SPAVINAW DAM

PIEZOMETRIC
Reading System

MAY 27, 1987

SPAVINAW DAM

PIEZOMETRIC READING SYSTEM

MAY 27, 1987

Prepared By:

Belinda Nichols

COMPUTER SUPPORT

USER INFORMATION

Lotus/Symphony Spreadsheet

User Documentation
File: Read.me

RAW WATER

PIEZOMETER READINGS

PURPOSE AND SCOPE:

The City of Tulsa has 15 piezometer's with 12 boring wholes on the earthen portion of the Spavinaw Dam. The boring's are read twice a month with a piezometer reading device. Each reading is recorded manually on a form and the information is then given to a consulting firm to analyze and plot the lake elevations on a yearly basis.

The Symphony application has been utilized to provide Raw Water with the capability of entering and analyzing the data. Data entry has been made available through a data entry worksheet. Reporting and automatic calculation capabilities are provided along with plotted data on charts.

A backup should be made after any data has been entered into the system to safeguard against data loss.

User Documentation
File: Install.doc

USER DEFINED INFORMATION

CREATING YOUR DIRECTORY:

First Time Instructions: Once these instructions have been followed you will not need to do them again!

You will Access Symphony from your hard disk (the C:> drive). You must first create the directory you will store your Piezometer data files in.

At the C:> prompt type:

MD\Symphony\pdata

You have now created a sub-directory PDATA within the Symphony sub-directory to hold all of your Piezometer data files.

With the Piezometer Tracking System Disk in Drive A: copy all the files to your PDATA sub-directory.

C:> A: <RETURN>

A:> Copy *.* C:\SYMPHONY\PDATA

You now have the Piezometer System in your PDATA Sub-directory.

DEFINING THE DEFAULT DRIVE AND DIRECTORY

You will be storing your piezometer worksheets, entry screens, graphs, etc. in the PDATA Sub-directory. Therefore it is more convenient to have Symphony assume a certain drive and/or directory to save you from typing it.

Symphony provides an initial setting for the default drive/directory which we will change to meet and suit our needs for the PDATA directory.

1. Press SERVICES.
2. Select Configuration.

   The Configuration setting sheet is displayed, which contains settings for a variety of Symphony operations. The only setting you need consider is the File Setting.

3. Select File.

4. Press ESCAPE to clear Symphony's suggestion.

5. Type the new initial drive and/or new initial directory:

   C:\SYMPHONY\PDATA.

6. Press RETURN

7. Select Update.

8. Select Quit to return to the worksheet.

MACRO UTILITY

User Documentation
File: Macro.gde

SPAVINAW DAM

LOTUS/SYMPHONY PIEZOMETER SYSTEM

MACRO INFORMATION AND GUIDE

A symphony Macro has been attached to the Piezometric data entry worksheet. The name of the macro is First.mlb. The purpose of the macro is to automate repetitive task.

The macro attached to the data entry worksheet is stored in hyperspace (an area of memory independent of the worksheet).

To attach the Macro to your worksheet you must do the following:

PRESS:	SERVICES
SELECT:	APPLICATION ATTACH
POINT TO:	MACROMGR.APP <RETURN>
SELECT:	QUIT

MACRO LIST

\C {COPIES FROM TWO CELLS ABOVE}

\H CITY OF TULSA RAW WATER SUPPLY

\O Summary of Piezometer Observations

\P PIEZOMETER DATA ENTRY SCREEN

\S SPAVINAW DAM

SYSTEM OVERVIEW

I. Introduction

Symphony is a flexible program that combines five capabilities into one package.

1.	Word Processing	(Doc Environment)
*2.	Spread Sheet	(Sheet Environment)
*3.	Business Graphics	(Graph Environment)
*4.	Database Management	(Forms Environment)
*5.	Communications	(Comm Environment)

Only three of the five environments will be used at the present time, however, the need for Communications may be utilized in the future when the departmental electronic mailing system is made available.

The Spread Sheet environment allows for the processing of numbers in a tabular format.

The Work Sheet environment is divided into rows and columns which have building blocks called cells. With this function it allows for information to be put in tabular format.

