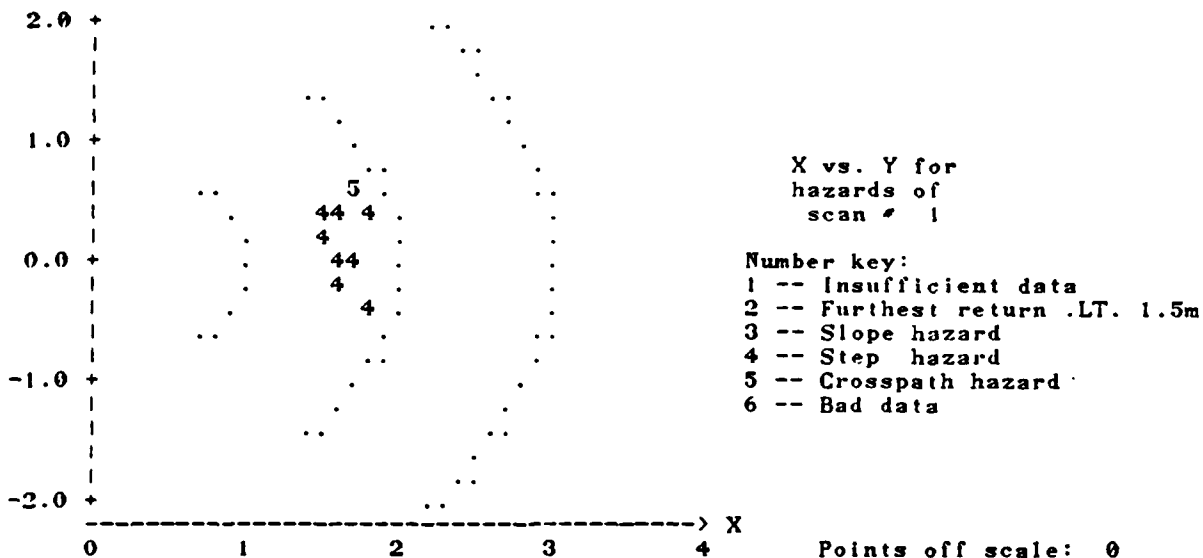
** MODEL1 PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 25.00 DEGREES



AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S	C A T A L O G E D		
2	-40.74	NO	H A Z A R D S	C A T A L O G E D		
3	-37.93	NO	H A Z A R D S	C A T A L O G E D		
4	-35.13	NO	H A Z A R D S	C A T A L O G E D		
5	-32.31	NO	H A Z A R D S	C A T A L O G E D		
6	-29.50	NO	H A Z A R D S	C A T A L O G E D		
7	-26.69	NO	H A Z A R D S	C A T A L O G E D		
8	-23.88	NO	H A Z A R D S	C A T A L O G E D		
9	-21.08	NO	H A Z A R D S	C A T A L O G E D		
10	-18.26	NO	H A Z A R D S	C A T A L O G E D		
11	-15.45	NO	H A Z A R D S	C A T A L O G E D		
12	-12.64	NO	H A Z A R D S	C A T A L O G E D		
13	-9.84	NO	H A Z A R D S	C A T A L O G E D		
14	-7.02	NO	H A Z A R D S	C A T A L O G E D		
15	-4.22	NO	H A Z A R D S	C A T A L O G E D		
16	-1.41	NO	H A Z A R D S	C A T A L O G E D		
17	1.40	1.84	1.84	0.05	0.12	Step hazard
18	4.21	1.72	1.71	0.13	0.00	Step hazard
19	7.02	NO	H A Z A R D S	C A T A L O G E D		
20	9.83	NO	H A Z A R D S	C A T A L O G E D		
21	12.64	NO	H A Z A R D S	C A T A L O G E D		
22	15.45	1.72	1.66	0.46	-0.01	Step hazard
23	18.26	NO	H A Z A R D S	C A T A L O G E D		
24	21.07	NO	H A Z A R D S	C A T A L O G E D		
25	23.88	NO	H A Z A R D S	C A T A L O G E D		
26	26.69	NO	H A Z A R D S	C A T A L O G E D		
27	29.50	NO	H A Z A R D S	C A T A L O G E D		
28	32.31	NO	H A Z A R D S	C A T A L O G E D		
29	35.12	NO	H A Z A R D S	C A T A L O G E D		
30	37.93	NO	H A Z A R D S	C A T A L O G E D		
31	40.74	NO	H A Z A R D S	C A T A L O G E D		
32	43.55	NO	H A Z A R D S	C A T A L O G E D		

Input file: MDL.SLOPE.30.25.90
 File Creation Date : THU, AUG 11 1983 System time 20:31:17

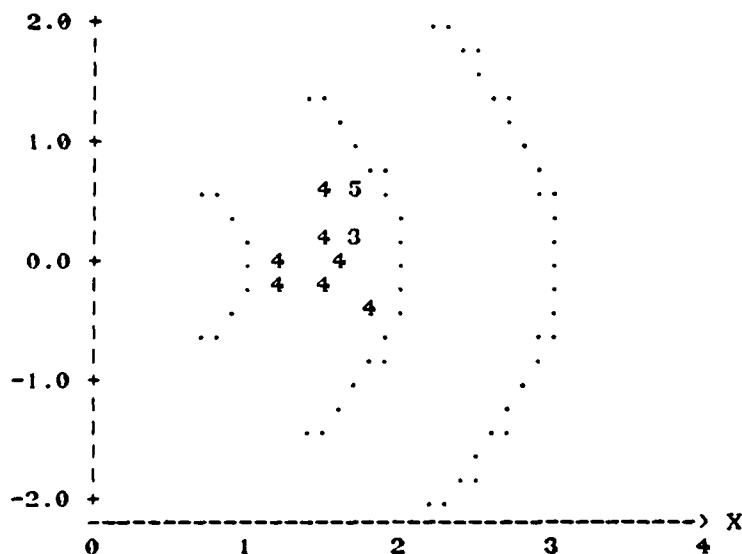
**** MODEL1 PARAMETERS ****
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 25.00 DEGREES



AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	HAZARDS	CATALOGED		
2	-40.74	NO	HAZARDS	CATALOGED		
3	-37.93	NO	HAZARDS	CATALOGED		
4	-35.13	NO	HAZARDS	CATALOGED		
5	-32.31	NO	HAZARDS	CATALOGED		
6	-29.50	NO	HAZARDS	CATALOGED		
7	-26.69	NO	HAZARDS	CATALOGED		
8	-23.88	NO	HAZARDS	CATALOGED		
9	-21.08	NO	HAZARDS	CATALOGED		
10	-18.26	NO	HAZARDS	CATALOGED		
11	-15.45	NO	HAZARDS	CATALOGED		
12	-12.64	NO	HAZARDS	CATALOGED		
13	-9.84	1.84	1.81	-0.31	0.19	Step hazard
14	-7.02	1.61	1.60	-0.20	0.04	Step hazard
15	-4.22	NO	HAZARDS	CATALOGED		
16	-1.41	1.61	1.61	-0.04	0.04	Step hazard
17	1.40	1.55	1.55	0.04	-0.00	Step hazard
		1.73	1.73	0.04	0.18	Step hazard
18	4.21	1.55	1.55	0.11	-0.00	Step hazard
19	7.02	NO	HAZARDS	CATALOGED		
20	9.83	NO	HAZARDS	CATALOGED		
21	12.64	NO	HAZARDS	CATALOGED		
22	15.45	1.61	1.55	0.43	0.04	Step hazard
		1.82	1.76	0.49	0.15	Step hazard
23	18.26	1.55	1.47	0.49	-0.01	Step hazard
		1.75	1.66	0.55	-0.01	Crosspath hazard
24	21.07	NO	HAZARDS	CATALOGED		
25	23.88	NO	HAZARDS	CATALOGED		
26	26.69	NO	HAZARDS	CATALOGED		
27	29.50	NO	HAZARDS	CATALOGED		
28	32.31	NO	HAZARDS	CATALOGED		
29	35.12	NO	HAZARDS	CATALOGED		
30	37.93	NO	HAZARDS	CATALOGED		
31	40.74	NO	HAZARDS	CATALOGED		
32	43.55	NO	HAZARDS	CATALOGED		

Input file: MDL.SLOPE.35.25.90
 File Creation Date : THU, AUG 11 1983 System time 20:31:44

**** MODEL1 PARAMETERS ****
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 25.00 DEGREES



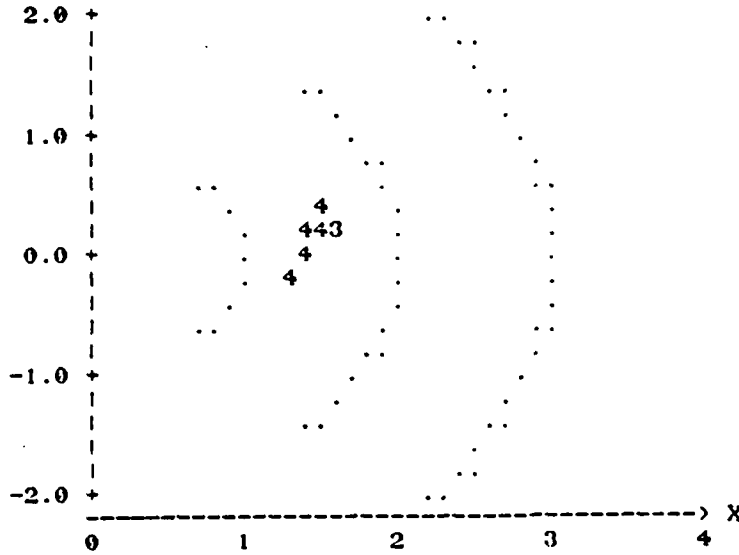
X vs. Y for
 hazards of
 scan # 1

Number key:
 1 -- Insufficient data
 2 -- Furthest return .LT. 1.5m
 3 -- Slope hazard
 4 -- Step hazard
 5 -- Crosspath hazard
 6 -- Bad data

Points off scale: 0

AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S		C A T A L O G E D	
2	-40.74	NO	H A Z A R D S		C A T A L O G E D	
3	-37.93	NO	H A Z A R D S		C A T A L O G E D	
4	-35.13	NO	H A Z A R D S		C A T A L O G E D	
5	-32.31	NO	H A Z A R D S		C A T A L O G E D	
6	-29.50	NO	H A Z A R D S		C A T A L O G E D	
7	-26.69	NO	H A Z A R D S		C A T A L O G E D	
8	-23.88	NO	H A Z A R D S		C A T A L O G E D	
9	-21.08	NO	H A Z A R D S		C A T A L O G E D	
10	-18.26	NO	H A Z A R D S		C A T A L O G E D	
11	-15.45	NO	H A Z A R D S		C A T A L O G E D	
12	-12.64	NO	H A Z A R D S		C A T A L O G E D	
13	-9.84	1.23	1.21	-0.21	-0.11	Step hazard
		1.51	1.49	-0.26	0.07	Step hazard
		1.82	1.79	-0.31	0.27	Step hazard
14	-7.02	NO	H A Z A R D S		C A T A L O G E D	
15	-4.22	1.51	1.51	-0.11	0.04	Step hazard
16	-1.41	1.23	1.23	-0.03	-0.10	Step hazard
17	1.40	1.63	1.62	0.04	0.23	Step hazard
18	4.21	1.72	1.72	0.13	0.30	Slope hazard
19	7.02	1.51	1.50	0.19	0.06	Step hazard
20	9.83	NO	H A Z A R D S		C A T A L O G E D	
21	12.64	NO	H A Z A R D S		C A T A L O G E D	
22	15.45	NO	H A Z A R D S		C A T A L O G E D	
23	18.26	1.61	1.53	0.50	0.07	Step hazard
		1.75	1.66	0.55	0.07	Crosspath hazard
24	21.07	NO	H A Z A R D S		C A T A L O G E D	
25	23.88	NO	H A Z A R D S		C A T A L O G E D	
26	26.69	NO	H A Z A R D S		C A T A L O G E D	
27	29.50	NO	H A Z A R D S		C A T A L O G E D	
28	32.31	NO	H A Z A R D S		C A T A L O G E D	
29	35.12	NO	H A Z A R D S		C A T A L O G E D	
30	37.93	NO	H A Z A R D S		C A T A L O G E D	
31	40.74	NO	H A Z A R D S		C A T A L O G E D	
32	43.55	NO	H A Z A R D S		C A T A L O G E D	

** MODEL1 PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 25.00 DEGREES



X vs. Y for hazards of scan # 1

- Number key:
 1 -- Insufficient data
 2 -- Furthest return .LT. 1.5m
 3 -- Slope hazard
 4 -- Step hazard
 5 -- Crosspath hazard
 6 -- Bad data

Points off scale: 0

AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	HAZARDS	CATALOGED	
2	-40.74	NO	HAZARDS	CATALOGED	
3	-37.93	NO	HAZARDS	CATALOGED	
4	-35.13	NO	HAZARDS	CATALOGED	
5	-32.31	NO	HAZARDS	CATALOGED	
6	-29.50	NO	HAZARDS	CATALOGED	
7	-26.69	NO	HAZARDS	CATALOGED	
8	-23.88	NO	HAZARDS	CATALOGED	
9	-21.08	NO	HAZARDS	CATALOGED	
10	-18.26	NO	HAZARDS	CATALOGED	
11	-15.45	NO	HAZARDS	CATALOGED	
12	-12.64	1.34	1.31	-0.29	0.07 Step hazard
13	-9.84	NO	HAZARDS	CATALOGED	
14	-7.02	NO	HAZARDS	CATALOGED	
15	-4.22	NO	HAZARDS	CATALOGED	
16	-1.41	1.42	1.42	-0.03	0.13 Step hazard
17	1.40	1.42	1.42	0.03	0.13 Step hazard
18	4.21	1.42	1.42	0.10	0.13 Step hazard
19	7.02	1.42	1.41	0.17	0.13 Step hazard
		1.63	1.62	0.20	0.34 Slope hazard
20	9.83	1.42	1.40	0.24	0.13 Step hazard
		1.54	1.51	0.26	0.22 Step hazard
21	12.64	NO	HAZARDS	CATALOGED	
22	15.45	NO	HAZARDS	CATALOGED	
23	18.26	1.60	1.51	0.50	0.23 Step hazard
24	21.07	NO	HAZARDS	CATALOGED	
25	23.88	NO	HAZARDS	CATALOGED	
26	26.69	NO	HAZARDS	CATALOGED	
27	29.50	NO	HAZARDS	CATALOGED	
28	32.31	NO	HAZARDS	CATALOGED	
29	35.12	NO	HAZARDS	CATALOGED	
30	37.93	NO	HAZARDS	CATALOGED	
31	40.74	NO	HAZARDS	CATALOGED	
32	43.55	NO	HAZARDS	CATALOGED	

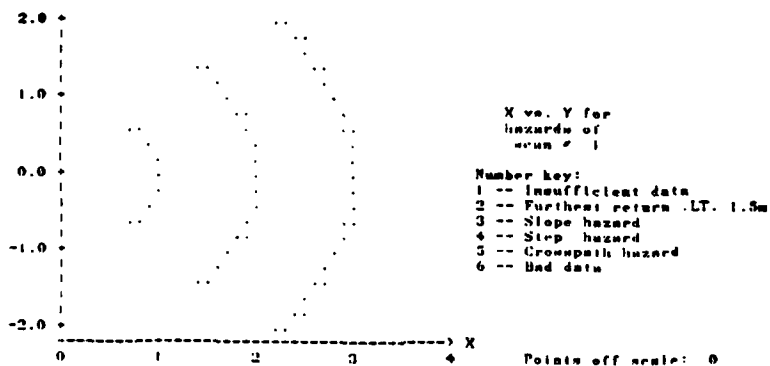
7.2.2.6 B=0.85; Slope Threshold=25

7.2.2.6.1	5 Degree Slope	.....	150
7.2.2.6.1	10 Degree Slope	.....	150
7.2.2.6.2	15 Degree Slope	.....	151
7.2.2.6.3	20 Degree Slope	.....	152
7.2.2.6.4	25 Degree Slope	.....	153
7.2.2.6.5	30 Degree Slope	.....	154
7.2.2.6.6	35 Degree Slope	.....	155
7.2.2.6.7	40 Degree Slope	.....	156

Input file: MDL.SLOPE.05.25.85
 File Creation Date : THU, AUG 11 1983 System time 20:39:13

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** MODEL1 PARAMETERS **
HEIGHT FILTER COEFFICIENT * 0.25
SLOPE FILTER COEFFICIENT * 0.85
LEVEL GROUND STEP THRESHOLD * 0.25 METERS
SLOPE THRESHOLD * 25.00 DEGREES
  
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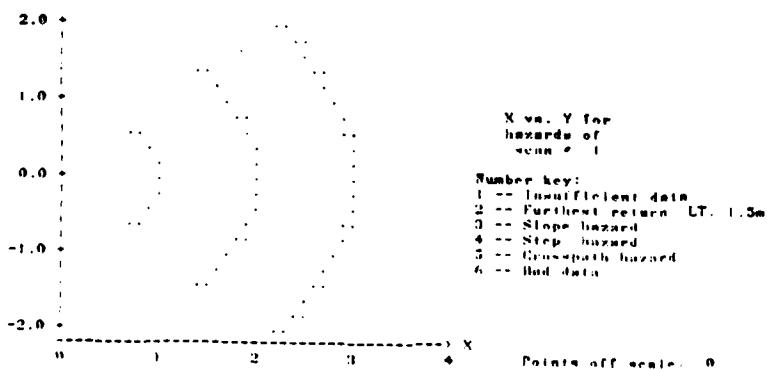


NO HAZARDS CATALOGED THIS SCAN

Input file: MDL.SLOPE.10.25.85
 File Creation Date : THU, AUG 11 1983 System time 20:39:33

