Remedial Investigation Report
Stillwater Boiler House Property
NYSDEC Site No. B00197
US Route 4 and Best Avenue
Town of Stillwater
Saratoga County, New York

VOLUME 3 of 7: GPR Report

February 2009

Chazen Project No. 30201.14

Prepared for:

Department of Environmental Conservation

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Stillwater New York

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Prepared by:

THE Chazen COMPANIES

ENGINEERS/SURVEYORS
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GROUND PENETRATING RADAR SURVEY

RESULTS FOR THE

LOCATION OF:

Underground Drums

AT:

Best Ave.
Stillwater, NY

PREPARED FOR:

Chazen Environmental Services, Inc.
Troy, NY

PREPARED BY:

SUB-SURFACE INFORMATIONAL SURVEYS, INC.
143C SHAKER ROAD, SUITE 206
EASTLONGMEADOW, MA 01028

July 24, 2004

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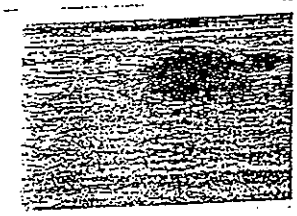

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1.0 Introduction

In accordance with your authorization, Sub-Surface Informational Surveys, Inc. (SIS) reports to you the results of ground penetrating radar survey conducted on Saturday, July 28, 2004 at the Stillwater Boiler House located on the corner of NY Route #4 and Best Avenue in the City of Stillwater, NY. The survey was directed by your approval of SIS quotation #1.2333.04 dated April 27, 2004.

1.1 Purpose and Scope

The purpose of the survey was to investigate for the presence of suspected drums within the parameters of the property.

Geophysical Survey

The geophysical survey was performed by Sub-Surface Informational Surveys, Inc. A transducer operator along with a supervising GPR technician performed the survey.

2.1 Geophysical Survey Procedures

The depth setting of the GPR survey was approximately 10.0' to locate parabolic features common to buried drums. A traverse grid with a 4.5' minimum spacing was used to conduct the GPR survey. Typically a 5.0' – 10.0' spacing is sufficient to detect all large capacity UST's (500-gallon or greater) and/or buried drums with a high degree of certainty. The spacing of 4.5' was used to better define any existing suspected anomalies.

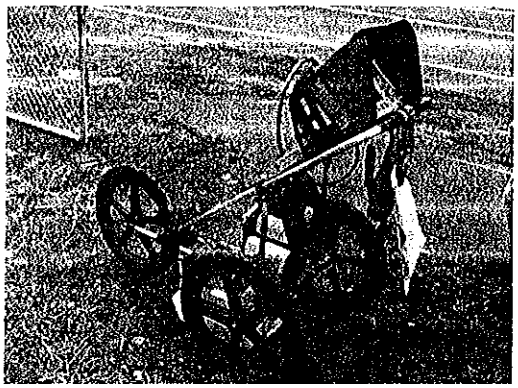
The equipment used to conduct the geophysical survey included GPR equipment which consists of subsurface **interface radar (SIR-3000)** computer manufactured by Geophysical Survey Systems, Inc., power supply, graphic recorder, video display unit and transmitting/receiving antenna. The equipment is known collectively as a **GPR system.** The transmitting/receiving antenna transmits electromagnetic signals into the subsurface and then detects, amplifies and displays reflections of the signal on a graphic recorder and a video display unit. As the antenna is moved slowly across the ground surface or surface of contact, a radar image of the subsurface is produced. The maximum depth of penetration of the GPR signal and the resolution of the reflections are a function of the antenna frequency and the electrical properties of the subsurface. As electrical conductivity of the subsurface increases, GPR signal penetration decreases. GPR reflections are produced by spatial changes in the physical properties of the subsurface (I.e., type of material, presence of any subsurface fluid, and porosity) and related changes in the electrical properties of the subsurface material in the path of the signals. The greater the difference, the stronger the observed GPR reflection.

Characteristics that are considered in the interpretation of GPR data from a given site include the size, shape and amplitude of the reflections. Metallic underground storage tanks, (UST's) utilities and conduits have electrical properties uniquely different from those of the soils in which they are buried. As a result, the GPR reflections are usually of high amplitude and have distinctive shapes. For GPR profiles oriented perpendicular to the long axis of the tanks, the signature is similar to a hyperbola. The signature is also a function of the tank diameter.

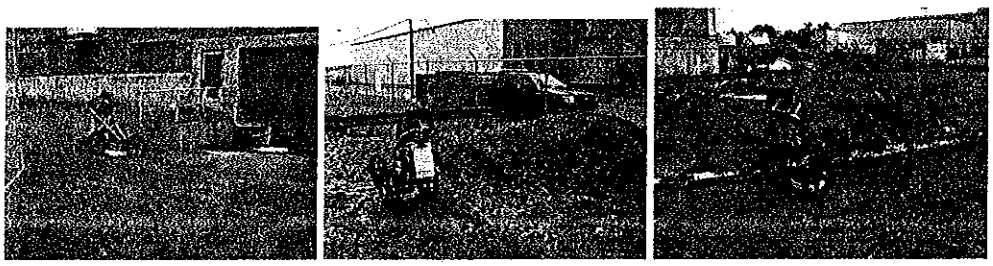
2.2 Geophysical Survey Results

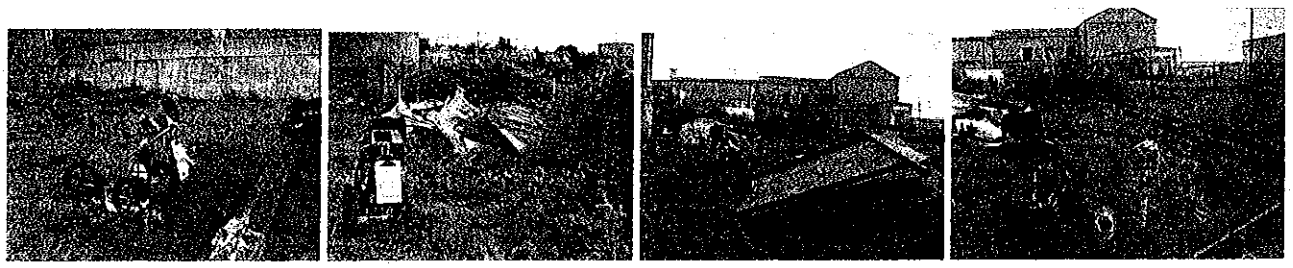
All of the open accessible areas around the four (4) sides of the former boiler house were surveyed using a maximum 4.5' parallel grid. A large percentage of the area surveyed was performed in tighter grids such as 3.0' – 3.5' due to surface debris. High vegetation, pieces of metal as well as miscellaneous debris was present throughout 2/3rds of the surface area. Traverses were "dog-legged" around surface debris for maximum coverage of the site. No unusual anomalies were found to indicate the presence of any storage drums. There was an area slightly north of the metal stairs that showed a change in the interface. This was painted on site on the day of the survey. (14' north of metal post; 4' east of building wall and 9' west of guard rail; AOC appears to be 17'north/south X 12' east/west. Please refer to the attached GPR Data for the location of that particular piece of data.

Start of survey at entrance gate north to wood chip pile

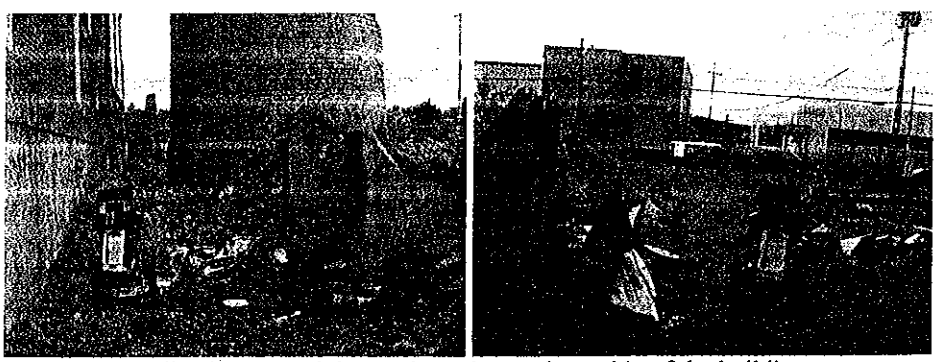


SIR-3000 Portable GPR unit used in this survey



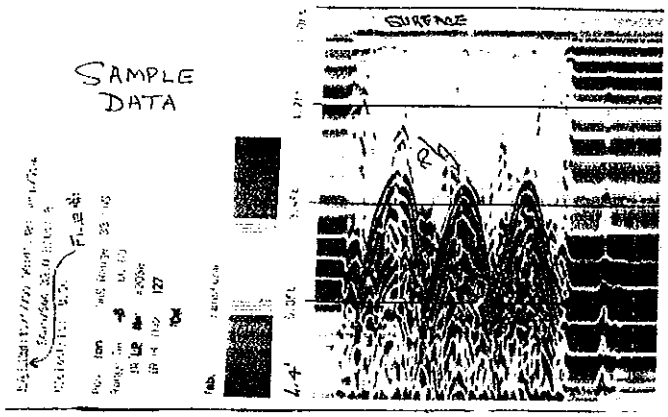


Above photos show various data points during the survey. Notice the position of the GPR unit which is "dodging" the surface debris. Scanning was performed as close to the surface debris as possible for sufficient coverage of the area.

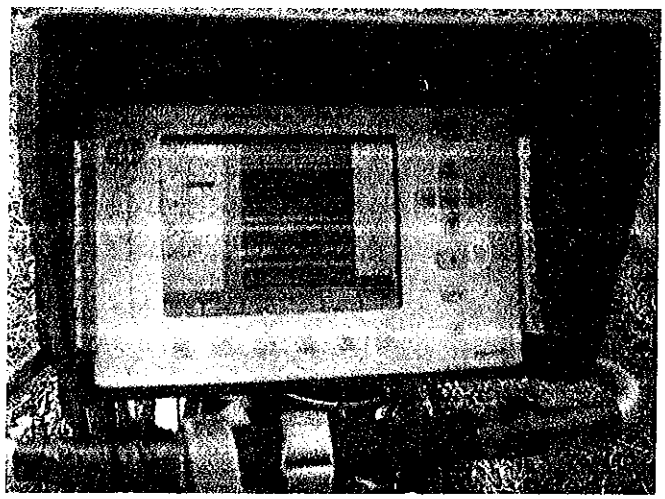


Collecting around the stack on the northern side of the building

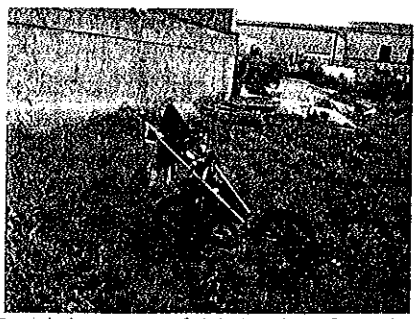
ACQUIRED DATA EXPLANATION



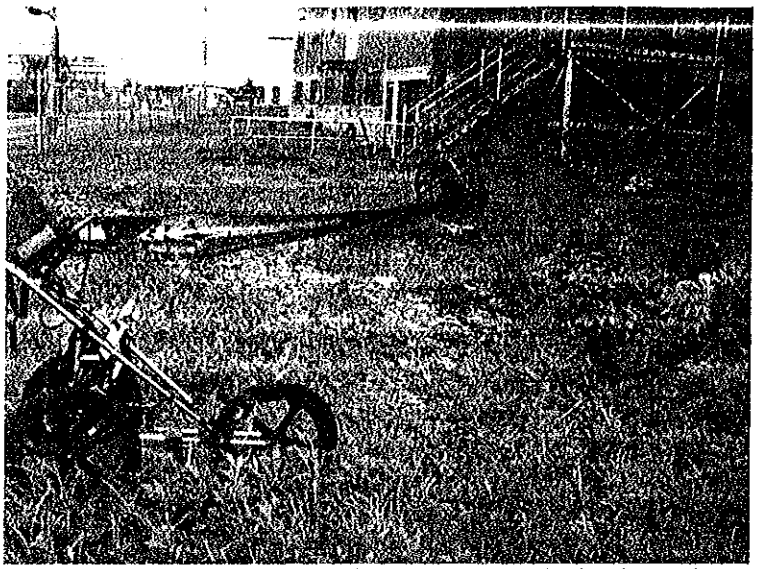
Above represents a sample of data collected by Sub-Surface Informational Surveys, Inc. on October 17, 1999 at a site in the State of Connecticut. It shows three (3) underground storage tanks with a marked centerline. The data FILE# is located on the left tab which also shows the nanosecond (depth) setting, dielectric constant, etc., which is set by our SIR-2000 computer operator. Please match the FILE# on the data with the same FILE# in this report for an explanation of the collected data. NOTE: The above is <u>not</u> part of the data collected for this survey.



