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# Seasonal Fluctuations of Water Tables at Selected Sites in Nova Scotia

Centre for Land
and Biological Resources Research

Centre de recherches sur les
terres et les ressources biologiques

Canada

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*Conception par le Service aux programmes de recherches.*

# SEASONAL FLUCTUATIONS OF WATER TABLES AT SELECTED SITES IN NOVA SCOTIA

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# INTRODUCTION

Seasonal water table fluctuation is important to agronomists, engineers, and environmentalists. High water tables saturate soils reducing their ability support loads and may delay or prevent successful soil cultivation. High water tables early in the growing season can also restrict root penetration into the soil resulting in a draughtiness problem if the water table falls rapidly. In addition wet soils warm more slowly in the spring retarding germination and plant growth (Hohner and Presant 1985). All water tables do not have a detrimental effect. Cornish (1989) found that the upward flow of water from a water table in a typical podzolic soil can satisfy high evaporative demand and maintain surface soil water potentials adequate for germination and early seedling establishment.

Excavation below the water table is a concern for construction engineers. High water tables are also of concern when they contribute to frost heaving or flooding of roads. Wet basements are often the result of high water tables.

High water tables are of concern to health officers because of the adverse effects on the performance of sanitary landfills and on-site sewage disposal systems.

Soil water tables are rarely monitored in Nova Scotia. Although low chroma and the presence of mottles may not always be indicative of poor drainage conditions (van Breeman 1988), soil drainage class is routinely determined by color and depth of occurrence of mottles. The collection of soil water table data by the dipwell method was carried out from 1979 to 1986 in Nova Scotia. The purpose of this study was to relate seasonal fluctuations to soil morphological characteristics and to the soil moisture regimes of some common soils in Nova Scotia. Information from this study will be useful in assisting agricultural extentionists, land use engineers and land use planners related to their land use decision making.

# METHODS

Initially a system of 21 soil water table monitoring sites was established in Cumberland, Colchester and Pictou Counties, Nova Scotia. Due to problems with vandalism and inability to access some sites at certain times of the year those sites were abandoned.

## A. Site Selection

Site selection was carried out by members of the Canada Soil Survey in conjunction with soil surveys and research projects. Sites were selected because many of these soils are common throughout the province and some of the most important soils agriculturally creating an interest in the seasonal water table fluctuations of that soil.

The soil was described and sampled for chemical and physical analyses. Sites were mainly forested areas to minimize the risk of vandalism. Sites on cleared land were on field edges to minimize interference with machinery.

## B. Site Installation

Each of the sites had at least two wells. The wells were constructed of 3.8 cm inside diameter PVC pipe cut to lengths of 60 and 120 cm. Each 60 cm pipe had 4 mm diameter holes drilled along its length to allow water entry while the 120 cm pipes had holes drilled on the lower 60 cm.

Installation of the deep well (120 cm) involved digging a hole to the surface of the compact layer, or approximately 50 cm, then augering a hole of slightly smaller diameter than the well pipe to 120 cm. The well pipe was then driven into the hole with a maul and any excess soil that collected inside the pipe was removed with an auger.

A layer of bentonite was poured into the hole surrounding the pipe to seal the soil to the pipe and to prevent seepage of surface water into the well. The hole was then backfilled with soil. A rubber stopper was placed in the top of the pipe to prevent the entry of foreign objects.

The shorter well was installed by boring a hole of slightly smaller diameter than the pipe to 50 cm and driving the pipe into the hole with a maul. Any excess soil that collected inside the pipe was removed with an auger. A rubber stopper was placed in the top of the well to prevent the entry of foreign objects.

## C. Data Collection

Water table depths in the wells were measured in one centimetre increments with a blow tube (a 2 cm wide, 1.5 metre long, measuring stick with a polyethylene tube attached to its full length). The stick was lowered into the well while air was blown through the tube. The depth at which water bubbled was noted as the top of the water table. The height of the well extending above the ground surface was then subtracted to get the recorded depth of the water table.

At the start of the project the sites were monitored every two weeks year round. Due to time constraints the monitoring period was changed to every two weeks from May to September and once a month for the remainder of the year.

Monthly rainfall data for climatological recording stations closest to the well sites were purchased from Atmospheric and Environment Services of Environment Canada.

## D. Data Analysis

### D1. Summarizing the Soil Water Table Data

Graphs are used in the results and discussion to indicate the trends for the soil water tables for each site. These graphs indicate the range of water table fluctuations in the soils for the total number of years monitored. A second set of graphs which indicate the fluctuations in the deep and shallow wells at each site in a specific year and are presented in Appendix 3.

### D2. Site Descriptions and Analytical Data

Soil profile data containing morphological, chemical and physical information are presented in tabular form in Appendix 1.

All sites with the exception of site 21 were described, sampled and analyzed by methods found in the Manual on soil sampling and methods of analysis (McKeague 1978). The analytical method numbers from McKeague (1978) are indicated in parentheses:

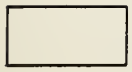
- particle size analysis by pipet method (2.11)
- pretreatments to remove organic matter, iron oxides and carbonates (2.11)
- bulk density by core method (2.21)
- water retention by pressure plate extraction (2.43)
- saturated hydraulic conductivity by core method (2.51)
- pH in $CaCl_2$ (3.11)

- exchangeable cations by NaCl extraction (3.31)
- extractable Fe and Al by pyrophosphate (3.53)
- organic carbon by wet oxidation (3.613)
- total N (3.621)

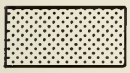
D3. Plots of Rainfall

Yearly plots of the rainfall are presented in Appendix 2 in the form of bar graphs indicating the monthly rainfall in the area of the site. These plots can be used to show the correlation between rainfall and the depth of the water in the soil water table wells.

## KEY TO GRAPHS

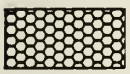


Area where the apparent water table may be found at that time of the year.

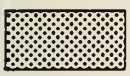


Soil area below lowest recorded water table at that site.

Soil area above highest recorded water table at that site.



Temporarily perched water tables.



Long duration perched water tables.



Highest water table recorded for the site.



Lowest water table recorded for the site.

**Table 1.** Correlation of soil names with various surveys of counties involved.

| *AFDA (1:20,000)[1] | Pictou County[2] | Cumberland County[3] |
|---|---|---|
| Debert | Pugwash | Debert |
| Falmouth | Queens | Queens |
| Hantsport | Millbrook | |
| Kingsville | Queens | Kingsville |
| Lawrencetown | | |
| Mahone | | |
| Masstown | Pugwash | Masstown |
| Pugwash | Pugwash | Pugwash |
| | | Tormentine |
| Queens | Queens | Queens |

*The AFDA (1:20,000) series includes Soils of the Cobequid Shore Area of Nova Scotia which covers sections of Cumberland County and Soils of the Northumberland Shore Area of Nova Scotia which covers sections of Cumberland and Pictou Counties.

[1]Webb, Duff and Langille 1989; and Patterson and Thompson 1989.
[2]Webb 1990.
[3]Nowland and MacDougall 1973.

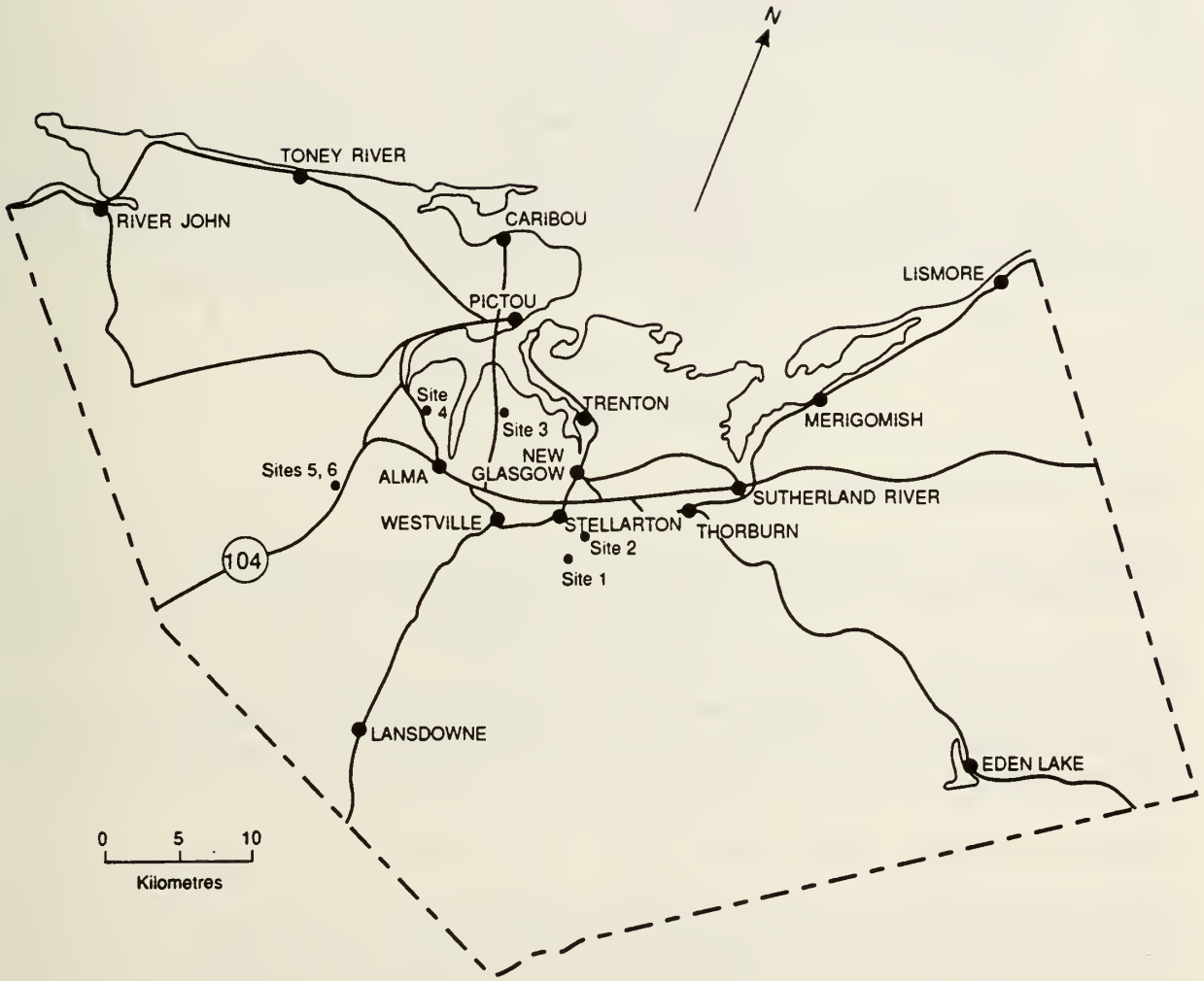
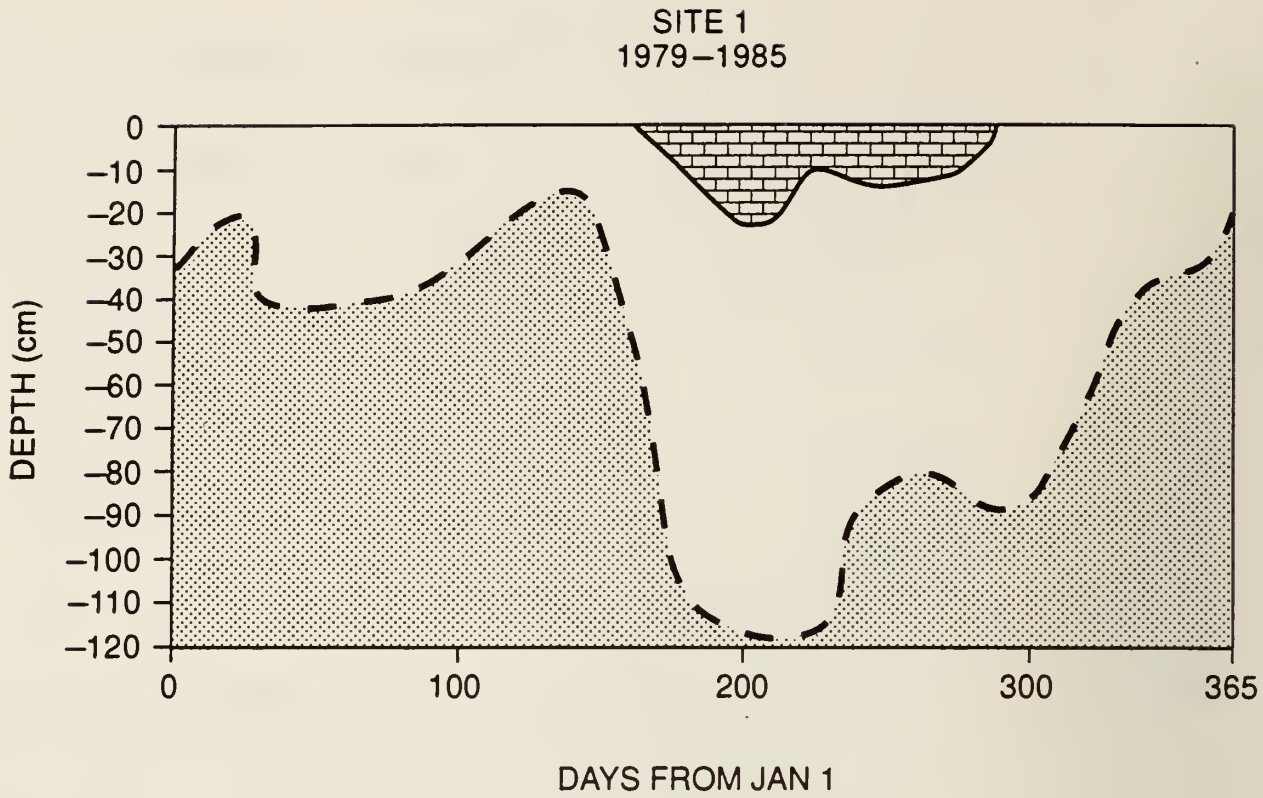



**Figure 1.** Location map of water table monitoring sites in Pictou County.




**Site 1 - MacLellans Brook**

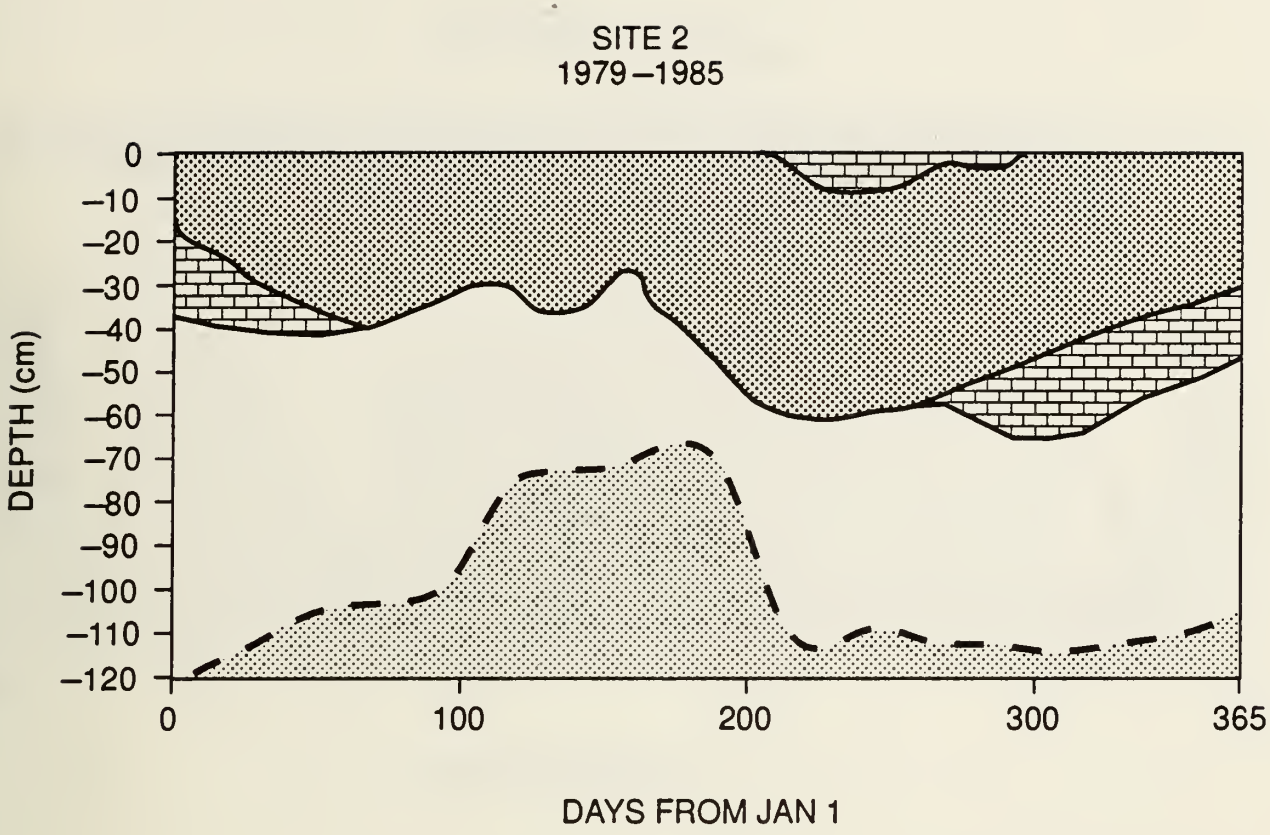
Site Description - This site was located near MacLellans Brook, Pictou County, in an area of black spruce forest on very gently sloping land.

Soil Characteristics - The soil at this site is composed of friable, silty clay loam over friable and firm, loam and silt loam lacustrine sediments. Prominent to distinct mottles were found in all the horizons below the LFH. The soil was classified as poorly drained.

Soil Name - Joggins 5 (Jg5) (Webb 1990).

Water Table Discussion - The water table at this site generally remains in the 0 to 30 cm range from January 1 to June 1 then it gradually drops to approximately 110 cm by mid July. In early September it begins to rise and reaches the 0 to 30 cm range by late October where it stays the remainder of the year.

For further information see Appendix 3 for annual plots of water table data and Appendix 2 for annual rainfall data.




**Site 2 - Reeves Road**

Site Description - The site was located adjacent to Reeves road south of Stellarton in Pictou County, on nearly level abandoned farmland.

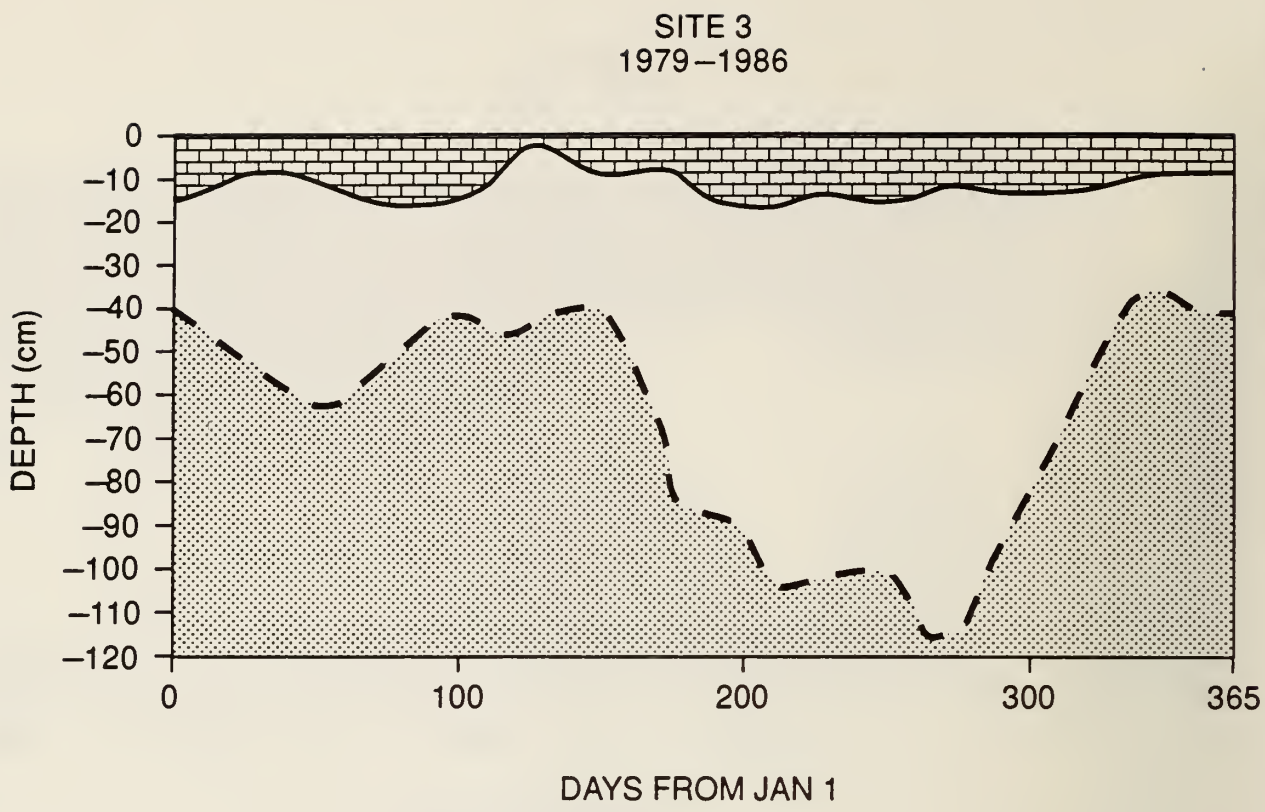
Soil Characteristics - The soil at the site is very friable to friable, silty clay loam and clay loam over firm to very firm, silty clay and gravelly silty clay loam till. Mottles are found throughout the profile below the Ap horizon. The soil is poorly drained.

Soil Name - Joggins 5 (Jg5) (Webb 1990).

Water Table Discussion - This site is one of two sites in the project that have two distinct water tables year round. The perched water table remains close to the surface from January 1 to late June. It reaches its maximum depth of 60 cm in late August and then rises again.

The apparent water table is at its lowest point of 110 cm in early January and late November and usually at its highest point of 40 cm in mid June.

For further information see Appendix 3 for annual plots of water table data and Appendix 2 for annual rainfall data.




**Site 3 - Alma Station**

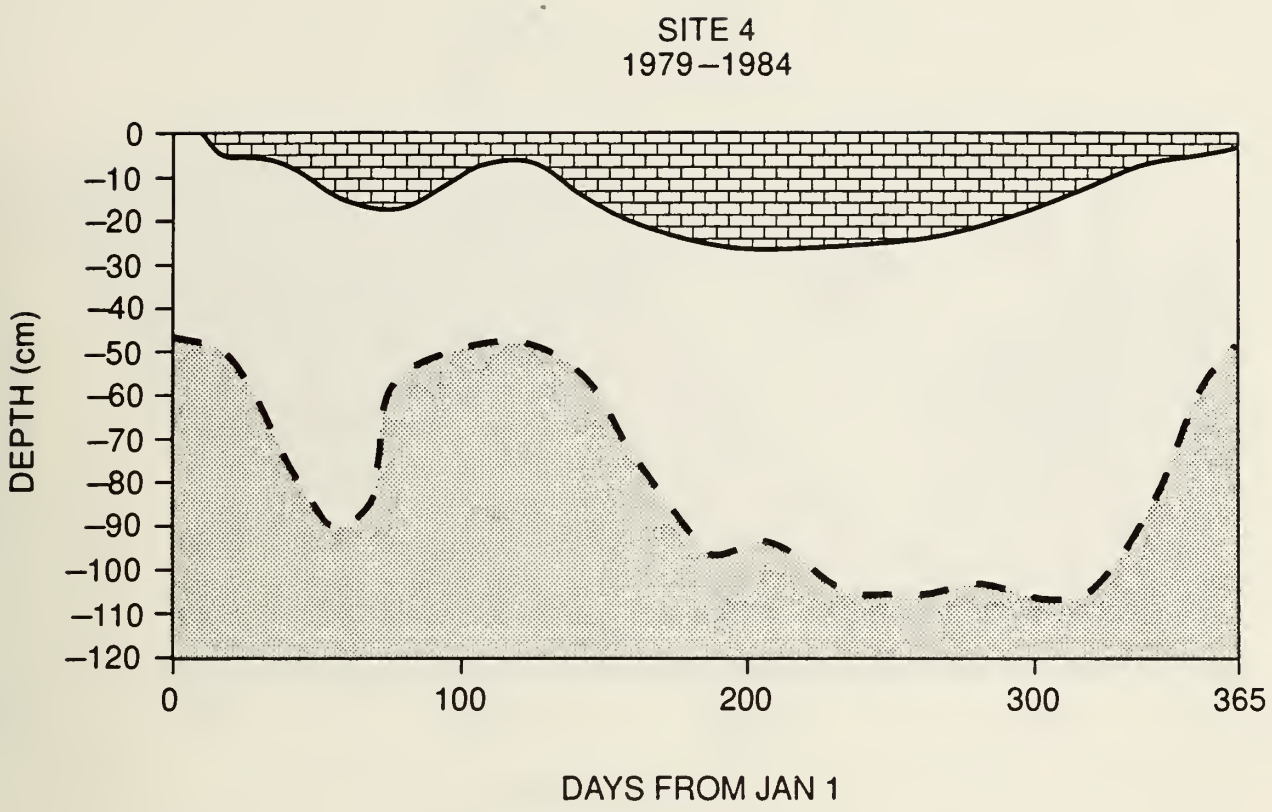
Site Description - This site was located in Alma Station, Pictou County, in a black spruce forest on gently sloping terrain.

Soil Characteristics - The soil at this site is composed of friable, loam and silt loam over firm, loam and sandy loam till. Distinct mottles occur in all horizons below the LFH. The soil is poorly drained.

Soil Name - Pugwash 5 (Pw5) (Webb 1990).

Water Table Discussion - The water table at this site generally remains within 40 cm of the surface from January 1 to June 1. It then recedes to its maximum depth of 120 cm between mid July and early September. Following this period it usually rises to within 40 cm of the surface by late November.

For further information see Appendix 3 for annual plots of water table data and Appendix 2 for annual rainfall data.




**Site 4 - Sylvester**

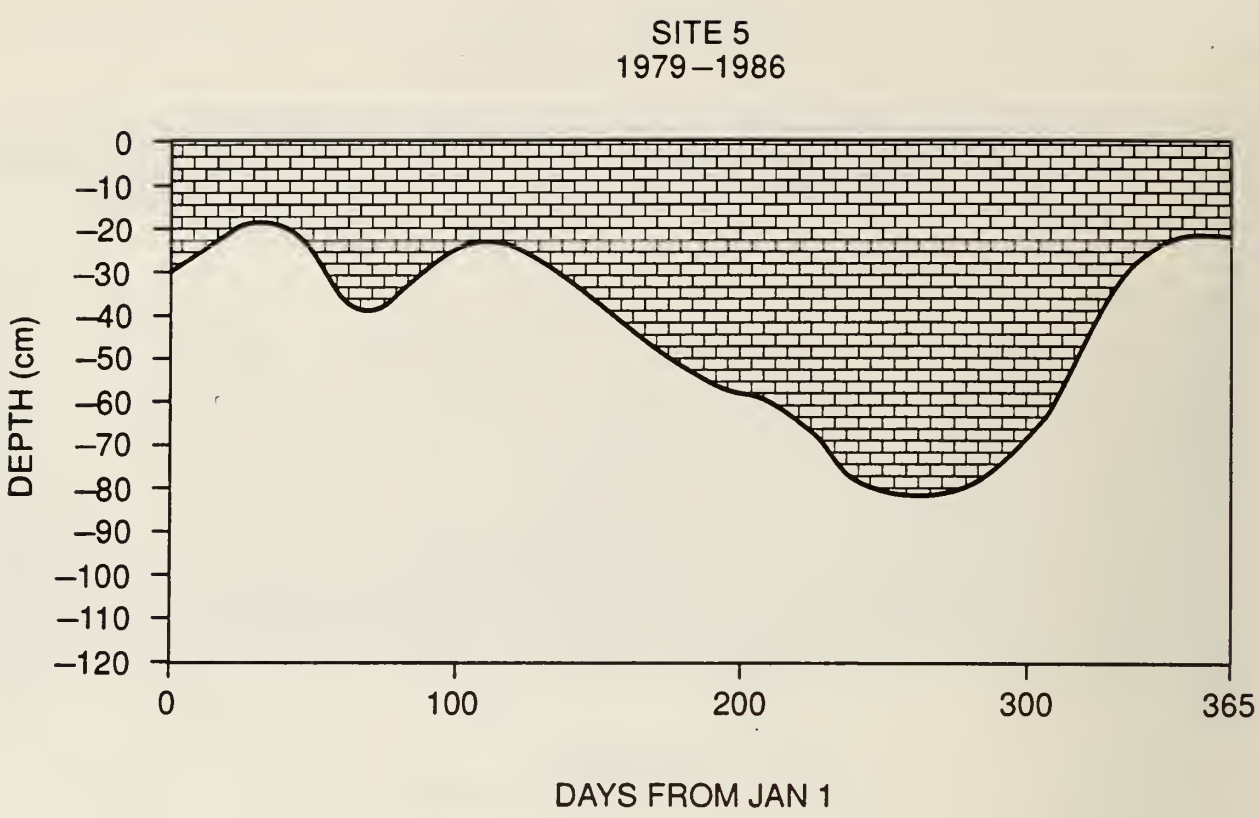
Site Description - This site was located in Sylvester, Pictou County, in a spruce-fir forest on a very gentle slope.

Soil Characteristics - The soil at the site is composed of friable, silt loam and gravelly silt loam over very firm, gravelly silty clay loam till. Faint mottles are found in all horizons below the LFH. The soil is imperfectly drained.

Soil Name - Millbrook 3 (Mi3) (Webb 1990).

Water Table Discussion - The water table at this site is generally found in the 20 to 40 cm range in early January after which it recedes gradually until late February. It then rises again until mid April. After this a gradual drop takes place until the water table reaches its maximum depth of 110 cm in early August. Then the water table rises to the 20 to 40 cm range by mid December.

For further information see Appendix 3 for annual plots of water table data and Appendix 2 for annual rainfall data.




**Site 5 - West River 1**

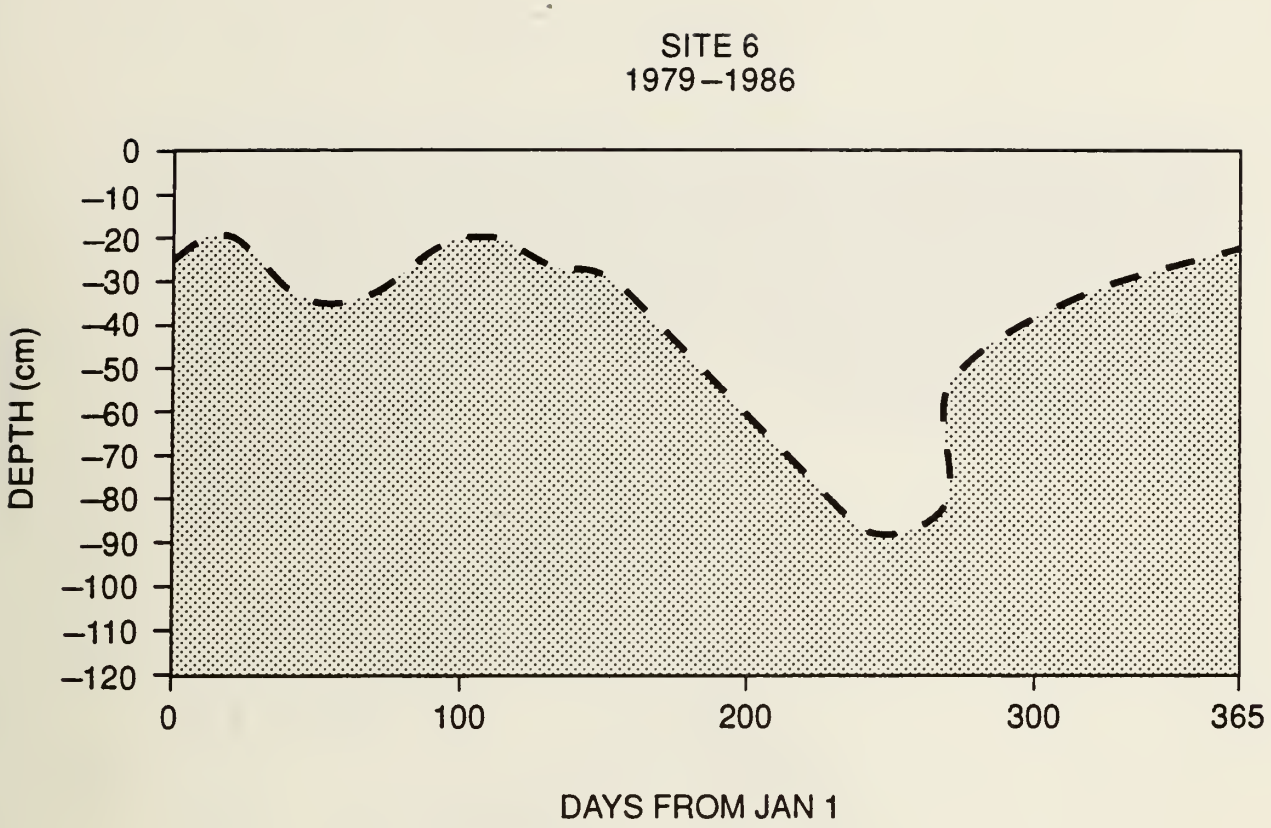
Site Description - This site was located in West River, Pictou County, in an area of mixed hardwood and softwood productive woodland on very gently sloping land.

Soil Characteristics - The soil at this site is composed of very friable to friable, sandy loam over very firm, sandy loam till. Faint mottles were found in the C horizon. The soil is moderately well drained.

Soil Name - Pugwash 1 (Pw1) (Webb 1990).

Water Table Discussion - This site has little or no water table during periods of diminished precipitation. Water tables were present only after periods of rain and spring snow melt.

For further information see Appendix 3 for annual plots of water table data and Appendix 2 for annual rainfall data.




**Site 6 - West River 2**

Site Description - This site was located in West River, Pictou County, in an area of mixed hardwood and softwood productive woodland on moderately sloping land.

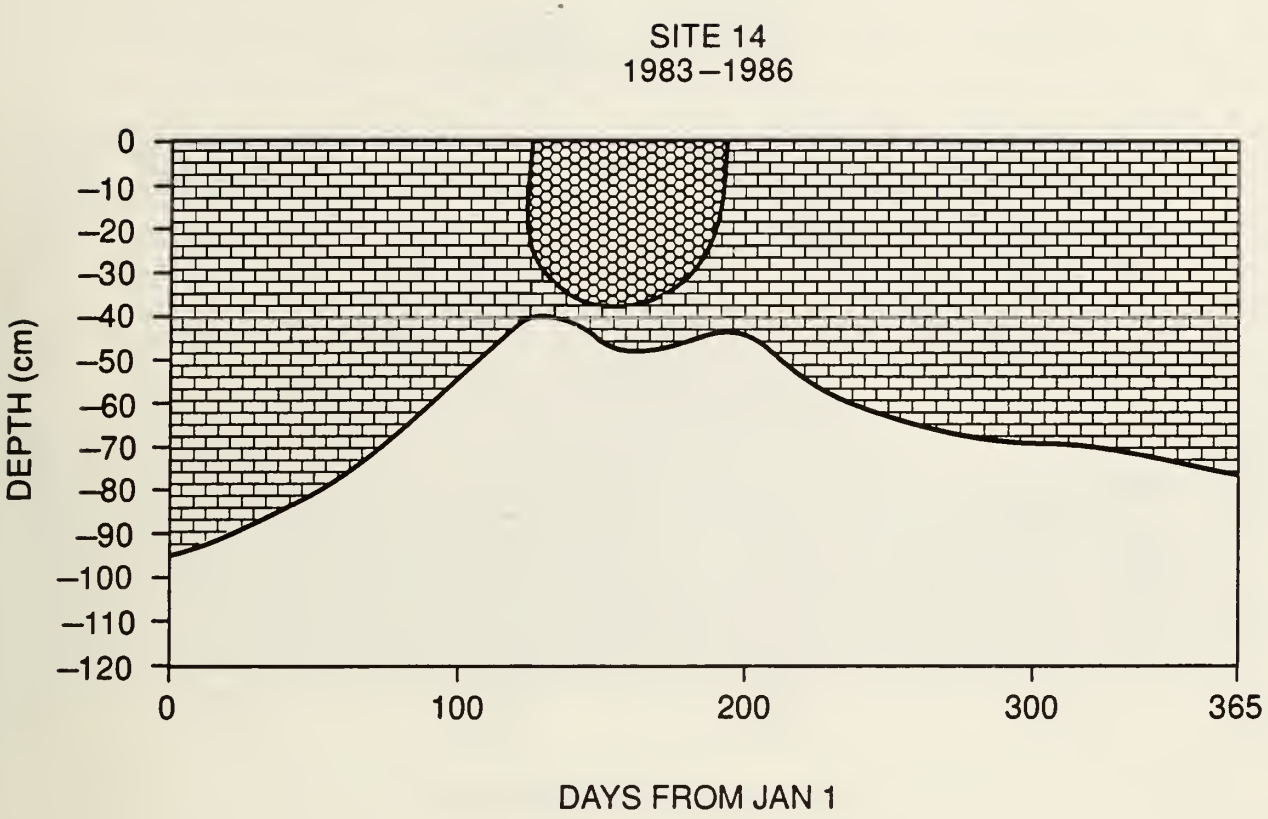
Soil Characteristics - The soil at this site is composed of very friable, loam and sandy loam over friable to firm, sandy loam till. Faint mottles are found in all horizons below the A horizon. The soil was classified as imperfectly drained by morphological inspection, but water table measurements indicate that it is poorly drained.

Soil Name - Pugwash 5 (Pw5) (Webb 1990).

Water Table Discussion - The water table at this site remains close to the surface year round. The top of the water table reaches its lowest point in early September and in a dry year may be as low as 80 cm. The water table rapidly rises until by the end of the year it is near the soil surface again.

For further information see Appendix 3 for annual plots of water table data and Appendix 2 for annual rainfall data.


**Figure 2.** Location map of water table monitoring sites in Cumberland County.




**Site 14 - Middleboro 1**

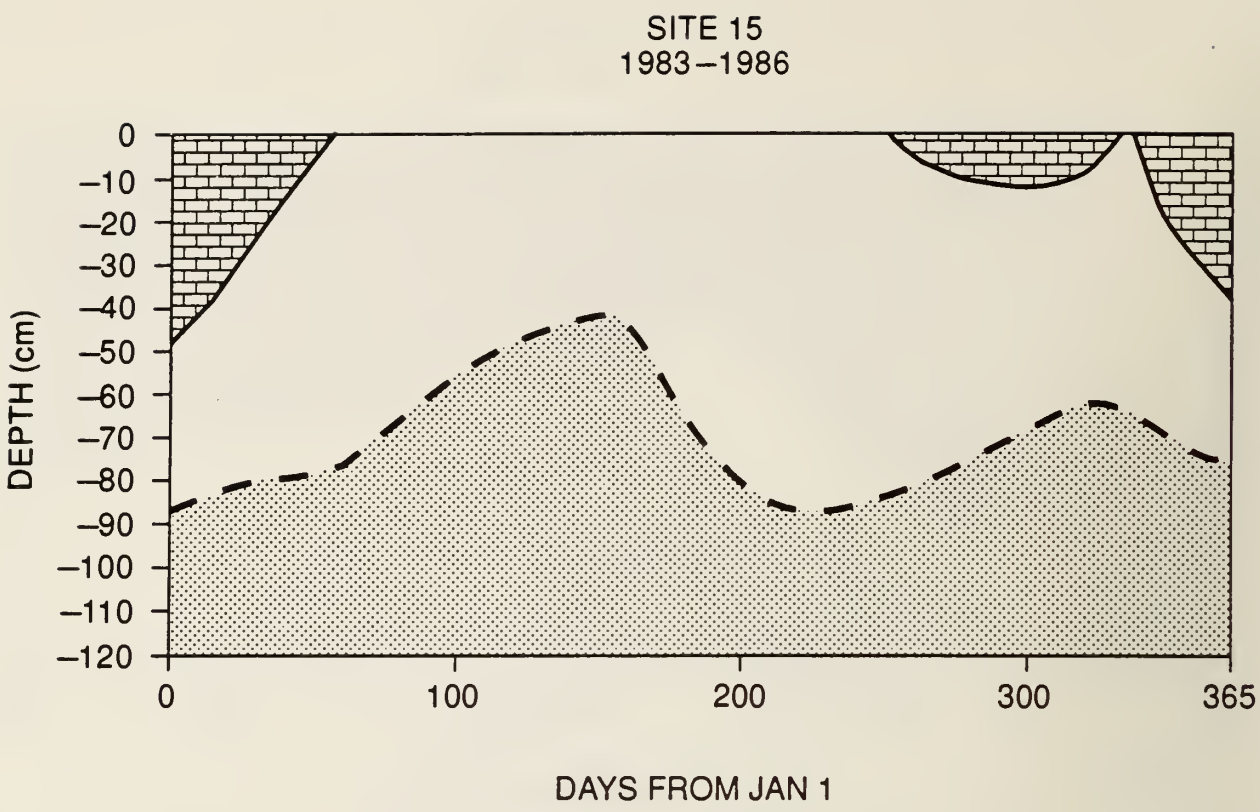
Site Description - This site was located in Middleboro, Cumberland County, in an area of mixed hardwood and softwood productive woodland on very gently sloping land.

Soil Characteristics - The soil at this site is composed of friable, sandy loam till. Faint to distinct mottles are found in some horizons. The soil is imperfectly drained.

Soil Name - Debert (De) (Nowland and MacDougall 1973).

Water Table Discussion - The water table at this site is generally nonexistent in the control section for most of the year. It is generally only found after periods of rain. However, in early June a temporarily perched water table is usually found 0 to 30 cm below the surface.

For further information see Appendix 3 for annual plots of water table data and Appendix 2 for annual rainfall data.




**Site 15 - Middleboro 2**

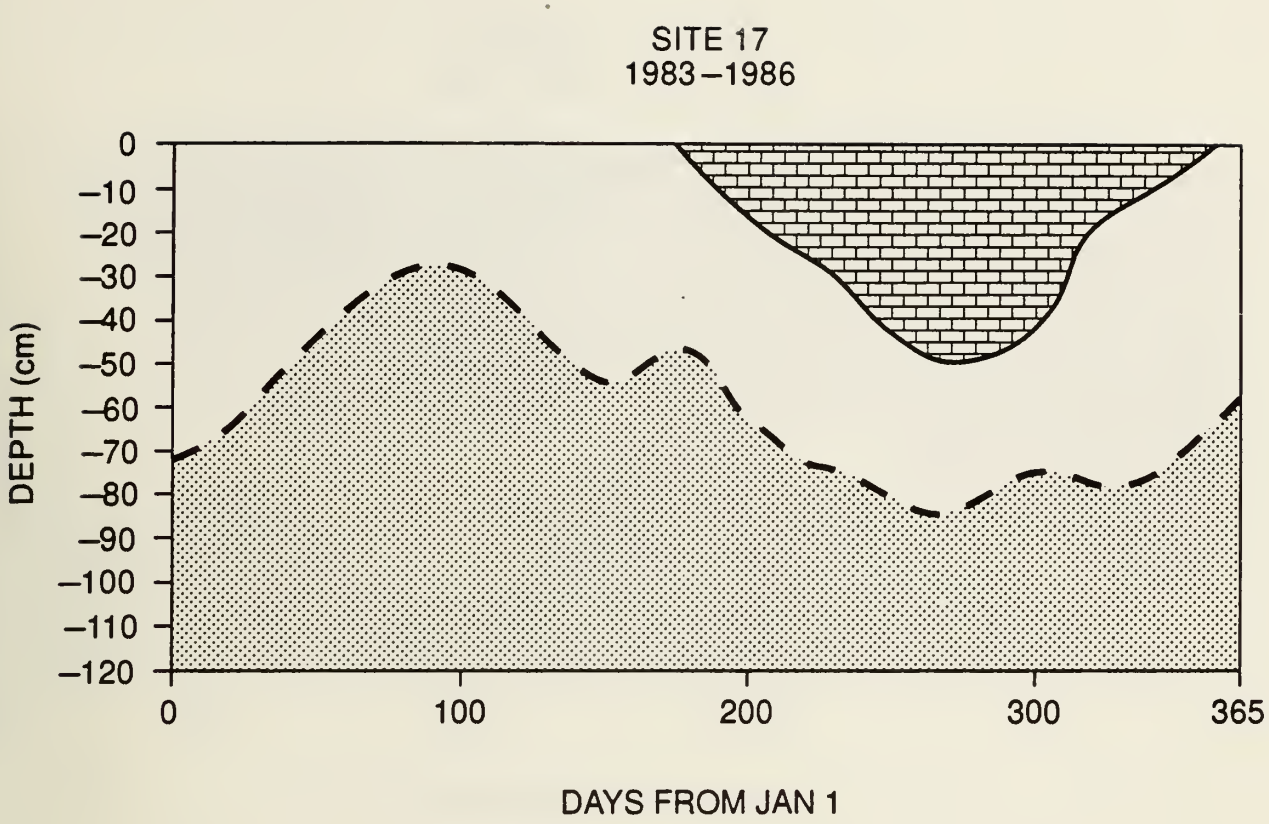
Site Description - This site was located in Middleboro, Cumberland County, in an area of mixed hardwood and softwood productive woodland on very gently sloping land.

Soil Characteristics - The soil at this site is composed of friable, sandy clay loam and sandy loam over firm, loam till. Prominent to distinct mottles are found in horizons below the A horizon. The soil is poorly drained.

Soil Name - Masstown (Ma) (Nowland and MacDougall 1973).

Water Table Discussion - At this site high water tables are present the year round. The water table reaches its lowest point of approximately 80 cm in late July or early August.

For further information see Appendix 3 for annual plots of water table data and Appendix 2 for annual rainfall data.




**Site 17 - Experimental Farm 1**

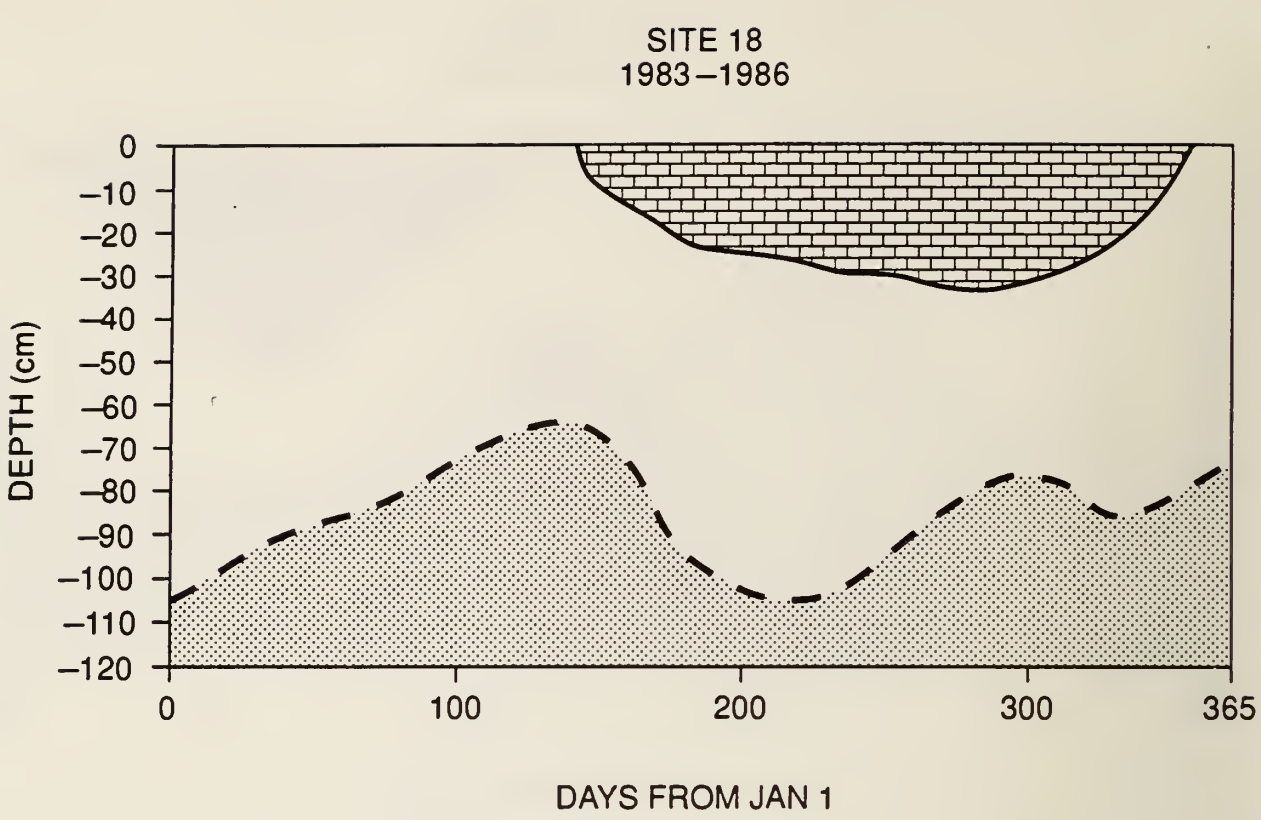
Site Description - This site was located on the Nappan Experimental Farm, Nappan, Cumberland County, on gently sloping forage cropland.

Soil Characteristics - The soil at this site is composed of friable, loam over firm, loam till. Mottles are present in all horizons above the C horizon. The soil is poorly drained.

Soil Name - Kingsville (Kv) (Nowland and MacDougall 1973).

Water Table Discussion - The water table at this site is on or near the surface of the soil until early July. Then the water table gradually drops until it reaches its lowest point in late September. The water table then gradually returns to the surface by the year end.

For further information see Appendix 3 for annual plots of water table data and Appendix 2 for annual rainfall data.