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** MODEL1 PARAMETERS **
HEIGHT FILTER COEFFICIENT * 0.25
SLOPE FILTER COEFFICIENT * 0.85
LEVEL GROUND STEP THRESHOLD * 0.25 METERS
SLOPE THRESHOLD * 25.00 DEGREES
  
```

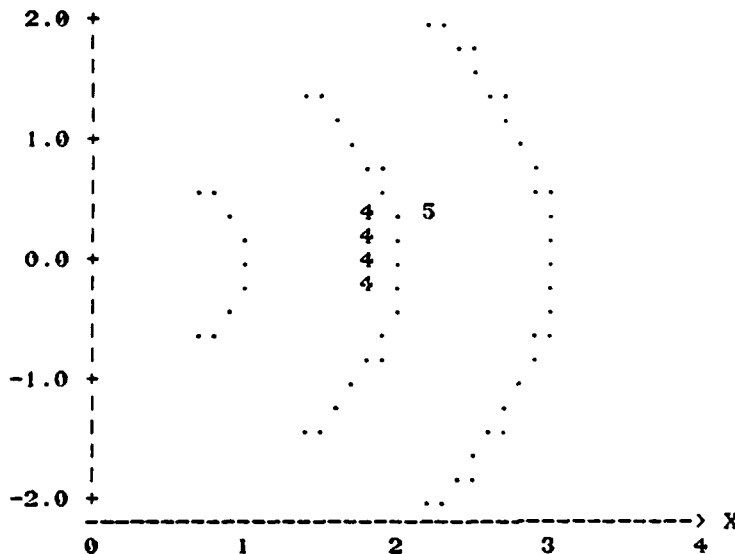


NO HAZARDS CATALOGED THIS SCAN

Input file: MDL.SLOPE.15.25.85
 File Creation Date : THU, AUG 11 1983

System time 20:40:29

** MODEL1 PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.85
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 25.00 DEGREES



X vs. Y for
 hazards of
 scan # 1

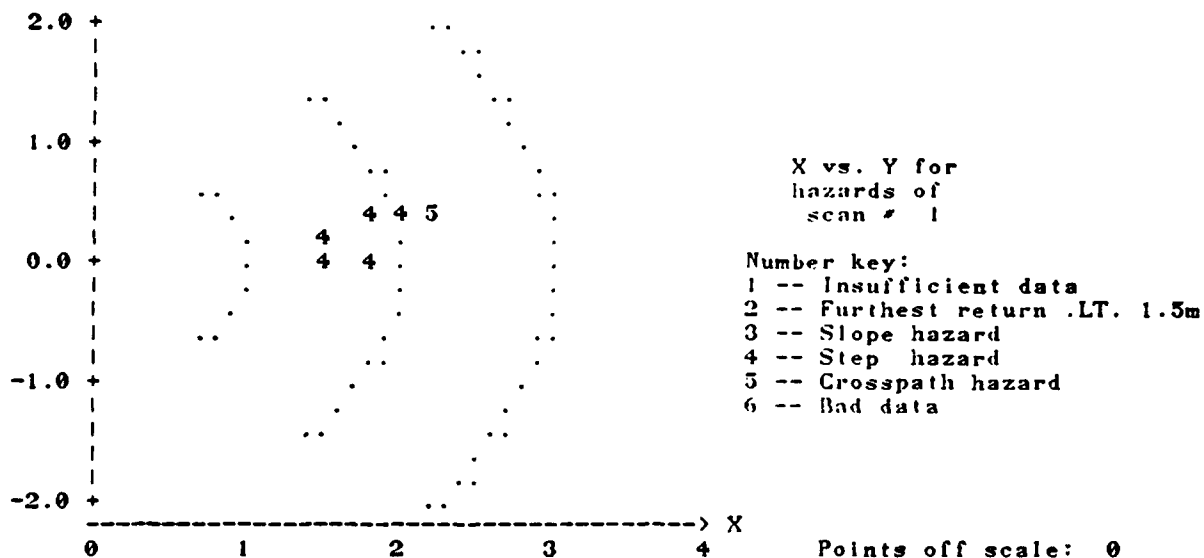
- Number key:
 1 -- Insufficient data
 2 -- Furthest return .LT. 1.5m
 3 -- Slope hazard
 4 -- Step hazard
 5 -- Crosspath hazard
 6 -- Bad data

Points off scale: 0

AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	HAZARDS		CATALOGED	
2	-40.74	NO	HAZARDS		CATALOGED	
3	-37.93	NO	HAZARDS		CATALOGED	
4	-35.13	NO	HAZARDS		CATALOGED	
5	-32.31	NO	HAZARDS		CATALOGED	
6	-29.50	NO	HAZARDS		CATALOGED	
7	-26.69	NO	HAZARDS		CATALOGED	
8	-23.88	NO	HAZARDS		CATALOGED	
9	-21.08	NO	HAZARDS		CATALOGED	
10	-18.26	NO	HAZARDS		CATALOGED	
11	-15.45	NO	HAZARDS		CATALOGED	
12	-12.64	NO	HAZARDS		CATALOGED	
13	-9.84	NO	HAZARDS		CATALOGED	
14	-7.02	NO	HAZARDS		CATALOGED	
15	-4.22	1.84	1.83	-0.13	-0.08	Step hazard
16	-1.41	1.84	1.84	-0.05	-0.08	Step hazard
17	1.40	1.84	1.84	0.05	-0.08	Step hazard
18	4.21	NO	HAZARDS		CATALOGED	
19	7.02	1.84	1.82	0.22	-0.08	Step hazard
20	9.83	1.84	1.81	0.31	-0.08	Step hazard
21	12.64	2.25	2.20	0.49	-0.04	Crosspath hazard
22	15.45	NO	HAZARDS		CATALOGED	
23	18.26	NO	HAZARDS		CATALOGED	
24	21.07	NO	HAZARDS		CATALOGED	
25	23.88	NO	HAZARDS		CATALOGED	
26	26.69	NO	HAZARDS		CATALOGED	
27	29.50	NO	HAZARDS		CATALOGED	
28	32.31	NO	HAZARDS		CATALOGED	
29	35.12	NO	HAZARDS		CATALOGED	
30	37.93	NO	HAZARDS		CATALOGED	
31	40.74	NO	HAZARDS		CATALOGED	
32	43.55	NO	HAZARDS		CATALOGED	

Input file: MDL.SLOPE.20.25.85
 File Creation Date : THU, AUG 11 1983 System time 20:41:19

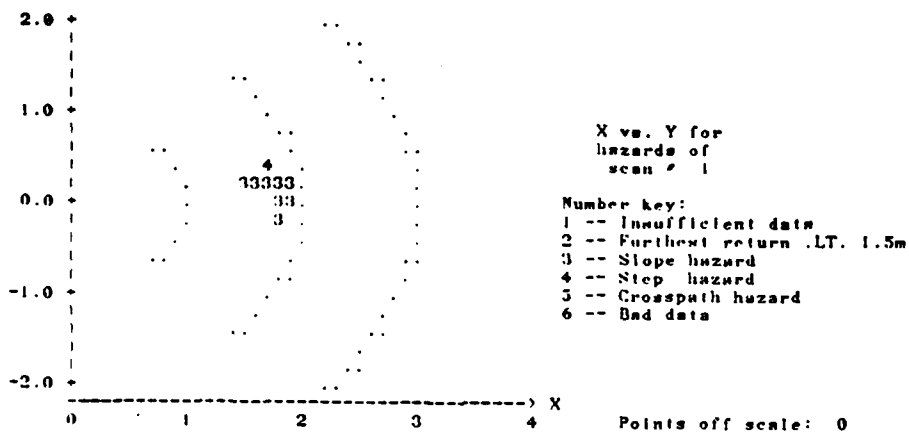
**** MODEL1 PARAMETERS ****
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.85
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 25.00 DEGREES



AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S	S	C A T A L O C E D	
2	-40.74	NO	H A Z A R D S	S	C A T A L O C E D	
3	-37.93	NO	H A Z A R D S	S	C A T A L O C E D	
4	-35.13	NO	H A Z A R D S	S	C A T A L O C E D	
5	-32.31	NO	H A Z A R D S	S	C A T A L O C E D	
6	-29.50	NO	H A Z A R D S	S	C A T A L O C E D	
7	-26.69	NO	H A Z A R D S	S	C A T A L O C E D	
8	-23.88	NO	H A Z A R D S	S	C A T A L O C E D	
9	-21.08	NO	H A Z A R D S	S	C A T A L O C E D	
10	-18.26	NO	H A Z A R D S	S	C A T A L O C E D	
11	-15.45	NO	H A Z A R D S	S	C A T A L O C E D	
12	-12.64	NO	H A Z A R D S	S	C A T A L O C E D	
13	-9.84	NO	H A Z A R D S	S	C A T A L O C E D	
14	-7.02	NO	H A Z A R D S	S	C A T A L O C E D	
15	-4.22	NO	H A Z A R D S	S	C A T A L O C E D	
16	-1.41	1.51	1.51	-0.04	-0.15	Step hazard
		1.84	1.84	-0.05	-0.07	Step hazard
17	1.40	1.51	1.51	0.04	-0.14	Step hazard
18	4.21	1.53	1.53	0.11	-0.05	Slope hazard
19	7.02	1.51	1.50	0.18	-0.14	Step hazard
20	9.83	1.51	1.48	0.26	-0.15	Step hazard
		1.84	1.81	0.31	-0.07	Step hazard
21	12.64	1.84	1.79	0.40	-0.07	Step hazard
		2.04	1.99	0.45	-0.01	Step hazard
		2.25	2.20	0.49	-0.01	Crosspath hazard
22	15.45	NO	H A Z A R D S	S	C A T A L O C E D	
23	18.26	NO	H A Z A R D S	S	C A T A L O C E D	
24	21.07	NO	H A Z A R D S	S	C A T A L O C E D	
25	23.88	NO	H A Z A R D S	S	C A T A L O C E D	
26	26.69	NO	H A Z A R D S	S	C A T A L O C E D	
27	29.50	NO	H A Z A R D S	S	C A T A L O C E D	
28	32.31	NO	H A Z A R D S	S	C A T A L O C E D	
29	35.12	NO	H A Z A R D S	S	C A T A L O C E D	
30	37.93	NO	H A Z A R D S	S	C A T A L O C E D	
31	40.74	NO	H A Z A R D S	S	C A T A L O C E D	
32	43.55	NO	H A Z A R D S	S	C A T A L O C E D	

Input file: MDL.SLOPE.25.25.85
 File Creation Date : THU, AUG 11 1983 System time 20:41:44

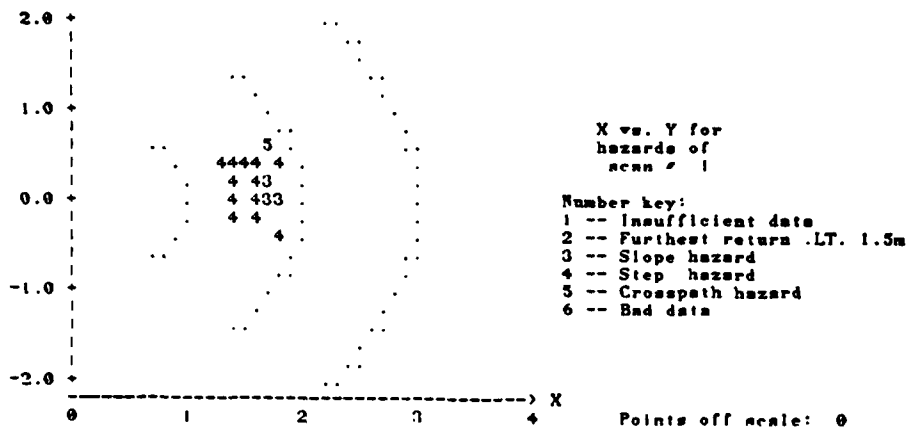
** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT * 0.25
 SLOPE FILTER COEFFICIENT * 0.85
 LEVEL GROUND STEP THRESHOLD * 0.25 METERS
 SLOPE THRESHOLD * 25.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE	
1	-43.56	NO	HAZARDS	CATALOGED		
2	-40.74	NO	HAZARDS	CATALOGED		
3	-37.93	NO	HAZARDS	CATALOGED		
4	-35.13	NO	HAZARDS	CATALOGED		
5	-32.31	NO	HAZARDS	CATALOGED		
6	-29.50	NO	HAZARDS	CATALOGED		
7	-26.69	NO	HAZARDS	CATALOGED		
8	-23.88	NO	HAZARDS	CATALOGED		
10	-18.26	NO	HAZARDS	CATALOGED		
11	-15.43	NO	HAZARDS	CATALOGED		
12	-12.64	NO	HAZARDS	CATALOGED		
13	-9.84	NO	HAZARDS	CATALOGED		
14	-7.02	NO	HAZARDS	CATALOGED		
15	-4.22	1.76	1.76	-0.13	0.07	Slope hazard
		1.84	1.83	-0.14	0.11	Slope hazard
16	-1.41	1.84	1.84	-0.05	0.12	Slope hazard
17	1.40	1.93	1.93	0.05	0.19	Slope hazard
18	4.21	1.53	1.53	0.11	-0.05	Slope hazard
		1.76	1.76	0.13	0.07	Slope hazard
		1.84	1.83	0.14	0.11	Slope hazard
		1.93	1.94	0.14	0.14	Slope hazard
19	7.02	1.53	1.52	0.19	-0.05	Slope hazard
		1.58	1.57	0.19	-0.15	Step hazard
		1.65	1.64	0.20	0.00	Slope hazard
		1.76	1.73	0.22	0.07	Slope hazard
		1.84	1.82	0.22	0.11	Slope hazard
		1.93	1.93	0.24	0.14	Slope hazard
20	9.83	NO	HAZARDS	CATALOGED		
21	12.64	NO	HAZARDS	CATALOGED		
22	15.43	1.72	1.66	0.46	-0.01	Step hazard
23	18.26	NO	HAZARDS	CATALOGED		
24	21.07	NO	HAZARDS	CATALOGED		
25	23.88	NO	HAZARDS	CATALOGED		
26	26.69	NO	HAZARDS	CATALOGED		
27	29.50	NO	HAZARDS	CATALOGED		
28	32.31	NO	HAZARDS	CATALOGED		
29	35.12	NO	HAZARDS	CATALOGED		
30	37.93	NO	HAZARDS	CATALOGED		
31	40.74	NO	HAZARDS	CATALOGED		
32	43.55	NO	HAZARDS	CATALOGED		

Input file: MDL.SLOPE.30.25.85
 File Creation Date : THU. AUG 11 1983 System time 20:42:12

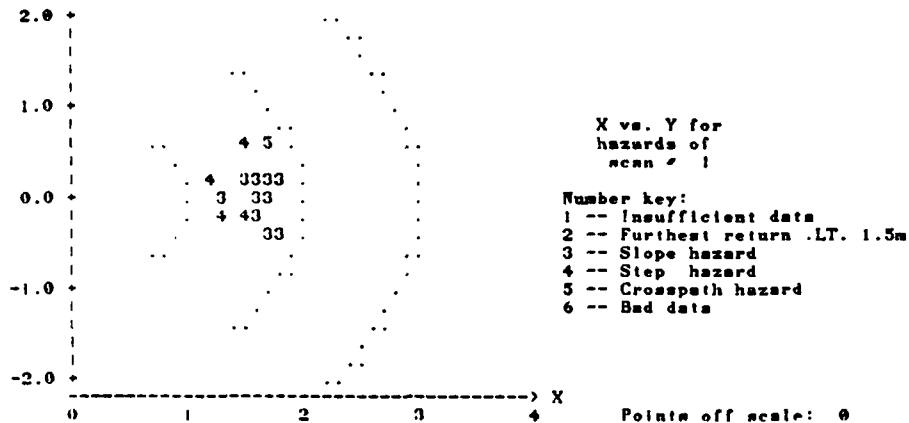
** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT * 0.25
 SLOPE FILTER COEFFICIENT * 0.85
 LEVEL GROUND STEP THRESHOLD * 0.25 METERS
 SLOPE THRESHOLD * 25.00 DEGREES



AZINUTH (deg)	RANCE	X	Y	Z	HAZARD TYPE
1	-43.36	N O	H A Z A R D S	C A T A L O G E D	
2	-40.74	N O	H A Z A R D S	C A T A L O G E D	
3	-37.93	N O	H A Z A R D S	C A T A L O G E D	
4	-35.13	N O	H A Z A R D S	C A T A L O G E D	
5	-32.31	N O	H A Z A R D S	C A T A L O G E D	
6	-29.30	N O	H A Z A R D S	C A T A L O G E D	
7	-26.69	N O	H A Z A R D S	C A T A L O G E D	
8	-23.88	N O	H A Z A R D S	C A T A L O G E D	
9	-21.09	N O	H A Z A R D S	C A T A L O G E D	
10	-18.26	N O	H A Z A R D S	C A T A L O G E D	
11	-15.43	N O	H A Z A R D S	C A T A L O G E D	
12	-12.64	N O	H A Z A R D S	C A T A L O G E D	
13	-9.84	1.40	1.38 -0.24	-0.06	Step hazard
		1.84	1.81 -0.31	0.19	Step hazard
14	-7.02	1.40	1.39 -0.17	-0.06	Step hazard
		1.61	1.60 -0.20	0.04	Step hazard
15	-4.22	1.40	1.40 -0.10	-0.06	Step hazard
		1.60	1.59 -0.12	0.00	Step hazard
16	-1.41	1.40	1.40 -0.03	-0.06	Step hazard
		1.61	1.61 -0.04	0.04	Step hazard
17	1.40	1.40	1.40 0.03	-0.06	Step hazard
		1.66	1.66 0.04	0.13	Slope hazard
		1.73	1.73 0.04	0.18	Slope hazard
		1.82	1.82 0.04	0.25	Slope hazard
18	4.21	1.40	1.40 0.10	-0.06	Step hazard
		1.66	1.63 0.12	0.13	Slope hazard
		1.73	1.72 0.13	0.18	Slope hazard
19	7.02	1.40	1.39 0.17	-0.06	Step hazard
		1.60	1.59 0.20	0.00	Step hazard
20	9.83	1.40	1.38 0.24	-0.06	Step hazard
		1.60	1.57 0.27	0.00	Step hazard
21	12.64	1.40	1.37 0.31	-0.06	Step hazard
		1.50	1.56 0.35	0.00	Step hazard
22	15.45	1.40	1.35 0.37	-0.06	Step hazard
		1.82	1.76 0.49	0.13	Step hazard
23	18.26	1.55	1.47 0.49	-0.01	Step hazard
		1.75	1.66 0.55	-0.01	Crosspath hazard
24	21.07	N O	H A Z A R D S	C A T A L O G E D	
25	23.88	N O	H A Z A R D S	C A T A L O G E D	
26	26.69	N O	H A Z A R D S	C A T A L O G E D	
27	29.30	N O	H A Z A R D S	C A T A L O G E D	
28	32.31	N O	H A Z A R D S	C A T A L O G E D	
29	35.12	N O	H A Z A R D S	C A T A L O G E D	
30	37.93	N O	H A Z A R D S	C A T A L O G E D	
31	40.74	N O	H A Z A R D S	C A T A L O G E D	
32	43.53	N O	H A Z A R D S	C A T A L O G E D	

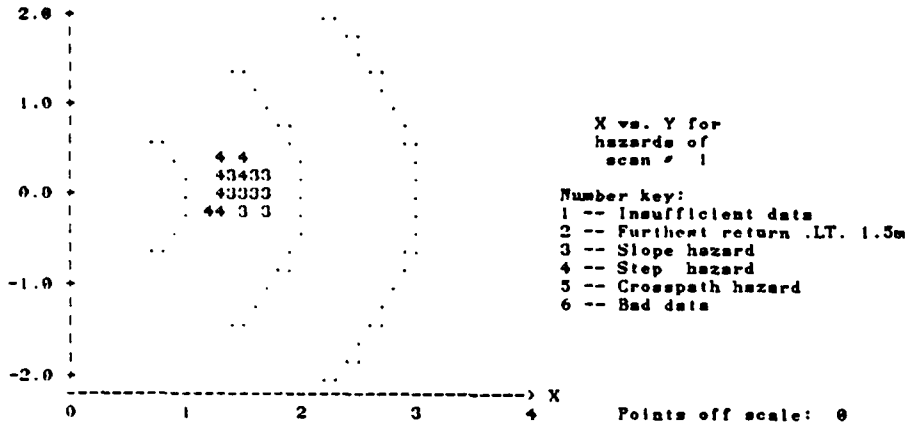
Input file: MDL.SLOPE.35.25.85
 File Creation Date : THU, AUG 11 1983 System time 20:42:48

**** MODEL1 PARAMETERS ****
 HEIGHT FILTER COEFFICIENT * 0.25
 SLOPE FILTER COEFFICIENT * 0.85
 LEVEL GROUND STEP THRESHOLD * 0.25 METERS
 SLOPE THRESHOLD * 25.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE	
1	-43.56	N 0	H A Z A R D S	C A T A L O G E D		
2	-40.74	N 0	H A Z A R D S	C A T A L O G E D		
3	-37.93	N 0	H A Z A R D S	C A T A L O G E D		
4	-35.13	N 0	H A Z A R D S	C A T A L O G E D		
5	-32.31	N 0	H A Z A R D S	C A T A L O G E D		
6	-29.50	N 0	H A Z A R D S	C A T A L O G E D		
7	-26.69	N 0	H A Z A R D S	C A T A L O G E D		
8	-23.88	N 0	H A Z A R D S	C A T A L O G E D		
9	-21.08	N 0	H A Z A R D S	C A T A L O G E D		
10	-18.26	N 0	H A Z A R D S	C A T A L O G E D		
11	-15.45	N 0	H A Z A R D S	C A T A L O G E D		
12	-12.64	N 0	H A Z A R D S	C A T A L O G E D		
13	-9.84	1.34	1.32	-0.23	0.07	Slope hazard
		1.56	1.54	-0.27	0.17	Slope hazard
		1.63	1.60	-0.28	0.18	Slope hazard
		1.77	1.75	-0.30	0.23	Slope hazard
		1.82	1.79	-0.31	0.27	Step hazard
		1.82	1.79	-0.31	0.27	Slope hazard
14	-7.02	1.30	1.29	-0.16	-0.06	Step hazard
		1.56	1.53	-0.19	0.17	Slope hazard
		1.63	1.61	-0.20	0.23	Slope hazard
15	-4.22	1.51	1.51	-0.11	0.04	Step hazard
16	-1.41	1.34	1.34	-0.03	0.07	Slope hazard
		1.56	1.56	-0.04	0.17	Slope hazard
		1.63	1.62	-0.04	0.23	Slope hazard
17	1.40	1.56	1.56	0.04	0.17	Slope hazard
		1.63	1.62	0.04	0.23	Slope hazard
		1.72	1.72	0.04	0.30	Slope hazard
18	4.21	1.51	1.51	0.11	0.12	Slope hazard
		1.56	1.56	0.11	0.18	Slope hazard
		1.63	1.62	0.12	0.23	Slope hazard
		1.72	1.72	0.13	0.30	Slope hazard
		1.82	1.82	0.13	0.28	Slope hazard
19	7.02	N 0	H A Z A R D S	C A T A L O G E D		
20	9.83	1.17	1.16	0.20	-0.16	Step hazard
		1.26	1.24	0.21	0.01	Step hazard
		1.56	1.54	0.27	0.17	Slope hazard
		1.63	1.60	0.28	0.23	Slope hazard
21	12.64	N 0	H A Z A R D S	C A T A L O G E D		
22	15.45	N 0	H A Z A R D S	C A T A L O G E D		
23	18.26	1.61	1.53	0.50	0.07	Step hazard
		1.75	1.66	0.55	0.07	Crosspath hazard
24	21.07	N 0	H A Z A R D S	C A T A L O G E D		
25	23.88	N 0	H A Z A R D S	C A T A L O G E D		
26	26.69	N 0	H A Z A R D S	C A T A L O G E D		
27	29.50	N 0	H A Z A R D S	C A T A L O G E D		
28	32.31	N 0	H A Z A R D S	C A T A L O G E D		
29	35.12	N 0	H A Z A R D S	C A T A L O G E D		
30	37.93	N 0	H A Z A R D S	C A T A L O G E D		
31	40.74	N 0	H A Z A R D S	C A T A L O G E D		
32	43.55	N 0	H A Z A R D S	C A T A L O G E D		

** MODEL1 PARAMETERS **
 HEIGHT FILTER COEFFICIENT * 0.25
 SLOPE FILTER COEFFICIENT * 0.85
 LEVEL GROUND STEP THRESHOLD * 0.25 METERS
 SLOPE THRESHOLD 23.00 DEGREES



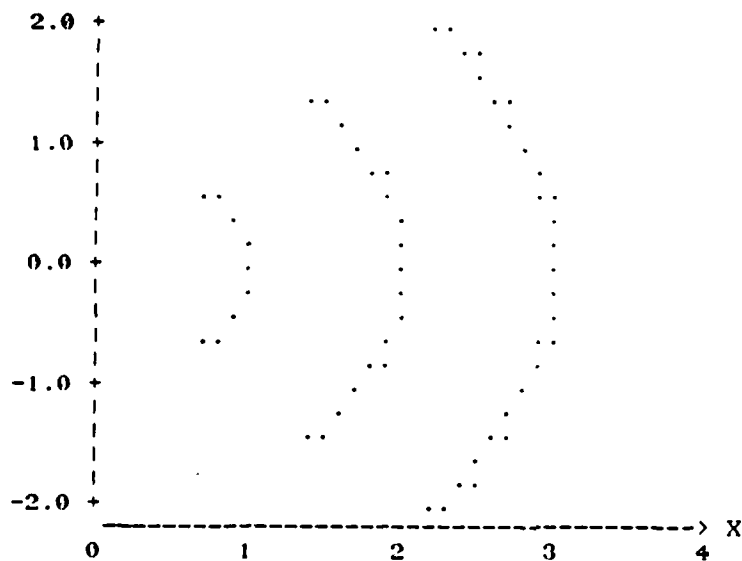
AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1 -43.56	NO	H A Z A R D S	C A T A L O G E D		
2 -40.74	NO	H A Z A R D S	C A T A L O G E D		
3 -37.93	NO	H A Z A R D S	C A T A L O G E D		
4 -35.13	NO	H A Z A R D S	C A T A L O G E D		
5 -32.31	NO	H A Z A R D S	C A T A L O G E D		
6 -29.50	NO	H A Z A R D S	C A T A L O G E D		
7 -26.69	NO	H A Z A R D S	C A T A L O G E D		
8 -23.88	NO	H A Z A R D S	C A T A L O G E D		
9 -21.08	NO	H A Z A R D S	C A T A L O G E D		
10 -18.26	NO	H A Z A R D S	C A T A L O G E D		
11 -15.45	NO	H A Z A R D S	C A T A L O G E D		
12 -12.64	1.26	1.23	-0.28	-0.07	Step hazard
	1.34	1.31	-0.29	0.07	Step hazard
13 -9.84	1.47	1.43	-0.23	0.22	Slope hazard
	1.67	1.63	-0.29	0.29	Slope hazard
	1.72	1.70	-0.29	0.31	Slope hazard
14 -7.02	1.47	1.46	-0.18	0.22	Slope hazard
15 -4.22	1.47	1.47	-0.11	0.22	Slope hazard
	1.67	1.67	-0.12	0.29	Slope hazard
	1.72	1.72	-0.13	0.31	Slope hazard
16 -1.41	1.30	1.30	-0.03	0.03	Step hazard
	1.37	1.37	-0.03	0.12	Slope hazard
	1.47	1.47	-0.04	0.22	Slope hazard
	1.54	1.53	-0.04	0.23	Slope hazard
	1.59	1.58	-0.04	0.28	Slope hazard
	1.67	1.67	-0.04	0.30	Slope hazard
17 1.40	1.30	1.30	0.03	0.03	Step hazard
	1.37	1.37	0.03	0.12	Slope hazard
	1.47	1.47	0.04	0.22	Slope hazard
	1.53	1.53	0.04	0.26	Slope hazard
	1.59	1.58	0.04	0.29	Slope hazard
	1.63	1.63	0.04	0.34	Slope hazard
18 4.21	1.30	1.30	0.10	0.03	Step hazard
	1.37	1.37	0.10	0.12	Slope hazard
	1.47	1.47	0.11	0.22	Slope hazard
	1.53	1.53	0.11	0.26	Slope hazard
	1.59	1.58	0.12	0.29	Slope hazard
	1.63	1.63	0.12	0.34	Slope hazard
19 7.02	1.30	1.29	0.16	0.03	Step hazard
	1.37	1.36	0.17	0.12	Slope hazard
	1.47	1.46	0.18	0.22	Slope hazard
	1.59	1.57	0.19	0.28	Slope hazard
	1.63	1.62	0.20	0.34	Slope hazard
	1.72	1.71	0.21	0.32	Slope hazard
20 9.83	1.30	1.28	0.22	0.03	Step hazard
	1.37	1.35	0.23	0.12	Slope hazard
	1.47	1.45	0.23	0.22	Slope hazard
	1.54	1.51	0.26	0.22	Step hazard
21 12.64	1.54	1.50	0.34	0.23	Step hazard
22 15.45	1.54	1.48	0.41	0.23	Step hazard
23 18.26	1.37	1.31	0.43	0.11	Step hazard
	1.60	1.51	0.50	0.23	Step hazard
24 21.07	NO	H A Z A R D S	C A T A L O G E D		
25 23.88	NO	H A Z A R D S	C A T A L O G E D		
26 26.69	NO	H A Z A R D S	C A T A L O G E D		
27 29.50	NO	H A Z A R D S	C A T A L O G E D		
28 32.31	NO	H A Z A R D S	C A T A L O G E D		
29 35.12	NO	H A Z A R D S	C A T A L O G E D		
30 37.93	NO	H A Z A R D S	C A T A L O G E D		
31 40.74	NO	H A Z A R D S	C A T A L O G E D		
32 43.55	NO	H A Z A R D S	C A T A L O G E D		

7.2.2.7 B=0.80; Slope Threshold=25

7.2.2.7.1	5 Degree Slope	158
7.2.2.7.2	10 Degree Slope	159
7.2.2.7.3	15 Degree Slope	160
7.2.2.7.4	20 Degree Slope	161
7.2.2.7.5	25 Degree Slope	162
7.2.2.7.6	30 Degree Slope	163
7.2.2.7.7	35 Degree Slope	164
7.2.2.7.8	40 Degree Slope	165

Input file: MDL.SLOPE.05.25.80
 File Creation Date : TIRU, AUG 11 1983 System time 20:47:27

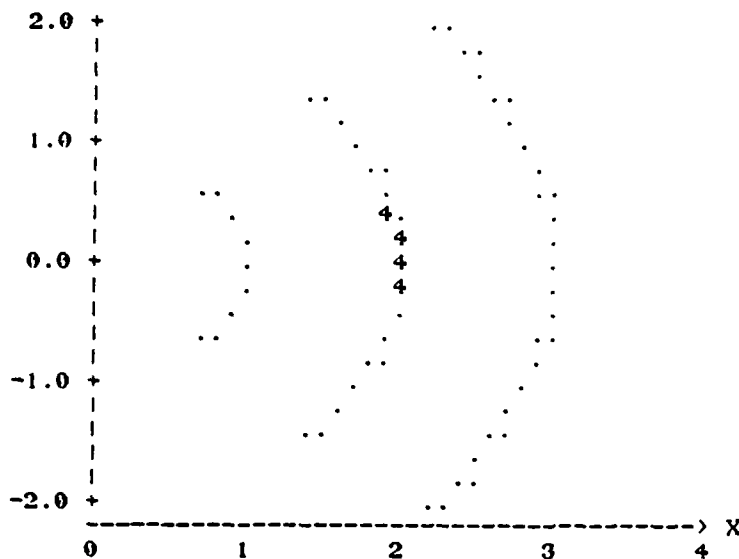
** MODEL1 PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.80
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 25.00 DEGREES



NO HAZARDS CATALOGED THIS SCAN

Input file: MDL.SLOPE.10.25.80
 File Creation Date : THU, AUG 11 1988 System time 20:48:06

** MODEL1 PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.80
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 25.00 DEGREES



X vs. Y for
 hazards of
 scan # 1

Number key:
 1 -- Insufficient data.
 2 -- Furthest return .LT. 1.5m
 3 -- Slope hazard
 4 -- Step hazard
 5 -- Crosspath hazard
 6 -- Bad data

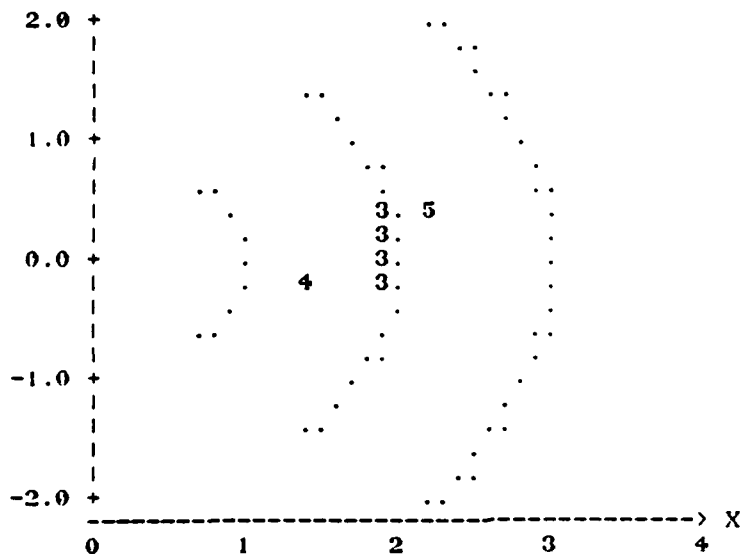
Points off scale: 0

AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	HAZARDS	SS	CATALOGED	D
2	-40.74	NO	HAZARDS	SS	CATALOGED	D
3	-37.93	NO	HAZARDS	SS	CATALOGED	D
4	-35.13	NO	HAZARDS	SS	CATALOGED	D
5	-32.31	NO	HAZARDS	SS	CATALOGED	D
6	-29.50	NO	HAZARDS	SS	CATALOGED	D
7	-26.69	NO	HAZARDS	SS	CATALOGED	D
8	-23.88	NO	HAZARDS	SS	CATALOGED	D
9	-21.08	NO	HAZARDS	SS	CATALOGED	D
10	-18.26	NO	HAZARDS	SS	CATALOGED	D
11	-15.45	NO	HAZARDS	SS	CATALOGED	D
12	-12.64	NO	HAZARDS	SS	CATALOGED	D
13	-9.84	NO	HAZARDS	SS	CATALOGED	D
14	-7.02	1.97	1.96	-0.24	-0.17	Step hazard
15	-4.22	1.97	1.96	-0.14	-0.17	Step hazard
16	-1.41	1.97	1.97	-0.05	-0.17	Step hazard
17	1.40	1.97	1.97	0.05	-0.17	Step hazard
18	4.21	1.97	1.96	0.14	-0.17	Step hazard
19	7.02	1.97	1.96	0.24	-0.17	Step hazard
20	9.83	1.97	1.94	0.34	-0.17	Step hazard
21	12.64	1.97	1.92	0.43	-0.17	Step hazard
22	15.45	NO	HAZARDS	SS	CATALOGED	D
23	18.26	NO	HAZARDS	SS	CATALOGED	D
24	21.07	NO	HAZARDS	SS	CATALOGED	D
25	23.88	NO	HAZARDS	SS	CATALOGED	D
26	26.69	NO	HAZARDS	SS	CATALOGED	D
27	29.50	NO	HAZARDS	SS	CATALOGED	D
28	32.31	NO	HAZARDS	SS	CATALOGED	D
29	35.12	NO	HAZARDS	SS	CATALOGED	D
30	37.93	NO	HAZARDS	SS	CATALOGED	D
31	40.74	NO	HAZARDS	SS	CATALOGED	D
32	43.55	NO	HAZARDS	SS	CATALOGED	D

Input file: MDL.SLOPE.15.25.80
 File Creation Date : THU, AUG 11 1983

System time 20:48:46

** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.80
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 25.60 DEGREES



X vs. Y for
 hazards of
 scan # 1

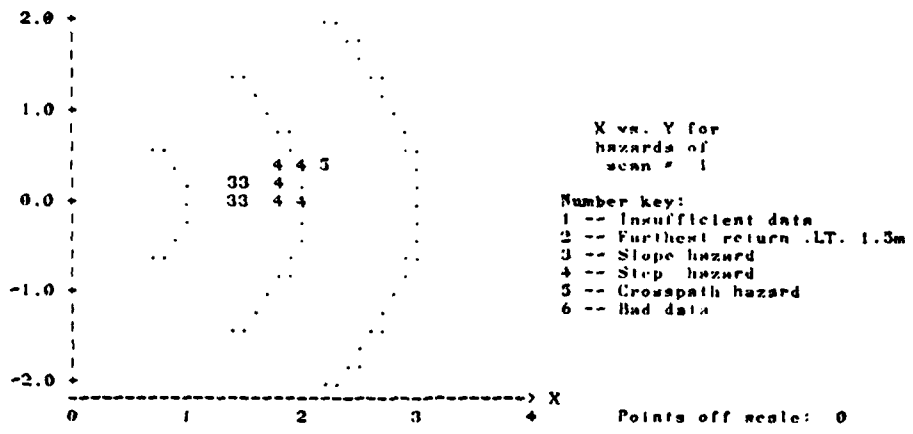
Number key:
 1 -- Insufficient data
 2 -- Furthest return .LT. 1.5m
 3 -- Slope hazard
 4 -- Step hazard
 5 -- Crosspath hazard
 6 -- Bad data

Points off scale: 0

AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S		C A T A L O G E D	
2	-40.74	NO	H A Z A R D S		C A T A L O G E D	
3	-37.93	NO	H A Z A R D S		C A T A L O G E D	
4	-35.13	NO	H A Z A R D S		C A T A L O G E D	
5	-32.31	NO	H A Z A R D S		C A T A L O G E D	
6	-29.50	NO	H A Z A R D S		C A T A L O G E D	
7	-26.69	NO	H A Z A R D S		C A T A L O G E D	
8	-23.88	NO	H A Z A R D S		C A T A L O G E D	
9	-21.08	NO	H A Z A R D S		C A T A L O G E D	
10	-18.26	NO	H A Z A R D S		C A T A L O G E D	
11	-15.45	NO	H A Z A R D S		C A T A L O G E D	
12	-12.64	NO	H A Z A R D S		C A T A L O G E D	
13	-9.84	NO	H A Z A R D S		C A T A L O G E D	
14	-7.02	1.40	1.39	-0.17	-0.24	Step hazard
15	-4.22	1.88	1.87	-0.14	-0.01	Slope hazard
16	-1.41	1.88	1.83	-0.05	-0.01	Slope hazard
17	1.40	1.88	1.83	0.05	-0.01	Slope hazard
18	4.21	NO	H A Z A R D S		C A T A L O G E D	
19	7.02	1.88	1.87	0.23	-0.01	Slope hazard
20	9.83	1.88	1.85	0.32	-0.01	Slope hazard
21	12.64	2.25	2.20	0.49	-0.04	Crosspath hazard
22	15.45	NO	H A Z A R D S		C A T A L O G E D	
23	18.26	NO	H A Z A R D S		C A T A L O G E D	
24	21.07	NO	H A Z A R D S		C A T A L O G E D	
25	23.88	NO	H A Z A R D S		C A T A L O G E D	
26	26.69	NO	H A Z A R D S		C A T A L O G E D	
27	29.50	NO	H A Z A R D S		C A T A L O G E D	
28	32.31	NO	H A Z A R D S		C A T A L O G E D	
29	35.12	NO	H A Z A R D S		C A T A L O G E D	
30	37.93	NO	H A Z A R D S		C A T A L O G E D	
31	40.74	NO	H A Z A R D S		C A T A L O G E D	
32	43.55	NO	H A Z A R D S		C A T A L O G E D	

Input file: MDL.SLOPE.20.25.80
 File Creation Date : THU, AUG 11 1983 System time 20:50:22

== MODEL PARAMETERS ==
 HEIGHT FILTER COEFFICIENT : 0.25
 SLOPE FILTER COEFFICIENT : 0.00
 LEVEL GROUND STEP THRESHOLD : 0.25 METERS
 SLOPE THRESHOLD : 25.00 DEGREES

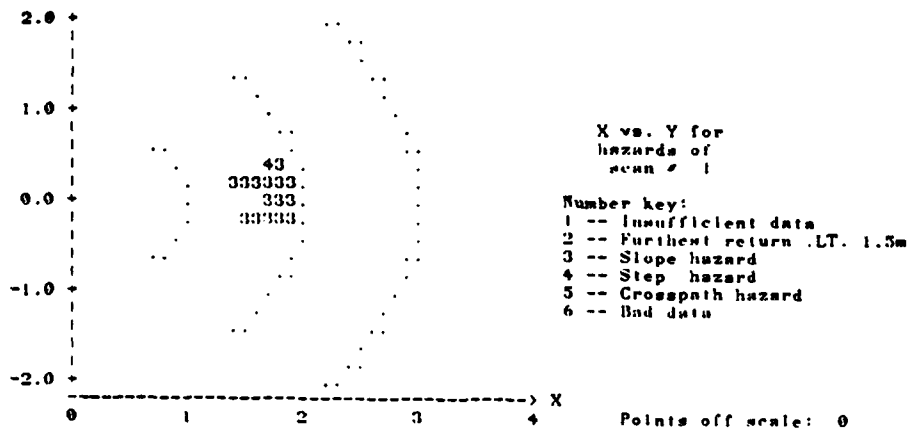


AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE	
1	-43.56	NO	HAZARDS	CATALOGED		
2	-40.74	NO	HAZARDS	CATALOGED		
3	-37.93	NO	HAZARDS	CATALOGED		
4	-35.13	NO	HAZARDS	CATALOGED		
5	-32.31	NO	HAZARDS	CATALOGED		
6	-29.50	NO	HAZARDS	CATALOGED		
7	-26.69	NO	HAZARDS	CATALOGED		
8	-23.88	NO	HAZARDS	CATALOGED		
9	-21.08	NO	HAZARDS	CATALOGED		
10	-18.26	NO	HAZARDS	CATALOGED		
11	-15.45	NO	HAZARDS	CATALOGED		
12	-12.64	NO	HAZARDS	CATALOGED		
13	-9.84	NO	HAZARDS	CATALOGED		
14	-7.02	NO	HAZARDS	CATALOGED		
15	-4.22	NO	HAZARDS	CATALOGED		
16	-1.41	1.53	1.53	-0.04	-0.06	Slope hazard
		1.84	1.84	-0.05	-0.07	Step hazard
17	1.40	1.43	1.43	0.04	-0.12	Slope hazard
		1.53	1.53	0.04	-0.06	Slope hazard
		1.04	1.04	0.05	-0.07	Step hazard
		2.04	2.03	0.05	-0.01	Step hazard
18	4.21	1.43	1.43	0.11	-0.12	Slope hazard
		1.47	1.47	0.11	-0.10	Slope hazard
		1.53	1.53	0.11	-0.03	Slope hazard
		1.84	1.83	0.13	-0.07	Step hazard
19	7.02	1.53	1.52	0.19	-0.06	Slope hazard
20	9.83	1.53	1.51	0.26	-0.06	Slope hazard
		1.04	1.01	0.31	-0.07	Step hazard
21	12.64	1.04	1.79	0.40	-0.07	Step hazard
		2.04	1.99	0.45	-0.01	Step hazard
		2.25	2.20	0.49	-0.01	Crosspath hazard
22	15.45	NO	HAZARDS	CATALOGED		
23	18.26	NO	HAZARDS	CATALOGED		
24	21.07	NO	HAZARDS	CATALOGED		
25	23.88	NO	HAZARDS	CATALOGED		
26	26.69	NO	HAZARDS	CATALOGED		
27	29.50	NO	HAZARDS	CATALOGED		
28	32.31	NO	HAZARDS	CATALOGED		
29	35.12	NO	HAZARDS	CATALOGED		
30	37.93	NO	HAZARDS	CATALOGED		
31	40.74	NO	HAZARDS	CATALOGED		
32	43.55	NO	HAZARDS	CATALOGED		

Points off scale: 0

Input file: MDL.SLOPE.25.25.80
 File Creation Date : THU, AUG 11 1983 System time 20:51:23

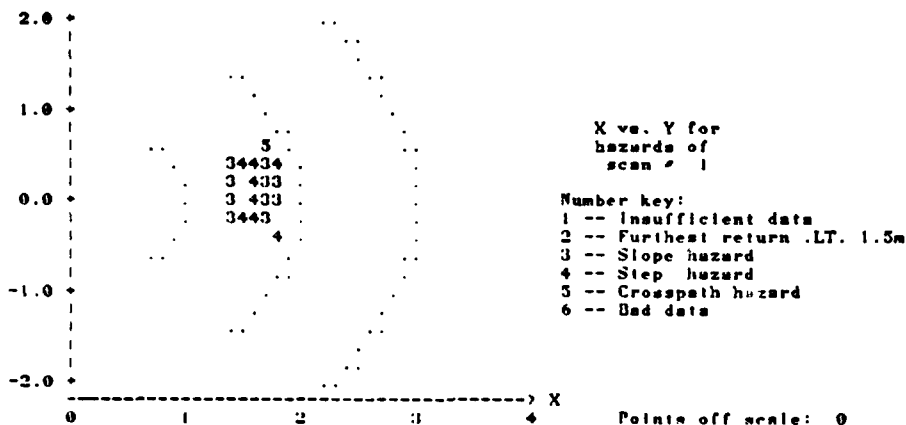
** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT : 0.25
 SLOPE FILTER COEFFICIENT : 0.80
 LEVEL GROUND STEP THRESHOLD : 0.25 METERS
 SLOPE THRESHOLD : 25.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE	
1	-43.56	NO	H A Z A R D S	C A T A L O C E D		
2	-40.74	NO	H A Z A R D S	C A T A L O C E D		
3	-37.93	NO	H A Z A R D S	C A T A L O C E D		
4	-33.13	NO	H A Z A R D S	C A T A L O C E D		
5	-32.31	NO	H A Z A R D S	C A T A L O C E D		
6	-29.30	NO	H A Z A R D S	C A T A L O C E D		
7	-26.69	NO	H A Z A R D S	C A T A L O C E D		
8	-23.88	NO	H A Z A R D S	C A T A L O C E D		
9	-21.08	NO	H A Z A R D S	C A T A L O C E D		
10	-18.26	NO	H A Z A R D S	C A T A L O C E D		
11	-15.45	NO	H A Z A R D S	C A T A L O C E D		
12	-12.64	NO	H A Z A R D S	C A T A L O C E D		
13	-9.84	NO	H A Z A R D S	C A T A L O C E D		
14	-7.02	1.76	1.73	-0.22	0.07	Slope hazard
		1.84	1.82	-0.22	0.11	Slope hazard
15	-4.22	1.53	1.53	-0.11	-0.05	Slope hazard
		1.58	1.58	-0.12	-0.15	Step hazard
		1.65	1.65	-0.12	0.00	Slope hazard
		1.76	1.76	-0.13	0.07	Slope hazard
		1.84	1.83	-0.14	0.11	Slope hazard
		1.95	1.94	-0.14	0.14	Slope hazard
16	-1.41	1.65	1.65	-0.04	0.01	Slope hazard
		1.76	1.76	-0.04	0.07	Slope hazard
		1.84	1.84	-0.03	0.12	Slope hazard
17	1.40	1.76	1.76	0.04	0.07	Slope hazard
		1.84	1.84	0.05	0.12	Slope hazard
		1.93	1.93	0.05	0.19	Slope hazard
18	4.21	1.43	1.43	0.11	-0.12	Slope hazard
		1.47	1.47	0.11	-0.10	Slope hazard
		1.53	1.53	0.11	-0.05	Slope hazard
		1.58	1.58	0.12	-0.03	Slope hazard
		1.62	1.61	0.12	-0.01	Slope hazard
		1.76	1.76	0.13	0.07	Slope hazard
		1.81	1.81	0.14	0.11	Slope hazard
		1.93	1.94	0.14	0.14	Slope hazard
19	7.02	1.43	1.42	0.18	-0.12	Slope hazard
		1.47	1.46	0.18	-0.10	Slope hazard
		1.53	1.52	0.19	-0.05	Slope hazard
		1.58	1.57	0.19	-0.15	Step hazard
		1.65	1.64	0.20	0.00	Slope hazard
		1.76	1.75	0.22	0.07	Slope hazard
		1.84	1.82	0.22	0.11	Slope hazard
		1.95	1.93	0.24	0.14	Slope hazard
20	9.83	1.76	1.74	0.30	0.07	Slope hazard
		1.84	1.81	0.31	0.11	Slope hazard
21	12.64	1.84	1.79	0.40	0.12	Slope hazard
22	15.45	1.72	1.66	0.46	-0.01	Step hazard
23	18.26	NO	H A Z A R D S	C A T A L O C E D		
24	21.07	NO	H A Z A R D S	C A T A L O C E D		
25	23.88	NO	H A Z A R D S	C A T A L O C E D		
26	26.69	NO	H A Z A R D S	C A T A L O C E D		
27	29.30	NO	H A Z A R D S	C A T A L O C E D		
28	32.31	NO	H A Z A R D S	C A T A L O C E D		
29	35.12	NO	H A Z A R D S	C A T A L O C E D		
30	37.93	NO	H A Z A R D S	C A T A L O C E D		
31	40.74	NO	H A Z A R D S	C A T A L O C E D		
32	43.55	NO	H A Z A R D S	C A T A L O C E D		

Input file: MDL.SLOPE.30.25.80
 File Creation Date : THU. AUG 11 1983 System time 20:52:05

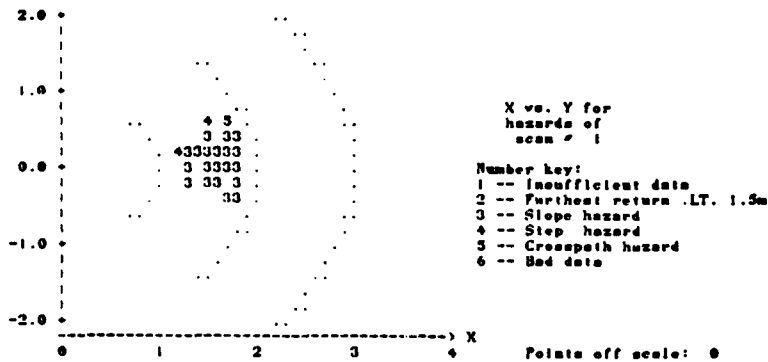
== MODEL PARAMETERS ==
 HEIGHT FILTER COEFFICIENT * 0.25
 SLOPE FILTER COEFFICIENT * 0.80
 LEVEL GROUND STEP THRESHOLD * 0.25 METERS
 SLOPE THRESHOLD * 25.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE	
1	-43.36	N 0	H A Z A R D S	C A T A L O G E D		
2	-40.74	N 0	H A Z A R D S	C A T A L O G E D		
3	-37.93	N 0	H A Z A R D S	C A T A L O G E D		
4	-35.13	N 0	H A Z A R D S	C A T A L O G E D		
5	-32.31	N 0	H A Z A R D S	C A T A L O G E D		
6	-29.50	N 0	H A Z A R D S	C A T A L O G E D		
7	-26.69	N 0	H A Z A R D S	C A T A L O G E D		
8	-23.88	N 0	H A Z A R D S	C A T A L O G E D		
9	-21.08	N 0	H A Z A R D S	C A T A L O G E D		
10	-18.26	N 0	H A Z A R D S	C A T A L O G E D		
11	-15.45	N 0	H A Z A R D S	C A T A L O G E D		
12	-12.64	N 0	H A Z A R D S	C A T A L O G E D		
13	-9.84	1.43	1.41	-0.24	0.02	Slope hazard
		1.55	1.53	-0.27	0.05	Step hazard
		1.84	1.81	-0.31	0.19	Step hazard
14	-7.02	1.43	1.42	-0.18	0.02	Slope hazard
		1.61	1.60	-0.20	0.04	Step hazard
		1.73	1.71	-0.21	0.17	Slope hazard
15	-4.22	1.43	1.43	-0.11	0.02	Slope hazard
		1.60	1.59	-0.12	0.00	Step hazard
		1.73	1.72	-0.13	0.17	Slope hazard
16	-1.41	1.43	1.43	-0.04	0.02	Slope hazard
		1.61	1.61	-0.04	0.04	Step hazard
		1.73	1.73	-0.04	0.17	Slope hazard
17	1.40	1.43	1.43	0.04	0.02	Slope hazard
		1.66	1.66	0.04	0.13	Slope hazard
		1.73	1.73	0.04	0.18	Slope hazard
18	4.21	1.82	1.82	0.04	0.23	Slope hazard
		1.43	1.43	0.11	0.02	Slope hazard
		1.66	1.65	0.12	0.13	Slope hazard
		1.73	1.72	0.13	0.18	Slope hazard
		1.84	1.83	0.13	0.19	Slope hazard
19	7.02	1.43	1.42	0.18	0.02	Slope hazard
		1.60	1.59	0.20	0.00	Step hazard
		1.73	1.71	0.21	0.17	Slope hazard
20	9.83	1.43	1.41	0.24	0.02	Slope hazard
		1.60	1.57	0.27	0.00	Step hazard
		1.73	1.70	0.29	0.17	Slope hazard
21	12.64	1.43	1.40	0.31	0.02	Slope hazard
		1.60	1.56	0.35	0.00	Step hazard
		1.73	1.63	0.38	0.17	Slope hazard
22	15.45	1.43	1.38	0.38	0.02	Slope hazard
		1.61	1.55	0.43	0.04	Step hazard
		1.73	1.66	0.46	0.17	Slope hazard
		1.82	1.76	0.49	0.15	Step hazard
23	18.26	1.55	1.47	0.49	-0.01	Step hazard
		1.73	1.66	0.53	-0.01	Crosspath hazard
24	21.07	N 0	H A Z A R D S	C A T A L O G E D		
25	23.88	N 0	H A Z A R D S	C A T A L O G E D		
26	26.69	N 0	H A Z A R D S	C A T A L O G E D		
27	29.50	N 0	H A Z A R D S	C A T A L O G E D		
28	32.31	N 0	H A Z A R D S	C A T A L O G E D		
29	35.12	N 0	H A Z A R D S	C A T A L O G E D		
30	37.93	N 0	H A Z A R D S	C A T A L O G E D		
31	40.74	N 0	H A Z A R D S	C A T A L O G E D		
32	43.55	N 0	H A Z A R D S	C A T A L O G E D		

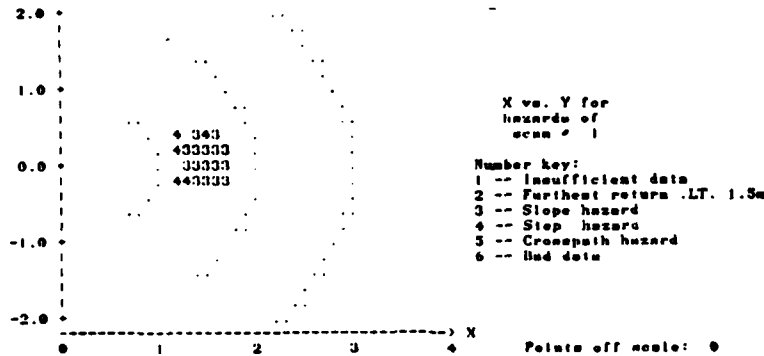
Input file: MDL.SLOPE.35.25.80
 File Creation Date : THU, AUG 11 1983 System time 20:32:36

== MODEL1 PARAMETERS ==
 HEIGHT FILTER COEFFICIENT * 0.25
 SLOPE FILTER COEFFICIENT * 0.80
 LEVEL GROUND STEP THRESHOLD * 0.25 METERS
 SLOPE THRESHOLD * 25.00 DECALES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE	