FILE TYPE:	EXT:
Add-In file	.APP
Comm config file	.CCF
Character Code Translation file	.CTF
Graph (pic) file	.PIC
Print file	.PRN
Work Sheet file	.WR1

II. SYSTEM REQUIREMENTS:

HARDWARE_REQUIREMENTS: IBM AT with 512k Random Access Memory, with 640k Above Board Expandable Memory. 1-1.2 Megabyte Double sided High Density Disk drive and 1-360 Kilobyte Double sided Double Density Disk drive and 1-30 Megabyte Fixed Disk. 1 color display monitor with the IBM Enhanced graphics adapter card. The 80286 Micro-processor and the 80287 Math Co-processor. An IBM Proprinter XL and a Hayes 1200 Baud Smart Modem.

SOFTWARE_REQUIREMENTS: PC-DOS Version 3.0 or above and Lotus-Symphony Version 1.2.

OTHER_REQUIREMENTS:

(1). IBM/Symphony Keyboard guide.
(2). Symphony Quick Reference guide.
(3). Symphony Reference Manual.
(4). Piezometer spreadsheet User's Documentation and Guide.

III. DATA ENTRY SCREENS:

SPAVINAW DAM

PIEZOMETER OBSERVATION

DATA ENTRY SCREEN

Date:_____

Piez. No.	Year	Date Read	Piez. Tip Elevation	Gage Zero Reading	Reading
21194					
21196					
21193					
21189					
21192					
21186					
21191					
21195					
21183					
21182					
21185					
21184					
21187					
21190					
21188					

Lake Stage _____

IV. EQUATIONS

Method of Calculation

1. Actual Reading = Reading - Gage Zero Reading

2. Correction Factor - determined by utilizing Actual Readings from Calibration Curves.

Piezometer No. Correction Factor's (determined by R. Bailey, 4/21/87):

21194 = .20

21196 = .28

21193 = .25

21189 = .20

21192 = .09

21186 = .46

21191 = .34

21195 = .31

21183 = .25

21182 = .23

21185 = .20

21184 = .00

21187 = .32

21190 = .22

21180 = .32

3. True Pressure = Actual Reading - Correction Factor

4. Hydrostatic Head = True Pressure x 2.31

5. Elevation of Piezometric Surface = Piezometer Tip Elevation + Hydrostatic Head

V. INSTALLATION RECORDS

SPAVINAW DAM

RECORD OF PIEZOMETER INSTALLATIONS

Piezometer No.	21183	Installation Date:	1-5-84
Boring No.	1		
Surface Ovulation:	698	Tip Elevation:	659.3
Installation Depth:	38.7		
Initial Reading:	8.1		
Gage Zero Reading:	2.3		

Comments:

SPAVINAW DAM

RECORD OF PIEZOMETER INSTALLATIONS

Piezometer No.	21191	Installation Date:	12-12-83
Boring No.	2		
Surface Evalation:	698	Tip Elevation:	673.0
Installation Depth:	25.0		
Initial Reading:	0.60		
Gage Zero Reading:	0		

Comments:

SPAVINAW DAM

RECORD OF PIEZOMETER INSTALLATIONS

Piezometer No.	21195	Installation Date:	12-12-83
Boring No.	2		
Surface Elevation:	698	Tip Elevation:	659.8
Installation Depth:	38.2		
Initial Reading:	4.40		
Gage Zero Reading:	0		

Comments:

SPAVINAW DAM

RECORD OF PIEZOMETER INSTALLATIONS

Piezometer No.	21184	Installation Date:	1-6-84
Boring No.	3		
Surface Elevation:	675	Tip Elevation:	658.0
Installation Depth:	17.0		
Initial Reading:	5.80		
Gage Zero Reading:	2.3		

Comments:

SPAVINAW DAM

RECORD OF PIEZOMETER INSTALLATIONS

Piezometer No.	21187	Installation Date:	1-11-84
Boring No.	4		
Surface Elevation:	668.0	Tip Elevation:	655.0
Installation Depth:	13.0		
Initial Reading:	5.60		
Gage Zero Reading:	2.4		

Comments:

SPAVINAW DAM

RECORD OF PIEZOMETER INSTALLATIONS

Piezometer No. 21186 Installation Date: 1-7-84

Boring No. 5

Surface Elevation: 698.0 Tip Elevation: 647.0

Installation Depth: 51.0

Initial Reading: 13.1

Gage Zero Reading: 12.1

Comments:

SPAVINAW DAM

RECORD OF PIEZOMETER INSTALLATIONS

Piezometer No.	21189	Installation Date:	12-16-83
Boring No.	6		
Surface Elevation:	698.0	Tip Elevation:	650.9
Installation Depth:	47.1		
Initial Reading:	7.90		
Gage Zero Reading:	0		

Comments:

SPAVINAW DAM

RECORD OF PIEZOMETER INSTALLATIONS

Piezometer No.	21192	Installation Date:	12-16-83
Boring No.	6		
Surface Elevation:	698.0	Tip Elevation:	661.5
Installation Depth:	36.5		
Initial Reading:	5.3		
Gage Zero Reading:	0		

Comments:

SPAVINAW DAM

RECORD OF PIEZOMETER INSTALLATIONS

Piezometer No.	21185	Installation Date:	1-5-84
Boring No.	7		
Surface Elevation:	675	Tip Elevation:	651.0
Installation Depth:	24.0		
Initial Reading:	6.3		
Gage Zero Reading:	2.3		

Comments:

SPAVINAW DAM

RECORD OF PIEZOMETER INSTALLATIONS

Piezometer No.	21190	Installation Date:	1-10-84
Boring No.	8		
Surface Elevation:	660.0	Tip Elevation:	649.0
Installation Depth:	11.0		
Initial Reading:	4.1		
Gage Zero Reading:	2.1		

Comments:

SPAVINAW DAM

RECORD OF PIEZOMETER INSTALLATIONS

Piezometer No.	21193	Installation Date:	1-8-84
Boring No.	9		
Surface Elevation:	698.0	Tip Elevation:	658.5
Installation Depth:	39.5		
Initial Reading:	6.0		
Gage Zero Reading:	2.0		

Comments:

SPAVINAW DAM

RECORD OF PIEZOMETER INSTALLATIONS

Piezometer No.	21196	Installation Date:	12-17-83
Boring No.	10 Range 3		
Surface Elevation:	698.0	Tip Elevation:	656.0
Installation Depth:	42.0		
Initial Reading:	4.2		
Gage Zero Reading:	0		

Comments:

SPAVINAW DAM

RECORD OF PIEZOMETER INSTALLATIONS

Piezometer No.	21194	Installation Date:	1-4-84
Boring No.	10		
Surface Elevation:	698.0	Tip Elevation:	671.9
Installation Depth:	26.1		
Initial Reading:	0.2		
Gage Zero Reading:	0		

Comments:

SPAVINAW DAM

RECORD OF PIEZOMETER INSTALLATIONS

Piezometer No.	21182	Installation Date:	1-4-84
Boring No.	11		
Surface Elevation:	675	Tip Elevation:	656.5
Installation Depth:	18.5		
Initial Reading:	2.7		
Gage Zero Reading:	0.1		

Comments:

SPAVINAW DAM

RECORD OF PIEZOMETER INSTALLATIONS

Piezometer No. 21188 Installation Date: 1-10-84

Boring No. 12

Surface Elevation: 672.0 Tip Elevation: 660.0

Installation Depth: 12.0

Initial Reading: 5.40

Gage Zero Reading: 2.4

Comments:

VI. OBSERVATION SUMMARY

SPAVINAW DAM

SUMMARY OF PIEZOMETER OBSERVATIONS

DATE: (YEAR)	JAN/87	JAN/87	thru	DEC/87
Lake Elevation(Ft)	679.8	680.4		680.6

**NOTE: The Lake Elevation is captured from the Data Entry Sheet and will automatically be placed in the proper fields.

Bor. No.	Piez. No.	Tip Elev.	ELEVATION OF PIEZOMETRIC SURFACE			
1	21183	659.3	673.6	674.1		674.3
2	21195	659.8	667.0	666.0		667.2

**NOTE: The Summary of Observations sheet needs no input from the user. All data is taken from the Entry Sheet and is calculated and automatically placed in the proper fields. The Summary of Observations will contain one year of data and will have all 12 boring numbers.