**Site 18 - Experimental Farm 2**

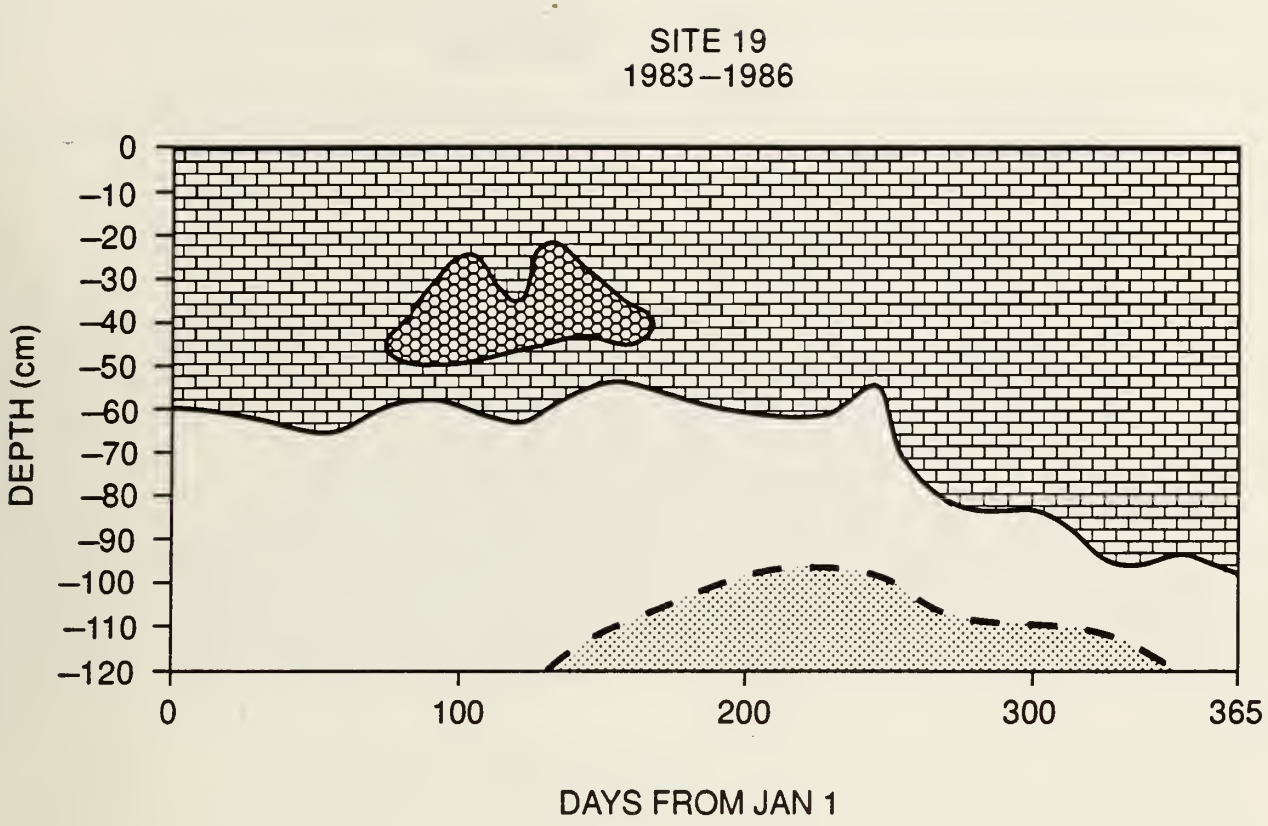
Site Description - This site was located on the Nappan Experimental Farm, Nappan, Cumberland County, on gently sloping forage crop land.

Soil Characteristics - The soil at this site is composed of friable, loam over firm, clay loam till. Mottles were found in the top two horizons. The soil is imperfectly drained.

Soil Name - Queens (Q) (Nowland and MacDougall 1973).

Water Table Discussion - The water table at this site is often found near the soil surface and has a wide range at the beginning of the year. This range narrows until early May. After this period the water table recedes until it ranges between 30 to 90 cm below the surface in mid-August. This range narrows again in late September and then becomes greater as the top of the water table can be found near the soil surface after periods of rain or spring snow melt.

For further information see Appendix 3 for annual plots of water table data and Appendix 2 for annual rainfall data.




**Site 19 - Experimental Farm 3**

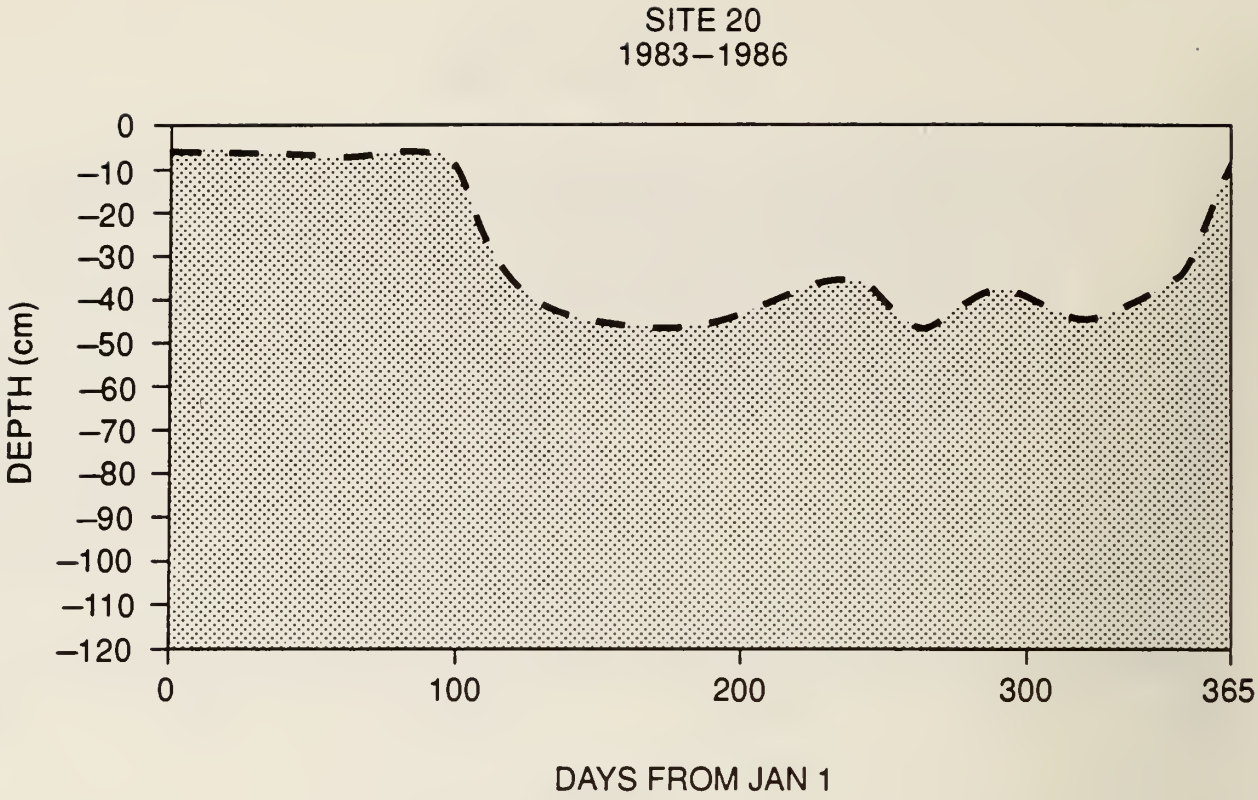
Site Description - This site was located on the Nappan Experimental Farm, Nappan, Cumberland County, in an area of mixed hardwood and softwood productive woodland on very gentle slopes.

Soil Characteristics - The soil at this site is composed of very friable to friable, loam and silt loam over firm, silt loam and silty clay loam till. The soil is moderately well drained.

Soil Name - Falmouth (F) (Nowland and MacDougall 1973).

Water Table Discussion - This site has both an apparent and a temporarily perched water table. The surface of the apparent water table is near 60 cm early in the year and ranges from 60 to 100 in mid summer then drops to 90 by the year end. The temporarily perched water table is present from mid March to late June and ranges from 20 to 50 cm following spring snow melt and rains.

For further information see Appendix 3 for annual plots of water table data and Appendix 2 for annual rainfall data.




**Site 20 - Experimental Farm 4**

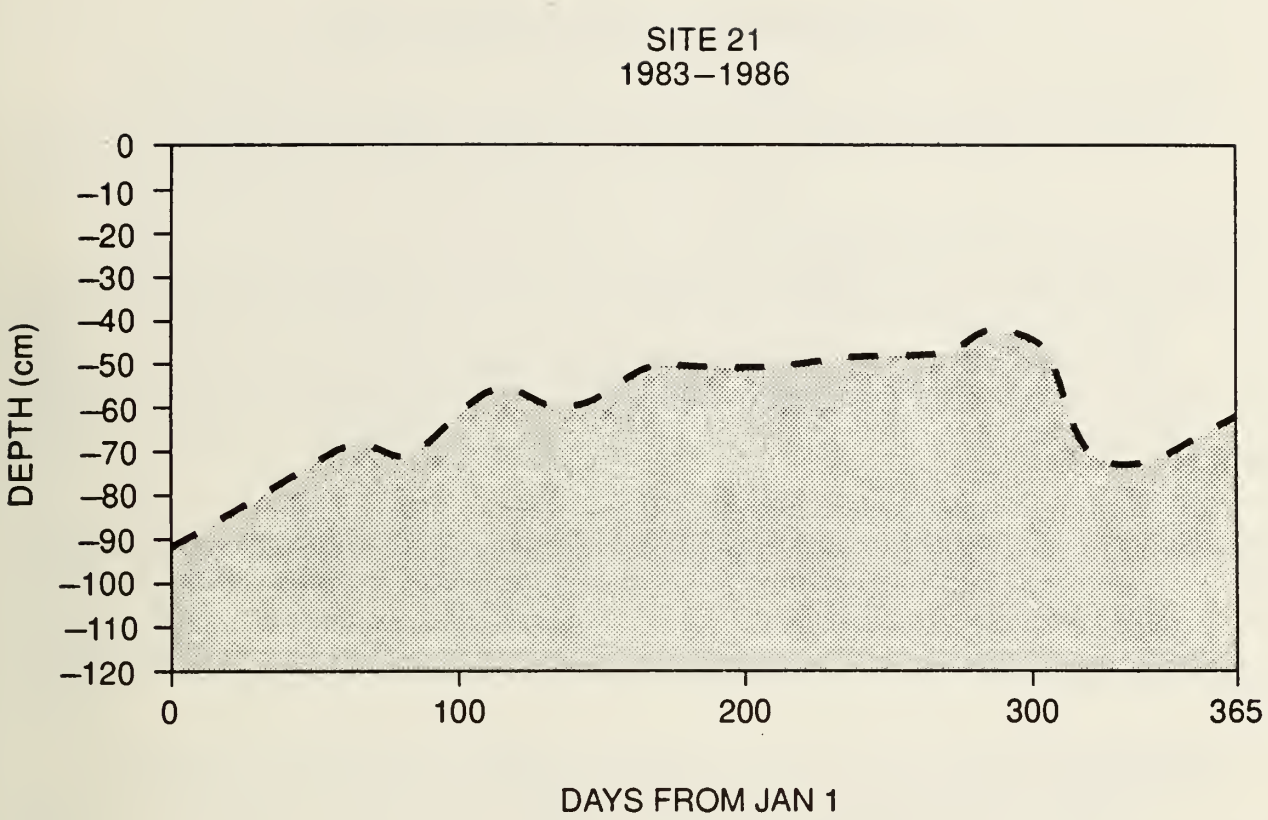
Site Description - This site was located on the Nappan Experimental Farm, Nappan, Cumberland County, in an area of mixed hardwood and softwood productive woodland on very gentle slopes.

Soil Characteristics - The soil at this site is composed of very friable, sandy loam and silty clay loam over firm, silty clay loam and silt loam till. Distinct mottles were found in the C horizons. The soil was classified as imperfectly drained by morphological inspection, but water table measurements indicate that it is poorly drained.

Soil Name - Kingsville (Kv) (Nowland and MacDougall 1973).

Water Table Discussion - The water table at this site rarely falls below 40 cm even during droughty periods because of its position at the toe of the slope.

For further information see Appendix 3 for annual plots of water table data and Appendix 2 for annual rainfall data.




**Site 21 - Experimental Farm 5**

Site Description - This site was located on the Nappan Experimental Farm, Nappan, Cumberland County, in a depressional area of mixed hardwood and softwood productive woodland on very gentle slopes.

Soil Characteristics - The soil at this site is composed of friable, silt loam and loam over very firm, clay loam till. The upper soil material is gleyed. The soil is poorly drained.

Soil Name - Kingsville (Kv) (Nowland and MacDougall 1973).

Water Table Discussion - The water table at this site generally remains close to the soil surface throughout the year. In the early part of the year the water table ranges from 0 to 80 cm. This generally narrows by mid-summer when the range is from 0 to 50 cm and by the year end the range is back to 0 to 80 cm.

For further information see Appendix 3 for annual plots of water table data and Appendix 2 for annual rainfall data.

# DISCUSSION AND CONCLUSIONS

All the sites investigated in this study had soil water tables present at some time and seasonal fluctuations of the water tables did not always agree with the drainage class assigned after the sites were described.

Sites 1, 2, 3, 15, 17 and 21 looked both morphologically and by soil water table regime like poorly drained soils. The water table was high in the wetter seasons of spring and fall and fell during the generally dryer summer months. Following periods of rain in the summer the soil water table would rise causing saturated conditions for short periods of time. This saturated condition gave rise to the low chroma mottling of the soils and gray or gleyed colors of the saturated horizons.

Sites 4, 14, and 18 were classified as imperfectly drained after morphological inspection and following the well study. These water tables at these sites were not as responsive to the addition of water (by snowmelt or rainfall) and were not as strongly gleyed as the poorly drained sites. This could be due to a higher slope position where water did not collect or better drainage due to having a more porous subsoil.

Although low chroma mottling and gray colors are used as soil classification criteria for the aquic soil moisture regime, they may be misleading if used for inferences on drainage conditions, since soil saturation with water may occur for a long period without development of mottles or soil colors with chromas of <2 (Couto et al. 1985). Reduction of Fe III can only take place if the following requirements are met : (1) presence of organic matter, (2) absence of $O_2$, $NO_3^-$ and easily reducible Mn oxides, and (3) presence of anaerobic microorganisms and conditions suitable for their growth (van Breeman 1988).

The fact that a soil has gleyed features does not necessarily mean that it is poorly drained and has a high water table for prolonged periods of time. Conversely soils with few gleyed features may be poorly drained and have high water tables for prolonged periods. The time needed for gley development is generally decades (formation of mottled horizons due to periodic water saturation) to thousands of years, but may be as little as days (van Breeman 1988).

In the cases of sites 6 and 20, where both sites had high water tables year round indicating that they are poorly drained though both the sites were initially classified as being imperfectly drained based on morphological inspection. Because of this discrepancy it was felt that since both sites were located at the toes of slopes they probably receive a steady supply of oxygenated seepage water which would reduce the severity of gleying. These seepage conditions are not present at sites 2 and 21 where conditions are conducive to gleying. If this is not the case then it may be as stated in Couto et al (1985) where the soil horizons may lack the energy source to reduce Fe compounds, even if they are saturated for several months of the year. If organic matter is not present in the proper concentration gleying cannot take place.

Sites 5 and 19 were the most freely drained sites in the study. Site 5 only had a water table present immediately following spring snow melt or rainfall and was classified as well drained while site 19 maintained a water table for slightly longer periods of time and was classified as moderately well drained. Another reason for concluding that these sites were better drained than others in the study were the bright soil colors. Site 5 had few, fine, faint mottles in the C horizon indicating very short periods of saturation deep in the profile. Site 19 had firm, slowly permeable subsoil which created a temporarily perched water table.

Results from this study indicate that morphological inspections of soil profiles provides correct soil drainage classification in most cases. However, to get a better appreciation of the complexities of the soil water regime classification one should use methods as described in the Soil Water Investigations Manual "SWIMM" compiled by Eilers 1991.

# GLOSSARY OF TERMS AND ABBREVIATIONS

This glossary covers terms and abbreviations used in this report. For more information see Day (1983) and Agriculture Canada (1976).

**Anaerobic** (i) Having no molecular oxygen in the environment. (ii) Growing in the absence of molecular oxygen, such as anaerobic bacteria. (iii) Occurring in the absence of molecular oxygen, as in a biochemical process.

**Aquic** Soil profile is saturated for moderately long periods of time.

**Bulk density ($Mg/m^3$)** The mass of dry soil per unit bulk volume measured in megagrams per cubic metre.

**CEC** Cation exchange capacity is the total amount of exchangeable cations that a soil can absorb. Exchangeable cations are positive ions held or absorbed on negatively charged sites on mineral or organic particles which in total are referred to as the exchange complex of the soil. In this report CEC is the sum of the exchangeable cations recorded in centimols per kilogram of soil (cmol/kg). One centimol is the amount of an element or compound that will combine with or replace ten milligrams of hydrogen.

**Coarse fragment (% volume)** Mineral soil particles greater than 2 mm measured as a percent of the total volume of a soil sample.

**Consistence** The resistance of the soil material to deformation or rupture (i.e., its strength). Terms used to describe consistence depend on the moisture of the soil.

**Drainage** Soil drainage classes are defined in terms of available water storage capacity and source of water. Soil drainage in a dynamic sense refers to the rapidity and extent of the removal of water from soils in relation to additions. It is affected by a number of factors that act separately or in combination, including texture, structure, slope gradient, slope length, water holding capacity, and evapotranspiration.

Rapidly drained Water is removed from the soil rapidly in relation to supply. Excess water flows downward if the underlying material is pervious. Subsurface flows may occur on steep gradients during heavy rainfall. Soils have low available water storage capacity (2.5-4 cm) within the control section and are usually coarse textured, or shallow, or both. Water source is precipitation.

Well drained Water is removed from the soil readily but not rapidly. Excess water flows downward readily into the underlying pervious material or laterally as subsurface flow. Soils have intermediate available water storage capacity (4-5 cm) within the control section and are generally intermediate in

texture and depth. Water source is precipitation. On slopes subsurface flow may occur for short durations but additions are equalled by losses.
Moderately well drained Water supply is removed from the soil somewhat slowly in relation to the supply. Excess water is removed somewhat slowly because of low perviousness, shallow water table, lack of gradient, or some combination of these. Soils have intermediate to high water storage capacity (5-6 cm) within the control section and are usually medium to fine textured. Precipitation is the dominant water source in medium to fine textured soils; precipitation and significant additions by subsurface flow are necessary in coarse textured soils.

Imperfectly drained Water is removed from the soil sufficiently slowly in relation to supply to keep the soil wet for a significant part of the growing season. Excess water moves slowly downward if the precipitation is the major supply. If subsurface water or ground water, or both, is the main source, flow rate may vary but the soil remains wet for a significant part of the growing season. Precipitation is the main source if the available water storage capacity is high; contribution by subsurface flow or ground water flow, or both, increases as the available water storage capacity decreases. Soils have a wide range in available water supply, texture, and depth and are gleyed equivalents of well drained subgroups.

Poorly drained Water is removed so slowly in relation to supply that the soil remains wet for a comparatively large part of the time when the soil is not frozen. Excess water is evident in the soil for a large part of the time. Subsurface flow or ground water flow or both, in addition to precipitation are main water sources; there may also be a perched water table, and precipitation may exceed evapotranspiration. Soils have a wide range in available water storage capacity, texture, and depth and are gleyed subgroups, gleysols, or organic.

Very poorly drained Water is removed from the soil so slowly that the water table remains at or on the surface for the greater part of the time the soil is not frozen. Excess water is present in the soil for the greater part of the time. Ground water flow and subsurface flow are major water sources. Precipitation is less important except where there is a perched water table with precipitation exceeding evapotranspiration. Soils have a wide range in available water storage capacity, texture, and depth, and are either Gleysolic or Organic.

**Horizon** A soil layer approximately parallel to the land surface which differs from other layers in properties such as color, particle size, structure, and consistence and in chemical, biological, and physical properties.

**Gleysation** A soil forming process, operating under poor drainage conditions which results in reduction of iron and other elements and in gray colors and mottles.

**Hydraulic conductivity (cm/h) (Ksat)** The ability of the soil to transmit water vertically when saturated, expressed as a velocity in centimetres per hour.

**Mottle** Spots or blotches of different color or shades of color interspersed with the dominant color.

**Organic matter (%)** The organic fraction of the soil as a percentage; including plant and animal residues at various stages of decomposition and substances synthesized by the soil population.

**Moisture retention (%)** Numbers showing the soil moisture percentage (by weight or volume) versus applied tension or pressure.

**Mottles** Spots or blotches of a different color or shades of color (usually reds, oranges, or reddish browns) interspersed with the dominant soil color. Mottles are oxides of iron and are indicative of soils that have been periodically saturated.

**Organic C (%)** Percentage by weight carbon present in the soil as a constituent in soil organic matter.

**Particle size distribution (%)** Percentages of the various soil separates in a soil sample. The abbreviations, names and sizes of the separates are as follows:

| | |
|---|---|
| VCS | very coarse sand (2-1 mm) |
| CS | coarse sand (1-0.5 mm) |
| MS | medium sand (0.5-0.25 mm) |
| FS | fine sand (0.25-0.1 mm) |
| VFS | very fine sand (0.1-0.05 mm) |
| Total sand | all of the above (2-0.05 mm) |
| Silt | (0.05-0.002 mm) |
| Clay | (<0.002 mm) |

**pH** The negative logarithm of the hydrogen ion activity of the soil. The degree of acidity or alkalinity of the soil measured in water ($H_2O$) or a solution of calcium chloride ($CaCl_2$).

**Perched water table** A water table due to the "perching" of water on the relatively impermeable layer at some depth within the soil. The soil within or below the impermeable is not saturated with water.

**Water table** Elevation at which the pressure in the water is zero with respect to atmospheric pressure.

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# APPENDIX 1

## Site Descriptions and Analytical Data for Pictou and Cumberland Counties

**Table 1-1. Site 1**

| | | | |
|---|---|---|---|
| Location: | UTM 20T NF 3114 4504 | Drainage: | Poor |
| Established: | 13/07/79 | Land use: | Black spruce forest |
| Site name: | MacLellans Brook | Slope: | 4.0% |
| Soil name: | Joggins (Jg5) | Climatic station: | Hopewell, Lorne Station |

Soil Classification (1987): Orthic Gleysol

Profile description

| Horizon | Depth (cm) | Color (moist) | Texture | Structure | | | Consistence | Mottles (Fe) |
|---|---|---|---|---|---|---|---|---|
| | | | | Grade | Size | Kind | | |
| LFH | 6-0 | poorly decomposed forest litter | | | | | | |
| Aeg | 0-20 | yellowish brown (10YR 3/2) | silty clay loam | weak | coarse | platy | friable | many medium distinct |
| Bgxj | 20-50 | brown (10YR 5/3) | loam | weak | coarse | subangular blocky | firm | many coarse prominent |
| Cg | 50-100 | dark brown (10YR 3/3) | silt loam | weak | coarse | subangular blocky | friable | many coarse distinct |

Analyses

| Horizon | Depth (cm) | pH ($CaCl_2$) | C % | N % | Pyrophosphate | | Exchangeable cations (cmol/kg soil) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | % Fe | % Al | Ca | Mg | K | Al | CEC |
| LFH | 6-0 | 3.2 | 31.06 | 0.88 | 0.4 | 0.2 | 0.51 | 0.38 | --- | 1.40 | --- |
| Aeg | 0-20 | 3.5 | 1.34 | 0.08 | 0.4 | 0.3 | 0.02 | 0.02 | --- | 1.04 | --- |
| Bgxj | 20-50 | 4.0 | 0.18 | 0.04 | 0.5 | 0.2 | 0.02 | 0.03 | --- | 0.18 | --- |
| Cg | 50-100 | 4.0 | 0.12 | 0.03 | 0.3 | 0.1 | 0.06 | 0.08 | --- | 0.10 | --- |

| Horizon | Particle size distribution (%) | | | | | | | | Bulk density ($Mg/m^3$) | Ksat (cm/h) | Moisture retention (-kPa) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VCS | CS | MS | FS | VF | Total sand | Silt | Clay | | | 10 | 33 | 300 | 1500 |
| FH | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Aeg | 1 | 1 | 1 | 4 | 6 | 13 | 58 | 29 | 1.35 | 6.7 | 35.3 | 33.4 | --- | 10.4 |
| Bgxj | 1 | 2 | 2 | 11 | 22 | 38 | 47 | 15 | 2.00 | 0.2 | 34.1 | 32.0 | --- | 6.7 |
| Cg | 0 | 0 | 1 | 4 | 11 | 16 | 71 | 13 | 1.70 | 0.0 | 31.5 | 29.7 | --- | 5.5 |

**Table 1-2. Site 2**

Location: UTM 20T NF 3260 4494
Established: 13/07/79
Site name: Reeves Road
Soil name: Joggins (Jg5)
Drainage: Poor
Land use: Abandoned farmland
Slope: 2.0%
Climatic station: Hopewell, Lorne Station
Soil Classification (1987): Orthic Luvic Gleysol

Profile description

| Horizon | Depth (cm) | Color (moist) | Texture | Structure | | | Consistence | Mottles (Fe) |
|---|---|---|---|---|---|---|---|---|
| | | | | Grade | Size | Kind | | |
| Ap | 0-10 | dark brown (10YR 4/4) | clay loam | moderate to strong | fine to medium | granular | very friable | none |
| Aegj | 10-15 | brown (10YR 5/3) | silty clay loam | weak | coarse | subangular blocky | friable | common fine distinct |
| Btg | 15-35 | gray (10YR 5/1) | silty clay | moderate to strong | very coarse | subangular blocky | very firm | many medium prominent |
| BC | 35-55 | brown (10YR 5/3) | silty clay | moderate | medium | subangular blocky | very firm | many medium prominent |
| Cgj | 55-100 | very dark grayish brown (10YR 3/2) | gravelly silty clay loam | weak | medium to coarse | subangular blocky | firm | common fine faint |

Analyses

| Horizon | Depth (cm) | pH ($CaCl_2$) | C % | N % | Pyrophosphate | | Exchangeable cations (cmol/kg soil) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | % Fe | % Al | Ca | Mg | K | Al | CEC |
| Ap | 0-10 | 4.3 | 3.5 | 0.3 | 0.74 | 0.31 | 0.237 | 0.088 | 0.023 | 0.108 | 0.456 |
| Aegj | 10-15 | 4.3 | 1.4 | 0.1 | 0.57 | 0.20 | 0.200 | 0.079 | 0.017 | 0.111 | 0.407 |
| Btg | 15-35 | 4.2 | 0.5 | 0.04 | 0.09 | 0.08 | 0.141 | 0.135 | 0.016 | 0.209 | 0.501 |
| BC | 35-55 | 4.3 | 1.3 | 0.1 | 0.06 | 0.07 | 0.354 | 0.258 | 0.017 | 0.128 | 0.757 |
| Cgj | 55-100 | 4.6 | 1.7 | 0.1 | 0.07 | 0.04 | 0.490 | 0.350 | 0.013 | 0.000 | 0.843 |

| Horizon | Particle size distribution (%) | | | | | | | | Bulk density ($Mg/m^3$) | Ksat (cm/h) | Moisture retention (-kPa) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VCS | CS | MS | FS | VFS | Total sand | Silt | Clay | | | 10 | 33 | 300 | 1500 |
| Ap | 6.2 | 3.8 | 2.4 | 4.0 | 4.0 | 20.4 | 41.5 | 38.1 | 1.1 | 3.7 | --- | --- | --- | --- |
| Aegj | 5.1 | 4.3 | 2.1 | 2.6 | 1.5 | 15.6 | 45.5 | 38.9 | --- | --- | --- | --- | --- | --- |
| Btg | 0.0 | 0.0 | 0.3 | 0.7 | 4.6 | 5.6 | 52.2 | 42.2 | 1.5 | 1.3 | --- | --- | --- | --- |
| BC | 0.0 | 0.9 | 1.4 | 1.6 | 3.3 | 7.2 | 51.2 | 41.6 | 1.6 | 0.05 | --- | --- | --- | --- |
| Cgj | 2.1 | 2.2 | 1.2 | 2.5 | 5.1 | 13.1 | 58.5 | 28.4 | 1.9 | 0.0 | --- | --- | --- | --- |

**Table 1-3. Site 3**

Location: UTM 20T NF 1974 4763
Established: 01/06/79
Site name: Alma Station
Soil name: Pugwash (Pg5)
Drainage: Poor
Land use: Black spruce forest
Slope: 3.0%
Climatic station: Hopewell, Lorne Station
Soil Classification (1987): Gleyed Dystric Brunisol

Profile description

| Horizon | Depth (cm) | Color (moist) | Texture | Structure | | | Consistence | Mottles (Fe) |
|---|---|---|---|---|---|---|---|---|
| | | | | Grade | Size | Kind | | |
| LFH | 13-0 | poorly decomposed forest litter | | | | | | |
| Aegj | 0-23 | light brownish gray (10YR 6/2) | loam | weak | medium to coarse | platy | friable | common coarse distinct |
| Bmgj | 23-32 | strong brown (7.5YR 5/6) | silt loam | weak | fine to medium | subangular blocky | friable | common coarse distinct |
| C | 32-78 | dark reddish brown (5YR 3/4) | loam | weak | coarse | platy | firm | none |
| Cgj | 78-100 | dark reddish brown (5YR 3/4) | sandy loam | | | massive | firm | common medium distinct |

Analyses

| Horizon | Depth (cm) | pH ($CaCl_2$) | C % | N % | Pyrophosphate | | Exchangeable cations (cmol/kg soil) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | % Fe | % Al | Ca | Mg | K | Al | CEC |
| LFH | 13-0 | 3.7 | 21.12 | 0.48 | 0.36 | 0.13 | 0.338 | 0.178 | 0.182 | 0.339 | 1.037 |
| Aegj | 0-23 | 3.6 | 0.48 | 0.03 | 0.01 | 0.04 | 0.017 | 0.010 | 0.007 | 0.414 | 0.448 |
| Bmgj | 23-32 | 4.0 | 0.35 | 0.03 | 0.20 | 0.09 | 0.048 | 0.033 | 0.008 | 0.225 | 0.314 |
| C | 32-78 | 4.0 | 0.10 | 0.02 | 0.03 | 0.04 | 0.042 | 0.024 | 0.006 | 0.078 | 0.150 |
| Cgj | 78-100 | 4.9 | 0.10 | 0.01 | 0.01 | 0.01 | 0.344 | 0.075 | 0.008 | Tr * | 0.427 |

| Horizon | Particle size distribution (%) | | | | | | | | Bulk density ($Mg/m^3$) | Ksat (cm/h) | Moisture retention (-kPa) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VCS | CS | MS | FS | VFS | Total sand | Silt | Clay | | | 10 | 33 | 300 | 1500 |
| LFH | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Aegj | 1.1 | 1.4 | 2.2 | 15.4 | 27.1 | 47.2 | 44.2 | 8.6 | 1.5 | 0.48 | --- | --- | --- | --- |
| Bmgj | 1.5 | 1.4 | 2.2 | 13.0 | 24.3 | 42.4 | 43.3 | 14.3 | 1.6 | 0.11 | --- | --- | --- | --- |
| C | 4.7 | 4.5 | 3.0 | 15.7 | 23.4 | 51.3 | 35.4 | 13.3 | 1.8 | 0.71 | --- | --- | --- | --- |
| Cgj | 8.9 | 4.5 | 3.6 | 18.1 | 18.7 | 53.8 | 30.6 | 15.6 | --- | --- | --- | --- | --- | --- |

* Trace

**Table 1-4. Site 4**

Location: UTM 20T NF 1770 5085
Established: 01/06/79
Site name: Sylvester
Soil name: Millbrook (Mi3)
Drainage: Imperfect
Land use: Spruce-fir forest
Slope: 4.0%
Climatic station: Hopewell, Lorne Station
Soil Classification (1987): Gleyed Brunisolic Gray Luvisol

Profile description

| Horizon | Depth (cm) | Color (moist) | Texture | Structure | | | Consistence | Mottles (Fe) |
|---|---|---|---|---|---|---|---|---|
| | | | | Grade | Size | Kind | | |
| LFH | 6-0 | poorly decomposed forest litter | | | | | | |
| Ahe | 0-4 | reddish brown (5YR 5/3) | silt loam | moderate | medium | granular | very friable | none |
| Bmgj | 4-22 | reddish brown (5YR 4/4) | gravelly silt loam | moderate | medium | subangular blocky | friable | few fine faint |
| Btgj1 | 22-35 | reddish brown (5YR 4/4) | gravelly silt loam | strong | medium | subangular blocky | friable | common fine faint |
| Btgj2 | 35-65 | dark reddish brown (5YR 3/4) | gravelly silty clay loam | strong | medium | subangular blocky | very firm | common fine faint |
| Cgj | 65-100 | reddish brown (5YR 3/4) | gravelly clay loam | strong | medium | subangular blocky | very firm | common fine faint |

Analyses

| Horizon | Depth (cm) | pH ($CaCl_2$) | C % | N % | Pyrophosphate | | Exchangeable cations (cmol/kg soil) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | % Fe | % Al | Ca | Mg | K | Al | CEC |
| LFH | 6-0 | 4.3 | 31.5 | --- | 0.32 | 0.19 | 0.898 | 0.370 | 0.097 | 0.179 | 1.544 |
| Ahe | 0-4 | 4.1 | 4.4 | --- | 0.43 | 0.24 | 0.329 | 0.094 | 0.024 | 0.250 | 0.697 |
| Bmgj | 4-22 | 4.2 | 3.3 | --- | 0.31 | 0.22 | 0.020 | 0.015 | 0.008 | 0.209 | 0.252 |
| Btgj1 | 22-35 | 4.3 | 2.1 | --- | 0.09 | 0.11 | 0.178 | 0.064 | 0.011 | 0.186 | 0.439 |
| Btgj2 | 35-65 | 4.8 | 1.8 | --- | 0.04 | 0.05 | 0.456 | 0.142 | 0.012 | 0.002 | 0.612 |
| Cgj | 65-100 | 6.0 | 1.9 | --- | 0.02 | 0.04 | 0.819 | 0.097 | 0.011 | Tr | 0.927 |

| Horizon | Particle size distribution (%) | | | | | | | | Bulk density ($Mg/m^3$) | Ksat (cm/h) | Moisture retention (-kPa) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VCS | CS | MS | FS | VFS | Total sand | Silt | Clay | | | 10 | 33 | 300 | 1500 |
| LFH | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Ahe | 0.7 | 1.1 | 1.9 | 9.3 | 12.2 | 25.2 | 56.4 | 18.4 | --- | --- | --- | --- | --- | --- |
| Bmgj | 3.2 | 3.2 | 3.2 | 10.0 | 13.4 | 33.0 | 51.7 | 15.3 | 1.6 | 0.23 | --- | --- | --- | --- |
| Btgj1 | 3.4 | 3.0 | 2.3 | 5.5 | 7.9 | 22.1 | 52.0 | 25.9 | 1.7 | --- | --- | --- | --- | --- |
| Btgj2 | 2.5 | 2.5 | 2.1 | 4.8 | 7.5 | 19.4 | 50.3 | 30.3 | 1.8 | 0.41 | --- | --- | --- | --- |
| Cgj | 3.9 | 3.3 | 2.8 | 5.0 | 7.1 | 22.1 | 44.6 | 33.3 | 1.8 | 1.04 | --- | --- | --- | --- |

**Table 1-5. Site 5**

Location: UTM 20T NF 1310 4674
Established: 01/06/79
Site name: West River
Soil name: Pugwash (Pg1)
Drainage: Moderately well
Land use: Productive woodland
Slope: 4.0%
Climatic station: Hopewell, Lorne Station
Soil Classification (1987): Eluviated Dystric Brunisol

Profile description

| Horizon | Depth (cm) | Color (moist) | Texture | Structure | | | Consistence | Mottles (Fe) |
|---|---|---|---|---|---|---|---|---|
| | | | | Grade | Size | Kind | | |
| LFH | 6-0 | poorly decomposed forest litter | | | | | | |
| Ae | 0-5 | pinkish gray (5YR 6/2) | sandy loam | weak | very fine | granular | very friable | none |
| Bm | 5-47 | yellowish red (5YR 4/6) | sandy loam | weak | medium | subangular blocky | very friable | none |
| BC | 47-59 | reddish brown 5YR 4/4) | gravelly sandy loam | moderate | medium | platy | friable | none |
| Cgj | 59-100 | dark reddish brown (5YR 3/4) | sandy loam | very weak | coarse | platy | very firm | few fine faint |

Analyses

| Horizon | Depth (cm) | pH ($CaCl_2$) | C % | N % | Pyrophosphate | | Exchangeable cations (cmol/kg soil) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | % Fe | % Al | Ca | Mg | K | Al | CEC |
| LFH | 6-0 | 3.0 | 26.36 | 0.88 | 0.23 | 0.13 | 0.507 | 0.296 | 0.115 | --- | 0.918 |
| Ae | 0-5 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Bm | 5-47 | 4.5 | 0.88 | 0.06 | 0.29 | 0.24 | 0.013 | 0.004 | 0.007 | 0.115 | 0.139 |
| BC | 47-59 | 4.3 | 0.19 | 0.02 | 0.05 | 0.05 | 0.013 | 0.019 | 0.003 | 0.040 | 0.075 |
| Cgj | 59-100 | 4.6 | 0.08 | 0.0 | --- | --- | 0.009 | 0.005 | 0.003 | 0.003 | 0.020 |

| Horizon | Particle size distribution (%) | | | | | | | | Bulk density ($Mg/m^3$) | Ksat (cm/h) | Moisture retention (-kPa) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VCS | CS | MS | FS | VFS | Total sand | Silt | Clay | | | 10 | 33 | 300 | 1500 |
| LFH | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Ae | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Bm | 2.9 | 3.0 | 3.6 | 23.8 | 22.9 | 56.2 | 27.3 | 16.5 | 1.1 | 6.35 | --- | --- | --- | --- |
| BC | 3.0 | 3.1 | 3.9 | 26.2 | 26.3 | 62.5 | 25.6 | 11.9 | 1.8 | 0.05 | --- | --- | --- | --- |
| Cgj | 1.9 | 2.1 | 9.6 | 23.4 | 25.8 | 62.8 | 20.0 | 17.2 | 1.8 | 0.19 | --- | --- | --- | --- |

**Table 1-6. Site 6**

Location: UTM 20T NF 1305 4672
Established: 01/06/79
Site name: West River
Soil name: Pugwash (Pg5)
Drainage: Poor
Land use: Productive woodland
Slope: 7.0%
Climatic station: Hopewell, Lorne Station
Soil Classification (1987): Gleyed Sombric Brunisol

Profile description

| Horizon | Depth (cm) | Color (moist) | Texture | Structure | | | Consistence | Mottles (Fe) |
|---|---|---|---|---|---|---|---|---|
| | | | | Grade | Size | Kind | | |
| LFH | 8-0 | poorly decomposed forest litter | | | | | | |
| Ahej | 0-16 | dark reddish brown (5YR 3/4) | loam | weak | medium | subangular blocky | very friable | none |
| Bmgj | 16-38 | yellowish red (5YR 4/6) | sandy loam | weak | coarse | subangular blocky | very friable | few coarse faint |
| BC | 38-85 | dark reddish brown (5YR 3/4) | sandy loam | weak | coarse | platy | firm | common coarse faint |
| Cgj | 85-100 | dark reddish brown (5YR 3/4) | sandy loam | weak | coarse | subangular blocky | friable | few coarse faint |

Analyses

| Horizon | Depth (cm) | pH ($CaCl_2$) | C % | N % | Pyrophosphate | | Exchangeable cations (cmol/kg soil) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | % Fe | % Al | Ca | Mg | K | Al | CEC |
| LFH | 8-0 | 3.6 | 19.20 | 0.96 | 0.48 | 0.17 | 0.058 | 0.023 | 0.010 | 0.056 | 0.147 |
| Ahej | 0-16 | 3.9 | 2.04 | 0.10 | 0.35 | 0.13 | 0.053 | 0.038 | 0.009 | 0.034 | 0.434 |
| Bmgj | 16-38 | 4.2 | 0.54 | 0.04 | 0.17 | 0.10 | 0.029 | 0.007 | 0.004 | 0.103 | 0.143 |
| BC | 38-85 | 5.3 | 0.13 | 0.02 | 0.02 | 0.01 | 0.294 | 0.053 | 0.008 | --- | 0.355 |
| Cgj | 85-100 | 5.2 | 0.10 | 0.01 | 0.01 | 0.01 | 0.203 | 0.016 | 0.007 | --- | 0.226 |

| Horizon | Particle size distribution (%) | | | | | | | | Bulk density ($Mg/m^3$) | Ksat (cm/h) | Moisture retention (-kPa) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VCS | CS | MS | FS | VFS | Total sand | Silt | Clay | | | 10 | 33 | 300 | 1500 |
| LFH | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Ahej | 1.5 | 1.7 | 3.2 | 22.5 | 22.2 | 51.1 | 33.2 | 15.7 | 1.4 | 0.67 | --- | --- | --- | --- |
| Bmgj | 0.9 | 1.0 | 2.5 | 29.3 | 24.9 | 58.6 | 31.3 | 10.1 | 1.6 | 0.89 | --- | --- | --- | --- |
| BC | 1.5 | 1.6 | 3.7 | 29.9 | 25.3 | 62.0 | 23.4 | 14.6 | 1.8 | 0.03 | --- | --- | --- | --- |
| Cgj | 3.7 | 2.9 | 5.0 | 31.5 | 24.7 | 67.8 | 21.8 | 10.4 | 2.0 | 0.03 | --- | --- | --- | --- |

**Table 1-7. Site 14**

Location: UTM 20T MF 5580 6796
Established: 11/06/82
Site name: Middleboro
Soil name: Debert (De)
Drainage: Imperfect
Land use: Productive woodland
Slope: 4.0%
Climatic station: Pugwash
Soil Classification (1987): Gleyed Dystric Brunisol

Profile description

| Horizon | Depth (cm) | Color (moist) | Texture | Structure | | | Consistence | Mottles (Fe) |
|---|---|---|---|---|---|---|---|---|
| | | | | Grade | Size | Kind | | |
| LFH | 4-0 | poorly decomposed forest litter | | | | | | |
| Ah | 0-2 | --- | --- | --- | --- | --- | --- | --- |
| Bmgj1 | 2-29 | reddish brown (5YR 4/3) | sandy loam | weak | coarse | subangular blocky | friable | few medium faint |
| Bmgj2 | 29-46 | reddish brown (5YR 4/3) | sandy loam | weak | coarse | subangular blocky | friable | few medium distinct |
| BC | 47-70 | reddish brown (5YR 4/4) | sandy loam | very weak | coarse | platy | friable | common medium distinct |
| C | 70-100 | dark reddish brown (5YR 3/4) | sandy loam | very weak | coarse | platy | friable | none |

Analyses

| Horizon | Depth (cm) | pH ($CaCl_2$) | C % | N % | Pyrophosphate | | Exchangeable cations (cmol/kg soil) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | % Fe | % Al | Ca | Mg | K | Al | CEC |
| LFH | 4-0 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Ah | 0-2 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Bmgj1 | 2-29 | 4.01 | 1.32 | --- | 0.21 | 0.12 | 0.055 | 0.012 | 0.007 | 0.244 | 0.318 |
| Bmgj2 | 29-46 | 4.10 | 0.29 | --- | 0.11 | 0.11 | 0.044 | 0.007 | 0.005 | 0.111 | 0.167 |
| BC | 46-70 | 3.95 | 0.24 | --- | 0.06 | 0.06 | 0.058 | 0.017 | 0.005 | 0.170 | 0.250 |
| C | 70-100 | 4.36 | 0.11 | --- | 0.06 | 0.06 | 0.287 | 0.122 | 0.007 | --- | 0.416 |

| Horizon | Particle size distribution (%) | | | | | | | | Bulk density ($Mg/m^3$) | Ksat (cm/h) | Moisture retention (-kPa) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VC | CS | MS | FS | VFS | Total sand | Silt | Clay | | | 10 | 33 | 300 | 1500 |
| LFH | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Ah | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Bmgj1 | 4.0 | 4.6 | 7.5 | 21.1 | 15.6 | 52.8 | 34.8 | 12.4 | --- | --- | --- | --- | --- | --- |
| Bmgj2 | 5.3 | 6.0 | 9.7 | 22.0 | 13.8 | 56.8 | 32.1 | 11.1 | --- | --- | --- | --- | --- | --- |
| BC | 4.3 | 5.7 | 9.7 | 20.4 | 13.2 | 53.4 | 35.3 | 11.3 | --- | --- | --- | --- | --- | --- |
| C | 2.8 | 6.9 | 10.6 | 18.9 | 11.6 | 50.9 | 34.1 | 15.1 | --- | --- | --- | --- | --- | --- |

**Table 1-8.** Site 15

Location: UTM 20T MF 5574 6809
Established: 11/06/82
Site name: Middleboro
Soil name: Masstown (Ma)
Soil Classification (1987): Orthic Humic Gleysol

Drainage: Poor
Land use: Productive woodland
Slope: 3.0%
Climatic station: Pugwash

Profile description

| Horizon | Depth (cm) | Color (moist) | Texture | Structure | | | Consistence | Mottles (Fe) |
|---|---|---|---|---|---|---|---|---|
| | | | | Grade | Size | Kind | | |
| LFH | 2-0 | poorly decomposed forest litter | | | | | | |
| Ah | 0-19 | | sandy clay loam | weak | medium | subangular | friable | none blocky |
| Bg | 19-40 | | sandy loam | weak | coarse | subangular blocky | friable | common medium prominent |
| BC | 40-63 | | sandy loam | moderate | coarse | platy | firm | many medium distinct |
| Cg1 | 63-73 | | loamy sand | | | single grained | loose | common coarse prominent |
| C | 73-100 | | loam | moderate | coarse | platy | firm | none |

Analyses

| Horizon | Depth (cm) | pH ($CaCl_2$) | C % | N % | Pyrophosphate | | Exchangeable cations (cmol/kg soil) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | % Fe | % Al | Ca | Mg | K | Al | CEC |
| LFH | 2-0 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Ah | 0-19 | 4.52 | 6.22 | --- | 0.52 | 0.34 | 0.870 | 0.085 | 0.022 | --- | 0.977 |
| Bg | 19-40 | 4.82 | 0.42 | --- | 0.14 | 0.12 | 0.196 | 0.016 | 0.004 | --- | 0.216 |
| BC | 40-63 | 4.92 | 0.21 | --- | 0.09 | 0.05 | 0.227 | 0.002 | 0.005 | --- | 0.234 |
| Cg1 | 63-73 | 4.77 | 0.17 | --- | 0.04 | 0.01 | 0.185 | 0.021 | 0.004 | --- | 0.210 |
| C | 73-100 | 5.31 | 0.11 | --- | 0.03 | 0.01 | 0.417 | 0.005 | 0.009 | --- | 0.476 |

| Horizon | Particle size distribution (%) | | | | | | | | Bulk density ($Mg/m^3$) | Ksat (cm/h) | Moisture retention (-kPa) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VCS | CS | MS | FS | VFS | Total sand | Silt | Clay | | | 10 | 33 | 300 | 1500 |
| LFH | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Ah | 1.6 | 1.9 | 5.7 | 35.7 | 10.1 | 54.9 | 23.6 | 21.5 | --- | --- | --- | --- | --- | --- |
| Bg | 2.4 | 3.6 | 9.7 | 40.2 | 13.9 | 69.9 | 21.4 | 8.8 | --- | --- | --- | --- | --- | --- |
| BC | 2.6 | 4.1 | 8.5 | 36.1 | 13.6 | 64.9 | 27.6 | 7.5 | --- | --- | --- | --- | --- | --- |
| Cg1 | 1.1 | 2.1 | 8.7 | 57.8 | 10.9 | 80.7 | 13.6 | 5.7 | --- | --- | --- | --- | --- | --- |
| C | 2.0 | 2.1 | 4.5 | 24.1 | 11.5 | 44.0 | 41.8 | 14.2 | --- | --- | --- | --- | --- | --- |

**Table 1-9. Site 17**

Location: UTM 20T MF 0426 6766
Established: 20/05/82
Site name: Experimental Farm 1
Soil name: Kingsville (Kv)
Soil Classification (1987): Orthic Gleysol

Drainage: Poor
Land use: Cropland
Slope: 7.5%
Climatic station: Nappan

Profile description

| Horizon | Depth (cm) | Color (moist) | Texture | Structure | | | Consistence | Mottles (Fe) |
|---|---|---|---|---|---|---|---|---|
| | | | | Grade | Size | Kind | | |
| Apg | 0-30 | dark reddish brown (5YR 3/2) | loam | moderate | medium | subangular blocky | friable | common fine prominent |
| Bgj1 | 30-48 | reddish brown (5YR 4/3) | loam | weak | medium | subangular blocky | friable | common medium faint |
| Bgj2 | 48-57 | dark reddish brown (5YR 3/4) | loam | moderate | medium | subangular blocky | firm | few fine faint |
| C | 57-100 | dark red (2.5YR 3/6) | loam | | | massive | firm | none |

Analyses

| Horizon | Depth (cm) | pH ($CaCl_2$) | C % | N % | Pyrophosphate | | Exchangeable cations (cmol/kg soil) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | % Fe | % Al | Ca | Mg | K | Al | CEC |
| Apg | 0-30 | 4.8 | 1.86 | --- | 0.3 | 0.1 | 0.55 | 0.18 | 0.04 | --- | 0.770 |
| Bgj1 | 30-48 | 4.4 | 0.31 | --- | 0.1 | 0.1 | 0.22 | 0.14 | 0.02 | 0.063 | 0.443 |
| Bgj2 | 48-57 | 4.2 | 0.12 | --- | 0.1 | 0.1 | 0.21 | 0.11 | 0.01 | 0.189 | 0.524 |
| C | 57-100 | 4.4 | 0.10 | --- | 0.1 | 0.0 | 0.62 | 0.16 | 0.01 | 0.030 | 0.818 |

| Horizon | Particle size distribution (%) | | | | | | | | Bulk density ($Mg/m^3$) | Ksat (cm/h) | Moisture retention (-kPa) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VCS | CS | MS | FS | VFS | Total sand | Silt | Clay | | | 10 | 33 | 300 | 1500 |
| Apg | 6.5 | 5.9 | 8.5 | 15.4 | 12.4 | 48.7 | 34.1 | 17.2 | --- | --- | --- | --- | --- | --- |
| Bgj1 | 2.0 | 3.7 | 7.9 | 16.5 | 12.9 | 43.0 | 38.4 | 18.6 | --- | --- | --- | --- | --- | --- |
| Bgj2 | 0.6 | 2.6 | 7.0 | 14.8 | 13.1 | 38.1 | 45.2 | 16.7 | --- | --- | --- | --- | --- | --- |
| C | 1.1 | 2.4 | 6.4 | 14.5 | 10.5 | 35.0 | 40.1 | 25.0 | --- | --- | --- | --- | --- | --- |