1	-43.36	NO	HAZARDS	CATALOGED		
2	-49.74	NO	HAZARDS	CATALOGED		
3	-37.90	NO	HAZARDS	CATALOGED		
4	-35.13	NO	HAZARDS	CATALOGED		
5	-32.31	NO	HAZARDS	CATALOGED		
6	-29.50	NO	HAZARDS	CATALOGED		
7	-26.69	NO	HAZARDS	CATALOGED		
8	-23.88	NO	HAZARDS	CATALOGED		
9	-21.06	NO	HAZARDS	CATALOGED		
10	-18.26	NO	HAZARDS	CATALOGED		
11	-15.45	NO	HAZARDS	CATALOGED		
12	-12.64	NO	HAZARDS	CATALOGED		
13	-9.84	1.34	1.32	-0.23	0.07	Slope hazard
		1.31	1.39	-0.26	0.07	Slope hazard
		1.36	1.34	-0.27	0.17	Slope hazard
		1.63	1.60	-0.28	0.18	Slope hazard
		1.77	1.75	-0.30	0.25	Slope hazard
		1.82	1.79	-0.31	0.27	Slope hazard
		1.82	1.79	-0.31	0.27	Slope hazard
14	-7.02	1.34	1.33	-0.16	0.07	Slope hazard
		1.36	1.33	-0.19	0.17	Slope hazard
		1.63	1.61	-0.20	0.23	Slope hazard
		1.77	1.76	-0.22	0.25	Slope hazard
		1.82	1.81	-0.22	0.27	Slope hazard
15	-4.22	1.36	1.36	-0.11	0.16	Slope hazard
		1.63	1.62	-0.12	0.18	Slope hazard
		1.77	1.77	-0.11	0.25	Slope hazard
16	-1.41	1.34	1.34	-0.03	0.07	Slope hazard
		1.36	1.36	-0.04	0.17	Slope hazard
		1.63	1.62	-0.04	0.23	Slope hazard
		1.77	1.77	-0.04	0.25	Slope hazard
17	1.40	1.45	1.43	0.04	0.07	Slope hazard
		1.36	1.36	0.04	0.17	Slope hazard
		1.63	1.62	0.04	0.23	Slope hazard
		1.72	1.72	0.04	0.30	Slope hazard
18	4.21	1.45	1.45	0.11	0.07	Slope hazard
		1.31	1.31	0.11	0.12	Slope hazard
		1.36	1.36	0.11	0.18	Slope hazard
		1.63	1.62	0.12	0.23	Slope hazard
		1.72	1.72	0.13	0.30	Slope hazard
		1.82	1.82	0.13	0.38	Slope hazard
19	7.02	1.29	1.22	0.15	-0.10	Step hazard
		1.31	1.30	0.19	0.06	Step hazard
		1.63	1.61	0.20	0.23	Slope hazard
20	9.83	1.26	1.23	0.21	0.01	Slope hazard
		1.34	1.32	0.23	0.09	Slope hazard
		1.36	1.34	0.27	0.17	Slope hazard
		1.63	1.60	0.28	0.23	Slope hazard
		1.77	1.75	0.30	0.25	Slope hazard
		1.82	1.79	0.31	0.27	Slope hazard
21	12.64	1.20	1.17	0.26	-0.07	Step hazard
		1.31	1.30	0.30	0.07	Step hazard
22	15.45	1.36	1.30	0.42	0.17	Slope hazard
23	18.26	1.61	1.53	0.50	0.07	Step hazard
		1.75	1.66	0.55	0.07	Crosspath hazard
24	21.07	NO	HAZARDS	CATALOGED		
25	23.88	NO	HAZARDS	CATALOGED		
26	26.69	NO	HAZARDS	CATALOGED		
27	29.50	NO	HAZARDS	CATALOGED		
28	32.31	NO	HAZARDS	CATALOGED		
29	35.12	NO	HAZARDS	CATALOGED		
30	37.93	NO	HAZARDS	CATALOGED		
31	40.74	NO	HAZARDS	CATALOGED		
32	43.55	NO	HAZARDS	CATALOGED		

== MINNLI PARAMETERS ==
 HEIGHT FILTER COEFFICIENT * 0.25
 SLOPE FILTER COEFFICIENT * 0.00
 LEVEL GROUND STEP THRESHOLD * 0.25 METERS
 SLOPE THRESHOLD * 25.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1 -43.56	NO	HAZARDS			C A T A L O G E D
2 -40.74	NO	HAZARDS			C A T A L O G E D
3 -37.93	NO	HAZARDS			C A T A L O G E D
4 -35.13	NO	HAZARDS			C A T A L O G E D
5 -32.31	NO	HAZARDS			C A T A L O G E D
6 -29.50	NO	HAZARDS			C A T A L O G E D
7 -26.69	NO	HAZARDS			C A T A L O G E D
8 -23.88	NO	HAZARDS			C A T A L O G E D
9 -21.08	NO	HAZARDS			C A T A L O G E D
10 -18.26	NO	HAZARDS			C A T A L O G E D
11 -15.45	NO	HAZARDS			C A T A L O G E D
12 -12.64	1.26	1.23	-0.28	-0.07	Step hazard
	1.34	1.31	-0.29	0.07	Step hazard
13 -9.84	1.30	1.28	-0.22	0.02	Step hazard
	1.37	1.33	-0.23	0.12	Slope hazard
	1.47	1.43	-0.23	0.22	Slope hazard
	1.63	1.60	-0.28	0.24	Slope hazard
	1.67	1.63	-0.29	0.29	Slope hazard
	1.72	1.70	-0.29	0.31	Slope hazard
14 -7.02	1.30	1.29	-0.16	0.03	Step hazard
	1.37	1.36	-0.17	0.12	Slope hazard
	1.47	1.46	-0.18	0.22	Slope hazard
	1.54	1.52	-0.19	0.23	Slope hazard
	1.67	1.66	-0.20	0.29	Slope hazard
	1.72	1.71	-0.21	0.31	Slope hazard
15 -4.22	1.30	1.30	-0.10	0.02	Step hazard
	1.37	1.37	-0.10	0.12	Slope hazard
	1.47	1.47	-0.11	0.22	Slope hazard
	1.67	1.67	-0.12	0.29	Slope hazard
	1.72	1.72	-0.13	0.31	Slope hazard
16 -1.41	1.34	1.34	-0.03	0.09	Slope hazard
	1.37	1.37	-0.03	0.12	Slope hazard
	1.42	1.42	-0.03	0.13	Slope hazard
	1.47	1.47	-0.04	0.22	Slope hazard
	1.54	1.53	-0.04	0.23	Slope hazard
	1.59	1.58	-0.04	0.28	Slope hazard
	1.67	1.67	-0.04	0.30	Slope hazard
17 1.40	1.34	1.34	0.03	0.09	Slope hazard
	1.37	1.37	0.03	0.12	Slope hazard
	1.42	1.42	0.03	0.13	Slope hazard
	1.47	1.47	0.04	0.22	Slope hazard
	1.53	1.53	0.04	0.26	Slope hazard
	1.59	1.58	0.04	0.29	Slope hazard
	1.63	1.63	0.04	0.34	Slope hazard
18 4.21	1.34	1.34	0.10	0.09	Slope hazard
	1.37	1.37	0.10	0.12	Slope hazard
	1.42	1.42	0.10	0.13	Slope hazard
	1.47	1.47	0.11	0.22	Slope hazard
	1.53	1.53	0.11	0.26	Slope hazard
	1.59	1.58	0.12	0.29	Slope hazard
	1.63	1.63	0.12	0.34	Slope hazard
19 7.02	1.20	1.19	0.15	-0.04	Step hazard
	1.34	1.33	0.16	0.09	Slope hazard
	1.37	1.36	0.17	0.12	Slope hazard
	1.42	1.41	0.17	0.13	Slope hazard
	1.47	1.46	0.18	0.22	Slope hazard
	1.54	1.52	0.19	0.22	Slope hazard
	1.59	1.57	0.19	0.28	Slope hazard
	1.63	1.62	0.20	0.34	Slope hazard
	1.72	1.71	0.21	0.32	Slope hazard
20 9.83	1.34	1.32	0.21	0.09	Slope hazard
	1.37	1.35	0.21	0.12	Slope hazard
	1.42	1.40	0.24	0.13	Slope hazard
	1.47	1.45	0.25	0.22	Slope hazard
	1.54	1.51	0.26	0.22	Slope hazard
	1.67	1.63	0.29	0.29	Slope hazard
	1.72	1.70	0.29	0.31	Slope hazard
21 12.64	1.42	1.38	0.31	0.11	Step hazard
	1.63	1.59	0.36	0.33	Slope hazard
22 15.45	1.42	1.37	0.38	0.11	Step hazard
	1.63	1.57	0.43	0.33	Slope hazard
23 18.26	1.30	1.24	0.41	0.02	Step hazard
	1.47	1.40	0.46	0.22	Slope hazard
	1.60	1.51	0.50	0.23	Step hazard
24 21.07	NO	HAZARDS			C A T A L O G E D
25 23.88	NO	HAZARDS			C A T A L O G E D
26 26.69	NO	HAZARDS			C A T A L O G E D
27 29.50	NO	HAZARDS			C A T A L O G E D
28 32.31	NO	HAZARDS			C A T A L O G E D
29 35.12	NO	HAZARDS			C A T A L O G E D
30 37.93	NO	HAZARDS			C A T A L O G E D
31 40.74	NO	HAZARDS			C A T A L O G E D
32 43.55	NO	HAZARDS			C A T A L O G E D

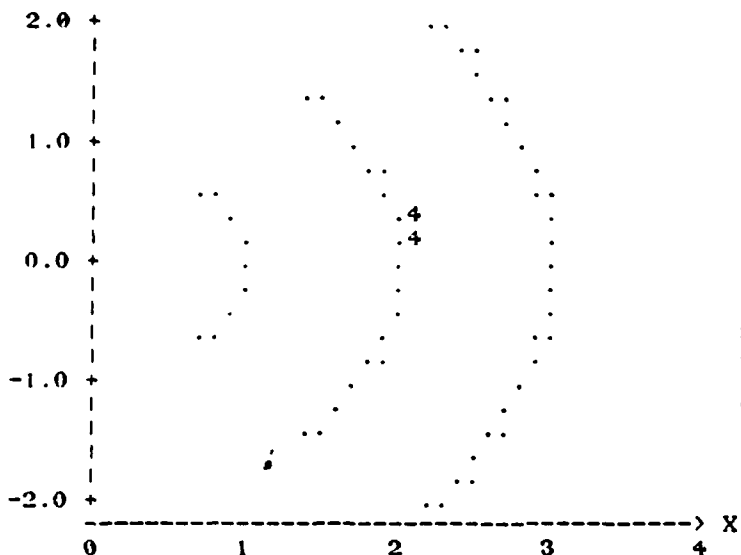
7.2.2.8 B=0.75; Slope Threshold=25

7.2.2.8.1	5 Degree Slope	167
7.2.2.8.2	10 Degree Slope	168
7.2.2.8.3	15 Degree Slope	169
7.2.2.8.4	20 Degree Slope	170
7.2.2.8.5	25 Degree Slope	171
7.2.2.8.6	30 Degree Slope	172
7.2.2.8.7	35 Degree Slope	173
7.2.2.8.8	40 Degree Slope	174

Input file: MDL.SLOPE.05.25.75
 File Creation Date : FRI, AUG 12 1983

System time 18:43:36

** MODEL1 PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.75
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 25.00 DEGREES



X vs. Y for
 hazards of
 scan # 1

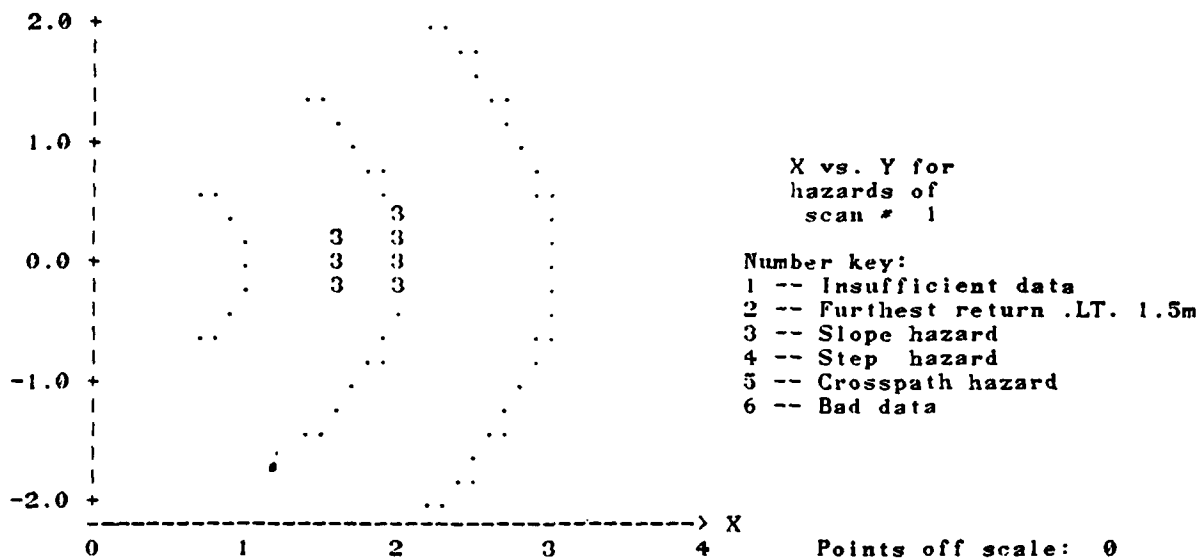
Number key:
 1 -- Insufficient data
 2 -- Furthest return .LT. 1.5m
 3 -- Slope hazard
 4 -- Step hazard
 5 -- Crosspath hazard
 6 -- Bad data

Points off scale: 0

AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S			C A T A L O G E D
2	-40.74	NO	H A Z A R D S			C A T A L O G E D
3	-37.93	NO	H A Z A R D S			C A T A L O G E D
4	-35.13	NO	H A Z A R D S			C A T A L O G E D
5	-32.31	NO	H A Z A R D S			C A T A L O G E D
6	-29.50	NO	H A Z A R D S			C A T A L O G E D
7	-26.69	NO	H A Z A R D S			C A T A L O G E D
8	-23.88	NO	H A Z A R D S			C A T A L O G E D
9	-21.08	NO	H A Z A R D S			C A T A L O G E D
10	-18.26	NO	H A Z A R D S			C A T A L O G E D
11	-15.45	NO	H A Z A R D S			C A T A L O G E D
12	-12.64	NO	H A Z A R D S			C A T A L O G E D
13	-9.84	NO	H A Z A R D S			C A T A L O G E D
14	-7.02	NO	H A Z A R D S			C A T A L O G E D
15	-4.22	NO	H A Z A R D S			C A T A L O G E D
16	-1.41	NO	H A Z A R D S			C A T A L O G E D
17	1.40	NO	H A Z A R D S			C A T A L O G E D
18	4.21	NO	H A Z A R D S			C A T A L O G E D
19	7.02	2.12	2.10	0.26	-0.25	Step hazard
20	9.83	2.12	2.09	0.36	-0.25	Step hazard
21	12.64	NO	H A Z A R D S			C A T A L O G E D
22	15.45	NO	H A Z A R D S			C A T A L O G E D
23	18.26	NO	H A Z A R D S			C A T A L O G E D
24	21.07	NO	H A Z A R D S			C A T A L O G E D
25	23.88	NO	H A Z A R D S			C A T A L O G E D
26	26.69	NO	H A Z A R D S			C A T A L O G E D
27	29.50	NO	H A Z A R D S			C A T A L O G E D
28	32.31	NO	H A Z A R D S			C A T A L O G E D
29	35.12	NO	H A Z A R D S			C A T A L O G E D
30	37.93	NO	H A Z A R D S			C A T A L O G E D
31	40.74	NO	H A Z A R D S			C A T A L O G E D
32	43.55	NO	H A Z A R D S			C A T A L O G E D

Input file: MDL.SLOPE.10.25.75
 File Creation Date : FRI, AUG 12 1983 System time 18:45:16

 ** MODEL1 PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.75
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 25.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	HAZARDS	CATALOGED	
2	-40.74	NO	HAZARDS	CATALOGED	
3	-37.93	NO	HAZARDS	CATALOGED	
4	-35.13	NO	HAZARDS	CATALOGED	
5	-32.31	NO	HAZARDS	CATALOGED	
6	-29.50	NO	HAZARDS	CATALOGED	
7	-26.69	NO	HAZARDS	CATALOGED	
8	-23.88	NO	HAZARDS	CATALOGED	
9	-21.08	NO	HAZARDS	CATALOGED	
10	-18.26	NO	HAZARDS	CATALOGED	
11	-15.45	NO	HAZARDS	CATALOGED	
12	-12.64	NO	HAZARDS	CATALOGED	
13	-9.84	NO	HAZARDS	CATALOGED	
14	-7.02	1.64	1.63	-0.13	Slope hazard
		2.01	2.00	-0.23	Slope hazard
15	-4.22	2.01	2.00	-0.15	Slope hazard
16	-1.41	2.01	2.01	-0.05	Slope hazard
17	1.40	1.64	1.64	0.04	Slope hazard
		2.01	2.01	0.05	Slope hazard
18	4.21	1.64	1.64	0.12	Slope hazard
		2.01	2.00	0.13	Slope hazard
19	7.02	2.01	2.00	0.25	Slope hazard
20	9.83	2.01	1.98	0.34	Slope hazard
21	12.64	2.01	1.96	0.44	Slope hazard
22	15.45	NO	HAZARDS	CATALOGED	
23	18.26	NO	HAZARDS	CATALOGED	
24	21.07	NO	HAZARDS	CATALOGED	
25	23.88	NO	HAZARDS	CATALOGED	
26	26.69	NO	HAZARDS	CATALOGED	
27	29.50	NO	HAZARDS	CATALOGED	
28	32.31	NO	HAZARDS	CATALOGED	
29	35.12	NO	HAZARDS	CATALOGED	
30	37.93	NO	HAZARDS	CATALOGED	
31	40.74	NO	HAZARDS	CATALOGED	
32	43.55	NO	HAZARDS	CATALOGED	

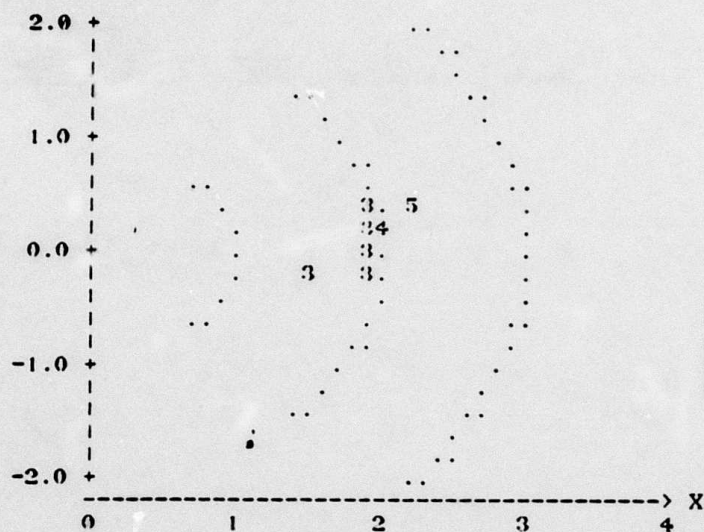
Input file: MDL.SLOPE.15.25.75

File Creation Date : FRI, AUG 12 1983

System time 18:46:01

** MODEL PARAMETERS **

HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.75
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 25.00 DEGREES



X vs. Y for
hazards of
scan # 1

Number key:

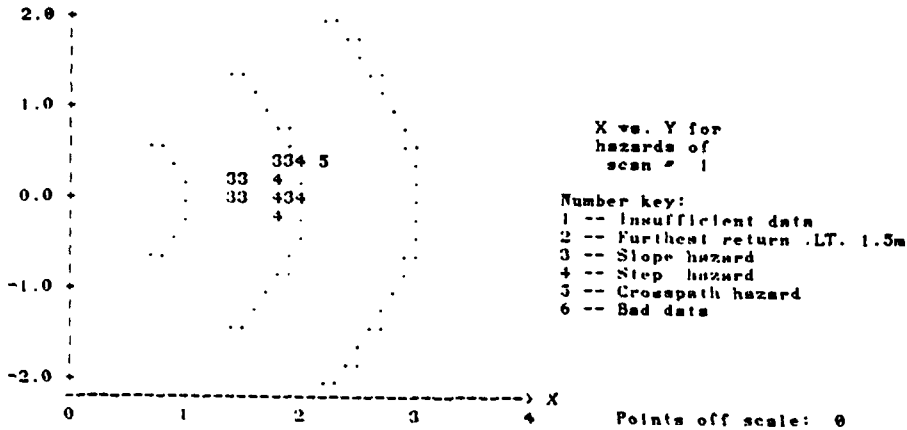
- 1 -- Insufficient data
- 2 -- Furthest return .LT. 1.5m
- 3 -- Slope hazard
- 4 -- Step hazard
- 5 -- Crosspath hazard
- 6 -- Bad data

Points off scale: 0

AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S		C A T A L O G E D	
2	-40.74	NO	H A Z A R D S		C A T A L O G E D	
3	-37.93	NO	H A Z A R D S		C A T A L O G E D	
4	-35.13	NO	H A Z A R D S		C A T A L O G E D	
5	-32.31	NO	H A Z A R D S		C A T A L O G E D	
6	-29.50	NO	H A Z A R D S		C A T A L O G E D	
7	-26.69	NO	H A Z A R D S		C A T A L O G E D	
8	-23.88	NO	H A Z A R D S		C A T A L O G E D	
9	-21.08	NO	H A Z A R D S		C A T A L O G E D	
10	-18.26	NO	H A Z A R D S		C A T A L O G E D	
11	-15.45	NO	H A Z A R D S		C A T A L O G E D	
12	-12.64	NO	H A Z A R D S		C A T A L O G E D	
13	-9.84	NO	H A Z A R D S		C A T A L O G E D	
14	-7.02	1.46	1.35	-0.18	-0.17	Slope hazard
15	-4.22	1.33	1.37	-0.14	-0.01	Slope hazard
16	-1.41	1.33	1.33	-0.05	-0.01	Slope hazard
17	1.40	1.33	1.33	0.05	-0.01	Slope hazard
18	4.21	1.97	1.96	0.14	-0.14	Step hazard
19	7.02	1.33	1.37	0.23	-0.01	Slope hazard
20	9.83	1.33	1.35	0.32	-0.01	Slope hazard
21	12.64	2.25	2.20	0.49	-0.04	Crosspath hazard
22	15.45	NO	H A Z A R D S		C A T A L O G E D	
23	18.26	NO	H A Z A R D S		C A T A L O G E D	
24	21.07	NO	H A Z A R D S		C A T A L O G E D	
25	23.88	NO	H A Z A R D S		C A T A L O G E D	
26	26.69	NO	H A Z A R D S		C A T A L O G E D	
27	29.50	NO	H A Z A R D S		C A T A L O G E D	
28	32.31	NO	H A Z A R D S		C A T A L O G E D	
29	35.12	NO	H A Z A R D S		C A T A L O G E D	
30	37.93	NO	H A Z A R D S		C A T A L O G E D	
31	40.74	NO	H A Z A R D S		C A T A L O G E D	
32	43.55	NO	H A Z A R D S		C A T A L O G E D	

Input file: MDL.SLOPE.20.25.75
 File Creation Date : FRI, AUG 12 1983 System time 18:46:32

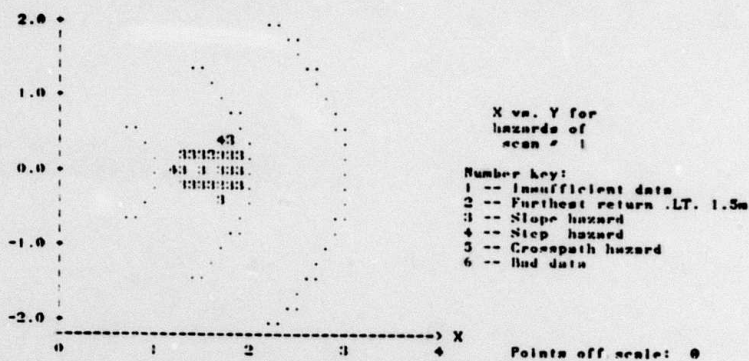
** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT : 0.25
 SLOPE FILTER COEFFICIENT : 0.75
 LEVEL GROUND STEP THRESHOLD : 0.25 METERS
 SLOPE THRESHOLD : 25.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE	
1	-43.56	NO	HAZARDS	CATALOGED		
2	-40.74	NO	HAZARDS	CATALOGED		
3	-37.93	NO	HAZARDS	CATALOGED		
4	-35.13	NO	HAZARDS	CATALOGED		
5	-32.31	NO	HAZARDS	CATALOGED		
6	-29.50	NO	HAZARDS	CATALOGED		
7	-26.69	NO	HAZARDS	CATALOGED		
8	-23.88	NO	HAZARDS	CATALOGED		
9	-21.08	NO	HAZARDS	CATALOGED		
10	-18.26	NO	HAZARDS	CATALOGED		
11	-15.45	NO	HAZARDS	CATALOGED		
12	-12.64	NO	HAZARDS	CATALOGED		
13	-9.84	NO	HAZARDS	CATALOGED		
14	-7.02	1.84	1.02	-0.22	-0.07	Step hazard
15	-4.22	NO	HAZARDS	CATALOGED		
16	-1.41	1.40	1.40	-0.03	-0.14	Slope hazard
		1.53	1.53	-0.04	-0.06	Slope hazard
		1.88	1.88	-0.03	-0.00	Slope hazard
		1.96	1.96	-0.03	0.05	Slope hazard
17	1.40	1.40	1.40	0.03	-0.14	Slope hazard
		1.43	1.43	0.04	-0.12	Slope hazard
		1.53	1.53	0.04	-0.06	Slope hazard
		1.84	1.84	0.03	-0.07	Step hazard
		2.04	2.03	0.03	-0.01	Step hazard
18	4.21	1.40	1.39	0.10	-0.14	Slope hazard
		1.43	1.43	0.11	-0.12	Slope hazard
		1.47	1.47	0.11	-0.10	Slope hazard
		1.53	1.53	0.11	-0.05	Slope hazard
		1.84	1.83	0.13	-0.07	Step hazard
19	7.02	1.53	1.52	0.19	-0.06	Slope hazard
		1.84	1.82	0.22	-0.07	Step hazard
20	9.83	1.40	1.33	0.24	-0.14	Slope hazard
		1.53	1.51	0.26	-0.06	Slope hazard
		1.88	1.83	0.32	-0.00	Slope hazard
		1.96	1.93	0.34	0.05	Slope hazard
21	12.64	1.88	1.83	0.41	-0.00	Slope hazard
		2.04	1.99	0.43	-0.01	Step hazard
		2.25	2.20	0.49	-0.01	Crosspath hazard
22	15.45	NO	HAZARDS	CATALOGED		
23	18.26	NO	HAZARDS	CATALOGED		
24	21.07	NO	HAZARDS	CATALOGED		
25	23.88	NO	HAZARDS	CATALOGED		
26	26.69	NO	HAZARDS	CATALOGED		
27	29.50	NO	HAZARDS	CATALOGED		
28	32.31	NO	HAZARDS	CATALOGED		
29	35.12	NO	HAZARDS	CATALOGED		
30	37.93	NO	HAZARDS	CATALOGED		
31	40.74	NO	HAZARDS	CATALOGED		
32	43.55	NO	HAZARDS	CATALOGED		

Input file: MDL.SLOPE.25.25.75
 File Creation Date : FRI, AUG 12 1983 System time 18:47:13

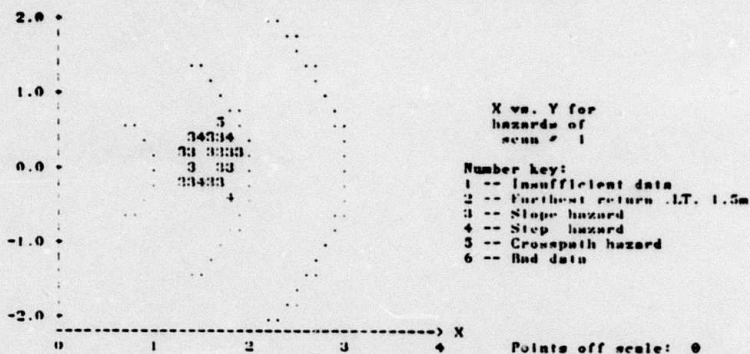
== MODEL PARAMETERS ==
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.75
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 25.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1 -43.56	NO	HAZARDS		CATALOGUED	
2 -40.74	NO	HAZARDS		CATALOGUED	
3 -37.93	NO	HAZARDS		CATALOGUED	
4 -33.13	NO	HAZARDS		CATALOGUED	
5 -32.31	NO	HAZARDS		CATALOGUED	
6 -29.30	NO	HAZARDS		CATALOGUED	
7 -26.69	NO	HAZARDS		CATALOGUED	
8 -23.08	NO	HAZARDS		CATALOGUED	
9 -21.08	NO	HAZARDS		CATALOGUED	
10 -18.26	NO	HAZARDS		CATALOGUED	
11 -15.45	NO	HAZARDS		CATALOGUED	
12 -12.64	NO	HAZARDS		CATALOGUED	
13 -9.84	1.35	1.33	-0.23	-0.07	Slope hazard
	1.76	1.74	-0.30	0.07	Slope hazard
14 -7.02	1.63	1.64	-0.20	0.00	Slope hazard
	1.76	1.75	-0.22	0.07	Slope hazard
	1.84	1.82	-0.22	0.11	Slope hazard
15 -4.22	1.43	1.43	-0.11	-0.12	Slope hazard
	1.47	1.47	-0.11	-0.10	Slope hazard
	1.53	1.53	-0.11	-0.03	Slope hazard
	1.58	1.58	-0.12	-0.13	Step hazard
	1.65	1.65	-0.12	0.00	Slope hazard
	1.76	1.76	-0.13	0.07	Slope hazard
	1.84	1.83	-0.14	0.11	Slope hazard
16 -1.41	1.93	1.94	-0.14	0.14	Slope hazard
	1.21	1.21	-0.03	-0.24	Step hazard
	1.30	1.30	-0.03	-0.13	Slope hazard
	1.33	1.33	-0.04	-0.03	Slope hazard
	1.63	1.63	-0.04	0.01	Slope hazard
	1.76	1.76	-0.04	0.07	Slope hazard
	1.84	1.84	-0.03	0.12	Slope hazard
17 1.40	1.82	1.82	0.03	-0.10	Slope hazard
	1.65	1.65	0.04	0.01	Slope hazard
	1.76	1.76	0.04	0.07	Slope hazard
	1.84	1.84	0.05	0.12	Slope hazard
18 4.21	1.93	1.91	0.05	0.19	Slope hazard
	1.43	1.39	0.10	-0.14	Slope hazard
	1.43	1.43	0.11	-0.12	Slope hazard
	1.47	1.47	0.11	-0.10	Slope hazard
	1.53	1.53	0.11	-0.05	Slope hazard
	1.58	1.58	0.12	-0.03	Slope hazard
	1.62	1.61	0.12	-0.01	Slope hazard
	1.76	1.76	0.13	0.07	Slope hazard
	1.84	1.83	0.14	0.11	Slope hazard
	1.93	1.94	0.14	0.14	Slope hazard
19 7.02	1.20	1.39	0.17	-0.14	Slope hazard
	1.43	1.42	0.18	-0.12	Slope hazard
	1.47	1.46	0.18	-0.10	Slope hazard
	1.53	1.52	0.19	-0.05	Slope hazard
	1.58	1.57	0.19	-0.15	Step hazard
	1.65	1.64	0.20	0.00	Slope hazard
	1.76	1.75	0.22	0.07	Slope hazard
	1.84	1.82	0.22	0.11	Slope hazard
	1.93	1.93	0.24	0.14	Slope hazard
20 9.83	1.65	1.63	0.28	0.00	Slope hazard
	1.76	1.74	0.30	0.07	Slope hazard
	1.84	1.81	0.31	0.11	Slope hazard
21 12.64	1.25	1.32	0.33	-0.07	Slope hazard
	1.76	1.72	0.39	0.07	Slope hazard
	1.84	1.79	0.40	0.12	Slope hazard
22 15.45	1.72	1.66	0.46	-0.01	Step hazard
23 18.26	NO	HAZARDS		CATALOGUED	
24 21.07	NO	HAZARDS		CATALOGUED	
25 23.08	NO	HAZARDS		CATALOGUED	
26 26.69	NO	HAZARDS		CATALOGUED	
27 29.30	NO	HAZARDS		CATALOGUED	
28 32.31	NO	HAZARDS		CATALOGUED	
29 35.12	NO	HAZARDS		CATALOGUED	
30 37.93	NO	HAZARDS		CATALOGUED	
31 40.74	NO	HAZARDS		CATALOGUED	
32 43.56	NO	HAZARDS		CATALOGUED	

Input file: MDL.SLOPE.30.25.75
 File Creation Date : FRI, AUG 12 1983 System time 18:48:19

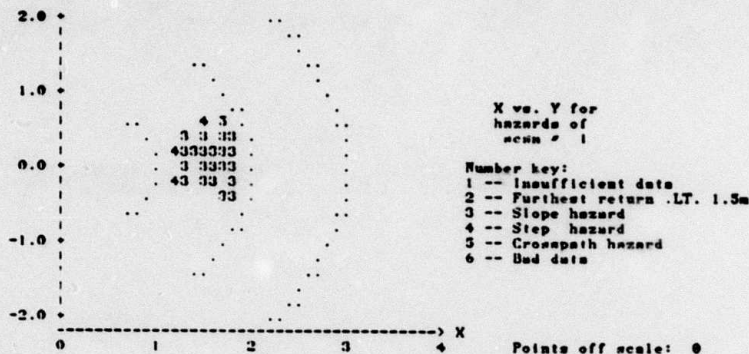
== MODEL PARAMETERS ==
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.75
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 25.00 DEGREES



AZ	WIDTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1		-43.56	NO	HAZARD	SS	CATALOGED	
2		-40.74	NO	HAZARD	SS	CATALOGED	
3		-37.93	NO	HAZARD	SS	CATALOGED	
4		-35.13	NO	HAZARD	SS	CATALOGED	
5		-32.31	NO	HAZARD	SS	CATALOGED	
6		-29.50	NO	HAZARD	SS	CATALOGED	
7		-26.69	NO	HAZARD	SS	CATALOGED	
8		-23.88	NO	HAZARD	SS	CATALOGED	
9		-21.08	NO	HAZARD	SS	CATALOGED	
10		-18.26	NO	HAZARD	SS	CATALOGED	
11		-15.45	NO	HAZARD	SS	CATALOGED	
12		-12.64	NO	HAZARD	SS	CATALOGED	
13		-9.84	1.43	1.41	-0.24	0.02	Slope hazard
			1.33	1.33	-0.27	0.03	Step hazard
			1.73	1.70	-0.29	0.18	Slope hazard
			1.84	1.81	-0.31	0.19	Step hazard
14		-7.02	1.33	1.34	-0.17	-0.07	Slope hazard
			1.43	1.42	-0.18	0.02	Slope hazard
			1.66	1.64	-0.20	0.12	Slope hazard
			1.73	1.71	-0.21	0.17	Slope hazard
15		-4.22	1.33	1.33	-0.10	-0.07	Slope hazard
			1.43	1.43	-0.11	0.02	Slope hazard
			1.66	1.63	-0.12	0.11	Slope hazard
			1.73	1.72	-0.13	0.17	Slope hazard
16		-1.41	1.33	1.33	-0.03	-0.07	Slope hazard
			1.43	1.43	-0.04	0.02	Slope hazard
			1.66	1.66	-0.04	0.12	Slope hazard
			1.73	1.73	-0.04	0.17	Slope hazard
17		1.40	1.33	1.33	0.03	-0.07	Slope hazard
			1.43	1.43	0.04	0.02	Slope hazard
			1.66	1.66	0.04	0.13	Slope hazard
			1.73	1.73	0.04	0.18	Slope hazard
			1.82	1.82	0.04	0.23	Slope hazard
18		4.21	1.33	1.33	0.10	-0.07	Slope hazard
			1.43	1.43	0.11	0.02	Slope hazard
			1.66	1.63	0.12	0.13	Slope hazard
			1.73	1.72	0.13	0.18	Slope hazard
			1.84	1.83	0.13	0.19	Slope hazard
			1.88	1.87	0.14	0.21	Slope hazard
19		7.02	1.33	1.34	0.17	-0.07	Slope hazard
			1.43	1.42	0.18	0.02	Slope hazard
			1.66	1.64	0.20	0.11	Slope hazard
			1.73	1.71	0.21	0.17	Slope hazard
20		9.83	1.33	1.33	0.23	-0.07	Slope hazard
			1.43	1.41	0.24	0.02	Slope hazard
			1.66	1.63	0.26	0.11	Slope hazard
			1.73	1.70	0.29	0.17	Slope hazard
21		12.64	1.33	1.32	0.30	-0.07	Slope hazard
			1.43	1.40	0.31	0.02	Slope hazard
			1.66	1.62	0.36	0.11	Slope hazard
			1.73	1.60	0.38	0.17	Slope hazard
22		15.45	1.43	1.38	0.38	0.02	Slope hazard
			1.66	1.60	0.44	0.12	Slope hazard
			1.73	1.66	0.46	0.17	Slope hazard
			1.82	1.76	0.49	0.13	Step hazard
23		18.26	1.33	1.47	0.49	-0.01	Step hazard
			1.73	1.66	0.53	-0.01	Crosspath hazard
24		21.07	NO	HAZARD	SS	CATALOGED	
25		23.88	NO	HAZARD	SS	CATALOGED	
26		26.69	NO	HAZARD	SS	CATALOGED	
27		29.50	NO	HAZARD	SS	CATALOGED	
28		32.31	NO	HAZARD	SS	CATALOGED	
29		35.12	NO	HAZARD	SS	CATALOGED	
30		37.93	NO	HAZARD	SS	CATALOGED	
31		40.74	NO	HAZARD	SS	CATALOGED	
32		43.55	NO	HAZARD	SS	CATALOGED	

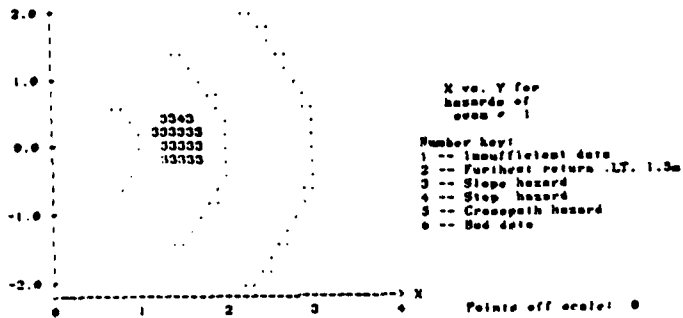
Input file: MDL.SLOPE.35.25.75
 File Creation Date : FRI, AUG 12 1983 System time 18:40:50

== MODEL PARAMETERS ==
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = -0.75
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 25.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	0.00	0.00	0.00	C A T A L O C E D
2	-40.74	0.00	0.00	0.00	C A T A L O C E D
3	-37.93	0.00	0.00	0.00	C A T A L O C E D
4	-35.13	0.00	0.00	0.00	C A T A L O C E D
5	-32.31	0.00	0.00	0.00	C A T A L O C E D
6	-29.50	0.00	0.00	0.00	C A T A L O C E D
7	-26.69	0.00	0.00	0.00	C A T A L O C E D
8	-23.88	0.00	0.00	0.00	C A T A L O C E D
9	-21.08	0.00	0.00	0.00	C A T A L O C E D
10	-18.26	0.00	0.00	0.00	C A T A L O C E D
11	-15.45	0.00	0.00	0.00	C A T A L O C E D
12	-12.64	0.00	0.00	0.00	C A T A L O C E D
13	-9.84	1.30	1.20	-0.22	-0.05 Slope hazard
		1.34	1.32	-0.23	0.07 Slope hazard
		1.31	1.49	-0.26	0.07 Slope hazard
		1.55	1.34	-0.27	0.17 Slope hazard
		1.63	1.60	-0.28	0.18 Slope hazard
		1.77	1.75	-0.30	0.25 Slope hazard
		1.82	1.79	-0.31	0.27 Slope hazard
		1.82	1.79	-0.31	0.27 Slope hazard
14	-7.02	1.26	1.25	-0.15	-0.14 Step hazard
		1.34	1.33	-0.16	0.07 Slope hazard
		1.51	1.50	-0.19	0.07 Slope hazard
		1.56	1.55	-0.19	0.17 Slope hazard
		1.63	1.61	-0.20	0.23 Slope hazard
		1.77	1.76	-0.22	0.25 Slope hazard
		1.82	1.81	-0.22	0.27 Slope hazard
15	-4.22	1.26	1.25	-0.09	-0.14 Step hazard
		1.39	1.29	-0.10	-0.06 Step hazard
		1.56	1.56	-0.11	0.16 Slope hazard
		1.63	1.62	-0.12	0.18 Slope hazard
		1.77	1.77	-0.13	0.25 Slope hazard
		1.82	1.82	-0.13	0.27 Slope hazard
16	-1.41	1.30	1.30	-0.03	-0.05 Slope hazard
		1.34	1.34	-0.03	0.07 Slope hazard
		1.56	1.56	-0.04	0.17 Slope hazard
		1.63	1.62	-0.04	0.23 Slope hazard
		1.77	1.77	-0.04	0.25 Slope hazard
17	1.40	1.45	1.45	0.04	0.07 Slope hazard
		1.56	1.56	0.04	0.17 Slope hazard
		1.63	1.62	0.04	0.23 Slope hazard
		1.72	1.72	0.04	0.30 Slope hazard
18	4.21	1.45	1.45	0.11	0.07 Slope hazard
		1.51	1.51	0.11	0.12 Slope hazard
		1.56	1.56	0.11	0.18 Slope hazard
		1.63	1.62	0.12	0.23 Slope hazard
		1.72	1.72	0.13	0.30 Slope hazard
		1.82	1.82	0.13	0.28 Slope hazard
19	7.02	1.26	1.25	0.15	-0.07 Slope hazard
		1.56	1.55	0.19	0.17 Slope hazard
		1.63	1.61	0.20	0.23 Slope hazard
		1.77	1.76	0.22	0.25 Slope hazard
20	9.83	1.17	1.16	0.20	-0.16 Step hazard
		1.26	1.24	0.21	0.01 Slope hazard
		1.34	1.32	0.23	0.09 Slope hazard
		1.56	1.56	0.27	0.17 Slope hazard
		1.63	1.60	0.28	0.23 Slope hazard
		1.77	1.73	0.30	0.25 Slope hazard
		1.82	1.79	0.31	0.27 Slope hazard
21	12.64	1.20	1.17	0.26	-0.07 Step hazard
		1.56	1.52	0.34	0.17 Slope hazard
		1.77	1.73	0.39	0.26 Slope hazard
22	15.45	1.34	1.29	0.36	0.09 Slope hazard
		1.56	1.50	0.42	0.17 Slope hazard
		1.77	1.71	0.47	0.25 Slope hazard
		1.82	1.76	0.49	0.27 Slope hazard
23	18.26	1.61	1.53	0.50	0.07 Step hazard
		1.75	1.66	0.55	0.07 Crosspath hazard
24	21.07	0.00	0.00	0.00	C A T A L O C E D
25	23.88	0.00	0.00	0.00	C A T A L O C E D
26	26.69	0.00	0.00	0.00	C A T A L O C E D
27	29.50	0.00	0.00	0.00	C A T A L O C E D
28	32.31	0.00	0.00	0.00	C A T A L O C E D
29	35.12	0.00	0.00	0.00	C A T A L O C E D
30	37.93	0.00	0.00	0.00	C A T A L O C E D
31	40.74	0.00	0.00	0.00	C A T A L O C E D
32	43.55	0.00	0.00	0.00	C A T A L O C E D

== MODEL PARAMETERS ==
 HEIGHT FILTER COEFFICIENT * 0.25
 SLOPE FILTER COEFFICIENT * 0.75
 LEVEL GROUND STEP THRESHOLD * 0.25 METERS
 SLOPE THRESHOLD * 25.00 DEGREES

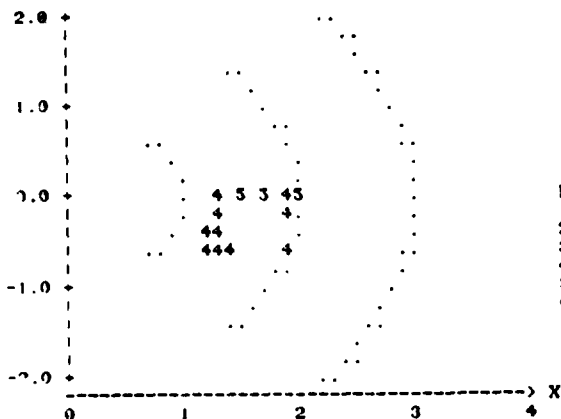


AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE	
1	-43.36	NO	HAZARDS	CATALOGUE		
2	-40.74	NO	HAZARDS	CATALOGUE		
3	-37.93	NO	HAZARDS	CATALOGUE		
4	-35.13	NO	HAZARDS	CATALOGUE		
5	-32.31	NO	HAZARDS	CATALOGUE		
6	-29.50	NO	HAZARDS	CATALOGUE		
8	-23.88	NO	HAZARDS	CATALOGUE		
9	-21.98	NO	HAZARDS	CATALOGUE		
10	-18.29	NO	HAZARDS	CATALOGUE		
11	-13.43	NO	HAZARDS	CATALOGUE		
12	-12.44	1.34	1.31	-0.29	0.07	Slope hazard
		1.34	1.31	-0.29	0.07	Slope hazard
13	-9.84	1.34	1.32	-0.23	0.09	Slope hazard
		1.37	1.35	-0.25	0.12	Slope hazard
		1.47	1.43	-0.25	0.22	Slope hazard
		1.43	1.40	-0.28	0.24	Slope hazard
		1.47	1.43	-0.29	0.29	Slope hazard
		1.72	1.70	-0.29	0.31	Slope hazard
14	-7.82	1.36	1.31	-0.16	0.09	Slope hazard
		1.37	1.34	-0.17	0.12	Slope hazard
		1.42	1.41	-0.17	0.13	Slope hazard
		1.47	1.46	-0.18	0.22	Slope hazard
		1.34	1.32	-0.19	0.23	Slope hazard
		1.47	1.44	-0.20	0.29	Slope hazard
15	-4.22	1.72	1.71	-0.21	0.31	Slope hazard
		1.34	1.34	-0.10	0.09	Slope hazard
		1.37	1.37	-0.10	0.12	Slope hazard
		1.47	1.47	-0.11	0.22	Slope hazard
		1.47	1.47	-0.12	0.29	Slope hazard
		1.72	1.72	-0.13	0.31	Slope hazard
16	-1.41	1.26	1.26	-0.03	0.02	Slope hazard
		1.34	1.34	-0.03	0.09	Slope hazard
		1.37	1.37	-0.03	0.12	Slope hazard
		1.42	1.42	-0.03	0.13	Slope hazard
		1.47	1.47	-0.04	0.22	Slope hazard
		1.34	1.33	-0.04	0.23	Slope hazard
		1.39	1.38	-0.04	0.28	Slope hazard
		1.47	1.47	-0.04	0.30	Slope hazard
17	1.46	1.74	1.74	0.03	0.02	Slope hazard
		1.34	1.34	0.03	0.09	Slope hazard
		1.37	1.37	0.03	0.12	Slope hazard
		1.42	1.42	0.03	0.13	Slope hazard
		1.47	1.47	0.04	0.22	Slope hazard
		1.33	1.33	0.04	0.24	Slope hazard
		1.39	1.38	0.04	0.29	Slope hazard
		1.42	1.42	0.04	0.34	Slope hazard
18	4.21	1.26	1.23	0.09	0.02	Slope hazard
		1.34	1.34	0.10	0.09	Slope hazard
		1.37	1.37	0.10	0.12	Slope hazard
		1.42	1.42	0.10	0.13	Slope hazard
		1.47	1.47	0.11	0.22	Slope hazard
		1.35	1.33	0.11	0.24	Slope hazard
		1.39	1.38	0.12	0.29	Slope hazard
		1.43	1.43	0.12	0.34	Slope hazard
19	7.82	1.26	1.23	0.15	0.02	Slope hazard
		1.34	1.33	0.16	0.09	Slope hazard
		1.37	1.36	0.17	0.12	Slope hazard
		1.42	1.41	0.17	0.13	Slope hazard
		1.47	1.46	0.18	0.22	Slope hazard
		1.34	1.32	0.19	0.22	Slope hazard
		1.39	1.37	0.19	0.28	Slope hazard
		1.43	1.42	0.20	0.34	Slope hazard
		1.72	1.71	0.21	0.32	Slope hazard