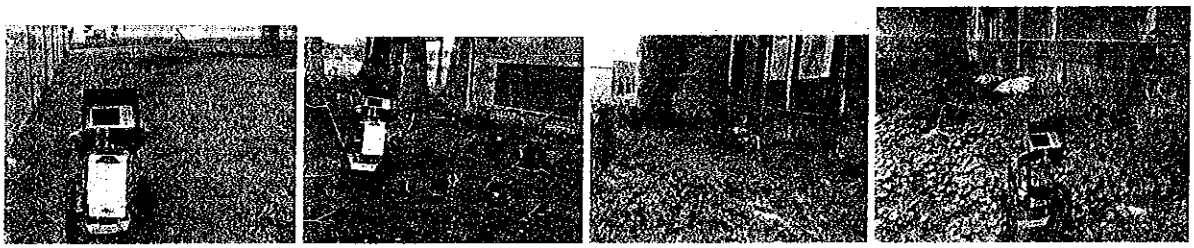
Real-time data collected in the field



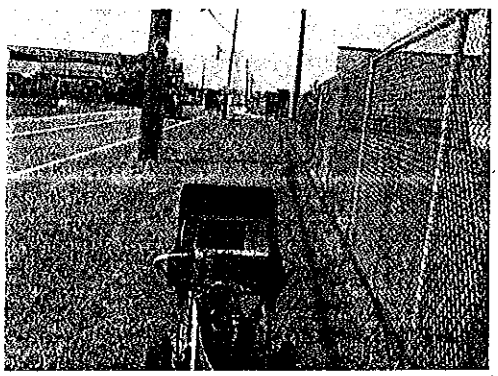
GPR unit in center of AOC subsurface change



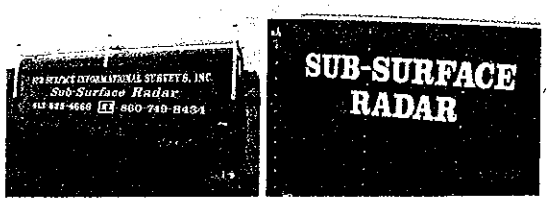
AOC between the guard rail and building as seen in the above photo



Additional data locations during the survey



Scanning [outside] fence area along Route 4



END OF REPORT

The attached analytical result are copies of GPR Data Files collected in the field and reproduced at our corporate office. After reviewing the data, selected samples are taken and duplicated for this report.

Copies are made under the following guidelines:

A. When there are distinctive differences in the collected data. NOTE: When one traverse is almost identical in characterization to another, only one copy would be reproduced.

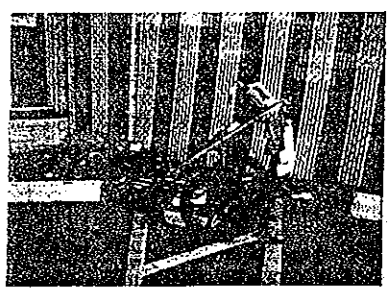
B. If there is a significant difference with suspected anomaly found within the data.

C. In the location of anomalies, such as pipes, and/or conduits, underground storage tanks or other specific characteristics important to the investigation, such data is copied and annotated.

D. Samples of *signal refusal,* (water, clay, or some other highly conductive sub-surface interface).

E. Requested data.

F. Specific locations of rebar and conduits using encoder wheel with measured bench marks.



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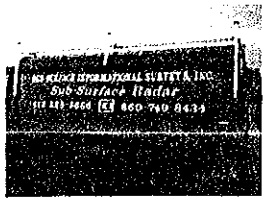
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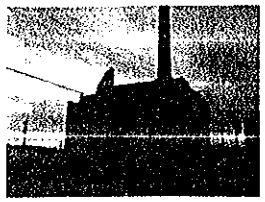
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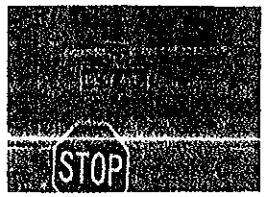

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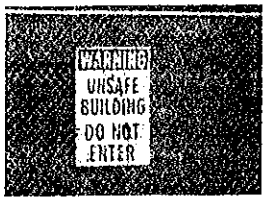

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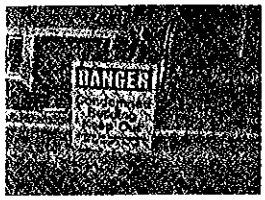

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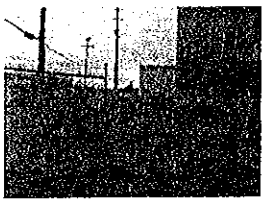
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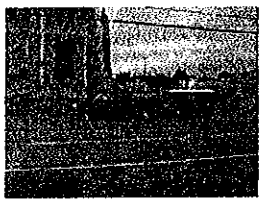
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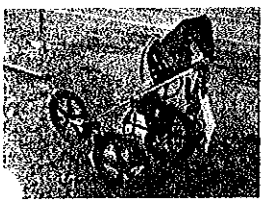
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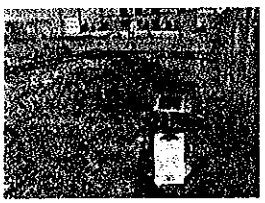
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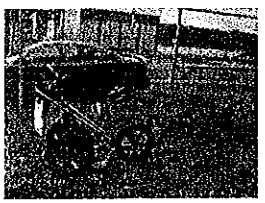
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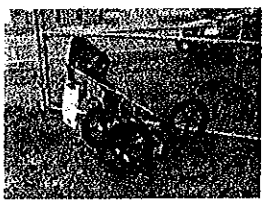
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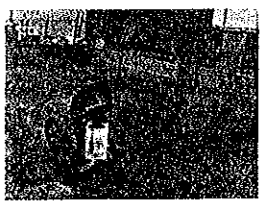
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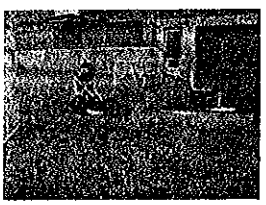
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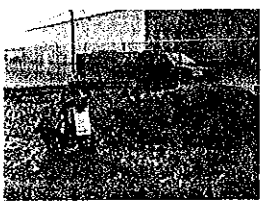
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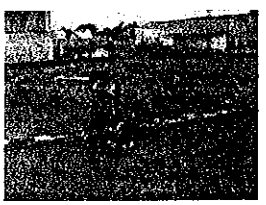
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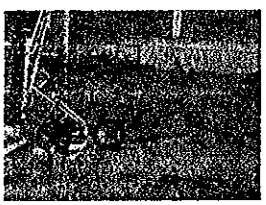
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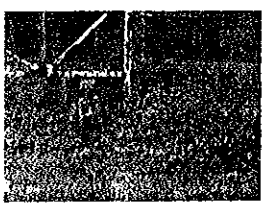
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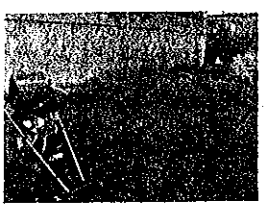
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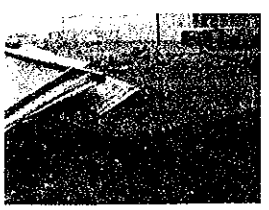
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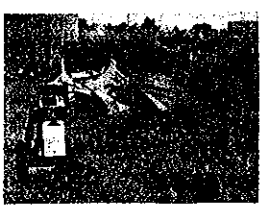
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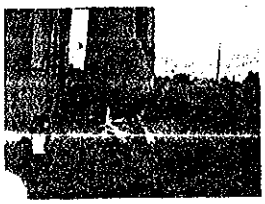
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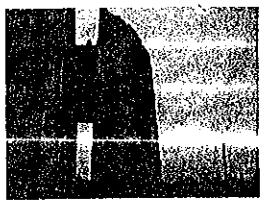
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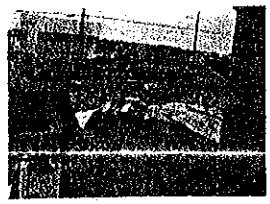
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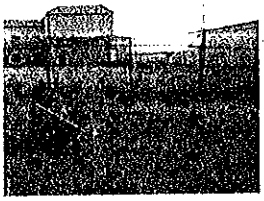
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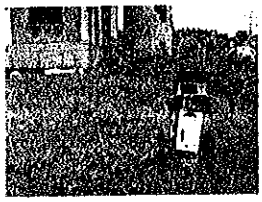
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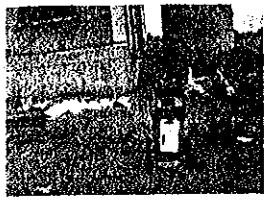
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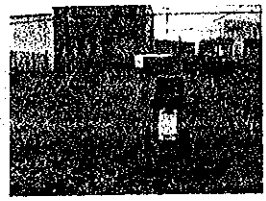
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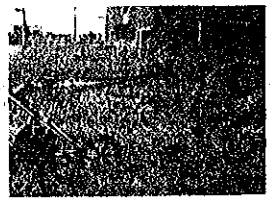
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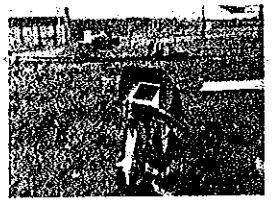
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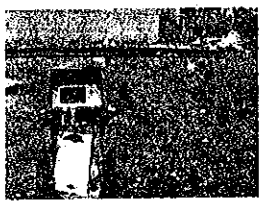
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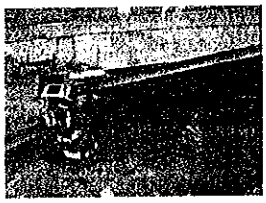
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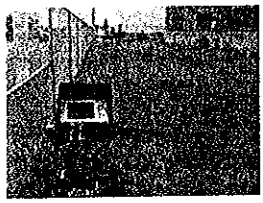
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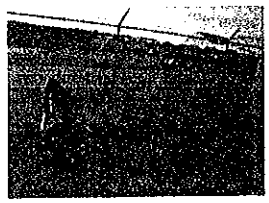
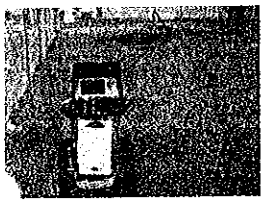
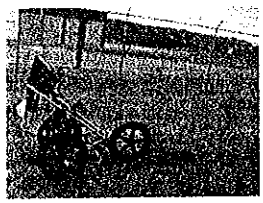
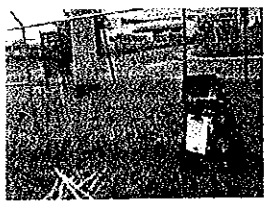
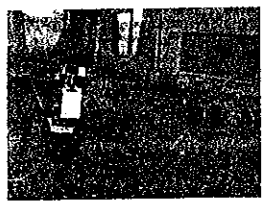
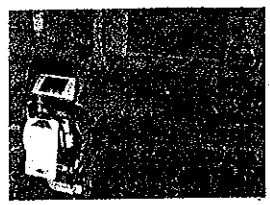