**Table 1-10. Site 18**

Location: UTM 20T MF 0447 6748
Established: 20/05/82
Site name: Experimental Farm 2
Soil name: Queens (Qu)
Drainage: Imperfect
Land use: Cropland
Slope: 6.5%
Climatic station: Nappan
Soil Classification (1987): Humic Luvic Gleysol

Profile description

| Horizon | Depth (cm) | Color (moist) | Texture | Structure | | | Consistence | Mottles (Fe) |
|---|---|---|---|---|---|---|---|---|
| | | | | Grade | Size | Kind | | |
| Apgj | 0-20 | brown (7.5YR 4/4) | loam | moderate | coarse | subangular blocky | friable | many coarse faint |
| Bg | 20-33 | reddish brown (5YR 4/4) | loam | moderate | coarse | subangular blocky | firm | common coarse distinct |
| Btgj | 33-46 | reddish brown (5YR 4/4) | clay loam | strong | coarse | subangular blocky | firm | few fine faint |
| BC | 46-57 | reddish brown (5YR 4/4) | clay loam | strong | coarse | subangular blocky | firm | none |
| C | 57-100 | dark red (2.5YR 3/6) | clay loam | | | massive | firm | none |

Analyses

| Horizon | Depth (cm) | pH ($CaCl_2$) | C % | N % | Pyrophosphate | | Exchangeable cations (cmol/kg soil) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | % Fe | % Al | Ca | Mg | K | Al | CEC |
| Apgj | 0-20 | 5.37 | 2.39 | --- | 0.35 | 0.17 | 0.713 | 0.141 | 0.010 | 0.081 | 0.945 |
| Bg | 20-33 | 5.26 | 0.48 | --- | 0.17 | 0.09 | 0.501 | 0.114 | 0.009 | 0.807 | 1.431 |
| Btgj | 33-46 | 5.40 | 0.15 | --- | 0.04 | 0.03 | 0.709 | 0.164 | 0.011 | 0.484 | 1.368 |
| BC | 46-57 | 5.39 | 0.15 | --- | 0.02 | 0.02 | 0.793 | 0.174 | 0.010 | 0.289 | 1.266 |
| C | 57-100 | 5.64 | 0.10 | --- | 0.02 | 0.02 | 0.802 | 0.175 | 0.010 | 0.019 | 1.006 |

| Horizon | Particle size distribution (%) | | | | | | | | Bulk density ($Mg/m^3$) | Ksat (cm/h) | Moisture retention (-kPa) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VCS | CS | MS | FS | VFS | Total sand | Silt | Clay | | | 10 | 33 | 300 | 1500 |
| Apgj | 2.0 | 3.8 | 7.9 | 16.4 | 12.2 | 42.4 | 36.5 | 21.1 | --- | --- | --- | --- | --- | --- |
| Bg | 1.0 | 3.4 | 8.0 | 16.1 | 13.1 | 41.6 | 37.1 | 21.3 | --- | --- | --- | --- | --- | --- |
| Btgj | 0.9 | 2.4 | 5.4 | 12.2 | 10.3 | 31.3 | 40.0 | 28.7 | --- | --- | --- | --- | --- | --- |
| BC | 0.6 | 2.4 | 5.6 | 13.3 | 10.8 | 32.6 | 38.6 | 28.8 | --- | --- | --- | --- | --- | --- |
| C | 0.7 | 2.0 | 5.6 | 12.8 | 10.5 | 31.5 | 39.3 | 29.2 | --- | --- | --- | --- | --- | --- |

**Table1-11. Site 19**

Location: UTM 20T MF 0469 6723
Established: 20/05/82
Site name: Experimental Farm 3
Soil name: Falmouth (F)
Drainage: Moderately well
Land use: Productive woodland
Slope: 2.5%
Climatic station: Nappan
Soil Classification (1987): Orthic Humo-Ferric Podzol

Profile description

| Horizon | Depth (cm) | Color (moist) | Texture | Structure | | | Consistence | Mottles (Fe) |
|---|---|---|---|---|---|---|---|---|
| | | | | Grade | Size | Kind | | |
| LFH | 6-0 | poorly decomposed forest litter | | | | | | |
| Ae | 0-18 | brown (7.5YR 4/4) | loam | moderate | medium to coarse | platy | very friable | none |
| Bf1 | 18-32 | reddish brown (5YR 4/4) | loam | moderate | fine | subangular blocky | very friable | none |
| Bf2 | 32-39 | brown (7.5YR 5/4) | silt loam | weak | fine to medium | subangular blocky | friable | none |
| BC | 39-70 | dark brown (7.5YR 3/4) | silt loam | | | massive | firm | none |
| Cgj | 70-100 | dark brown (7.5YR 3/4) | silty clay loam | | | massive | firm | few fine faint |

Analyses

| Horizon | Depth (cm) | pH ($CaCl_2$) | C % | N % | Pyrophosphate | | Exchangeable cations (cmol/kg soil) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | % Fe | % Al | Ca | Mg | K | Al | CEC |
| LFH | 6-0 | 3.81 | 34.3 | --- | 0.08 | 0.08 | 2.400 | 0.375 | 0.219 | --- | 2.994 |
| Ae | 0-18 | 3.36 | 0.67 | --- | 0.05 | 0.06 | 0.025 | 0.009 | 0.007 | 0.477 | 0.581 |
| Bf1 | 18-32 | 3.71 | 2.32 | --- | 1.27 | 0.51 | 0.038 | 0.013 | 0.017 | 0.844 | 0.912 |
| Bf2 | 32-39 | 3.87 | 1.88 | --- | 0.64 | 0.40 | 0.027 | 0.009 | 0.014 | 0.548 | 0.598 |
| BC | 39-70 | 3.84 | 0.31 | --- | 0.07 | 0.12 | 0.066 | 0.142 | 0.017 | 0.777 | 1.002 |
| Cgj | 70-100 | 3.91 | 0.20 | --- | 0.07 | 0.08 | 0.183 | 0.131 | 0.013 | 0.481 | 0.808 |

| Horizon | Particle size distribution (%) | | | | | | | | Bulk density ($Mg/m^3$) | Ksat (cm/h) | Moisture retention (-kPa) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VCS | CS | MS | FS | VFS | Total sand | Silt | Clay | | | 10 | 33 | 300 | 1500 |
| LFH | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Ae | 0.5 | 0.7 | 1.5 | 12.1 | 28.0 | 42.8 | 45.4 | 11.7 | --- | --- | --- | --- | --- | --- |
| Bf1 | 0.6 | 0.9 | 1.1 | 6.4 | 20.0 | 28.9 | 47.9 | 23.1 | --- | --- | --- | --- | --- | --- |
| Bf2 | 1.2 | 1.6 | 1.7 | 6.6 | 15.5 | 26.6 | 51.2 | 22.2 | --- | --- | --- | --- | --- | --- |
| BC | --- | --- | --- | --- | --- | 8.0 | 64.4 | 27.6 | --- | --- | --- | --- | --- | --- |
| Cgj | 0.7 | 1.5 | 1.7 | 3.5 | 6.9 | 14.2 | 53.3 | 32.5 | --- | --- | --- | --- | --- | --- |

**Table 1-12. Site 20**

Location: UTM 20T MF 0467 6713
Established: 20/05/82
Site name: Experimental Farm 4
Soil name: Kingsville (Kv)
Soil Classification (1987): Orthic Gleysol

Drainage: Poor
Land use: Productive woodland
Slope: 4.5%
Climatic station: Nappan

Profile description

| Horizon | Depth (cm) | Color (moist) | Texture | Structure | | | Consistence | Mottles (Fe) |
|---|---|---|---|---|---|---|---|---|
| | | | | Grade | Size | Kind | | |
| LFH | 6-0 | poorly decomposed forest litter | | | | | | |
| Ae | 0-4 | --- | sandy loam | moderate | fine | subangular blocky | very friable | none |
| Bm | 4-16 | dark reddish brown (5YR 3/4) | silty clay loam | moderate | fine to medium | subangular blocky | very friable | none |
| Cg | 16-26 | reddish brown (5YR 3/4) | silty clay loam | very weak | coarse | subangular blocky | firm | many coarse distinct |
| Cgj | 26-100 | reddish brown (5YR 3/4) | silt loam | very weak | coarse | subangular blocky | firm | few coarse distinct |

Analyses

| Horizon | Depth (cm) | pH ($CaCl_2$) | C % | N % | Pyrophosphate | | Exchangeable cations (cmol/kg soil) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | % Fe | % Al | Ca | Mg | K | Al | CEC |
| LFH | 6-0 | 3.6 | 29.20 | --- | 0.26 | 0.51 | 0.570 | 0.138 | 0.123 | 1.032 | 1.863 |
| Ae | 0-4 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Bm | 4-16 | 3.7 | 1.26 | --- | 0.47 | 0.22 | 0.034 | 0.015 | 0.017 | 0.734 | 0.800 |
| Cg | 16-26 | 3.7 | 0.68 | --- | 0.13 | 0.11 | 0.063 | 0.030 | 0.014 | 0.634 | 0.741 |
| Cgj | 26-100 | 4.1 | 0.28 | --- | 0.05 | 0.07 | 0.123 | 0.208 | 0.019 | 0.467 | 0.817 |

| Horizon | Particle size distribution (%) | | | | | | | | Bulk density ($Mg/m^3$) | Ksat (cm/h) | Moisture retention (-kPa) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VCS | CS | MS | FS | VFS | Total sand | Silt | Clay | | | 10 | 33 | 300 | 1500 |
| LFH | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Ae | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Bm | 0.1 | 2.9 | 2.6 | 4.5 | 5.1 | 16.2 | 45.3 | 38.5 | --- | --- | --- | --- | --- | --- |
| Cg | 0.8 | 0.8 | 1.0 | 2.7 | 6.8 | 12.1 | 54.2 | 33.7 | --- | --- | --- | --- | --- | --- |
| Cgj | 0.4 | 0.4 | 0.2 | 2.3 | 21.5 | 24.9 | 52.4 | 22.6 | --- | --- | --- | --- | --- | --- |

**Table 1-13. Site 21**

| | | | |
|---|---|---|---|
| Location: | UTM 20T MF 0460 6706 | Drainage: | Poor |
| Established: | 20/05/82 | Land use: | Productive woodland |
| Site name: | Experimental Farm 5 | Slope: | 5% |
| Soil name: | Kingsville (Kv) | Climatic station: | Nappan |

Soil Classification (1987): Orthic Humic Gleysol (estimated)

Profile description

| Horizon | Depth (cm) | Color (moist) | Texture | Structure | | | Consistence | Mottles (Fe) |
|---|---|---|---|---|---|---|---|---|
| | | | | Grade | Size | Kind | | |
| No description available | | | | | | | | |

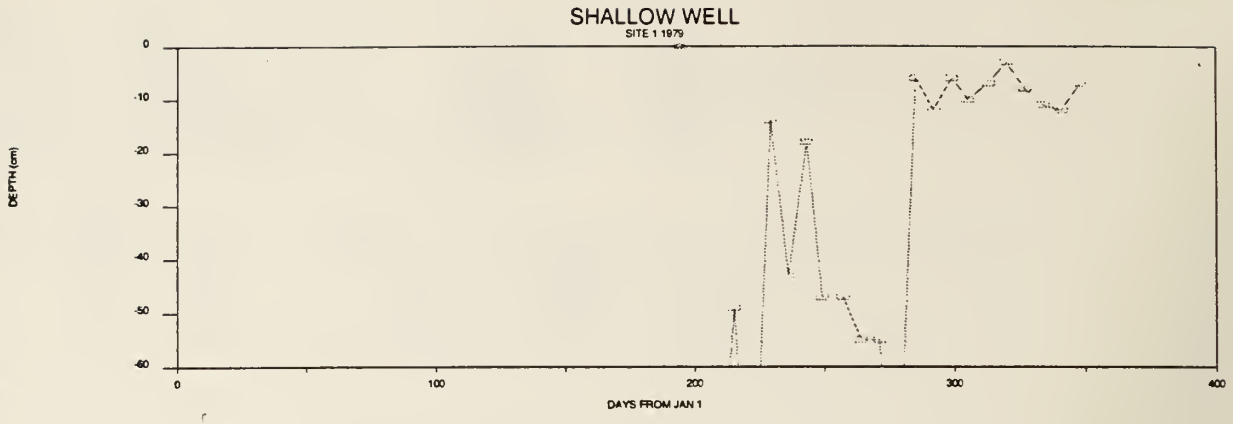
Analyses

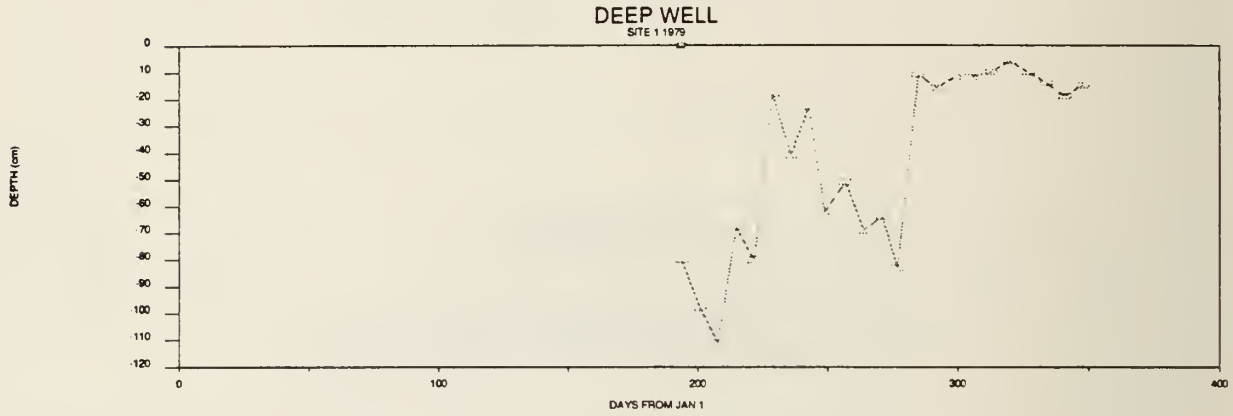
| Horizon | Depth (cm) | pH ($CaCl_2$) | C % | N % | Pyrophosphate | | Exchangeable cations (cmol/kg soil) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | % Fe | % Al | Ca | Mg | K | Al | CEC |
| No data available | | | | | | | | | | | |

| Horizon | Particle size distribution (%) | | | | | | | | Bulk density ($Mg/m^3$) | Ksat (cm/h) | Moisture retention (-kPa) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VCS | CS | MS | FS | VFS | Total sand | Silt | Clay | | | 10 | 33 | 300 | 1500 |
| No data available | | | | | | | | | | | | | | |

# APPENDIX 2

## Annual Water Table Plots for Pictou and Cumberland County Sites


SHALLOW WELL
SITE 1 1979
DEPTH (cm)
0
-10
-20
-30
-40
-50
-60
0
100
200
300
400
DAYS FROM JAN 1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SITE 1 1979
DEPTH (cm)
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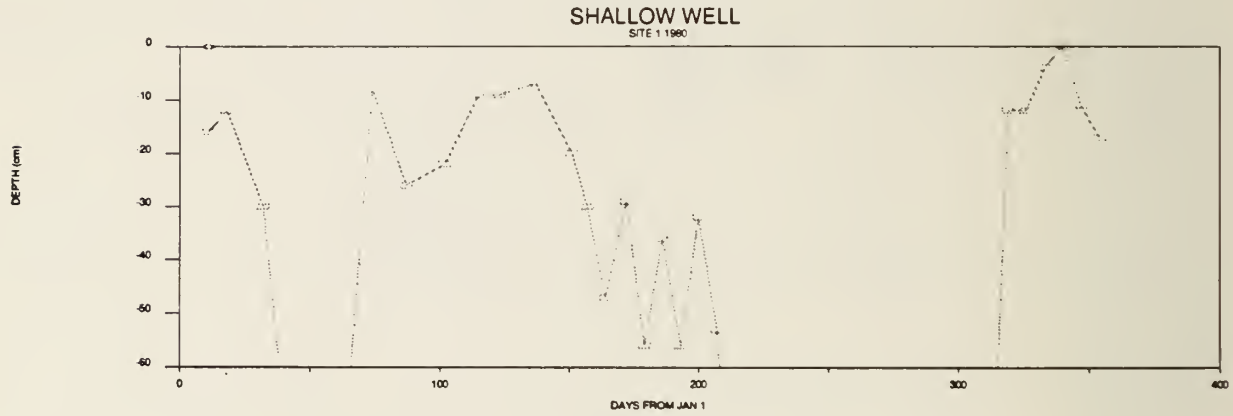
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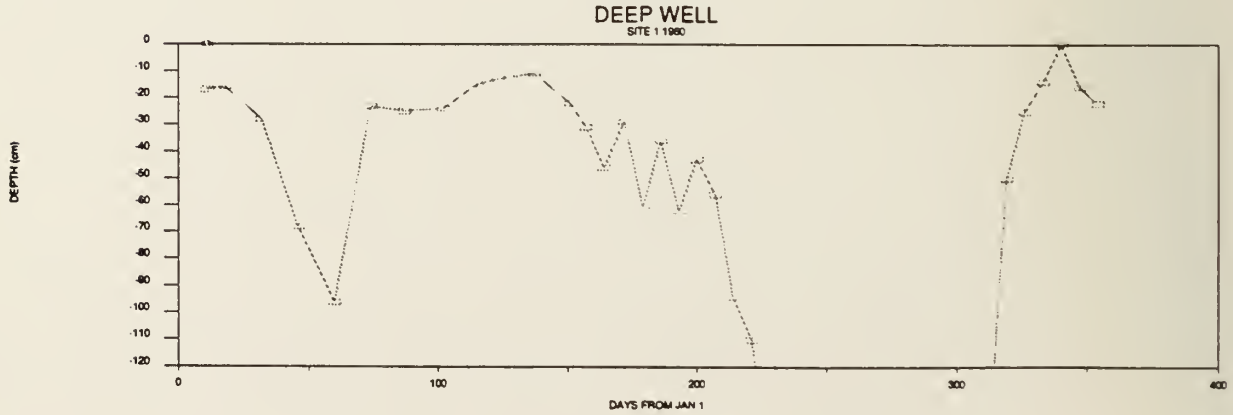
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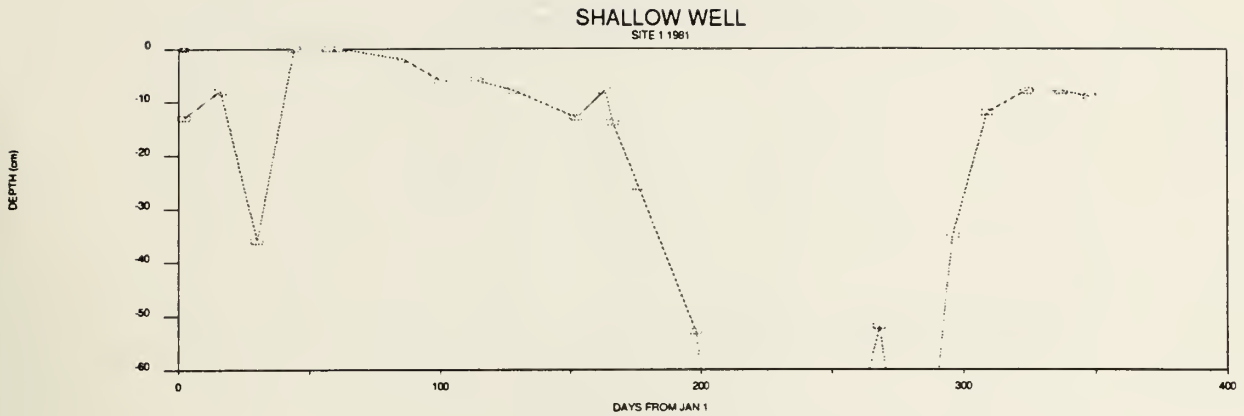
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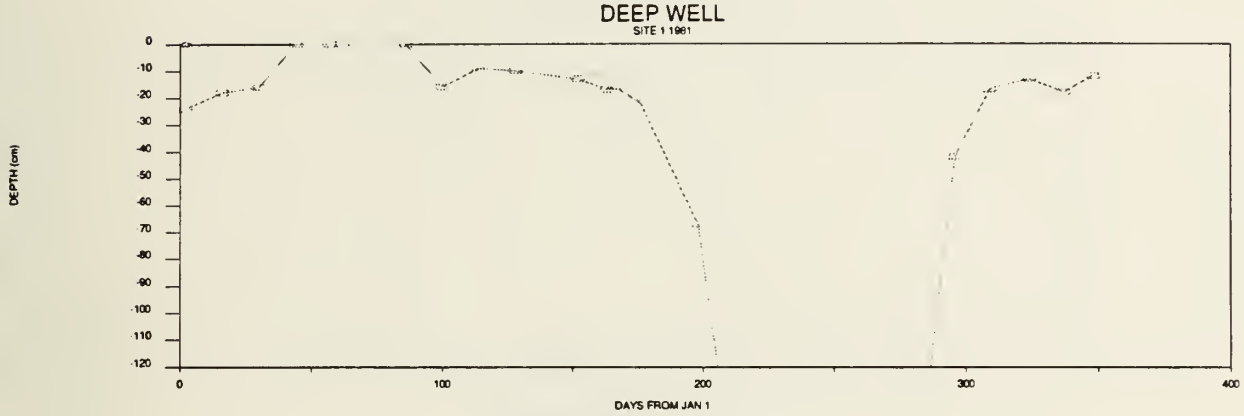
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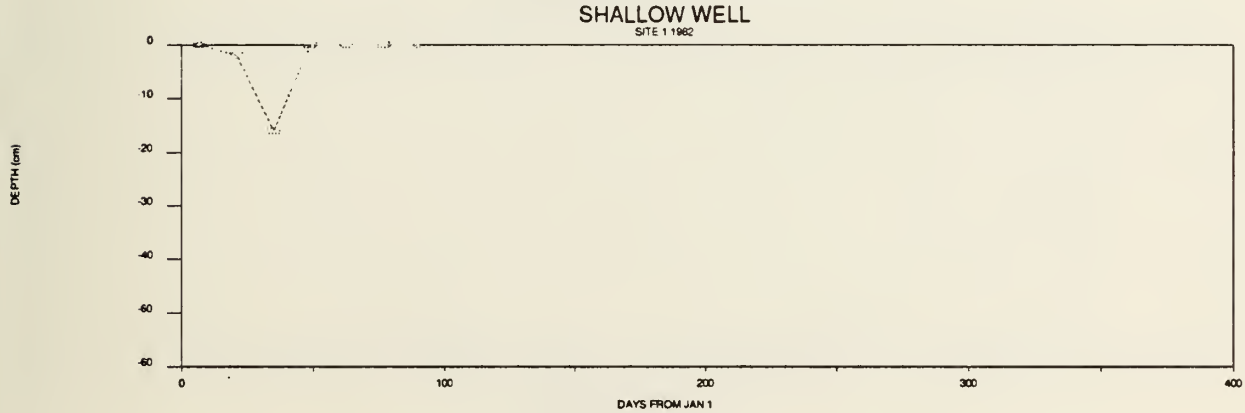
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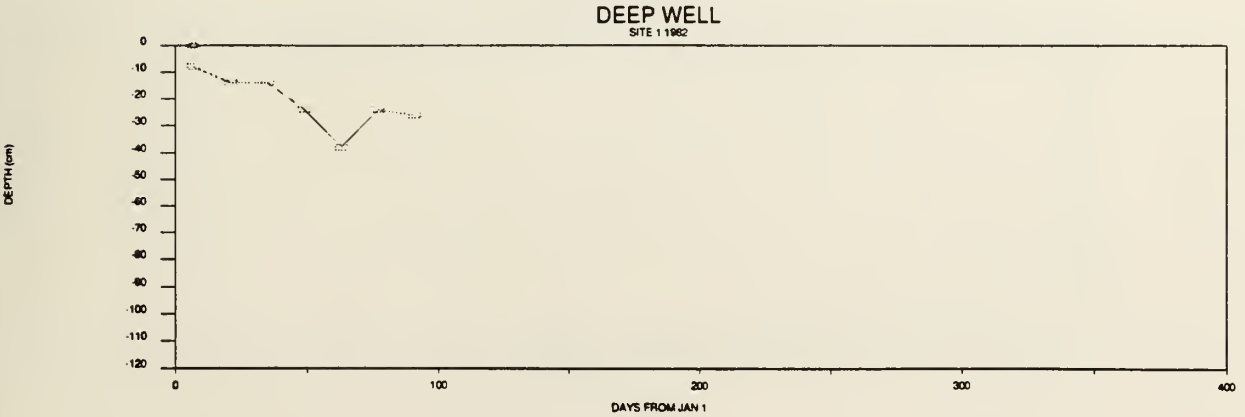
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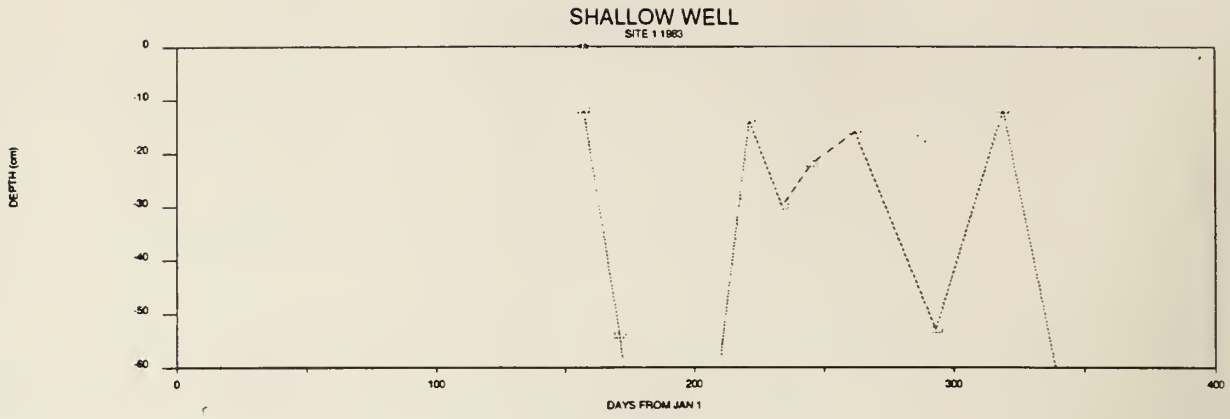
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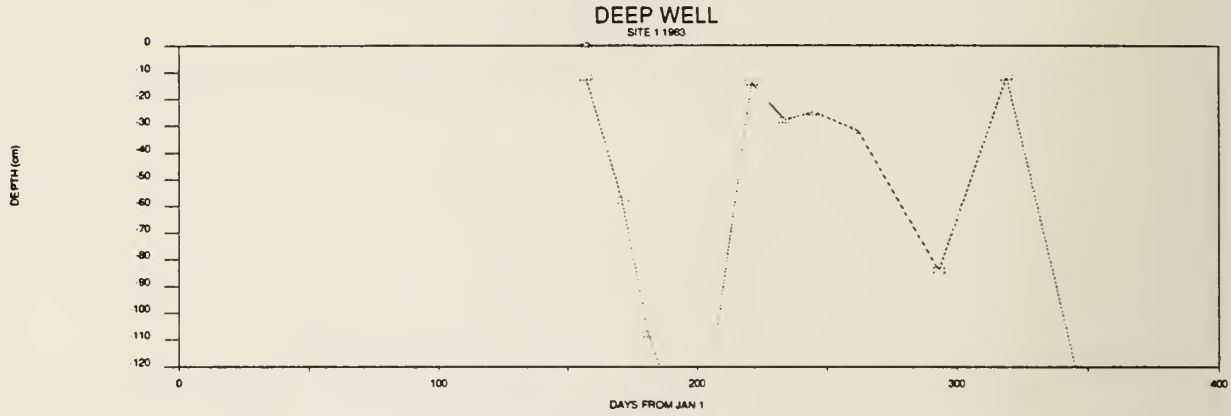
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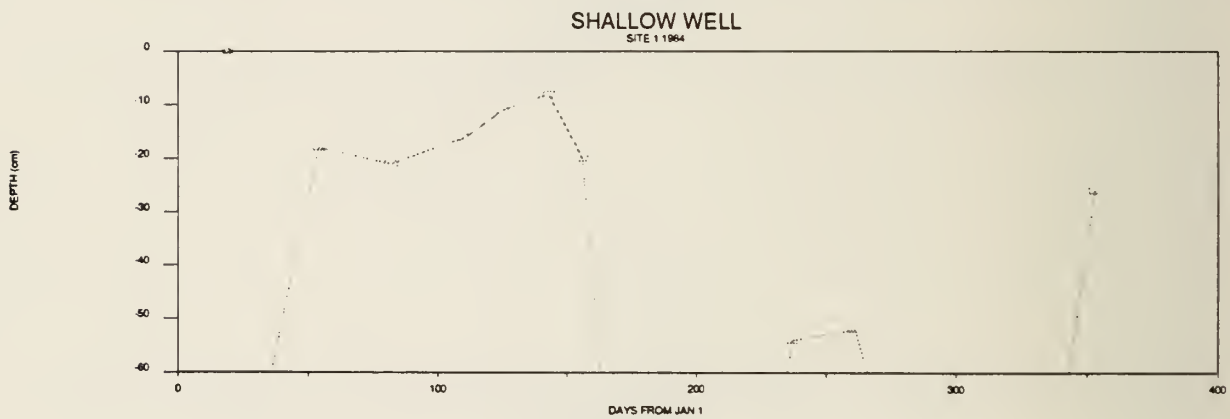
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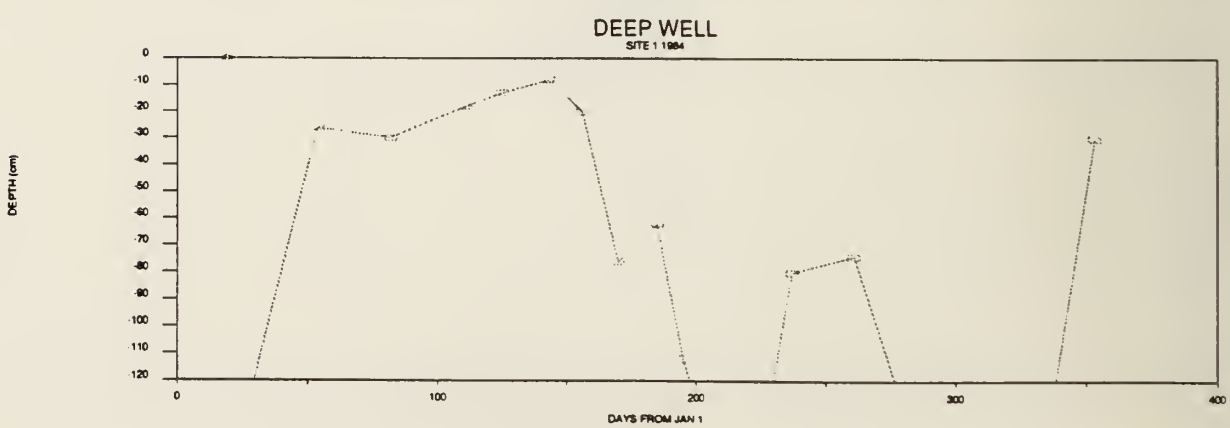
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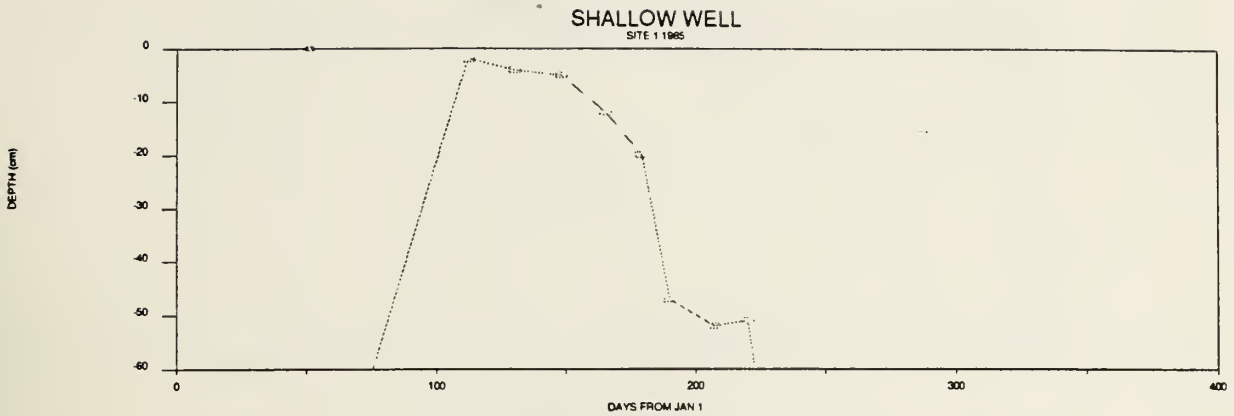
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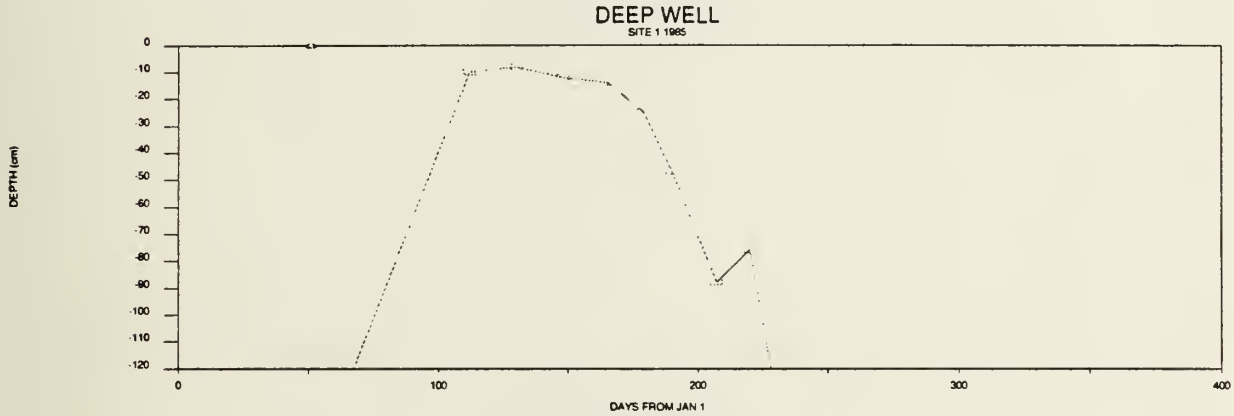
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DEPTH (cm)
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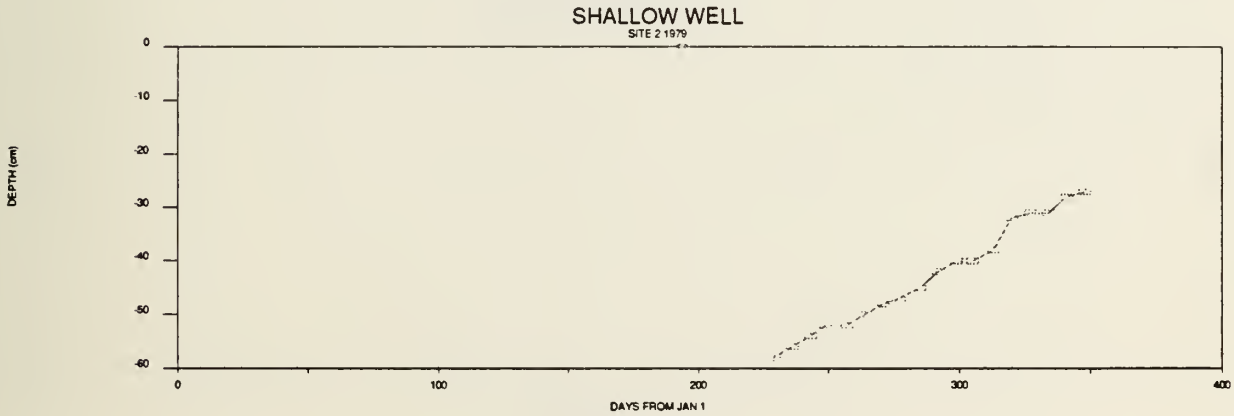
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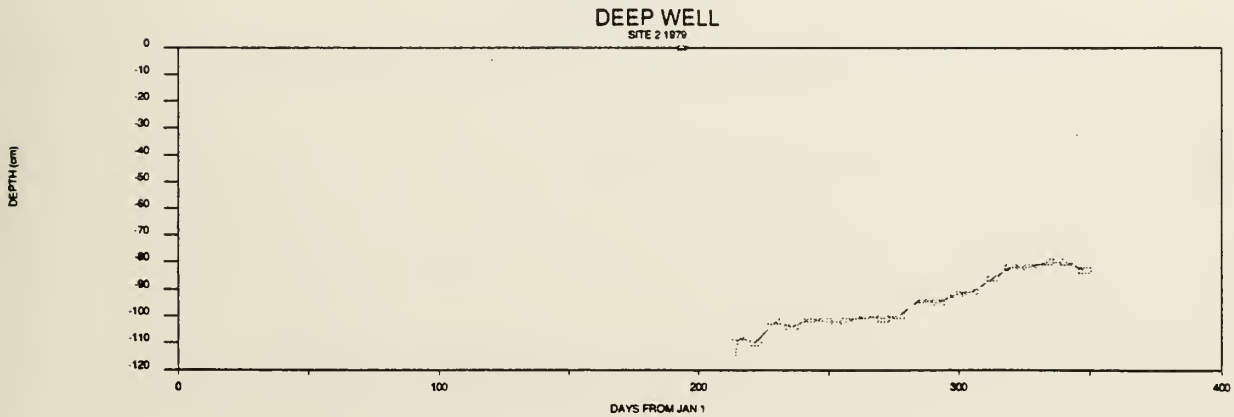
DAYS FROM JAN 1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DEPTH (cm)
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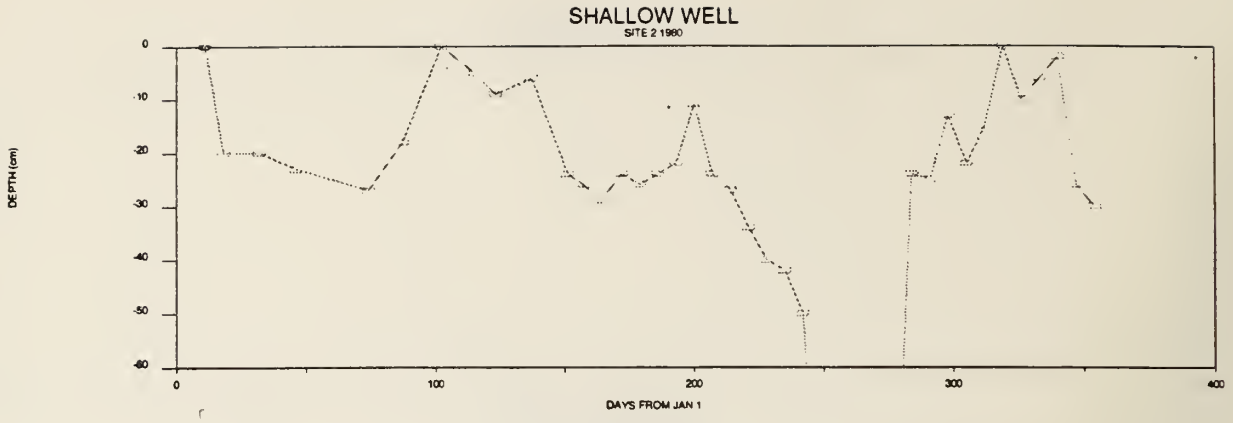
DAYS FROM JAN 1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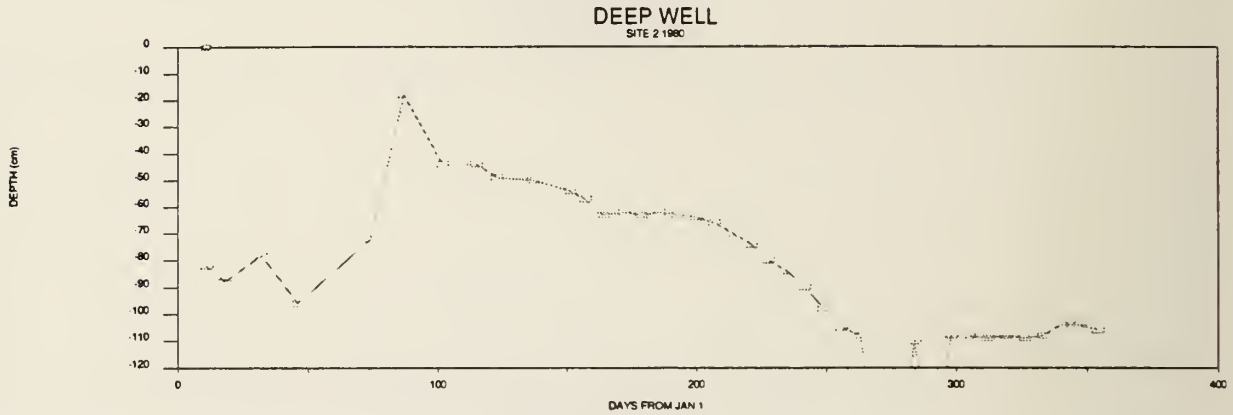
DAYS FROM JAN 1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SITE 2 1980
DEPTH (cm)
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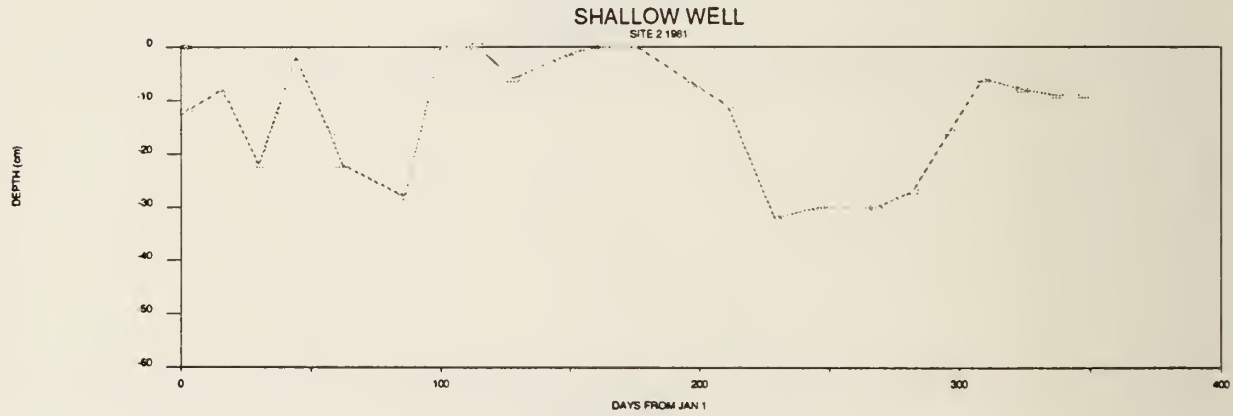
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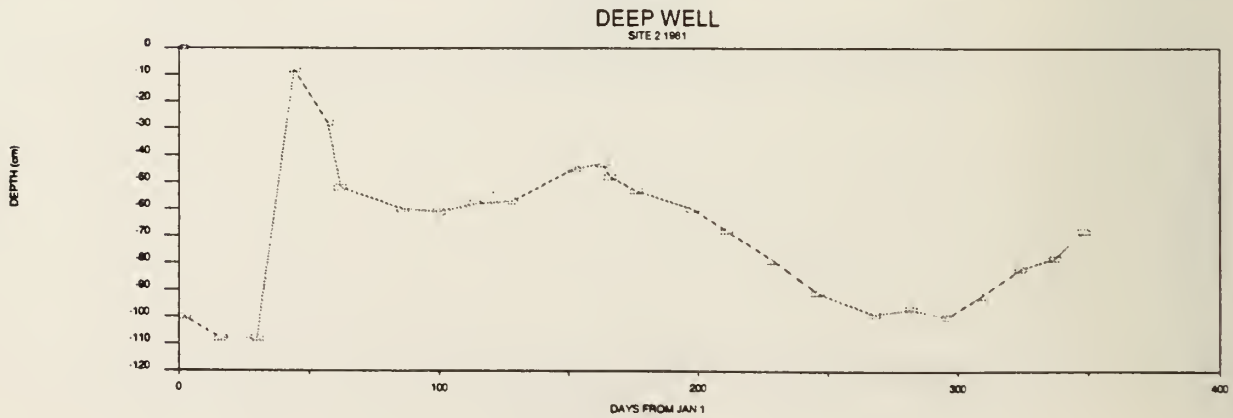
DAYS FROM JAN 1


DEEP WELL
SITE 2 1981
DEPTH (cm)
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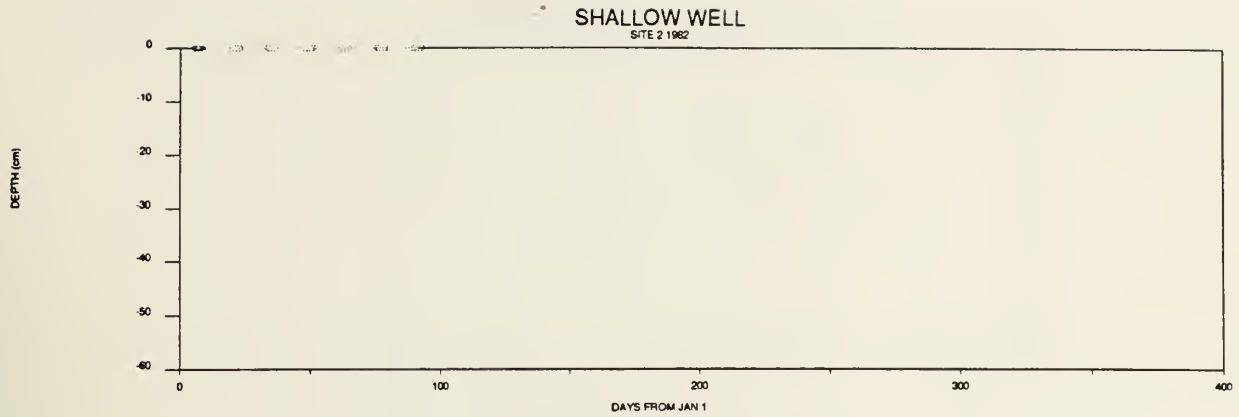
SHALLOW WELL
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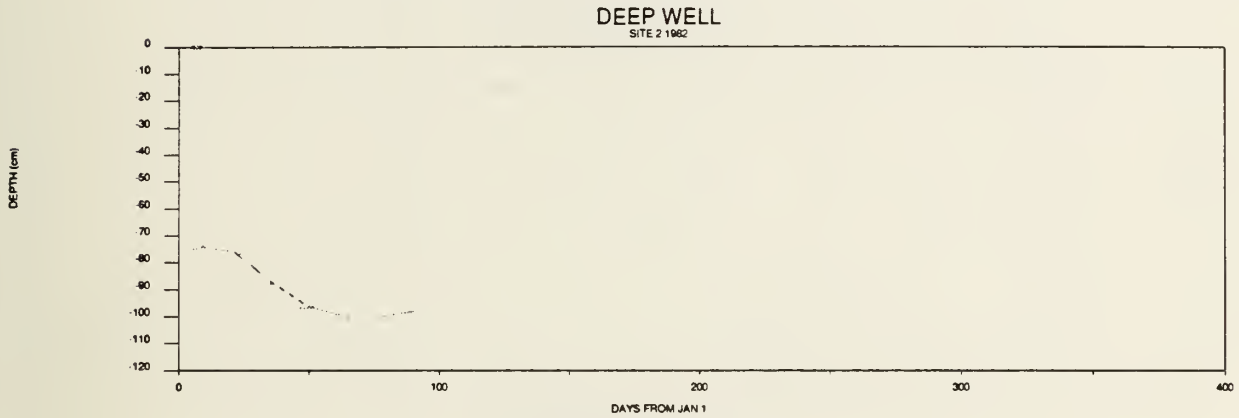
DAYS FROM JAN 1


DEEP WELL
SITE 2 1982
DEPTH (cm)
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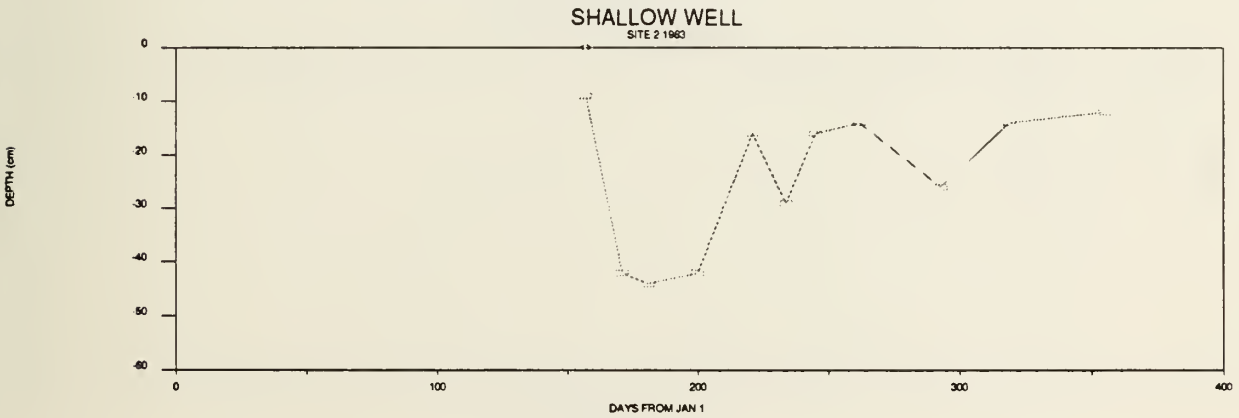
DAYS FROM JAN 1