20	9.83	1.26	1.24	0.21	0.02	Slope hazard
		1.34	1.32	0.22	0.09	Slope hazard
		1.37	1.35	0.22	0.12	Slope hazard
		1.42	1.40	0.24	0.13	Slope hazard
		1.47	1.43	0.25	0.22	Slope hazard
		1.34	1.31	0.26	0.22	Slope hazard
		1.47	1.43	0.29	0.29	Slope hazard
		1.72	1.70	0.29	0.31	Slope hazard
21	12.64	1.47	1.44	0.32	0.22	Slope hazard
		1.34	1.30	0.34	0.23	Slope hazard
		1.43	1.39	0.34	0.33	Slope hazard
22	15.43	1.47	1.42	0.39	0.22	Slope hazard
		1.34	1.48	0.41	0.23	Slope hazard
23	18.24	1.43	1.37	0.43	0.33	Slope hazard
		1.37	1.31	0.43	0.11	Slope hazard
		1.47	1.40	0.44	0.22	Slope hazard
		1.34	1.46	0.46	0.33	Slope hazard
		1.40	1.31	0.30	0.23	Slope hazard
24	21.07	NO	HAZARDS	CATALOGUE		
25	23.88	NO	HAZARDS	CATALOGUE		
26	26.69	NO	HAZARDS	CATALOGUE		
27	29.50	NO	HAZARDS	CATALOGUE		
28	32.31	NO	HAZARDS	CATALOGUE		
29	35.12	NO	HAZARDS	CATALOGUE		
30	37.93	NO	HAZARDS	CATALOGUE		
31	40.74	NO	HAZARDS	CATALOGUE		
32	43.55	NO	HAZARDS	CATALOGUE		

7.2.3 Two Steps Test Results

7.2.3.1	Heights: 0 cm, 35 cm	176
7.2.3.2	Heights: 5 cm, 35 cm	177
7.2.3.3	Heights: 10 cm, 35 cm.....	178
7.2.3.4	Heights: 15 cm, 35 cm.....	179
7.2.3.5	Heights: 20 cm, 35 cm.....	180
7.2.3.6	Heights: 25 cm, 35 cm.....	181
7.2.3.7	Heights: 30 cm, 35 cm.....	182
7.2.3.8	Heights: 35 cm, 35 cm.....	183

== MODEL PARAMETERS ==
 HEIGHT FILTER COEFFICIENT * 0.25
 SLOPE FILTER COEFFICIENT * 0.90
 LEVEL GROUND STEP THRESHOLD * 0.25 METERS
 SLOPE THRESHOLD * 30.00 DEGREES



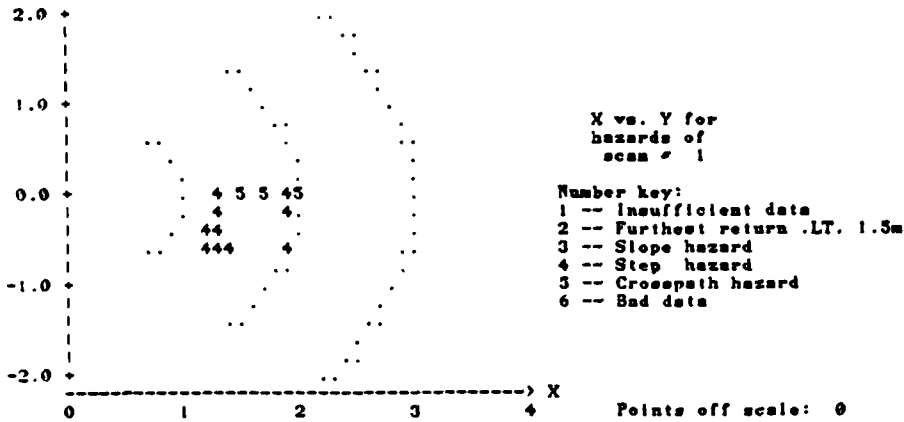
X vs. Y for
 hazards of
 scan # 1

Number key:
 1 -- Insufficient data
 2 -- Furthest return .LT. 1.5m
 3 -- Slope hazard
 4 -- Step hazard
 5 -- Crosspath hazard
 6 -- Bad data

Points off scale: 0

AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	N0	H A Z A R D S	C A T A L O C E D		
2	-40.74	N0	H A Z A R D S	C A T A L O C E D		
3	-37.93	N0	H A Z A R D S	C A T A L O C E D		
4	-35.13	N0	H A Z A R D S	C A T A L O C E D		
5	-32.31	N0	H A Z A R D S	C A T A L O C E D		
6	-29.50	1.37	1.19	-0.67	-0.37	Step hazard
7	-26.69	1.33	1.18	-0.60	-0.37	Step hazard
		1.55	1.39	-0.79	-0.03	Step hazard
8	-23.88	1.33	1.21	-0.54	-0.38	Step hazard
		1.33	1.21	-0.54	-0.38	Step hazard
		1.33	1.21	-0.54	-0.38	Step hazard
		1.37	1.25	-0.55	-0.36	Step hazard
		1.41	1.29	-0.57	-0.34	Step hazard
9	-21.08	1.33	1.24	-0.48	-0.38	Step hazard
		1.33	1.24	-0.48	-0.38	Step hazard
		1.33	1.24	-0.48	-0.38	Step hazard
10	-18.26	1.33	1.26	-0.42	-0.38	Step hazard
		1.33	1.26	-0.42	-0.38	Step hazard
		1.33	1.26	-0.42	-0.38	Step hazard
		1.37	1.30	-0.43	-0.36	Step hazard
11	-15.45	1.29	1.24	-0.34	-0.37	Step hazard
		1.29	1.24	-0.34	-0.37	Step hazard
		1.29	1.24	-0.34	-0.37	Step hazard
		1.33	1.28	-0.35	-0.37	Step hazard
		1.96	1.89	-0.52	0.01	Step hazard
12	-12.64	1.29	1.26	-0.28	-0.37	Step hazard
		1.29	1.26	-0.28	-0.37	Step hazard
		1.29	1.26	-0.28	-0.37	Step hazard
		1.32	1.29	-0.29	-0.30	Step hazard
13	-9.84	1.32	1.30	-0.23	-0.30	Step hazard
		1.32	1.30	-0.23	-0.30	Step hazard
		1.37	1.35	-0.23	-0.08	Step hazard
14	-7.02	1.29	1.28	-0.16	-0.37	Step hazard
		1.29	1.28	-0.16	-0.37	Step hazard
		1.29	1.28	-0.16	-0.37	Step hazard
		1.32	1.31	-0.16	-0.30	Step hazard
		1.96	1.94	-0.24	0.00	Step hazard
15	-4.22	1.29	1.29	-0.09	-0.37	Step hazard
		1.29	1.29	-0.09	-0.37	Step hazard
		1.29	1.29	-0.09	-0.37	Step hazard
16	-1.41	1.29	1.29	-0.03	-0.37	Step hazard
		1.29	1.29	-0.03	-0.37	Step hazard
		1.29	1.29	-0.03	-0.37	Step hazard
		1.32	1.32	-0.03	-0.30	Step hazard
		1.50	1.50	-0.04	0.05	Crosspath hazard
		1.75	1.75	-0.04	0.01	Crosspath hazard
		1.88	1.88	-0.05	0.01	Step hazard
		2.00	2.00	-0.05	0.01	Crosspath hazard
17	1.40	N0	H A Z A R D S	C A T A L O C E D		
18	4.21	N0	H A Z A R D S	C A T A L O C E D		
19	7.02	N0	H A Z A R D S	C A T A L O C E D		
20	9.83	N0	H A Z A R D S	C A T A L O C E D		
21	12.64	N0	H A Z A R D S	C A T A L O C E D		
22	15.45	N0	H A Z A R D S	C A T A L O C E D		
23	18.26	N0	H A Z A R D S	C A T A L O C E D		
24	21.07	N0	H A Z A R D S	C A T A L O C E D		
25	23.88	N0	H A Z A R D S	C A T A L O C E D		
26	26.69	N0	H A Z A R D S	C A T A L O C E D		
27	29.50	N0	H A Z A R D S	C A T A L O C E D		
28	32.31	N0	H A Z A R D S	C A T A L O C E D		
29	35.12	N0	H A Z A R D S	C A T A L O C E D		
30	37.93	N0	H A Z A R D S	C A T A L O C E D		
31	40.74	N0	H A Z A R D S	C A T A L O C E D		
32	43.55	N0	H A Z A R D S	C A T A L O C E D		

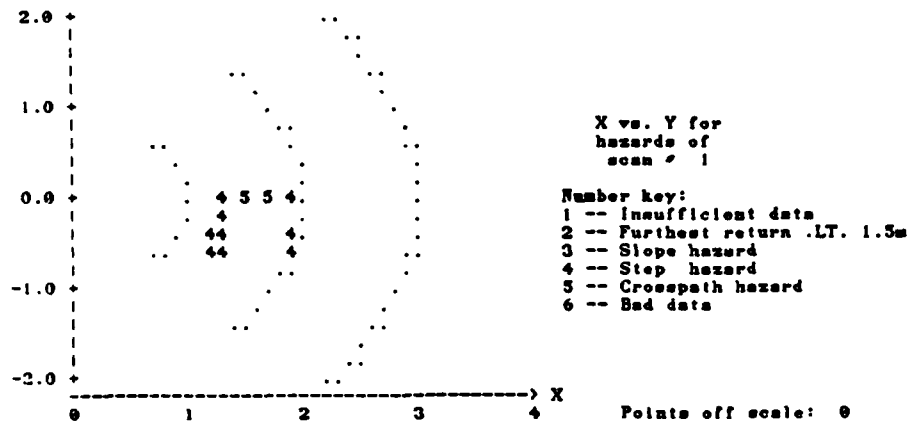
** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT * 0.25
 SLOPE FILTER COEFFICIENT * 0.90
 LEVEL GROUND STEP THRESHOLD * 0.25 METERS
 SLOPE THRESHOLD * 30.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1 -43.56	NO	HAZARDS	CATALOGED		
2 -40.74	NO	HAZARDS	CATALOGED		
3 -37.93	NO	HAZARDS	CATALOGED		
4 -35.13	NO	HAZARDS	CATALOGED		
5 -32.31	NO	HAZARDS	CATALOGED		
6 -29.50	1.37	1.19	-0.67	-0.37	Step hazard
7 -26.69	1.33	1.18	-0.60	-0.37	Step hazard
	1.53	1.39	-0.70	-0.03	Step hazard
8 -23.88	1.33	1.21	-0.54	-0.38	Step hazard
	1.33	1.21	-0.54	-0.38	Step hazard
	1.33	1.21	-0.54	-0.38	Step hazard
	1.37	1.25	-0.55	-0.36	Step hazard
	1.41	1.29	-0.57	-0.34	Step hazard
9 -21.08	1.33	1.24	-0.48	-0.38	Step hazard
	1.33	1.24	-0.48	-0.38	Step hazard
	1.33	1.24	-0.48	-0.38	Step hazard
10 -18.26	1.33	1.26	-0.42	-0.38	Step hazard
	1.33	1.26	-0.42	-0.38	Step hazard
	1.33	1.26	-0.42	-0.38	Step hazard
	1.37	1.30	-0.43	-0.36	Step hazard
11 -15.45	1.29	1.24	-0.34	-0.37	Step hazard
	1.29	1.24	-0.34	-0.37	Step hazard
	1.29	1.24	-0.34	-0.37	Step hazard
	1.33	1.28	-0.35	-0.37	Step hazard
	1.96	1.89	-0.52	0.01	Step hazard
12 -12.64	1.29	1.26	-0.28	-0.37	Step hazard
	1.29	1.26	-0.28	-0.37	Step hazard
	1.29	1.26	-0.28	-0.37	Step hazard
	1.32	1.29	-0.29	-0.30	Step hazard
13 -9.84	1.32	1.30	-0.23	-0.30	Step hazard
	1.32	1.30	-0.23	-0.30	Step hazard
	1.37	1.35	-0.23	-0.08	Step hazard
14 -7.02	1.29	1.28	-0.16	-0.37	Step hazard
	1.29	1.28	-0.16	-0.37	Step hazard
	1.29	1.28	-0.16	-0.37	Step hazard
	1.32	1.31	-0.16	-0.30	Step hazard
	1.96	1.94	-0.24	0.00	Step hazard
15 -4.22	1.29	1.29	-0.09	-0.37	Step hazard
	1.29	1.29	-0.09	-0.37	Step hazard
	1.29	1.29	-0.09	-0.37	Step hazard
16 -1.41	1.29	1.29	-0.03	-0.37	Step hazard
	1.29	1.29	-0.03	-0.37	Step hazard
	1.29	1.29	-0.03	-0.37	Step hazard
	1.32	1.32	-0.03	-0.30	Step hazard
	1.50	1.50	-0.04	0.05	Crosspath hazard
	1.75	1.75	-0.04	0.01	Crosspath hazard
	1.88	1.88	-0.05	0.01	Step hazard
	2.00	2.00	-0.05	0.01	Crosspath hazard
17 1.40	NO	HAZARDS	CATALOGED		
18 4.21	NO	HAZARDS	CATALOGED		
19 7.02	NO	HAZARDS	CATALOGED		
20 9.83	NO	HAZARDS	CATALOGED		
21 12.64	NO	HAZARDS	CATALOGED		
22 15.45	NO	HAZARDS	CATALOGED		
23 18.26	NO	HAZARDS	CATALOGED		
24 21.07	NO	HAZARDS	CATALOGED		
25 23.88	NO	HAZARDS	CATALOGED		
26 26.69	NO	HAZARDS	CATALOGED		
27 29.50	NO	HAZARDS	CATALOGED		
28 32.31	NO	HAZARDS	CATALOGED		
29 35.12	NO	HAZARDS	CATALOGED		
30 37.93	NO	HAZARDS	CATALOGED		
31 40.74	NO	HAZARDS	CATALOGED		
32 43.55	NO	HAZARDS	CATALOGED		

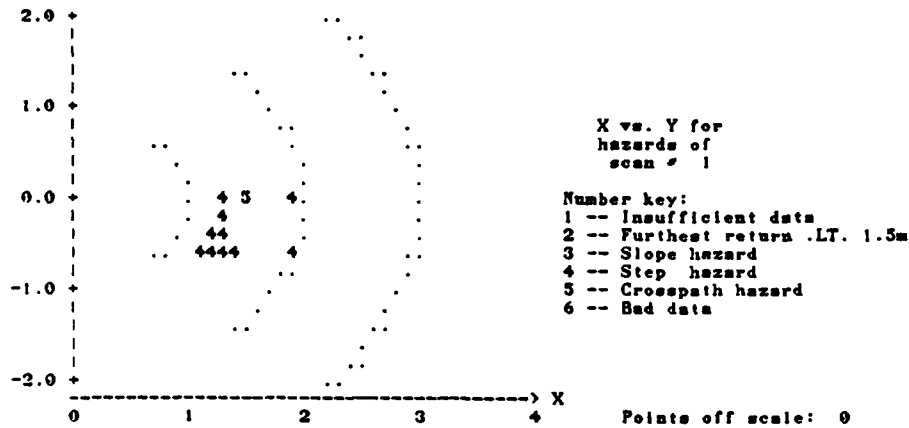
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== MODEL PARAMETERS ==
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1 -43.56	NO	HAZARDS		CATALOGED	
2 -40.74	NO	HAZARDS		CATALOGED	
3 -37.93	NO	HAZARDS		CATALOGED	
4 -35.13	NO	HAZARDS		CATALOGED	
5 -32.31	NO	HAZARDS		CATALOGED	
6 -29.50	1.37	1.19	-0.67	-0.37	Step hazard
7 -26.69	1.33	1.18	-0.60	-0.37	Step hazard
	1.37	1.22	-0.61	-0.36	Step hazard
8 -23.88	1.33	1.21	-0.54	-0.38	Step hazard
	1.41	1.29	-0.57	-0.34	Step hazard
	1.41	1.29	-0.57	-0.34	Step hazard
9 -21.08	1.33	1.24	-0.48	-0.38	Step hazard
	1.33	1.24	-0.48	-0.38	Step hazard
	1.33	1.24	-0.48	-0.38	Step hazard
	1.33	1.24	-0.48	-0.38	Step hazard
10 -18.26	1.29	1.22	-0.40	-0.37	Step hazard
	1.29	1.22	-0.40	-0.37	Step hazard
	1.33	1.26	-0.42	-0.37	Step hazard
	1.37	1.30	-0.43	-0.29	Step hazard
	1.29	1.24	-0.34	-0.37	Step hazard
	1.29	1.24	-0.34	-0.37	Step hazard
	1.33	1.28	-0.35	-0.37	Step hazard
12 -12.64	1.96	1.89	-0.52	0.01	Step hazard
	1.29	1.26	-0.28	-0.37	Step hazard
	1.29	1.26	-0.28	-0.37	Step hazard
	1.29	1.26	-0.28	-0.37	Step hazard
	1.33	1.29	-0.29	-0.37	Step hazard
13 -9.84	1.32	1.30	-0.23	-0.30	Step hazard
	1.32	1.30	-0.23	-0.30	Step hazard
	1.37	1.35	-0.23	-0.08	Step hazard
	1.96	1.93	-0.33	0.00	Step hazard
14 -7.02	1.29	1.28	-0.16	-0.37	Step hazard
	1.29	1.28	-0.16	-0.37	Step hazard
	1.29	1.28	-0.16	-0.37	Step hazard
	1.32	1.31	-0.16	-0.30	Step hazard
15 -4.22	1.29	1.29	-0.09	-0.37	Step hazard
	1.29	1.29	-0.09	-0.37	Step hazard
	1.29	1.29	-0.09	-0.37	Step hazard
16 -1.41	1.29	1.29	-0.03	-0.37	Step hazard
	1.29	1.29	-0.03	-0.37	Step hazard
	1.29	1.29	-0.03	-0.37	Step hazard
	1.33	1.32	-0.03	-0.37	Step hazard
	1.50	1.50	-0.04	0.05	Crosspath hazard
	1.73	1.73	-0.04	0.01	Crosspath hazard
	1.88	1.88	-0.03	0.02	Step hazard
17 1.40	NO	HAZARDS		CATALOGED	
18 4.21	NO	HAZARDS		CATALOGED	
19 7.02	NO	HAZARDS		CATALOGED	
20 9.83	NO	HAZARDS		CATALOGED	
21 12.64	NO	HAZARDS		CATALOGED	
22 15.45	NO	HAZARDS		CATALOGED	
23 18.26	NO	HAZARDS		CATALOGED	
24 21.07	NO	HAZARDS		CATALOGED	
25 23.88	NO	HAZARDS		CATALOGED	
26 26.69	NO	HAZARDS		CATALOGED	
27 29.50	NO	HAZARDS		CATALOGED	
28 32.31	NO	HAZARDS		CATALOGED	
29 35.12	NO	HAZARDS		CATALOGED	
30 37.93	NO	HAZARDS		CATALOGED	
31 40.74	NO	HAZARDS		CATALOGED	
32 43.55	NO	HAZARDS		CATALOGED	

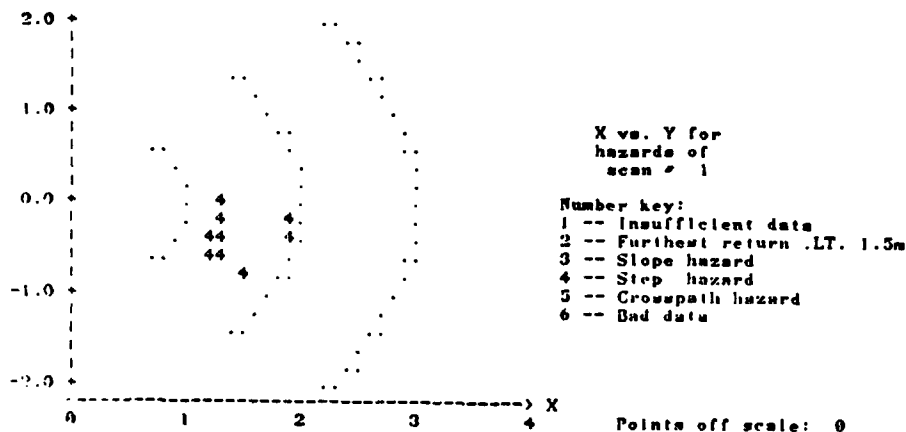
** MODEL1 PARAMETERS **
 HEIGHT FILTER COEFFICIENT * 0.25
 SLOPE FILTER COEFFICIENT * 0.90
 LEVEL GROUND STEP THRESHOLD * 0.25 METERS
 SLOPE THRESHOLD * 30.00 DEGREES



AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S	C A T A L O G E D		
2	-40.74	NO	H A Z A R D S	C A T A L O G E D		
3	-37.93	NO	H A Z A R D S	C A T A L O G E D		
4	-35.13	NO	H A Z A R D S	C A T A L O G E D		
5	-32.31	NO	H A Z A R D S	C A T A L O G E D		
6	-29.50	1.29	1.12	-0.63	-0.37	Step hazard
7	-26.69	1.33	1.18	-0.60	-0.37	Step hazard
		1.55	1.39	-0.70	-0.93	Step hazard
8	-23.88	1.33	1.21	-0.54	-0.38	Step hazard
		1.41	1.29	-0.57	-0.34	Step hazard
		1.41	1.29	-0.57	-0.34	Step hazard
9	-21.08	1.33	1.24	-0.48	-0.38	Step hazard
		1.33	1.24	-0.48	-0.38	Step hazard
		1.33	1.24	-0.48	-0.38	Step hazard
		1.41	1.31	-0.51	-0.28	Step hazard
10	-18.26	1.29	1.22	-0.40	-0.37	Step hazard
		1.29	1.22	-0.40	-0.37	Step hazard
		1.33	1.26	-0.42	-0.37	Step hazard
		1.37	1.30	-0.43	-0.36	Step hazard
		2.04	1.93	-0.64	-0.01	Step hazard
11	-15.45	1.29	1.24	-0.34	-0.37	Step hazard
		1.29	1.24	-0.34	-0.37	Step hazard
		1.29	1.24	-0.34	-0.37	Step hazard
		1.33	1.28	-0.35	-0.37	Step hazard
		1.96	1.89	-0.32	0.01	Step hazard
12	-12.64	1.33	1.29	-0.29	-0.38	Step hazard
		1.33	1.29	-0.29	-0.38	Step hazard
		1.33	1.29	-0.29	-0.38	Step hazard
		1.33	1.29	-0.29	-0.38	Step hazard
13	-9.84	1.33	1.31	-0.23	-0.38	Step hazard
		1.33	1.31	-0.23	-0.38	Step hazard
		1.33	1.31	-0.23	-0.38	Step hazard
		1.33	1.31	-0.23	-0.38	Step hazard
14	-7.02	1.29	1.28	-0.16	-0.37	Step hazard
		1.29	1.28	-0.16	-0.37	Step hazard
		1.29	1.28	-0.16	-0.37	Step hazard
		1.32	1.31	-0.16	-0.30	Step hazard
15	-4.22	1.29	1.29	-0.09	-0.37	Step hazard
		1.29	1.29	-0.09	-0.37	Step hazard
		1.29	1.29	-0.09	-0.37	Step hazard
16	-1.41	1.33	1.32	-0.03	-0.38	Step hazard
		1.33	1.32	-0.03	-0.38	Step hazard
		1.33	1.32	-0.03	-0.38	Step hazard
		1.33	1.32	-0.03	-0.38	Step hazard
		1.30	1.30	-0.04	0.03	Crosspath hazard
		1.88	1.88	-0.05	0.00	Step hazard
17	1.40	NO	H A Z A R D S	C A T A L O G E D		
18	4.21	NO	H A Z A R D S	C A T A L O G E D		
19	7.02	NO	H A Z A R D S	C A T A L O G E D		
20	9.83	NO	H A Z A R D S	C A T A L O G E D		
21	12.64	NO	H A Z A R D S	C A T A L O G E D		
22	15.45	NO	H A Z A R D S	C A T A L O G E D		
23	18.26	NO	H A Z A R D S	C A T A L O G E D		
24	21.07	NO	H A Z A R D S	C A T A L O G E D		
25	23.88	NO	H A Z A R D S	C A T A L O G E D		
26	26.69	NO	H A Z A R D S	C A T A L O G E D		
27	29.50	NO	H A Z A R D S	C A T A L O G E D		
28	32.31	NO	H A Z A R D S	C A T A L O G E D		
29	35.12	NO	H A Z A R D S	C A T A L O G E D		
30	37.93	NO	H A Z A R D S	C A T A L O G E D		
31	40.74	NO	H A Z A R D S	C A T A L O G E D		
32	43.55	NO	H A Z A R D S	C A T A L O G E D		

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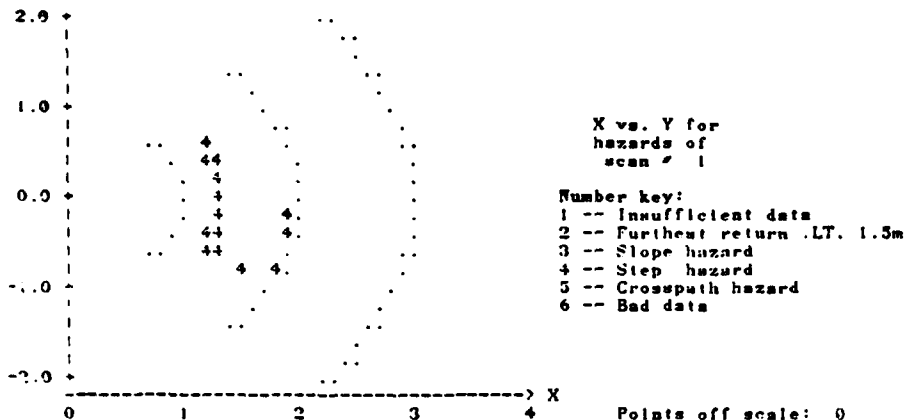
** MODEL1 PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1 -43.56	NO	HAZARDS	CATALOGED		
2 -40.74	NO	HAZARDS	CATALOGED		
3 -37.93	NO	HAZARDS	CATALOGED		
4 -35.13	NO	HAZARDS	CATALOGED		
5 -32.31	NO	HAZARDS	CATALOGED		
6 -29.50	1.33	1.15	-0.63	-0.37	Step hazard
7 -26.69	1.33	1.18	-0.60	-0.38	Step hazard
	1.33	1.10	-0.60	-0.38	Step hazard
	1.33	1.10	-0.60	-0.38	Step hazard
	1.41	1.26	-0.63	-0.34	Step hazard
	1.41	1.26	-0.63	-0.34	Step hazard
	1.72	1.53	-0.77	0.01	Step hazard
8 -23.88	1.33	1.21	-0.54	-0.38	Step hazard
	1.33	1.21	-0.54	-0.38	Step hazard
	1.33	1.21	-0.54	-0.38	Step hazard
	1.41	1.29	-0.57	-0.34	Step hazard
	1.41	1.29	-0.57	-0.34	Step hazard
9 -21.08	1.29	1.20	-0.46	-0.37	Step hazard
	1.29	1.20	-0.46	-0.37	Step hazard
	1.33	1.24	-0.48	-0.37	Step hazard
	1.37	1.27	-0.49	-0.29	Step hazard
10 -18.26	1.29	1.22	-0.40	-0.37	Step hazard
	1.29	1.22	-0.40	-0.37	Step hazard
	1.33	1.26	-0.42	-0.37	Step hazard
11 -15.45	1.33	1.28	-0.35	-0.38	Step hazard
	1.33	1.28	-0.35	-0.38	Step hazard
	1.33	1.28	-0.35	-0.38	Step hazard
12 -12.64	1.33	1.29	-0.29	-0.38	Step hazard
	1.33	1.29	-0.29	-0.38	Step hazard
	1.33	1.29	-0.29	-0.38	Step hazard
	1.33	1.29	-0.29	-0.38	Step hazard
13 -9.04	1.29	1.27	-0.22	-0.37	Step hazard
	1.29	1.27	-0.22	-0.37	Step hazard
	1.29	1.27	-0.22	-0.37	Step hazard
	1.32	1.30	-0.33	-0.30	Step hazard
	1.88	1.85	-0.32	0.03	Step hazard
14 -7.02	1.29	1.20	-0.16	-0.37	Step hazard
	1.29	1.28	-0.16	-0.37	Step hazard
	1.29	1.20	-0.16	-0.37	Step hazard
15 -4.22	1.33	1.32	-0.10	-0.38	Step hazard
	1.33	1.32	-0.10	-0.38	Step hazard
	1.33	1.32	-0.10	-0.38	Step hazard
	1.33	1.32	-0.10	-0.38	Step hazard
	1.88	1.07	-0.14	0.00	Step hazard
16 -1.41	NO	HAZARDS	CATALOGED		
17 1.40	NO	HAZARDS	CATALOGED		
18 4.21	NO	HAZARDS	CATALOGED		
19 7.02	NO	HAZARDS	CATALOGED		
20 9.83	NO	HAZARDS	CATALOGED		
21 12.64	NO	HAZARDS	CATALOGED		
22 15.45	NO	HAZARDS	CATALOGED		
23 18.26	NO	HAZARDS	CATALOGED		
24 21.07	NO	HAZARDS	CATALOGED		
25 23.88	NO	HAZARDS	CATALOGED		
26 26.69	NO	HAZARDS	CATALOGED		
27 29.50	NO	HAZARDS	CATALOGED		
28 32.31	NO	HAZARDS	CATALOGED		
29 35.12	NO	HAZARDS	CATALOGED		
30 37.93	NO	HAZARDS	CATALOGED		
31 40.74	NO	HAZARDS	CATALOGED		
32 43.55	NO	HAZARDS	CATALOGED		

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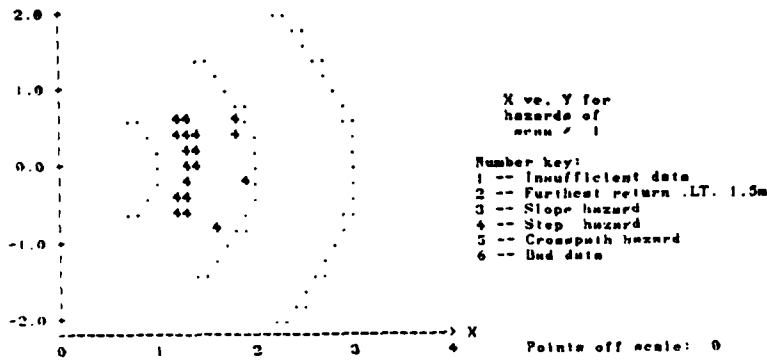
**** MODEL PARAMETERS ****
 HEIGHT FILTER COEFFICIENT * 0.25
 SLOPE FILTER COEFFICIENT * 0.90
 LEVEL GROUND STEP THRESHOLD * 0.25 METERS
 SLOPE THRESHOLD * 30.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.36	N O	H A Z A R D S	C A T A L O G E D	
2	-40.74	N O	H A Z A R D S	C A T A L O G E D	
3	-37.93	N O	H A Z A R D S	C A T A L O G E D	
4	-35.13	N O	H A Z A R D S	C A T A L O G E D	
5	-32.36	N O	H A Z A R D S	C A T A L O G E D	
6	-29.50	1.33	1.15 -0.65	-0.38	Step hazard
7	-26.69	1.45	1.29 -0.65	-0.32	Step hazard
		1.72	1.53 -0.77	0.01	Step hazard
8	-23.88	1.33	1.21 -0.54	-0.38	Step hazard
		1.33	1.21 -0.54	-0.38	Step hazard
		1.41	1.29 -0.57	-0.35	Step hazard
		1.41	1.29 -0.57	-0.35	Step hazard
		1.96	1.79 -0.79	0.01	Step hazard
9	-21.08	1.29	1.20 -0.46	-0.37	Step hazard
		1.29	1.20 -0.46	-0.37	Step hazard
		1.33	1.24 -0.48	-0.37	Step hazard
		1.37	1.27 -0.49	-0.29	Step hazard
10	-18.26	1.33	1.26 -0.42	-0.38	Step hazard
		1.33	1.26 -0.42	-0.38	Step hazard
		1.33	1.26 -0.42	-0.38	Step hazard
		1.37	1.30 -0.43	-0.36	Step hazard
11	-15.45	1.33	1.28 -0.35	-0.38	Step hazard
		1.33	1.28 -0.35	-0.38	Step hazard
		1.36	1.31 -0.36	-0.22	Step hazard
12	-12.64	1.29	1.26 -0.28	-0.37	Step hazard
		1.29	1.26 -0.28	-0.37	Step hazard
		1.29	1.26 -0.28	-0.37	Step hazard
		1.32	1.29 -0.29	-0.30	Step hazard
		1.96	1.91 -0.43	0.00	Step hazard
13	-9.84	1.29	1.27 -0.22	-0.37	Step hazard
		1.29	1.27 -0.22	-0.37	Step hazard
		1.29	1.27 -0.22	-0.37	Step hazard
14	-7.02	1.29	1.28 -0.16	-0.37	Step hazard
		1.29	1.28 -0.16	-0.37	Step hazard
		1.29	1.28 -0.16	-0.37	Step hazard
		1.33	1.32 -0.16	-0.37	Step hazard
15	-4.22	1.33	1.32 -0.10	-0.38	Step hazard
		1.33	1.32 -0.10	-0.38	Step hazard
		1.33	1.32 -0.10	-0.38	Step hazard
		1.33	1.32 -0.10	-0.38	Step hazard
		1.33	1.32 -0.10	-0.38	Step hazard
		1.88	1.87 -0.14	0.01	Step hazard
16	-1.41	1.33	1.32 -0.03	-0.38	Step hazard
17	1.40	1.29	1.29 0.03	-0.37	Step hazard
18	4.31	1.33	1.32 0.10	-0.38	Step hazard
19	7.02	1.33	1.32 0.16	-0.38	Step hazard
20	9.83	1.33	1.31 0.23	-0.38	Step hazard
21	12.64	1.33	1.29 0.29	-0.38	Step hazard
22	15.45	1.37	1.32 0.36	-0.37	Step hazard
23	18.26	1.37	1.30 0.43	-0.37	Step hazard
24	21.07	1.33	1.24 0.48	-0.38	Step hazard
25	23.88	1.29	1.18 0.52	-0.37	Step hazard
26	26.69	N O	H A Z A R D S	C A T A L O G E D	
27	29.50	N O	H A Z A R D S	C A T A L O G E D	
28	32.31	N O	H A Z A R D S	C A T A L O G E D	
29	35.12	N O	H A Z A R D S	C A T A L O G E D	
30	37.93	N O	H A Z A R D S	C A T A L O G E D	
31	40.74	N O	H A Z A R D S	C A T A L O G E D	
32	43.55	N O	H A Z A R D S	C A T A L O G E D	

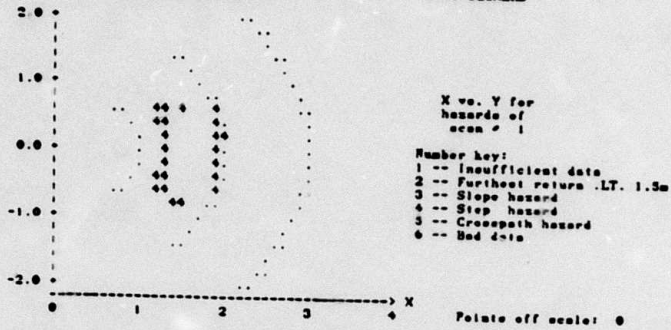
Input file: RDL.TWO.14.12
 File Creation Date : SUN, AUG 07 1983 System time 00:16:34

== MODEL PARAMETERS ==
 HEIGHT FILTER COEFFICIENT * 0.25
 SLOPE FILTER COEFFICIENT * 0.30
 LEVEL GROUND STEP THRESHOLD * 0.25 METERS
 SLOPE THRESHOLD * 30.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE	
1	-43.56	N O	H A Z A R D S	C A T A L O G E D		
2	-40.74	N O	H A Z A R D S	C A T A L O G E D		
3	-37.93	N O	H A Z A R D S	C A T A L O G E D		
4	-35.13	N O	H A Z A R D S	C A T A L O G E D		
5	-32.31	N O	H A Z A R D S	C A T A L O G E D		
6	-29.50	1.37	1.19	-0.67	-0.37	Step hazard
7	-26.69	1.45	1.29	-0.63	-0.32	Step hazard
8	-23.88	1.29	1.18	-0.52	-0.37	Step hazard
		1.33	1.21	-0.54	-0.37	Step hazard
		1.37	1.25	-0.55	-0.36	Step hazard
		1.41	1.29	-0.57	-0.34	Step hazard
		1.76	1.61	-0.71	0.07	Step hazard
9	-21.08	1.29	1.20	-0.46	-0.37	Step hazard
		1.29	1.20	-0.46	-0.37	Step hazard
		1.33	1.24	-0.48	-0.37	Step hazard
		1.37	1.27	-0.49	-0.29	Step hazard
10	-18.26	1.33	1.26	-0.42	-0.38	Step hazard
		1.33	1.26	-0.42	-0.38	Step hazard
		1.33	1.26	-0.42	-0.38	Step hazard
11	-15.45	1.33	1.28	-0.35	-0.38	Step hazard
		1.33	1.28	-0.35	-0.38	Step hazard
		1.33	1.28	-0.35	-0.38	Step hazard
12	-12.64	1.29	1.26	-0.28	-0.37	Step hazard
		1.29	1.26	-0.28	-0.37	Step hazard
		1.29	1.26	-0.28	-0.37	Step hazard
		1.32	1.29	-0.29	-0.30	Step hazard
13	-9.84	1.29	1.27	-0.22	-0.37	Step hazard
		1.29	1.27	-0.22	-0.37	Step hazard
		1.29	1.27	-0.22	-0.37	Step hazard
		1.32	1.30	-0.23	-0.30	Step hazard
14	-7.02	1.33	1.32	-0.16	-0.38	Step hazard
		1.33	1.32	-0.16	-0.38	Step hazard
		1.33	1.32	-0.16	-0.38	Step hazard
		1.96	1.94	-0.24	0.00	Step hazard
15	-4.22	1.33	1.32	-0.10	-0.38	Step hazard
		1.33	1.32	-0.10	-0.38	Step hazard
		1.33	1.32	-0.10	-0.38	Step hazard
16	-1.41	1.29	1.29	-0.03	-0.37	Step hazard
		1.29	1.29	-0.03	-0.37	Step hazard
		1.29	1.29	-0.03	-0.37	Step hazard
17	1.40	1.29	1.29	0.03	-0.37	Step hazard
		1.37	1.37	0.03	-0.36	Step hazard
18	4.21	1.33	1.32	0.10	-0.38	Step hazard
		1.37	1.36	0.10	-0.36	Step hazard
19	7.02	1.33	1.32	0.16	-0.38	Step hazard
		1.37	1.36	0.17	-0.36	Step hazard
20	9.03	1.29	1.27	0.22	-0.37	Step hazard
		1.37	1.35	0.23	-0.36	Step hazard
21	12.64	1.29	1.25	0.28	-0.37	Step hazard
		1.37	1.33	0.30	-0.36	Step hazard
		1.88	1.83	0.41	-0.00	Step hazard
22	15.45	1.33	1.28	0.35	-0.38	Step hazard
		1.37	1.32	0.36	-0.36	Step hazard
		1.45	1.39	0.39	-0.32	Step hazard
23	18.26	1.33	1.26	0.42	-0.38	Step hazard
		1.37	1.30	0.43	-0.36	Step hazard
		1.45	1.37	0.45	-0.32	Step hazard
24	21.07	1.29	1.20	0.46	-0.37	Step hazard
		1.37	1.27	0.49	-0.36	Step hazard
		1.45	1.33	0.52	-0.32	Step hazard
		1.88	1.73	0.68	-0.00	Step hazard
25	23.88	1.29	1.18	0.52	-0.37	Step hazard
		1.37	1.25	0.55	-0.36	Step hazard
		1.45	1.32	0.59	-0.32	Step hazard
26	26.69	N O	H A Z A R D S	C A T A L O G E D		
27	29.50	1.37	1.19	-0.67	-0.37	Step hazard
28	32.31	N O	H A Z A R D S	C A T A L O G E D		
29	35.12	N O	H A Z A R D S	C A T A L O G E D		
30	37.93	N O	H A Z A R D S	C A T A L O G E D		
31	40.74	N O	H A Z A R D S	C A T A L O G E D		
32	43.55	N O	H A Z A R D S	C A T A L O G E D		

== MODEL PARAMETERS ==
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



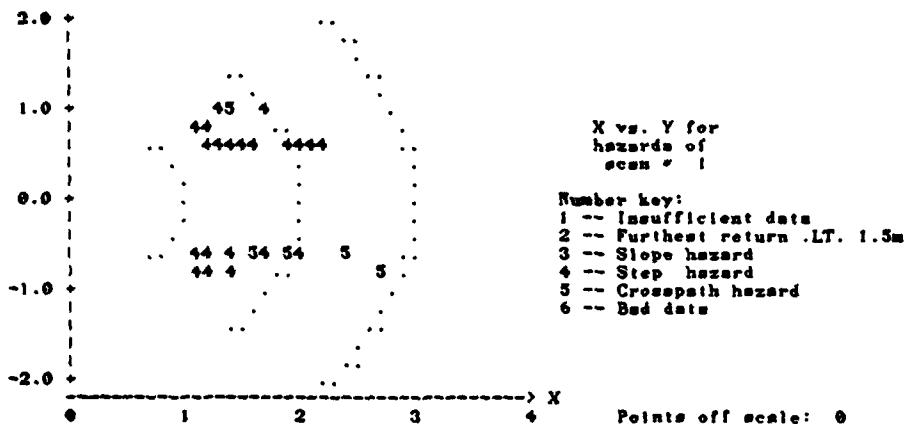
AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.36	N O	H A Z A R D S	C A T A L O G E D	
2	-40.74	N O	H A Z A R D S	C A T A L O G E D	
3	-37.93	N O	H A Z A R D S	C A T A L O G E D	
4	-35.13	N O	H A Z A R D S	C A T A L O G E D	
5	-32.31	N O	H A Z A R D S	C A T A L O G E D	
6	-29.50	1.33	1.13	-0.43	Step hazard
		1.33	1.13	-0.43	Step hazard
		1.33	1.19	-0.47	Step hazard
		1.40	1.39	-0.79	Step hazard
7	-26.69	1.29	1.13	-0.38	Step hazard
		1.33	1.18	-0.40	Step hazard
		1.37	1.22	-0.41	Step hazard
		1.41	1.26	-0.43	Step hazard
		1.72	1.53	-0.77	Step hazard
8	-23.88	1.29	1.18	-0.32	Step hazard
		1.29	1.10	-0.32	Step hazard
		1.33	1.21	-0.34	Step hazard
		1.37	1.23	-0.35	Step hazard
9	-21.08	1.33	1.24	-0.40	Step hazard
		1.33	1.24	-0.40	Step hazard
		1.33	1.24	-0.40	Step hazard
10	-18.26	1.33	1.24	-0.42	Step hazard
		1.33	1.24	-0.42	Step hazard
		1.29	1.24	-0.34	Step hazard
11	-15.45	1.29	1.24	-0.34	Step hazard
		1.29	1.24	-0.34	Step hazard
		1.32	1.28	-0.33	Step hazard
12	-12.64	1.96	1.89	-0.32	Step hazard
		1.29	1.26	-0.28	Step hazard
		1.29	1.24	-0.28	Step hazard
13	-9.84	1.29	1.26	-0.28	Step hazard
		1.33	1.31	-0.23	Step hazard
		1.33	1.31	-0.23	Step hazard
		1.33	1.31	-0.23	Step hazard
14	-7.02	1.96	1.93	-0.33	Step hazard
		1.33	1.32	-0.16	Step hazard
		1.33	1.32	-0.16	Step hazard
		1.33	1.32	-0.16	Step hazard
		1.33	1.32	-0.16	Step hazard
15	-4.22	1.88	1.87	-0.23	Step hazard
		1.29	1.29	-0.09	Step hazard
		1.29	1.29	-0.09	Step hazard
16	-1.41	1.29	1.29	-0.09	Step hazard
		1.29	1.29	-0.09	Step hazard
17	1.40	1.33	1.32	0.03	Step hazard
		1.33	1.32	0.03	Step hazard
		1.33	1.32	0.03	Step hazard
18	4.21	1.88	1.88	0.03	Step hazard
		1.33	1.32	0.10	Step hazard
		1.33	1.32	0.10	Step hazard
		1.33	1.32	0.10	Step hazard
19	7.02	1.96	1.93	0.14	Step hazard
		1.29	1.28	0.16	Step hazard
		1.29	1.28	0.16	Step hazard
		1.32	1.31	0.16	Step hazard
20	9.83	1.96	1.94	0.24	Step hazard
		1.29	1.27	0.22	Step hazard
		1.29	1.27	0.22	Step hazard
		1.32	1.30	0.23	Step hazard
21	12.64	1.33	1.29	0.29	Step hazard
		1.33	1.29	0.29	Step hazard
		1.33	1.29	0.29	Step hazard
22	15.45	1.96	1.91	0.43	Step hazard
		1.33	1.28	0.35	Step hazard
		1.33	1.28	0.35	Step hazard
23	18.26	1.33	1.28	0.35	Step hazard
		1.33	1.26	0.42	Step hazard
		1.33	1.26	0.42	Step hazard
		1.37	1.38	0.43	Step hazard
24	21.07	2.04	1.93	0.64	Step hazard
		1.29	1.20	0.44	Step hazard
		1.33	1.24	0.48	Step hazard
25	23.88	1.37	1.27	0.49	Step hazard
		1.33	1.21	0.34	Step hazard
		1.41	1.29	0.37	Step hazard
		1.43	1.31	0.47	Step hazard
26	26.69	1.33	1.18	0.60	Step hazard
27	29.50	N O	H A Z A R D S	C A T A L O G E D	
28	32.31	N O	H A Z A R D S	C A T A L O G E D	
29	35.12	N O	H A Z A R D S	C A T A L O G E D	
30	37.93	N O	H A Z A R D S	C A T A L O G E D	
31	40.74	N O	H A Z A R D S	C A T A L O G E D	
32	43.55	N O	H A Z A R D S	C A T A L O G E D	

7.2.4 Parallel Obstacles Test Results

7.2.4.1	Path Width: 100 cm	185
7.2.4.2	Path Width: 110 cm	186
7.2.4.3	Path Width: 120 cm	187
7.2.4.4	Path Width: 130 cm	188
7.2.4.5	Path Width: 140 cm	189
7.2.4.6	Path Width: 150 cm	190

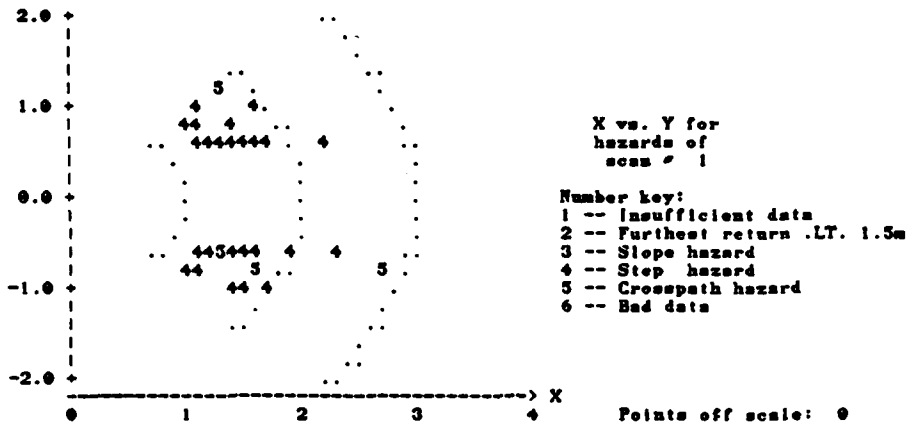
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 File Creation Date: WED, AUG 10 1983 System time 19:27:37

*** MODEL PARAMETERS ***
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.36	NO	HAZARDS	CATALOGUED	
2	-40.74	NO	HAZARDS	CATALOGUED	
3	-37.93	NO	HAZARDS	CATALOGUED	
4	-35.13	1.37	1.12	-0.79	Step hazard
5	-32.31	1.29	1.09	-0.69	Step hazard
		1.41	1.19	-0.75	Step hazard
		1.41	1.19	-0.73	Step hazard
		1.65	1.40	-0.88	Step hazard
6	-29.30	1.33	1.13	-0.65	Step hazard
		1.33	1.13	-0.65	Step hazard
		1.33	1.13	-0.65	Step hazard
		1.33	1.13	-0.65	Step hazard
7	-26.69	1.33	1.18	-0.60	Step hazard
		1.33	1.18	-0.60	Step hazard
		1.33	1.13	-0.60	Step hazard
8	-23.00	1.29	1.18	-0.52	Step hazard
		1.29	1.18	-0.52	Step hazard
		1.33	1.21	-0.54	Step hazard
		1.37	1.25	-0.55	Step hazard
		1.50	1.37	-0.61	Crosspath hazard
9	-21.08	1.55	1.44	-0.56	Step hazard
		1.72	1.60	-0.62	Step hazard
		1.75	1.63	-0.63	Crosspath hazard
10	-18.26	1.84	1.74	-0.58	Step hazard
		2.00	1.90	-0.63	Crosspath hazard
11	-15.45	2.09	2.01	-0.56	Step hazard
		2.50	2.41	-0.67	Crosspath hazard
		2.75	2.65	-0.73	Crosspath hazard
12	-12.64	NO	HAZARDS	CATALOGUED	
13	-9.84	NO	HAZARDS	CATALOGUED	
14	-7.02	NO	HAZARDS	CATALOGUED	
15	-4.22	NO	HAZARDS	CATALOGUED	
16	-1.41	NO	HAZARDS	CATALOGUED	
17	1.40	NO	HAZARDS	CATALOGUED	
18	4.21	NO	HAZARDS	CATALOGUED	
19	7.02	NO	HAZARDS	CATALOGUED	
20	9.83	NO	HAZARDS	CATALOGUED	
21	12.64	NO	HAZARDS	CATALOGUED	
22	15.45	2.09	2.01	0.56	Step hazard