Chazen 050


Chazen 051

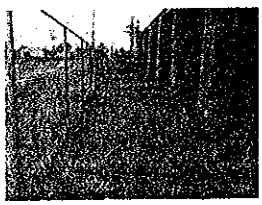

Chazen 052


Chazen 053

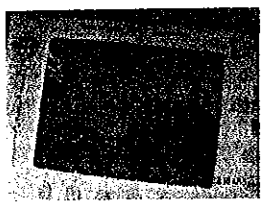

Chazen 054


Chazen 055

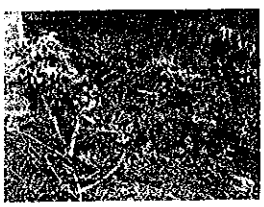

Chazen 056


Chazen 057


Chazen 058


Chazen 059


Chazen 060


Chazen 061

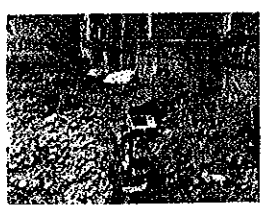

Chazen 062

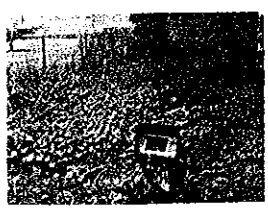

Chazen 063

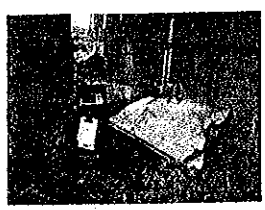

Chazen 064


Chazen 065


Chazen 066

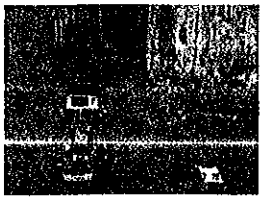

Chazen 067


Chazen 068


Chazen 069

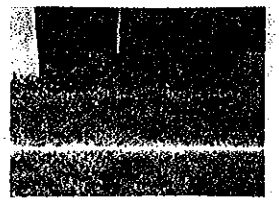

Chazen 070

Chazen 071

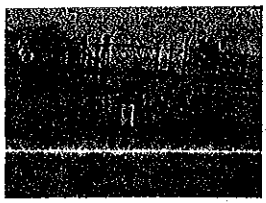


Chazen 072

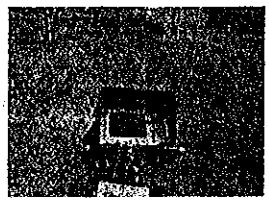
Chazen 073



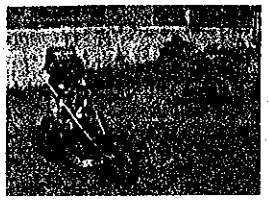
Chazen 074



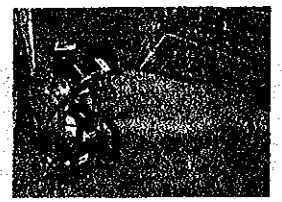
Chazen 075



Chazen 076



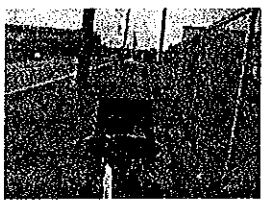
Chazen 077



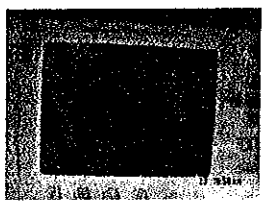
Chazen 078

Chazen 079

Chazen 080

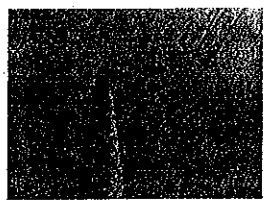


Chazen 081

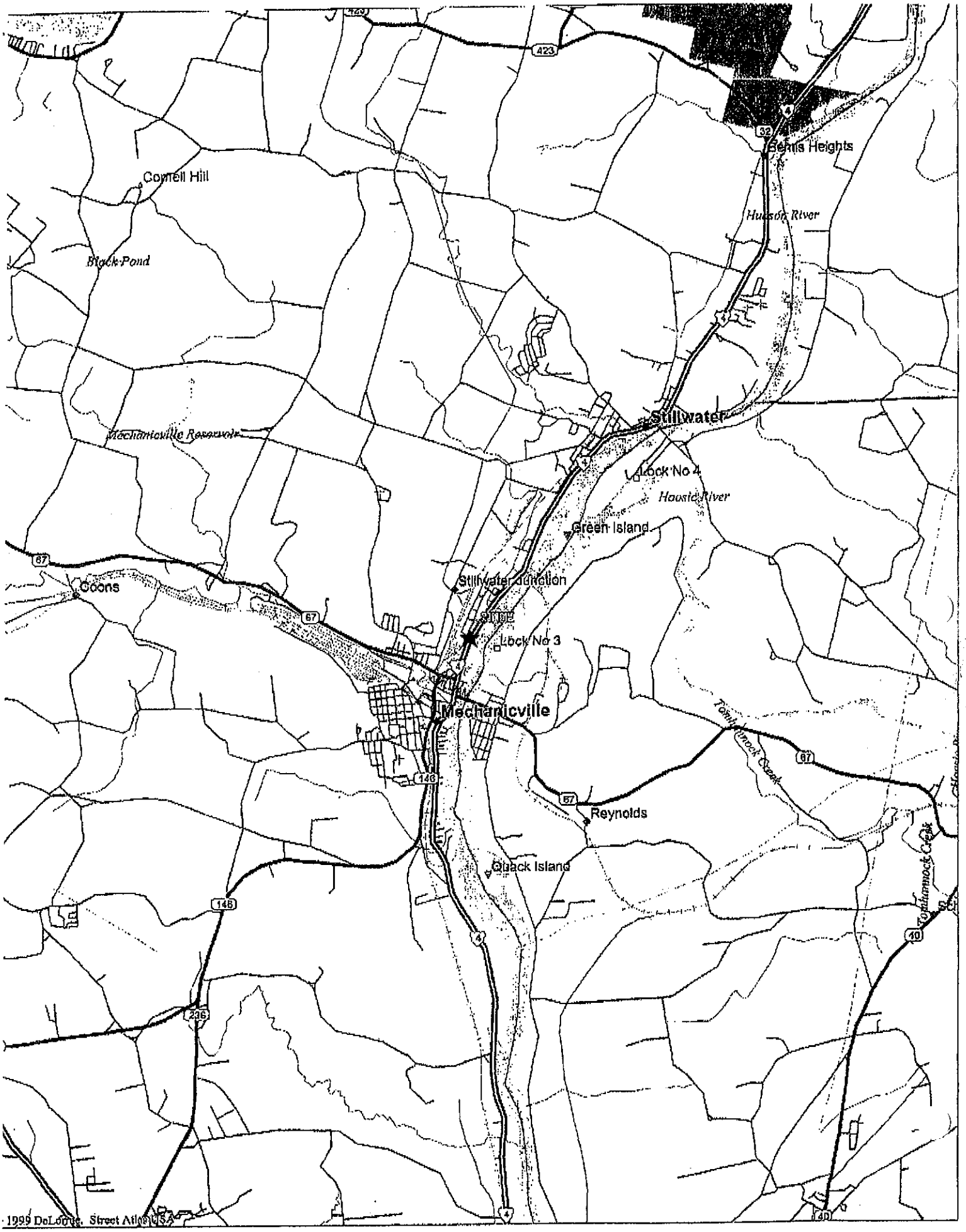


Chazen 082

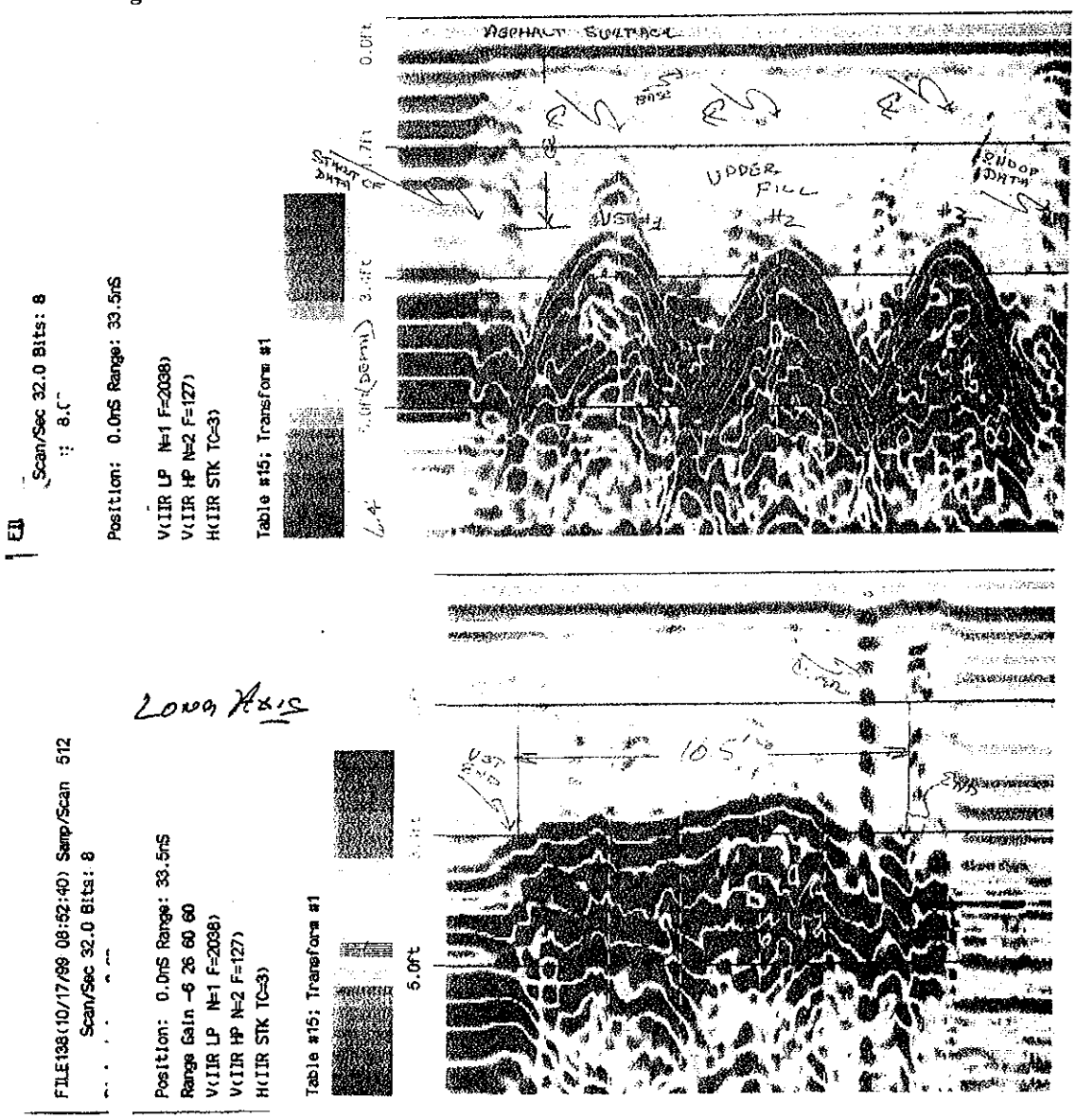
Chazen 083



Chazen 084


Cornell Hill
Black Pond
Mechanicville Reservoir
Coons
Stillwater Junction
Lock No 3
Mechanicville
Reynolds
Black Island
Bemis Heights
Hudson River
Stillwater
Lock No 4
Hoosic River
Green Island
Tomhannock Creek
423
4
32
67
146
148
236
40
1999 DeLorme. Street Atlas USA

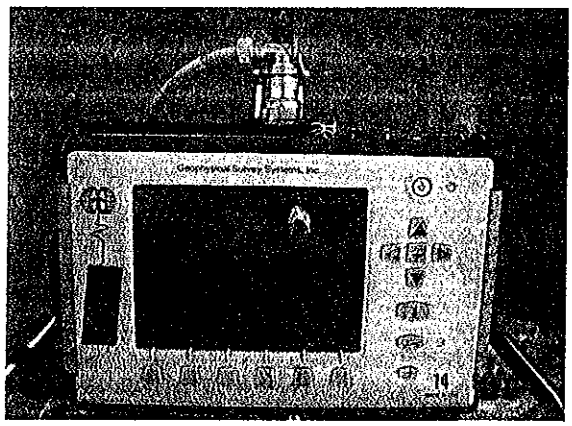
The profiles shown below represent copies of real data collected in the field. Each collected piece of data is issued a FILE# on the information tab to the left of the data. This FILE# is referenced within the report. Each piece of data is annotated from the information collected in the field such as estimated depth, length, direction or any other information that may be helpful to the subsurface investigation. The computer settings such as dielectric values, range in nanoseconds etc., is part of the information tab. The vertical benchmarks indicate points designated on the surface for the purpose of pinpointing a particular anomaly. This is used to estimate sometimes width or length or even distance between surface points such as fence posts, white lines in parking lots, centerlines of vehicles etc. The ↓↷↓ sign indicates 180 degree change in direction such as from a northerly traverse to a southerly traverse within the same piece of data. The profile below (FILE134) represents a perpendicular traverse over three 1,000g underground storage tanks at approximately 30" below the asphalt surface. The vertical benchmarks represent the centerline of each tank which was marked with marking paint on the surface per customer request. FILE138 is traversing over the long axis of one of the tanks with the vertical benchmarks at 2' intervals. The tank shows a profile of 10.5' in length from end-to-end.



GPR PROFILES OBTAINED IN THE FIELD

The attached copies are reproductions from data acquired in the field from the GSSI, SIR 3000 Geophysical computer. The original copies are downloaded on a T-104 thermal printer and reproduced on our commercial copier. Photo's are taken by a Sony DSC-F707 Digital still camera, using a 128 MB memory stick. The camera has the ability to take pictures in a no-light environment, which is useful for inside low light or no light building interiors, or during overcast days.

The pictures are downloaded in a Photo Suite program and reproduced at 640 X 480: 0.35 mega pixels. In addition, a disc is supplied with most reports of all the important photo's taken at the survey site. The image size duplicated makes it easy for e-mail attachments to be sent to your customer.