SHALLOW WELL
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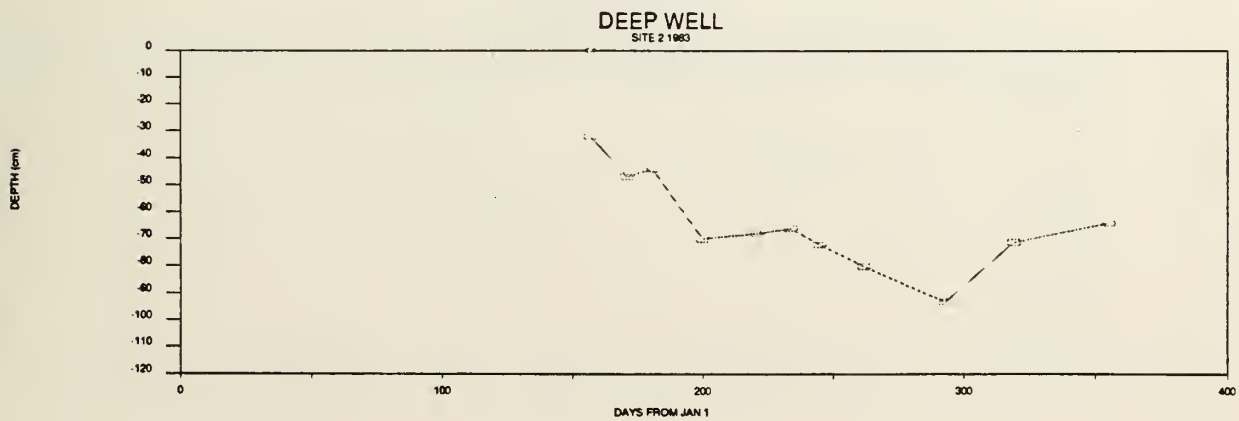
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DEPTH (cm)
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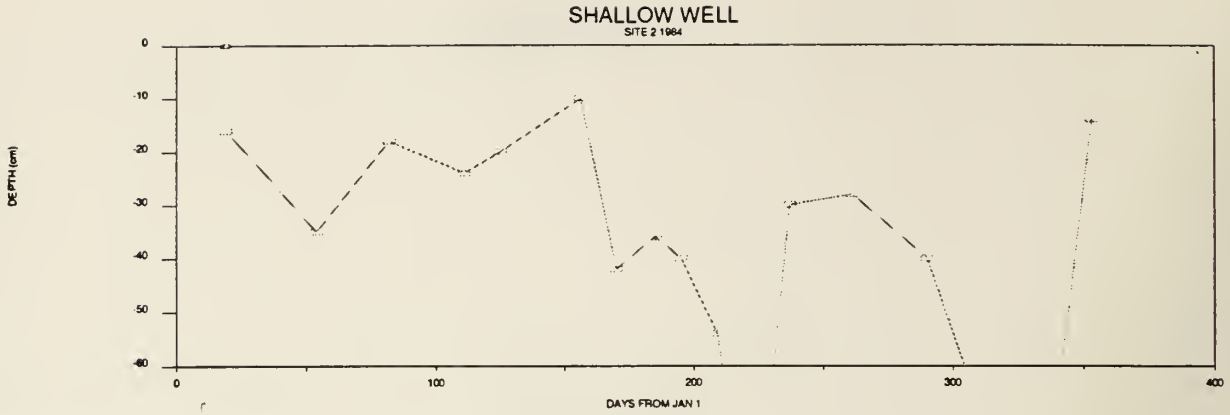
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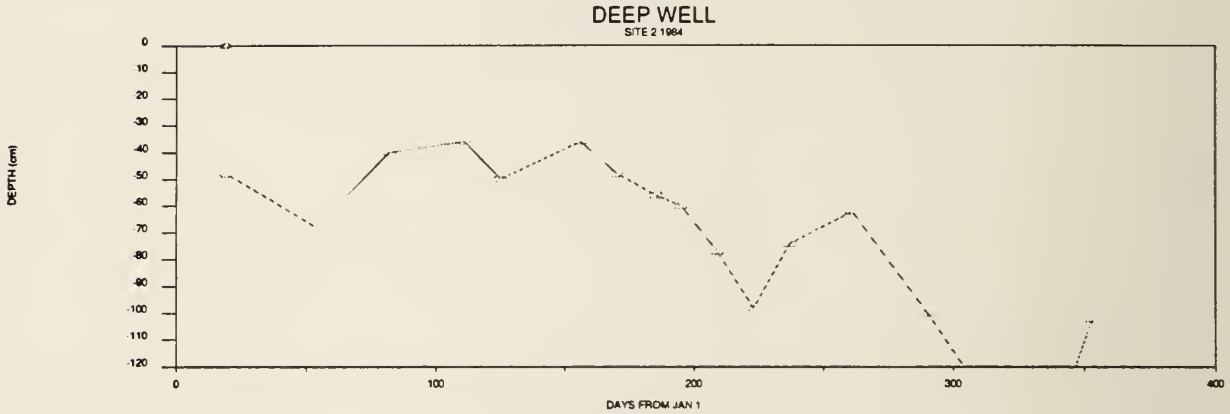
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DEPTH (cm)
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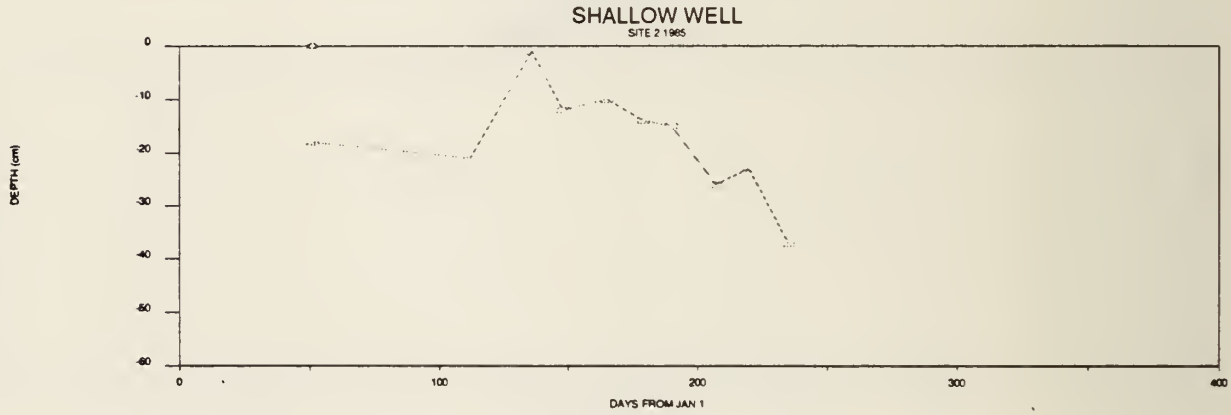
DAYS FROM JAN 1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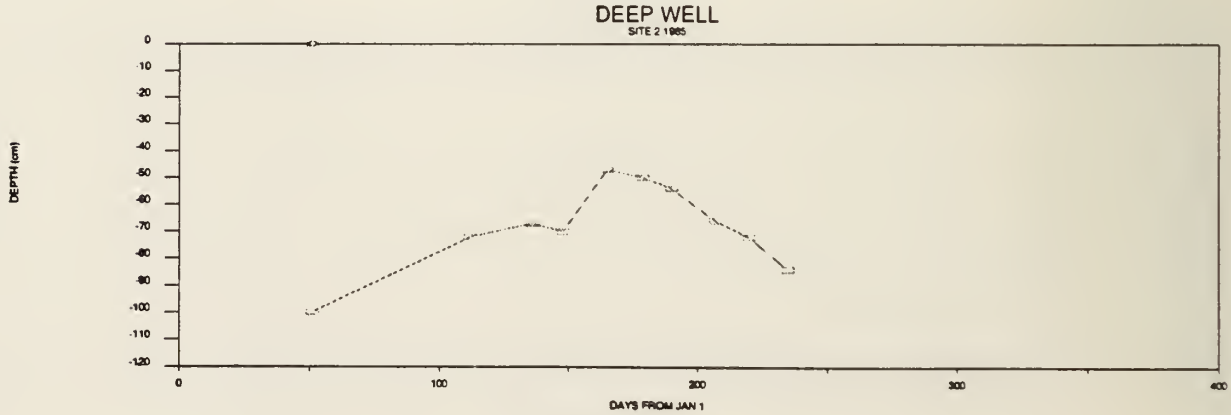
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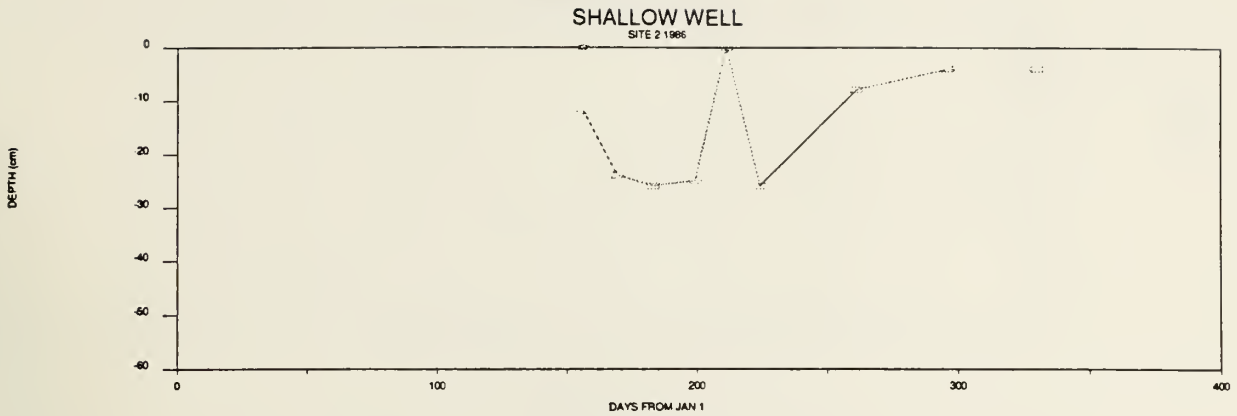
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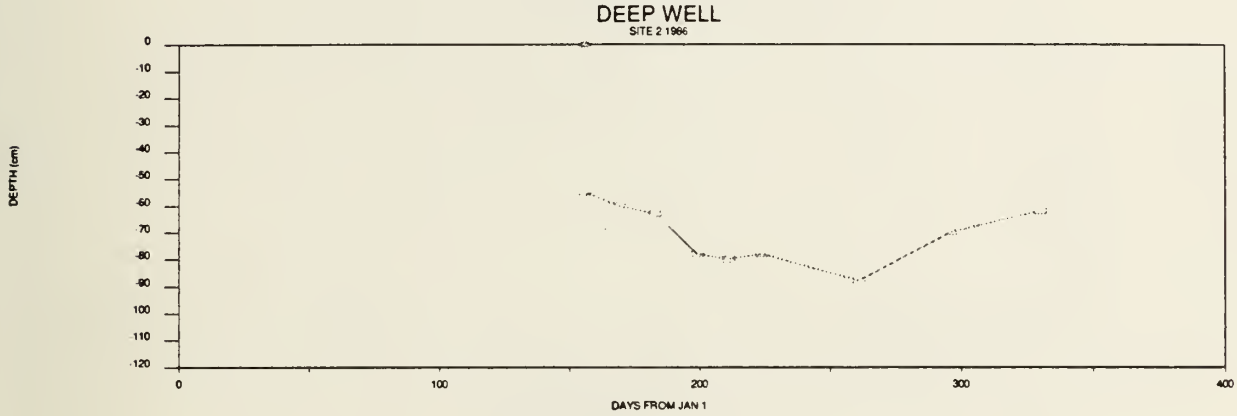
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DEPTH (cm)
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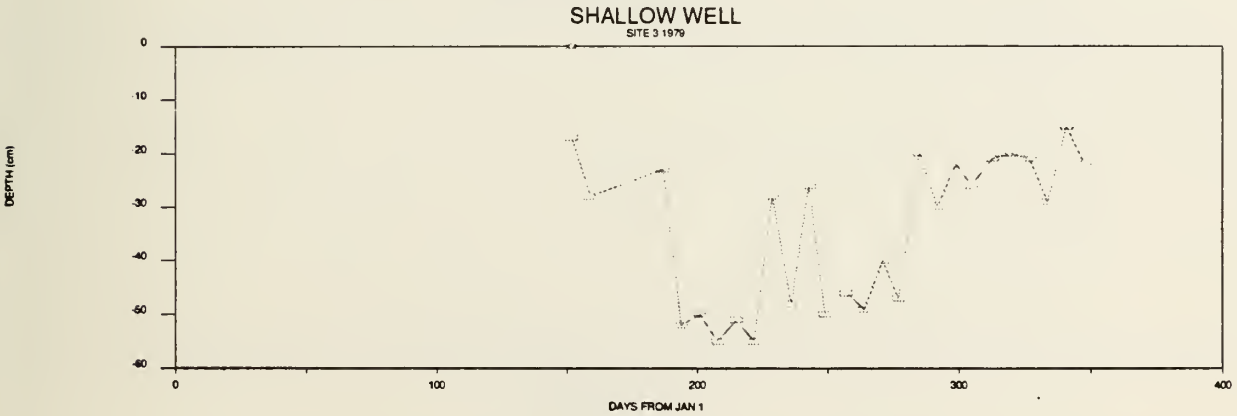
DAYS FROM JAN 1


SHALLOW WELL
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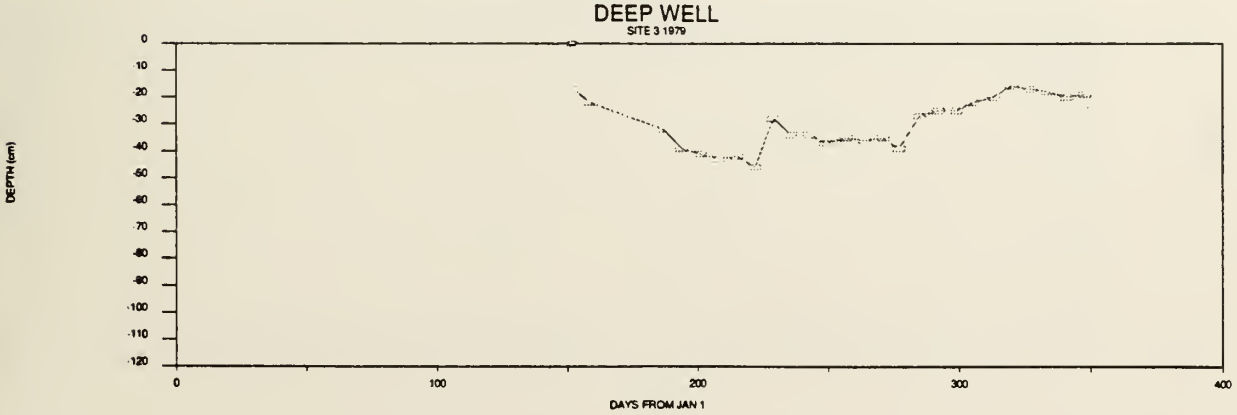
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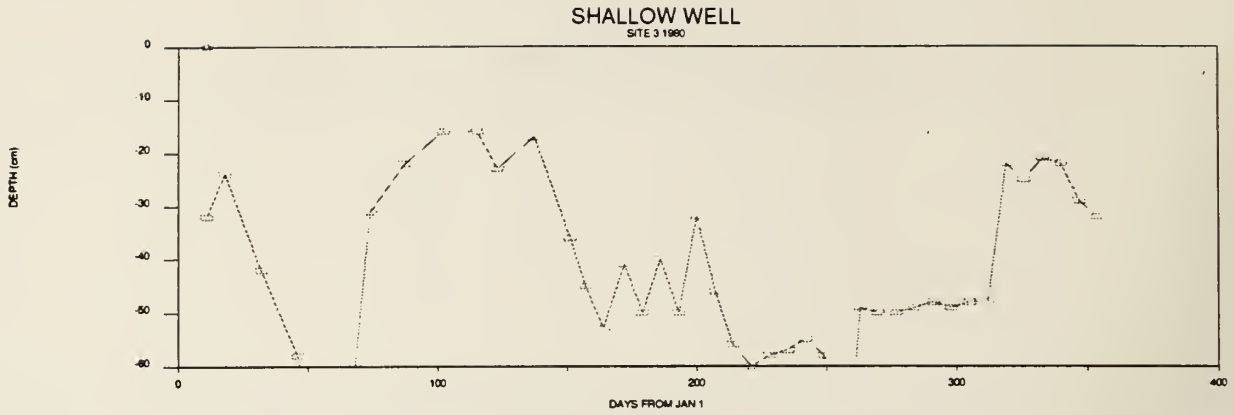
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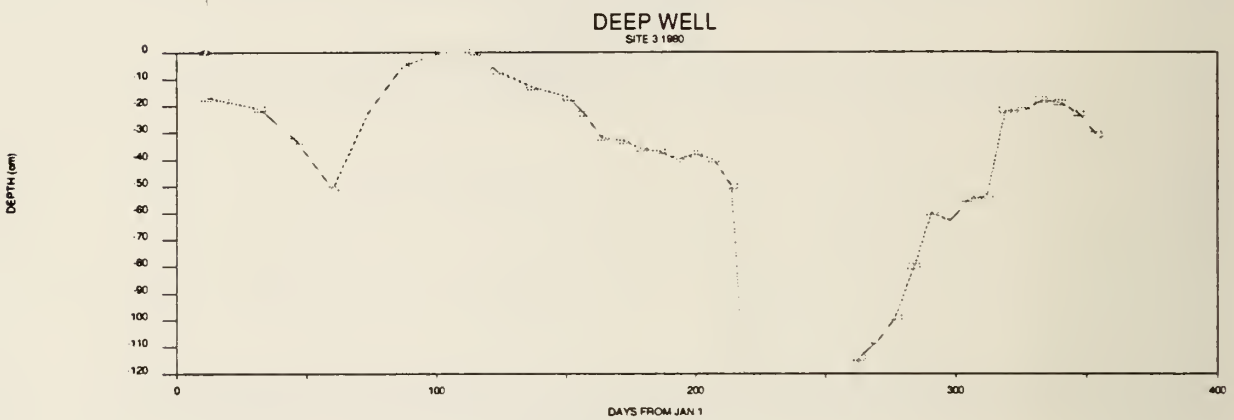
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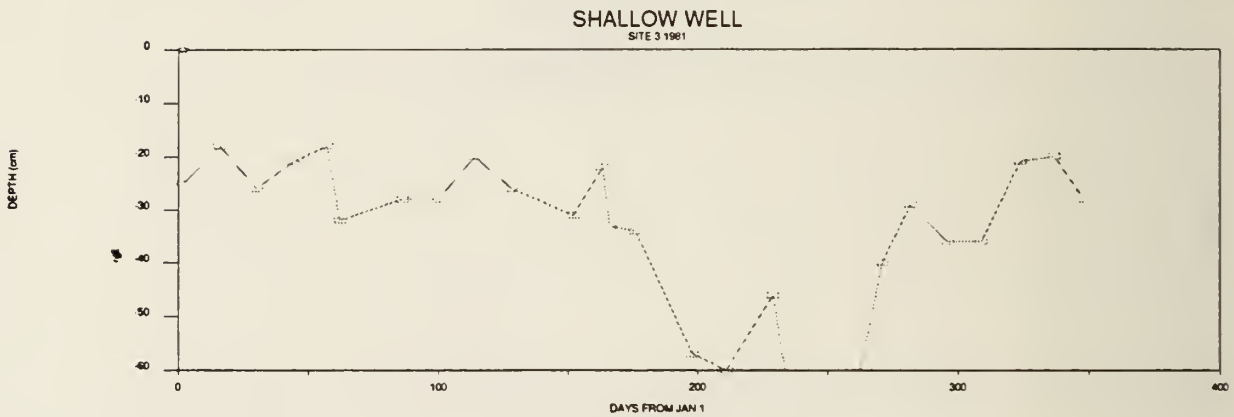
DAYS FROM JAN 1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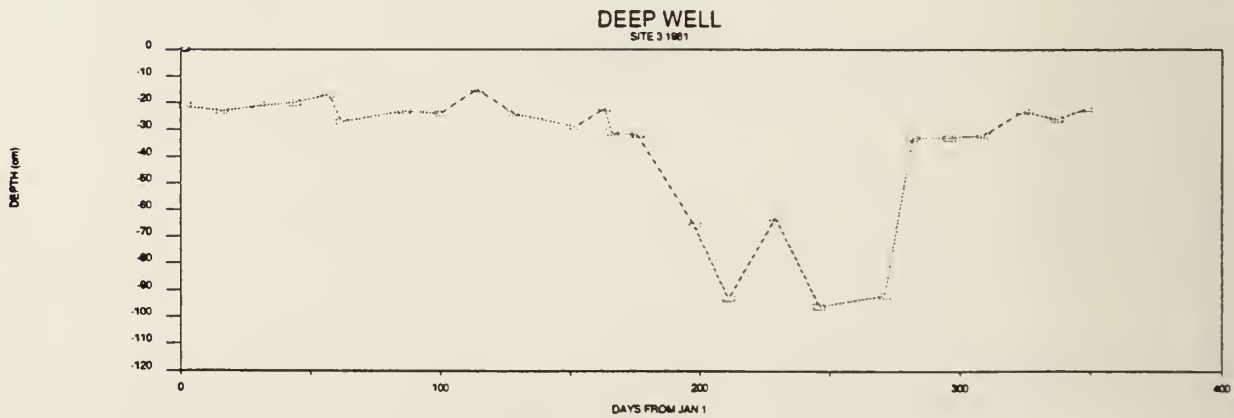
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DEPTH (cm)
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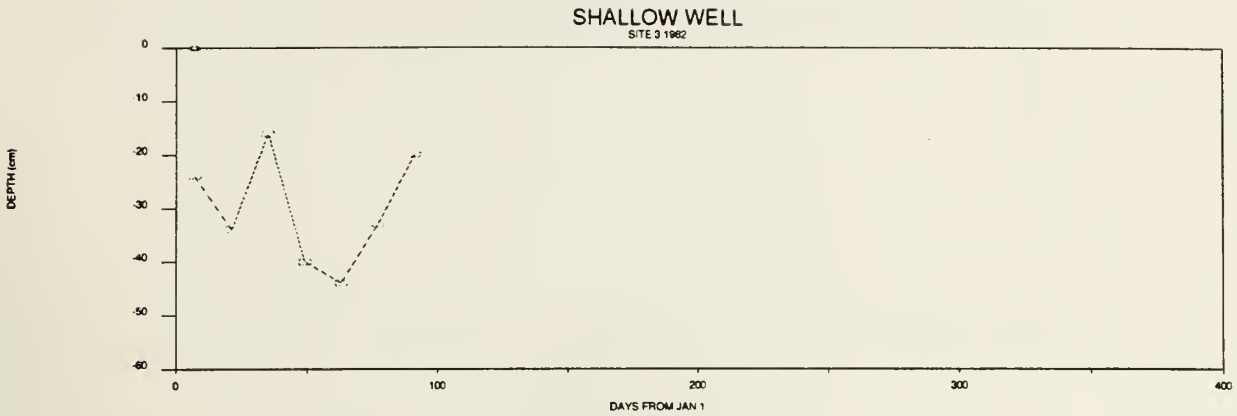
DAYS FROM JAN 1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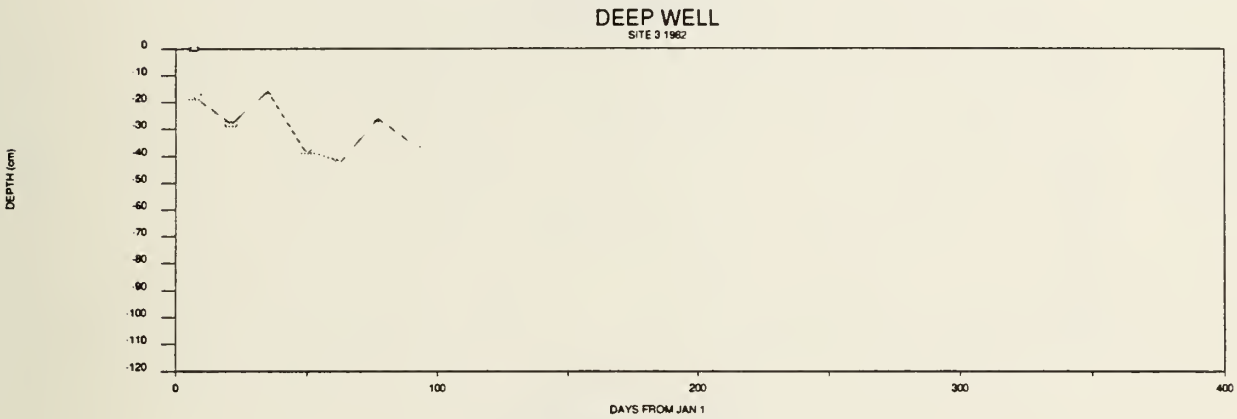
DAYS FROM JAN 1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SITE 3 1982
DEPTH (cm)
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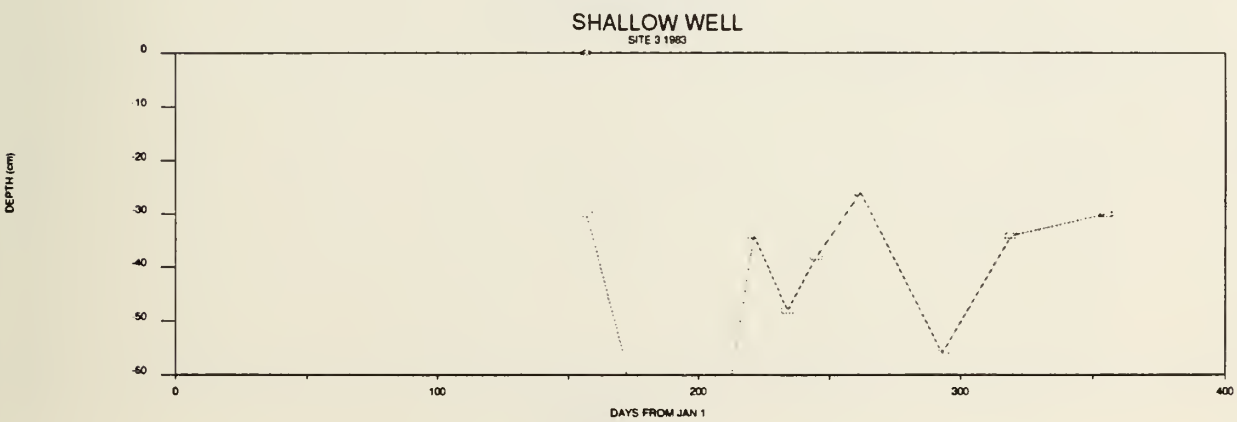
DAYS FROM JAN 1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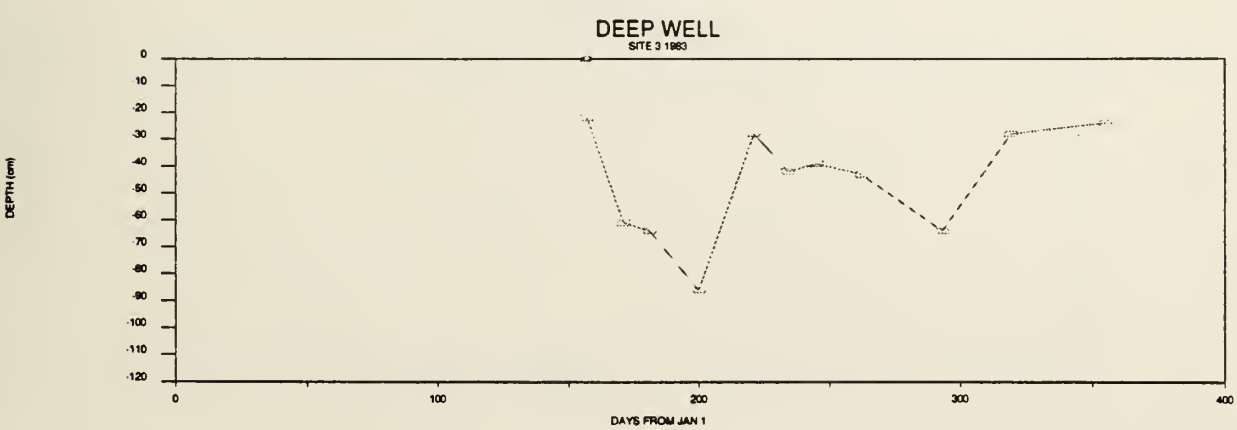
DAYS FROM JAN 1


DEEP WELL
SITE 3 1983
DEPTH (cm)
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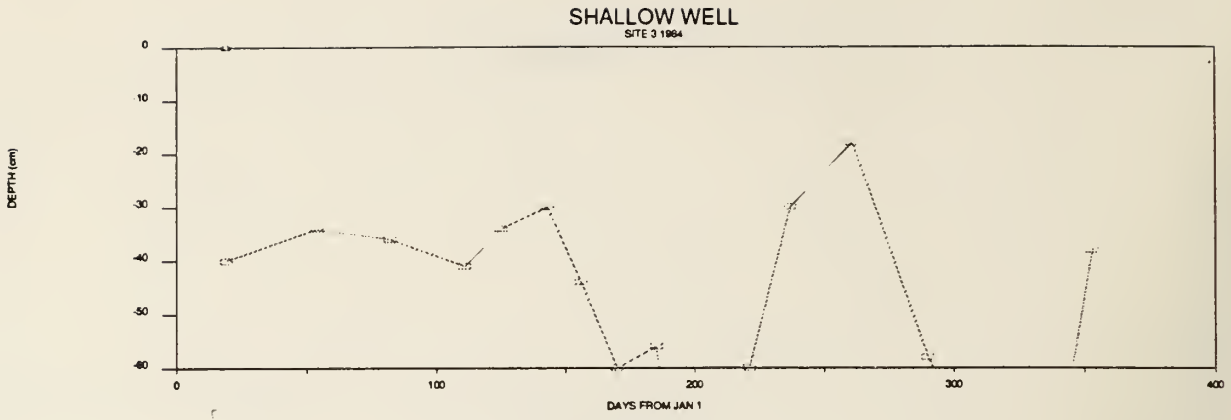
SHALLOW WELL
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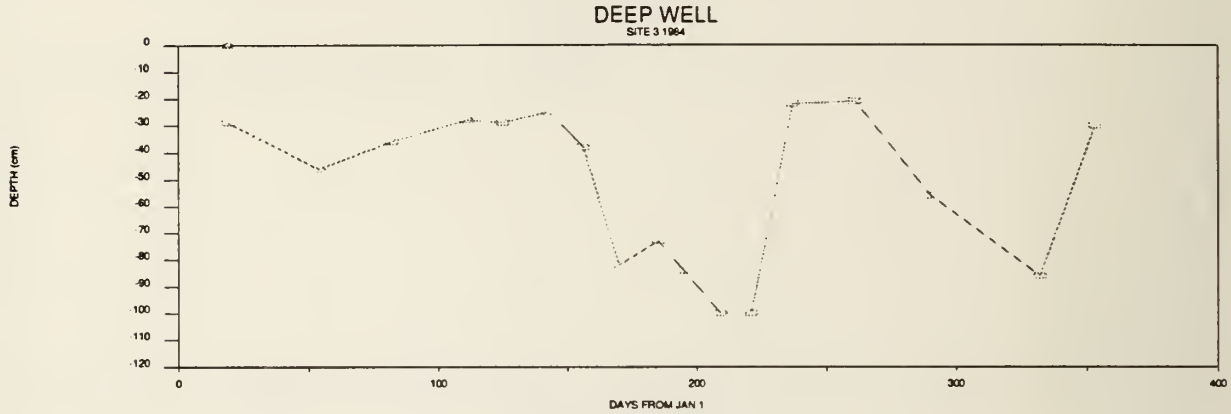
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DEPTH (cm)
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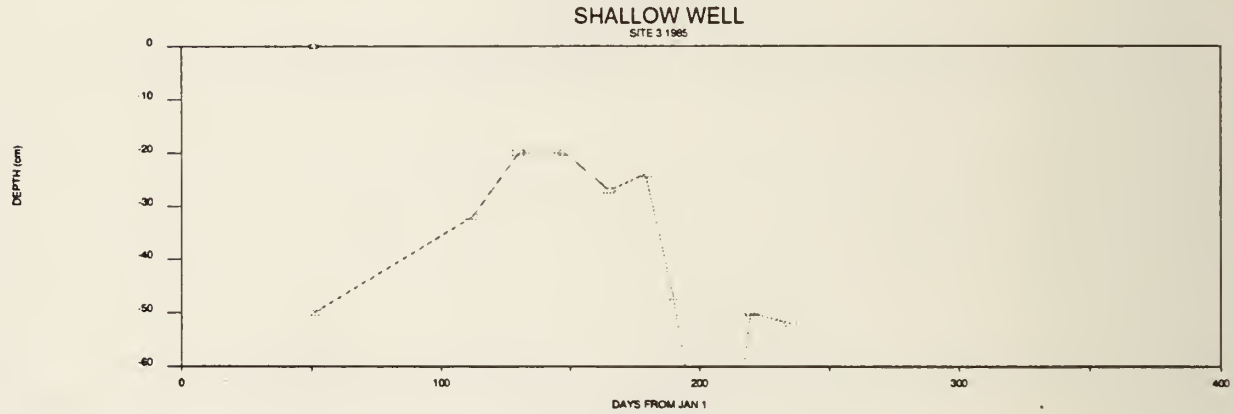
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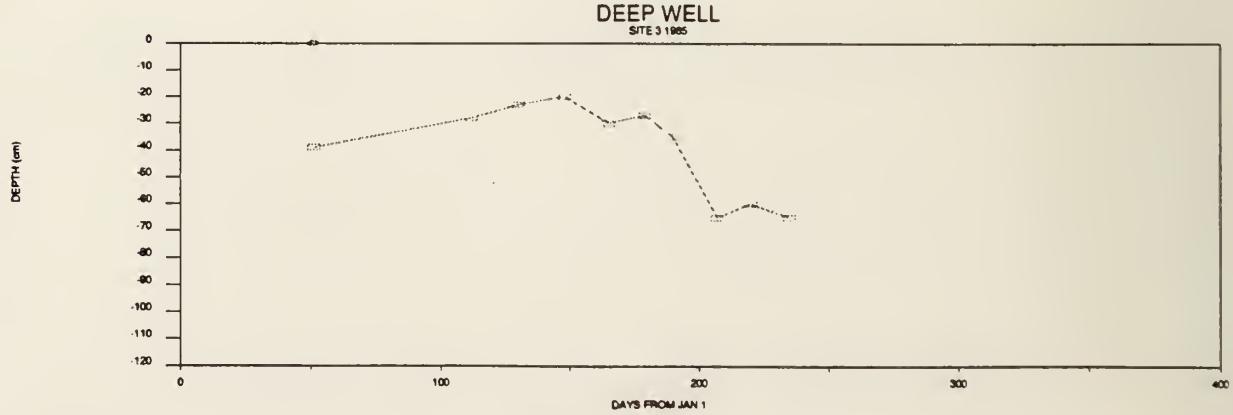
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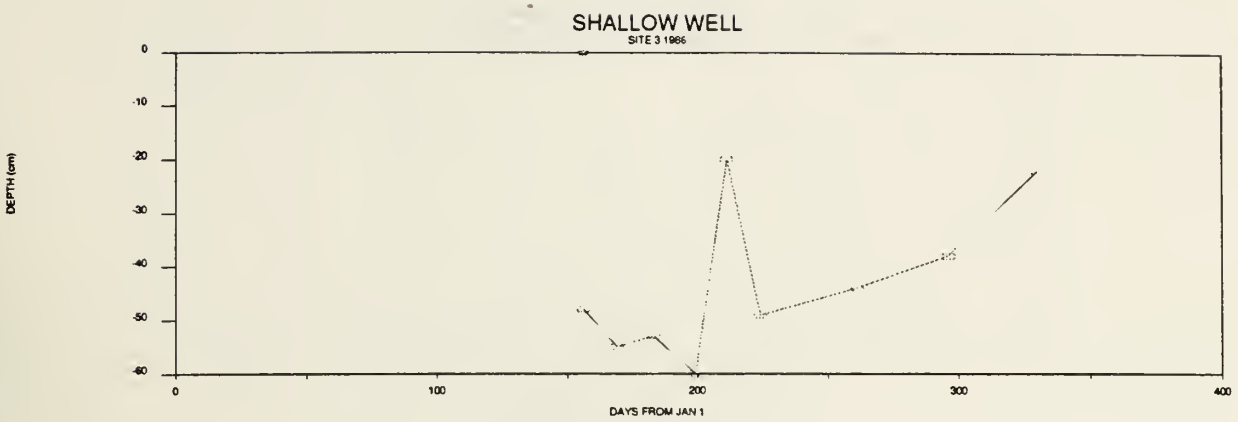
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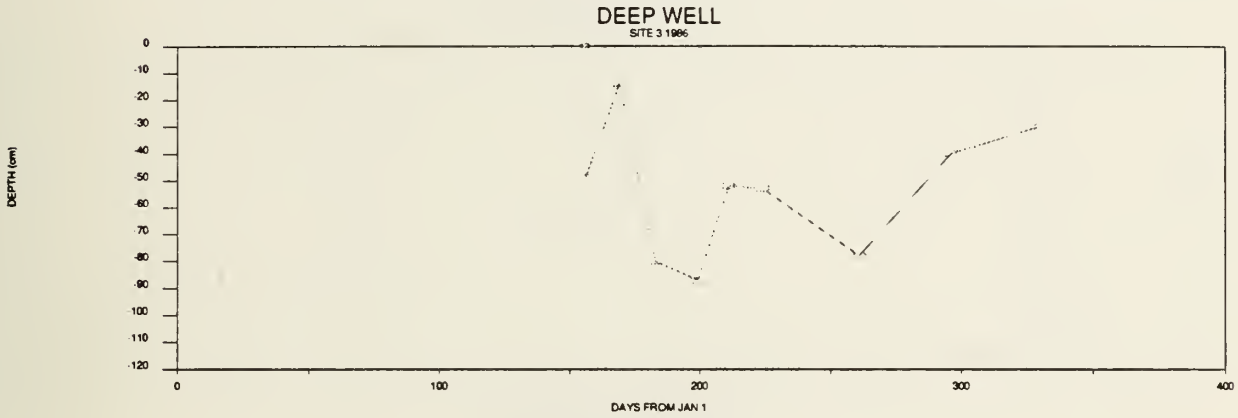
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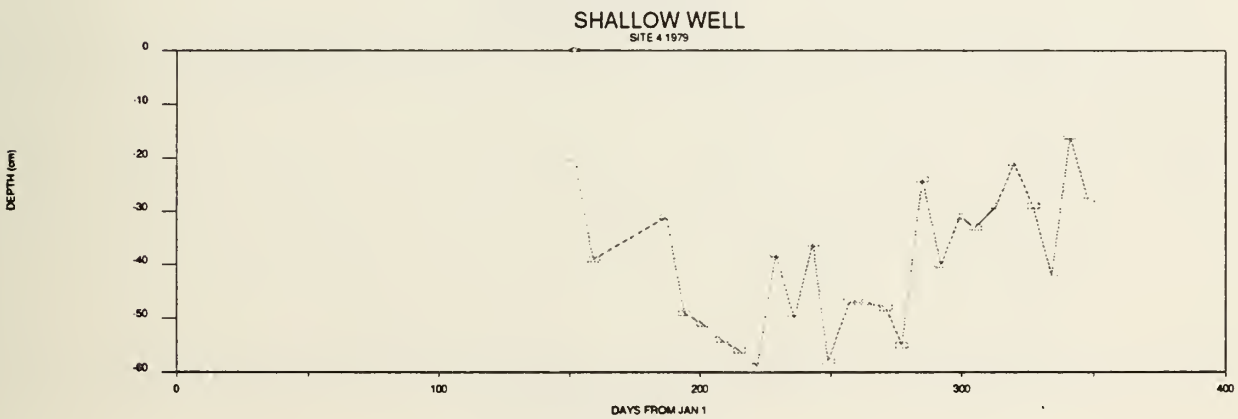
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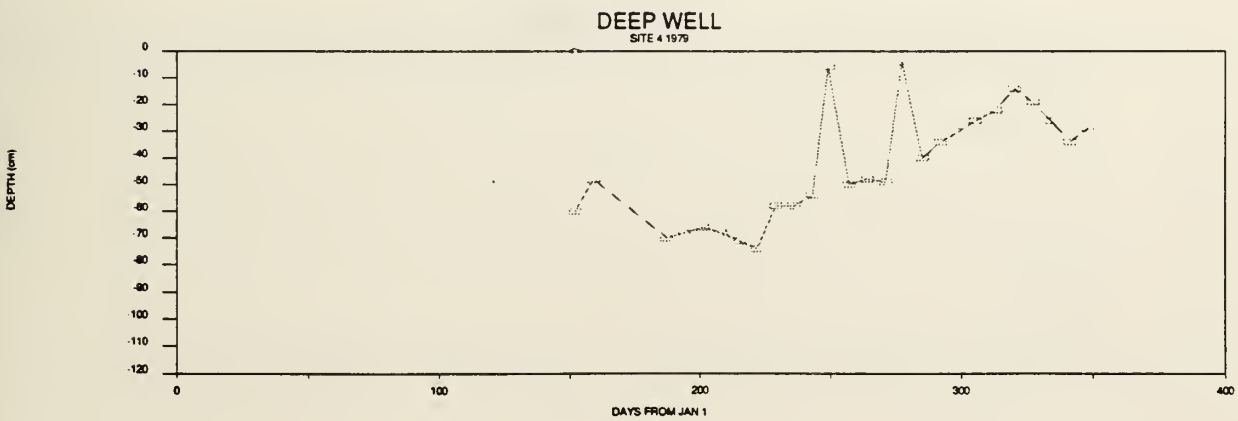
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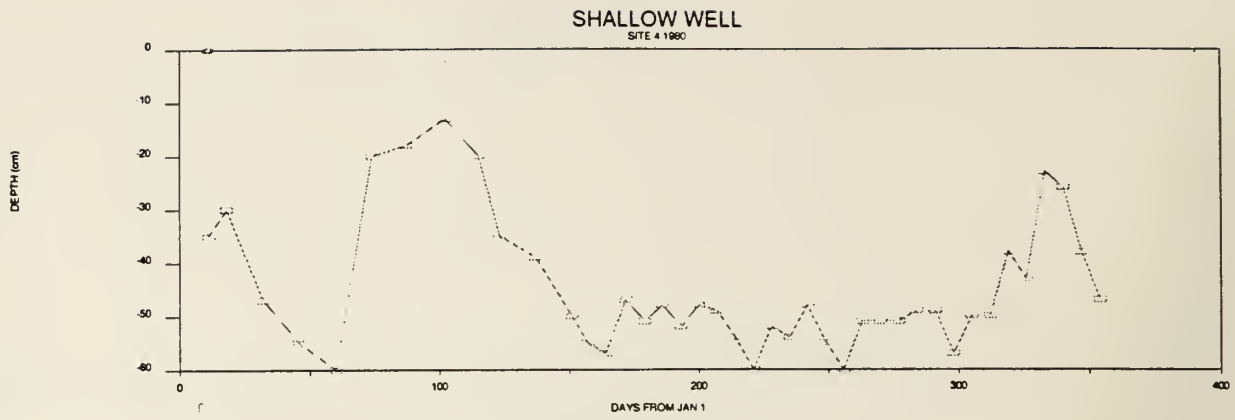
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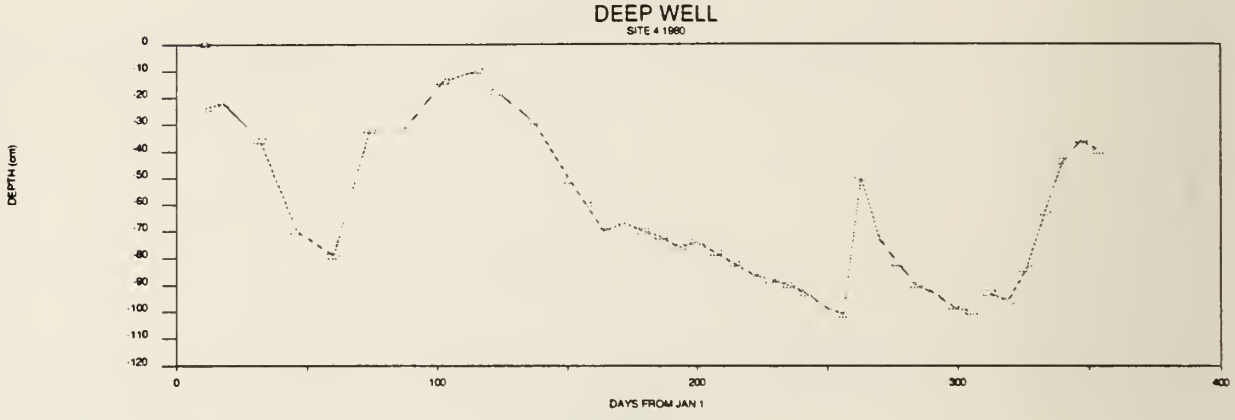
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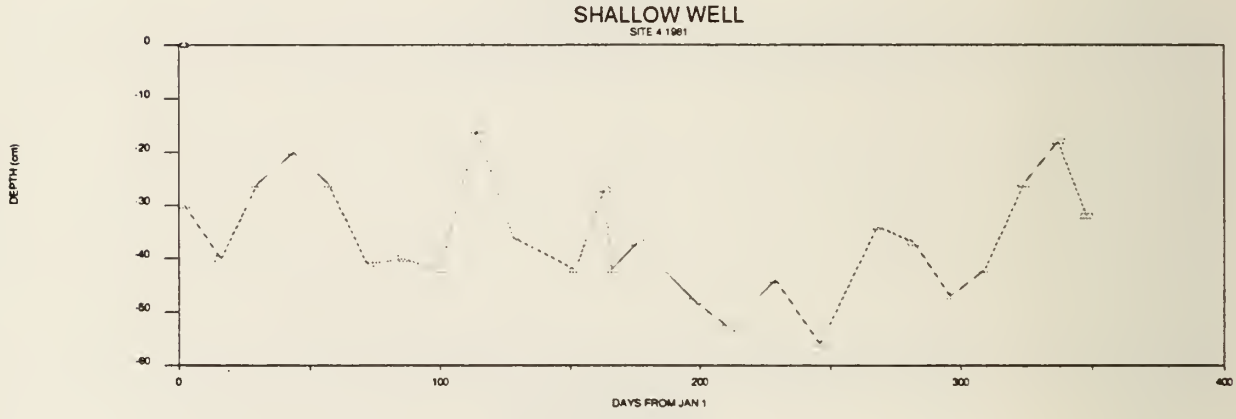
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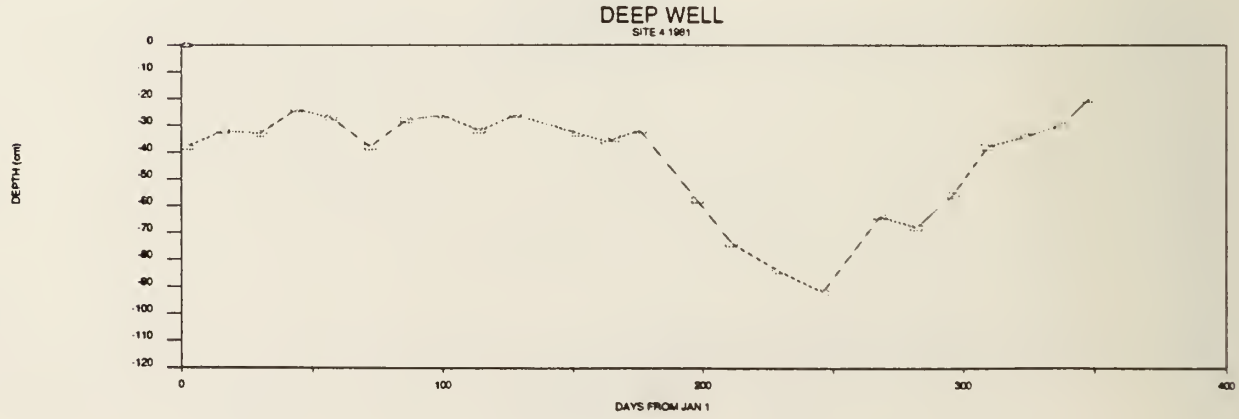
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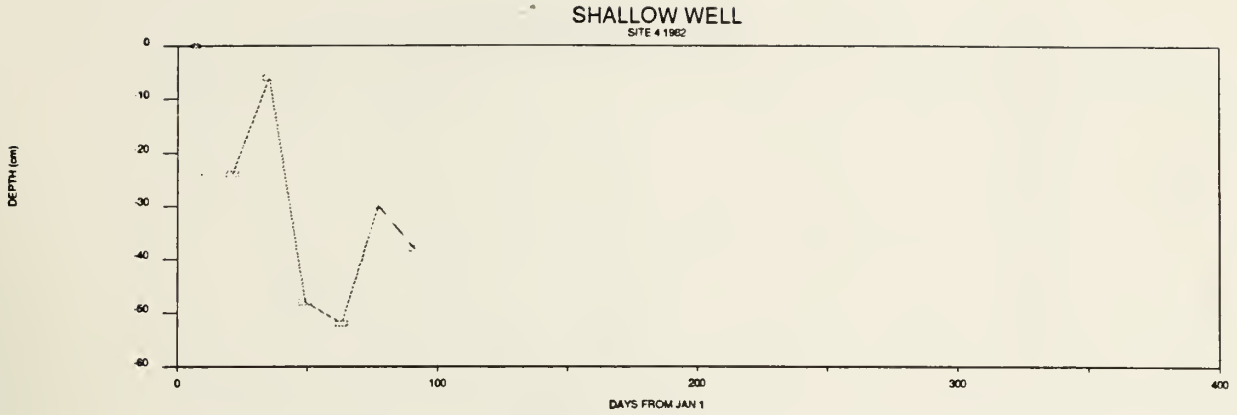
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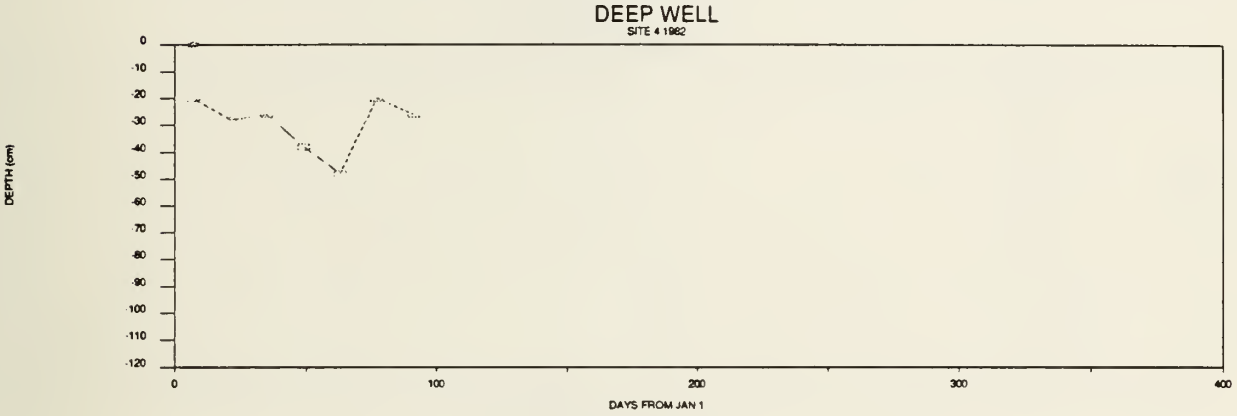
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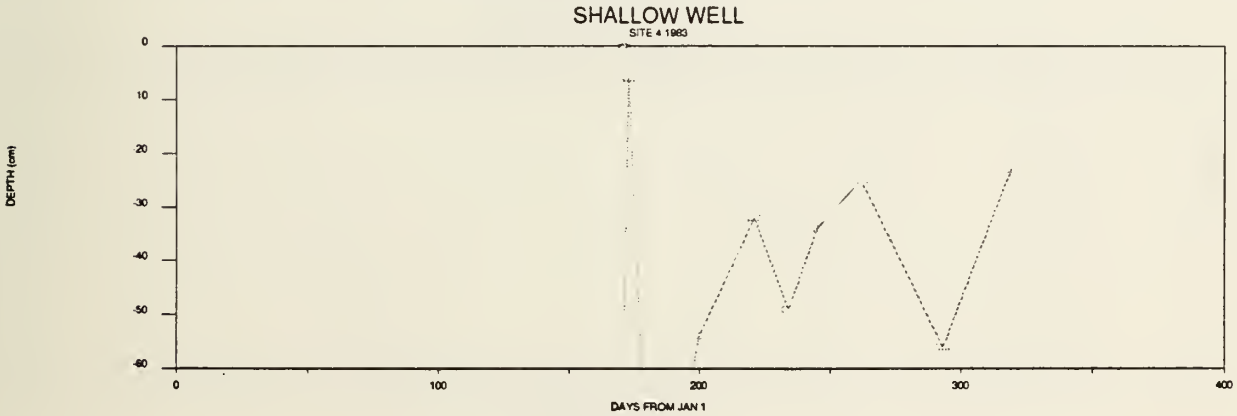
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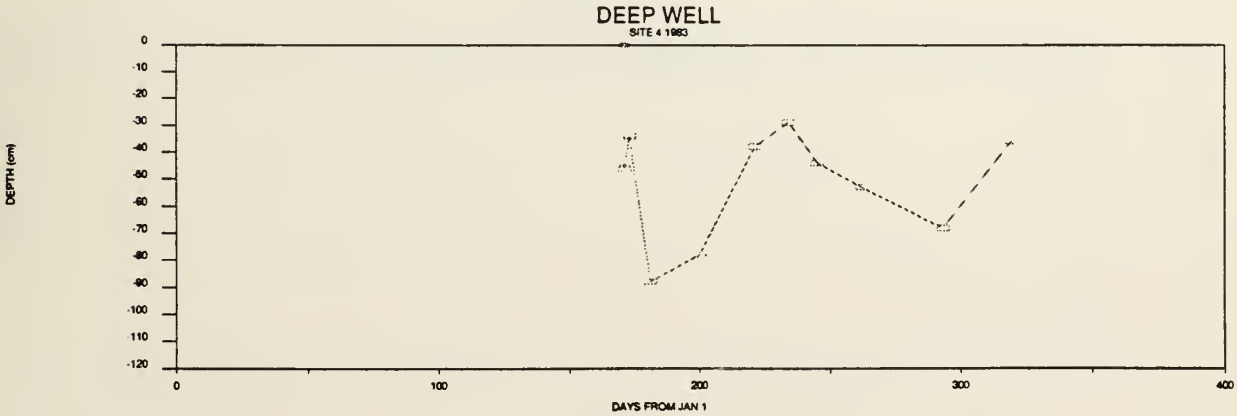
DAYS FROM JAN 1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SITE 4 1983
DEPTH (cm)
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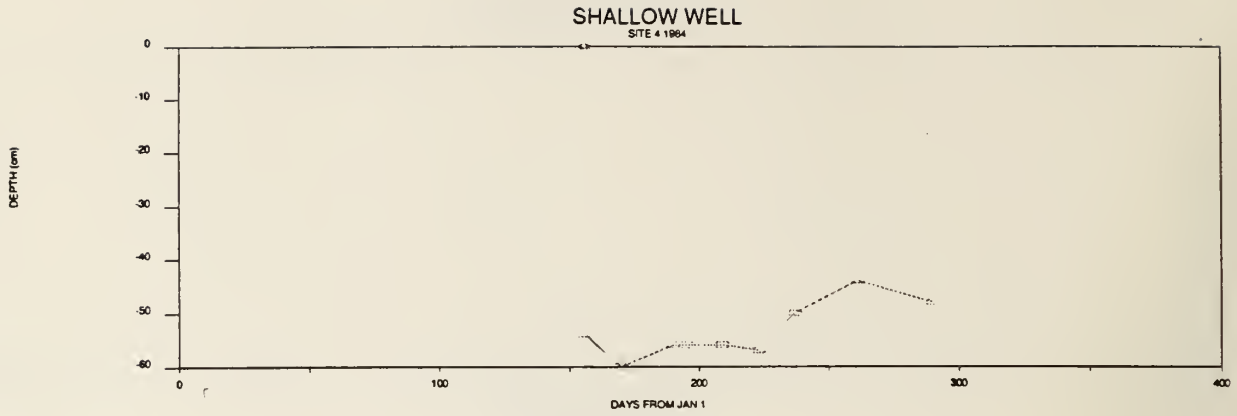
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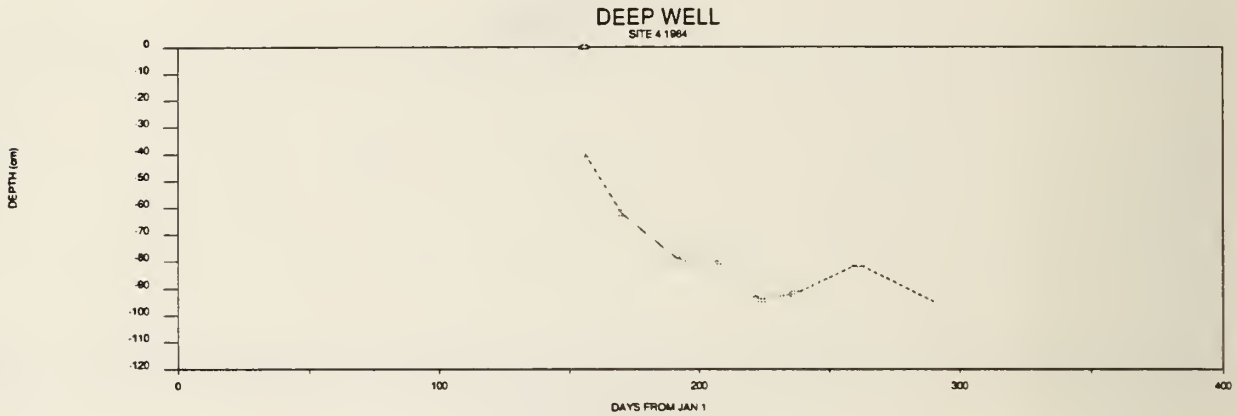
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SITE 4 1984
DEPTH (cm)
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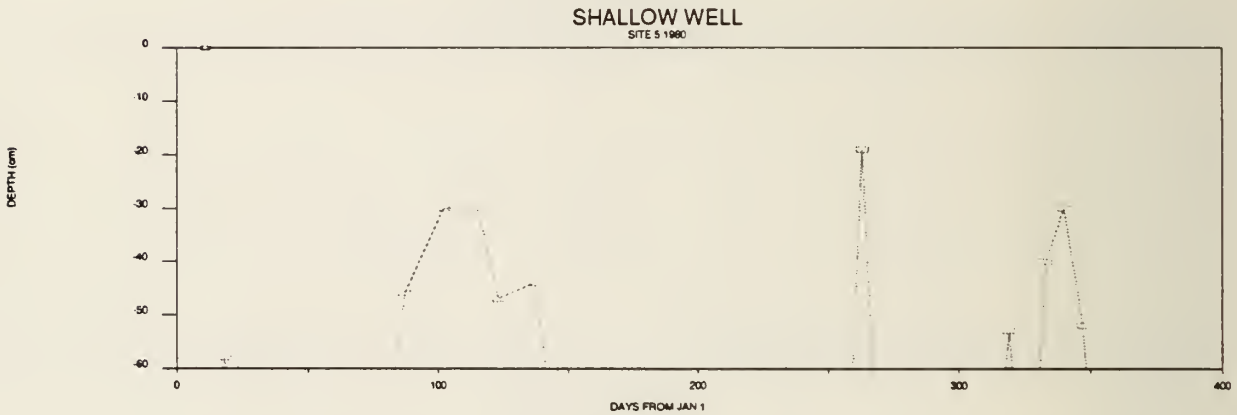
SHALLOW WELL
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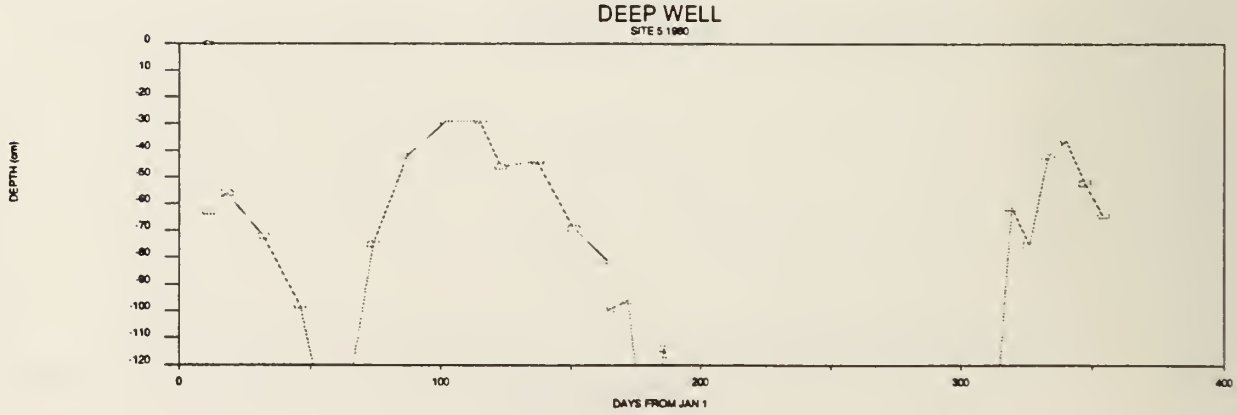
DAYS FROM JAN 1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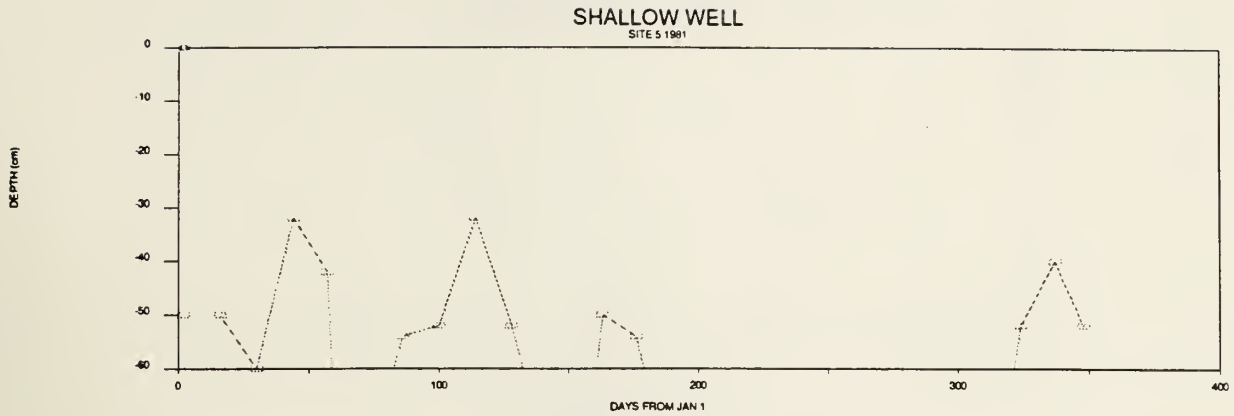
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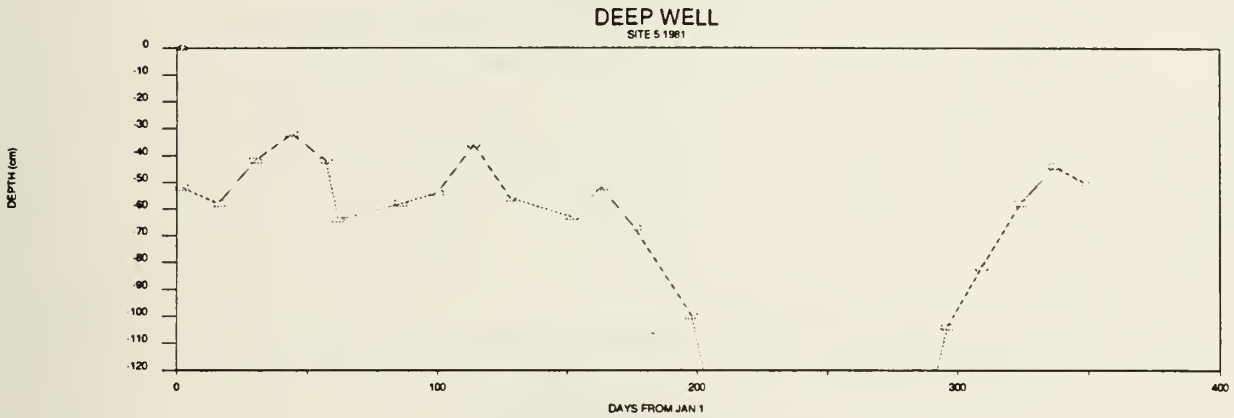
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SITE 5 1981
DEPTH (cm)
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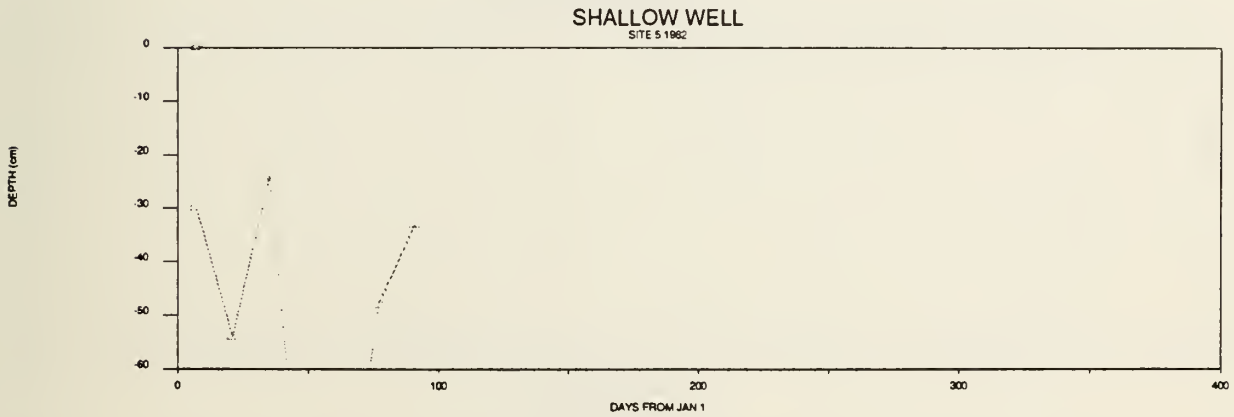
DAYS FROM JAN 1