		2.16	2.08	0.57	Step hazard
		2.29	2.21	0.61	Step hazard
23	18.26	1.97	1.87	0.62	Step hazard
		2.04	1.93	0.64	Step hazard
24	21.07	1.61	1.51	0.58	Step hazard
		1.71	1.60	0.61	Step hazard
25	23.88	1.51	1.38	0.61	Step hazard
26	26.69	1.33	1.18	0.60	Step hazard
		1.41	1.26	0.63	Step hazard
		1.41	1.26	0.63	Step hazard
27	29.50	1.33	1.13	0.63	Step hazard
		1.41	1.22	0.69	Step hazard
		1.41	1.22	0.69	Step hazard
		1.96	1.70	0.96	Step hazard
28	32.31	1.33	1.12	0.71	Step hazard
		1.41	1.19	0.73	Step hazard
		1.41	1.19	0.75	Step hazard
29	35.12	1.37	1.12	0.79	Step hazard
		1.41	1.15	0.81	Step hazard
		1.62	1.32	0.93	Step hazard
30	37.93	1.37	1.08	0.84	Step hazard
		1.75	1.38	1.00	Crosspath hazard
31	40.74	NO	HAZARDS	CATALOGUED	
32	43.55	NO	HAZARDS	CATALOGUED	

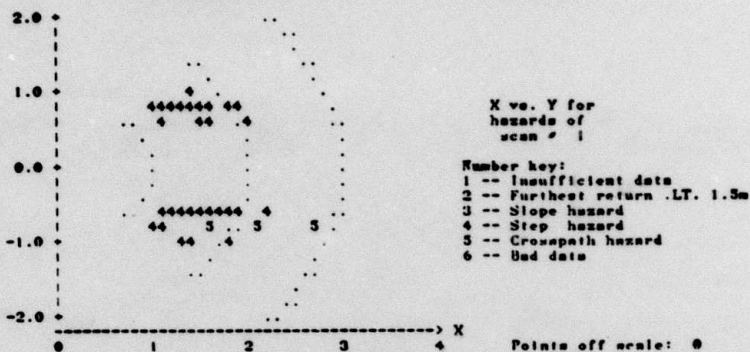
**** MODEL PARAMETERS ****
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE	
1	-43.56	NO	HAZARDS	CATALOGUED		
2	-40.74	1.33	1.00	-0.86	-0.38	Step hazard
3	-37.93	1.33	1.03	-0.81	-0.38	Step hazard
4	-35.13	1.29	1.03	-0.74	-0.37	Step hazard
		1.29	1.03	-0.74	-0.37	Step hazard
		1.37	1.12	-0.79	-0.28	Step hazard
		1.63	1.33	-0.93	0.02	Step hazard
5	-32.31	1.29	1.09	-0.69	-0.37	Step hazard
		1.29	1.09	-0.69	-0.37	Step hazard
		1.33	1.12	-0.71	-0.37	Step hazard
		1.72	1.43	-0.92	0.01	Step hazard
6	-29.50	1.33	1.13	-0.63	-0.38	Step hazard
		1.33	1.13	-0.63	-0.38	Step hazard
		1.33	1.13	-0.63	-0.38	Step hazard
		1.33	1.13	-0.63	-0.38	Step hazard
		1.96	1.70	-0.96	0.00	Step hazard
7	-26.69	1.33	1.18	-0.60	-0.38	Step hazard
		1.33	1.18	-0.60	-0.38	Step hazard
		1.37	1.22	-0.61	-0.36	Step hazard
		1.41	1.26	-0.63	-0.34	Step hazard
		1.41	1.26	-0.63	-0.34	Step hazard
		1.50	1.34	-0.67	0.03	Crosspath hazard
8	-23.88	1.51	1.38	-0.61	-0.25	Step hazard
		1.75	1.60	-0.71	0.00	Crosspath hazard
9	-21.08	1.61	1.51	-0.58	-0.38	Step hazard
		1.61	1.51	-0.58	-0.38	Step hazard
		1.64	1.53	-0.59	-0.37	Step hazard
		1.71	1.60	-0.61	-0.31	Step hazard
10	-18.26	1.97	1.87	-0.62	-0.20	Step hazard
11	-15.43	2.34	2.23	-0.62	-0.22	Step hazard
		2.73	2.65	-0.73	-0.09	Crosspath hazard
12	-12.64	NO	HAZARDS	CATALOGUED		
13	-9.84	NO	HAZARDS	CATALOGUED		
14	-7.02	NO	HAZARDS	CATALOGUED		
15	-4.22	NO	HAZARDS	CATALOGUED		
16	-1.41	NO	HAZARDS	CATALOGUED		
17	1.40	NO	HAZARDS	CATALOGUED		
18	4.21	NO	HAZARDS	CATALOGUED		
19	7.02	NO	HAZARDS	CATALOGUED		
20	9.83	NO	HAZARDS	CATALOGUED		
21	12.64	NO	HAZARDS	CATALOGUED		
22	15.45	2.29	2.21	0.61	-0.36	Step hazard
23	18.26	NO	HAZARDS	CATALOGUED		
24	21.07	1.86	1.73	0.67	-0.39	Step hazard
25	23.08	1.56	1.43	0.63	-0.32	Step hazard
		1.64	1.50	0.66	-0.35	Step hazard
		1.64	1.50	0.66	-0.35	Step hazard
		1.71	1.56	0.69	-0.31	Step hazard
26	26.69	1.41	1.26	0.63	-0.34	Step hazard
		1.56	1.40	0.70	-0.32	Step hazard
27	29.50	1.33	1.13	0.63	-0.38	Step hazard
		1.41	1.22	0.69	-0.34	Step hazard
28	32.31	1.29	1.09	0.69	-0.37	Step hazard
		1.29	1.09	0.69	-0.37	Step hazard
		1.33	1.12	0.71	-0.37	Step hazard
		1.80	1.59	1.00	0.00	Step hazard
29	35.12	1.29	1.03	0.74	-0.37	Step hazard
		1.33	1.08	0.76	-0.37	Step hazard
		1.61	1.13	0.81	-0.34	Step hazard
30	37.93	1.33	1.03	0.81	-0.38	Step hazard
		1.41	1.11	0.86	-0.34	Step hazard
31	40.74	1.37	1.03	0.89	-0.37	Step hazard
		1.41	1.07	0.92	-0.34	Step hazard
		1.75	1.33	1.14	-0.02	Crosspath hazard
32	43.55	NO	HAZARDS	CATALOGUED		

Input file: MDL.PATH.12
 File Creation Date : WED, AUG 10 1983 System time 19:17:03

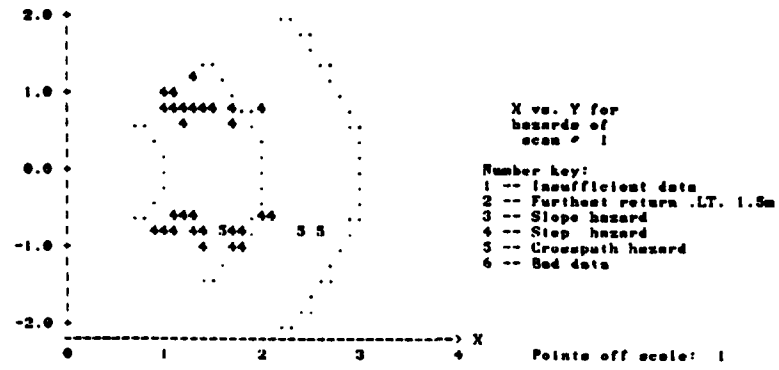
== MODEL PARAMETERS ==
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1 -43.36	1.33	1.00	-0.36	-0.38	Step hazard
2 -40.74	1.29	1.02	-0.79	-0.37	Step hazard
3 -37.91	1.33	1.05	-0.81	-0.37	Step hazard
	1.41	1.11	-0.86	-0.34	Step hazard
	1.65	1.30	-1.02	0.01	Step hazard
4 -33.13	1.29	1.03	-0.74	-0.37	Step hazard
	1.29	1.03	-0.74	-0.37	Step hazard
	1.29	1.03	-0.74	-0.37	Step hazard
	1.32	1.03	-0.76	-0.39	Step hazard
	1.72	1.40	-0.99	0.01	Step hazard
5 -32.31	1.29	1.09	-0.69	-0.37	Step hazard
	1.29	1.09	-0.69	-0.37	Step hazard
	1.29	1.09	-0.69	-0.37	Step hazard
	1.33	1.12	-0.71	-0.37	Step hazard
6 -29.50	1.33	1.13	-0.63	-0.38	Step hazard
	1.33	1.13	-0.63	-0.38	Step hazard
	1.33	1.13	-0.63	-0.38	Step hazard
	1.41	1.22	-0.69	-0.34	Step hazard
	2.06	1.80	-1.02	0.02	Step hazard
7 -26.69	1.33	1.13	-0.60	-0.37	Step hazard
	1.41	1.26	-0.63	-0.34	Step hazard
	1.41	1.26	-0.63	-0.34	Step hazard
	1.48	1.32	-0.66	-0.29	Step hazard
	1.75	1.56	-0.79	0.00	Crosspath hazard
8 -23.80	1.56	1.43	-0.63	-0.32	Step hazard
	1.64	1.50	-0.66	-0.33	Step hazard
	1.64	1.50	-0.66	-0.33	Step hazard
	1.71	1.56	-0.69	-0.31	Step hazard
9 -21.08	1.86	1.73	-0.67	-0.37	Step hazard
	2.25	2.10	-0.81	0.02	Crosspath hazard
10 -18.26	1.86	1.76	-0.53	-0.39	Step hazard
	1.97	1.87	-0.62	-0.20	Step hazard
11 -15.45	2.29	2.21	-0.61	-0.36	Step hazard
	2.75	2.65	-0.73	-0.09	Crosspath hazard
12 -12.64	NO	HAZARDS	CATALOGED		
13 -9.84	NO	HAZARDS	CATALOGED		
14 -7.02	NO	HAZARDS	CATALOGED		
15 -4.22	NO	HAZARDS	CATALOGED		
16 -1.41	NO	HAZARDS	CATALOGED		
17 1.40	NO	HAZARDS	CATALOGED		
18 4.21	NO	HAZARDS	CATALOGED		
19 7.02	NO	HAZARDS	CATALOGED		
20 9.83	NO	HAZARDS	CATALOGED		
21 12.64	NO	HAZARDS	CATALOGED		
22 15.45	NO	HAZARDS	CATALOGED		
23 18.26	2.09	1.98	0.63	-0.37	Step hazard
	2.16	2.03	0.68	-0.18	Step hazard
24 21.07	1.97	1.84	0.71	-0.20	Step hazard
	2.04	1.90	0.73	-0.06	Step hazard
25 23.88	1.61	1.48	0.63	-0.38	Step hazard
	1.71	1.56	0.69	-0.31	Step hazard
	1.77	1.61	0.71	-0.19	Step hazard
26 26.69	1.61	1.44	0.72	-0.38	Step hazard
	1.64	1.47	0.74	-0.37	Step hazard
27 29.50	1.57	1.36	0.71	-0.32	Step hazard
	1.51	1.32	0.74	-0.23	Step hazard
28 32.31	1.29	1.09	0.69	-0.37	Step hazard
	1.33	1.12	0.71	-0.37	Step hazard
	1.41	1.19	0.73	-0.34	Step hazard
	1.41	1.19	0.73	-0.34	Step hazard
29 35.12	1.29	1.03	0.74	-0.37	Step hazard
	1.29	1.03	0.74	-0.37	Step hazard
	1.33	1.08	0.76	-0.37	Step hazard
30 37.93	1.33	1.05	0.81	-0.38	Step hazard
	1.41	1.11	0.86	-0.34	Step hazard
	1.72	1.37	1.05	0.00	Step hazard
31 40.74	1.33	1.00	0.86	-0.28	Step hazard
32 43.55	NO	HAZARDS	CATALOGED		

Input file: MDL.PATH.13
 File Creation Date: WED, AUG 10 1983 System time 19:12:46

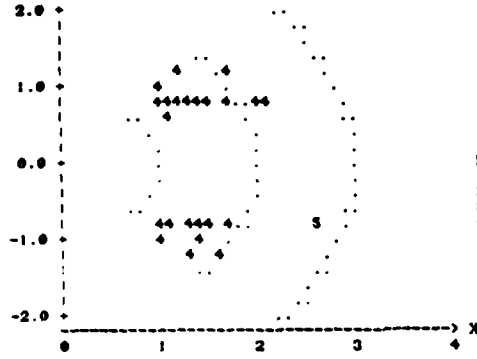
== MODEL PARAMETERS ==
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1 -43.36	1.29	0.93	-0.89	-0.37	Step hazard
2 -40.74	1.29	0.90	-0.84	-0.37	Step hazard
	1.37	1.01	-0.89	-0.28	Step hazard
	1.37	1.01	-0.89	-0.28	Step hazard
3 -37.93	0.00	0.00	0.00	0.74	Step hazard
	1.72	1.33	-1.06	0.00	Step hazard
4 -33.13	1.33	1.03	-0.76	-0.38	Step hazard
	1.33	1.03	-0.76	-0.38	Step hazard
	1.33	1.03	-0.76	-0.38	Step hazard
	1.33	1.03	-0.76	-0.38	Step hazard
5 -32.31	1.29	1.09	-0.69	-0.37	Step hazard
	1.29	1.09	-0.69	-0.37	Step hazard
	1.33	1.12	-0.71	-0.37	Step hazard
	1.50	1.27	-0.80	0.04	Crosspath hazard
	1.96	1.63	-1.03	0.00	Step hazard
6 -29.30	1.33	1.15	-0.63	-0.37	Step hazard
	1.37	1.19	-0.67	-0.36	Step hazard
	1.41	1.22	-0.69	-0.34	Step hazard
	1.48	1.29	-0.73	-0.29	Step hazard
	2.06	1.80	-1.02	0.02	Step hazard
7 -26.69	1.41	1.26	-0.63	-0.34	Step hazard
	1.56	1.40	-0.70	-0.32	Step hazard
	1.73	1.56	-0.79	0.00	Crosspath hazard
8 -23.88	1.84	1.68	-0.74	-0.11	Step hazard
9 -21.08	1.97	1.84	-0.71	-0.20	Step hazard
10 -18.26	2.09	1.98	-0.63	-0.37	Step hazard
	2.20	2.09	-0.69	-0.38	Step hazard
	2.30	2.37	-0.73	0.03	Crosspath hazard
	2.73	2.61	-0.86	-0.03	Crosspath hazard
11 -15.45	NO	HAZARDS			CATALOGUED
12 -12.64	NO	HAZARDS			CATALOGUED
13 -9.84	NO	HAZARDS			CATALOGUED
14 -7.02	NO	HAZARDS			CATALOGUED
15 -4.22	NO	HAZARDS			CATALOGUED
16 -1.41	NO	HAZARDS			CATALOGUED
17 1.40	NO	HAZARDS			CATALOGUED
18 4.21	NO	HAZARDS			CATALOGUED
19 7.02	NO	HAZARDS			CATALOGUED
20 9.83	NO	HAZARDS			CATALOGUED
21 12.64	NO	HAZARDS			CATALOGUED
22 15.45	NO	HAZARDS			CATALOGUED
23 18.26	NO	HAZARDS			CATALOGUED
24 21.07	1.86	1.73	0.67	-0.39	Step hazard
	2.14	1.99	0.77	-0.34	Step hazard
25 23.88	1.86	1.70	0.73	-0.39	Step hazard
26 26.69	1.61	1.44	0.72	-0.30	Step hazard
	1.64	1.47	0.74	-0.37	Step hazard
	1.71	1.53	0.77	-0.31	Step hazard
27 29.50	1.41	1.22	0.69	-0.34	Step hazard
	1.48	1.29	0.73	-0.29	Step hazard
	1.61	1.40	0.79	-0.38	Step hazard
	1.43	1.22	0.77	-0.32	Step hazard
	1.31	1.23	0.81	-0.25	Step hazard
28 32.31	1.37	1.12	0.79	-0.36	Step hazard
	1.41	1.13	0.81	-0.34	Step hazard
29 35.12	1.29	1.02	0.79	-0.37	Step hazard
	1.29	1.02	0.79	-0.37	Step hazard
	1.29	1.02	0.79	-0.37	Step hazard
	1.33	1.03	0.81	-0.37	Step hazard
30 37.93	1.33	1.09	0.86	-0.37	Step hazard
	1.41	1.07	0.92	-0.34	Step hazard
	1.41	1.07	0.92	-0.34	Step hazard
	1.72	1.30	1.12	0.01	Step hazard
31 40.74	1.37	0.99	0.94	-0.37	Step hazard
	1.41	1.02	0.97	-0.34	Step hazard
32 43.55	1.37	0.99	0.94	-0.37	Step hazard
	1.41	1.02	0.97	-0.34	Step hazard

Input file: HDL.PATH.14
File Creation Date: WED. AUG 10 1983 System time 10:07:04

== MODEL PARAMETERS ==
HEIGHT FILTER COEFFICIENT * 0.25
SLOPE FILTER COEFFICIENT * 0.90
LEVEL GROUND STEP THRESHOLD * 0.25 METERS
SLOPE THRESHOLD * 30.00 DEGREES



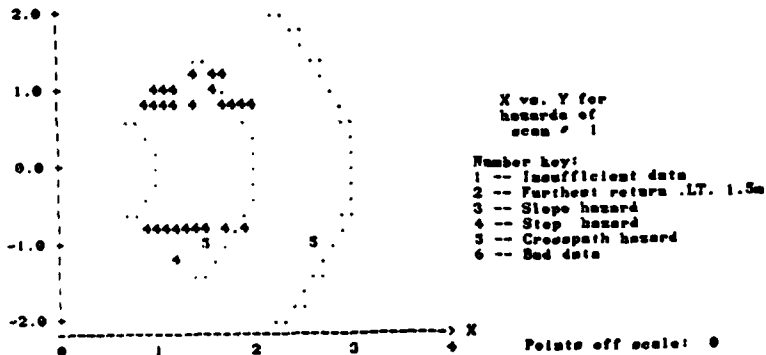
X vs. Y for hazard of class # 1
Number key:
1 -- insufficient data
2 -- Farthest return .LT. 1.5m
3 -- Slope hazard
4 -- Step hazard
5 -- Creospath hazard
6 -- Bad data

Points off scale: 0

AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE	
1	-43.36	1.37	0.99	-0.94	-0.37	Step hazard
		1.37	0.99	-0.94	-0.37	Step hazard
		1.37	0.99	-0.94	-0.37	Step hazard
2	-43.74	1.29	0.98	-0.84	-0.37	Step hazard
		1.29	0.98	-0.84	-0.37	Step hazard
		1.29	0.98	-0.84	-0.37	Step hazard
		1.22	1.20	-1.12	0.01	Step hazard
3	-37.93	1.29	1.02	-0.79	-0.37	Step hazard
		1.29	1.02	-0.79	-0.37	Step hazard
		1.29	1.02	-0.79	-0.37	Step hazard
		1.22	1.04	-0.81	-0.30	Step hazard
		1.74	1.39	-1.08	0.07	Step hazard
4	-35.13	1.33	1.03	-0.76	-0.37	Step hazard
		1.41	1.13	-0.61	-0.34	Step hazard
		1.41	1.13	-0.61	-0.34	Step hazard
		1.94	1.60	-1.13	0.00	Step hazard
5	-32.31	1.33	1.12	-0.71	-0.38	Step hazard
		1.38	1.23	-0.79	-0.29	Step hazard
6	-29.50	1.34	1.16	-0.77	-0.32	Step hazard
		1.64	1.43	-0.81	-0.33	Step hazard
		1.64	1.43	-0.81	-0.33	Step hazard
7	-26.69	1.61	1.44	-0.72	-0.38	Step hazard
		1.61	1.44	-0.72	-0.38	Step hazard
		1.64	1.47	-0.74	-0.37	Step hazard
		1.71	1.53	-0.77	-0.31	Step hazard
8	-23.08	1.70	1.70	-0.75	-0.39	Step hazard
9	-21.01	0.0	HAZARDS	CATALOGED		
10	-18.26	2.75	2.61	-0.86	-0.07	Crosspath hazard
11	-13.43	0.0	HAZARDS	CATALOGED		
12	-12.64	0.0	HAZARDS	CATALOGED		
13	-9.84	0.0	HAZARDS	CATALOGED		
14	-7.02	0.0	HAZARDS	CATALOGED		
15	-4.22	0.0	HAZARDS	CATALOGED		
16	-1.41	0.0	HAZARDS	CATALOGED		
17	1.49	0.0	HAZARDS	CATALOGED		
18	4.21	0.0	HAZARDS	CATALOGED		
19	7.02	0.0	HAZARDS	CATALOGED		
20	9.83	0.0	HAZARDS	CATALOGED		
21	12.64	0.0	HAZARDS	CATALOGED		
22	15.45	0.0	HAZARDS	CATALOGED		
23	18.26	0.0	HAZARDS	CATALOGED		
24	21.07	2.18	2.03	0.78	-0.14	Step hazard
		2.25	2.10	0.81	-0.02	Crosspath hazard
25	23.88	1.26	1.70	0.75	-0.28	Step hazard
		1.36	1.70	0.75	-0.39	Step hazard
26	26.69	1.36	1.66	0.83	-0.37	Step hazard
27	29.50	1.61	1.40	0.79	-0.38	Step hazard
		1.61	1.40	0.79	-0.38	Step hazard
		1.64	1.43	0.81	-0.37	Step hazard
		1.71	1.49	0.84	-0.31	Step hazard
28	32.31	1.29	1.09	0.69	-0.37	Step hazard
		1.41	1.19	0.75	-0.34	Step hazard
		1.41	1.19	0.73	-0.34	Step hazard
		1.48	1.25	0.79	-0.29	Step hazard
29	35.12	1.33	1.08	0.76	-0.38	Step hazard
		2.04	1.66	1.17	-0.01	Step hazard
30	37.93	1.33	1.05	0.81	-0.38	Step hazard
		1.41	1.11	0.86	-0.34	Step hazard
		1.41	1.11	0.86	-0.34	Step hazard
31	40.74	1.29	0.98	0.84	-0.37	Step hazard
		1.29	0.98	0.84	-0.37	Step hazard
		1.33	1.00	0.86	-0.37	Step hazard
32	43.55	1.41	0.96	0.91	-0.37	Step hazard
		1.41	1.02	0.97	-0.34	Step hazard
		1.41	1.02	0.97	-0.34	Step hazard
		1.72	1.24	1.18	0.01	Step hazard

Input file: HDL.PATH.15
 File Creation Date: WED, AUG 10 1983 System time 19:01:57

== MODEL PARAMETERS ==
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



AZIMUTH (deg)	RANGE	Y	Z	HAZARD TYPE	
1 -43.56	1.29	0.93	-0.89	-0.37	Step hazard
	1.29	0.93	-0.89	-0.37	Step hazard
	1.29	0.93	-0.89	-0.37	Step hazard
	1.72	1.24	-1.18	0.01	Step hazard
2 -40.74	1.33	1.00	-0.84	-0.38	Step hazard
	1.33	1.00	-0.84	-0.38	Step hazard
	1.33	1.00	-0.84	-0.38	Step hazard
	1.33	1.00	-0.84	-0.38	Step hazard
3 -37.93	1.33	1.03	-0.81	-0.38	Step hazard
	1.41	1.11	-0.84	-0.34	Step hazard
	1.41	1.11	-0.84	-0.34	Step hazard
	1.41	1.11	-0.84	-0.34	Step hazard
4 -35.13	1.33	1.08	-0.76	-0.37	Step hazard
	1.37	1.12	-0.79	-0.36	Step hazard
	1.41	1.13	-0.81	-0.34	Step hazard
	1.40	1.21	-0.85	-0.29	Step hazard
5 -32.31	1.41	1.19	-0.75	-0.34	Step hazard
	1.41	1.19	-0.75	-0.34	Step hazard
	1.40	1.23	-0.79	-0.29	Step hazard
	1.75	1.43	-0.94	0.00	Crosspath hazard
6 -29.50	1.61	1.40	-0.79	-0.38	Step hazard
	1.64	1.43	-0.81	-0.37	Step hazard
	1.71	1.49	-0.84	-0.31	Step hazard
7 -26.69	1.86	1.66	-0.83	-0.39	Step hazard
8 -23.88	2.04	1.86	-0.82	-0.26	Step hazard
	2.12	1.94	-0.86	-0.28	Step hazard
9 -21.08	2.75	2.57	-0.99	-0.07	Crosspath hazard
10 -18.26	3.0	HAZARD	RD	CATALOGED	
11 -15.45	3.0	HAZARD	RD	CATALOGED	
12 -12.64	3.0	HAZARD	RD	CATALOGED	
13 -9.83	3.0	HAZARD	RD	CATALOGED	
14 -7.02	3.0	HAZARD	RD	CATALOGED	
15 -4.22	3.0	HAZARD	RD	CATALOGED	
16 -1.41	3.0	HAZARD	RD	CATALOGED	
17 1.40	3.0	HAZARD	RD	CATALOGED	
18 4.21	3.0	HAZARD	RD	CATALOGED	
19 7.02	3.0	HAZARD	RD	CATALOGED	
20 9.83	3.0	HAZARD	RD	CATALOGED	
21 12.64	3.0	HAZARD	RD	CATALOGED	
22 15.45	3.0	HAZARD	RD	CATALOGED	
23 18.26	3.0	HAZARD	RD	CATALOGED	
24 21.07	3.0	HAZARD	RD	CATALOGED	
25 23.88	2.99	1.91	0.84	-0.37	Step hazard
	2.99	1.91	0.84	-0.37	Step hazard
	2.20	2.01	0.89	-0.08	Step hazard
26 26.69	1.86	1.66	0.83	-0.39	Step hazard
	2.00	1.79	0.90	-0.35	Step hazard
27 29.50	1.86	1.61	0.91	-0.37	Step hazard
	1.86	1.61	0.91	-0.37	Step hazard
28 32.31	1.61	1.36	0.86	-0.38	Step hazard
	1.64	1.35	0.90	-0.13	Step hazard
29 35.12	1.29	1.05	0.74	-0.37	Step hazard
	1.41	1.13	0.81	-0.34	Step hazard
	1.41	1.13	0.81	-0.34	Step hazard
	1.48	1.21	0.85	-0.29	Step hazard
	2.06	1.69	1.19	0.02	Step hazard
30 37.93	1.33	1.03	0.81	-0.38	Step hazard
	1.48	1.17	0.91	-0.29	Step hazard
	2.04	1.61	1.23	-0.01	Step hazard
31 40.74	1.33	1.00	0.86	-0.38	Step hazard
	1.41	1.07	0.92	-0.34	Step hazard
	1.84	1.42	1.23	0.00	Step hazard
32 43.55	1.29	0.93	0.89	-0.37	Step hazard
	1.29	0.93	0.89	-0.37	Step hazard
	1.31	0.96	0.91	-0.37	Step hazard

7.2.5 Range Test Results

7.2.5.1	Range of Obstacle: 40 cm	192
7.2.5.2	Range of Obstacle: 50 cm	193
7.2.5.3	Range of Obstacle: 60 cm	194
7.2.5.4	Range of Obstacle: 70 cm	195
7.2.5.5	Range of Obstacle: 80 cm	196
7.2.5.6	Range of Obstacle: 90 cm	197
7.2.5.7	Range of Obstacle: 90 cm	198
7.2.5.8	Range of Obstacle: 110 cm	199
7.2.5.9	Range of Obstacle: 120 cm	200
7.2.5.10	Range of Obstacle: 130 cm	201
7.2.5.11	Range of Obstacle: 140 cm	202
7.2.5.12	Range of Obstacle: 150 cm	203
7.2.5.13	Range of Obstacle: 160 cm	204
7.2.5.14	Range of Obstacle: 170 cm	205
7.2.5.15	Range of Obstacle: 180 cm	206
7.2.5.16	Range of Obstacle: 190 cm	207
7.2.5.17	Range of Obstacle: 200 cm	208
7.2.5.18	Range of Obstacle: 210 cm	209
7.2.5.19	Range of Obstacle: 220 cm	210
7.2.5.20	Range of Obstacle: 230 cm	211

Input file: MDL.RANGE.04

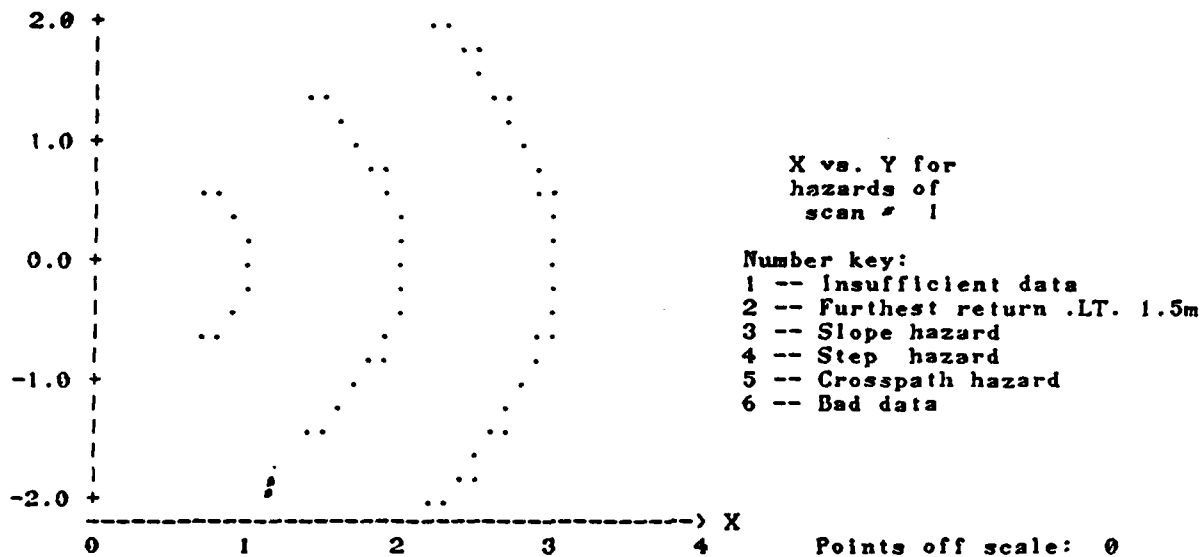
File Creation Date : WED, AUG 10 1983

System time 20:56:29

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** MODEL1 PARAMETERS **
HEIGHT FILTER COEFFICIENT = 0.25
SLOPE FILTER COEFFICIENT = 0.90
LEVEL GROUND STEP THRESHOLD = 0.25 METERS
SLOPE THRESHOLD = 30.00 DEGREES

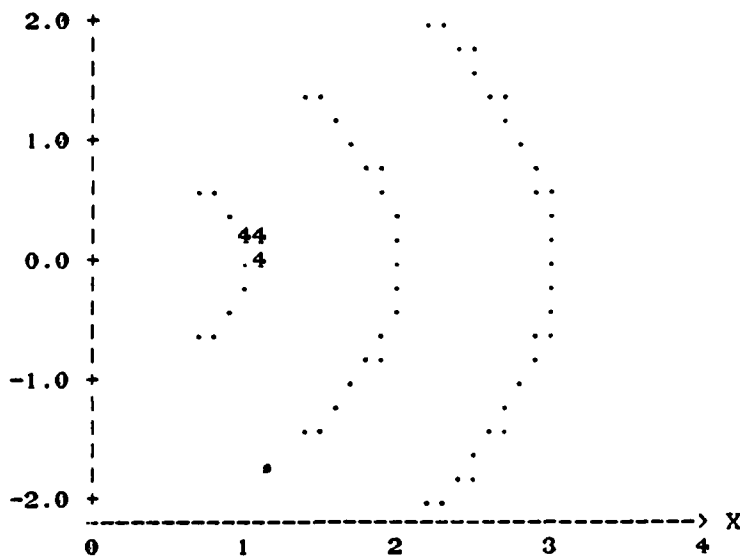
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NO HAZARDS CATALOGED THIS SCAN

Input file: MDL.RANGE.05
 File Creation Date : WED, AUG 10 1983 System time 20:54:20

 ** MODEL1 PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



X vs. Y for
 hazards of
 scan # 1

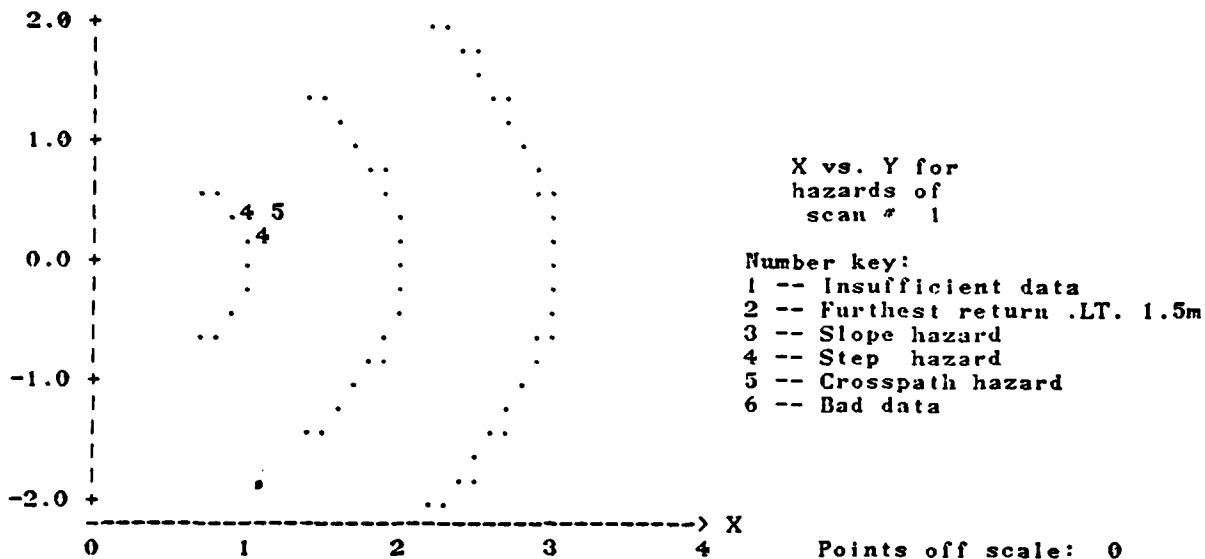
Number key:
 1 -- Insufficient data
 2 -- Furthest return .LT. 1.5m
 3 -- Slope hazard
 4 -- Step hazard
 5 -- Crosspath hazard
 6 -- Bad data

Points off scale: 0

AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S	S	C A T A L O G E D	
2	-40.74	NO	H A Z A R D S	S	C A T A L O G E D	
3	-37.93	NO	H A Z A R D S	S	C A T A L O G E D	
4	-35.13	NO	H A Z A R D S	S	C A T A L O G E D	
5	-32.31	NO	H A Z A R D S	S	C A T A L O G E D	
6	-29.50	NO	H A Z A R D S	S	C A T A L O G E D	
7	-26.69	NO	H A Z A R D S	S	C A T A L O G E D	
8	-23.88	NO	H A Z A R D S	S	C A T A L O G E D	
9	-21.08	NO	H A Z A R D S	S	C A T A L O G E D	
10	-18.26	NO	H A Z A R D S	S	C A T A L O G E D	
11	-15.45	NO	H A Z A R D S	S	C A T A L O G E D	
12	-12.64	NO	H A Z A R D S	S	C A T A L O G E D	
13	-9.84	NO	H A Z A R D S	S	C A T A L O G E D	
14	-7.02	NO	H A Z A R D S	S	C A T A L O G E D	
15	-4.22	1.06	1.05	-0.08	0.01	Step hazard
16	-1.41	1.06	1.06	-0.03	0.01	Step hazard
17	1.40	1.06	1.06	0.03	0.01	Step hazard
18	4.21	1.06	1.05	0.08	0.01	Step hazard
19	7.02	1.06	1.05	0.13	0.01	Step hazard
20	9.83	1.06	1.04	0.18	0.01	Step hazard
21	12.64	1.06	1.03	0.23	0.01	Step hazard
22	15.45	1.10	1.06	0.29	0.00	Step hazard
23	18.26	NO	H A Z A R D S	S	C A T A L O G E D	
24	21.07	NO	H A Z A R D S	S	C A T A L O G E D	
25	23.88	NO	H A Z A R D S	S	C A T A L O G E D	
26	26.69	NO	H A Z A R D S	S	C A T A L O G E D	
27	29.50	NO	H A Z A R D S	S	C A T A L O G E D	
28	32.31	NO	H A Z A R D S	S	C A T A L O G E D	
29	35.12	NO	H A Z A R D S	S	C A T A L O G E D	
30	37.93	NO	H A Z A R D S	S	C A T A L O G E D	
31	40.74	NO	H A Z A R D S	S	C A T A L O G E D	
32	43.55	NO	H A Z A R D S	S	C A T A L O G E D	

Input file: MDL.RANGE.06
 File Creation Date : WED, AUG 10 1983 System time 20:51:49

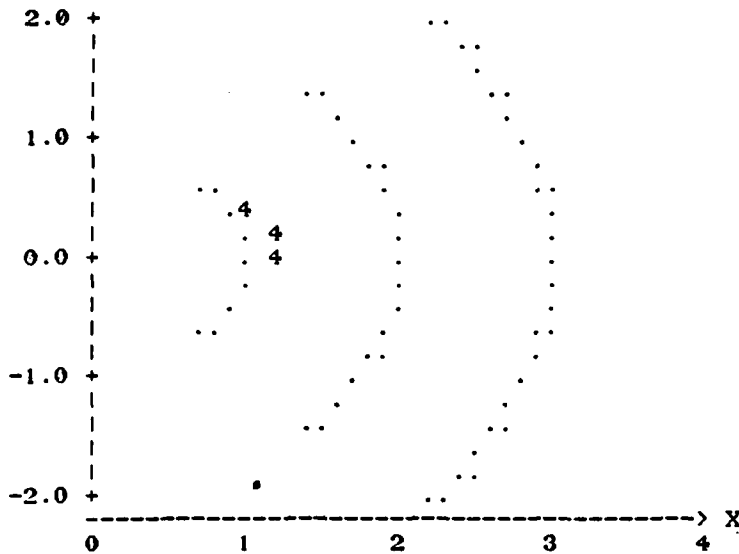
**** MODEL1 PARAMETERS ****
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S		C A T A L O G E D	
2	-40.74	NO	H A Z A R D S		C A T A L O G E D	
3	-37.93	NO	H A Z A R D S		C A T A L O G E D	
4	-35.13	NO	H A Z A R D S		C A T A L O G E D	
5	-32.31	NO	H A Z A R D S		C A T A L O G E D	
6	-29.50	NO	H A Z A R D S		C A T A L O G E D	
7	-26.69	NO	H A Z A R D S		C A T A L O G E D	
8	-23.88	NO	H A Z A R D S		C A T A L O G E D	
9	-21.08	NO	H A Z A R D S		C A T A L O G E D	
10	-18.26	NO	H A Z A R D S		C A T A L O G E D	
11	-15.45	NO	H A Z A R D S		C A T A L O G E D	
12	-12.64	NO	H A Z A R D S		C A T A L O G E D	
13	-9.84	NO	H A Z A R D S		C A T A L O G E D	
14	-7.02	NO	H A Z A R D S		C A T A L O G E D	
15	-4.22	NO	H A Z A R D S		C A T A L O G E D	
16	-1.41	NO	H A Z A R D S		C A T A L O G E D	
17	1.40	NO	H A Z A R D S		C A T A L O G E D	
18	4.21	NO	H A Z A R D S		C A T A L O G E D	
19	7.02	NO	H A Z A R D S		C A T A L O G E D	
20	9.83	NO	H A Z A R D S		C A T A L O G E D	
21	12.64	1.17	1.14	0.26	0.05	Step hazard
22	15.45	1.20	1.16	0.32	-0.02	Step hazard
23	18.26	1.06	1.00	0.33	0.01	Step hazard
		1.25	1.19	0.39	0.01	Crosspath hazard
24	21.07	NO	H A Z A R D S		C A T A L O G E D	
25	23.88	NO	H A Z A R D S		C A T A L O G E D	
26	26.69	NO	H A Z A R D S		C A T A L O G E D	
27	29.50	NO	H A Z A R D S		C A T A L O G E D	
28	32.31	NO	H A Z A R D S		C A T A L O G E D	
29	35.12	NO	H A Z A R D S		C A T A L O G E D	
30	37.93	NO	H A Z A R D S		C A T A L O G E D	
31	40.74	NO	H A Z A R D S		C A T A L O G E D	
32	43.55	NO	H A Z A R D S		C A T A L O G E D	

Input file: MDL.RANGE.07
 File Creation Date : WED, AUG 10 1983 System time 20:47:50

** MODEL1 PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



X vs. Y for
 hazards of
 scan # 1

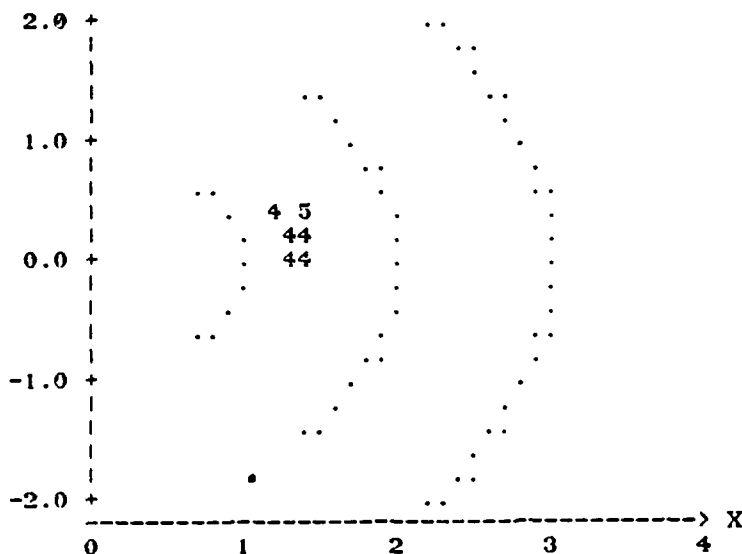
Number key:
 1 -- Insufficient data
 2 -- Furthest return .LT. 1.5m
 3 -- Slope hazard
 4 -- Step hazard
 5 -- Crosspath hazard
 6 -- Bad data

Points off scale: 0

AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	HAZARDS		CATALOGED	
2	-40.74	NO	HAZARDS		CATALOGED	
3	-37.93	NO	HAZARDS		CATALOGED	
4	-35.13	NO	HAZARDS		CATALOGED	
5	-32.31	NO	HAZARDS		CATALOGED	
6	-29.50	NO	HAZARDS		CATALOGED	
7	-26.69	NO	HAZARDS		CATALOGED	
8	-23.88	NO	HAZARDS		CATALOGED	
9	-21.08	NO	HAZARDS		CATALOGED	
10	-18.26	NO	HAZARDS		CATALOGED	
11	-15.45	NO	HAZARDS		CATALOGED	
12	-12.64	NO	HAZARDS		CATALOGED	
13	-9.84	NO	HAZARDS		CATALOGED	
14	-7.02	NO	HAZARDS		CATALOGED	
15	-4.22	NO	HAZARDS		CATALOGED	
16	-1.41	NO	HAZARDS		CATALOGED	
17	1.40	NO	HAZARDS		CATALOGED	
18	4.21	1.22	1.22	0.09	0.02	Step hazard
19	7.02	NO	HAZARDS		CATALOGED	
20	9.83	1.26	1.24	0.21	0.02	Step hazard
21	12.64	1.26	1.23	0.28	0.02	Step hazard
22	15.45	NO	HAZARDS		CATALOGED	
23	18.26	1.06	1.00	0.33	0.01	Step hazard
24	21.07	NO	HAZARDS		CATALOGED	
25	23.88	NO	HAZARDS		CATALOGED	
26	26.69	NO	HAZARDS		CATALOGED	
27	29.50	NO	HAZARDS		CATALOGED	
28	32.31	NO	HAZARDS		CATALOGED	
29	35.12	NO	HAZARDS		CATALOGED	
30	37.93	NO	HAZARDS		CATALOGED	
31	40.74	NO	HAZARDS		CATALOGED	
32	43.55	NO	HAZARDS		CATALOGED	

Input file: MDL.RANGE.08
 File Creation Date : WED, AUG 10 1983 System time 20:40:26

 ** MODEL1 PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



X vs. Y for
 hazards of
 scan # 1

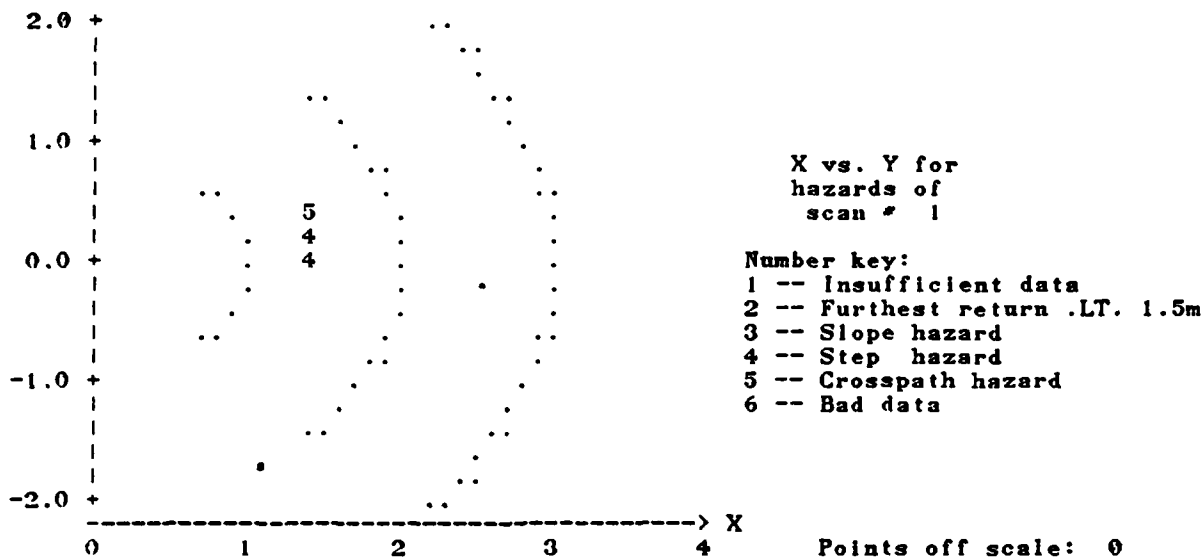
Number key:
 1 -- Insufficient data
 2 -- Furthest return .LT. 1.5m
 3 -- Slope hazard
 4 -- Step hazard
 5 -- Crosspath hazard
 6 -- Bad data

Points off scale: 0

AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S			C A T A L O G E D
2	-40.74	NO	H A Z A R D S			C A T A L O G E D
3	-37.93	NO	H A Z A R D S			C A T A L O G E D
4	-35.13	NO	H A Z A R D S			C A T A L O G E D
5	-32.31	NO	H A Z A R D S			C A T A L O G E D
6	-29.50	NO	H A Z A R D S			C A T A L O G E D
7	-26.69	NO	H A Z A R D S			C A T A L O G E D
8	-23.88	NO	H A Z A R D S			C A T A L O G E D
9	-21.08	NO	H A Z A R D S			C A T A L O G E D
10	-18.26	NO	H A Z A R D S			C A T A L O G E D
11	-15.45	NO	H A Z A R D S			C A T A L O G E D
12	-12.64	NO	H A Z A R D S			C A T A L O G E D
13	-9.84	NO	H A Z A R D S			C A T A L O G E D
14	-7.02	NO	H A Z A R D S			C A T A L O G E D
15	-4.22	NO	H A Z A R D S			C A T A L O G E D
16	-1.41	1.33	1.33	-0.03	-0.01	Step hazard
17	1.40	1.37	1.37	0.03	0.00	Step hazard
18	4.21	1.37	1.37	0.10	0.00	Step hazard
19	7.02	1.37	1.36	0.17	0.00	Step hazard
20	9.83	1.37	1.35	0.23	0.00	Step hazard
21	12.64	NO	H A Z A R D S			C A T A L O G E D
22	15.45	1.26	1.21	0.34	0.02	Step hazard
		1.50	1.45	0.40	0.02	Crosspath hazard
23	18.26	NO	H A Z A R D S			C A T A L O G E D
24	21.07	NO	H A Z A R D S			C A T A L O G E D
25	23.88	NO	H A Z A R D S			C A T A L O G E D
26	26.69	NO	H A Z A R D S			C A T A L O G E D
27	29.50	NO	H A Z A R D S			C A T A L O G E D
28	32.31	NO	H A Z A R D S			C A T A L O G E D
29	35.12	NO	H A Z A R D S			C A T A L O G E D
30	37.93	NO	H A Z A R D S			C A T A L O G E D
31	40.74	NO	H A Z A R D S			C A T A L O G E D
32	43.55	NO	H A Z A R D S			C A T A L O G E D

Input file: MDL.RANGE.09
 File Creation Date : WED, AUG 10 1983 System time 20:45:23

** MODEL1 PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES

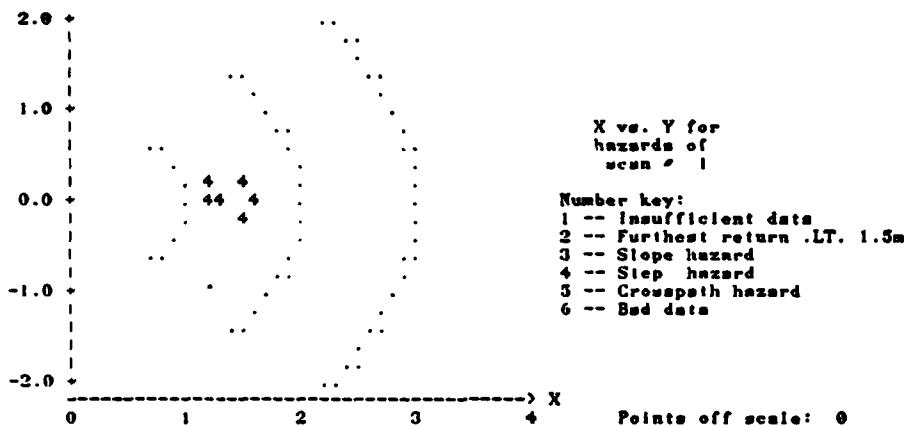


AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S		C A T A L O G E D	
2	-40.74	NO	H A Z A R D S		C A T A L O G E D	
3	-37.93	NO	H A Z A R D S		C A T A L O G E D	
4	-35.13	NO	H A Z A R D S		C A T A L O G E D	
5	-32.31	NO	H A Z A R D S		C A T A L O G E D	
6	-29.50	NO	H A Z A R D S		C A T A L O G E D	
7	-26.69	NO	H A Z A R D S		C A T A L O G E D	
8	-23.88	NO	H A Z A R D S		C A T A L O G E D	
9	-21.08	NO	H A Z A R D S		C A T A L O G E D	
10	-18.26	NO	H A Z A R D S		C A T A L O G E D	
11	-15.45	NO	H A Z A R D S		C A T A L O G E D	
12	-12.64	NO	H A Z A R D S		C A T A L O G E D	
13	-9.84	NO	H A Z A R D S		C A T A L O G E D	
14	-7.02	NO	H A Z A R D S		C A T A L O G E D	
15	-4.22	NO	H A Z A R D S		C A T A L O G E D	
16	-1.41	NO	H A Z A R D S		C A T A L O G E D	
17	1.40	1.43	1.43	0.04	0.03	Step hazard
18	4.21	NO	H A Z A R D S		C A T A L O G E D	
19	7.02	1.43	1.42	0.18	0.03	Step hazard
20	9.83	1.43	1.41	0.24	0.04	Step hazard
21	12.64	NO	H A Z A R D S		C A T A L O G E D	
22	15.45	1.50	1.45	0.40	-0.03	Crosspath hazard
23	18.26	NO	H A Z A R D S		C A T A L O G E D	
24	21.07	NO	H A Z A R D S		C A T A L O G E D	
25	23.88	NO	H A Z A R D S		C A T A L O G E D	
26	26.69	NO	H A Z A R D S		C A T A L O G E D	
27	29.50	NO	H A Z A R D S		C A T A L O G E D	
28	32.31	NO	H A Z A R D S		C A T A L O G E D	
29	35.12	NO	H A Z A R D S		C A T A L O G E D	
30	37.93	NO	H A Z A R D S		C A T A L O G E D	
31	40.74	NO	H A Z A R D S		C A T A L O G E D	
32	43.55	NO	H A Z A R D S		C A T A L O G E D	

Points off scale: 0

Input file: MDL.RANGE.10
 File Creation Date : WED, AUG 10 1983 System time 19:33:11

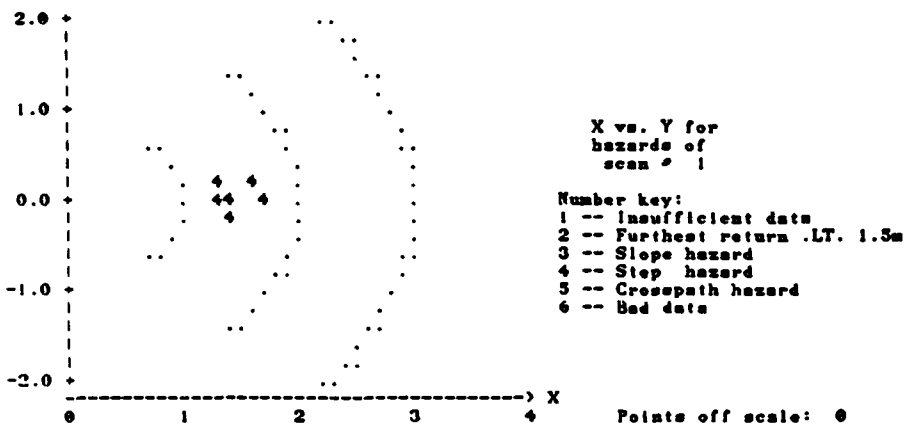
** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S	C A T A L O G E D	
2	-40.74	NO	H A Z A R D S	C A T A L O G E D	
3	-37.93	NO	H A Z A R D S	C A T A L O G E D	
4	-35.13	NO	H A Z A R D S	C A T A L O G E D	
5	-32.31	NO	H A Z A R D S	C A T A L O G E D	
6	-29.50	NO	H A Z A R D S	C A T A L O G E D	
7	-26.69	NO	H A Z A R D S	C A T A L O G E D	
8	-23.88	NO	H A Z A R D S	C A T A L O G E D	
9	-21.08	NO	H A Z A R D S	C A T A L O G E D	