VII. DATA ENTRY

ACCESSING THE ENTRY SHEET

To access the data entry sheet

Press: F9 - Services Menu

Press: F - for File

Press: R - for Retrieve

Select: Entry.wrl

Press: F9 - Services Menu

Press: W - for Window

Press: U - for Use

Press: F10 - to get a wide view of all the windows that are available.

Select: The month-name, you wish to enter data for.

**Note: Never select the window name "Entry". This is the master data entry file and all data is automatically transferred to this window when it is entered.

Once you have the month-screen you wish to enter Piezometric readings, enter the Date as follows:

Date: @Date(87,1,15) <Return>

Format is: @Date(YR,MM,DD)

Then proceed to the Date Read field and enter the date in the same format.

If the date read is the same for all piezometer readings, you may use a macro function to copy the date.

You must first invoke the macro.

Press: F9 - Services Menu

Select: A - Application

Select: A - Attach

Application name: C:\Macro.App

Select: First.MLB

Press: Q - Quit

Return to the Data entry worksheet.

Press: Esc.

Then move the cursor to the blank date field and Press:

ALT-C

This will copy the date you entered from two cells above.

Continue to enter until you have entered all the dates read.

Now enter the Gage Zero Readings.

This field has a format of 1 decimal place.

Enter numeric data by typing the number with the decimal included.

The reading field has a format with one decimal place. Enter numeric data with the decimal included.

The Lake Stage field also has a format of one decimal place. Enter numeric data with the decimal included.

Once you have completed entering data, you may print a copy of the entry sheet by:

Press: F9 - Services Menu

Select: P - Print

Select: Settings

Select: Name

Select: Use and Press: F10 to (List the Sheets available)

Select: Q - Quit

Press: G - Go

Symphony saves the print settings under a name for each entry sheet. Which has been already defined for you.

VIII. Graphing and Plotting Information

There are three different graphs that will be used for the Piezometric System. They are:

1. Time Plot with lake elevations shown on a per yearly basis.

   Data is collected from the data entry sheets and summarized in the Piezometer Summary of Observations. It is then plotted showing monthly elevations for a one year period.

2. Boring Plot in groups (1,5,9) with lake elevations shown on a per yearly basis.

3. Time Plot with lake elevations for each Piezometer No. on a per yearly basis.

GRAPHICS

To activate a graph for a certain entry sheet:

Press: F10 - Menu

Select: Graph

Select: 1st-Setting

Select: Name

Select: Use and Press: F10 (to display all graphs)

Select: The appropriate graph sheet <Return>

Graphs available for entry sheets are:

21182	21183	21184	21185
21186	21187	21188	21189
21190	21191	21192	21193
21194	21195	21196	Group1
Group5	Group9	Main	Yearly

The Main graphics sheet is blank. Once data has been entered each graph sheet must be updated and saved to a pic file. Each sheet has a pic file. This is to allow the user to print the graph with Print Graph and also have a usable copy of the graph.

Press: Q - Quit

Select: Image-Save

Press: F10 - to display all available .PIC files

Select: The appropriate sheet <Return>

Pic Graph files available are:

GRP1PIC.PIC - for Group1
GRP5PIC.PIC - for Group5
GRP9PIC.PIC - for Group9

YEARLY.PIC - for Yearly (Piezometric Summary of Lake Elevations).

PIC82.PIC - for 21182
PIC83.PIC - for 21183
PIC84.PIC - for 21184
PIC85.PIC - for 21185
PIC86.PIC - for 21186
PIC87.PIC - for 21187
PIC88.PIC - for 21188
PIC89.PIC - for 21189
PIC90.PIC - for 21190
PIC91.PIC - for 21191
PIC92.PIC - for 21192
PIC93.PIC - for 21193
PIC94.PIC - for 21194
PIC95.PIC - for 21195

Symphony will tell you "A File with that name already exist--Replace it?"