SHALLOW WELL
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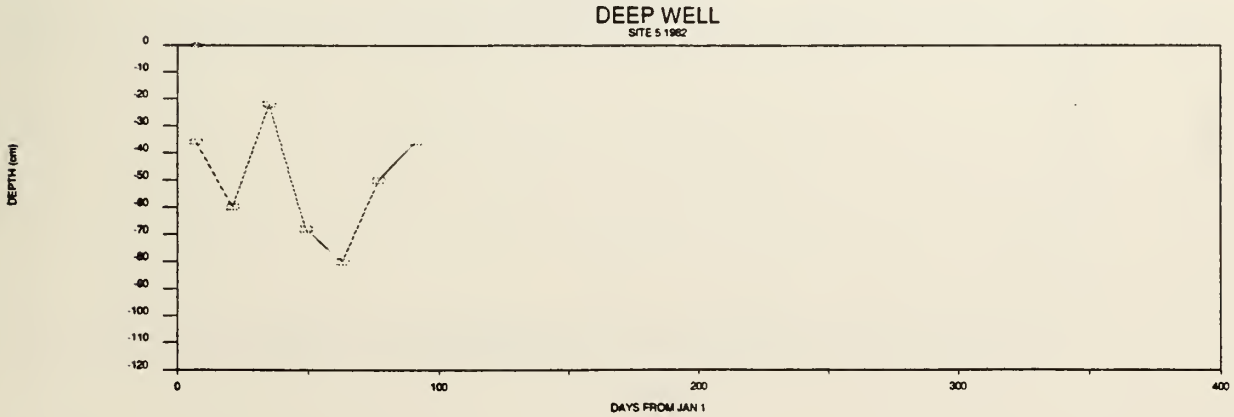
DAYS FROM JAN 1


DEEP WELL
SITE 5 1982
DEPTH (cm)
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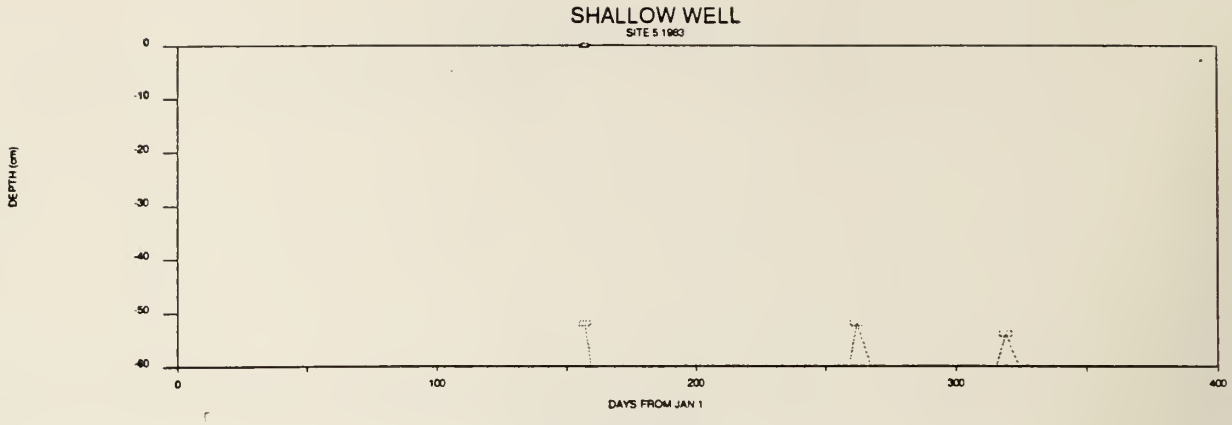
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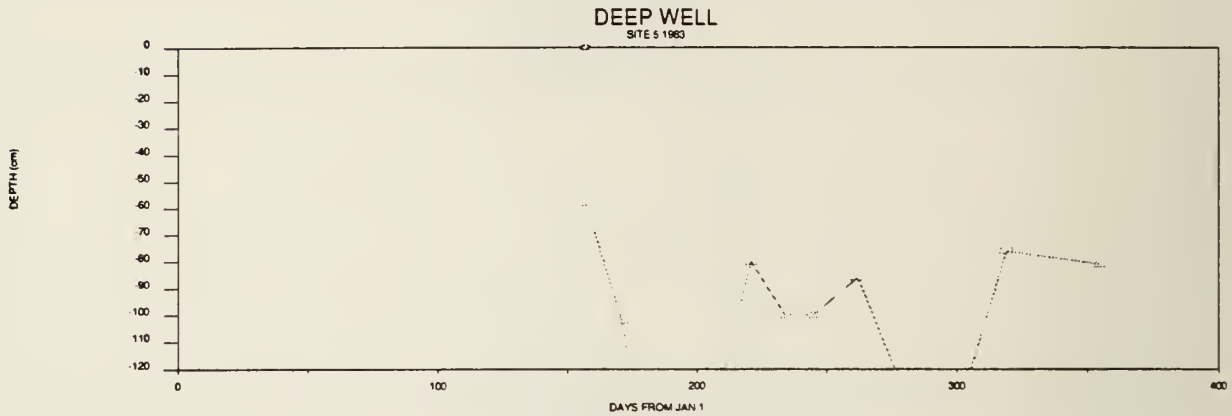
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DEPTH (cm)
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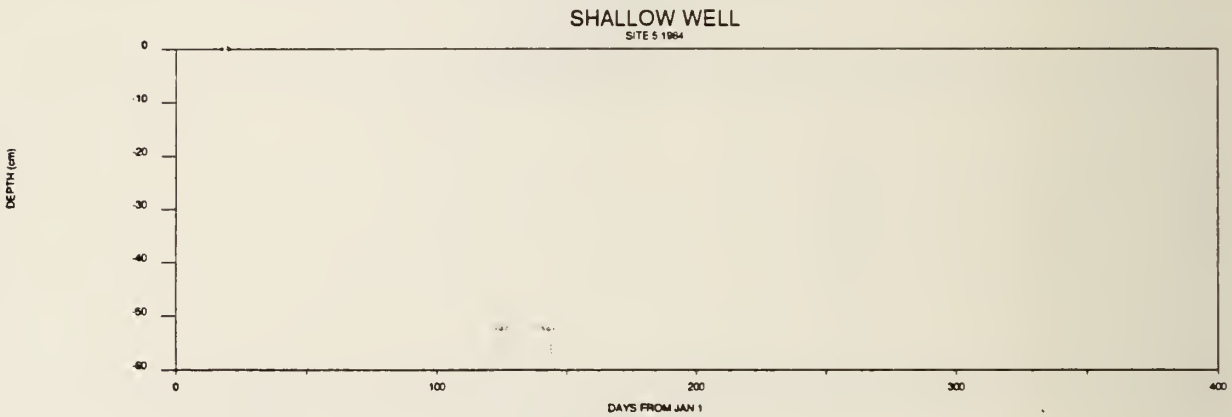
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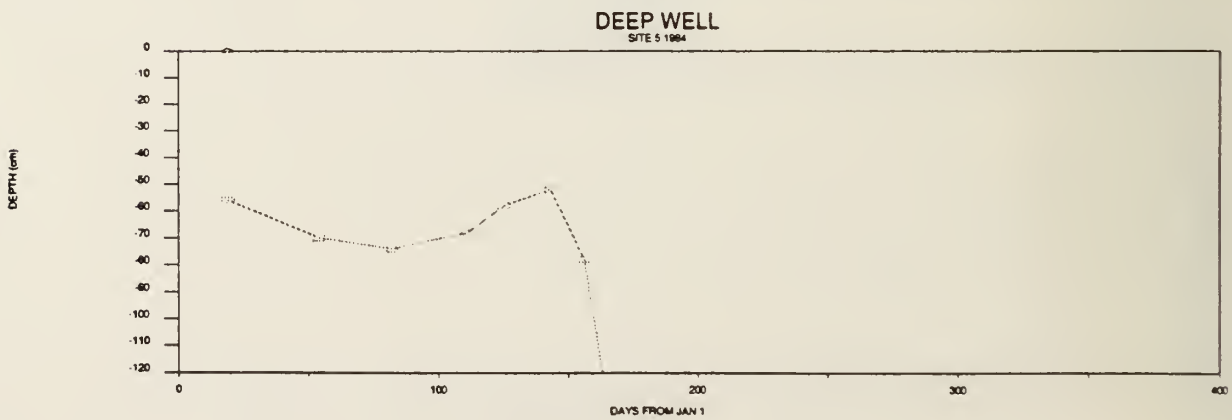
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DEPTH (cm)
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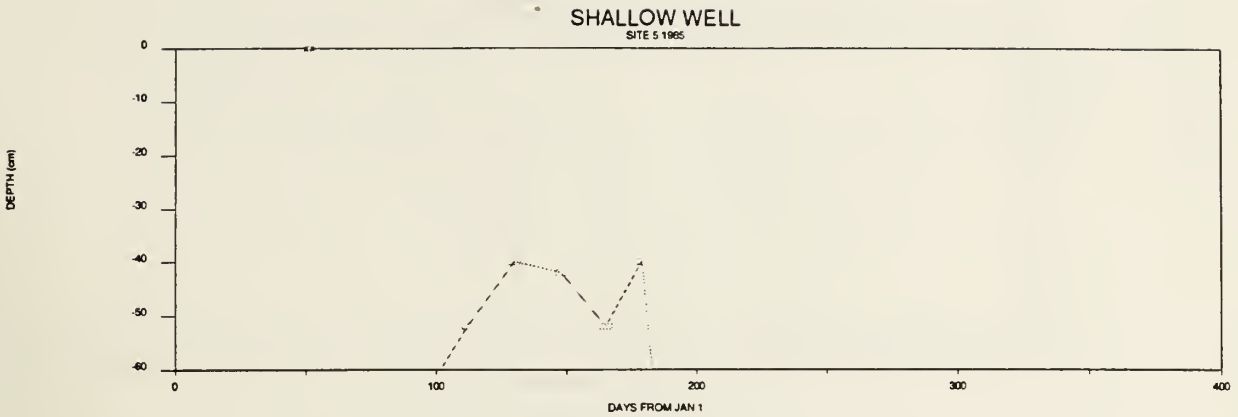
DAYS FROM JAN 1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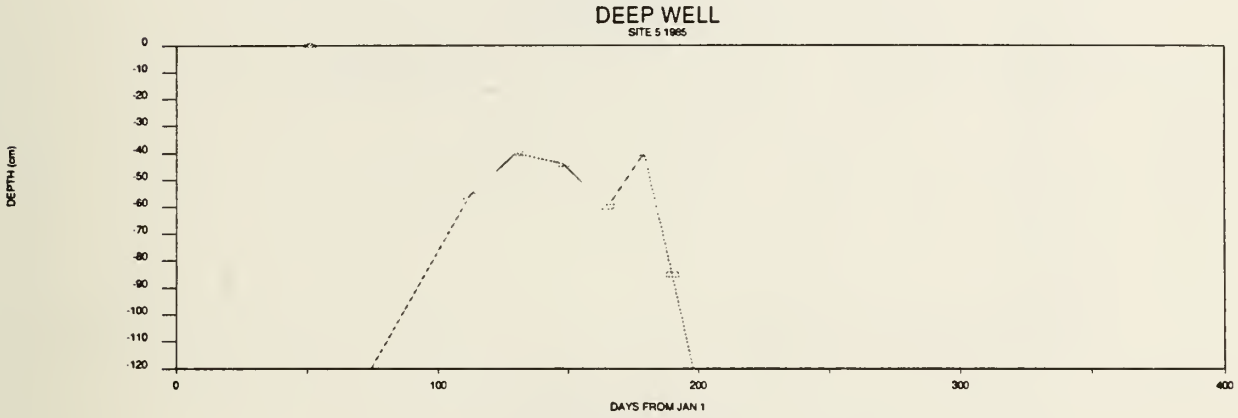
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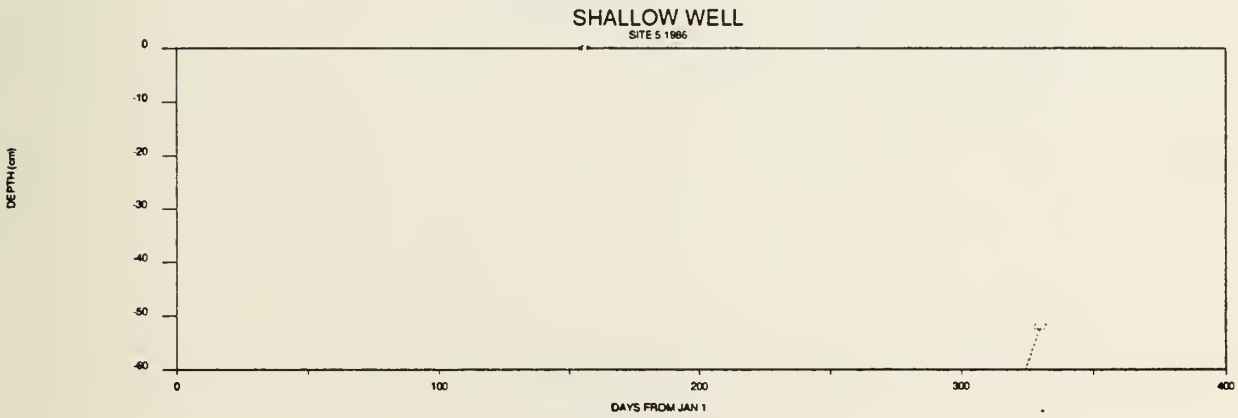
DAYS FROM JAN 1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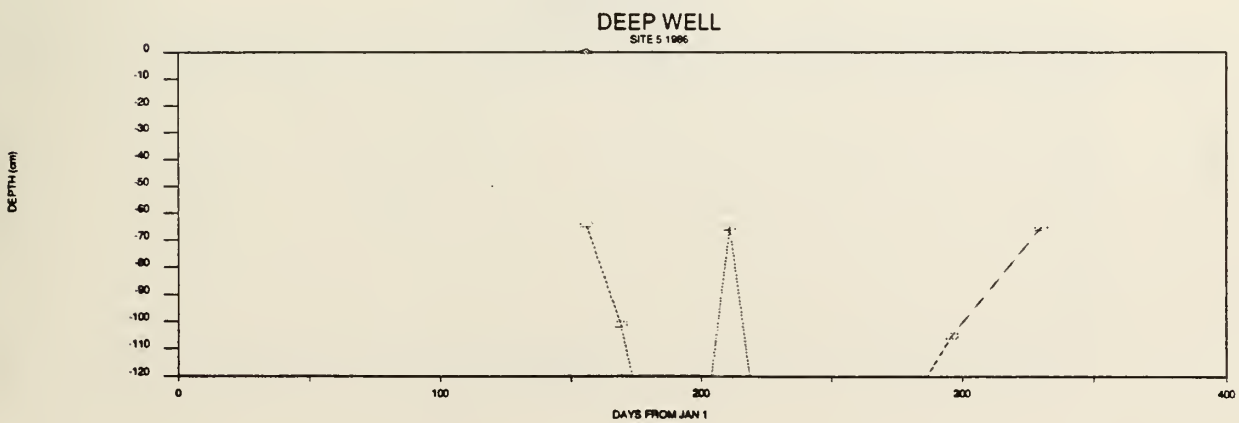
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SITE 5 1986
DEPTH (cm)
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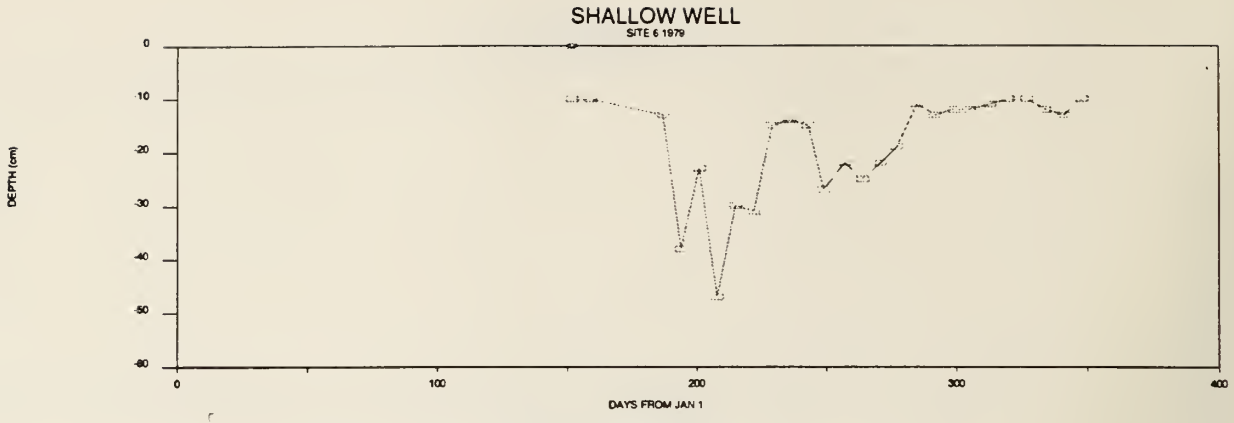
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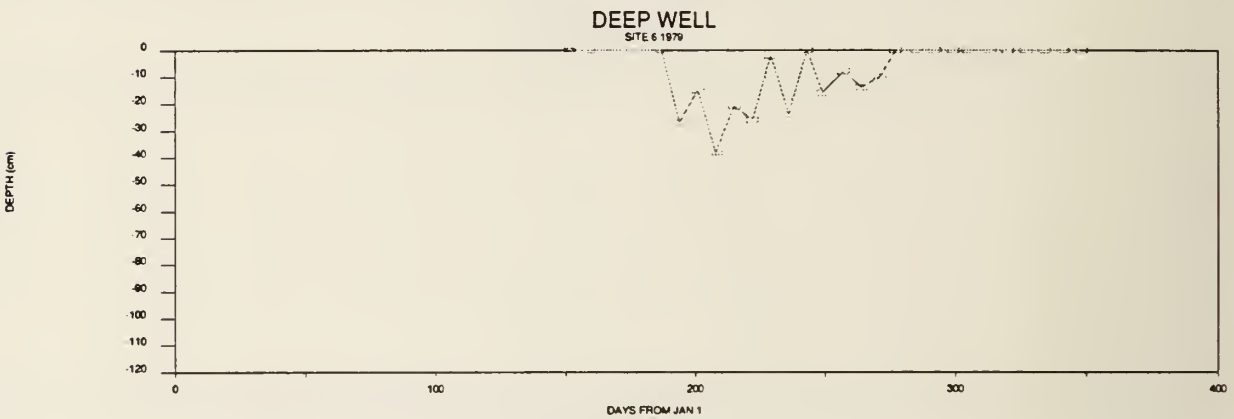
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SITE 6 1979
DEPTH (cm)
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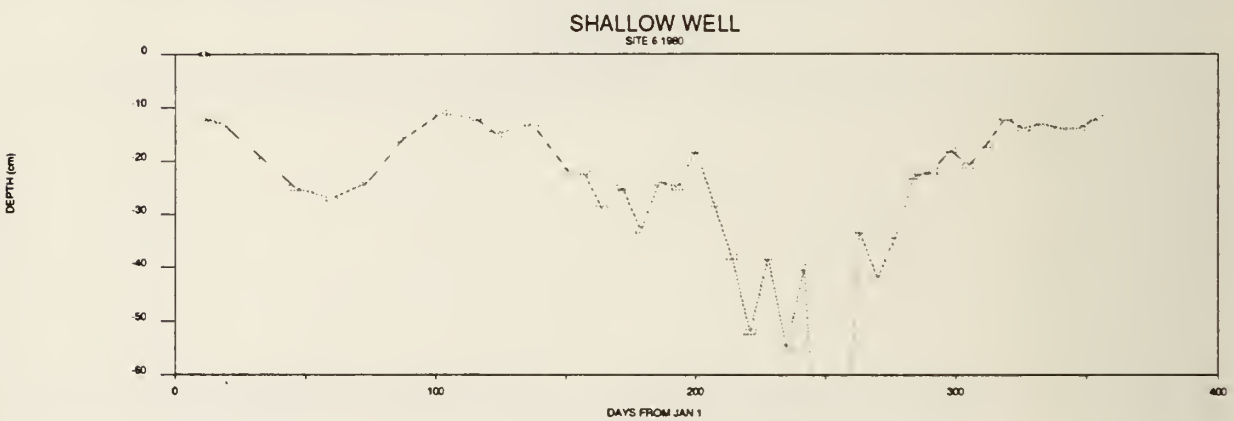
DAYS FROM JAN 1


SHALLOW WELL
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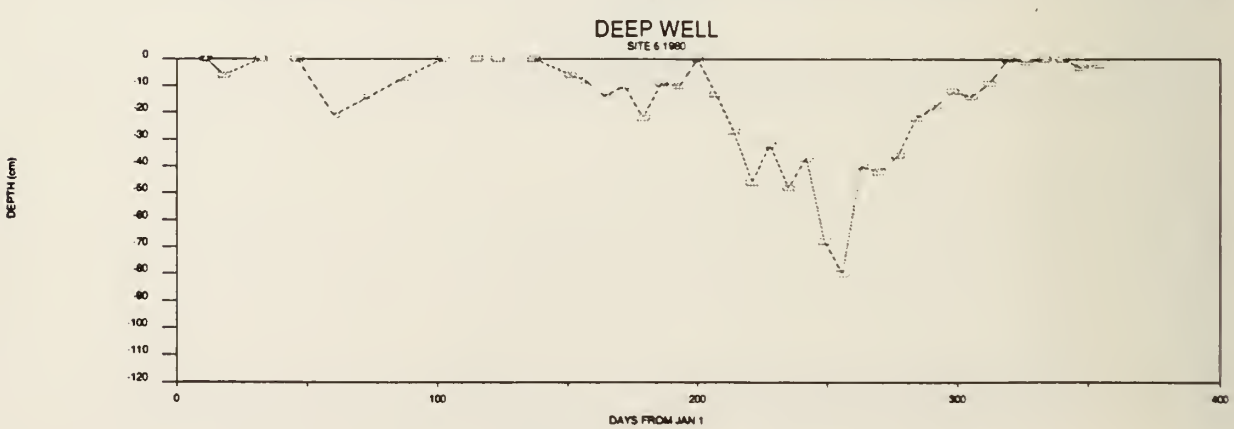
DEEP WELL
SITE 6 1980
DEPTH (cm)
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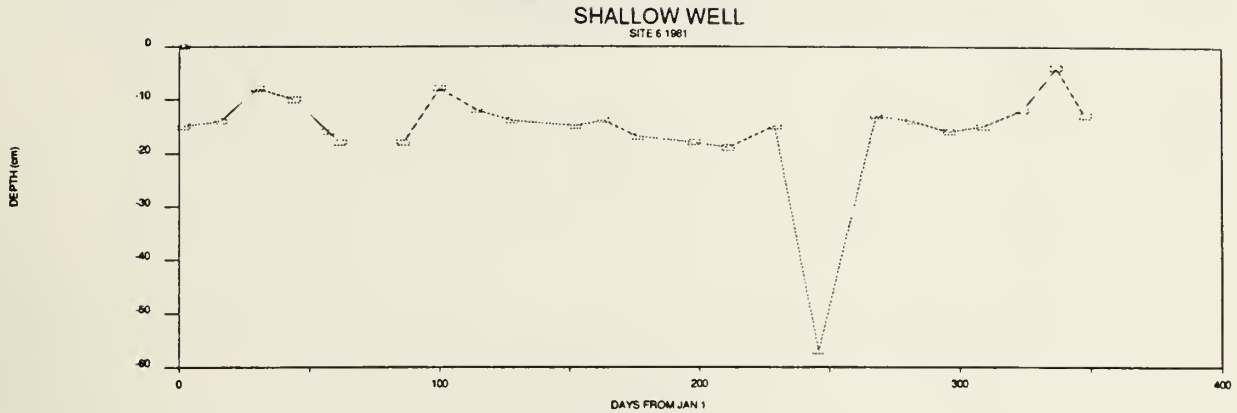
DAYS FROM JAN 1


SHALLOW WELL
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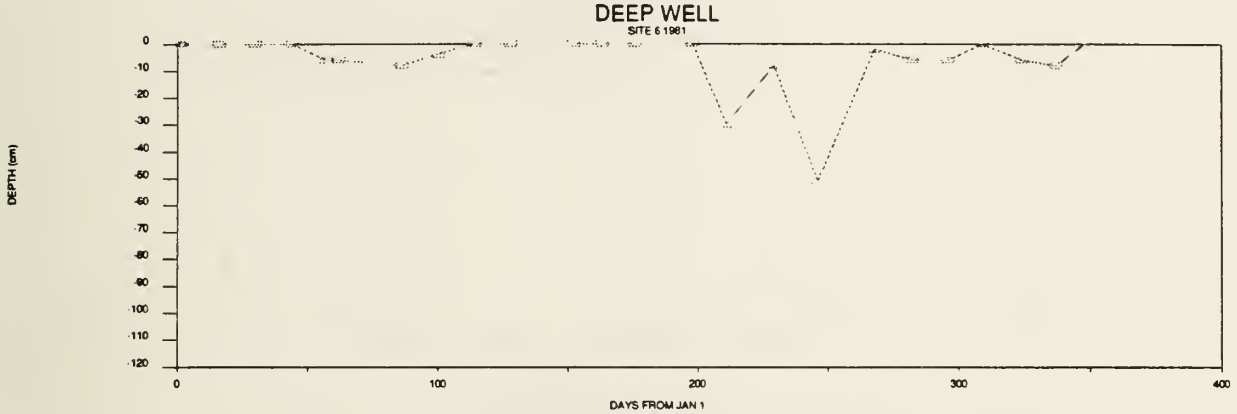
DAYS FROM JAN 1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SITE 6 1981
DEPTH (cm)
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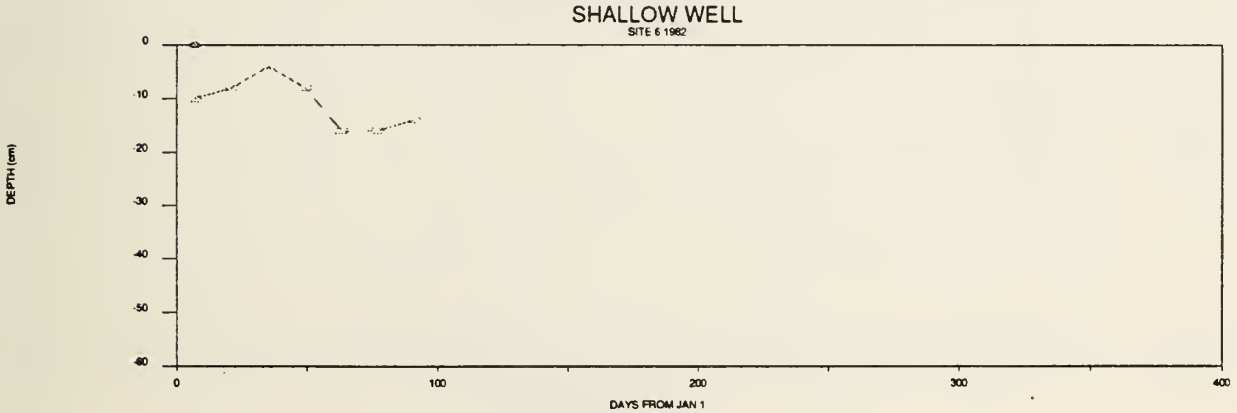
DAYS FROM JAN 1