10	-18.26	NO	H A Z A R D S	C A T A L O G E D	
11	-15.45	NO	H A Z A R D S	C A T A L O G E D	
12	-12.64	NO	H A Z A R D S	C A T A L O G E D	
13	-9.84	NO	H A Z A R D S	C A T A L O G E D	
14	-7.02	NO	H A Z A R D S	C A T A L O G E D	
15	-4.22	1.24	1.24 -0.09	-0.30	Step hazard
		1.24	1.24 -0.09	-0.30	Step hazard
		1.24	1.24 -0.09	-0.30	Step hazard
		1.53	1.53 -0.11	0.02	Step hazard
16	-1.41	1.24	1.24 -0.03	-0.30	Step hazard
		1.24	1.24 -0.03	-0.30	Step hazard
		1.24	1.24 -0.03	-0.30	Step hazard
17	1.40	1.55	1.55 0.04	-0.00	Step hazard
18	4.21	1.29	1.29 0.09	-0.36	Step hazard
		1.29	1.29 0.09	-0.36	Step hazard
		1.29	1.29 0.09	-0.36	Step hazard
		1.55	1.55 0.11	0.02	Step hazard
19	7.02	1.24	1.24 0.13	-0.30	Step hazard
		1.24	1.24 0.13	-0.30	Step hazard
		1.24	1.24 0.13	-0.30	Step hazard
20	9.83	NO	H A Z A R D S	C A T A L O G E D	
21	12.64	NO	H A Z A R D S	C A T A L O G E D	
22	15.45	NO	H A Z A R D S	C A T A L O G E D	
23	18.26	NO	H A Z A R D S	C A T A L O G E D	
24	21.07	NO	H A Z A R D S	C A T A L O G E D	
25	23.88	NO	H A Z A R D S	C A T A L O G E D	
26	26.69	NO	H A Z A R D S	C A T A L O G E D	
27	29.50	NO	H A Z A R D S	C A T A L O G E D	
28	32.31	NO	H A Z A R D S	C A T A L O G E D	
29	35.12	NO	H A Z A R D S	C A T A L O G E D	
30	37.93	NO	H A Z A R D S	C A T A L O G E D	
31	40.74	NO	H A Z A R D S	C A T A L O G E D	
32	43.55	NO	H A Z A R D S	C A T A L O G E D	

Input file: MDL.RANGE.11
 File Creation Date : WED, AUG 10 1983 System time 19:38:10

** MODEL1 PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES

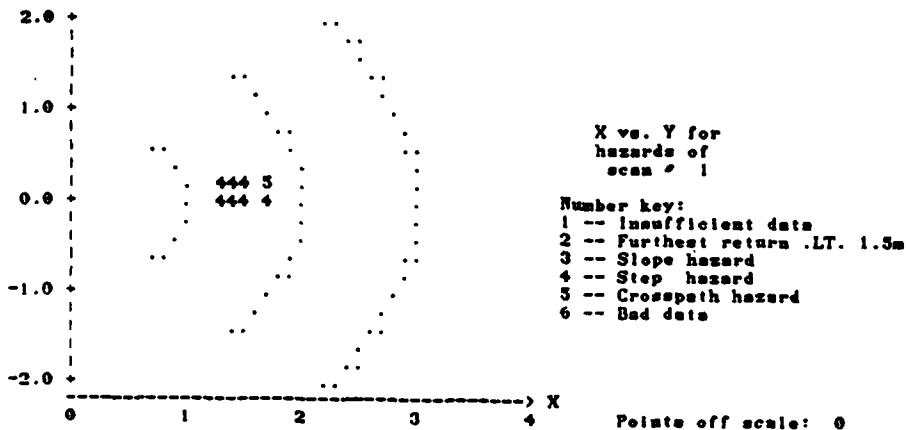


AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S			C A T A L O C E D
2	-40.74	NO	H A Z A R D S			C A T A L O C E D
3	-37.93	NO	H A Z A R D S			C A T A L O C E D
4	-35.13	NO	H A Z A R D S			C A T A L O C E D
5	-32.31	NO	H A Z A R D S			C A T A L O C E D
6	-29.50	NO	H A Z A R D S			C A T A L O C E D
7	-26.69	NO	H A Z A R D S			C A T A L O C E D
8	-23.88	NO	H A Z A R D S			C A T A L O C E D
9	-21.08	NO	H A Z A R D S			C A T A L O C E D
10	-18.26	NO	H A Z A R D S			C A T A L O C E D
11	-15.45	NO	H A Z A R D S			C A T A L O C E D
12	-12.64	NO	H A Z A R D S			C A T A L O C E D
13	-9.84	NO	H A Z A R D S			C A T A L O C E D
14	-7.02	NO	H A Z A R D S			C A T A L O C E D
15	-4.22	1.37	1.36	-0.10	-0.37	Step hazard
		1.37	1.36	-0.10	-0.37	Step hazard
		1.37	1.36	-0.10	-0.37	Step hazard
16	-1.41	1.29	1.29	-0.03	-0.37	Step hazard
		1.29	1.29	-0.03	-0.37	Step hazard
		1.33	1.32	-0.03	-0.37	Step hazard
		1.63	1.65	-0.04	0.02	Step hazard
17	1.40	1.29	1.29	0.03	-0.37	Step hazard
		1.29	1.29	0.03	-0.37	Step hazard
		1.37	1.37	0.03	-0.36	Step hazard
		1.37	1.37	0.03	-0.36	Step hazard
18	4.21	1.29	1.29	0.09	-0.37	Step hazard
		1.29	1.29	0.09	-0.37	Step hazard
		1.33	1.32	0.10	-0.37	Step hazard
		1.63	1.65	0.12	0.02	Step hazard
19	7.02	1.33	1.32	0.16	-0.38	Step hazard
		1.33	1.32	0.16	-0.38	Step hazard
		1.33	1.32	0.16	-0.38	Step hazard
		1.63	1.64	0.20	0.01	Step hazard
20	9.83	1.29	1.27	0.22	-0.37	Step hazard
		1.29	1.27	0.22	-0.37	Step hazard
21	12.64	NO	H A Z A R D S			C A T A L O C E D
22	15.45	NO	H A Z A R D S			C A T A L O C E D
23	18.26	NO	H A Z A R D S			C A T A L O C E D
24	21.07	NO	H A Z A R D S			C A T A L O C E D
25	23.88	NO	H A Z A R D S			C A T A L O C E D
26	26.69	NO	H A Z A R D S			C A T A L O C E D
27	29.50	NO	H A Z A R D S			C A T A L O C E D
28	32.31	NO	H A Z A R D S			C A T A L O C E D
29	35.12	NO	H A Z A R D S			C A T A L O C E D
30	37.93	NO	H A Z A R D S			C A T A L O C E D
31	40.74	NO	H A Z A R D S			C A T A L O C E D
32	43.55	NO	H A Z A R D S			C A T A L O C E D

Points off scale: 0

Input file: MDL.RANGE.12
 File Creation Date : WED, AUG 10 1983 System time 19:40:52

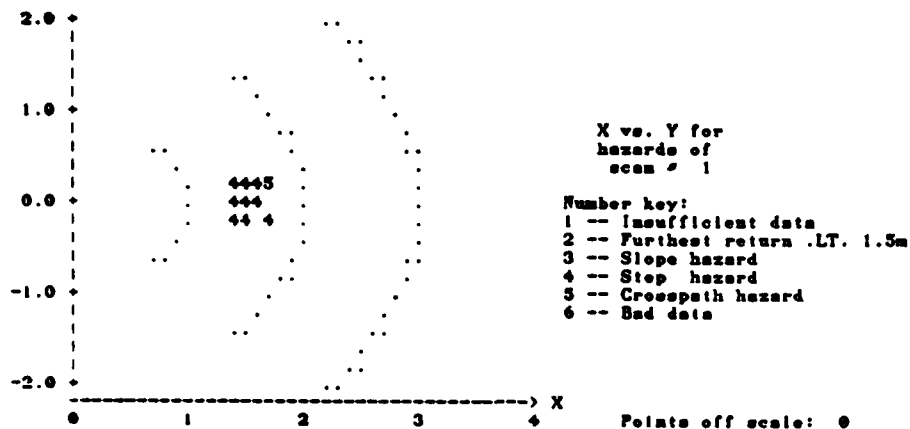
**** MODEL PARAMETERS ****
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S	C A T A L O C E D	
2	-40.74	NO	H A Z A R D S	C A T A L O C E D	
3	-37.93	NO	H A Z A R D S	C A T A L O C E D	
4	-35.13	NO	H A Z A R D S	C A T A L O C E D	
5	-32.31	NO	H A Z A R D S	C A T A L O C E D	
6	-29.50	NO	H A Z A R D S	C A T A L O C E D	
7	-26.69	NO	H A Z A R D S	C A T A L O C E D	
8	-23.88	NO	H A Z A R D S	C A T A L O C E D	
9	-21.08	NO	H A Z A R D S	C A T A L O C E D	
10	-18.26	NO	H A Z A R D S	C A T A L O C E D	
11	-15.45	NO	H A Z A R D S	C A T A L O C E D	
12	-12.64	NO	H A Z A R D S	C A T A L O C E D	
13	-9.84	NO	H A Z A R D S	C A T A L O C E D	
14	-7.02	NO	H A Z A R D S	C A T A L O C E D	
15	-4.22	1.29	1.29 -0.09	-0.37	Step hazard
16	-1.41	1.33	1.32 -0.03	-0.37	Step hazard
		1.37	1.37 -0.03	-0.36	Step hazard
		1.41	1.41 -0.03	-0.34	Step hazard
		1.49	1.49 -0.04	-0.38	Step hazard
		1.72	1.72 -0.04	0.01	Step hazard
17	1.40	1.33	1.32 0.03	-0.38	Step hazard
		1.41	1.41 0.03	-0.34	Step hazard
		1.41	1.41 0.03	-0.34	Step hazard
		1.49	1.49 0.04	-0.38	Step hazard
18	4.21	1.33	1.32 0.10	-0.38	Step hazard
		1.41	1.40 0.10	-0.34	Step hazard
		1.48	1.48 0.11	-0.29	Step hazard
19	7.02	1.33	1.32 0.16	-0.37	Step hazard
		1.37	1.36 0.17	-0.36	Step hazard
		1.41	1.40 0.17	-0.34	Step hazard
		1.73	1.74 0.21	0.01	Crosspath hazard
20	9.83	NO	H A Z A R D S	C A T A L O C E D	
21	12.64	NO	H A Z A R D S	C A T A L O C E D	
22	15.45	NO	H A Z A R D S	C A T A L O C E D	
23	18.26	NO	H A Z A R D S	C A T A L O C E D	
24	21.07	NO	H A Z A R D S	C A T A L O C E D	
25	23.88	NO	H A Z A R D S	C A T A L O C E D	
26	26.69	NO	H A Z A R D S	C A T A L O C E D	
27	29.50	NO	H A Z A R D S	C A T A L O C E D	
28	32.31	NO	H A Z A R D S	C A T A L O C E D	
29	35.12	NO	H A Z A R D S	C A T A L O C E D	
30	37.93	NO	H A Z A R D S	C A T A L O C E D	
31	40.74	NO	H A Z A R D S	C A T A L O C E D	
32	43.55	NO	H A Z A R D S	C A T A L O C E D	

Input file: HDL.RANGE.13
 File Creation Date : WED, AUG 10 1983 System time 19:43:35

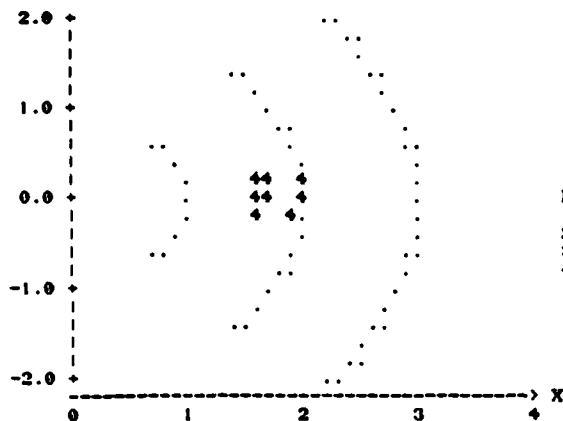
** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT * 0.25
 SLOPE FILTER COEFFICIENT * 0.90
 LEVEL GROUND STEP THRESHOLD * 0.25 METERS
 SLOPE THRESHOLD * 30.00 DEGREES



AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S		C A T A L O G E D	
2	-40.74	NO	H A Z A R D S		C A T A L O G E D	
3	-37.93	NO	H A Z A R D S		C A T A L O G E D	
4	-35.13	NO	H A Z A R D S		C A T A L O G E D	
5	-32.31	NO	H A Z A R D S		C A T A L O G E D	
6	-29.50	NO	H A Z A R D S		C A T A L O G E D	
7	-26.69	NO	H A Z A R D S		C A T A L O G E D	
8	-23.88	NO	H A Z A R D S		C A T A L O G E D	
9	-21.08	NO	H A Z A R D S		C A T A L O G E D	
10	-18.26	NO	H A Z A R D S		C A T A L O G E D	
11	-15.45	NO	H A Z A R D S		C A T A L O G E D	
12	-12.64	NO	H A Z A R D S		C A T A L O G E D	
13	-9.84	NO	H A Z A R D S		C A T A L O G E D	
14	-7.02	NO	H A Z A R D S		C A T A L O G E D	
15	-4.22	1.41	1.40	-0.10	-0.34	Step hazard
		1.41	1.40	-0.10	-0.34	Step hazard
		1.48	1.48	-0.11	-0.29	Step hazard
		1.72	1.71	-0.13	0.00	Step hazard
16	-1.41	1.37	1.37	-0.03	-0.36	Step hazard
		1.41	1.41	-0.03	-0.34	Step hazard
		1.48	1.48	-0.04	-0.29	Step hazard
		1.56	1.56	-0.04	-0.32	Step hazard
17	1.40	1.41	1.41	0.03	-0.34	Step hazard
		1.56	1.56	0.04	-0.32	Step hazard
18	4.21	1.41	1.40	0.10	-0.34	Step hazard
		1.56	1.56	0.11	-0.32	Step hazard
19	7.02	1.37	1.36	0.17	-0.36	Step hazard
		1.41	1.40	0.17	-0.34	Step hazard
		1.48	1.47	0.18	-0.29	Step hazard
		1.73	1.74	0.21	0.00	Crosspath hazard
20	9.83	NO	R A Z A R D S		C A T A L O G E D	
21	12.64	NO	H A Z A R D S		C A T A L O G E D	
22	15.45	NO	H A Z A R D S		C A T A L O G E D	
23	18.26	NO	H A Z A R D S		C A T A L O G E D	
24	21.07	NO	H A Z A R D S		C A T A L O G E D	
25	23.88	NO	H A Z A R D S		C A T A L O G E D	
26	26.69	NO	H A Z A R D S		C A T A L O G E D	
27	29.50	NO	H A Z A R D S		C A T A L O G E D	
28	32.31	NO	H A Z A R D S		C A T A L O G E D	
29	35.12	NO	H A Z A R D S		C A T A L O G E D	
30	37.93	NO	H A Z A R D S		C A T A L O G E D	
31	40.74	NO	H A Z A R D S		C A T A L O G E D	
32	43.55	NO	H A Z A R D S		C A T A L O G E D	

Input file: MDL.RANGE.14
 File Creation Date : WED, AUG 10 1983 System time 19:46:46

** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT * 0.25
 SLOPE FILTER COEFFICIENT * 0.90
 LEVEL GROUND STEP THRESHOLD * 0.25 METERS
 SLOPE THRESHOLD * 30.00 DEGREES



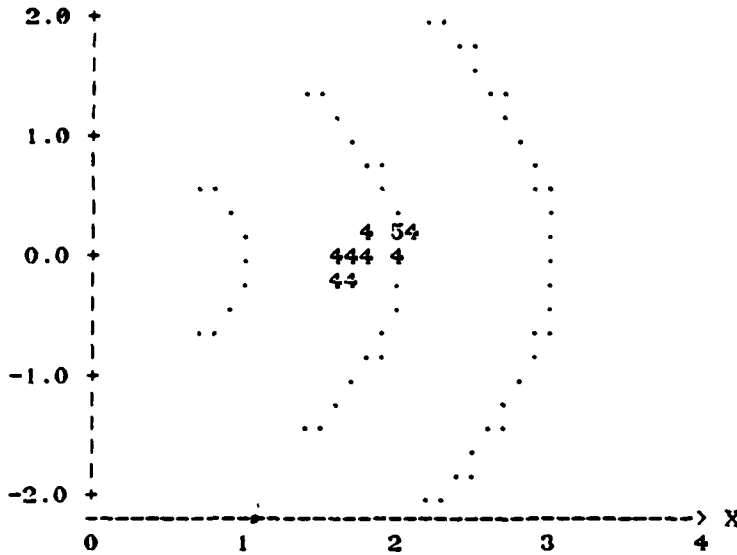
X vs. Y for
 hazards of
 scan # 1

Number key:
 1 -- Insufficient data
 2 -- Furthest return .LT. 1.5m
 3 -- Slope hazard
 4 -- Step hazard
 5 -- Crosspath hazard
 6 -- Bad data

Points off scale: 0

AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.36	NO	H A Z A R D S	C A T A L O C E D		
2	-40.74	NO	H A Z A R D S	C A T A L O C E D		
3	-37.93	NO	H A Z A R D S	C A T A L O C E D		
4	-35.13	NO	H A Z A R D S	C A T A L O C E D		
5	-32.31	NO	H A Z A R D S	C A T A L O C E D		
6	-29.50	NO	H A Z A R D S	C A T A L O C E D		
7	-26.69	NO	H A Z A R D S	C A T A L O C E D		
8	-23.88	NO	H A Z A R D S	C A T A L O C E D		
9	-21.08	NO	H A Z A R D S	C A T A L O C E D		
10	-18.26	NO	H A Z A R D S	C A T A L O C E D		
11	-15.45	NO	H A Z A R D S	C A T A L O C E D		
12	-12.64	NO	H A Z A R D S	C A T A L O C E D		
13	-9.84	NO	H A Z A R D S	C A T A L O C E D		
14	-7.02	NO	H A Z A R D S	C A T A L O C E D		
15	-4.22	1.61	1.61 -0.12	-0.38	Step hazard	
		1.88	1.87 -0.14	-0.02	Step hazard	
16	-1.41	1.61	1.61 -0.04	-0.38	Step hazard	
		1.61	1.61 -0.04	-0.38	Step hazard	
		1.68	1.63 -0.04	-0.35	Step hazard	
		1.71	1.71 -0.04	-0.31	Step hazard	
		1.96	1.96 -0.03	0.00	Step hazard	
17	1.40	1.56	1.56 0.04	-0.32	Step hazard	
		1.71	1.71 0.04	-0.29	Step hazard	
		1.96	1.96 0.05	0.00	Step hazard	
18	4.21	1.61	1.61 0.12	-0.38	Step hazard	
		1.61	1.61 0.12	-0.38	Step hazard	
		1.68	1.67 0.12	-0.35	Step hazard	
		1.71	1.71 0.13	-0.31	Step hazard	
		1.96	1.95 0.14	0.00	Step hazard	
19	7.02	1.61	1.60 0.20	-0.38	Step hazard	
20	9.83	NO	H A Z A R D S	C A T A L O C E D		
21	12.64	NO	H A Z A R D S	C A T A L O C E D		
22	15.45	NO	H A Z A R D S	C A T A L O C E D		
23	18.26	NO	H A Z A R D S	C A T A L O C E D		
24	21.07	NO	H A Z A R D S	C A T A L O C E D		
25	23.88	NO	H A Z A R D S	C A T A L O C E D		
26	26.69	NO	H A Z A R D S	C A T A L O C E D		
27	29.50	NO	H A Z A R D S	C A T A L O C E D		
28	32.31	NO	H A Z A R D S	C A T A L O C E D		
29	35.12	NO	H A Z A R D S	C A T A L O C E D		
30	37.93	NO	H A Z A R D S	C A T A L O C E D		
31	40.74	NO	H A Z A R D S	C A T A L O C E D		
32	43.55	NO	H A Z A R D S	C A T A L O C E D		

** MODEL1 PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



X vs. Y for
 hazards of
 scan # 1

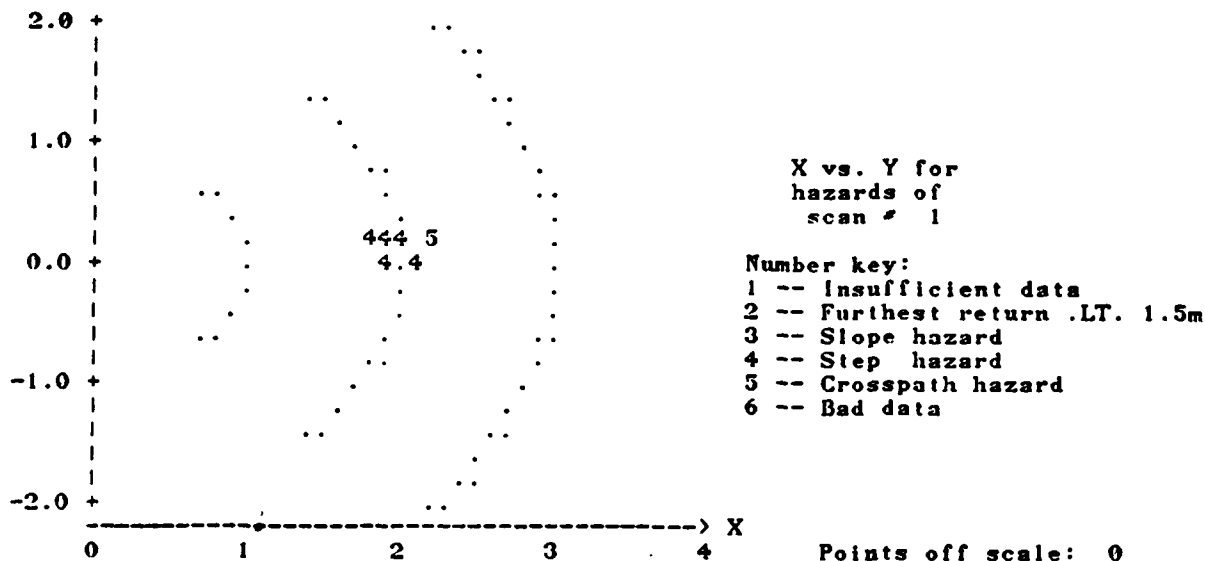
- Number key:
 1 -- Insufficient data
 2 -- Furthest return .LT. 1.5m
 3 -- Slope hazard
 4 -- Step hazard
 5 -- Crosspath hazard
 6 -- Bad data

Points off scale: 0

AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	HAZARDS	S	C	CATALOGED
2	-40.74	NO	HAZARDS	S	C	CATALOGED
3	-37.93	NO	HAZARDS	S	C	CATALOGED
4	-25.13	NO	HAZARDS	S	C	CATALOGED
5	-32.31	NO	HAZARDS	S	C	CATALOGED
6	-29.50	NO	HAZARDS	S	C	CATALOGED
7	-26.69	NO	HAZARDS	S	C	CATALOGED
8	-23.08	NO	HAZARDS	S	C	CATALOGED
9	-21.08	NO	HAZARDS	S	C	CATALOGED
10	-18.26	NO	HAZARDS	S	C	CATALOGED
11	-15.45	NO	HAZARDS	S	C	CATALOGED
12	-12.64	NO	HAZARDS	S	C	CATALOGED
13	-9.84	NO	HAZARDS	S	C	CATALOGED
14	-7.02	NO	HAZARDS	S	C	CATALOGED
15	-4.22	1.64	1.64	-0.12	-0.36	Step hazard
		1.71	1.71	-0.13	-0.31	Step hazard
16	-1.41	1.61	1.61	-0.04	-0.39	Step hazard
		1.63	1.68	-0.04	-0.35	Step hazard
17	1.40	1.24	1.84	0.05	-0.11	Step hazard
		2.04	2.03	0.05	-0.01	Step hazard
18	4.21	1.84	1.83	0.13	-0.11	Step hazard
		2.60	1.99	0.15	-0.00	Crosspath hazard
		2.06	2.06	0.15	0.02	Step hazard
19	7.02	NO	HAZARDS	S	C	CATALOGED
20	9.83	NO	HAZARDS	S	C	CATALOGED
21	12.64	NO	HAZARDS	S	C	CATALOGED
22	15.45	NO	HAZARDS	S	C	CATALOGED
23	18.26	NO	HAZARDS	S	C	CATALOGED
24	21.07	NO	HAZARDS	S	C	CATALOGED
25	23.88	NO	HAZARDS	S	C	CATALOGED
26	26.69	NO	HAZARDS	S	C	CATALOGED
27	29.50	NO	HAZARDS	S	C	CATALOGED
28	32.31	NO	HAZARDS	S	C	CATALOGED
29	35.12	NO	HAZARDS	S	C	CATALOGED
30	37.93	NO	HAZARDS	S	C	CATALOGED
31	40.74	NO	HAZARDS	S	C	CATALOGED
32	43.55	NO	HAZARDS	S	C	CATALOGED

Input file: MDL.RANGE.16
 File Creation Date : WED, AUG 10 1983 System time 19:51:27

**** MODEL1 PARAMETERS ****
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



AZIMUTH (deg)	RANGE	X	Y	Z	HAZARD TYPE	
1	-43.56	NO	HAZARDS	CATALOGED		
2	-40.74	NO	HAZARDS	CATALOGED		
3	-37.93	NO	HAZARDS	CATALOGED		
4	-35.13	NO	HAZARDS	CATALOGED		
5	-32.31	NO	HAZARDS	CATALOGED		
6	-29.50	NO	HAZARDS	CATALOGED		
7	-26.69	NO	HAZARDS	CATALOGED		
8	-23.88	NO	HAZARDS	CATALOGED		
9	-21.08	NO	HAZARDS	CATALOGED		
10	-18.26	NO	HAZARDS	CATALOGED		
11	-15.45	NO	HAZARDS	CATALOGED		
12	-12.64	NO	HAZARDS	CATALOGED		
13	-9.84	NO	HAZARDS	CATALOGED		
14	-7.02	NO	HAZARDS	CATALOGED		
15	-4.22	NO	HAZARDS	CATALOGED		
16	-1.41	1.86	1.85	-0.05	-0.37	Step hazard
		2.13	2.13	-0.05	0.02	Step hazard
17	1.40	1.86	1.85	0.05	-0.37	Step hazard
		2.13	2.13	0.05	0.02	Step hazard
18	4.21	1.86	1.85	0.14	-0.39	Step hazard
19	7.02	1.86	1.84	0.23	-0.39	Step hazard
		2.60	1.98	0.24	-0.05	Crosspath hazard
		2.64	2.02	0.25	-0.02	Step hazard
		2.25	2.23	0.28	-0.02	Crosspath hazard
20	9.83	NO	HAZARDS	CATALOGED		
21	12.64	NO	HAZARDS	CATALOGED		
22	15.45	NO	HAZARDS	CATALOGED		
23	18.26	NO	HAZARDS	CATALOGED		
24	21.07	NO	HAZARDS	CATALOGED		
25	23.88	NO	HAZARDS	CATALOGED		
26	26.69	NO	HAZARDS	CATALOGED		
27	29.50	NO	HAZARDS	CATALOGED		
28	32.31	NO	HAZARDS	CATALOGED		
29	35.12	NO	HAZARDS	CATALOGED		
30	37.93	NO	HAZARDS	CATALOGED		
31	40.74	NO	HAZARDS	CATALOGED		
32	43.55	NO	HAZARDS	CATALOGED		

Input file: MDL.RANGE.17

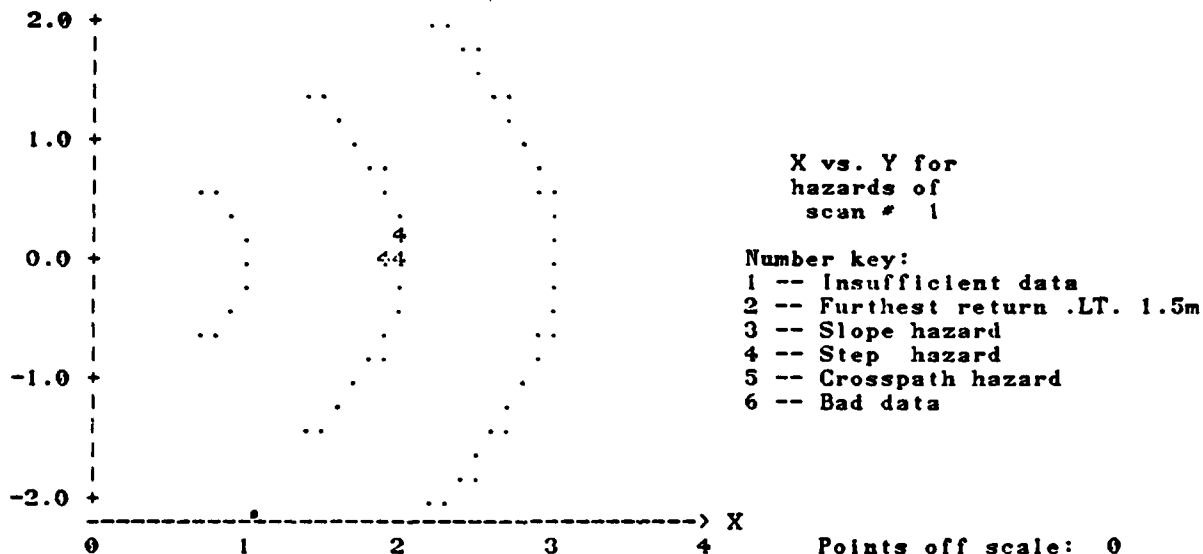
File Creation Date : WED, AUG 10 1983

System time 19:53:52

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** MODEL1 PARAMETERS **
HEIGHT FILTER COEFFICIENT = 0.25
SLOPE FILTER COEFFICIENT = 0.90
LEVEL GROUND STEP THRESHOLD = 0.25 METERS
SLOPE THRESHOLD = 30.00 DEGREES

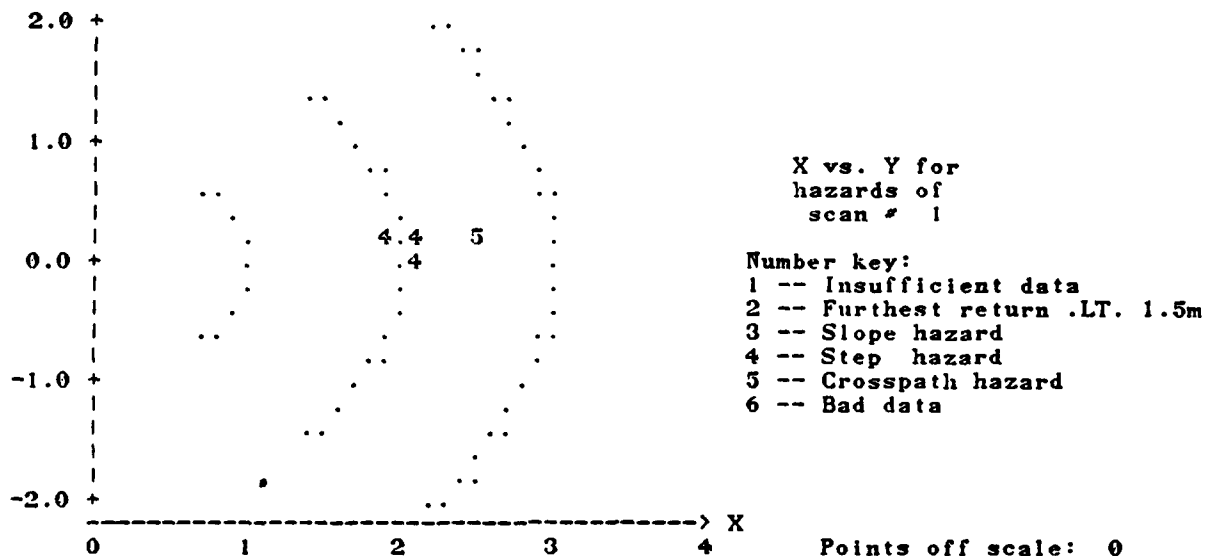
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AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S		C A T A L O G E D	
2	-40.74	NO	H A Z A R D S		C A T A L O G E D	
3	-37.93	NO	H A Z A R D S		C A T A L O G E D	
4	-35.13	NO	H A Z A R D S		C A T A L O G E D	
5	-32.31	NO	H A Z A R D S		C A T A L O G E D	
6	-29.50	NO	H A Z A R D S		C A T A L O G E D	
7	-26.69	NO	H A Z A R D S		C A T A L O G E D	
8	-23.88	NO	H A Z A R D S		C A T A L O G E D	
9	-21.03	NO	H A Z A R D S		C A T A L O G E D	
10	-18.26	NO	H A Z A R D S		C A T A L O G E D	
11	-15.45	NO	H A Z A R D S		C A T A L O G E D	
12	-12.64	NO	H A Z A R D S		C A T A L O G E D	
13	-9.84	NO	H A Z A R D S		C A T A L O G E D	
14	-7.02	NO	H A Z A R D S		C A T A L O G E D	
15	-4.22	NO	H A Z A R D S		C A T A L O G E D	
16	-1.41	1.97	1.97	-0.05	-0.20	Step hazard
		2.04	2.03	-0.05	-0.06	Step hazard
17	1.40	1.86	1.85	0.05	-0.39	Step hazard
		1.97	1.97	0.05	-0.20	Step hazard
18	4.21	1.97	1.96	0.14	-0.20	Step hazard
		2.04	2.03	0.15	-0.06	Step hazard
19	7.02	NO	H A Z A R D S		C A T A L O G E D	
20	9.83	NO	H A Z A R D S		C A T A L O G E D	
21	12.64	NO	H A Z A R D S		C A T A L O G E D	
22	15.45	NO	H A Z A R D S		C A T A L O G E D	
23	18.26	NO	H A Z A R D S		C A T A L O G E D	
24	21.07	NO	H A Z A R D S		C A T A L O G E D	
25	23.88	NO	H A Z A R D S		C A T A L O G E D	
26	26.69	NO	H A Z A R D S		C A T A L O G E D	
27	29.50	NO	H A Z A R D S		C A T A L O G E D	
28	32.31	NO	H A Z A R D S		C A T A L O G E D	
29	35.12	NO	H A Z A R D S		C A T A L O G E D	
30	37.93	NO	H A Z A R D S		C A T A L O G E D	
31	40.74	NO	H A Z A R D S		C A T A L O G E D	
32	43.55	NO	H A Z A R D S		C A T A L O G E D	

Input file: MDL.RANGE.18
 File Creation Date : WED, AUG 10 1983 System time 19:55:41

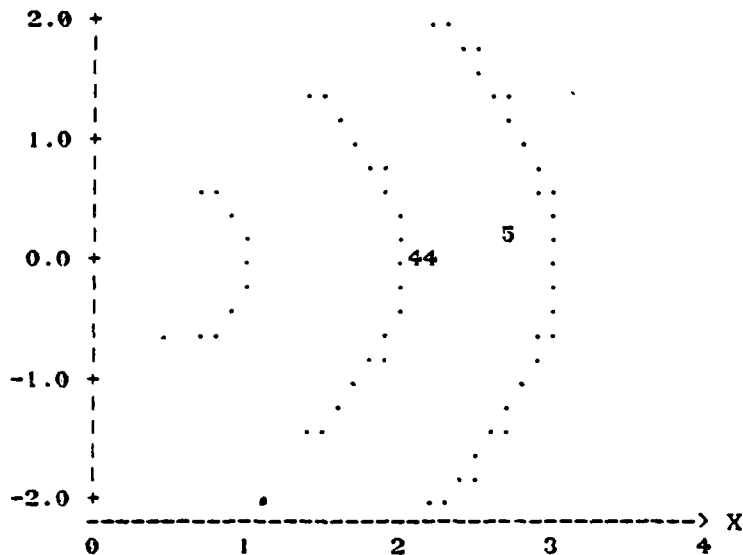
**** MODEL PARAMETERS ****
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S		C A T A L O G E D	
2	-40.74	NO	H A Z A R D S		C A T A L O G E D	
3	-37.93	NO	H A Z A R D S		C A T A L O G E D	
4	-35.13	NO	H A Z A R D S		C A T A L O G E D	
5	-32.31	NO	H A Z A R D S		C A T A L O G E D	
6	-29.50	NO	H A Z A R D S		C A T A L O G E D	
7	-26.69	NO	H A Z A R D S		C A T A L O G E D	
8	-23.83	NO	H A Z A R D S		C A T A L O G E D	
9	-21.08	NO	H A Z A R D S		C A T A L O G E D	
10	-18.26	NO	H A Z A R D S		C A T A L O G E D	
11	-15.45	NO	H A Z A R D S		C A T A L O G E D	
12	-12.64	NO	H A Z A R D S		C A T A L O G E D	
13	-9.84	NO	H A Z A R D S		C A T A L O G E D	
14	-7.02	NO	H A Z A R D S		C A T A L O G E D	
15	-4.22	NO	H A Z A R D S		C A T A L O G E D	
16	-1.41	2.09	2.09	-0.05	-0.35	Step hazard
17	1.40	2.09	2.09	0.05	-0.35	Step hazard
18	4.21	1.86	1.85	0.14	-0.39	Step hazard
		2.12	2.12	0.16	-0.27	Step hazard
		2.50	2.49	0.18	0.02	Crosspath hazard
19	7.02	NO	H A Z A R D S		C A T A L O G E D	
20	9.83	NO	H A Z A R D S		C A T A L O G E D	
21	12.64	NO	H A Z A R D S		C A T A L O G E D	
22	15.45	NO	H A Z A R D S		C A T A L O G E D	
23	18.26	NO	H A Z A R D S		C A T A L O G E D	
24	21.07	NO	H A Z A R D S		C A T A L O G E D	
25	23.88	NO	H A Z A R D S		C A T A L O G E D	
26	26.69	NO	H A Z A R D S		C A T A L O G E D	
27	29.50	NO	H A Z A R D S		C A T A L O G E D	
28	32.31	NO	H A Z A R D S		C A T A L O G E D	
29	35.12	NO	H A Z A R D S		C A T A L O G E D	
30	37.93	NO	H A Z A R D S		C A T A L O G E D	
31	40.74	NO	H A Z A R D S		C A T A L O G E D	
32	43.55	NO	H A Z A R D S		C A T A L O G E D	

Input file: MDL.RANGE.19
 File Creation Date : WED, AUG 10 1983 System time 20:04:50

**** MODEL1 PARAMETERS ****
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



X vs. Y for
 hazards of
 scan # 1

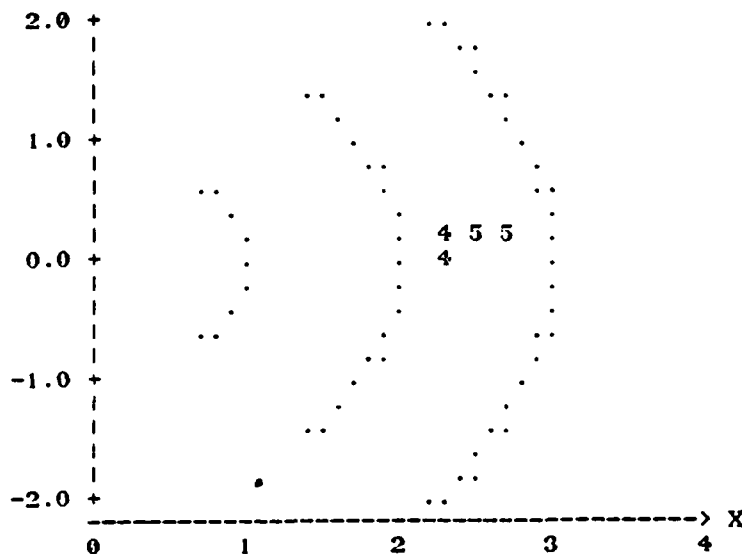
Number key:
 1 -- Insufficient data
 2 -- Furthest return .LT. 1.5m
 3 -- Slope hazard
 4 -- Step hazard
 5 -- Crosspath hazard
 6 -- Bad data

Points off scale: 0

AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S	C A T A L O G E D		
2	-40.74	NO	H A Z A R D S	C A T A L O G E D		
3	-37.93	NO	H A Z A R D S	C A T A L O G E D		
4	-35.13	NO	H A Z A R D S	C A T A L O G E D		
5	-32.31	NO	H A Z A R D S	C A T A L O G E D		
6	-29.50	NO	H A Z A R D S	C A T A L O G E D		
7	-26.69	NO	H A Z A R D S	C A T A L O G E D		
8	-23.83	NO	H A Z A R D S	C A T A L O G E D		
9	-21.08	NO	H A Z A R D S	C A T A L O G E D		
10	-18.26	NO	H A Z A R D S	C A T A L O G E D		
11	-15.45	NO	H A Z A R D S	C A T A L O G E D		
12	-12.64	NO	H A Z A R D S	C A T A L O G E D		
13	-9.84	NO	H A Z A R D S	C A T A L O G E D		
14	-7.02	NO	H A Z A R D S	C A T A L O G E D		
15	-4.22	NO	H A Z A R D S	C A T A L O G E D		
16	-1.41	2.09	2.09	-0.05	-0.37	Step hazard
		2.09	2.09	-0.05	-0.37	Step hazard
		2.20	2.20	-0.05	-0.08	Step hazard
17	1.40	2.09	2.09	0.05	-0.37	Step hazard
		2.14	2.13	0.05	-0.36	Step hazard
18	4.21	2.75	2.74	0.20	-0.07	Crosspath hazard
19	7.02	NO	H A Z A R D S	C A T A L O G E D		
20	9.33	NO	H A Z A R D S	C A T A L O G E D		
21	12.64	NO	H A Z A R D S	C A T A L O G E D		
22	15.45	NO	H A Z A R D S	C A T A L O G E D		
23	18.26	NO	H A Z A R D S	C A T A L O G E D		
24	21.07	NO	H A Z A R D S	C A T A L O G E D		
25	23.88	NO	H A Z A R D S	C A T A L O G E D		
26	26.69	NO	H A Z A R D S	C A T A L O G E D		
27	29.50	NO	H A Z A R D S	C A T A L O G E D		
28	32.31	NO	H A Z A R D S	C A T A L O G E D		
29	35.12	NO	H A Z A R D S	C A T A L O G E D		
30	37.93	NO	H A Z A R D S	C A T A L O G E D		
31	40.74	NO	H A Z A R D S	C A T A L O G E D		
32	43.55	NO	H A Z A R D S	C A T A L O G E D		

Input file: MDL.RANGE.20
 File Creation Date : WED, AUG 10 1983 System time 20:09:37

** MODEL1 PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



X vs. Y for
 hazards of
 scan # 1

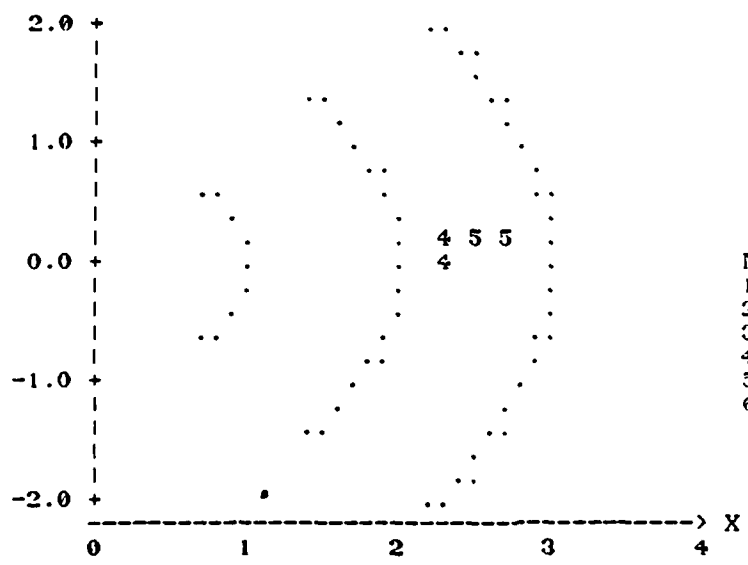
Number key:
 1 -- Insufficient data
 2 -- Furthest return .LT. 1.5m
 3 -- Slope hazard
 4 -- Step hazard
 5 -- Crosspath hazard
 6 -- Bad data

Points off scale: 0

AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S	S	C A T A L O G E D	
2	-40.74	NO	H A Z A R D S	S	C A T A L O G E D	
3	-37.93	NO	H A Z A R D S	S	C A T A L O G E D	
4	-35.13	NO	H A Z A R D S	S	C A T A L O G E D	
5	-32.31	NO	H A Z A R D S	S	C A T A L O G E D	
6	-29.50	NO	H A Z A R D S	S	C A T A L O G E D	
7	-26.69	NO	H A Z A R D S	S	C A T A L O G E D	
8	-23.88	NO	H A Z A R D S	S	C A T A L O G E D	
9	-21.08	NO	H A Z A R D S	S	C A T A L O G E D	
10	-18.26	NO	H A Z A R D S	S	C A T A L O G E D	
11	-15.45	NO	H A Z A R D S	S	C A T A L O G E D	
12	-12.64	NO	H A Z A R D S	S	C A T A L O G E D	
13	-9.84	NO	H A Z A R D S	S	C A T A L O G E D	
14	-7.02	NO	H A Z A R D S	S	C A T A L O G E D	
15	-4.22	NO	H A Z A R D S	S	C A T A L O G E D	
16	-1.41	2.29	2.29	-0.66	-0.32	Step hazard
17	1.40	2.29	2.29	0.06	-0.31	Step hazard
18	4.21	2.29	2.29	0.17	-0.32	Step hazard
		2.50	2.49	0.13	-0.05	Crosspath hazard
		2.75	2.74	0.20	-0.05	Crosspath hazard
19	7.02	NO	H A Z A R D S	S	C A T A L O G E D	
20	9.83	NO	H A Z A R D S	S	C A T A L O G E D	
21	12.64	NO	H A Z A R D S	S	C A T A L O G E D	
22	15.45	NO	H A Z A R D S	S	C A T A L O G E D	
23	18.26	NO	H A Z A R D S	S	C A T A L O G E D	
24	21.07	NO	H A Z A R D S	S	C A T A L O G E D	
25	23.88	NO	H A Z A R D S	S	C A T A L O G E D	
26	26.69	NO	H A Z A R D S	S	C A T A L O G E D	
27	29.50	NO	H A Z A R D S	S	C A T A L O G E D	
28	32.31	NO	H A Z A R D S	S	C A T A L O G E D	
29	35.12	NO	H A Z A R D S	S	C A T A L O G E D	
30	37.93	NO	H A Z A R D S	S	C A T A L O G E D	
31	40.74	NO	H A Z A R D S	S	C A T A L O G E D	
32	43.55	NO	H A Z A R D S	S	C A T A L O G E D	

Input file: MDL.RANGE.21
 File Creation Date : WED, AUG 10 1983 System time 20:12:51

**** MODEL1 PARAMETERS ****
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



X vs. Y for
 hazards of
 scan # 1

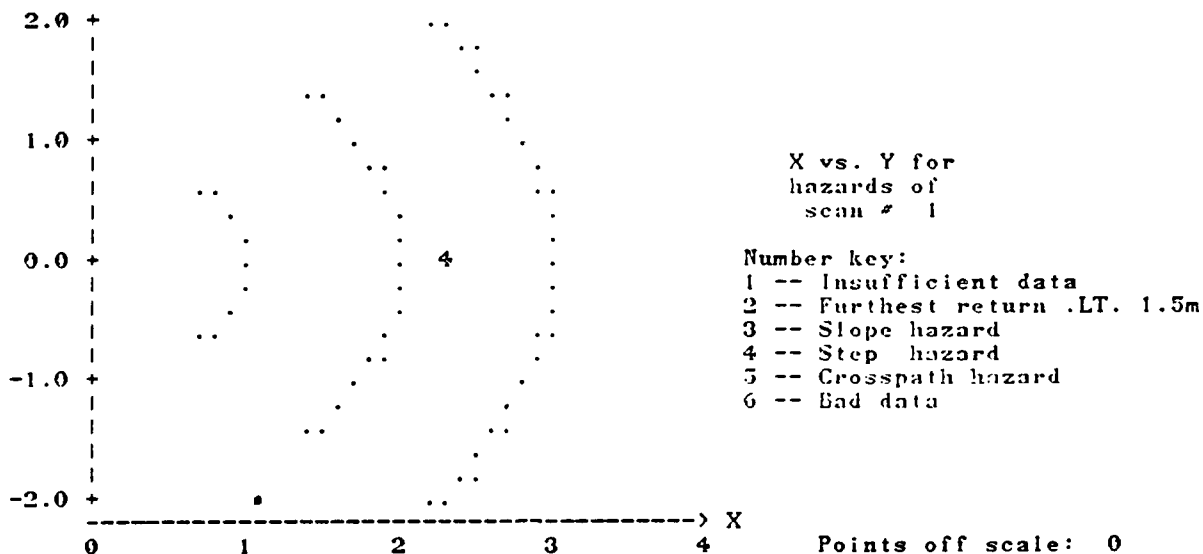
- Number key:
 1 -- Insufficient data
 2 -- Furthest return .LT. 1.5m
 3 -- Slope hazard
 4 -- Step hazard
 5 -- Crosspath hazard
 6 -- Bad data

Points off scale: 0

AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	HAZARDS	S	CATALOGED	
2	-40.74	NO	HAZARDS	S	CATALOGED	
3	-37.93	NO	HAZARDS	S	CATALOGED	
4	-35.13	NO	HAZARDS	S	CATALOGED	
5	-32.31	NO	HAZARDS	S	CATALOGED	
6	-29.50	NO	HAZARDS	S	CATALOGED	
7	-26.69	NO	HAZARDS	S	CATALOGED	
8	-23.88	NO	HAZARDS	S	CATALOGED	
9	-21.08	NO	HAZARDS	S	CATALOGED	
10	-18.26	NO	HAZARDS	S	CATALOGED	
11	-15.45	NO	HAZARDS	S	CATALOGED	
12	-12.64	NO	HAZARDS	S	CATALOGED	
13	-9.84	NO	HAZARDS	S	CATALOGED	
14	-7.02	NO	HAZARDS	S	CATALOGED	
15	-4.22	NO	HAZARDS	S	CATALOGED	
16	-1.41	2.29	2.29	-0.06	-0.34	Step hazard
17	1.40	2.29	2.29	0.06	-0.34	Step hazard
18	4.21	2.29	2.29	0.17	-0.36	Step hazard
		2.50	2.49	0.18	-0.16	Crosspath hazard
		2.75	2.74	0.20	-0.07	Crosspath hazard
19	7.02	NO	HAZARDS	S	CATALOGED	
20	9.83	NO	HAZARDS	S	CATALOGED	
21	12.64	NO	HAZARDS	S	CATALOGED	
22	15.45	NO	HAZARDS	S	CATALOGED	
23	18.26	NO	HAZARDS	S	CATALOGED	
24	21.07	NO	HAZARDS	S	CATALOGED	
25	23.88	NO	HAZARDS	S	CATALOGED	
26	26.69	NO	HAZARDS	S	CATALOGED	
27	29.50	NO	HAZARDS	S	CATALOGED	
28	32.31	NO	HAZARDS	S	CATALOGED	
29	35.12	NO	HAZARDS	S	CATALOGED	
30	37.93	NO	HAZARDS	S	CATALOGED	
31	40.74	NO	HAZARDS	S	CATALOGED	
32	43.55	NO	HAZARDS	S	CATALOGED	

Input file: MDL.RANGE.22
 File Creation Date : WED, AUG 10 1983 System time 20:21:43

**** MODEL1 PARAMETERS ****
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S	S	C A T A L O G E D	
2	-40.74	NO	H A Z A R D S	S	C A T A L O G E D	
3	-37.93	NO	H A Z A R D S	S	C A T A L O G E D	
4	-35.13	NO	H A Z A R D S	S	C A T A L O G E D	
5	-32.31	NO	H A Z A R D S	S	C A T A L O G E D	
6	-29.50	NO	H A Z A R D S	S	C A T A L O G E D	
7	-26.69	NO	H A Z A R D S	S	C A T A L O G E D	
8	-23.88	NO	H A Z A R D S	S	C A T A L O G E D	
9	-21.08	NO	H A Z A R D S	S	C A T A L O G E D	
10	-18.26	NO	H A Z A R D S	S	C A T A L O G E D	
11	-15.45	NO	H A Z A R D S	S	C A T A L O G E D	
12	-12.64	NO	H A Z A R D S	S	C A T A L O G E D	
13	-9.84	NO	H A Z A R D S	S	C A T A L O G E D	
14	-7.02	NO	H A Z A R D S	S	C A T A L O G E D	
15	-4.22	NO	H A Z A R D S	S	C A T A L O G E D	
16	-1.41	NO	H A Z A R D S	S	C A T A L O G E D	
17	1.40	2.29	2.29	0.06	-0.36	Step hazard
18	4.21	NO	H A Z A R D S	S	C A T A L O G E D	
19	7.02	NO	H A Z A R D S	S	C A T A L O G E D	
20	9.83	NO	H A Z A R D S	S	C A T A L O G E D	
21	12.64	NO	H A Z A R D S	S	C A T A L O G E D	
22	15.45	NO	H A Z A R D S	S	C A T A L O G E D	
23	18.26	NO	H A Z A R D S	S	C A T A L O G E D	
24	21.07	NO	H A Z A R D S	S	C A T A L O G E D	
25	23.88	NO	H A Z A R D S	S	C A T A L O G E D	
26	26.69	NO	H A Z A R D S	S	C A T A L O G E D	
27	29.50	NO	H A Z A R D S	S	C A T A L O G E D	
28	32.31	NO	H A Z A R D S	S	C A T A L O G E D	
29	35.12	NO	H A Z A R D S	S	C A T A L O G E D	
30	37.93	NO	H A Z A R D S	S	C A T A L O G E D	
31	40.74	NO	H A Z A R D S	S	C A T A L O G E D	
32	43.55	NO	H A Z A R D S	S	C A T A L O G E D	

Input file: MDL.RANGE.23

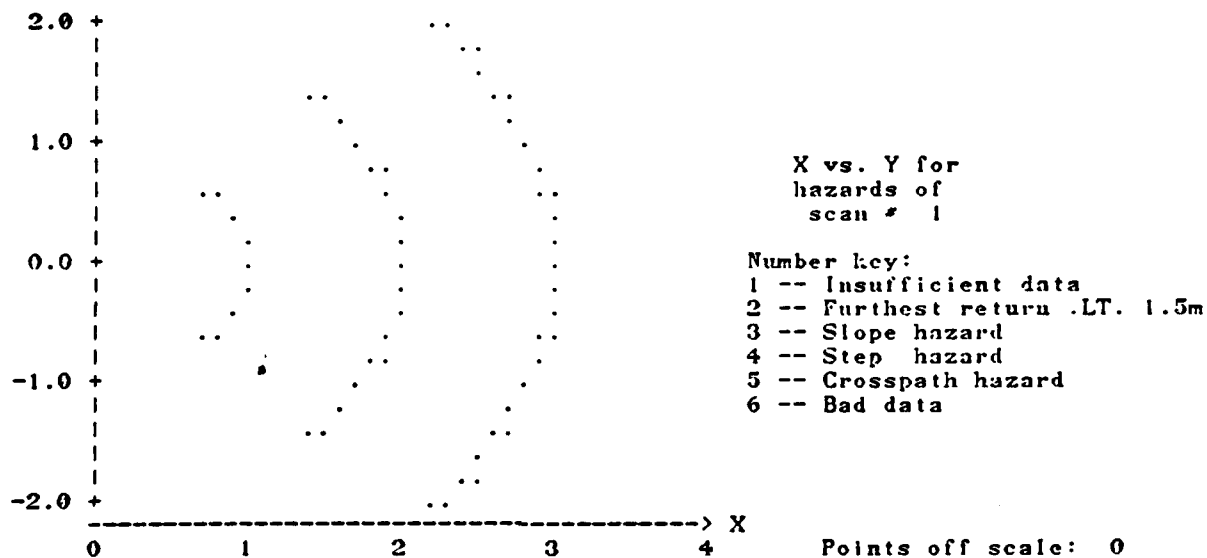
File Creation Date : WED, AUG 10 1983

System time 20:26:51

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** MODEL1 PARAMETERS **
HEIGHT FILTER COEFFICIENT = 0.25
SLOPE FILTER COEFFICIENT = 0.90
LEVEL GROUND STEP THRESHOLD = 0.25 METERS
SLOPE THRESHOLD = 30.00 DEGREES