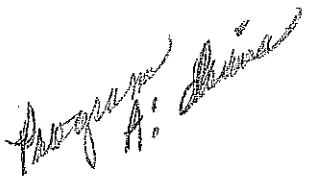
NO YES

Answer: YES

Then Press: Q - Quit

Save your file and Exit.

Access PrintGraph from the Symphony Menu.



Press: Image-Select <Return>

Listed are all the Graphs available

Select a graph <Return>

Press: G - Go

and Press: E - to Exit.

SPAVINAW DAM PIEZOMETERS						
Piezometer No.	Boring Number	Installation Date	Surface Elevation	Tip Elevation	Installation Depth	Initial Reading
21183	1	1/5/1984	698	659.3	38.7	8.10
21191	2	12/12/1983	698	673	25	0.60
21195	2	12/12/1983	698	659.8	38.2	4.40
21184	3	1/6/1984	675	658	17	5.80
21187	4	1/11/1984	668	655	13	5.60
21186	5	1/7/1984	698	647	51	13.10
21189	6	12/16/1983	698	650.9	47.1	7.90
21192	6	12/16/1983	698	661.5	36.5	5.30
21185	7	1/5/1984	675	651	24	6.30
21190	8	1/10/1984	660	649	11	4.10
21193	9	1/8/1984	698	658.5	39.5	6.00
21196	10 Range 3	12/17/1983	698	656	42	4.20
21194	10	1/4/1984	698	671.9	26.1	0.20
21182	11	1/4/1984	675	656.5	18.5	2.70
21188	12	1/10/1984	672	660	12	5.40

Map Unit Description

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this report, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named, soils that are similar to the named components, and some minor components that differ in use and management from the major soils.

Most of the soils similar to the major components have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Some minor components, however, have properties and behavior characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. All the soils of a series have major horizons that are similar in composition, thickness, and arrangement. Soils of a given series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Additional information about the map units described in this report is available in other soil reports, which give properties of the soils and the limitations, capabilities, and potentials for many uses. Also, the narratives that accompany the soil reports define some of the properties included in the map unit descriptions.

Mayes County, Oklahoma

SaB—Britwater silt loam, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2rt22
Elevation: 340 to 1,500 feet
Mean annual precipitation: 42 to 51 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 160 to 250 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Britwater and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Britwater

Setting

Landform: Stream terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Loamy alluvium derived from cherty limestone

Typical profile

Ap - 0 to 7 inches: silt loam
Bt1 - 7 to 63 inches: gravelly silty clay loam
Bt2 - 63 to 79 inches: very gravelly silty clay

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 9.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: Loamy Terrace Forest (F116AY034MO)
Hydric soil rating: No

Minor Components

Elsah

Percent of map unit: 3 percent
Landform: Drainageways, flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy/Gravelly Floodplain Forest (F116AY042MO)