SHALLOW WELL
SITE 6 1982
DEPTH (cm)
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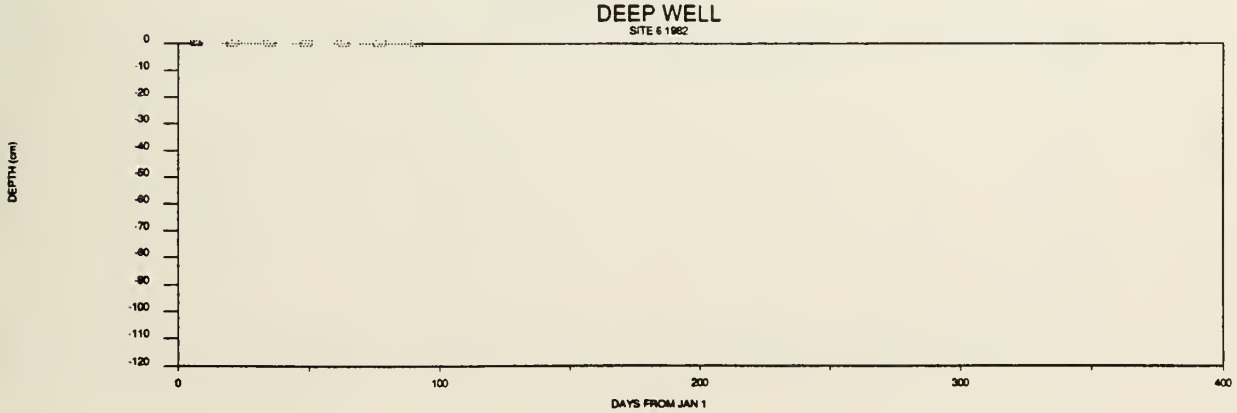
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DEPTH (cm)
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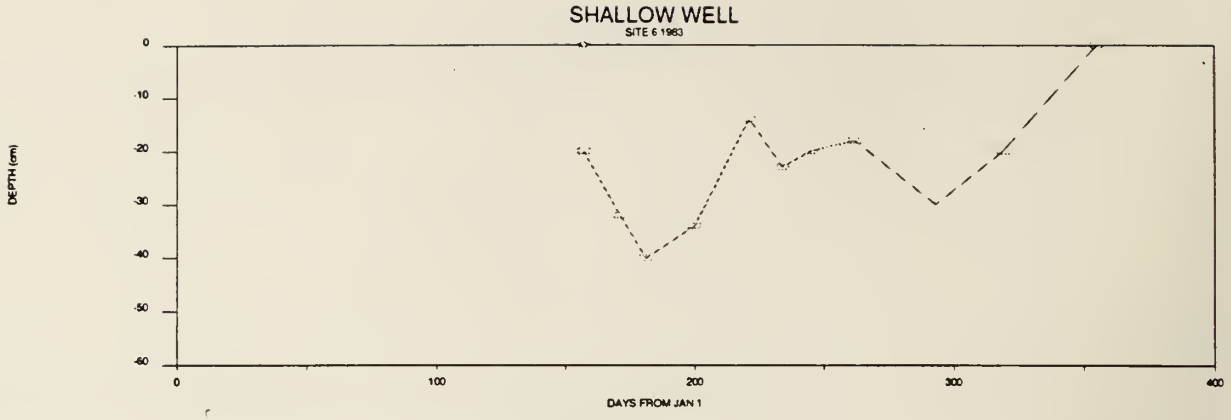
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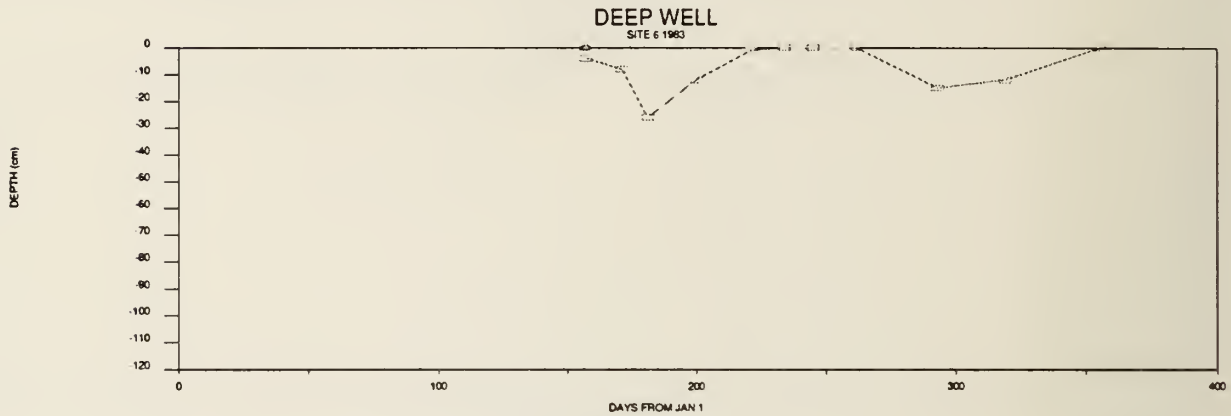
DAYS FROM JAN 1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DEPTH (cm)
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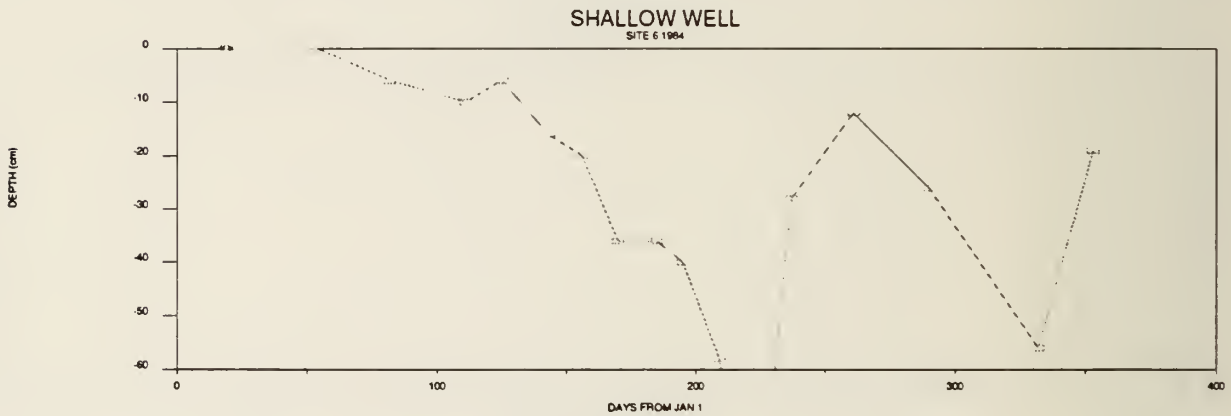
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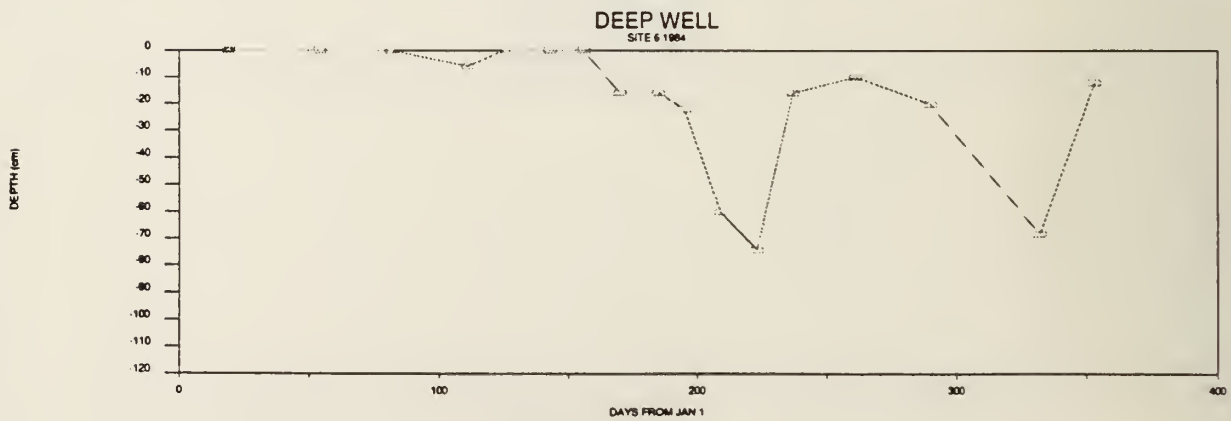
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DEPTH (cm)
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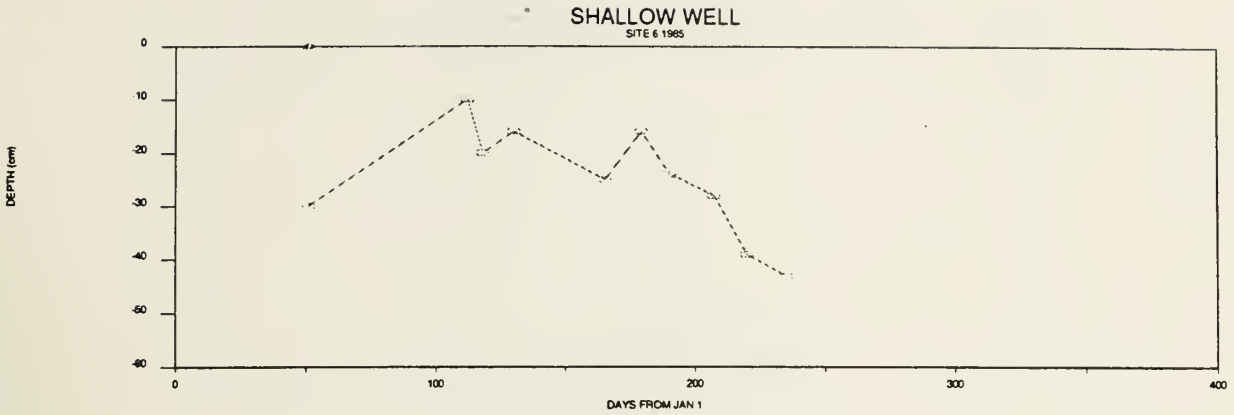
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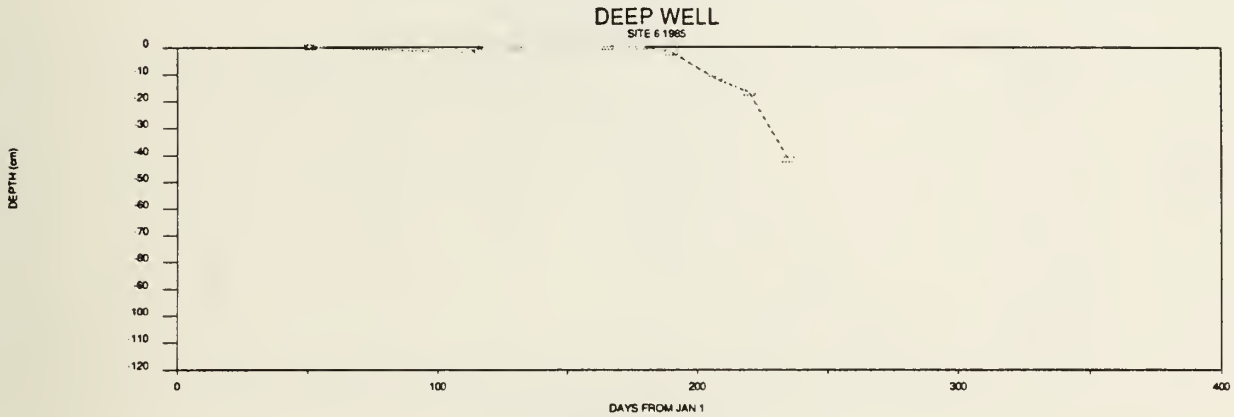
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DEPTH (cm)
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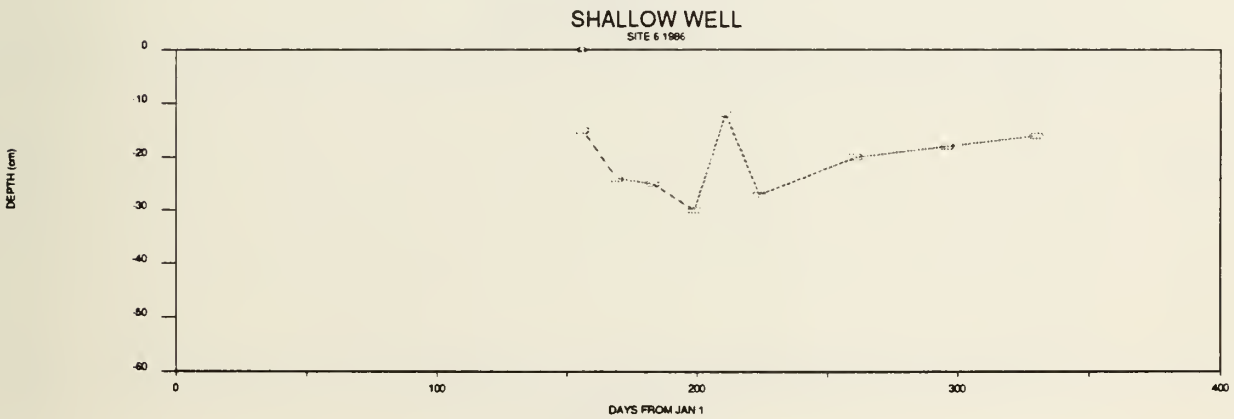
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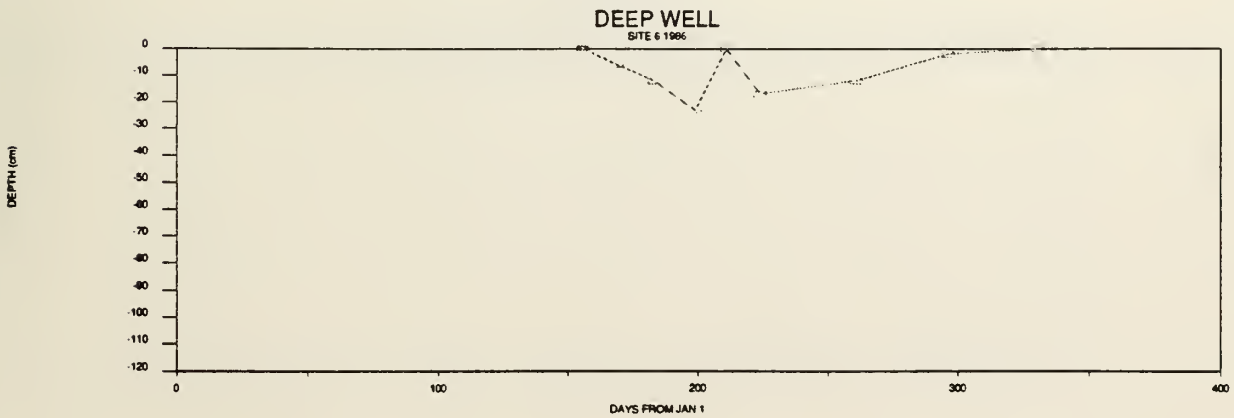
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DEPTH (cm)
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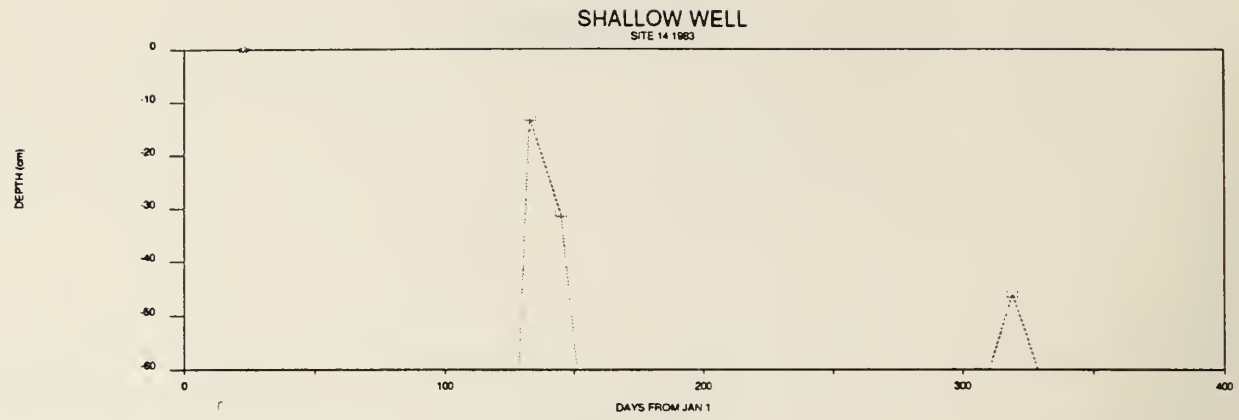
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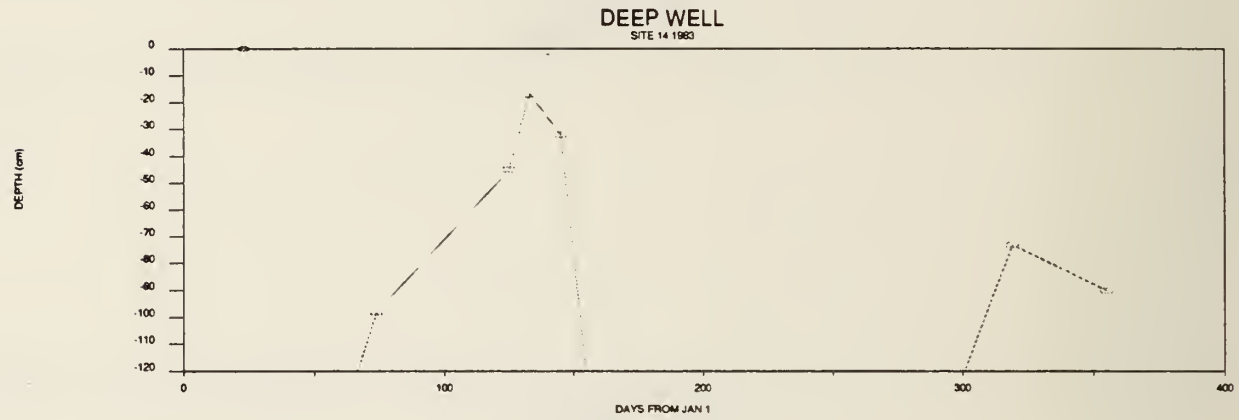
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SITE 14 1983
DEPTH (cm)
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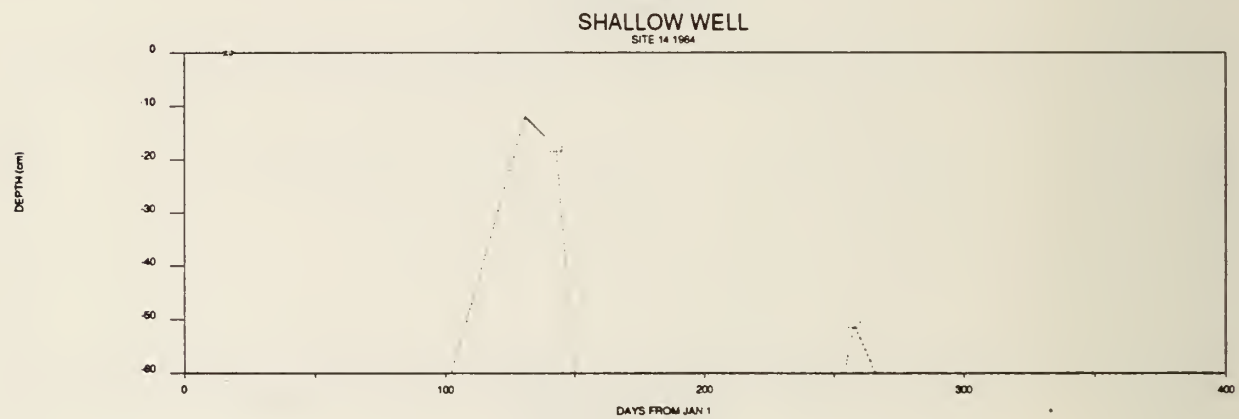
DAYS FROM JAN 1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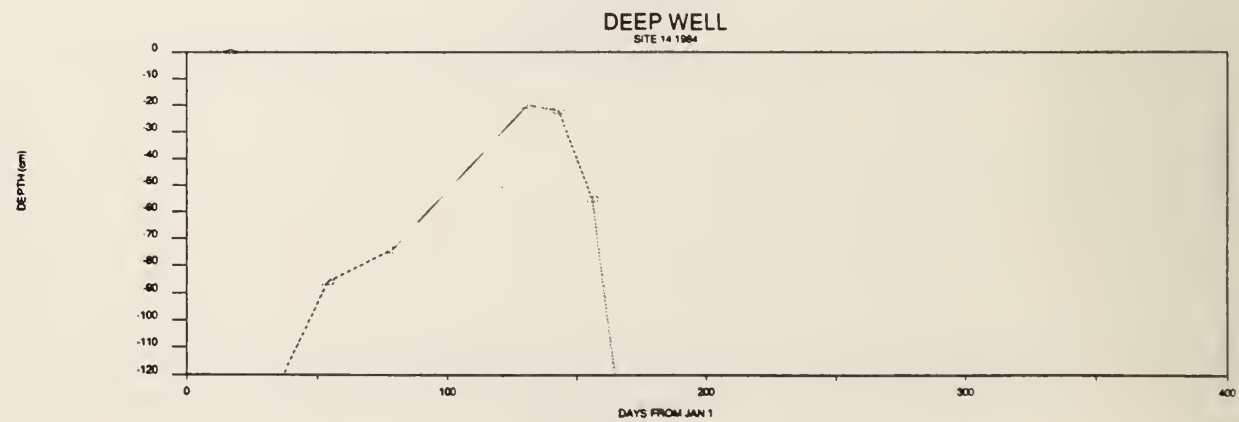
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DEPTH (cm)
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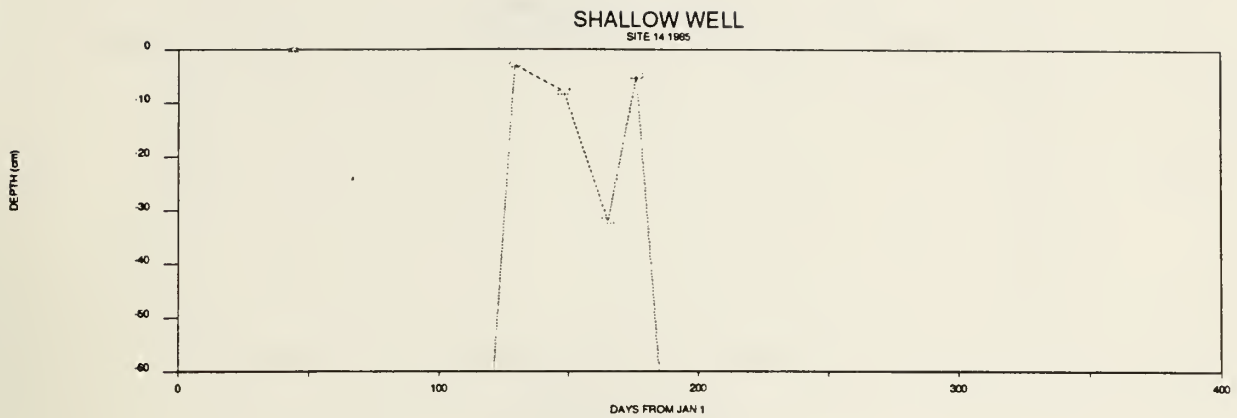
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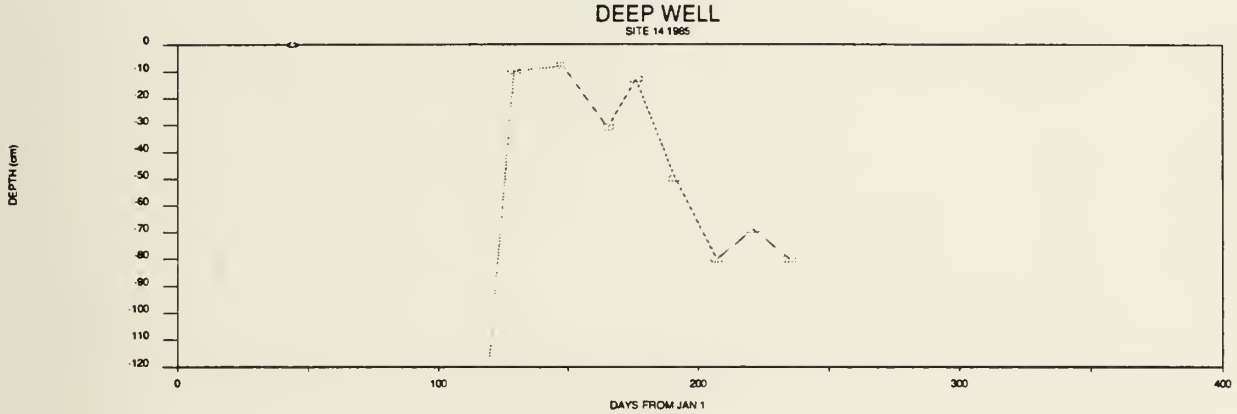
DAYS FROM JAN 1


DEEP WELL
SITE 14 1985
DEPTH (cm)
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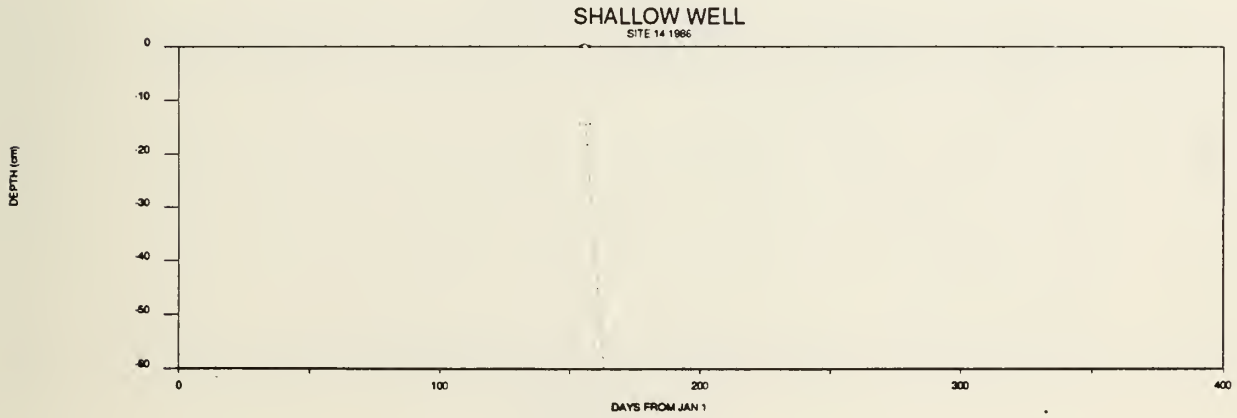
DAYS FROM JAN 1


SHALLOW WELL
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DEPTH (cm)
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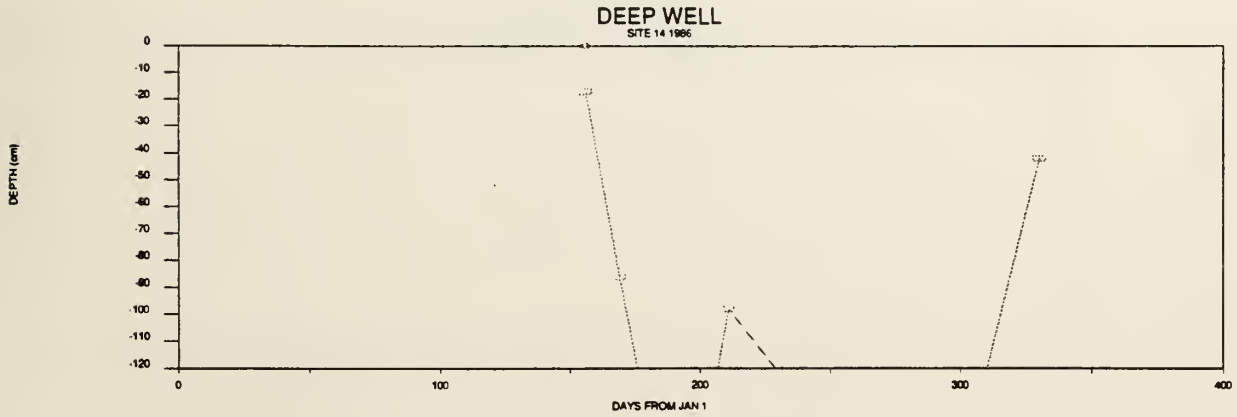
DAYS FROM JAN 1


DEEP WELL
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DEPTH (cm)
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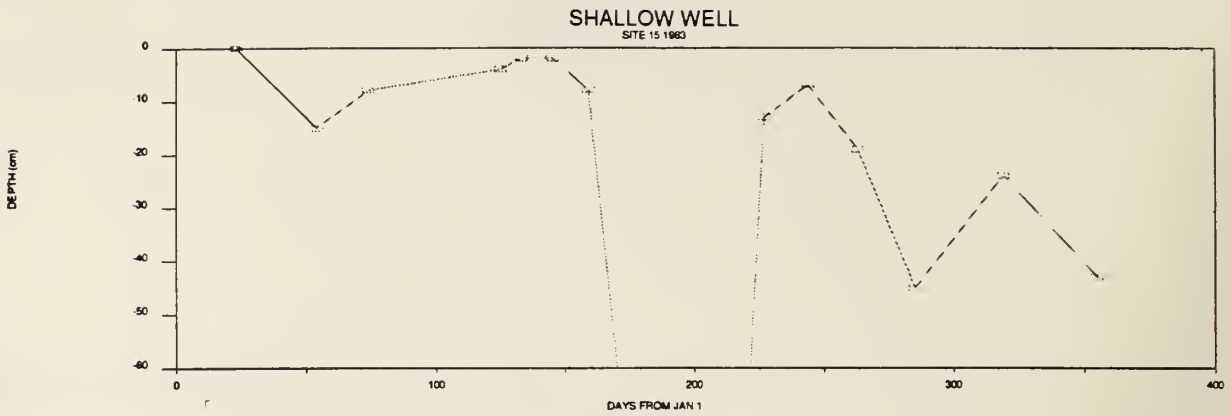
SHALLOW WELL
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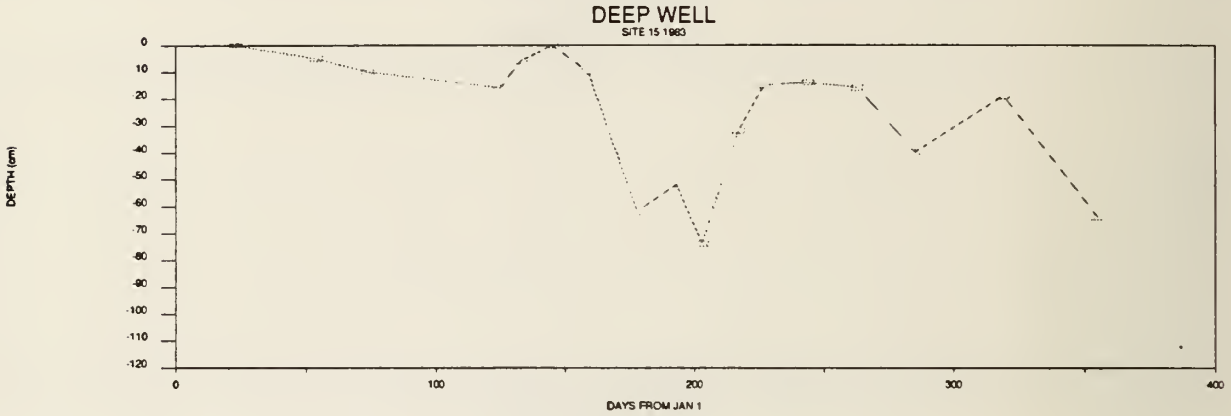
DAYS FROM JAN 1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DEPTH (cm)
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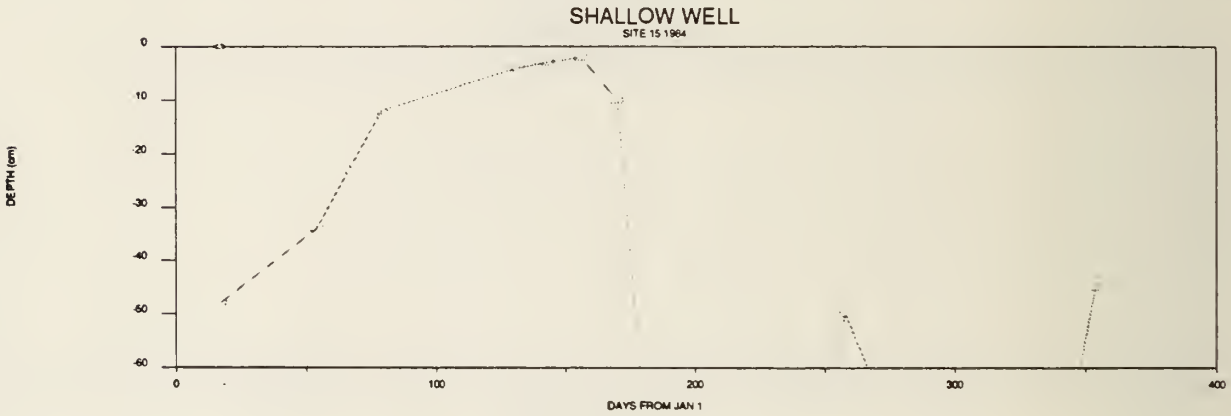
SHALLOW WELL
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DEPTH (cm)
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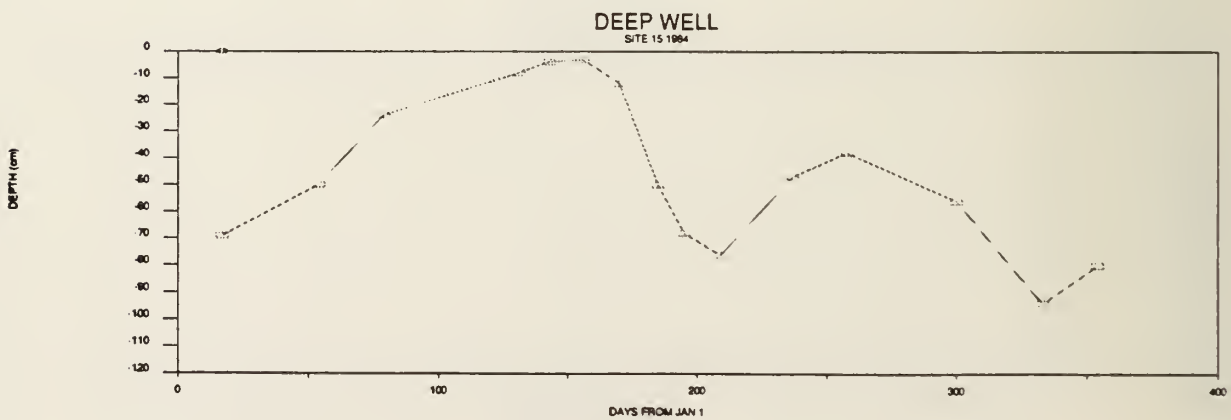
DAYS FROM JAN 1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SITE 15 1984
DEPTH (cm)
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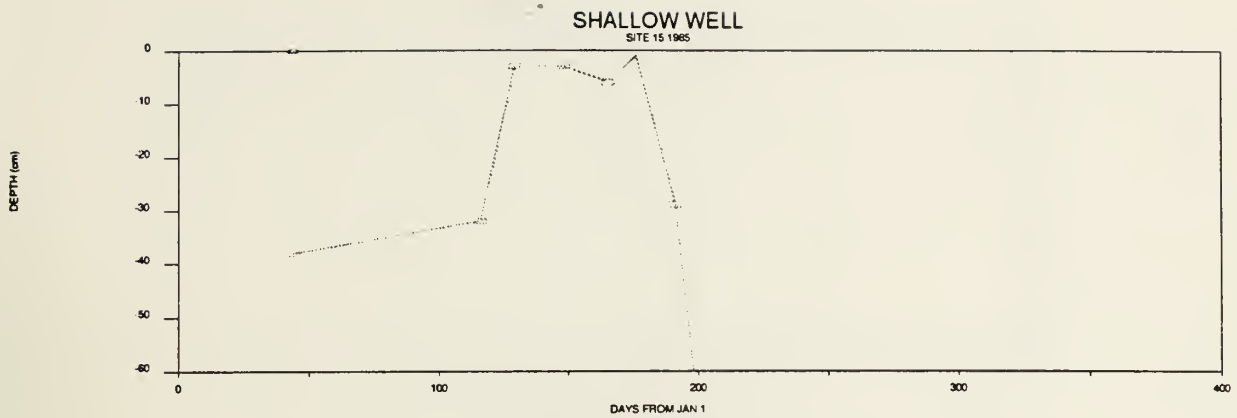
DAYS FROM JAN 1


SHALLOW WELL
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DEPTH (cm)
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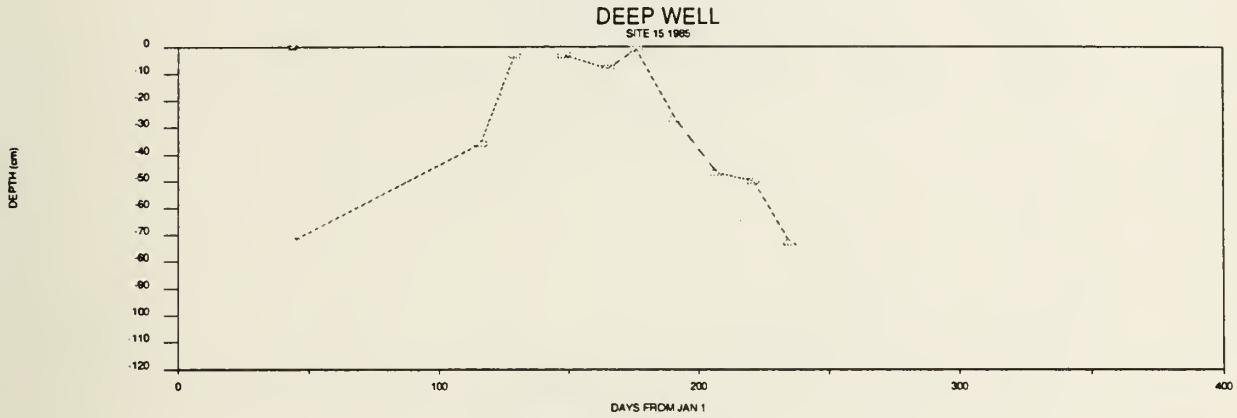
DAYS FROM JAN 1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DEPTH (cm)
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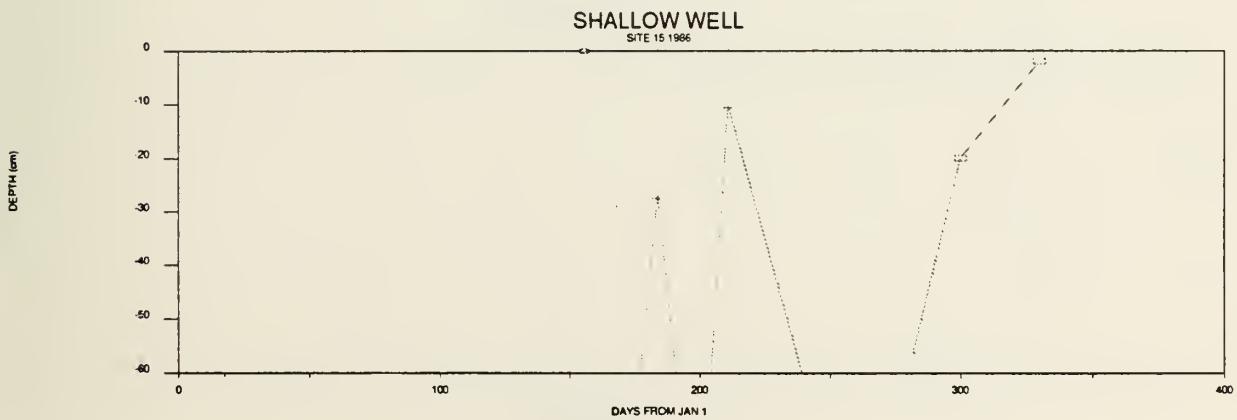
DAYS FROM JAN 1


SHALLOW WELL
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DEPTH (cm)
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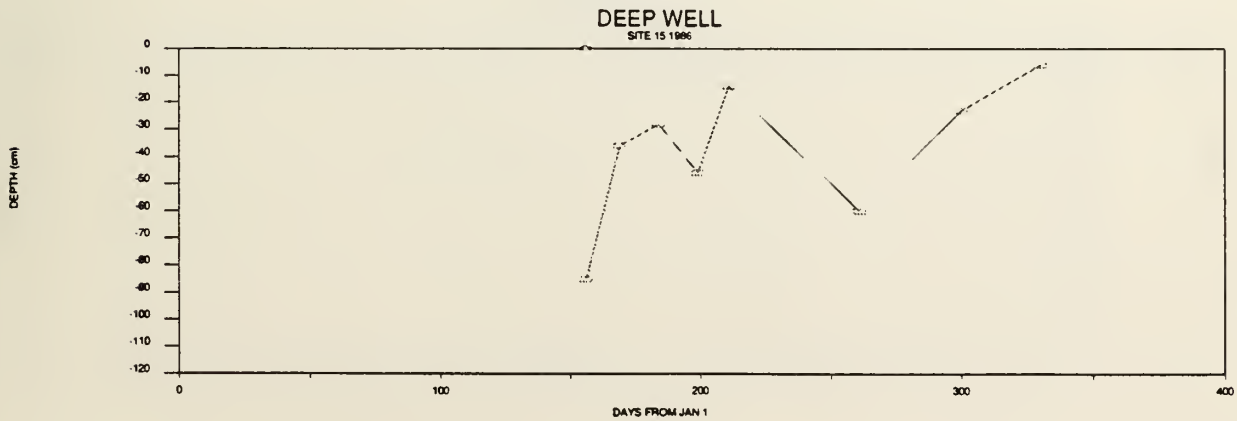
DAYS FROM JAN 1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DEPTH (cm)
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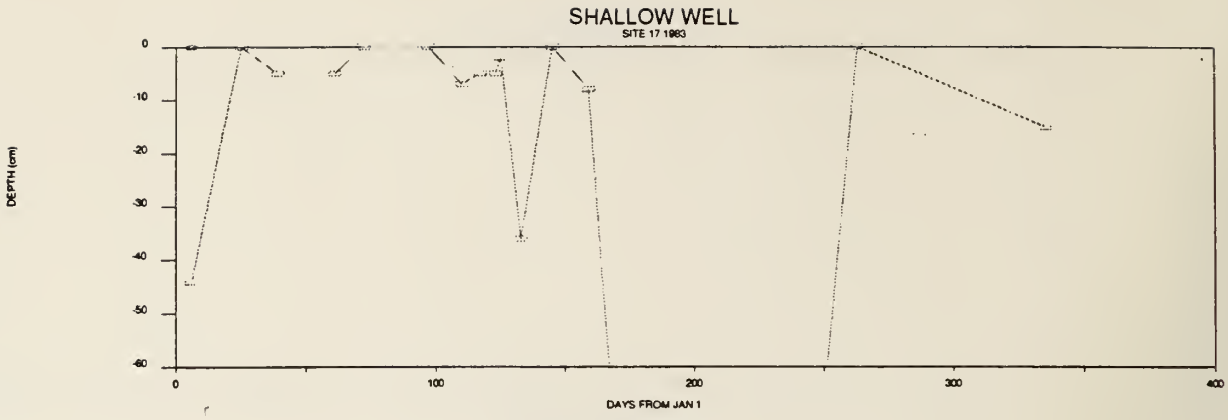
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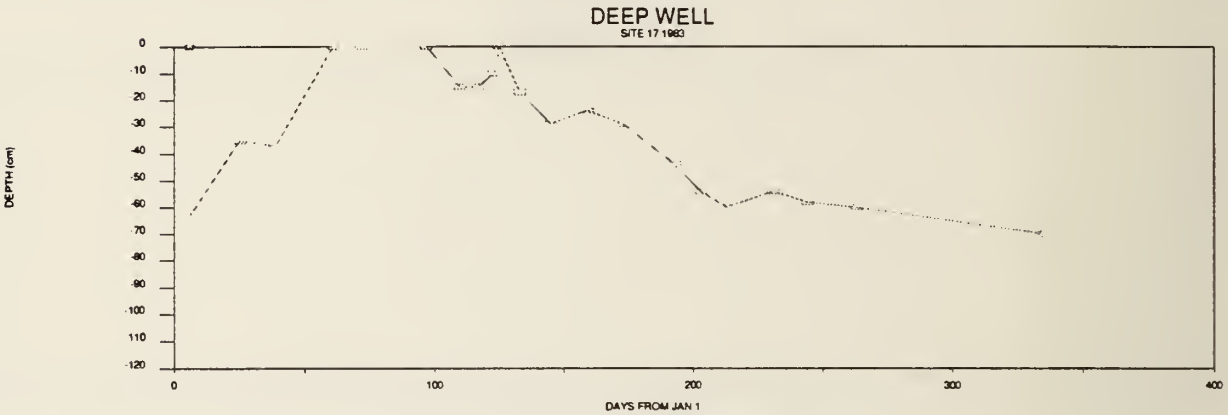
DAYS FROM JAN 1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DEPTH (cm)
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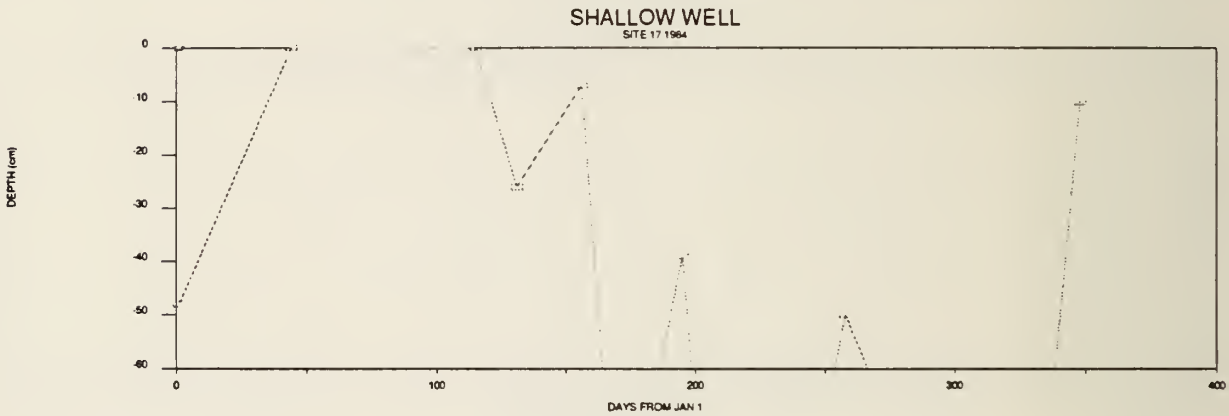
SHALLOW WELL
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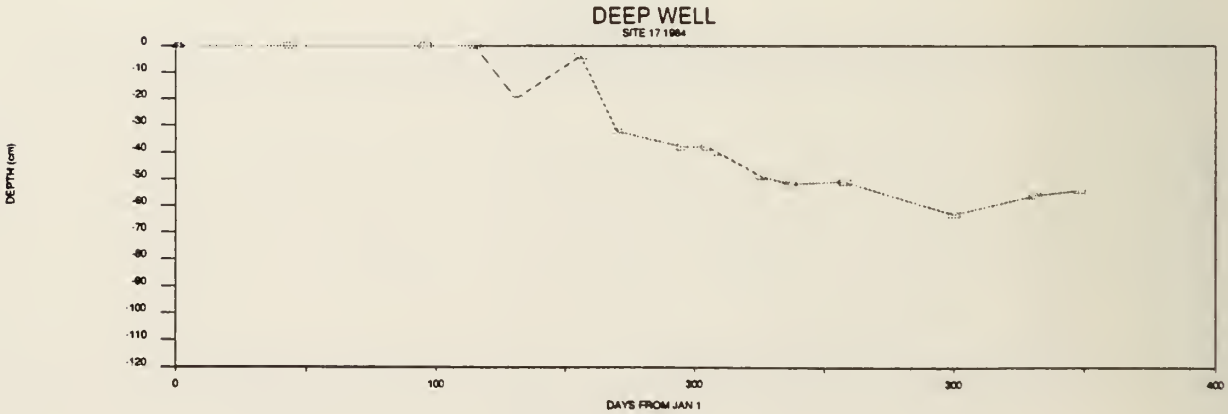
DAYS FROM JAN 1


DEEP WELL
SITE 17 1984
DEPTH (cm)
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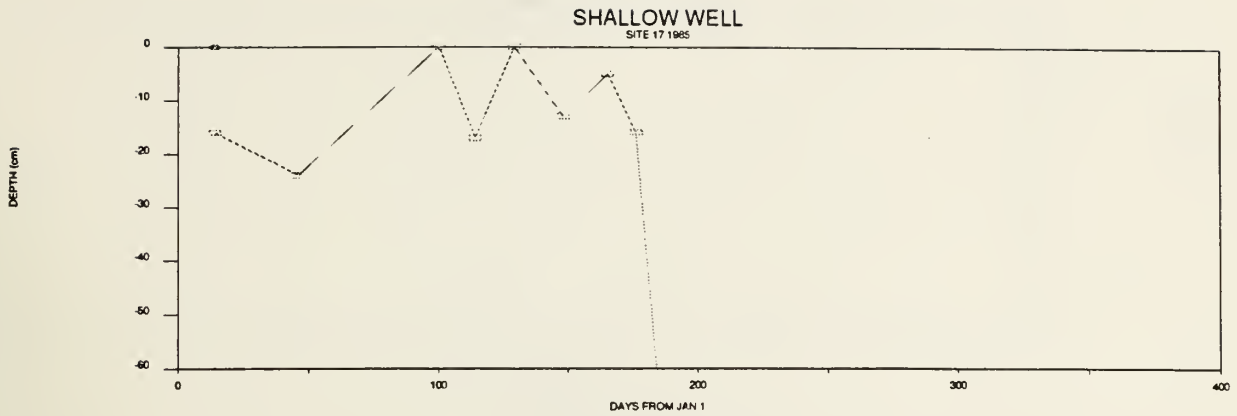
DAYS FROM JAN 1


SHALLOW WELL
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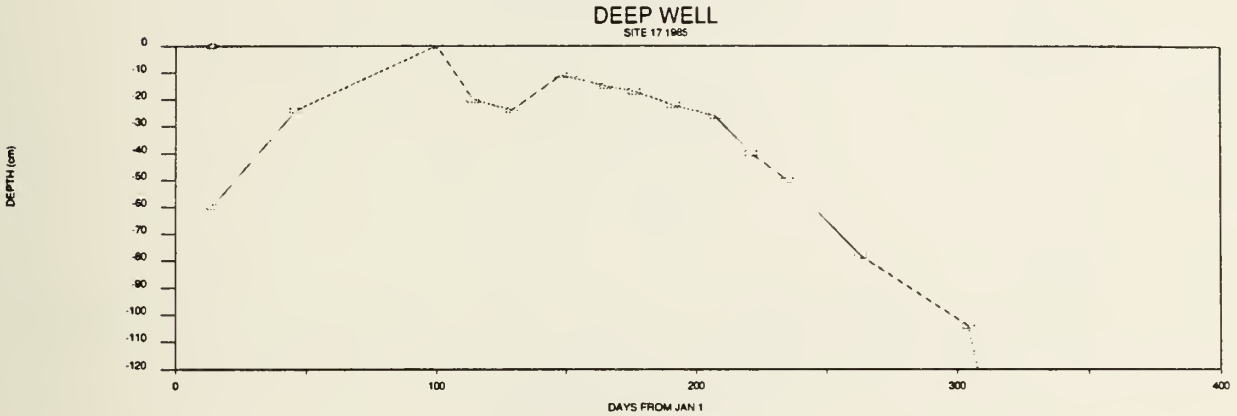
DAYS FROM JAN 1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SITE 17 1985
DEPTH (cm)
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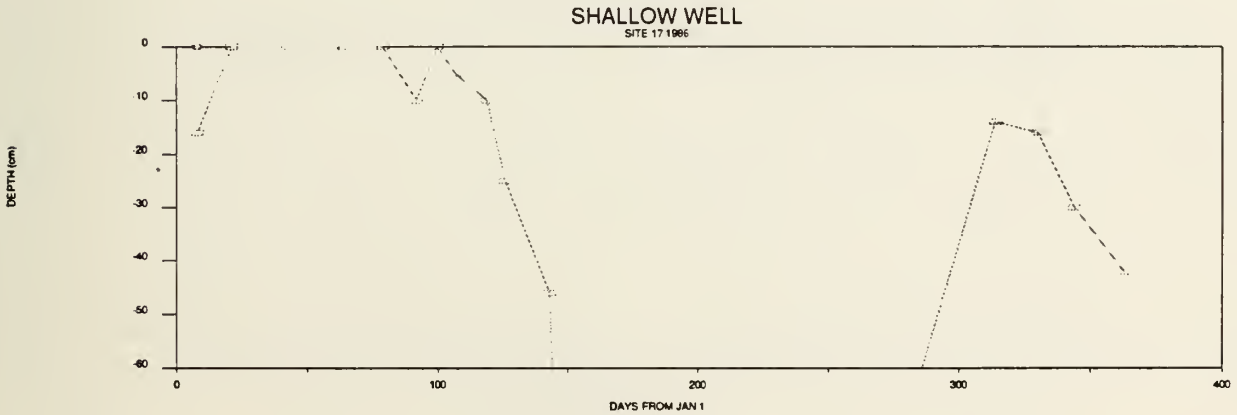
SHALLOW WELL
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DEPTH (cm)
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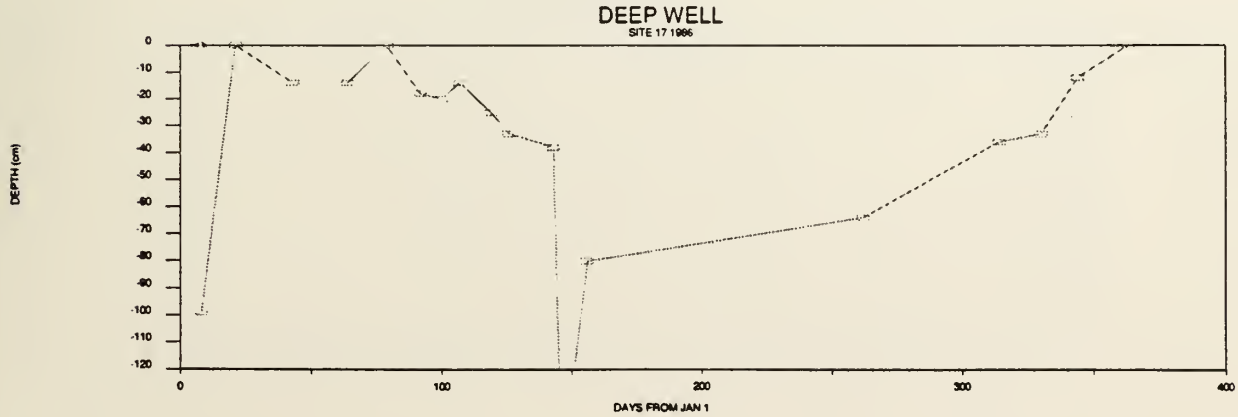
DAYS FROM JAN 1


DEEP WELL
SITE 17 1986
DEPTH (cm)
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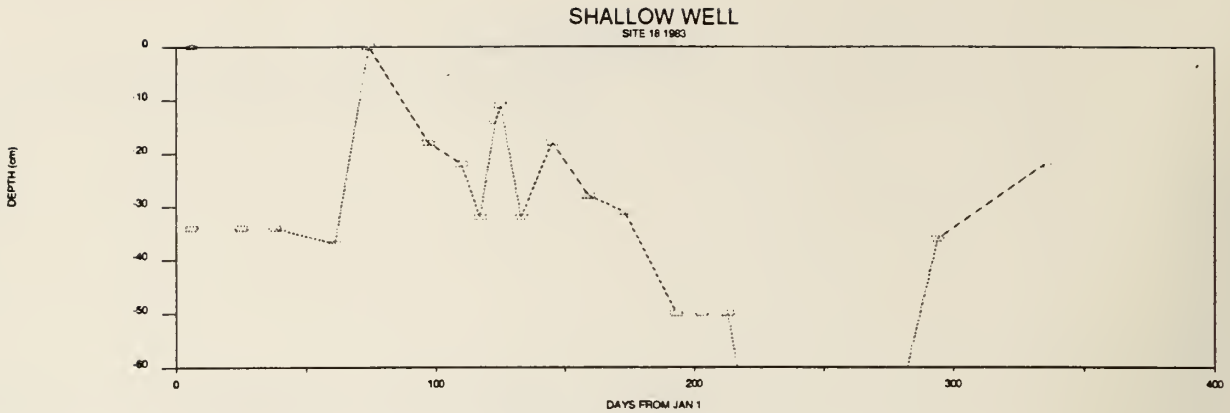
DAYS FROM JAN 1