```



NO HAZARDS CATALOGED THIS SCAN

7.2.6 Hole Tests Results

- 7.2.6.1 Small Square Hole: 30 cm x 30 cm.....213
- 7.2.6.2 Rectangular Hole: 30 cm x 60 cm.....218
- 7.2.6.3 Large Square Hole: 60 cm x 60 cm.....224

7.2.6.1 Small Square Hole: 30 cm x 30 cm

7.2.6.1.1	0 cm Depth	214
7.2.6.1.1	10 cm Depth	214
7.2.6.1.2	20 cm Depth	215
7.2.6.1.2	25 cm Depth	215
7.2.6.1.3	30 cm Depth	216
7.2.6.1.4	36 cm Depth	217

Input file: MDL.HOLE.00

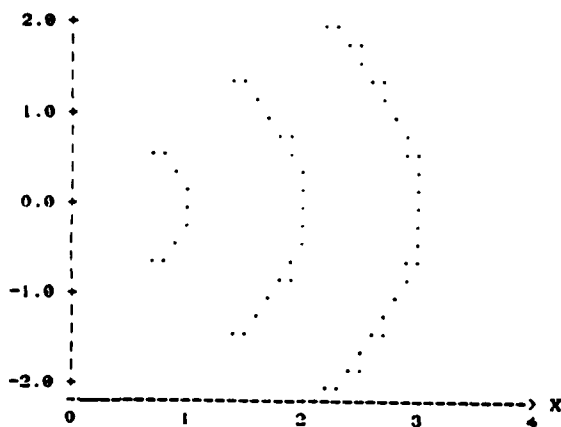
File Creation Date : MON, AUG 08 1983

System time 19:34:47

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** MODEL PARAMETERS **
HEIGHT FILTER COEFFICIENT * 0.25
SLOPE FILTER COEFFICIENT * 0.90
LEVEL GROUND STEP THRESHOLD * 0.25 METERS
SLOPE THRESHOLD * 30.00 DEGREES

```



X vs. Y for
hazards of
scan # 1

Number key:
1 -- Insufficient data
2 -- Furthest return .LT. 1.5m
3 -- Slope hazard
4 -- Step hazard
5 -- Crosspath hazard
6 -- Bad data

Points off scale: 0

NO HAZARDS CATALOGED THIS SCAN

Input file: MDL.LITTLE.HOLE.04

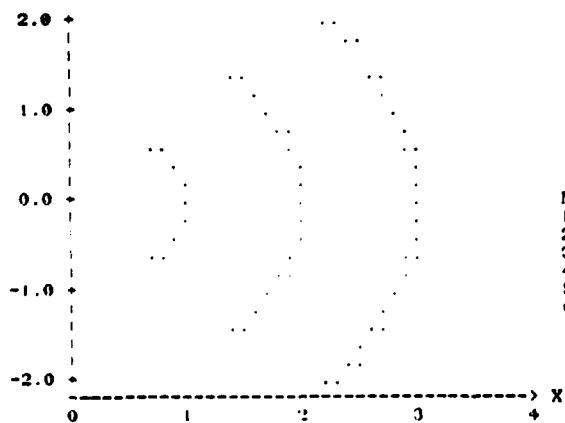
File Creation Date : MON, AUG 08 1983

System time 19:44:21

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** MODEL PARAMETERS **
HEIGHT FILTER COEFFICIENT * 0.25
SLOPE FILTER COEFFICIENT * 0.90
LEVEL GROUND STEP THRESHOLD * 0.25 METERS
SLOPE THRESHOLD * 30.00 DEGREES

```



X vs. Y for
hazards of
scan # 1

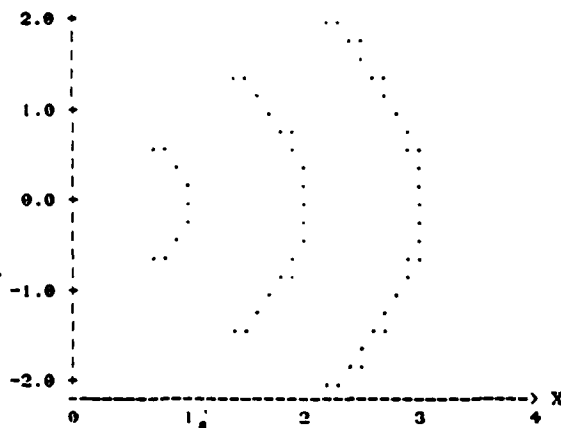
Number key:
1 -- Insufficient data
2 -- Furthest return .LT. 1.5m
3 -- Slope hazard
4 -- Step hazard
5 -- Crosspath hazard
6 -- Bad data

Points off scale: 0

NO HAZARDS CATALOGED THIS SCAN

Input file: MDL.LITTLE.HOLE.08
 File Creation Date : MON, AUG 08 1983 System time 19:59:14

** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT * 0.25
 SLOPE FILTER COEFFICIENT * 0.90
 LEVEL GROUND STEP THRESHOLD * 0.25 METERS
 SLOPE THRESHOLD * 30.00 DEGREES



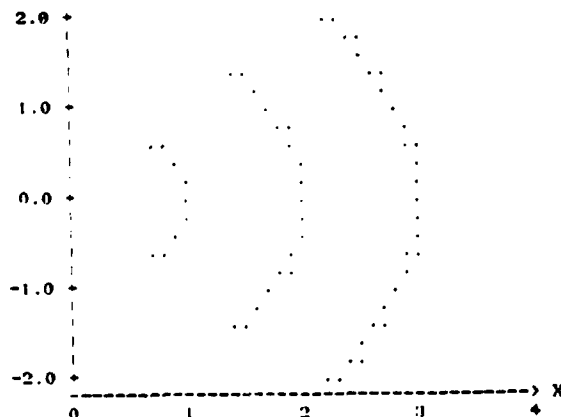
Number key:
 1 -- Insufficient data
 2 -- Furthest return .LT. 1.5m
 3 -- Slope hazard
 4 -- Step hazard
 5 -- Crosspath hazard
 6 -- Bad data

Points off scale: 0

NO HAZARDS CATALOGED THIS SCAN

Input file: MDL.LITTLE.HOLE.10
 File Creation Date : MON, AUG 08 1983 System time 20:08:20

** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT * 0.25
 SLOPE FILTER COEFFICIENT * 0.90
 LEVEL GROUND STEP THRESHOLD * 0.25 METERS
 SLOPE THRESHOLD * 30.00 DEGREES



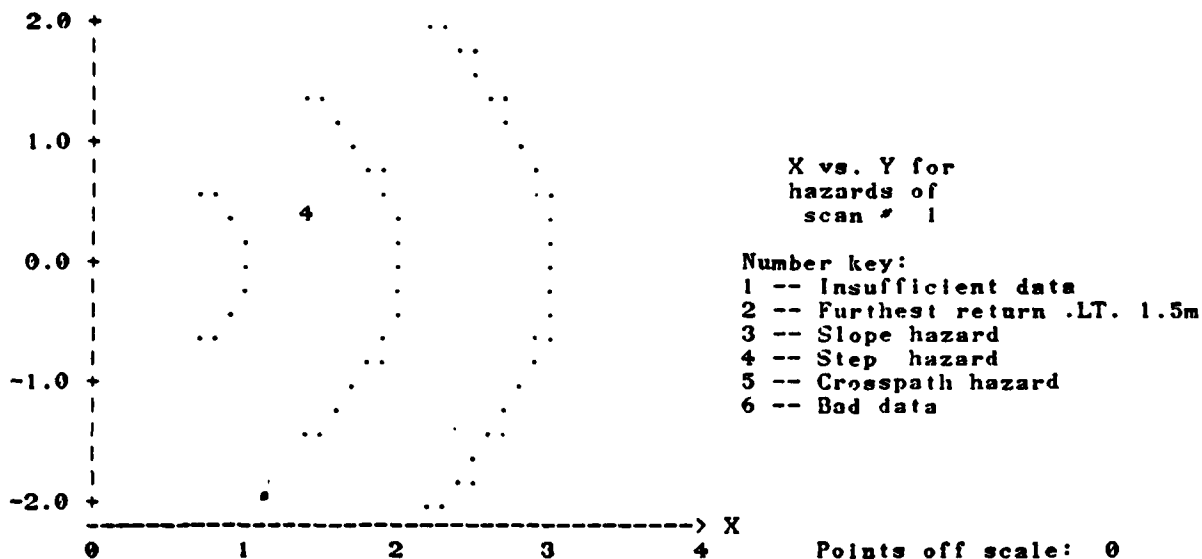
Number key:
 1 -- Insufficient data
 2 -- Furthest return .LT. 1.5m
 3 -- Slope hazard
 4 -- Step hazard
 5 -- Crosspath hazard
 6 -- Bad data

Points off scale: 0

NO HAZARDS CATALOGED THIS SCAN

Input file: MDL.LITTLE.HOLE.12
 File Creation Date : MON. AUG 08 1983 System time 20:15:21

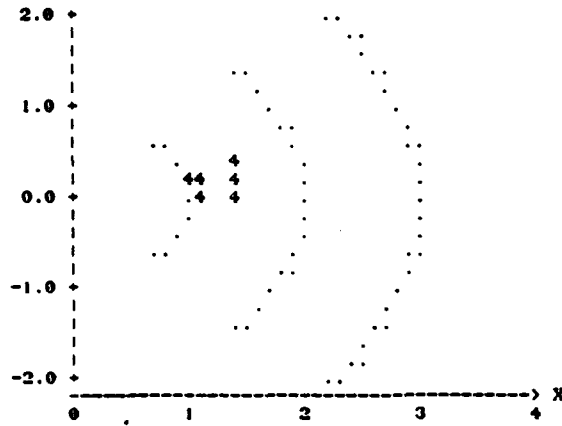
**** MODEL PARAMETERS ****
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S			C A T A L O G E D
2	-40.74	NO	H A Z A R D S			C A T A L O G E D
3	-37.93	NO	H A Z A R D S			C A T A L O G E D
4	-35.13	NO	H A Z A R D S			C A T A L O G E D
5	-32.31	NO	H A Z A R D S			C A T A L O G E D
6	-29.50	NO	H A Z A R D S			C A T A L O G E D
7	-26.69	NO	H A Z A R D S			C A T A L O G E D
8	-23.88	NO	H A Z A R D S			C A T A L O G E D
9	-21.08	NO	H A Z A R D S			C A T A L O G E D
10	-18.26	NO	H A Z A R D S			C A T A L O G E D
11	-15.45	NO	H A Z A R D S			C A T A L O G E D
12	-12.64	NO	H A Z A R D S			C A T A L O G E D
13	-9.84	NO	H A Z A R D S			C A T A L O G E D
14	-7.02	NO	H A Z A R D S			C A T A L O G E D
15	-4.22	NO	H A Z A R D S			C A T A L O G E D
16	-1.41	NO	H A Z A R D S			C A T A L O G E D
17	1.40	NO	H A Z A R D S			C A T A L O G E D
18	4.21	NO	H A Z A R D S			C A T A L O G E D
19	7.02	NO	H A Z A R D S			C A T A L O G E D
20	9.83	NO	H A Z A R D S			C A T A L O G E D
21	12.64	NO	H A Z A R D S			C A T A L O G E D
22	15.45	1.45	1.39	0.39	-0.28	Step hazard
		1.45	1.39	0.39	-0.28	Step hazard
23	18.26	NO	H A Z A R D S			C A T A L O G E D
24	21.07	NO	H A Z A R D S			C A T A L O G E D
25	23.88	NO	H A Z A R D S			C A T A L O G E D
26	26.69	NO	H A Z A R D S			C A T A L O G E D
27	29.50	NO	H A Z A R D S			C A T A L O G E D
28	32.31	NO	H A Z A R D S			C A T A L O G E D
29	35.12	NO	H A Z A R D S			C A T A L O G E D
30	37.93	NO	H A Z A R D S			C A T A L O G E D
31	40.74	NO	H A Z A R D S			C A T A L O G E D
32	43.55	NO	H A Z A R D S			C A T A L O G E D