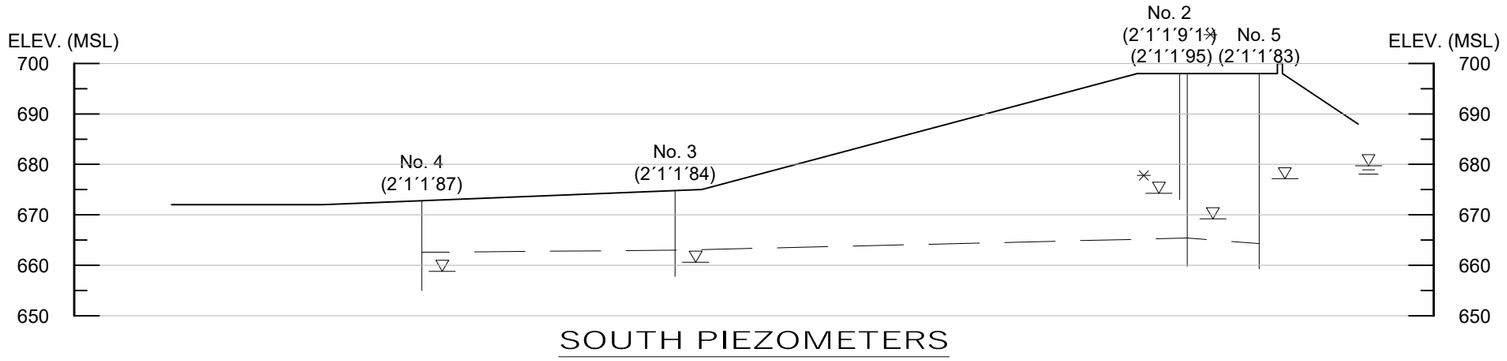
Hydric soil rating: No

Clarksville

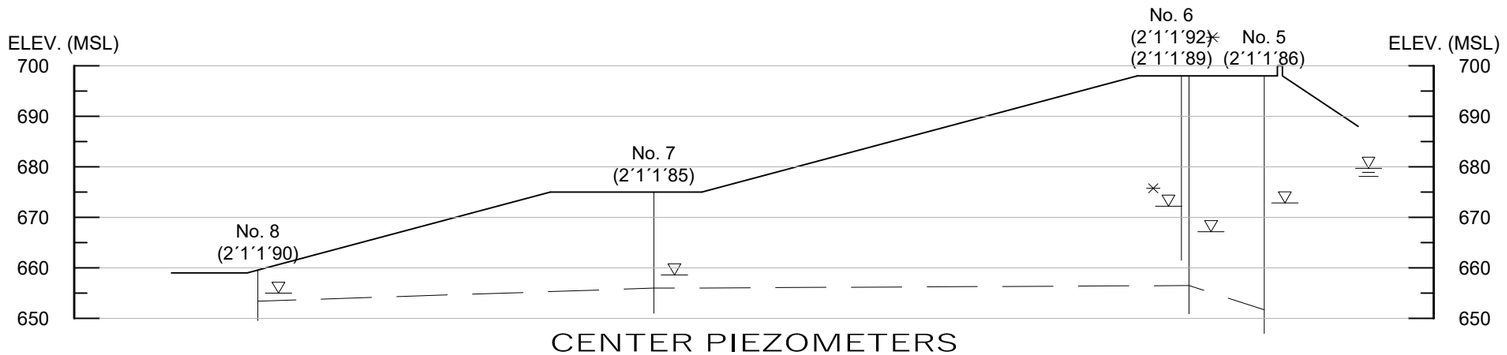
Percent of map unit: 2 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: Low-Base Chert Upland Woodland (F116AY012MO)
Hydric soil rating: No

Data Source Information

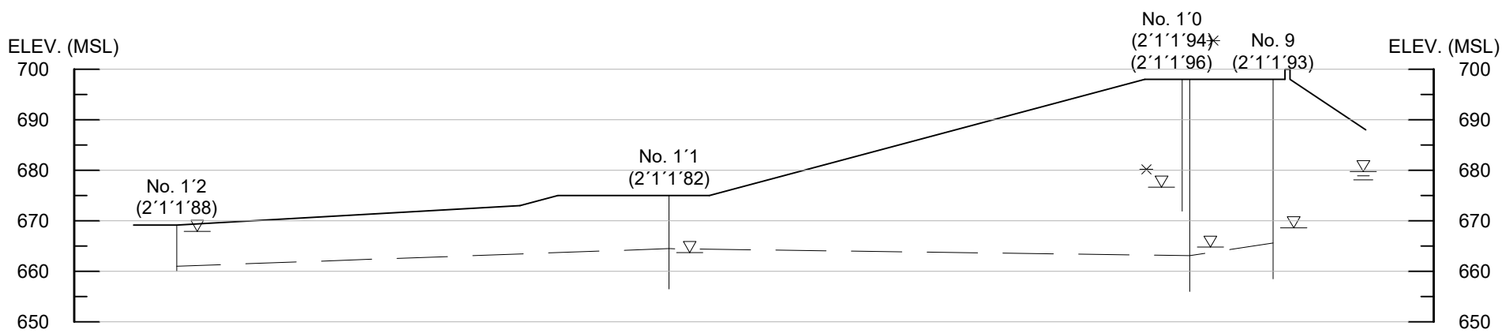
Soil Survey Area: Mayes County, Oklahoma
Survey Area Data: Version 13, Sep 16, 2019