SHALLOW WELL
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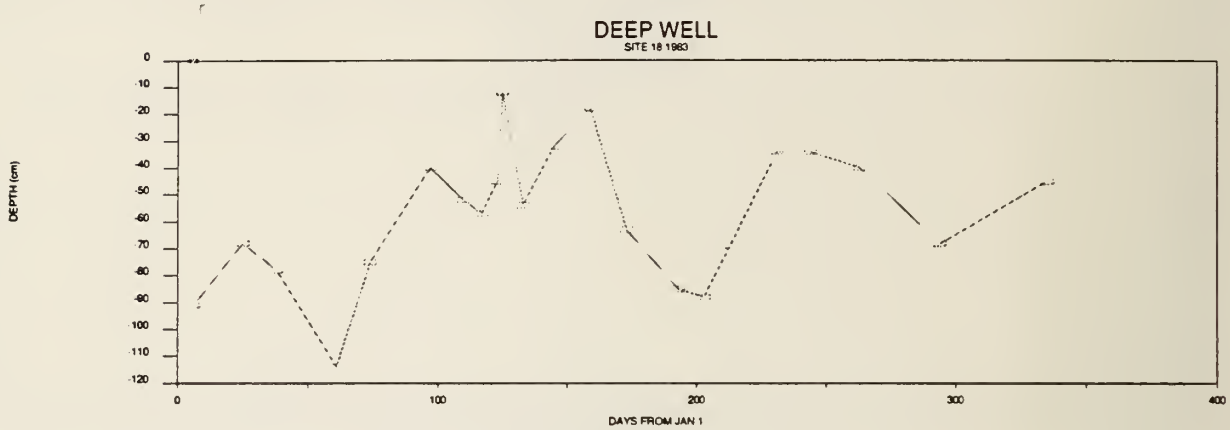
DAYS FROM JAN 1


DEEP WELL
SITE 18 1983
DEPTH (cm)
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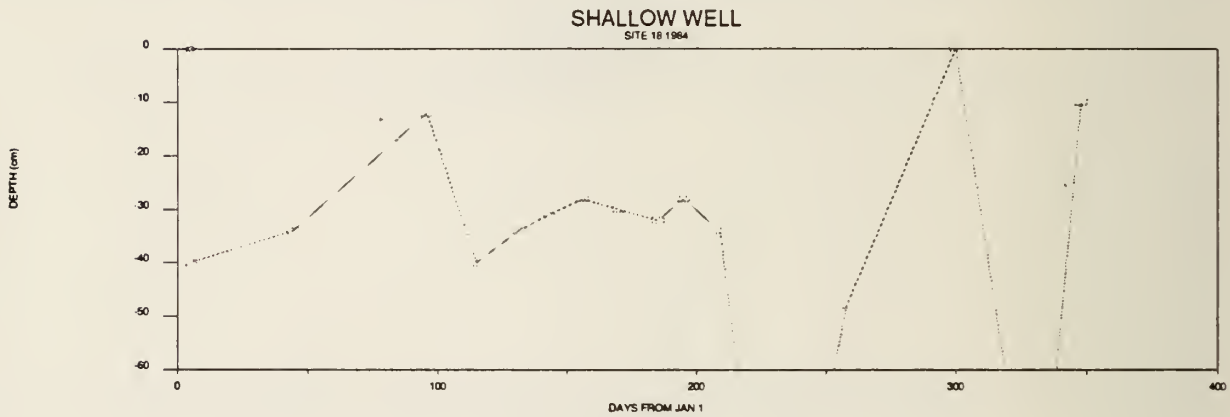
DAYS FROM JAN 1


SHALLOW WELL
SITE 18 1984
DEPTH (cm)
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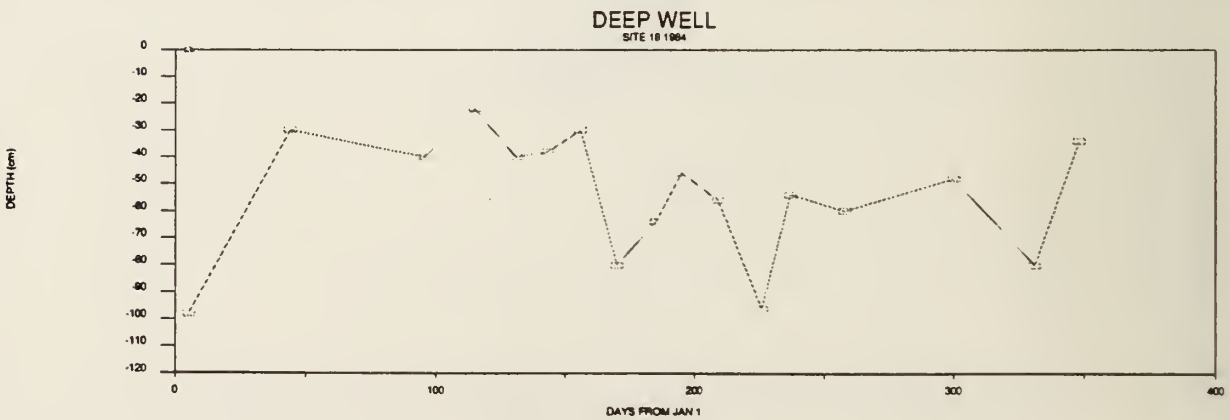
DAYS FROM JAN 1


DEEP WELL
SITE 18 1984
DEPTH (cm)
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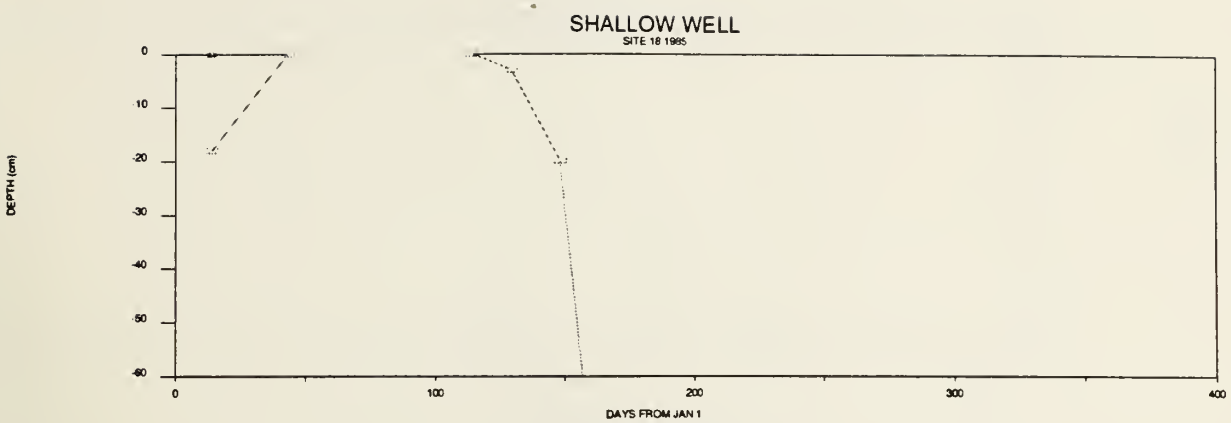
DAYS FROM JAN 1


SHALLOW WELL
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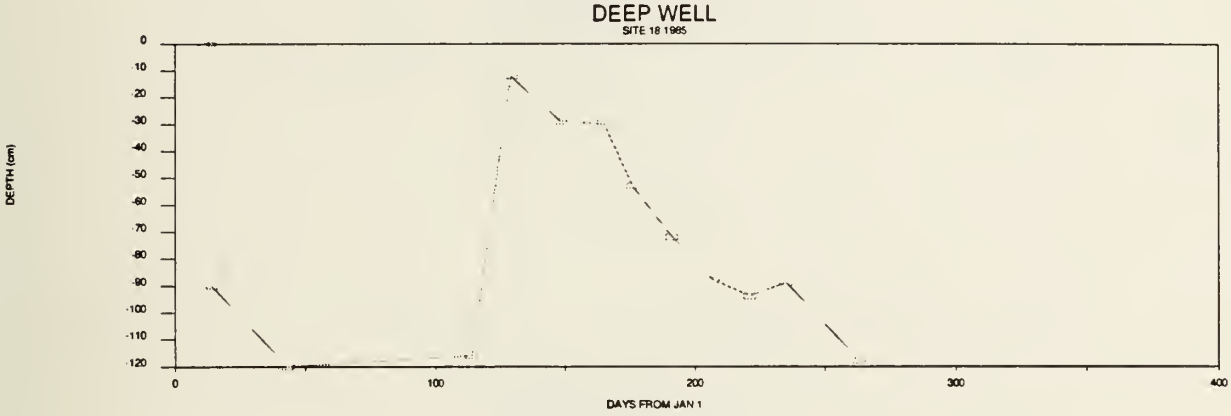
DAYS FROM JAN 1


DEEP WELL
SITE 18 1985
DEPTH (cm)
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-10
-20
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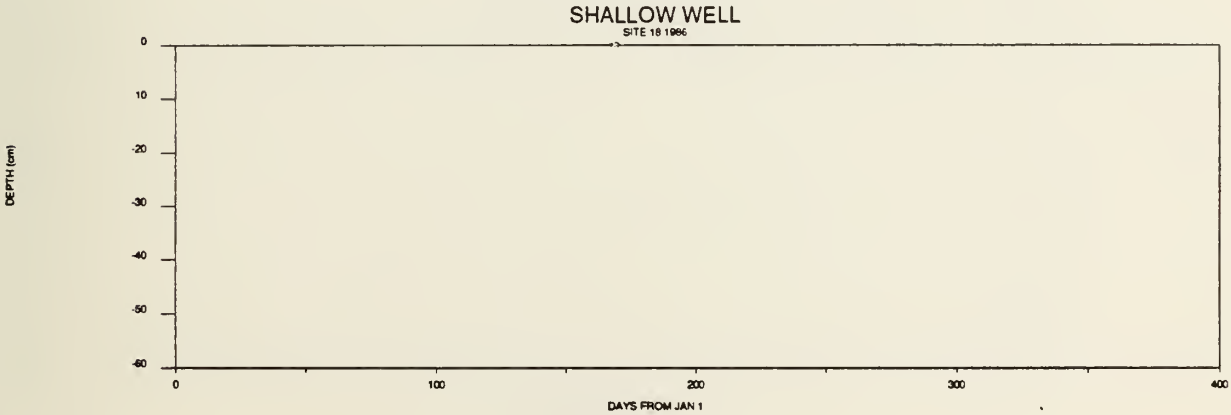
400
DAYS FROM JAN 1


SHALLOW WELL
SITE 18 1986
DEPTH (cm)
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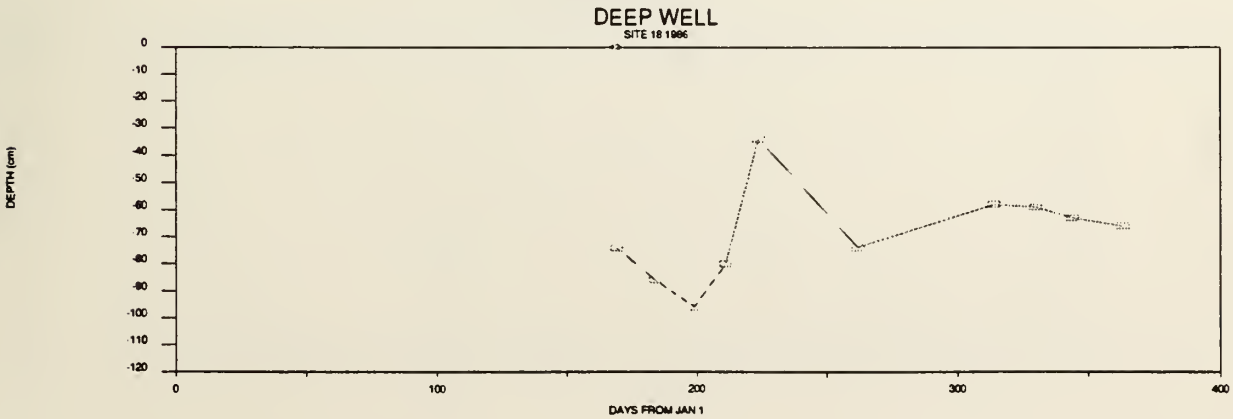
DAYS FROM JAN 1


DEEP WELL
SITE 18 1986
DEPTH (cm)
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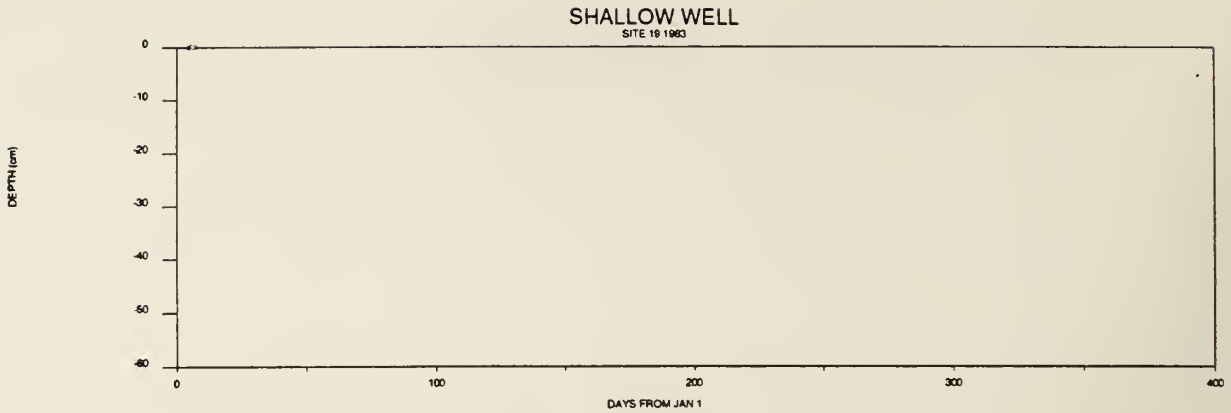
DAYS FROM JAN 1


SHALLOW WELL
SITE 19 1983
DEPTH (cm)
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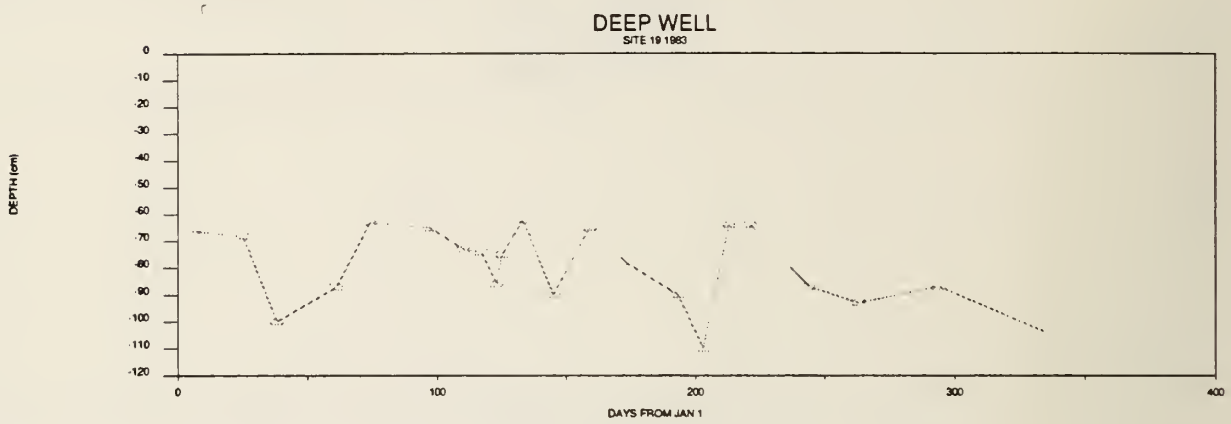
DAYS FROM JAN 1


DEEP WELL
SITE 19 1983
DEPTH (cm)
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-10
-20
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-50
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-80
-90
-100
-110
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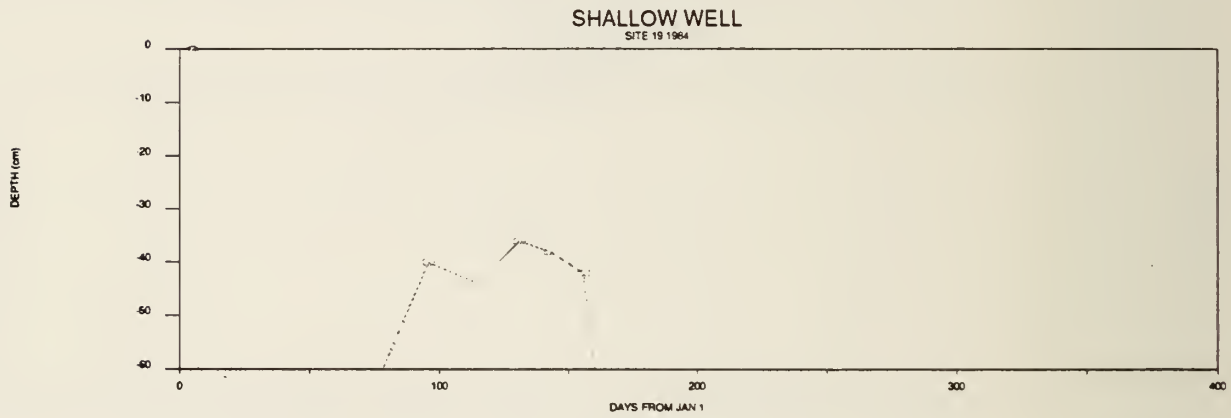
0
100
200
300
400
DAYS FROM JAN 1


SHALLOW WELL
SITE 19 1984
DEPTH (cm)
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-40
-50
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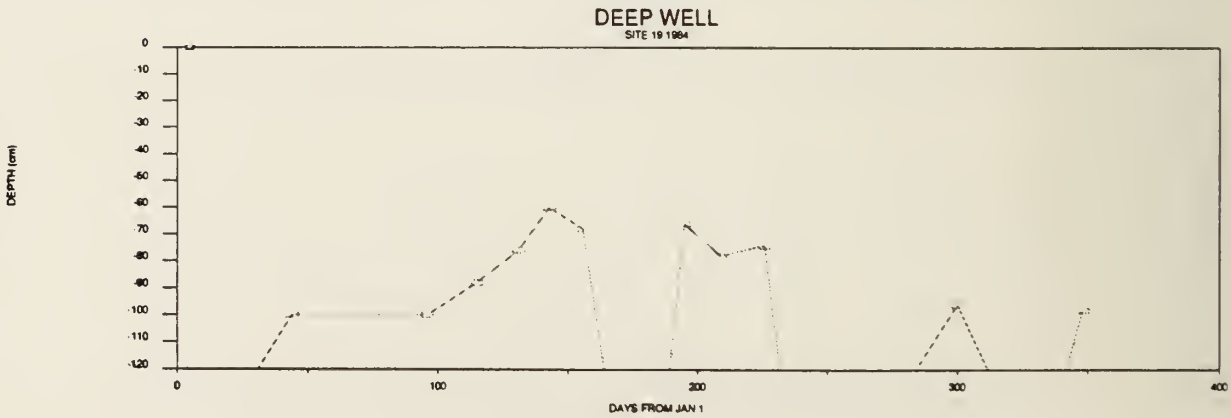
0
100
200
300
400
DAYS FROM JAN 1


DEEP WELL
SITE 19 1984
DEPTH (cm)
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-10
-20
-30
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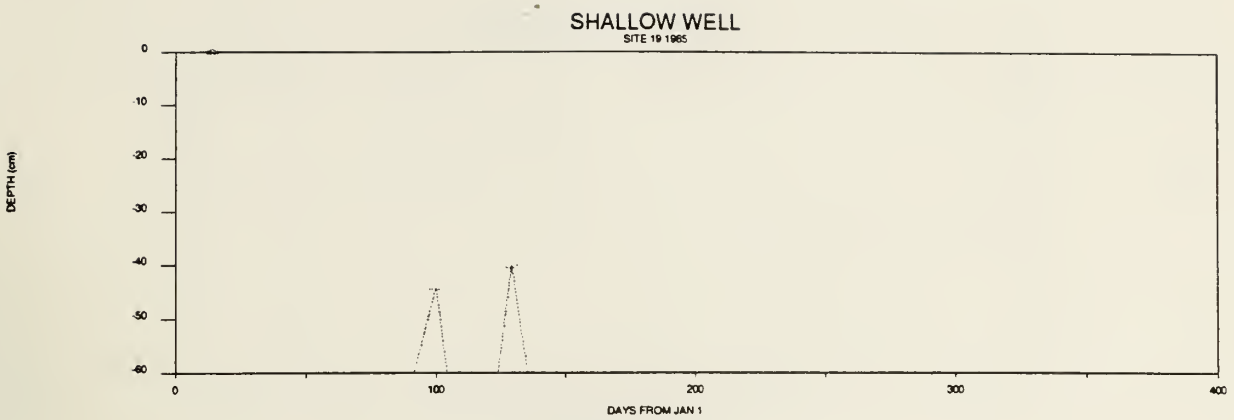
-80
-90
-100
-110
-120
0
100
200
300
400
DAYS FROM JAN 1


SHALLOW WELL
SITE 19 1985
DEPTH (cm)
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-40
-50
-60
0
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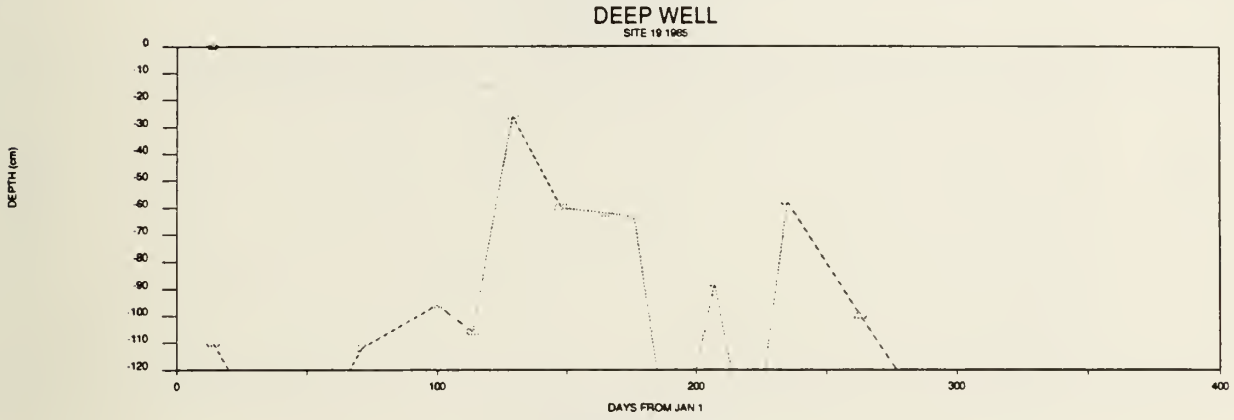
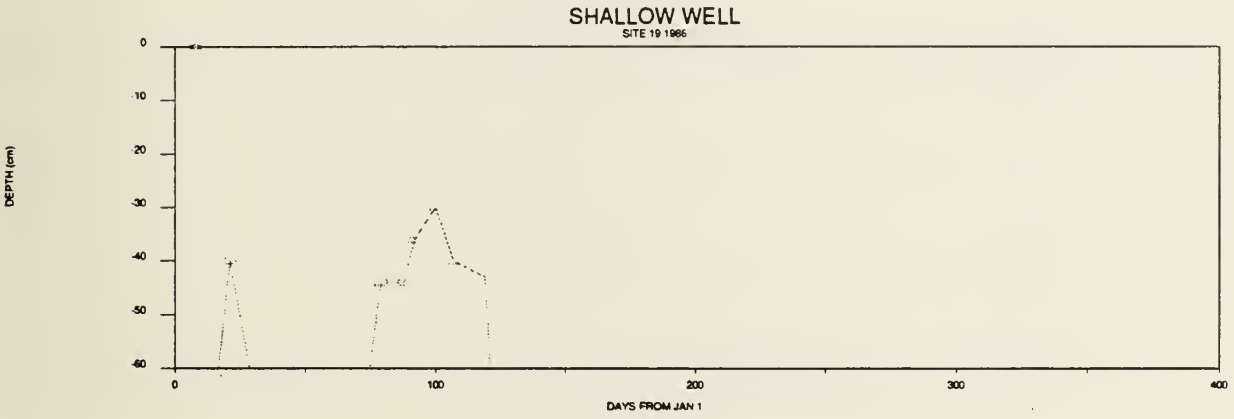
200
300
400
DAYS FROM JAN 1


DEEP WELL
SITE 19 1985
DEPTH (cm)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
0
100
200
300
400
DAYS FROM JAN 1


SHALLOW WELL
SITE 19 1986
DEPTH (cm)
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-10
-20
-30
-40
-50
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0
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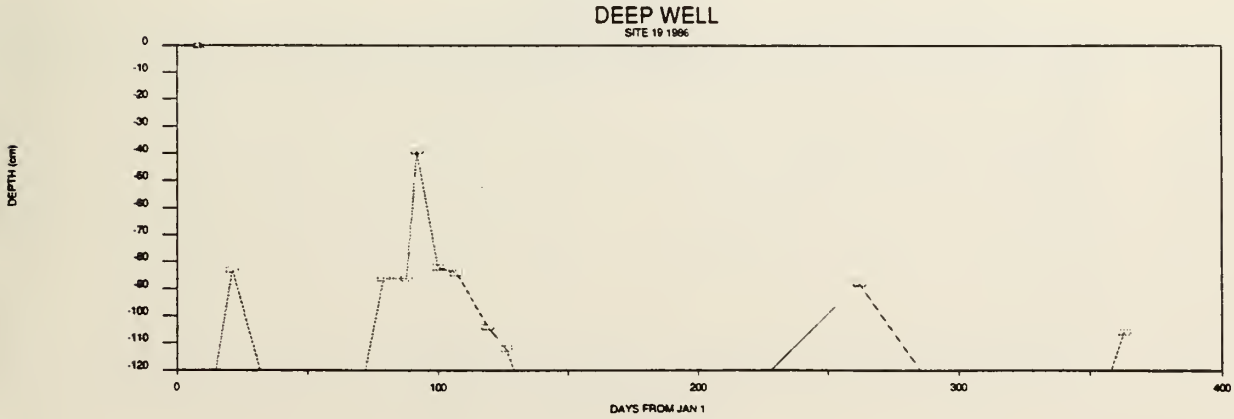
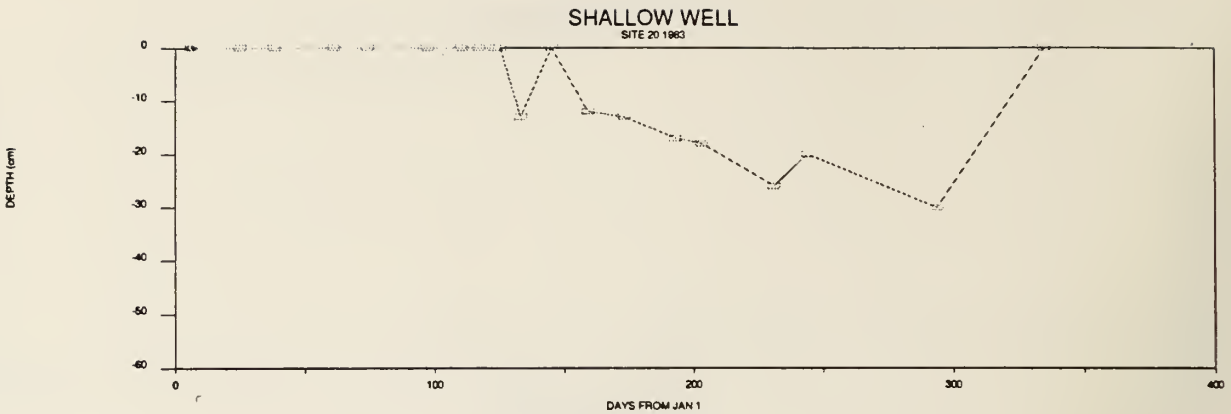
300
400
DAYS FROM JAN 1


DEEP WELL
SITE 19 1986
DEPTH (cm)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
0
100
200
300
400
DAYS FROM JAN 1


SHALLOW WELL
SITE 20 1983
DEPTH (cm)
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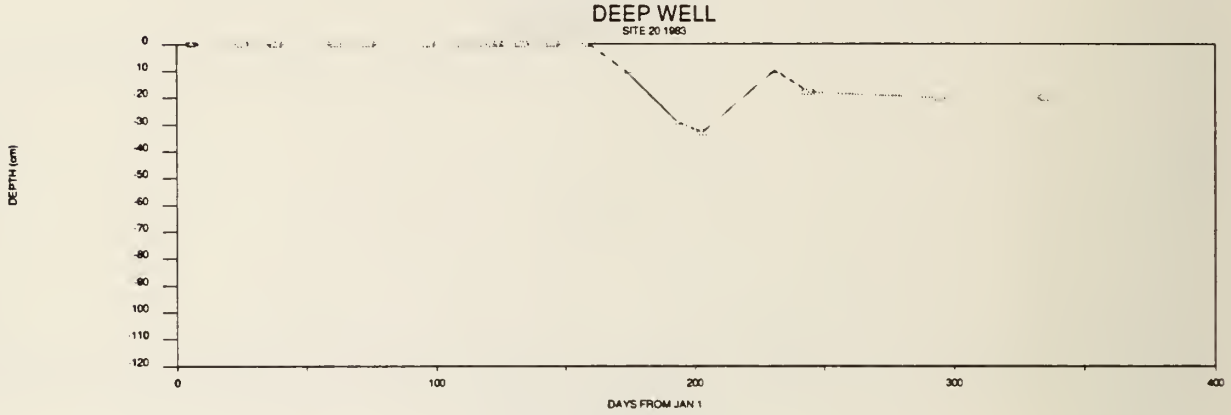
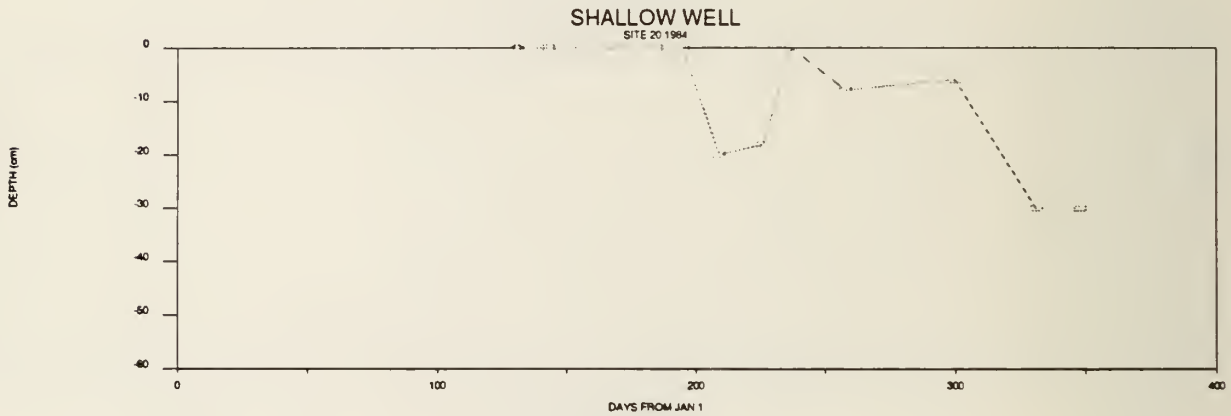
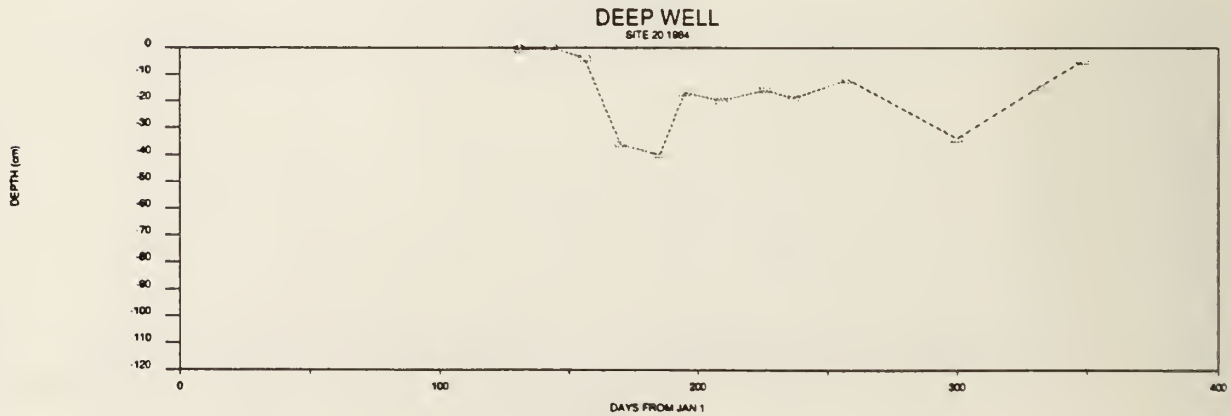
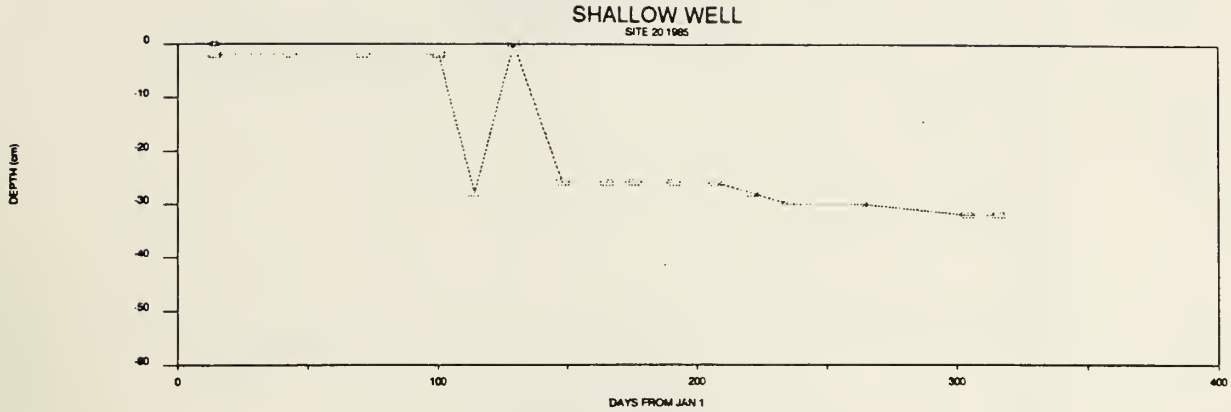
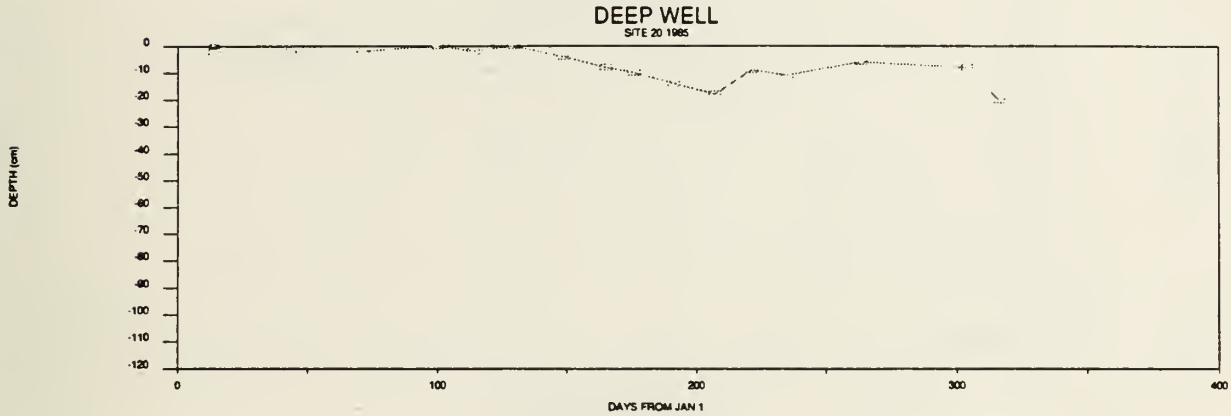
-10
-20
-30
-40
-50
-60
0
100
200
300
400
DAYS FROM JAN 1

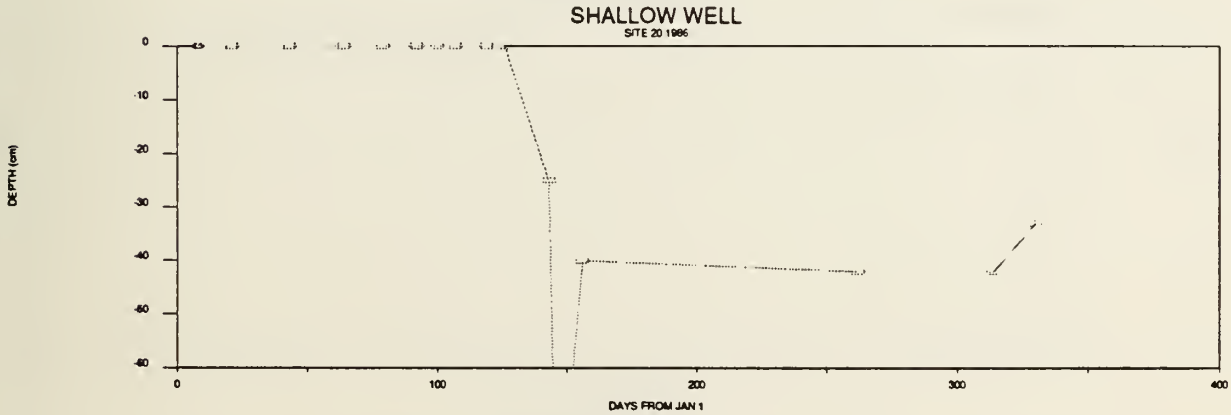

DEEP WELL
SITE 20 1983
DEPTH (cm)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
0
100
200
300
400
DAYS FROM JAN 1

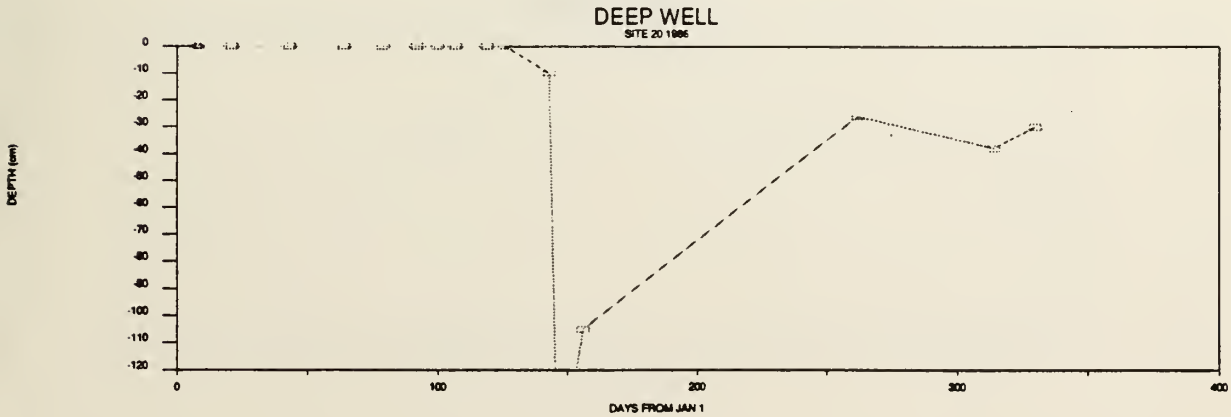

SHALLOW WELL
SITE 20 1984
DEPTH (cm)
0
-10
-20
-30
-40
-50
-60
0
100
200
300
400
DAYS FROM JAN 1

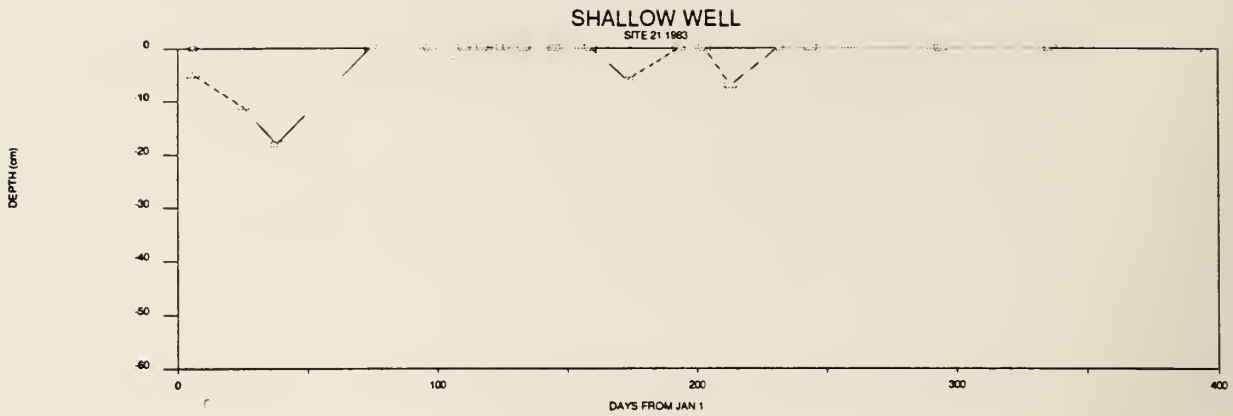

DEEP WELL
SITE 20 1984
DEPTH (cm)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
110
-120
0
100
200
300
400
DAYS FROM JAN 1

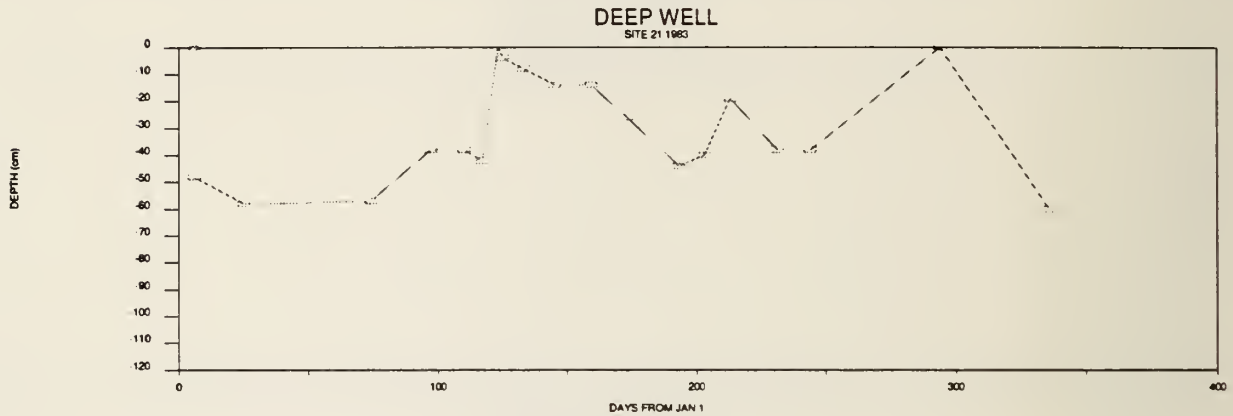

SHALLOW WELL
SITE 20 1985
DEPTH (cm)
0
-10
-20
-30
-40
-50
-60
0
100
200
300
400
DAYS FROM JAN 1

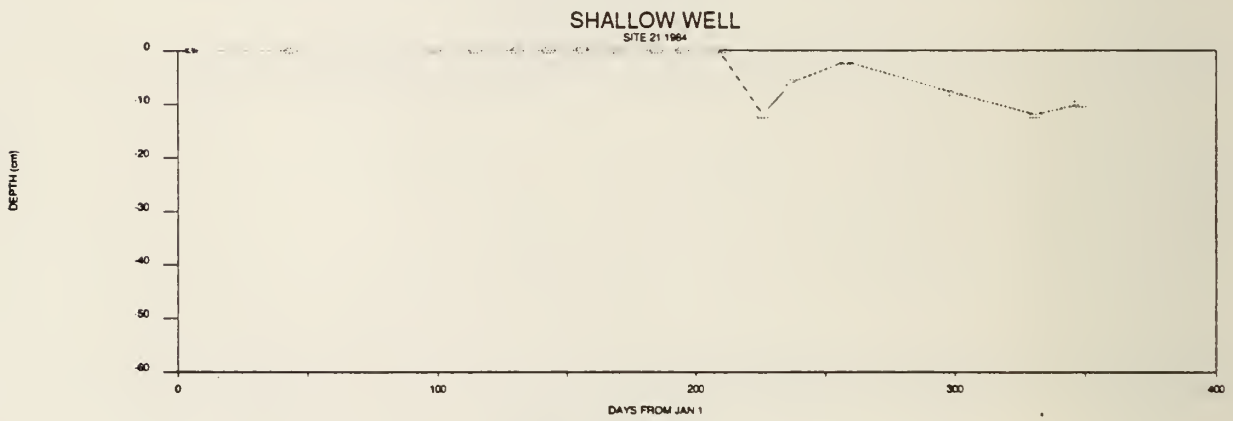

DEEP WELL
SITE 20 1985
DEPTH (cm)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
0
100
200
300
400
DAYS FROM JAN 1

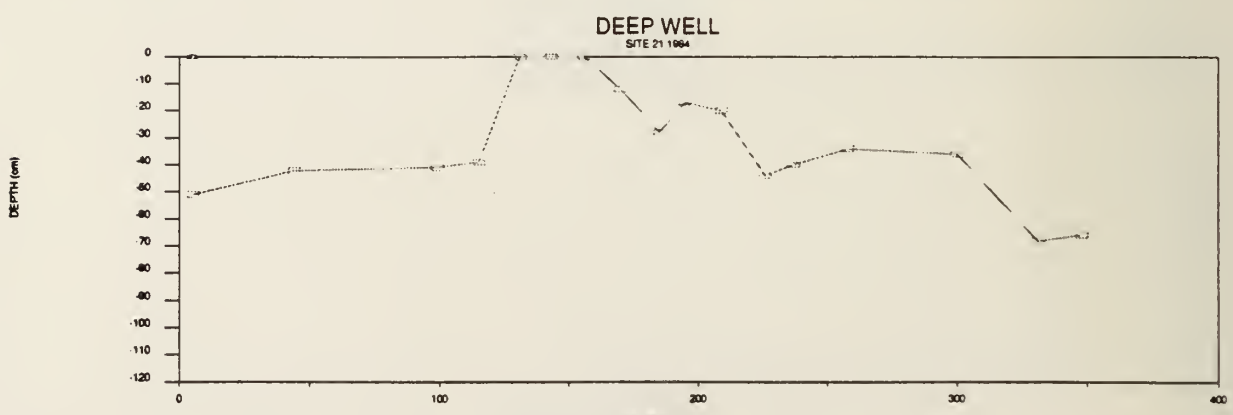

SHALLOW WELL
SITE 20 1986
DEPTH (cm)
0
-10
-20
-30
-40
-50
-60
0
100
200
300
400
DAYS FROM JAN 1

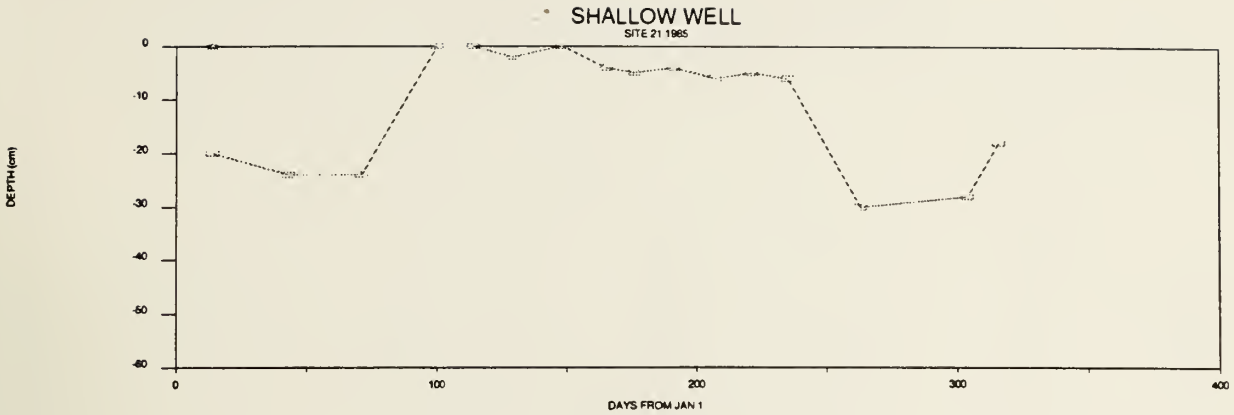

DEEP WELL
SITE 20 1986
DEPTH (cm)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
0
100
200
300
400
DAYS FROM JAN 1