Input file: MDL.LITTLE.HOLE.14
 File Creation Date : MON, AUG 08 1983 System time 20:25:22

** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT : 0.25
 SLOPE FILTER COEFFICIENT : 0.90
 LEVEL GROUND STEP THRESHOLD : 0.25 METERS
 SLOPE THRESHOLD : 30.00 DEGREES



X vs. Y for
 hazards of
 scan # 1

Number key:
 1 -- Insufficient data
 2 -- Furthest return .LT. 1.5m
 3 -- Slope hazard
 4 -- Step hazard
 5 -- Crosspath hazard
 6 -- Bad data

Points off scale: 0

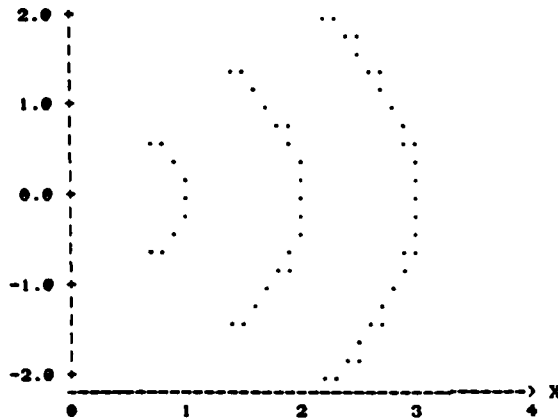
AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S	C A T A L O C E D		
2	-40.74	NO	H A Z A R D S	C A T A L O C E D		
3	-37.93	NO	H A Z A R D S	C A T A L O C E D		
4	-35.13	NO	H A Z A R D S	C A T A L O C E D		
5	-32.31	NO	H A Z A R D S	C A T A L O C E D		
6	-29.50	NO	H A Z A R D S	C A T A L O C E D		
7	-26.69	NO	H A Z A R D S	C A T A L O C E D		
8	-23.88	NO	H A Z A R D S	C A T A L O C E D		
9	-21.08	NO	H A Z A R D S	C A T A L O C E D		
10	-18.26	NO	H A Z A R D S	C A T A L O C E D		
11	-15.45	NO	H A Z A R D S	C A T A L O C E D		
12	-12.64	NO	H A Z A R D S	C A T A L O C E D		
13	-9.84	NO	H A Z A R D S	C A T A L O C E D		
14	-7.02	NO	H A Z A R D S	C A T A L O C E D		
15	-4.22	NO	H A Z A R D S	C A T A L O C E D		
16	-1.41	NO	H A Z A R D S	C A T A L O C E D		
17	1.40	1.06	1.06	0.03	0.01	Step hazard
		1.41	1.41	0.03	-0.25	Step hazard
18	4.21	1.06	1.05	0.08	0.01	Step hazard
		1.41	1.40	0.10	-0.25	Step hazard
		1.41	1.40	0.10	-0.25	Step hazard
		1.41	1.40	0.10	-0.25	Step hazard
19	7.02	1.06	1.05	0.13	0.01	Step hazard
		1.41	1.40	0.17	-0.25	Step hazard
		1.41	1.40	0.17	-0.25	Step hazard
20	9.83	1.06	1.04	0.18	0.01	Step hazard
		1.41	1.39	0.24	-0.25	Step hazard
21	12.64	1.06	1.03	0.23	0.01	Step hazard
		1.41	1.37	0.31	-0.25	Step hazard
22	15.45	1.10	1.06	0.29	0.00	Step hazard
		1.41	1.36	0.37	-0.25	Step hazard
23	18.26	NO	H A Z A R D S	C A T A L O C E D		
24	21.07	NO	H A Z A R D S	C A T A L O C E D		
25	23.88	NO	H A Z A R D S	C A T A L O C E D		
26	26.69	NO	H A Z A R D S	C A T A L O C E D		
27	29.50	NO	H A Z A R D S	C A T A L O C E D		
28	32.31	NO	H A Z A R D S	C A T A L O C E D		
29	35.12	NO	H A Z A R D S	C A T A L O C E D		
30	37.93	NO	H A Z A R D S	C A T A L O C E D		
32	43.55	NO	H A Z A R D S	C A T A L O C E D		

7.2.6.2 Rectangular Hole: 30 cm x 60 cm

7.2.6.2.1	0 cm Depth	219
7.2.6.2.1	10 cm Depth	219
7.2.6.2.2	20 cm Depth	220
7.2.6.2.3	25 cm Depth	221
7.2.6.2.4	30 cm Depth	222
7.2.6.2.5	36 cm Depth	223

Input file: MDL.HOLE.00
 File Creation Date : MON, AUG 08 1983 System time 19:34:47

== MODEL PARAMETERS ==
 HEIGHT FILTER COEFFICIENT * 0.25
 SLOPE FILTER COEFFICIENT * 0.90
 LEVEL GROUND STEP THRESHOLD * 0.25 METERS
 SLOPE THRESHOLD * 30.00 DEGREES



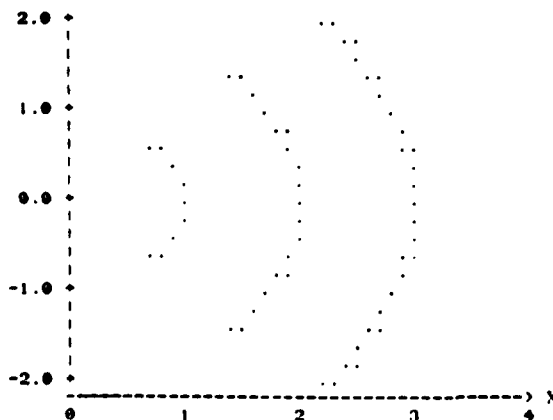
Number key:
 1 -- Insufficient data
 2 -- Furthest return .LT. 1.5m
 3 -- Slope hazard
 4 -- Step hazard
 5 -- Crosspath hazard
 6 -- Bad data

Points off scale: 0

NO HAZARDS CATALOGED THIS SCAN

Input file: MDL.MIDDLE.HOLE.04
 File Creation Date : MON, AUG 08 1983 System time 22:15:26

== MODEL PARAMETERS ==
 HEIGHT FILTER COEFFICIENT * 0.25
 SLOPE FILTER COEFFICIENT * 0.90
 LEVEL GROUND STEP THRESHOLD * 0.25 METERS
 SLOPE THRESHOLD * 30.00 DEGREES



Number key:
 1 -- Insufficient data
 2 -- Furthest return .LT. 1.5m
 3 -- Slope hazard
 4 -- Step hazard
 5 -- Crosspath hazard
 6 -- Bad data

Points off scale: 0

NO HAZARDS CATALOGED THIS SCAN

Input file: MDL.MIDDLE.HOLE.08

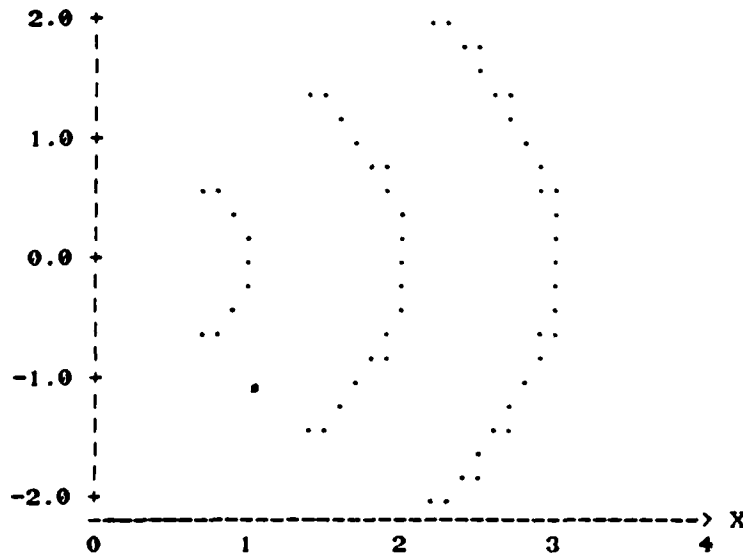
File Creation Date : MON, AUG 08 1983

System time 21:43:33

```

** MODEL1 PARAMETERS **
HEIGHT FILTER COEFFICIENT = 0.25
SLOPE FILTER COEFFICIENT = 0.90
LEVEL GROUND STEP THRESHOLD = 0.25 METERS
SLOPE THRESHOLD = 30.00 DEGREES

```



X vs. Y for
hazards of
scan # 1

Number key:
1 -- Insufficient data
2 -- Furthest return .LT. 1.5m
3 -- Slope hazard
4 -- Step hazard
5 -- Crosspath hazard
6 -- Bad data

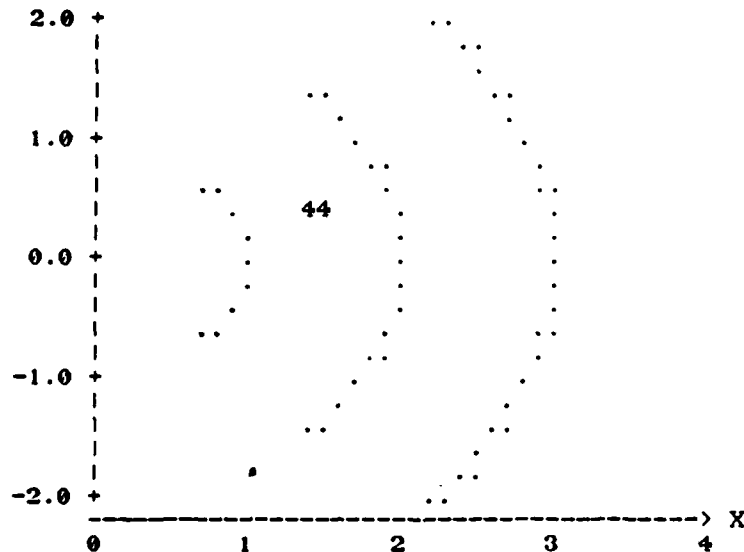
Points off scale: 0

NO HAZARDS CATALOGED THIS SCAN

Input file: MDL.MIDDLE.HOLE.10
 File Creation Date : MON, AUG 08 1983

System time 21:52:50

** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



X vs. Y for
 hazards of
 scan # 1

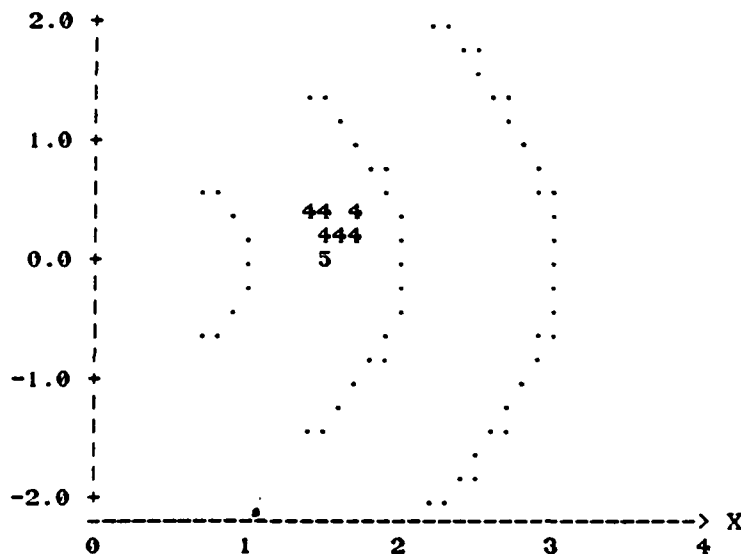
Number key:
 1 -- Insufficient data
 2 -- Furthest return .LT. 1.5m
 3 -- Slope hazard
 4 -- Step hazard
 5 -- Crosspath hazard
 6 -- Bad data

Points off scale: 0

AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S		C A T A L O C E D	
2	-40.74	NO	H A Z A R D S		C A T A L O C E D	
3	-37.93	NO	H A Z A R D S		C A T A L O C E D	
4	-35.13	NO	H A Z A R D S		C A T A L O C E D	
5	-32.31	NO	H A Z A R D S		C A T A L O C E D	
6	-29.50	NO	H A Z A R D S		C A T A L O C E D	
7	-26.69	NO	H A Z A R D S		C A T A L O C E D	
8	-23.88	NO	H A Z A R D S		C A T A L O C E D	
9	-21.08	NO	H A Z A R D S		C A T A L O C E D	
10	-18.26	NO	H A Z A R D S		C A T A L O C E D	
11	-15.45	NO	H A Z A R D S		C A T A L O C E D	
12	-12.64	NO	H A Z A R D S		C A T A L O C E D	
13	-9.84	NO	H A Z A R D S		C A T A L O C E D	
14	-7.02	NO	H A Z A R D S		C A T A L O C E D	
15	-4.22	NO	H A Z A R D S		C A T A L O C E D	
16	-1.41	NO	H A Z A R D S		C A T A L O C E D	
17	1.40	NO	H A Z A R D S		C A T A L O C E D	
18	4.21	NO	H A Z A R D S		C A T A L O C E D	
19	7.02	NO	H A Z A R D S		C A T A L O C E D	
20	9.83	NO	H A Z A R D S		C A T A L O C E D	
21	12.64	1.55	1.51	0.34	-0.22	Step hazard
22	15.45	1.48	1.43	0.39	-0.26	Step hazard
		1.48	1.43	0.39	-0.26	Step hazard
23	18.26	NO	H A Z A R D S		C A T A L O C E D	
24	21.07	NO	H A Z A R D S		C A T A L O C E D	
25	23.88	NO	H A Z A R D S		C A T A L O C E D	
26	26.69	NO	H A Z A R D S		C A T A L O C E D	
27	29.50	NO	H A Z A R D S		C A T A L O C E D	
28	32.31	NO	H A Z A R D S		C A T A L O C E D	
29	35.12	NO	H A Z A R D S		C A T A L O C E D	
30	37.93	NO	H A Z A R D S		C A T A L O C E D	
31	40.74	NO	H A Z A R D S		C A T A L O C E D	
32	43.55	NO	H A Z A R D S		C A T A L O C E D	

Input file: MDL.MIDDLE.HOLE.12
 File Creation Date : MON, AUC 08 1983 System time 21:22:45

**** MODEL1 PARAMETERS ****
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



X vs. Y for
 hazards of
 scan # 1

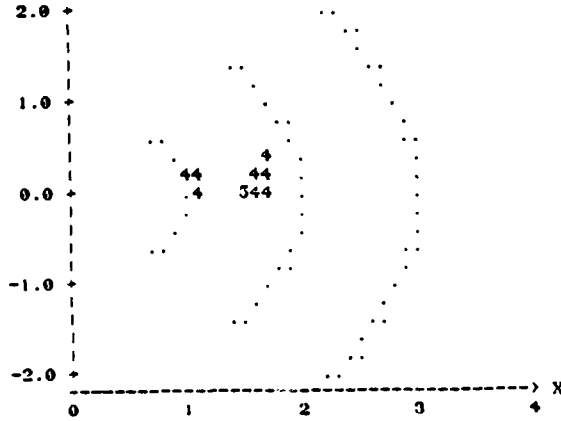
- Number key:
 1 -- Insufficient data
 2 -- Furthest return .LT. 1.5m
 3 -- Slope hazard
 4 -- Step hazard
 5 -- Crosspath hazard
 6 -- Bad data

Points off scale: 0

AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S		C A T A L O C E D	
2	-40.74	NO	H A Z A R D S		C A T A L O C E D	
3	-37.93	NO	H A Z A R D S		C A T A L O C E D	
4	-35.13	NO	H A Z A R D S		C A T A L O C E D	
5	-32.31	NO	H A Z A R D S		C A T A L O C E D	
6	-29.50	NO	H A Z A R D S		C A T A L O C E D	
7	-26.69	NO	H A Z A R D S		C A T A L O C E D	
8	-23.88	NO	H A Z A R D S		C A T A L O C E D	
9	-21.08	NO	H A Z A R D S		C A T A L O C E D	
10	-18.26	NO	H A Z A R D S		C A T A L O C E D	
11	-15.45	NO	H A Z A R D S		C A T A L O C E D	
12	-12.64	NO	H A Z A R D S		C A T A L O C E D	
13	-9.84	NO	H A Z A R D S		C A T A L O C E D	
14	-7.02	NO	H A Z A R D S		C A T A L O C E D	
15	-4.22	NO	H A Z A R D S		C A T A L O C E D	
16	-1.41	1.50	1.50	-0.04	0.05	Crosspath hazard
17	1.40	NO	H A Z A R D S		C A T A L O C E D	
18	4.21	NO	H A Z A R D S		C A T A L O C E D	
19	7.02	1.56	1.55	0.19	-0.32	Step hazard
		1.71	1.70	0.21	-0.29	Step hazard
20	9.83	1.56	1.54	0.27	-0.32	Step hazard
		1.71	1.68	0.29	-0.30	Step hazard
		1.71	1.68	0.29	-0.30	Step hazard
21	12.64	1.59	1.53	0.35	-0.27	Step hazard
		1.71	1.67	0.37	-0.29	Step hazard
22	15.45	1.45	1.39	0.39	-0.28	Step hazard
23	18.26	NO	H A Z A R D S		C A T A L O C E D	
24	21.07	NO	H A Z A R D S		C A T A L O C E D	
25	23.88	NO	H A Z A R D S		C A T A L O C E D	
26	26.69	NO	H A Z A R D S		C A T A L O C E D	
27	29.50	NO	H A Z A R D S		C A T A L O C E D	
28	32.31	NO	H A Z A R D S		C A T A L O C E D	
29	35.12	NO	H A Z A R D S		C A T A L O C E D	
30	37.93	NO	H A Z A R D S		C A T A L O C E D	
31	40.74	NO	H A Z A R D S		C A T A L O C E D	
32	43.55	NO	H A Z A R D S		C A T A L O C E D	

Input file: MDL.MIDDLE.HOLE.14
 File Creation Date : MON. AUG 08 1983 System time 21:04:27

** MODEL1 PARAMETERS **
 HEIGHT FILTER COEFFICIENT * 0.25
 SLOPE FILTER COEFFICIENT * 0.90
 LEVEL GROUND STEP THRESHOLD * 0.25 METERS
 SLOPE THRESHOLD * 30.00 DEGREES



X vs. Y for
 hazards of
 scan # 1

Number key:
 1 -- Insufficient data
 2 -- Furthest return .LT. 1.5m
 3 -- Slope hazard
 4 -- Step hazard
 5 -- Crosspath hazard
 6 -- Bad data

Points off scale: 0

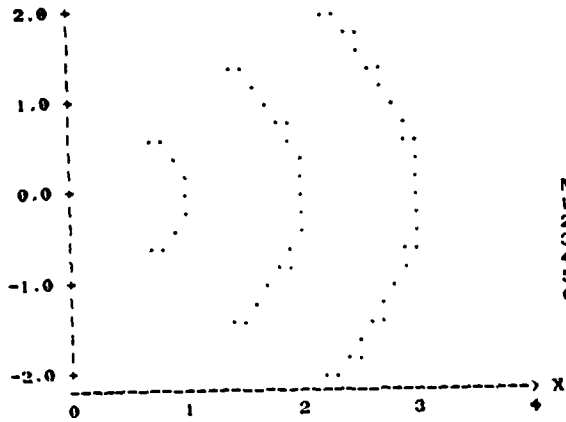
AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.36	NO	H A Z A R D S			C A T A L O G E D
2	-40.74	NO	H A Z A R D S			C A T A L O G E D
3	-37.93	NO	H A Z A R D S			C A T A L O G E D
4	-35.13	NO	H A Z A R D S			C A T A L O G E D
5	-32.31	NO	H A Z A R D S			C A T A L O G E D
6	-29.50	NO	H A Z A R D S			C A T A L O G E D
7	-26.69	NO	H A Z A R D S			C A T A L O G E D
9	-21.08	NO	H A Z A R D S			C A T A L O G E D
10	-18.26	NO	H A Z A R D S			C A T A L O G E D
11	-15.45	NO	H A Z A R D S			C A T A L O G E D
12	-12.64	NO	H A Z A R D S			C A T A L O G E D
13	-9.84	NO	H A Z A R D S			C A T A L O G E D
14	-7.02	NO	H A Z A R D S			C A T A L O G E D
15	-4.22	NO	H A Z A R D S			C A T A L O G E D
16	-1.41	1.50	1.50	-0.04	0.05	Crosspath hazard
		1.75	1.75	-0.04	0.01	Crosspath hazard
17	1.40	1.06	1.06	0.03	0.01	Step hazard
		1.61	1.61	0.04	-0.38	Step hazard
		1.61	1.61	0.04	-0.38	Step hazard
		1.68	1.68	0.04	-0.35	Step hazard
		1.71	1.71	0.04	-0.31	Step hazard
18	4.21	1.06	1.05	0.08	0.01	Step hazard
		1.61	1.61	0.12	-0.38	Step hazard
		1.61	1.61	0.12	-0.38	Step hazard
		1.68	1.67	0.12	-0.35	Step hazard
		1.71	1.71	0.13	-0.31	Step hazard
19	7.02	1.06	1.03	0.13	0.01	Step hazard
		1.61	1.60	0.20	-0.38	Step hazard
		1.61	1.60	0.20	-0.38	Step hazard
		1.68	1.67	0.21	-0.35	Step hazard
20	9.83	1.06	1.04	0.18	0.01	Step hazard
		1.61	1.59	0.28	-0.38	Step hazard
		1.61	1.59	0.28	-0.38	Step hazard
		1.71	1.68	0.29	-0.32	Step hazard
21	12.64	1.06	1.03	0.23	0.01	Step hazard
		1.77	1.72	0.39	-0.33	Step hazard
22	15.45	1.10	1.06	0.29	0.00	Step hazard
23	18.26	NO	H A Z A R D S			C A T A L O G E D
24	21.07	NO	H A Z A R D S			C A T A L O G E D
25	23.88	NO	H A Z A R D S			C A T A L O G E D
26	26.69	NO	H A Z A R D S			C A T A L O G E D
27	29.50	NO	H A Z A R D S			C A T A L O G E D
28	32.31	NO	H A Z A R D S			C A T A L O G E D
29	35.12	NO	H A Z A R D S			C A T A L O G E D
30	37.93	NO	H A Z A R D S			C A T A L O G E D
31	40.74	NO	H A Z A R D S			C A T A L O G E D
32	43.55	NO	H A Z A R D S			C A T A L O G E D

7.2.6.3 Large Square Hole: 60 cm x 60 cm

7.2.6.3.1	0 cm Depth	225
7.2.6.3.1	10 cm Depth	225
7.2.6.3.2	20 cm Depth	226
7.2.6.3.3	25 cm Depth	227
7.2.6.3.4	30 cm Depth	228
7.2.6.3.5	36 cm Depth	229

Input file: MDL.HOLE.00
 File Creation Date : MON, AUG 08 1983 System time 19:34:47

** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT * 0.25
 SLOPE FILTER COEFFICIENT * 0.90
 LEVEL GROUND STEP THRESHOLD * 0.25 METERS
 SLOPE THRESHOLD * 30.00 DEGREES



X vs. Y for
 hazards of
 scan # 1

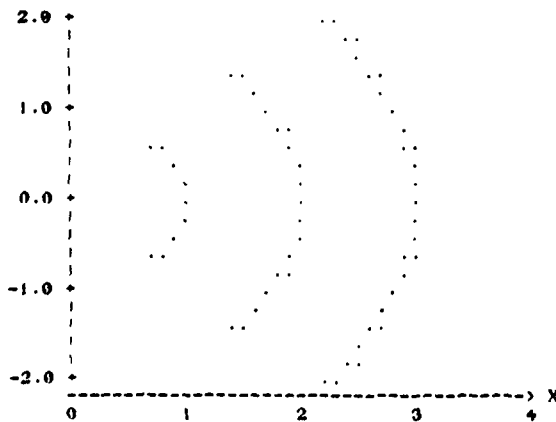
Number key:
 1 -- Insufficient data
 2 -- Furthest return .LT. 1.5m
 3 -- Slope hazard
 4 -- Step hazard
 5 -- Crosspath hazard
 6 -- Bad data

Points off scale: 0

NO HAZARDS CATALOGED THIS SCAN

Input file: MDL.RIG.HOLE.04
 File Creation Date : MON, AUG 08 1983 System time 23:05:12

** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT * 0.25
 SLOPE FILTER COEFFICIENT * 0.90
 LEVEL GROUND STEP THRESHOLD * 0.25 METERS
 SLOPE THRESHOLD * 30.00 DEGREES



X vs. Y for
 hazards of
 scan # 1

Number key:
 1 -- Insufficient data
 2 -- Furthest return .LT. 1.5m
 3 -- Slope hazard
 4 -- Step hazard
 5 -- Crosspath hazard
 6 -- Bad data

Points off scale: 0

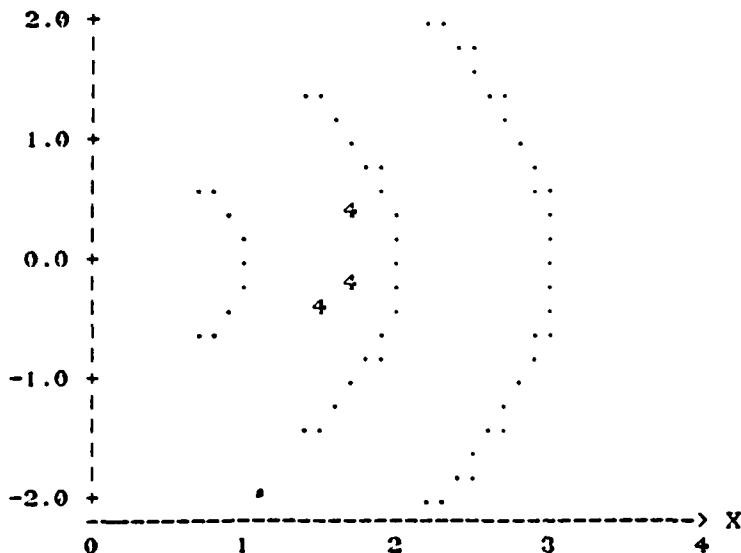
NO HAZARDS CATALOGED THIS SCAN

Input file: MDL.BIG.HOLE.08

File Creation Date : MON. AUG 08 1983

System time 23:00:51

** MODEL PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



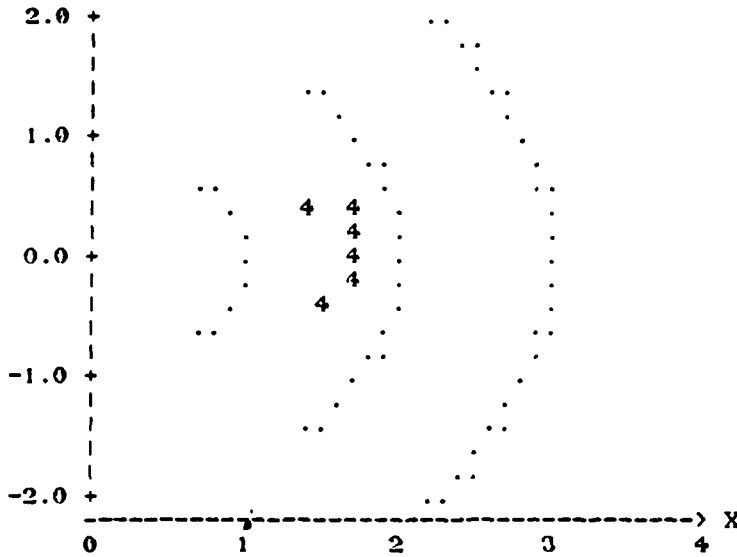
X vs. Y for hazards of scan # 1

- Number key:
- 1 -- Insufficient data
 - 2 -- Furthest return .LT. 1.5m
 - 3 -- Slope hazard
 - 4 -- Step hazard
 - 5 -- Crosspath hazard
 - 6 -- Bad data

Points off scale: 0

AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	HAZARDS		CATALOCED	
2	-40.74	NO	HAZARDS		CATALOCED	
3	-37.93	NO	HAZARDS		CATALOCED	
4	-35.13	NO	HAZARDS		CATALOCED	
5	-32.31	NO	HAZARDS		CATALOCED	
6	-29.50	NO	HAZARDS		CATALOCED	
7	-26.69	NO	HAZARDS		CATALOCED	
8	-23.88	NO	HAZARDS		CATALOCED	
9	-21.08	NO	HAZARDS		CATALOCED	
10	-18.26	NO	HAZARDS		CATALOCED	
11	-15.45	NO	HAZARDS		CATALOCED	
12	-12.64	1.55	1.51	-0.34	-0.21	Step hazard
13	-9.84	NO	HAZARDS		CATALOCED	
14	-7.02	NO	HAZARDS		CATALOCED	
15	-4.22	1.71	1.71	-0.13	-0.25	Step hazard
16	-1.41	NO	HAZARDS		CATALOCED	
17	1.40	NO	HAZARDS		CATALOCED	
18	4.21	NO	HAZARDS		CATALOCED	
19	7.02	NO	HAZARDS		CATALOCED	
20	9.83	NO	HAZARDS		CATALOCED	
21	12.64	1.71	1.67	0.37	-0.25	Step hazard
22	15.45	NO	HAZARDS		CATALOCED	
23	18.26	NO	HAZARDS		CATALOCED	
24	21.07	NO	HAZARDS		CATALOCED	
25	23.88	NO	HAZARDS		CATALOCED	
26	26.69	NO	HAZARDS		CATALOCED	
27	29.50	NO	HAZARDS		CATALOCED	
28	32.31	NO	HAZARDS		CATALOCED	
29	35.12	NO	HAZARDS		CATALOCED	
30	37.93	NO	HAZARDS		CATALOCED	
31	40.74	NO	HAZARDS		CATALOCED	
32	43.55	NO	HAZARDS		CATALOCED	

** MODEL1 PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



X vs. Y for
 hazards of
 scan # 1

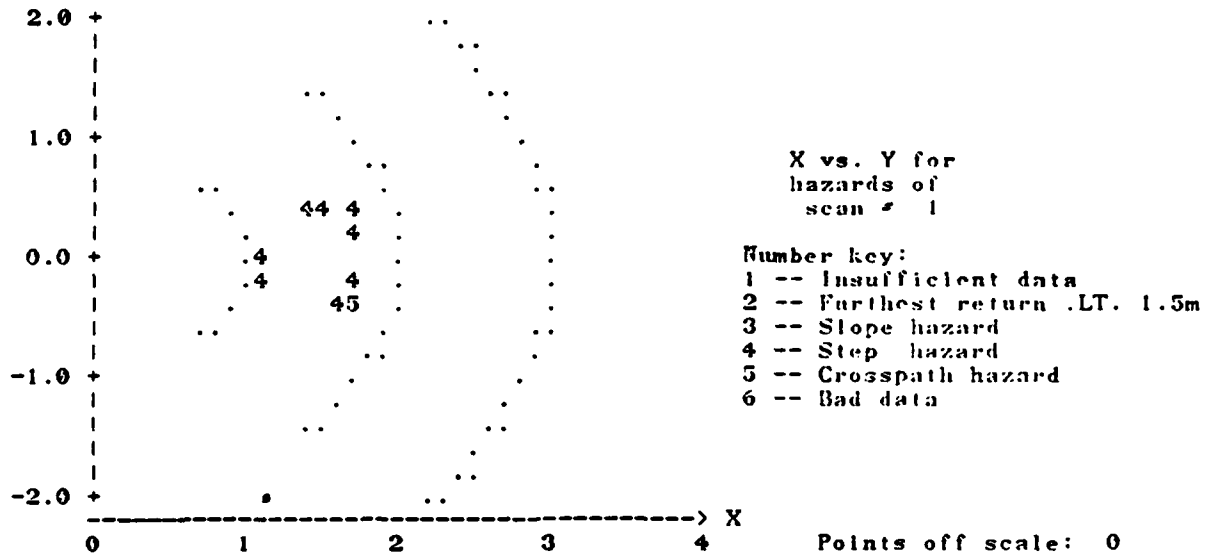
- Number key:
 1 -- Insufficient data
 2 -- Furthest return .LT. 1.5m
 3 -- Slope hazard
 4 -- Step hazard
 5 -- Crosspath hazard
 6 -- Bad data

Points off scale: 0

AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	HAZARDS	NO	CATALOGED	
2	-40.74	NO	HAZARDS	NO	CATALOGED	
3	-37.93	NO	HAZARDS	NO	CATALOGED	
4	-35.13	NO	HAZARDS	NO	CATALOGED	
5	-32.31	NO	HAZARDS	NO	CATALOGED	
6	-29.50	NO	HAZARDS	NO	CATALOGED	
7	-26.69	NO	HAZARDS	NO	CATALOGED	
8	-23.88	NO	HAZARDS	NO	CATALOGED	
9	-21.08	NO	HAZARDS	NO	CATALOGED	
10	-18.26	NO	HAZARDS	NO	CATALOGED	
11	-15.45	NO	HAZARDS	NO	CATALOGED	
12	-12.64	1.55	1.51	-0.34	-0.22	Step hazard
13	-9.84	1.71	1.68	-0.29	-0.27	Step hazard
14	-7.02	1.71	1.70	-0.21	-0.27	Step hazard
15	-4.22	1.71	1.71	-0.13	-0.27	Step hazard
		1.71	1.71	-0.13	-0.27	Step hazard
16	-1.41	1.71	1.71	-0.04	-0.27	Step hazard
		1.71	1.71	-0.04	-0.27	Step hazard
17	1.40	1.71	1.71	0.04	-0.27	Step hazard
		1.71	1.71	0.04	-0.27	Step hazard
18	4.21	1.71	1.71	0.13	-0.27	Step hazard
		1.71	1.71	0.13	-0.27	Step hazard
19	7.02	1.71	1.70	0.21	-0.27	Step hazard
20	9.83	1.71	1.68	0.29	-0.27	Step hazard
21	12.64	1.71	1.67	0.37	-0.28	Step hazard
22	15.45	1.48	1.43	0.39	-0.26	Step hazard
		1.48	1.43	0.39	-0.26	Step hazard
23	18.26	NO	HAZARDS	NO	CATALOGED	
24	21.07	NO	HAZARDS	NO	CATALOGED	
25	23.88	NO	HAZARDS	NO	CATALOGED	
26	26.69	NO	HAZARDS	NO	CATALOGED	
27	29.50	NO	HAZARDS	NO	CATALOGED	
28	32.31	NO	HAZARDS	NO	CATALOGED	
29	35.12	NO	HAZARDS	NO	CATALOGED	
30	37.93	NO	HAZARDS	NO	CATALOGED	
31	40.74	NO	HAZARDS	NO	CATALOGED	
32	43.55	NO	HAZARDS	NO	CATALOGED	

Input file: MDL.BIG.HOLE.12
 File Creation Date : MON, AUG 08 1983 System time 22:45:28

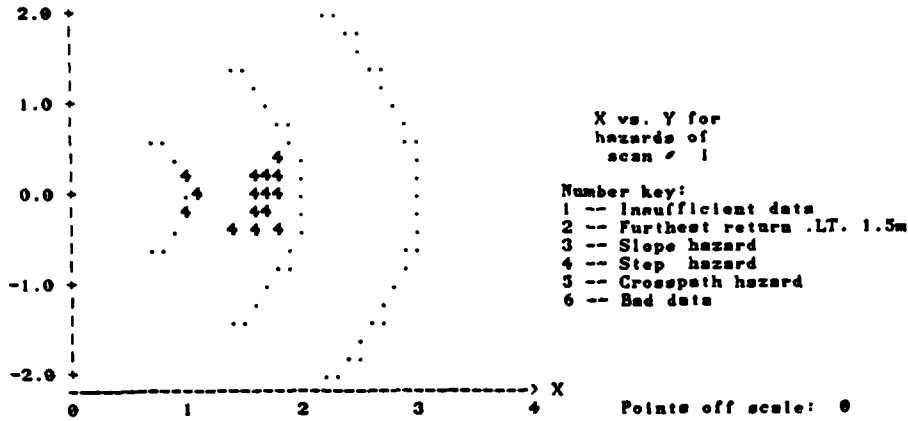
** MODEL1 PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	H A Z A R D S			C A T A L O G E D
2	-40.74	NO	H A Z A R D S			C A T A L O G E D
3	-37.93	NO	H A Z A R D S			C A T A L O G E D
4	-35.13	NO	H A Z A R D S			C A T A L O G E D
5	-32.31	NO	H A Z A R D S			C A T A L O G E D
6	-29.50	NO	H A Z A R D S			C A T A L O G E D
7	-26.69	NO	H A Z A R D S			C A T A L O G E D
8	-23.88	NO	H A Z A R D S			C A T A L O G E D
9	-21.08	NO	H A Z A R D S			C A T A L O G E D
10	-18.26	NO	H A Z A R D S			C A T A L O G E D
11	-15.45	1.75	1.69	-0.47	0.01	Crosspath hazard
12	-12.64	1.68	1.64	-0.37	-0.31	Step hazard
13	-9.84	NO	H A Z A R D S			C A T A L O G E D
14	-7.02	1.10	1.10	-0.13	0.00	Step hazard
		1.68	1.67	-0.21	-0.33	Step hazard
15	-4.22	1.10	1.10	-0.08	0.00	Step hazard
		1.68	1.67	-0.12	-0.33	Step hazard
16	-1.41	NO	H A Z A R D S			C A T A L O G E D
17	1.40	NO	H A Z A R D S			C A T A L O G E D
18	4.21	NO	H A Z A R D S			C A T A L O G E D
19	7.02	1.68	1.67	0.21	-0.29	Step hazard
20	9.83	NO	H A Z A R D S			C A T A L O G E D
21	12.64	1.59	1.55	0.35	-0.28	Step hazard
		1.71	1.67	0.37	-0.29	Step hazard
22	15.45	1.45	1.39	0.39	-0.28	Step hazard
		1.45	1.39	0.39	-0.28	Step hazard
		1.48	1.43	0.39	-0.28	Step hazard
23	18.26	NO	H A Z A R D S			C A T A L O G E D
24	21.07	NO	H A Z A R D S			C A T A L O G E D
25	23.88	NO	H A Z A R D S			C A T A L O G E D
26	26.69	NO	H A Z A R D S			C A T A L O G E D
27	29.50	NO	H A Z A R D S			C A T A L O G E D
28	32.31	NO	H A Z A R D S			C A T A L O G E D
29	35.12	NO	H A Z A R D S			C A T A L O G E D
30	37.93	NO	H A Z A R D S			C A T A L O G E D
31	40.74	NO	H A Z A R D S			C A T A L O G E D
32	43.55	NO	H A Z A R D S			C A T A L O G E D

Input file: MDL.BIG.HOLE.14
 File Creation Date : MON. AUC 08 1983 System time 22:37:30

** MODEL1 PARAMETERS **
 HEIGHT FILTER COEFFICIENT = 0.25
 SLOPE FILTER COEFFICIENT = 0.90
 LEVEL GROUND STEP THRESHOLD = 0.25 METERS
 SLOPE THRESHOLD = 30.00 DEGREES



AZIMUTH	(deg)	RANGE	X	Y	Z	HAZARD TYPE
1	-43.56	NO	HAZARDS			CATALOGED
2	-40.74	NO	HAZARDS			CATALOGED
3	-37.93	NO	HAZARDS			CATALOGED
4	-35.13	NO	HAZARDS			CATALOGED
5	-32.31	NO	HAZARDS			CATALOGED
6	-29.50	NO	HAZARDS			CATALOGED
7	-26.69	NO	HAZARDS			CATALOGED
8	-23.88	NO	HAZARDS			CATALOGED
9	-21.08	NO	HAZARDS			CATALOGED
10	-18.26	NO	HAZARDS			CATALOGED
11	-15.45	1.41	1.36	-0.37	-0.28	Step hazard
12	-12.64	1.06	1.03	-0.23	0.01	Step hazard
		1.61	1.57	-0.35	-0.38	Step hazard
		1.61	1.57	-0.35	-0.38	Step hazard
		1.61	1.57	-0.35	-0.38	Step hazard
		1.68	1.64	-0.37	-0.35	Step hazard
13	-9.84	1.06	1.04	-0.18	0.01	Step hazard
		1.86	1.83	-0.32	-0.37	Step hazard
14	-7.02	1.06	1.05	-0.13	0.01	Step hazard
		1.61	1.60	-0.20	-0.38	Step hazard
		1.68	1.67	-0.21	-0.35	Step hazard
15	-4.22	1.06	1.05	-0.08	0.01	Step hazard
		1.61	1.61	-0.12	-0.38	Step hazard
		1.61	1.61	-0.12	-0.38	Step hazard
		1.68	1.67	-0.12	-0.35	Step hazard
16	-1.41	1.06	1.06	-0.03	0.01	Step hazard
		1.68	1.68	-0.04	-0.35	Step hazard
		1.77	1.77	-0.04	-0.37	Step hazard
17	1.40	1.64	1.64	0.04	-0.37	Step hazard
18	4.21	1.64	1.64	0.12	-0.37	Step hazard
		1.84	1.83	0.13	-0.13	Step hazard
19	7.02	1.61	1.60	0.20	-0.38	Step hazard
		1.61	1.60	0.20	-0.38	Step hazard
		1.77	1.75	0.22	-0.31	Step hazard
20	9.83	1.06	1.04	0.18	0.01	Step hazard
		1.61	1.59	0.28	-0.38	Step hazard
		1.61	1.59	0.28	-0.38	Step hazard
		1.68	1.65	0.29	-0.35	Step hazard
21	12.64	1.06	1.03	0.23	0.01	Step hazard
		1.86	1.81	0.41	-0.37	Step hazard
22	15.45	1.06	1.02	0.28	0.01	Step hazard
23	18.26	NO	HAZARDS			CATALOGED
24	21.07	NO	HAZARDS			CATALOGED
25	23.88	NO	HAZARDS			CATALOGED
26	26.69	NO	HAZARDS			CATALOGED
27	29.50	NO	HAZARDS			CATALOGED
28	32.31	NO	HAZARDS			CATALOGED
29	35.12	NO	HAZARDS			CATALOGED
30	37.93	NO	HAZARDS			CATALOGED
31	40.74	NO	HAZARDS			CATALOGED
32	43.55	NO	HAZARDS			CATALOGED