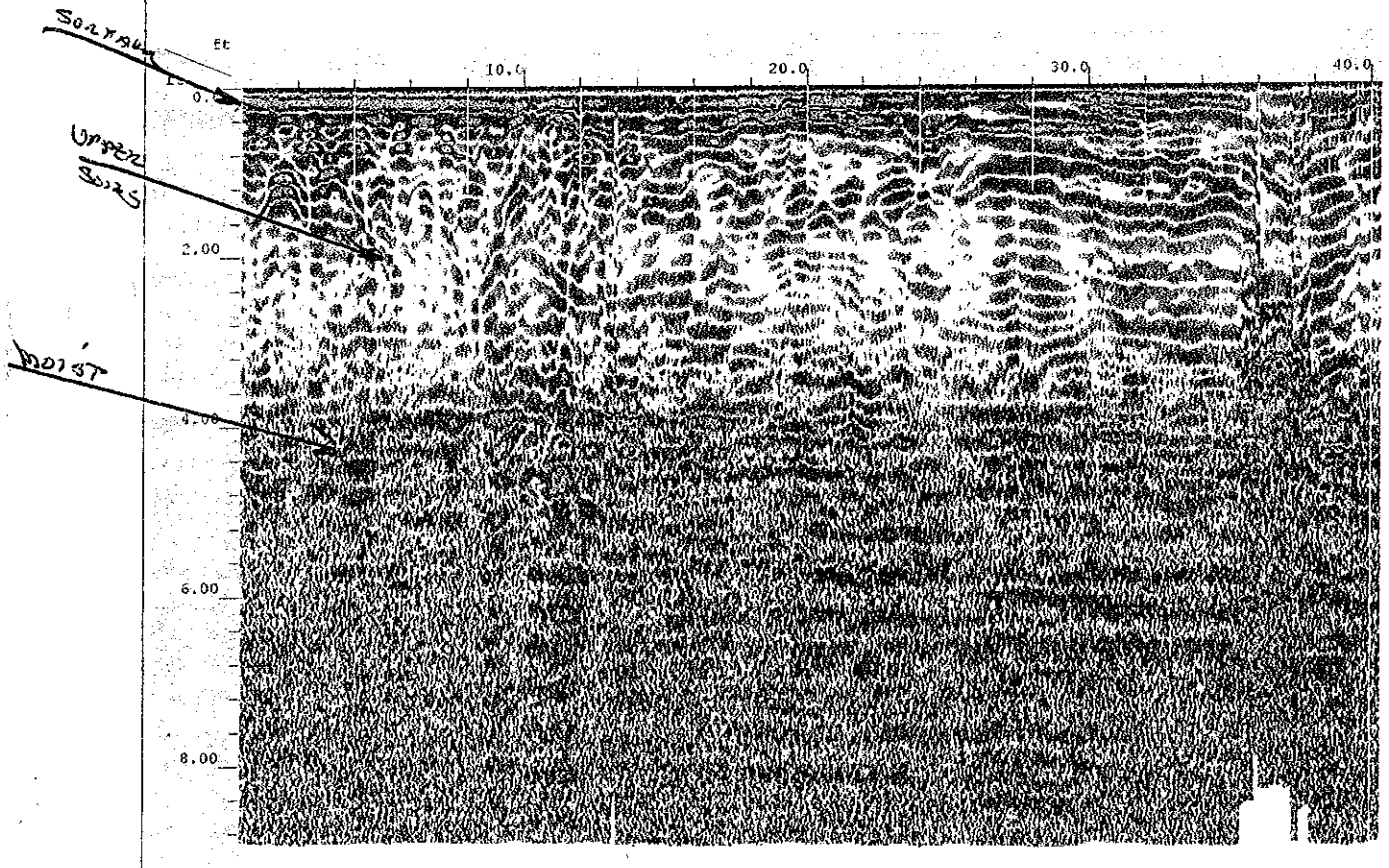
CH1

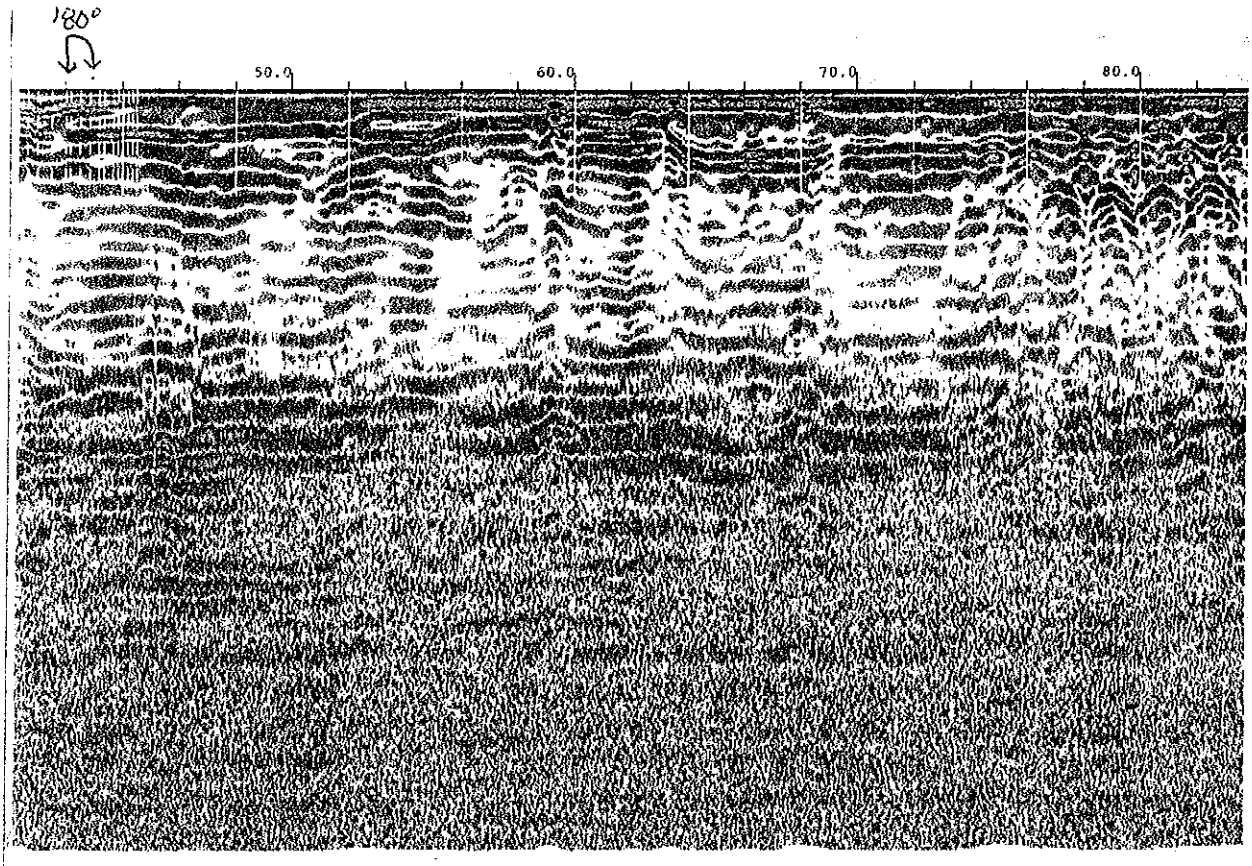
1st data collected in a northerly direction starting at the open gate along Route #4 and ending at the wood chip pile. No unusual anomalies.

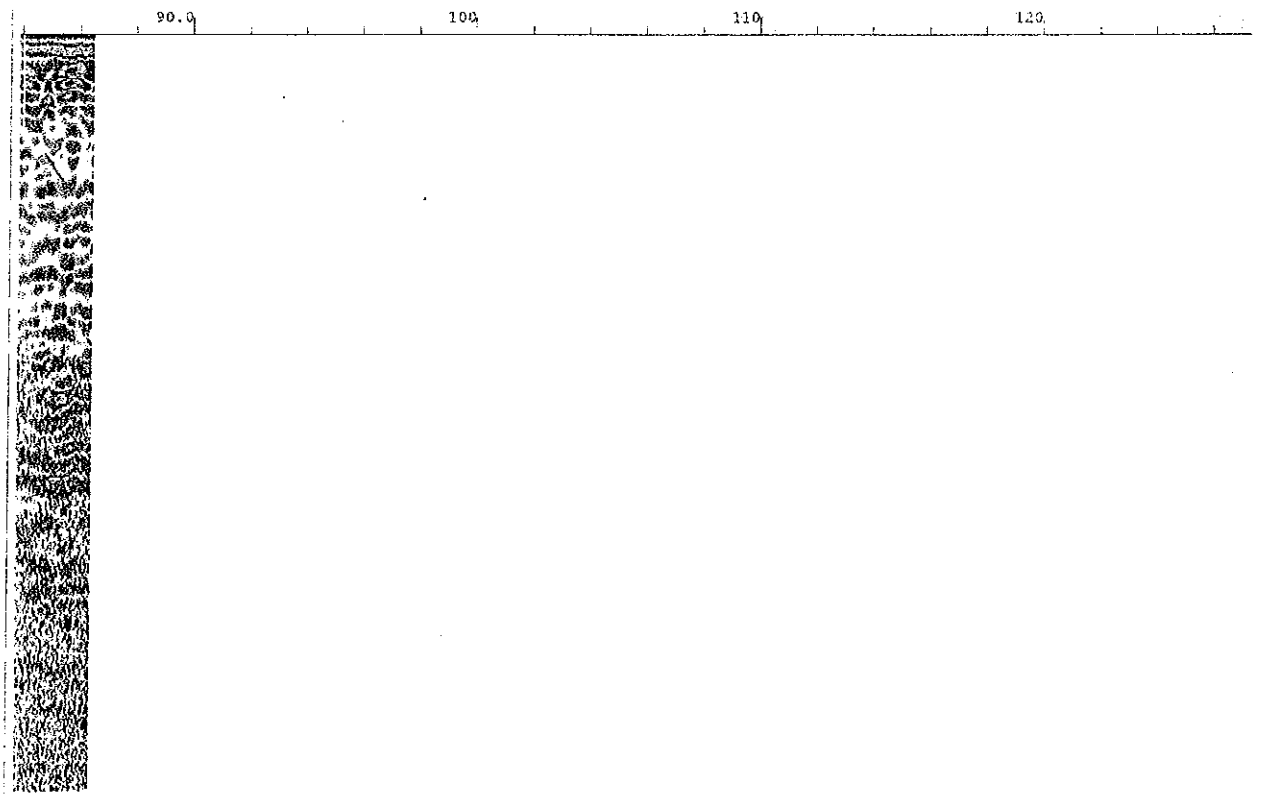
Created Jul, 24 2004, 08:24:42 Modified Jul, 24 2004, 08:27:46
Channel(s) 1 Samples/Scan 512 Bits/Sample 16
Scans/Second 100 Scans/Meter 78.7402 Meters/Mark 1.2192
Diel Constant 16

CHANNEL 1 400MHZ
Position 0 nS Range 81 nS
Vert IIR LP N =1 F =800 MHz
Vert IIR HP N =1 F =100 MHz
Position Correction -2.5 nS
Range Gain (dB) -20.0 43.0 49.0
Structure ID
Time Zero Adj. (Thres. 3000)
Antenna Type = 5103