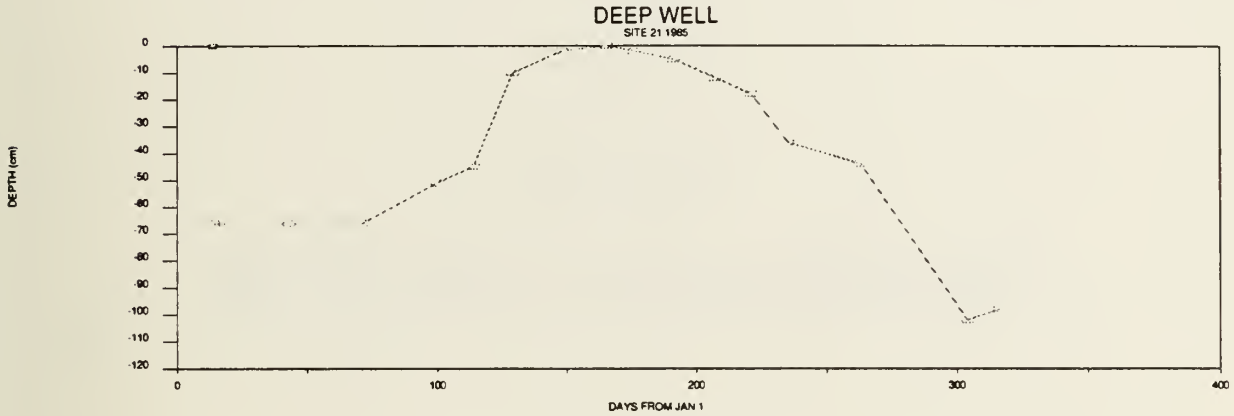

SHALLOW WELL
SITE 21 1983
DEPTH (cm)
0
-10
-20
-30
-40
-50
-60
0
100
200
300
400
DAYS FROM JAN 1

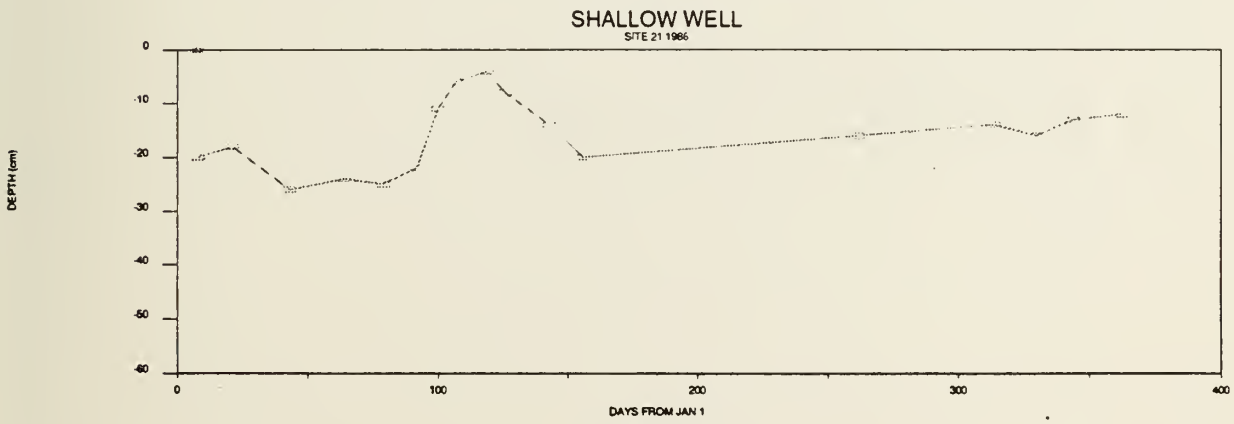

DEEP WELL
SITE 21 1983
DEPTH (cm)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
0
100
200
300
400
DAYS FROM JAN 1

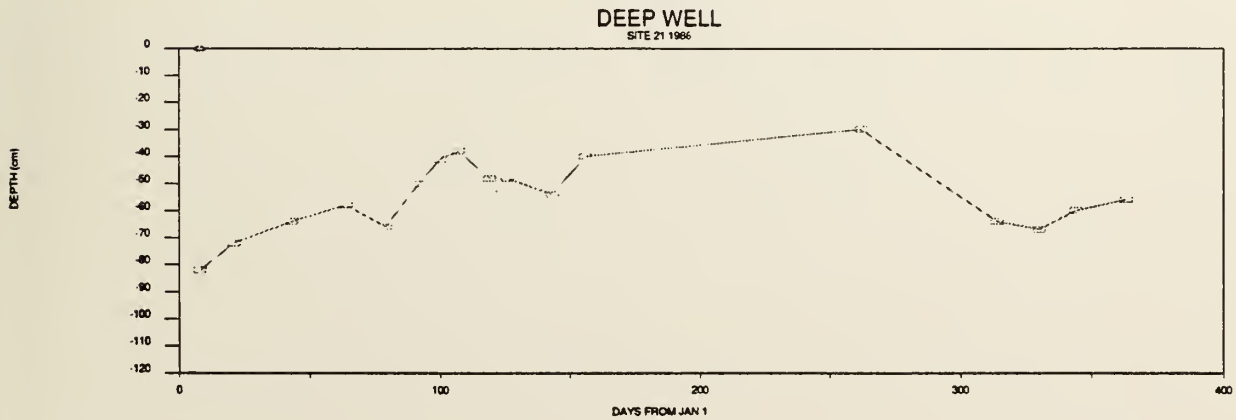

SHALLOW WELL
SITE 21 1984
DEPTH (cm)
0
-10
-20
-30
-40
-50
-60
0
100
200
300
400
DAYS FROM JAN 1


DEEP WELL
SITE 21 1984
DEPTH (cm)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
0
100
200
300
400
DAYS FROM JAN 1


SHALLOW WELL
SITE 21 1985
DEPTH (cm)
0
-10
-20
-30
-40
-50
-60
0
100
200
300
400
DAYS FROM JAN 1

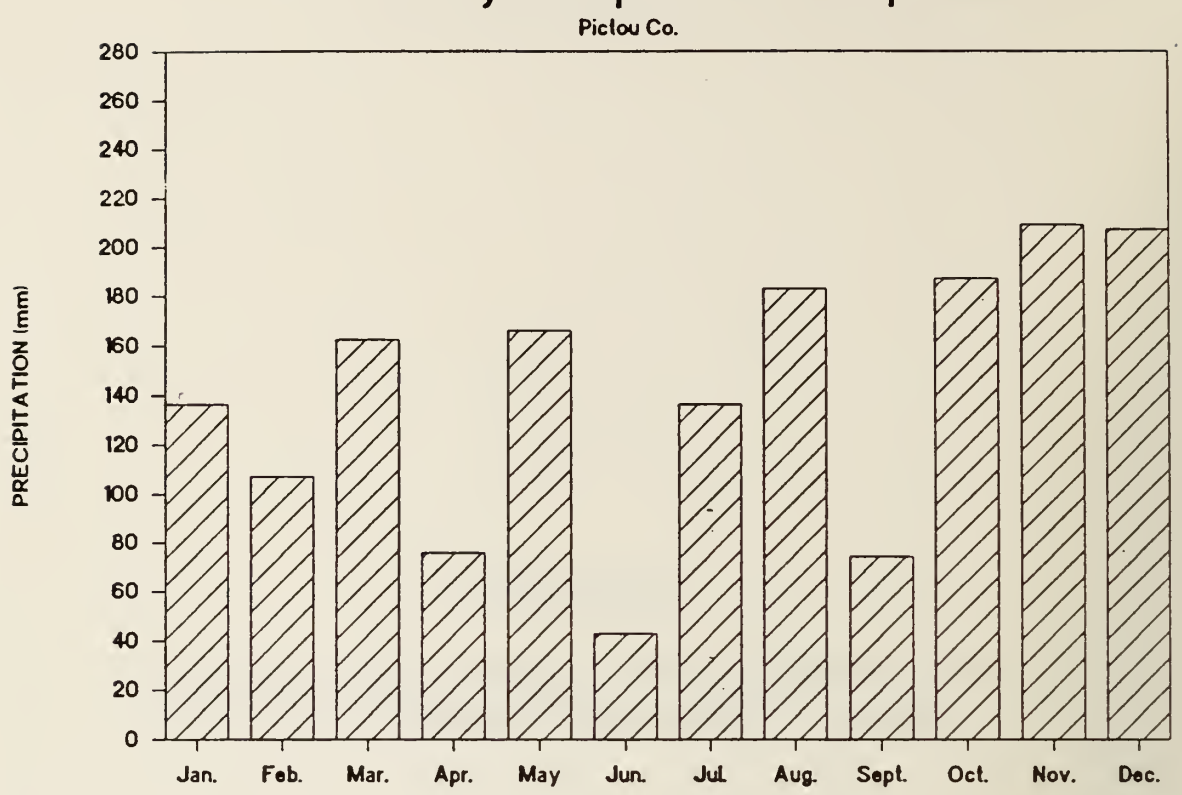

DEEP WELL
SITE 21 1985
DEPTH (cm)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
0
100
200
300
400
DAYS FROM JAN 1

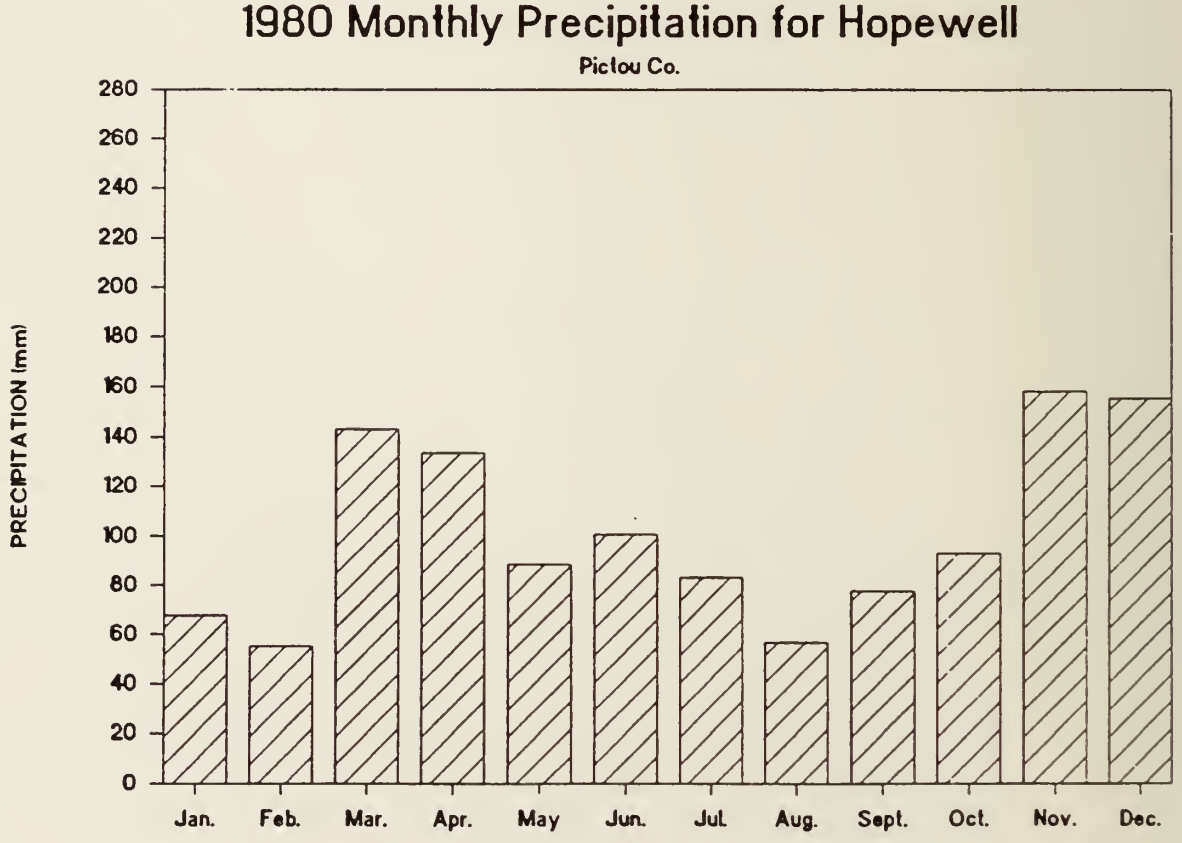

SHALLOW WELL
SITE 21 1986
DEPTH (cm)
0
-10
-20
-30
-40
-50
-60
0
100
200
300
400
DAYS FROM JAN 1

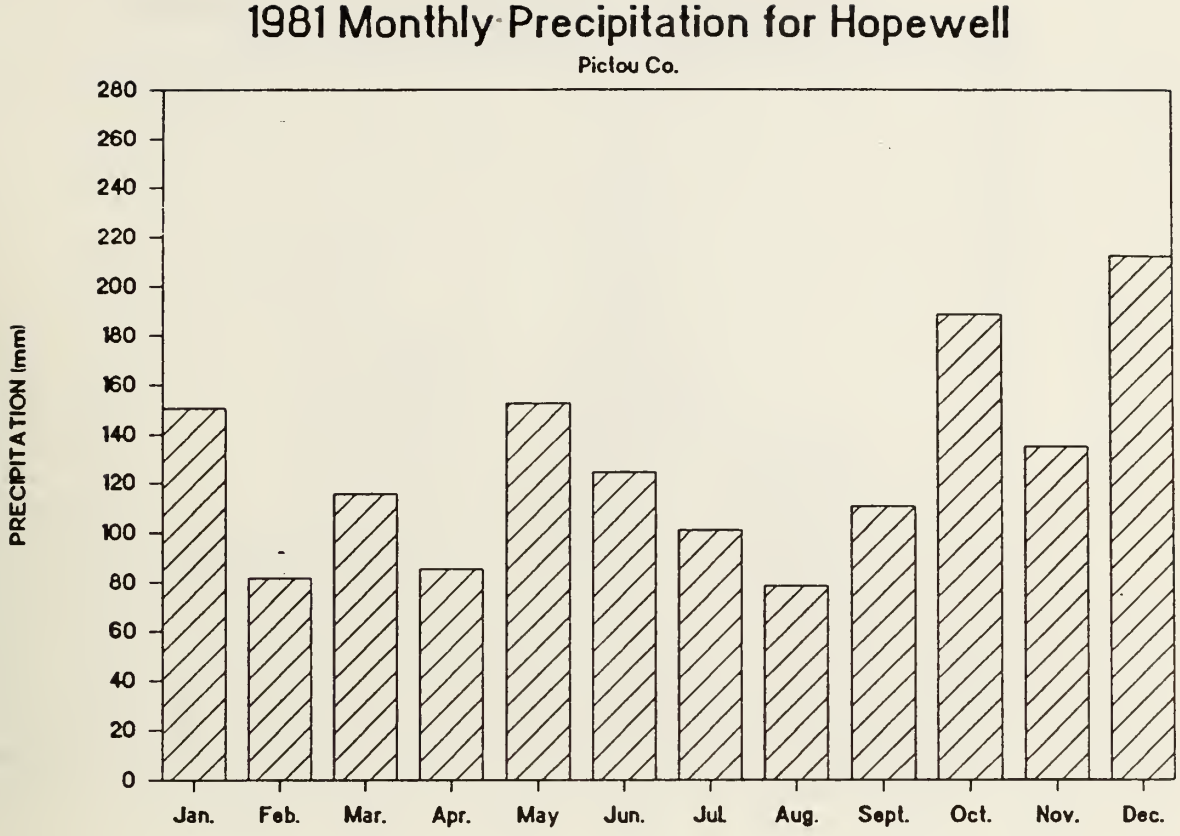

DEEP WELL
SITE 21 1986
DEPTH (cm)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
0
100
200
300
400
DAYS FROM JAN 1

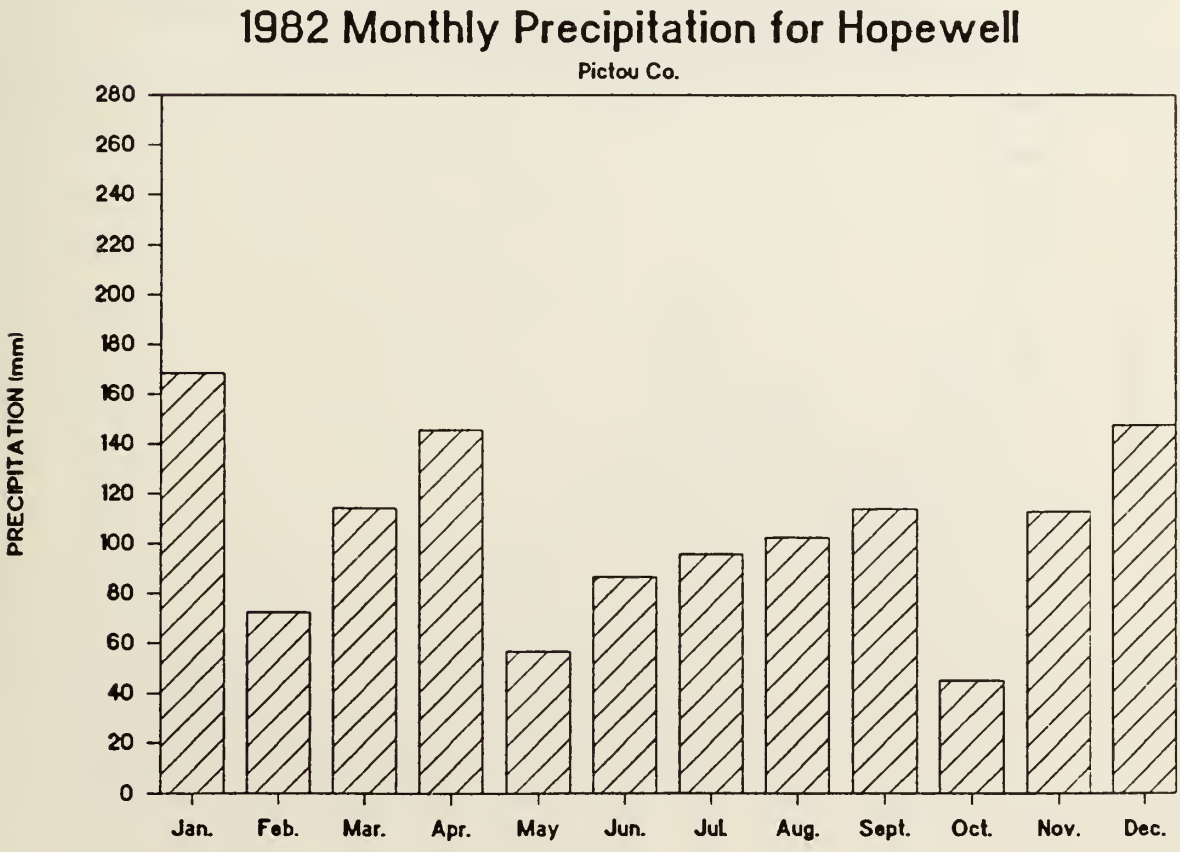
# APPENDIX 3

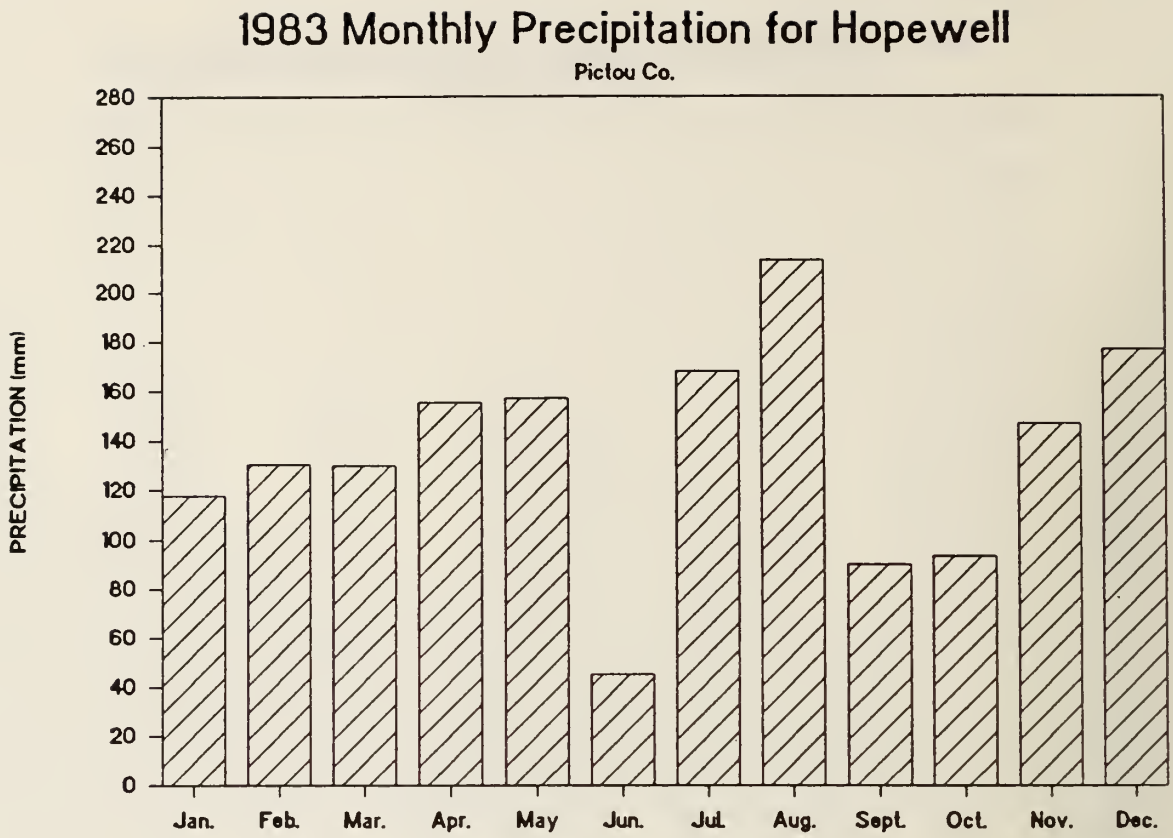
## Plots of Monthly Precipitation at AES Recording Stations for Pictou and Cumberland Counties

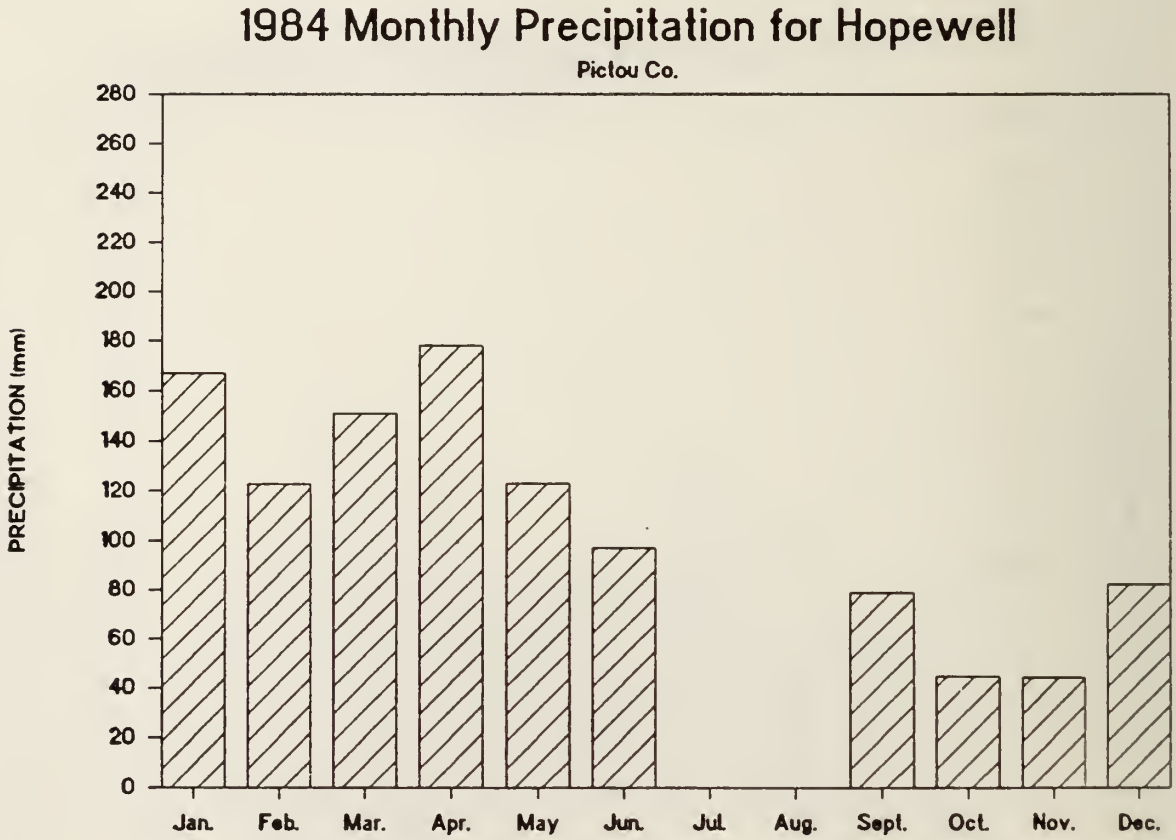

1979 Monthly Precipitation for Hopewell
Pictou Co.
PRECIPITATION (mm)
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
Jan.
Feb.
Mar.
Apr.
May
Jun.
Jul.
Aug.
Sept.
Oct.
Nov.
Dec.

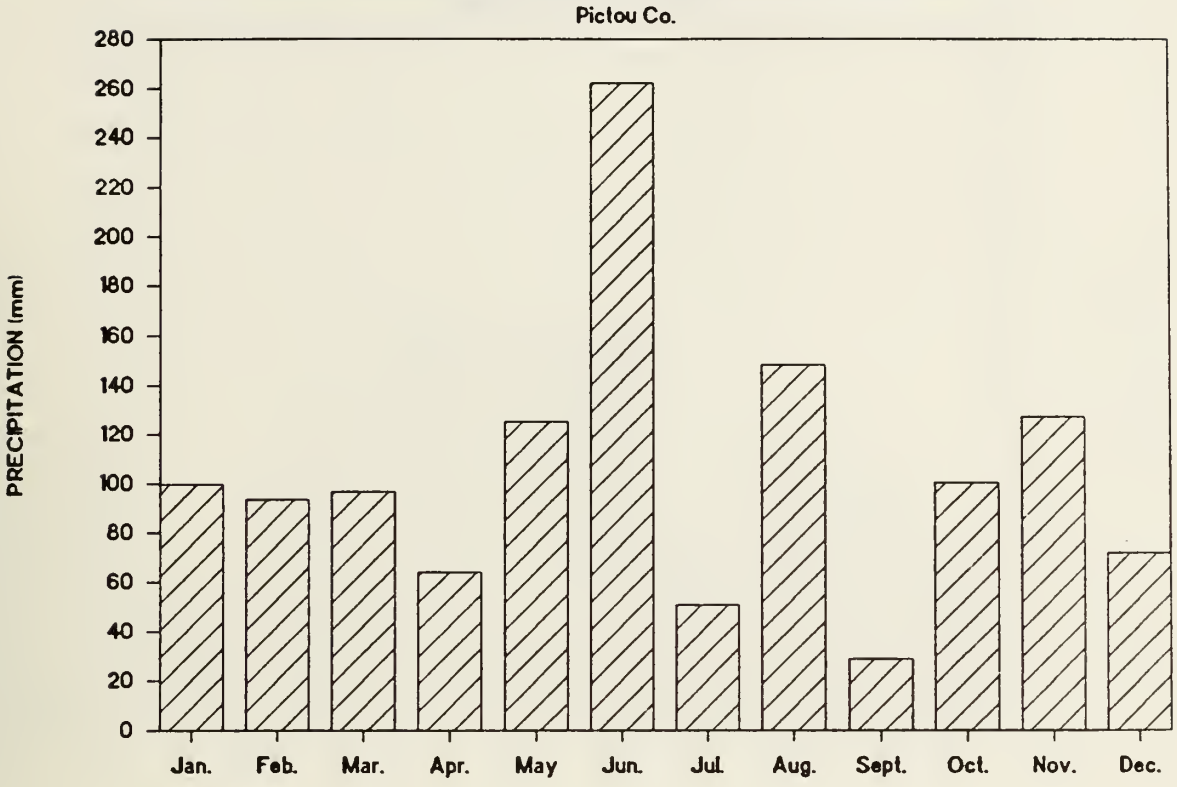

1980 Monthly Precipitation for Hopewell
Pictou Co.
PRECIPITATION (mm)
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
Jan.
Feb.
Mar.
Apr.
May
Jun.
Jul.
Aug.
Sept.
Oct.
Nov.
Dec.

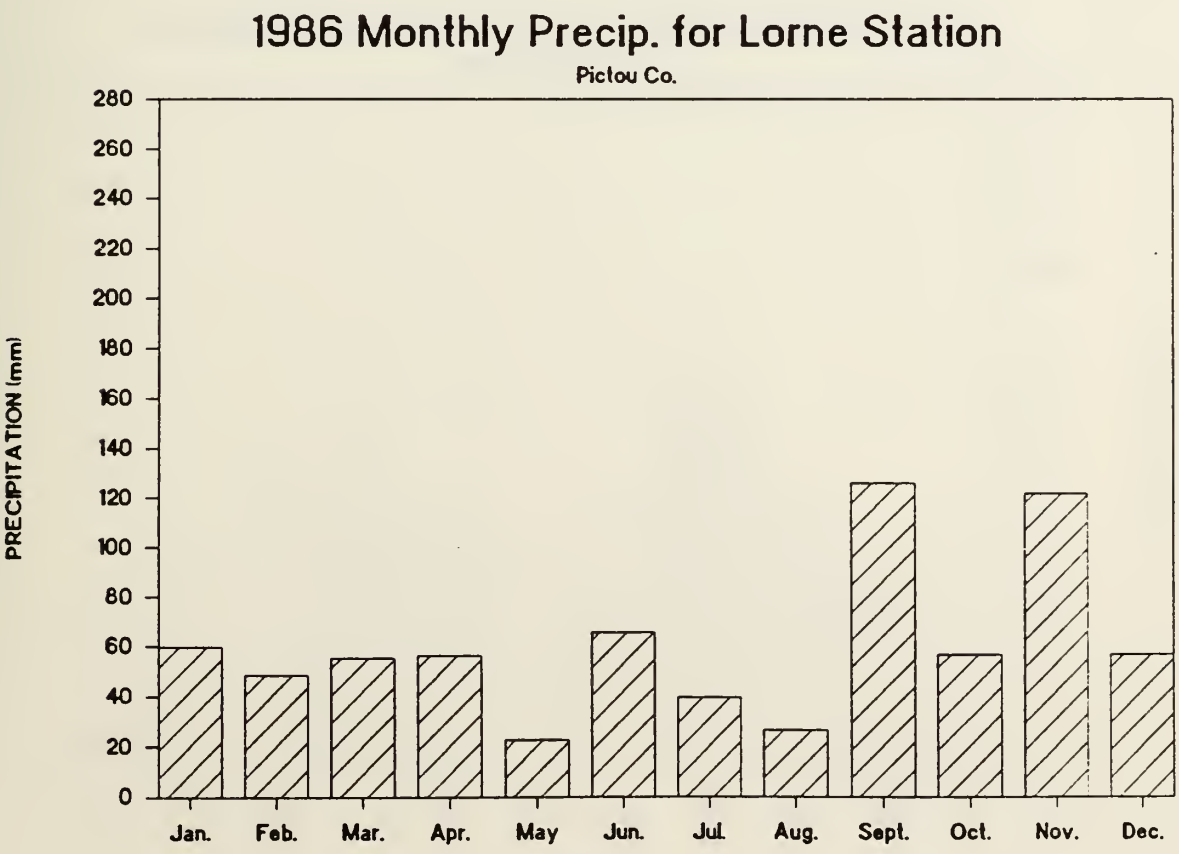

1981 Monthly Precipitation for Hopewell
Pictou Co.
PRECIPITATION (mm)
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
Jan.
Feb.
Mar.
Apr.
May
Jun.
Jul.
Aug.
Sept.
Oct.
Nov.
Dec.

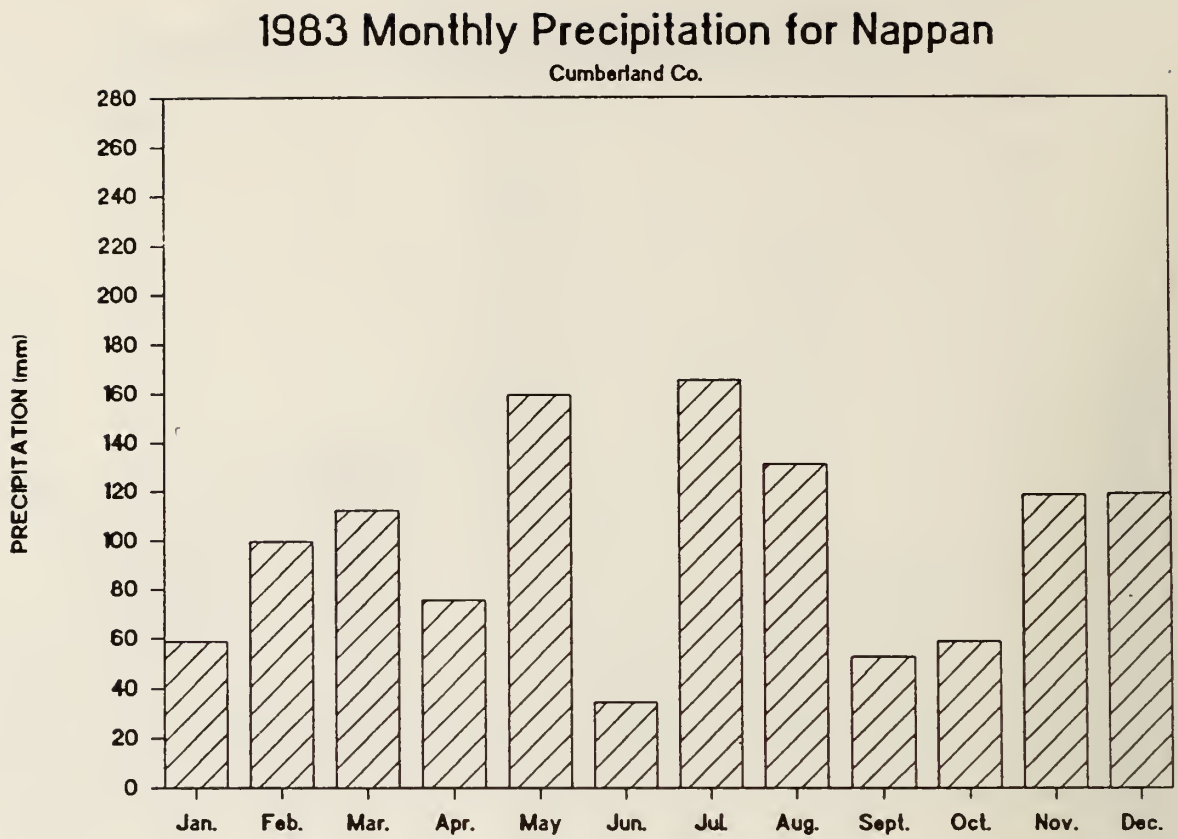

1982 Monthly Precipitation for Hopewell
Pictou Co.
PRECIPITATION (mm)
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
Jan.
Feb.
Mar.
Apr.
May
Jun.
Jul.
Aug.
Sept.
Oct.
Nov.
Dec.

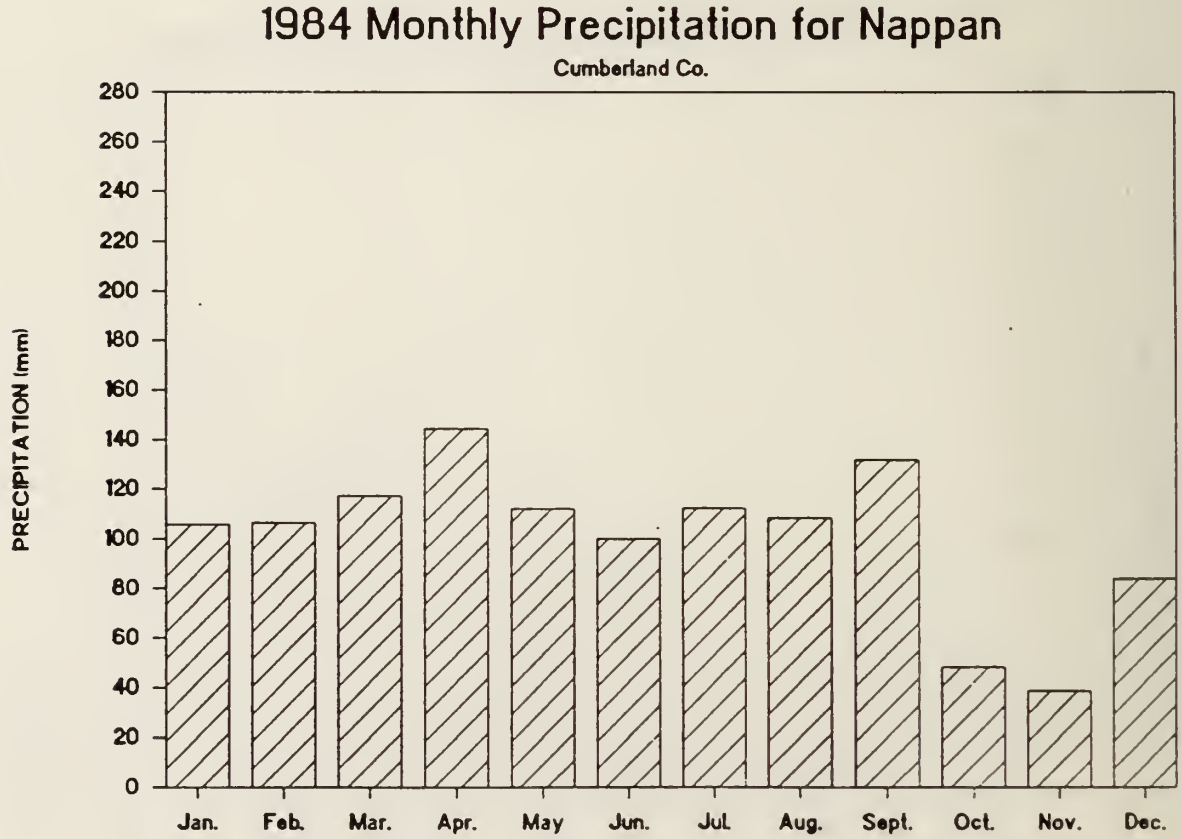

1983 Monthly Precipitation for Hopewell
Pictou Co.
PRECIPITATION (mm)
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
Jan.
Feb.
Mar.
Apr.
May
Jun.
Jul.
Aug.
Sept.
Oct.
Nov.
Dec.


1984 Monthly Precipitation for Hopewell
Pictou Co.
PRECIPITATION (mm)
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
Jan.
Feb.
Mar.
Apr.
May
Jun.
Jul.
Aug.
Sept.
Oct.
Nov.
Dec.


1985 Monthly Precipitation for Hopewell
Pictou Co.
PRECIPITATION (mm)
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
Jan.
Feb.
Mar.
Apr.
May
Jun.
Jul.
Aug.
Sept.
Oct.
Nov.
Dec.

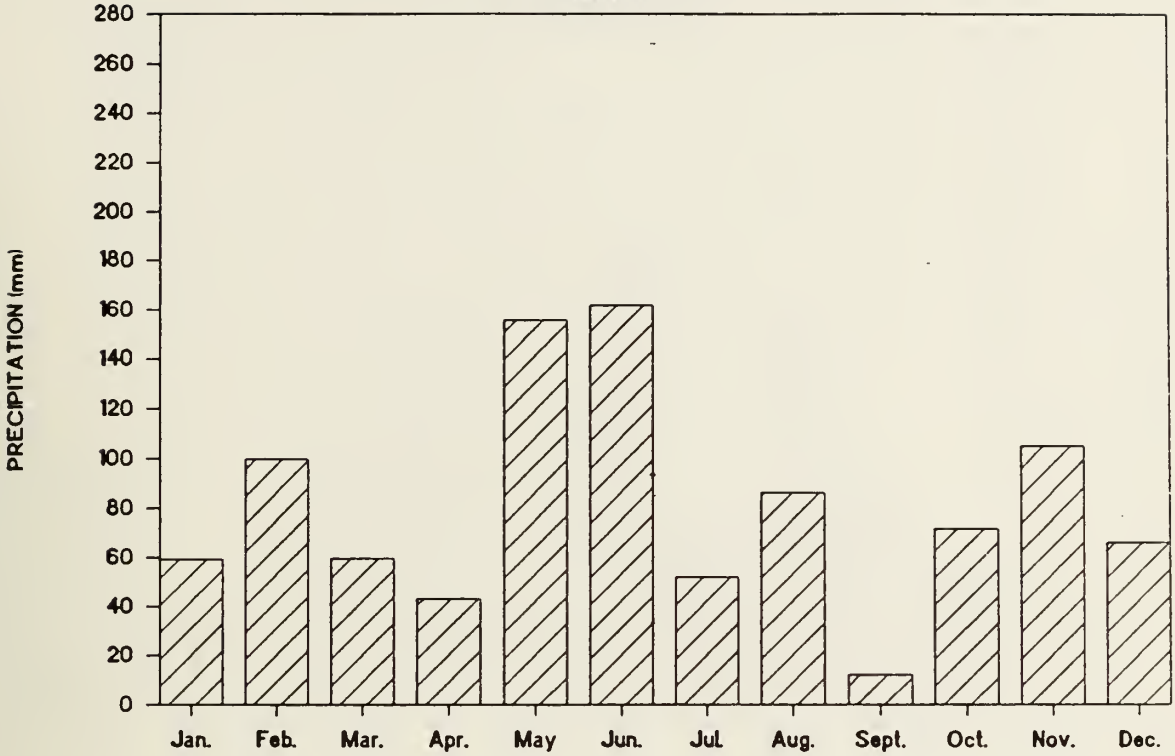

1986 Monthly Precip. for Lorne Station
Pictou Co.
PRECIPITATION (mm)
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
Jan.
Feb.
Mar.
Apr.
May
Jun.
Jul.
Aug.
Sept.
Oct.
Nov.
Dec.


1983 Monthly Precipitation for Nappan
Cumberland Co.
PRECIPITATION (mm)
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
Jan.
Feb.
Mar.
Apr.
May
Jun.
Jul.
Aug.
Sept.
Oct.
Nov.
Dec.


1984 Monthly Precipitation for Nappan
Cumberland Co.
PRECIPITATION (mm)
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
Jan.
Feb.
Mar.
Apr.
May
Jun.
Jul.
Aug.
Sept.
Oct.
Nov.
Dec.

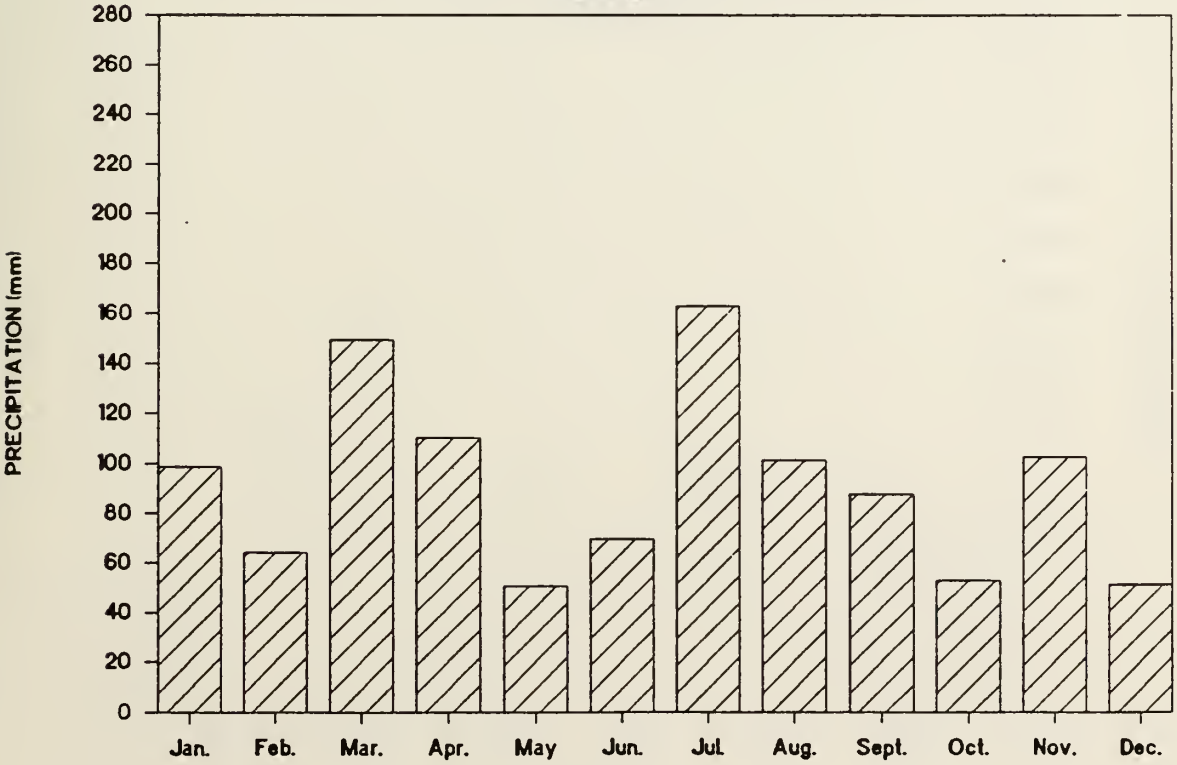
# 1985 Monthly Precipitation for Nappan

Cumberland Co.



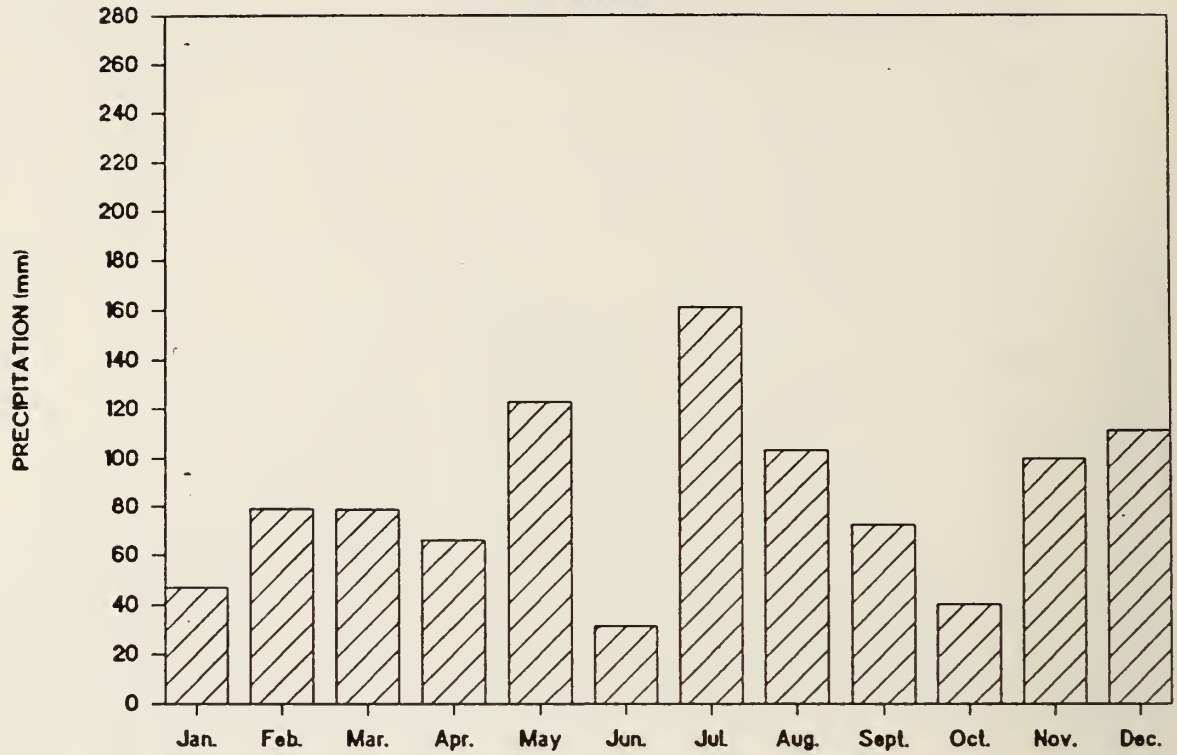

# 1986 Monthly Precipitation for Nappan

Cumberland Co.



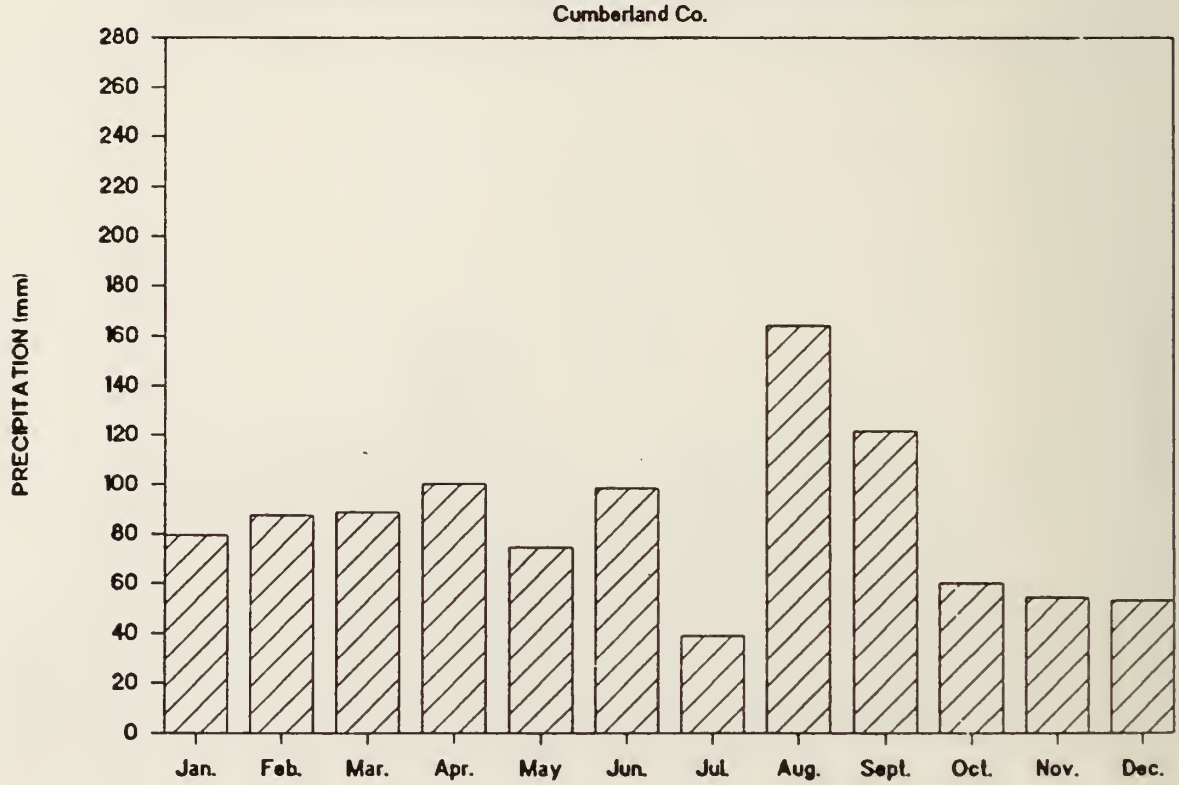
# 1983 Monthly Precipitation for Pugwash

Cumberland Co.




# 1984 Monthly Precipitation for Pugwash

Cumberland Co.



# 1985 Monthly Precipitation for Pugwash

Cumberland Co.


# 1986 Monthly Precipitation for Pugwash

Cumberland Co.