SOUTH PIEZOMETERS



CENTER PIEZOMETERS



NORTH PIEZOMETERS

SOUTH P´I´EZOMETERS FOUR YEAR AVERAGE (1999-2002)		
BORING NO.	P´I´EZ. NO.	P´I´EZ. SURFACE ELEV. (feet)
1	21183	677.15
2	21195	669.21
2 ⊀	21191	674.29
3	21184	660.63
4	21187	658.83
CENTER P´I´EZOMETERS FOUR YEAR AVERAGE (1999-2002)		
BORING NO.	P´I´EZ. NO.	P´I´EZ. SURFACE ELEV. (feet)
5	21186	672.87
6	21189	667.19
6 ⊀	21192	672.24
7	21185	658.64
8	21190	655.00
NORTH P´I´EZOMETERS FOUR YEAR AVERAGE (1999-2002)		
BORING NO.	P´I´EZ. NO.	P´I´EZ. SURFACE ELEV. (feet)
9	21193	668.62
1´0	21196	664.79
1´0 ⊀	21194	676.68
1´1	21182	663.72
1´2	21188	667.90
LAKE ELEVATION		679.74

▽ Piezometer Suface Elevation, (4 Year Average)

▽ Reservoir Elevation

⊀ Piezometer Tip in Embankment. All Other Tips in Bedrock.

— — Approximate Top of Bedrock, (HTB 1´984)

PRELIMINARY

"This document is preliminary in nature, and is not a final signed and sealed document."

OKIE811

EXHIBIT NO. 3-5
1999-2002 SPAVINAW DAM PROFILE OF PIEZOMETER OBSERVATIONS

2020
ANNUAL DAM INSPECTION

CITY OF TULSA, OKLAHOMA
ENGINEERING SERVICES DEPARTMENT

Plans and Estimates Prepared by:
KEITHLINE ENGINEERING GROUP
8556 E. 101ST ST., STE.C Tulsa, Oklahoma 74133 (918) 369-7911

REVISION	BY	DATE

PLAN SCALE
PROFILE SCALE
HORIZONTAL:
VERTICAL:

DRAWN	---	XX-XX-XX	APPROVED:
DESIGNED	---	XX-XX-XX	
SURVEY	---	XX-XX-XX	
PROJECT MGR			
LEAD ENGINEER			
FIELD MGR			

RECOMMENDED:
DESIGN MANAGER
CITY ENGINEER

FILE:
DATE: MAY 12, 2020
ATLAS PAGE NO: 10629, 10628
SHEET 02 OF 02 SHEETS

Boring No.	Piezometer No.
South	
1	21183
2	* 21191
	* 21195
3	21184
4	21188
Center	
5	21186
6	* 21189
	* 21192
7	21185
8	21190
North	
9	21193
10	* 21194
	* 21196
11	21182
12	21187
* Same Bore	

Legend
Piezometer

0 200 400 600

SCALE 1"=200'

PRELIMINARY

"This document is preliminary in nature, and is not a final signed and sealed document."

OKIE811

AERIAL MAP
SPAVINAW DAM
MAYES COUNTY, OKLAHOMA

2020
ANNUAL DAM INSPECTION

CITY OF TULSA, OKLAHOMA
ENGINEERING SERVICES DEPARTMENT

Plans and Estimates Prepared by:
KEITHLINE ENGINEERING GROUP
8556 E. 101ST ST., STE.C Tulsa, Oklahoma 74133 (918) 369-7911

REVISION	BY	DATE

PLAN SCALE
PROFILE SCALE
HORIZONTAL:
VERTICAL:

DRAWN	---	XX-XX-XX	APPROVED:
DESIGNED	---	XX-XX-XX	
SURVEY	---	XX-XX-XX	
PROJECT MGR			
LEAD ENGINEER			
FIELD MGR			

RECOMMENDED:
DESIGN MANAGER
CITY ENGINEER

FILE:
DATE: MAY 12, 2020

ATLAS PAGE NO: 10629, 10628
SHEET 01 OF 02 SHEETS