∩ = 180° DIRECTION CHANGE




180°
50.0
60.0
70.0
80.0

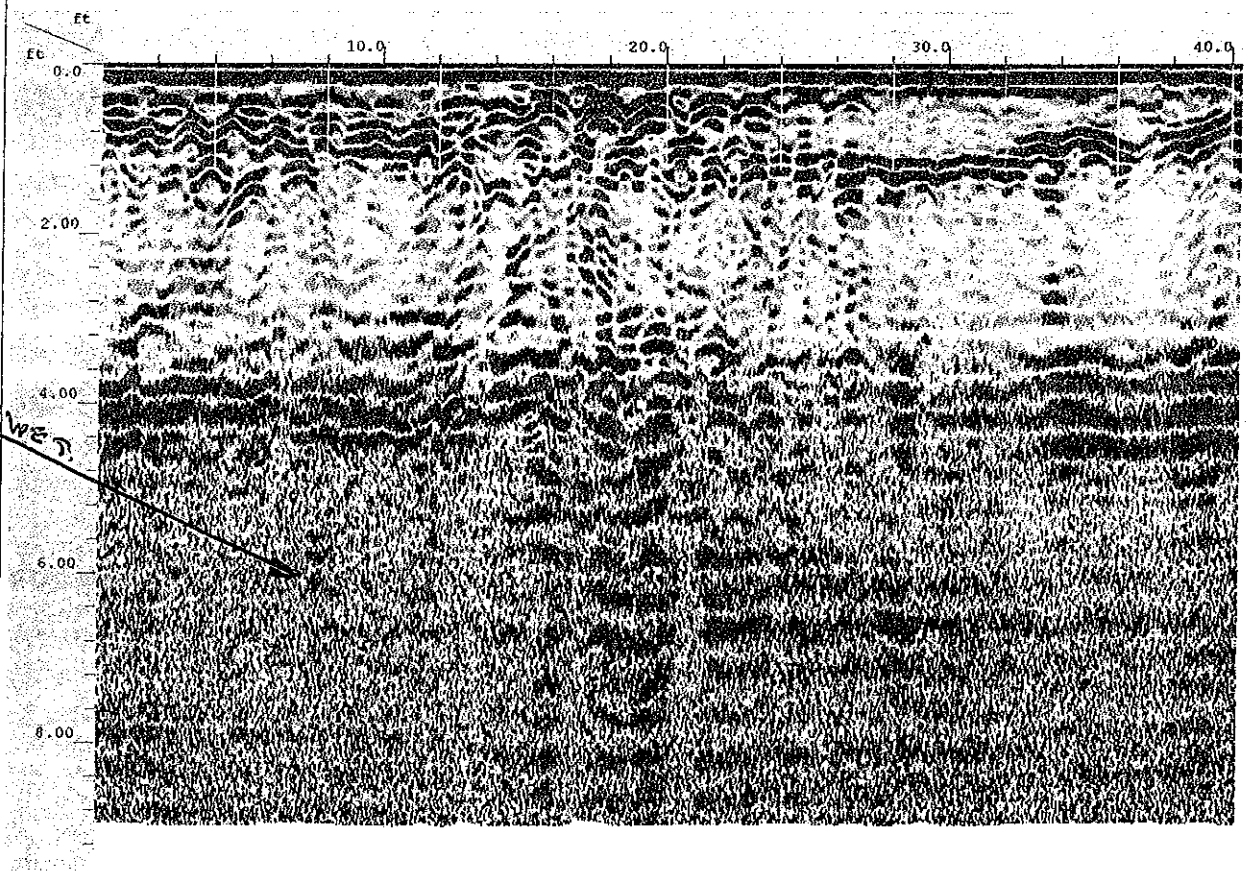

90.0
100
110
120

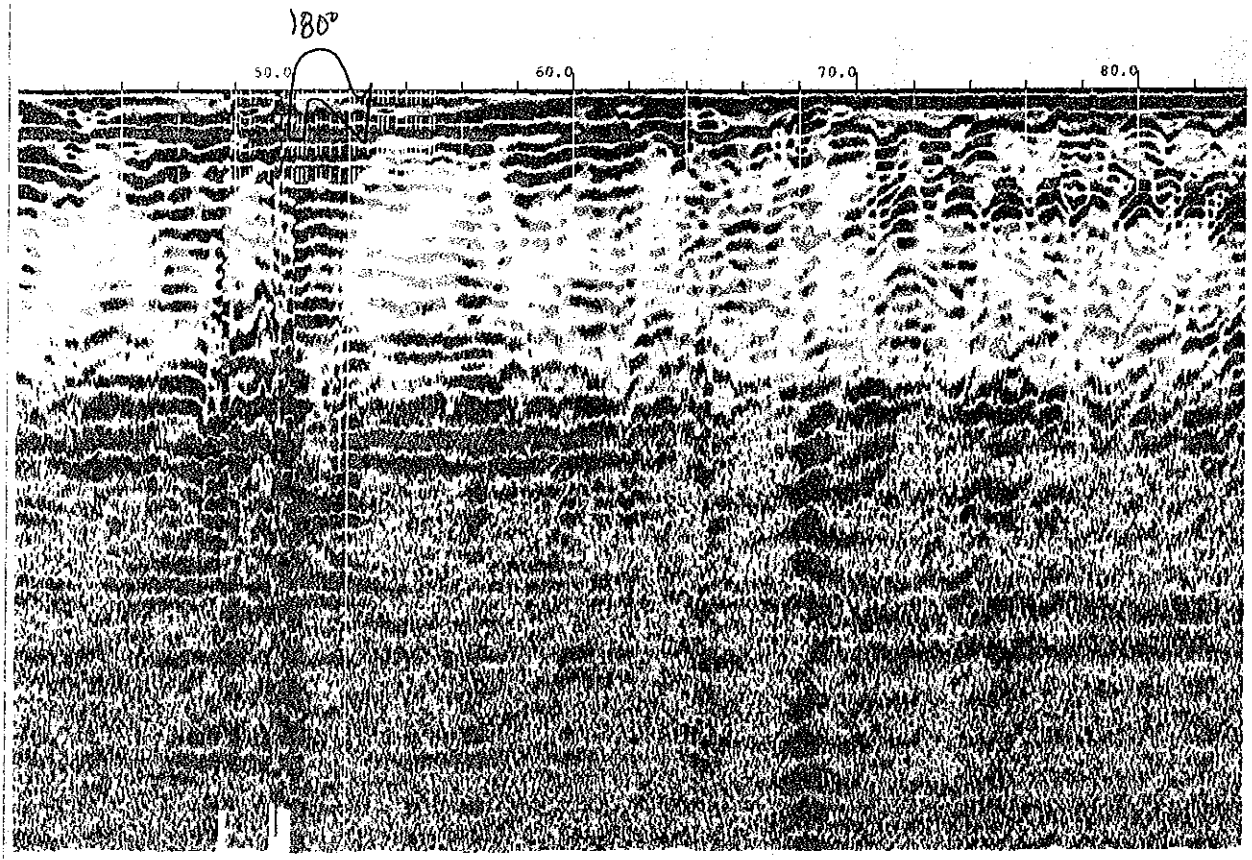
CH2

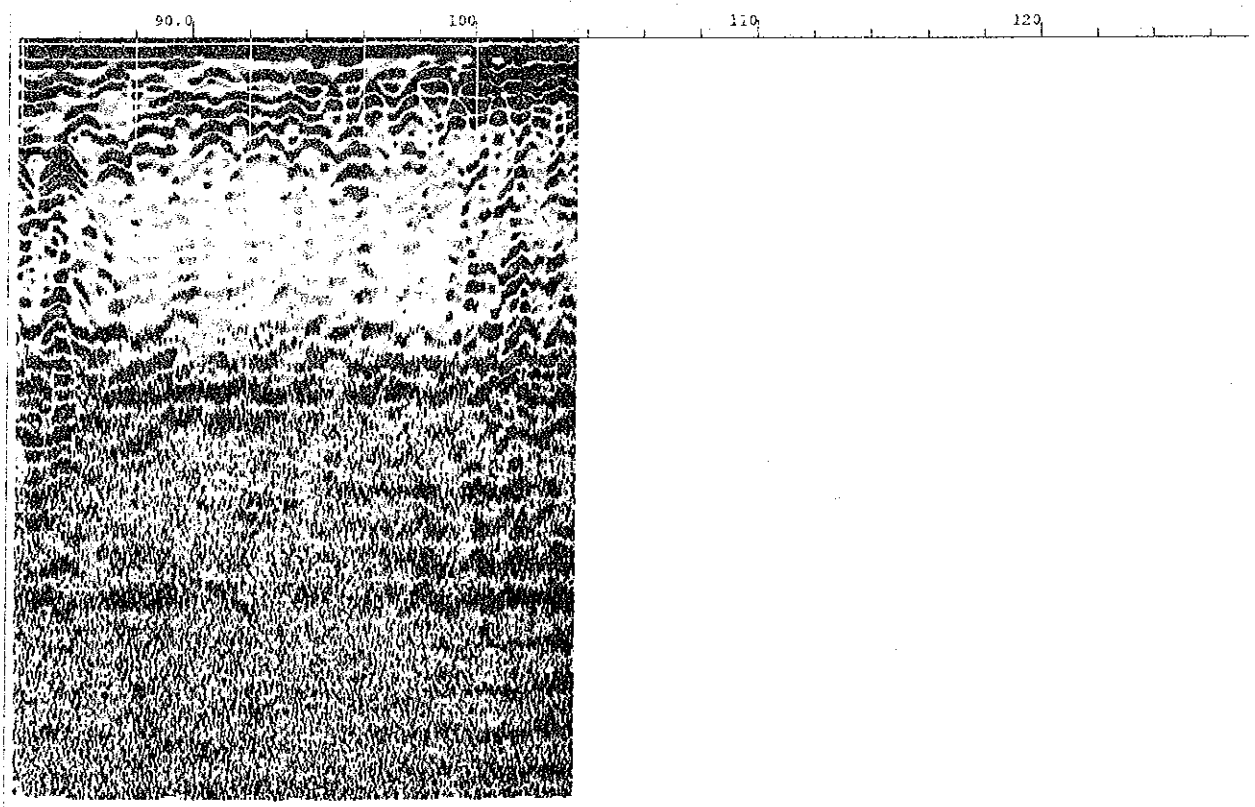
Parallel north/south piece of data to CH1 at 4.5' interval. Upper soils appear to be unchanged. The capillary fringe of the water table or some other highly conductive subsurface interface is seen near 4.25' below the surface. No other unusual anomalies to indicate drums.

Created Jul, 24 2004, 08:27:50 Modified Jul, 24 2004, 08:28:54
Channel(s) 1 Samples/Scan 512 Bits/Sample 16
Scans/Second 100 Scans/Meter 78.7402 Meters/Mark 1.2192
Diel Constant 16

CHANNEL 1 400MHZ
Position 0 nS Range 81 nS
Vert IIR LP N =1 F =800 MHz
Vert IIR HP N =1 F =100 MHz
Position Correction -2.5 nS
Range Gain (dB) -20.0 43.0 49.0
Structure ID
Time Zero Adj. (Thres. 3000)
Antenna Type = 5103




180°
50.0
60.0
70.0
80.0

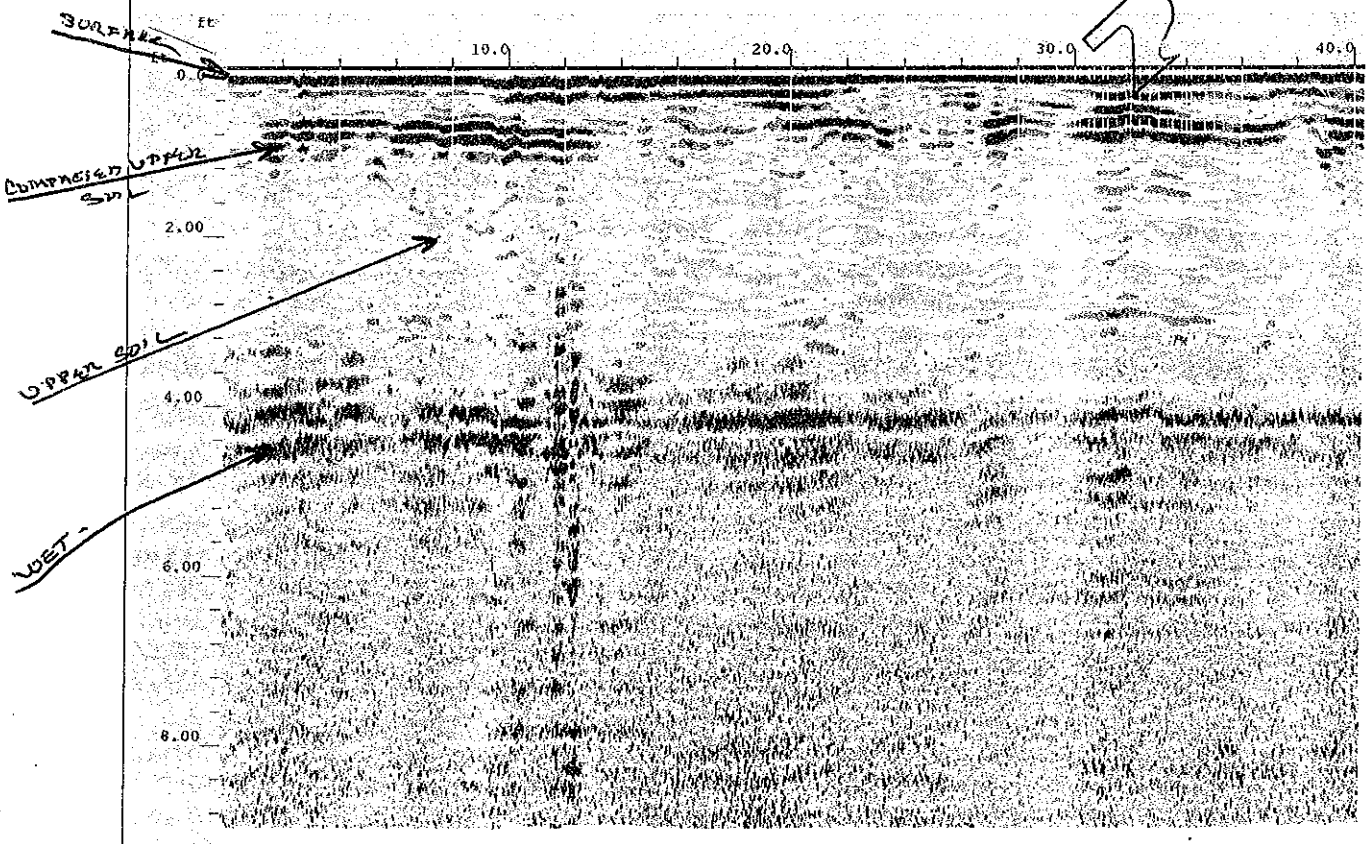

90.0
100
110
120

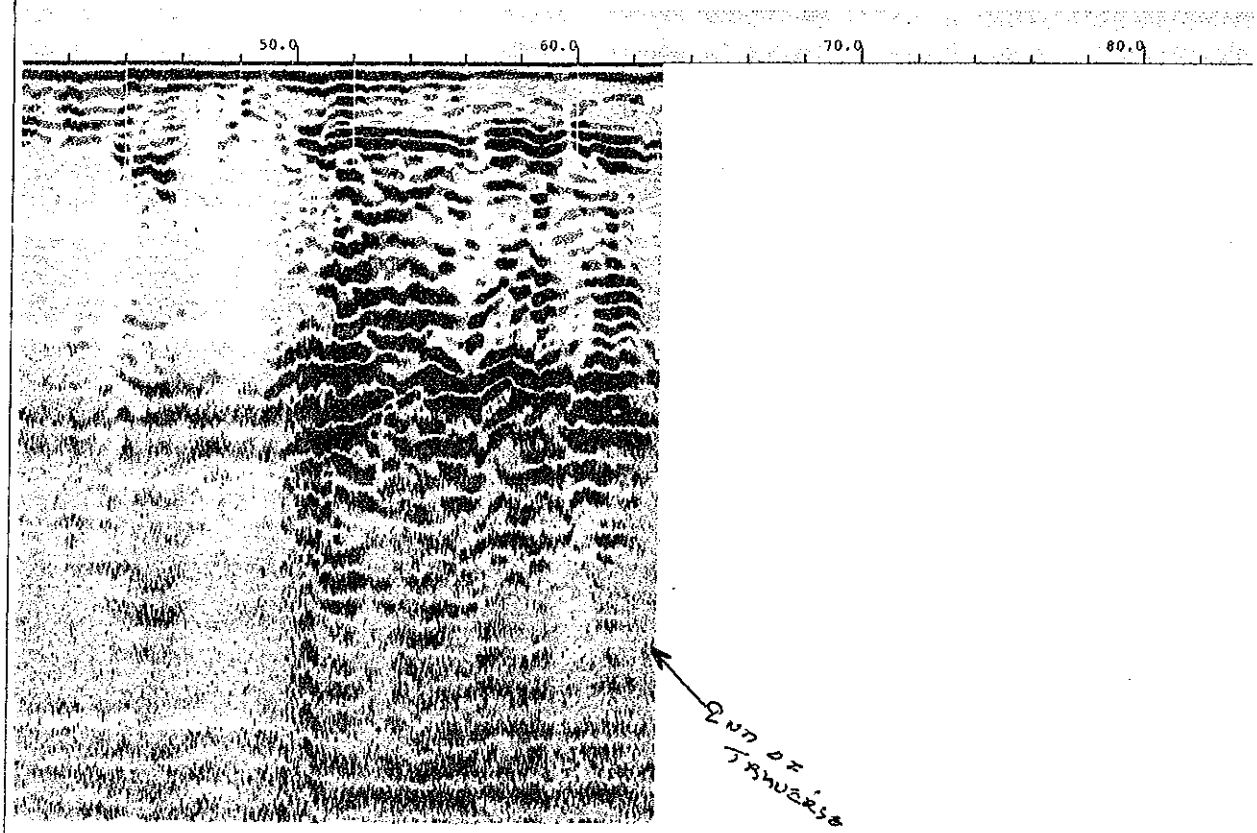
CH5

65' of continuous north/south data taken approximately 25' west of the entrance gate showing no unusual parabolic features.

Created Jul, 24 2004, 08:42:08 Modified Jul, 24 2004, 08:42:38
Channel(s) 1 Samples/Scan 512 Bits/Sample 16
Scans/Second 100 Scans/Meter 78.7402 Meters/Mark 1.2192
Diel Constant 16

CHANNEL 1 400MHZ
Position 0 nS Range 81 nS
Range Gain (dB) -20.0 42.0 49.0
Position Correction -2.5 nS
Vert IIR LP N =1 F =800 MHz
Vert IIR HP N =1 F =100 MHz
Structure ID
Time Zero Adj. (Thres. 3000)
Antenna Type = 5103



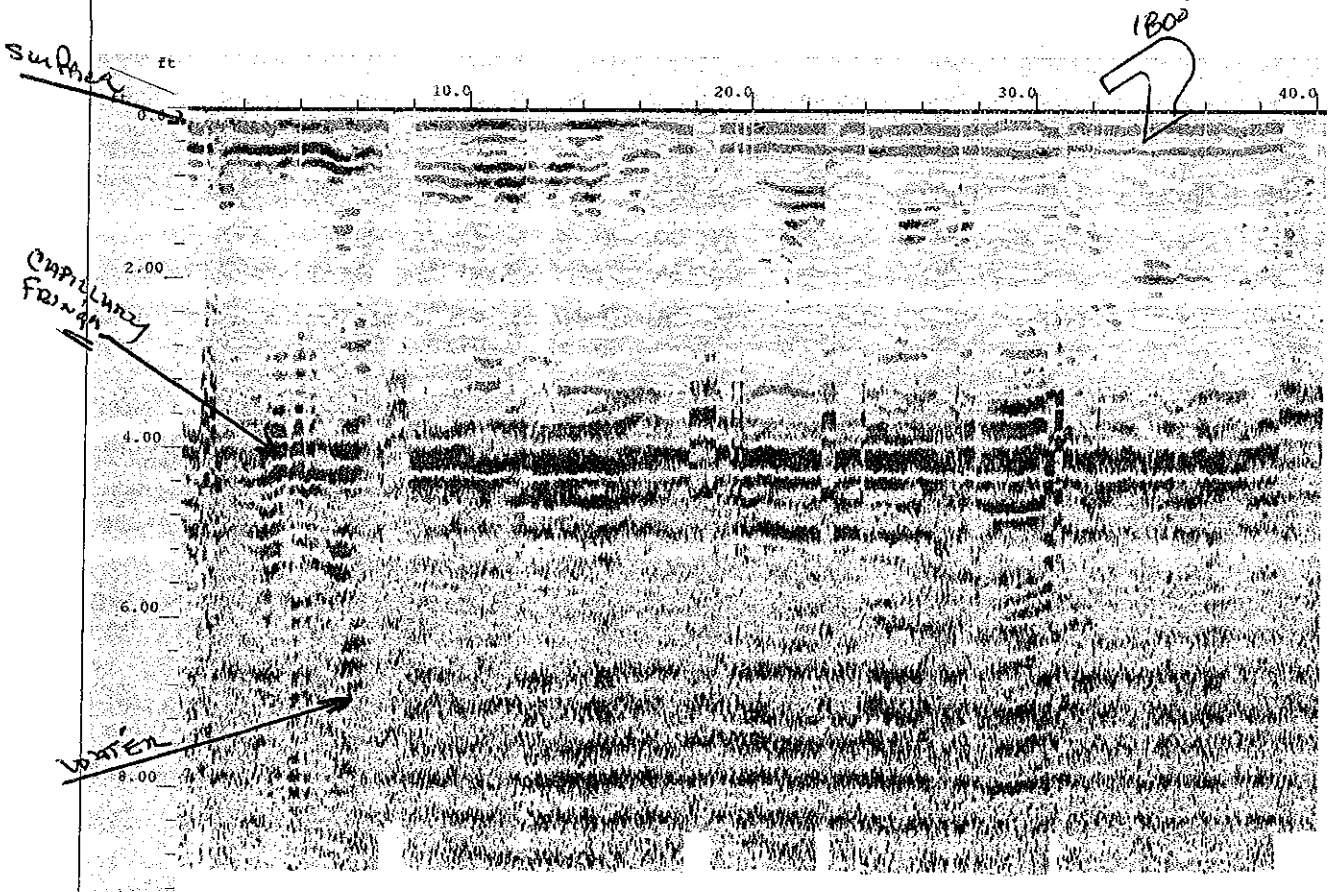

50.0
60.0
70.0
80.0

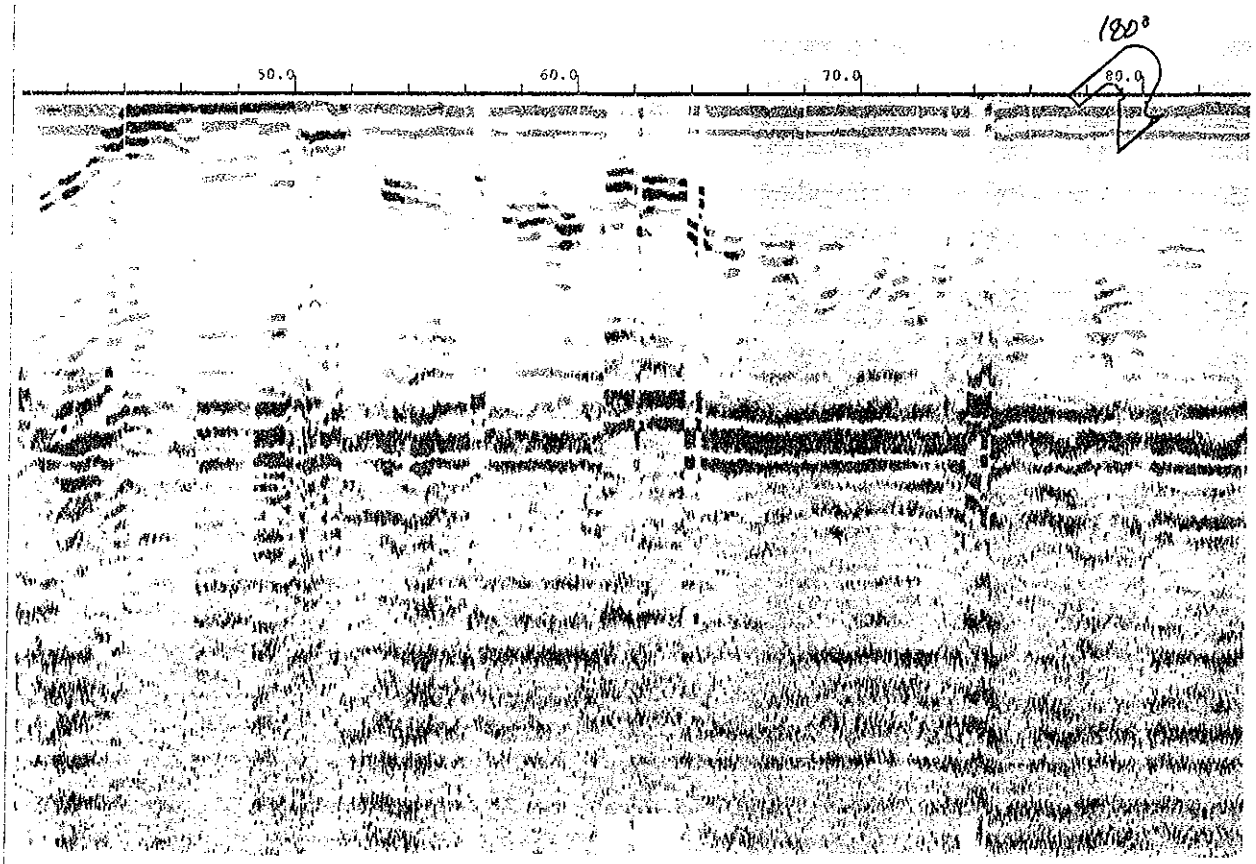
CH7

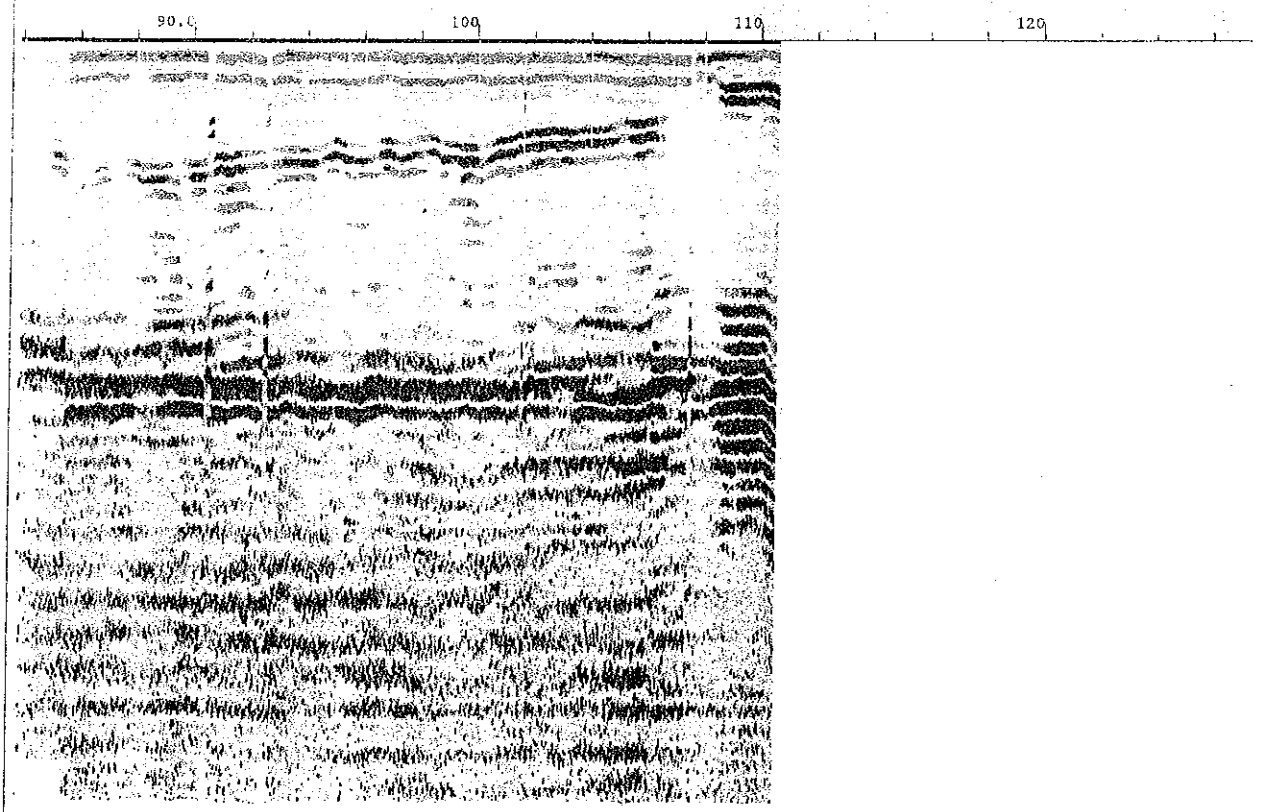
111' of continuous north/south data within 25' of the northeast corner of the buillding.
No unusual anomalies to indicate the presence of any storage drums.

Created Jul, 24 2004, 08:45:48 Modified Jul, 24 2004, 08:48:14
Channels: 1 Samples/Scan 512 Bits/Sample 16
Scans/Second 100 Scans/Meter 78.7402 Meters/Mark 1.2192
Diel Constant 16

CHANNEL 1 400MHZ
Position 0 nS Range 81 nS
Range Gain (dB) -20.0 43.0 49.0
Position Correction -2.5 nS
Vert IIR LP N =1 F =800 MHz
Vert IIR HP N =1 F =100 MHz
Structure ID
Time Zero Adj. (Thres. 3000)
Antenna Type = 5103




180°
50.0
60.0
70.0
80.0

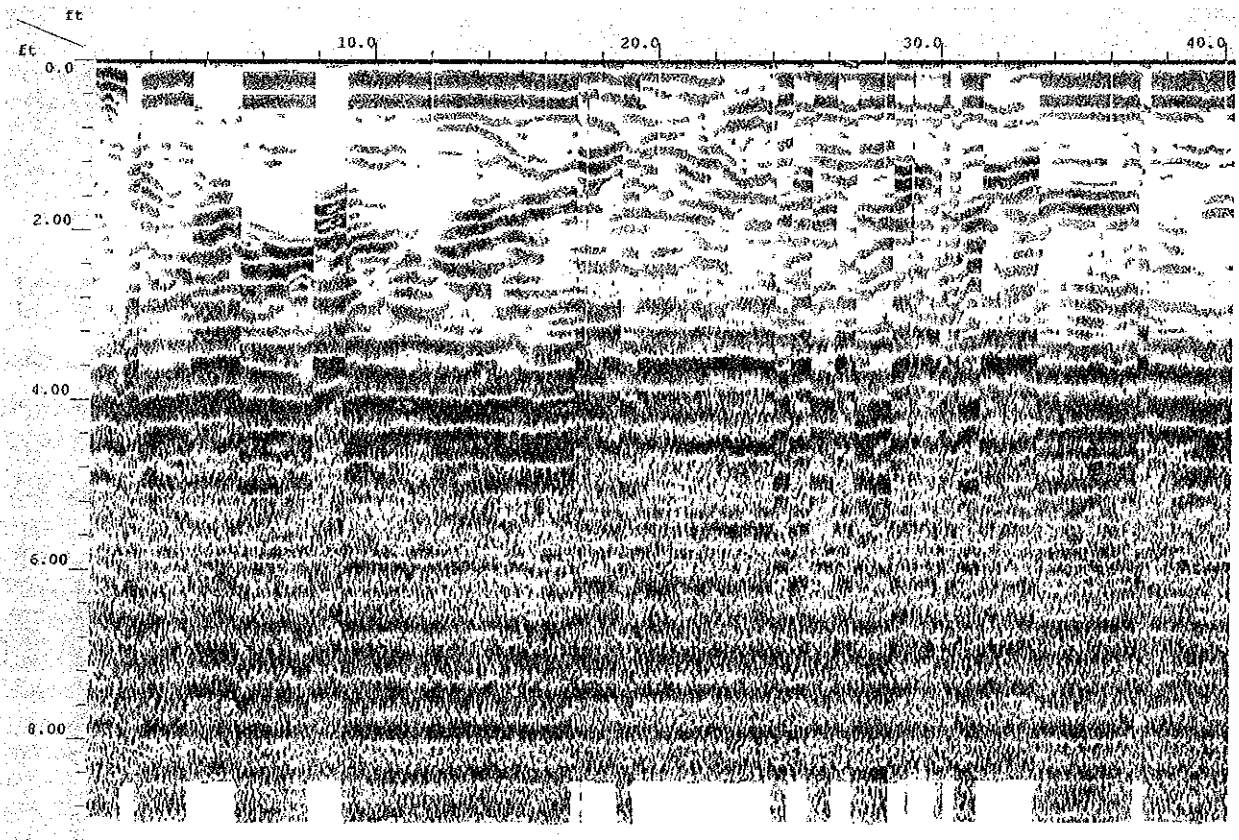

90.0
100
110
120

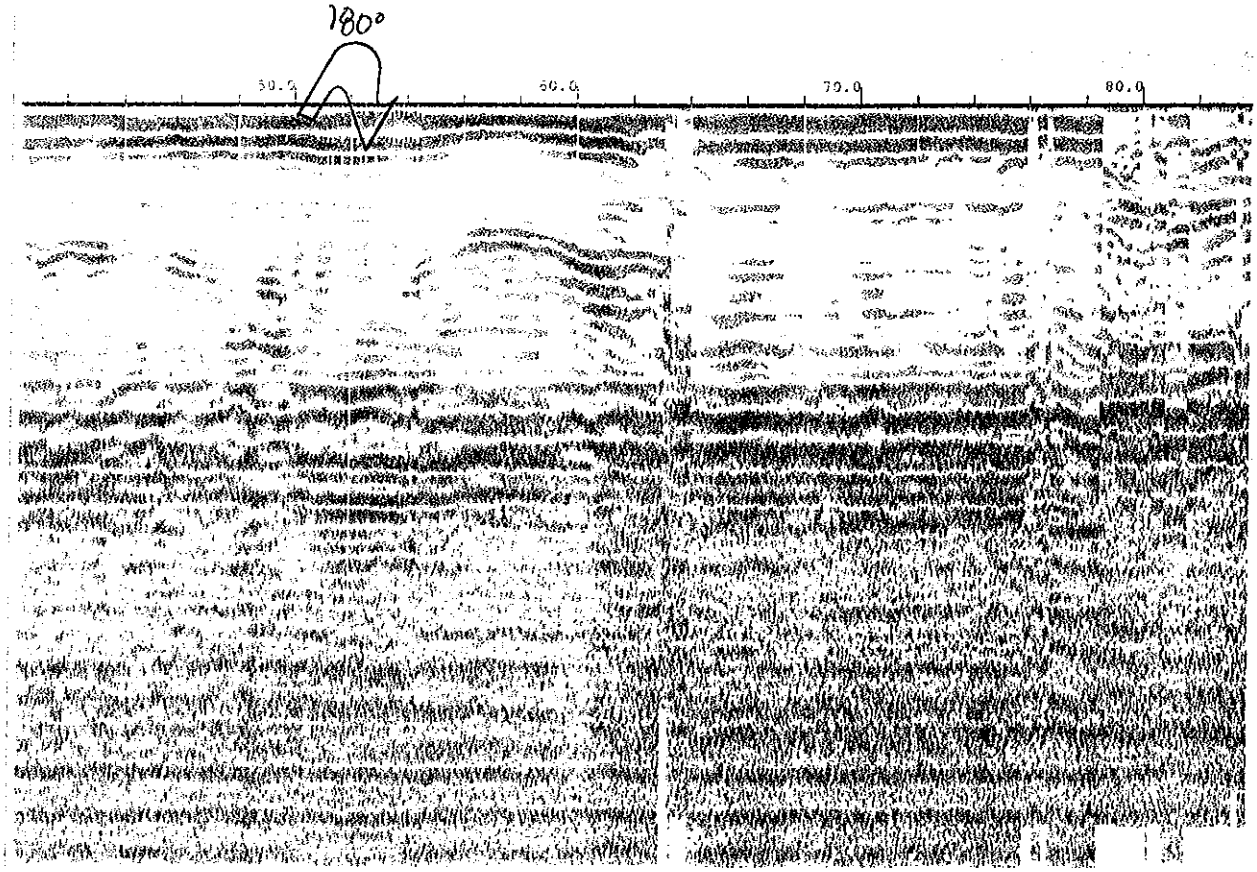
CH12

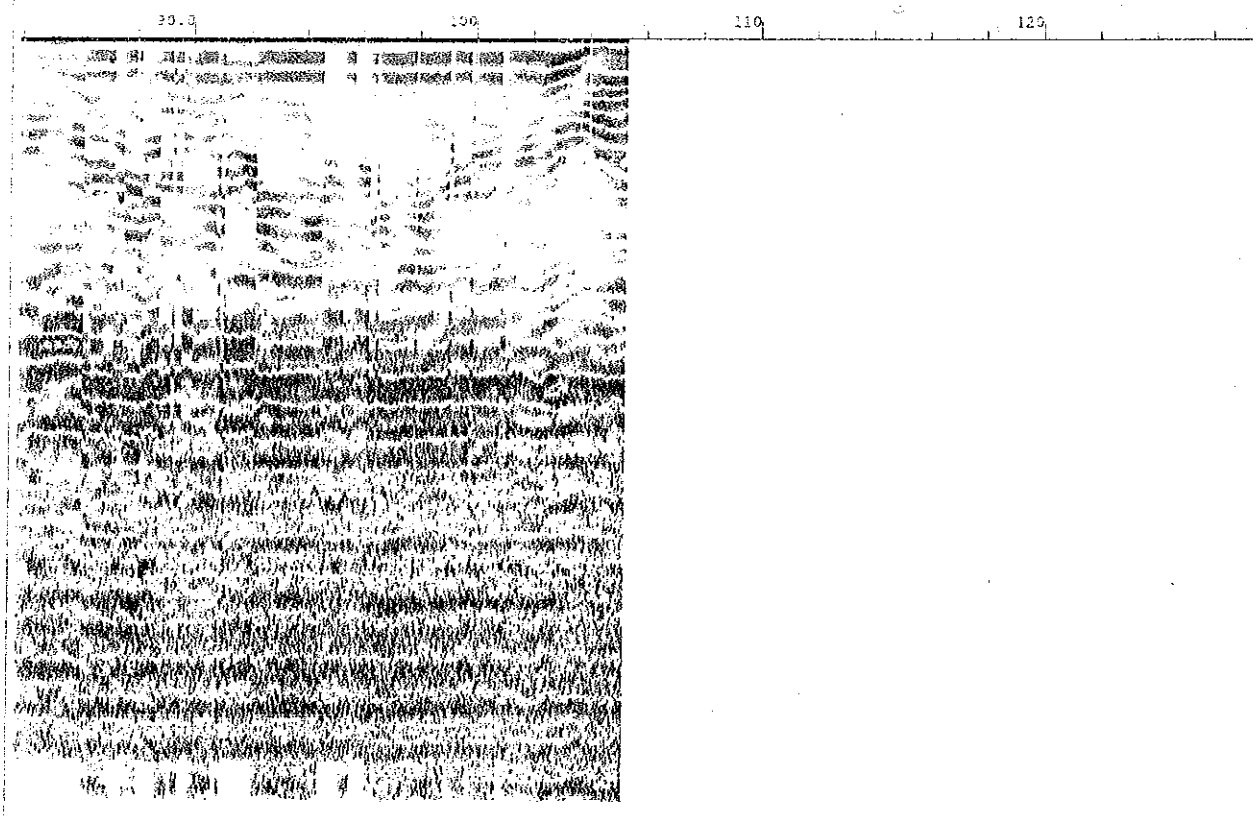
106' continuous east/west data at the northern end of the property. Unchanged.

Created Jul, 24 2004, 09:24:22 Modified Jul, 24 2004, 09:28:22
Channel(s) 1 Samples/Scan 512 Bits/Sample 16
Scans/Second 100 Scans/Meter 78.7402 Meters/Mark 1.2700
Diel Constant 16

CHANNEL 1 400MHZ
Position 0 nS Range 81 nS
Range Gain (dB) -20.0 43.0 49.0
Position Correction -2.5 nS
Vert IIR LP N =1 F =800 MHz
Vert IIR HP N =1 F =100 MHz
Structure ID
Time Zero Adj. (Thres. 3000)
Antenna Type = 5103



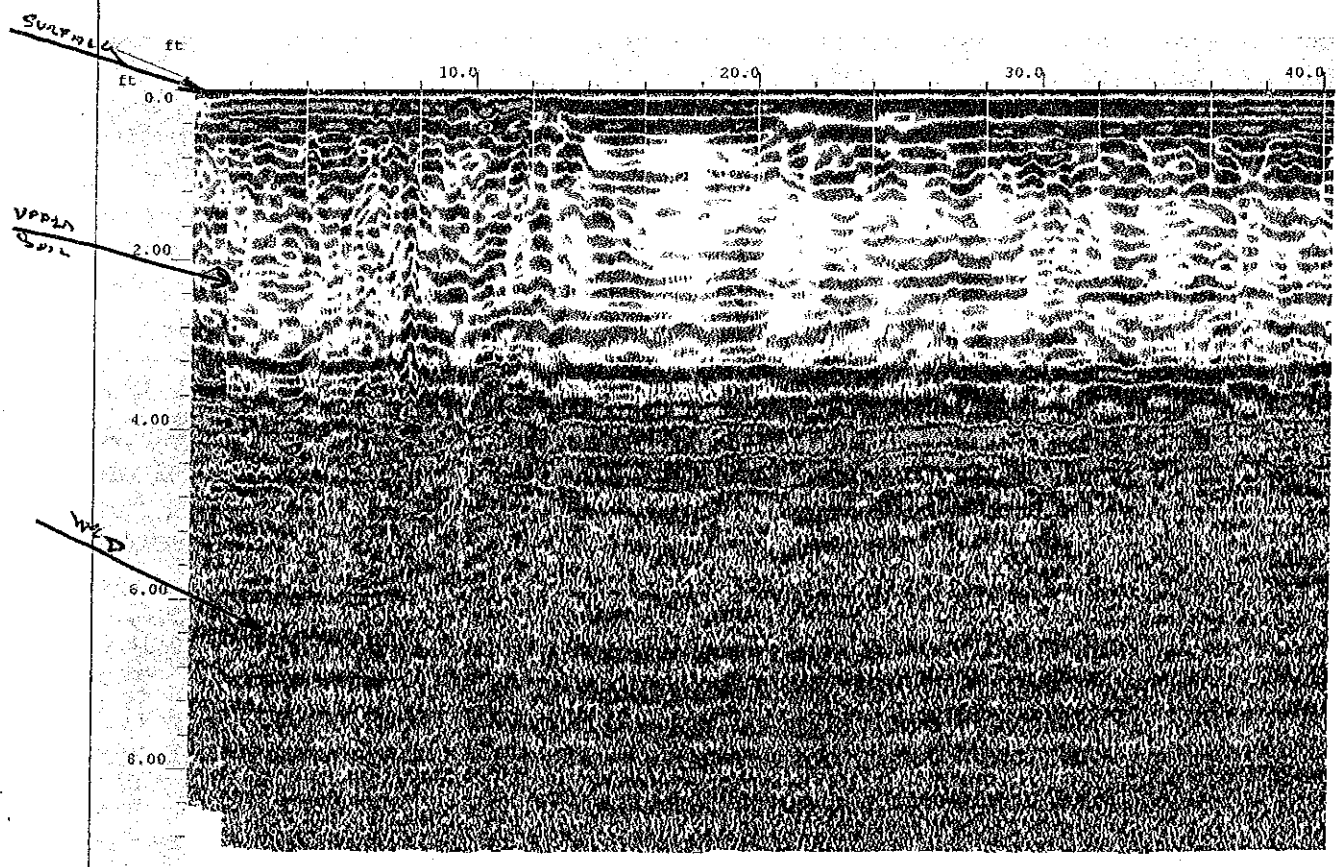

180°
50.0
60.0
70.0
80.0

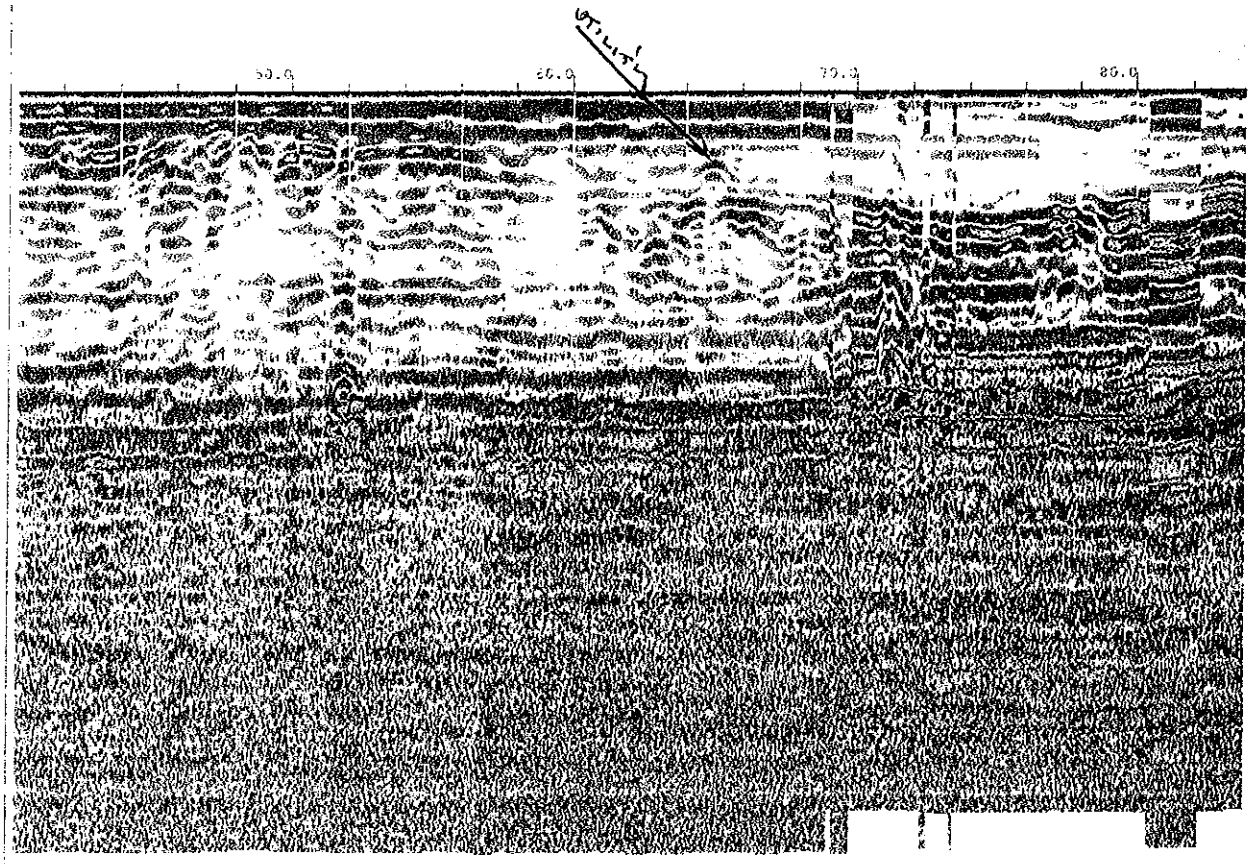

90.0
100
110
120

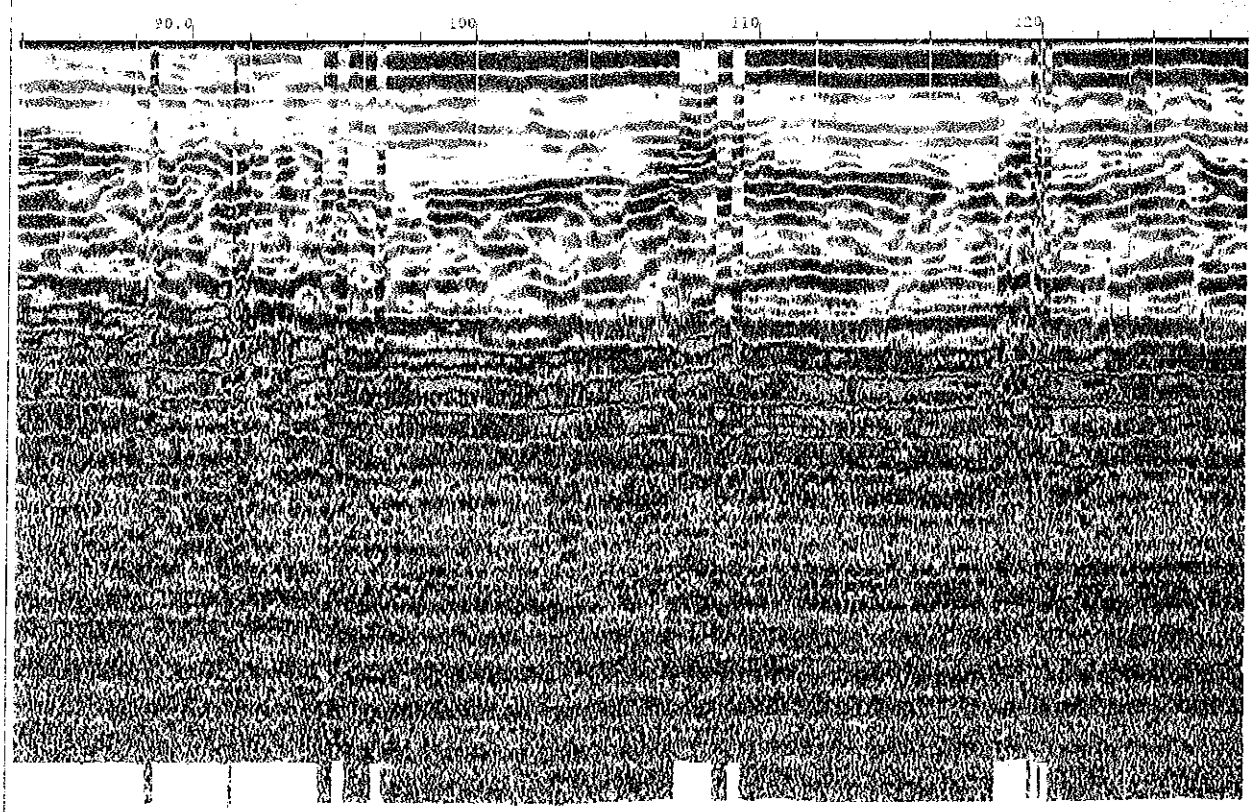
145' of continuous southerly data against the west side of the fence along Route 4. Several small parabolic featues appear to be that of underground utilities. No other unusual anomalies in this data.

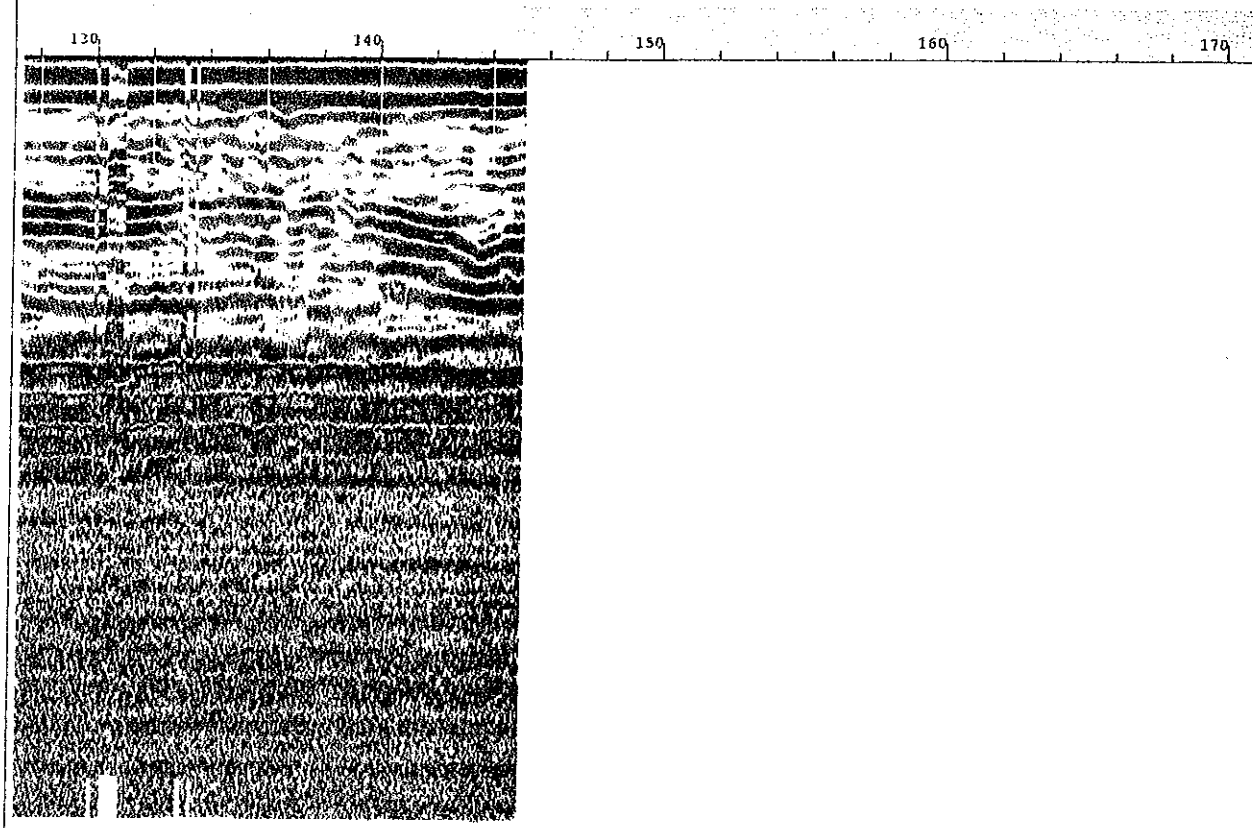
Created Jul, 24 2004, 09:36:38 Modified Jul, 24 2004, 09:37:56
Channel(s) 1 Samples/Scan 512 Bits/Sample 16
Scans/Second 100 Scans/Meter 78.7402 Meters/Mark 1.2192
Diel Constant 16

CHANNEL 1 400MHZ
Position 0 nS Range 81 nS
Range Gain (dB) -20.0 43.0 49.0
Position Correction -2.5 nS
Vert IIR LP N =1 F =800 MHz
Vert IIR HP N =1 F =100 MHz
Structure ID
Time Zero Adj. (Thres. 3000)
Antenna Type = 5103




50.0
60.0
70.0
80.0


90.0
100
110
120


130
140
150
160
170

5.0 ACQUIRING PROCEDURES

The acquiring of data from the field for the location and orientation of underground storage tanks, utilities, conduits w/in slab, rebar location, grave sites and other specific anomalies has been established by the *ground penetrating radar* for many years. Since 1988, Sub-Surface Information Surveys, Inc. has completed a multitude of successful investigations covering most phases of the *ground penetrating radar* profession. During an investigation, a cross-section of the project will be recorded on the hard drive of our computer. The data is then transferred, copied and duplicated to be made part of this report.

We do not necessarily record every traverse in most of our investigation since most of the information viewed on our monitor is related to the previous traverse. Traverses (I.e., profiles) are monitored on a constant basis. When a traverse is collected on the hard drive, it is also played back in the field for a second look. Where there is an *out-of-place characteristic*, it may be played back a number of times to determine its location and origin. This is recorded on the hard drive for further analyzing at our office. When specific anomalies are located, *all* are documented for reporting. Anomalies are marked in the field if requested to do so. Measurements are taken to identify the exact location such as a tank or utility.

During the start of all surveys, site characteristics and features must be documented to set the standard for that particular site such as soil conditions, conductive features, etc. While the survey is being conducted, there are periodic documentations which are used as a permanent visual comparison to confirm the standard of that site.

After the completion of our survey, it must be reasonably assured that the information is a true cross-section of the project and the information obtained is accurate according to our best professional efforts.

GPR PRINCIPLES
DIELECTRIC CONSTANTS
TWO-WAY SLOWNESS

Dielectric Constant = This parameter is the value of the dielectric constant used to convert two-way travel time to depth. The value ranges from 1 to 81 and depends upon the dielectric properties of the subsurface materials being profiled. *WARNING:* Dielectric constants for various materials, and thus the resulting depth scales, are only approximations. Additional approximates of various materials are as follows:

MATERIAL	D/C
Air	1
Snow Firm	1.5
Dry Loamy/Clayey Soils	2.5
Dry Clay	4
Dry Sands	4
Ice	4
Coal	4.5
Asphalt	5
Dry Granite	5
Frozen Sand & Gravel	5
Dry Concrete	5.5
Dry Limestone	5.5
Dry Sand & Gravel	5.5
Potash Ore	5.5
Dry Mineral/Sandy Soils	6
Dry Salt	6
Frozen Soil/Permafrost	6
Wet Sandstone	6

MATERIAL	D/C
Wet Granite	6.5
Travertine	8
West Limestone	8
Wet Basalt	8.5
Tills	11
Wet Concrete	12.5
Volcanic Ash	13
Wet Sands	15
Wet Sandy Soils	23.5
Dry Bauxite	25
Saturated Sands	25
Wet Clay	27
Peats	61.5
Organic Soils	64
Sea Water	81
Water	81
Syenite Porphyry	6

MATERIAL	T/ns/meters/ft
Snow	8/2.5
Asphalt	14/4.5
Wet concrete	23/7
Wet sands	25.5/7.5
Dry sand & gravel	15.5/4.5
Dry loamy/clayey soils	10.5/3
Organic soils	52.5/16
Frozen soil/permafrost	16/5
Peats	51.5/15.5
Dry clay	13/4
Wet granite	16.5/5
Volcanic ash	23.5/7
Dry bauxite	33/10
Travertine	18.5/5.5
Dry limestone	15.5/4.5
Wet sandstone	16/5

MATERIAL	T/ns/meters/ft
Water	59/18
Dry concrete	15/4.5
Dry sands	13/4
Saturated sands	33/10
Frozen sand & gravel	14.5/4.5
Dry mineral/sandy soils	16/5
Wet sandy soils	32/9.5
Tills	22/6.5
Wet clay	34/10.5
Dry granite	14.5/4.5
Wet basalt	19/6
Potash ore	15/4.5
Syenite porphyry	16/5
Coal	14/4
Wet limestone	18.5/5.5
Dry salt	16/5

Compliments of
Sub-Surface Informational Surveys, Inc.
E. Longmeadow, MA 01028-0452

REPORT NOTES

DATE _____

DATE:_____

DATE:_____

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