AQUIFER DESCRIPTIONS FROM THE U.S. GEOLOGICAL SURVEY REGIONAL AQUIFER-SYSTEM ANALYSIS PROGRAM, 1978-1993

Compiled by Claire B. Davidson
With a section on Use of the Aquifer Database by Helen Doherty

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U.S. GEOLOGICAL SURVEY
Open-File Report 94-465

Reston, Virginia
1994

U.S. DEPARTMENT OF THE INTERIOR

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U.S. Geological Survey Open-File Report 94-465, "Aquifer Descriptions from the U.S. Geological Survey Regional Aquifer-System Analysis Program, 1978-1993," compiled by C.B. Davidson, with a section by Helen Doherty

Subsequent to publication of this report, four additional aquifers in Paleozoic rocks of the Upper Colorado River Basin can be accessed on the Internet.

Correction:
Page 1. Second paragraph, change the size of floppy disk to 3 1/2".

Although the data search programs described in this report and included on the enclosed diskette have been used by the U.S. Geological Survey (USGS) no warranty, expressed or implied, is made by the USGS as to the accuracy of the functioning of the program and related material.

AQUIFER DESCRIPTIONS FROM THE U.S. GEOLOGICAL SURVEY REGIONAL AQUIFER-SYSTEM ANALYSIS PROGRAM, 1978-1993

Compiled by Claire B. Davidson

ABSTRACT

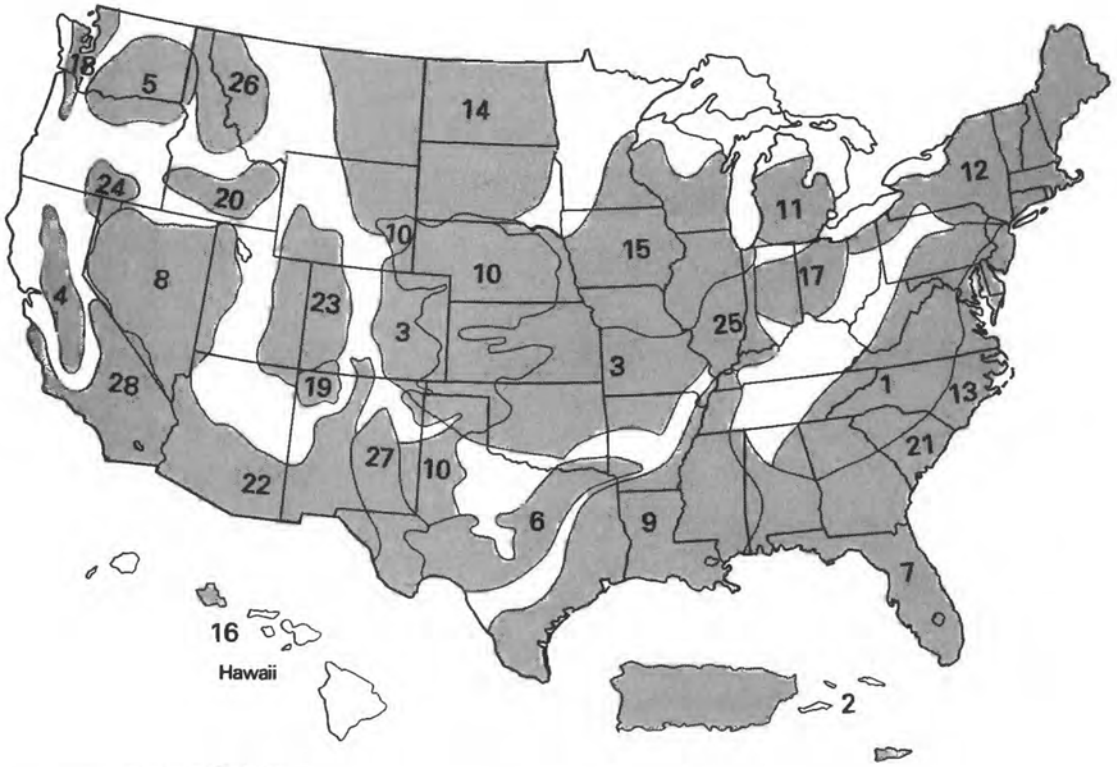
The Regional Aquifer-System Analysis Program of the U.S. Geological Survey began in 1978. The overall purpose of this program is to define the geologic, hydrologic, and geochemical framework of the Nation's most important aquifers and aquifer systems.

This report summarizes the aquifer or aquifer system name, geographic area, rock units, equivalent names, lithology, thickness, hydrologic characteristics, water quality, water use, and references for 157 aquifers in 23 areas of the United States. A 5 1/4-inch floppy disk containing the aquifer data and data search programs (in compressed ASCII format) is included in the report.

INTRODUCTION

The U.S. Geological Survey (USGS) began the Regional Aquifer-System Analysis (RASA) Program in 1978. A total of 28 of the Nation's most important aquifer systems were identified for study in this program (fig.1). The broad objectives for each RASA study area are to define the geologic, hydrologic, and geochemical framework in order to understand the aquifer system, and to develop predictive capabilities that will contribute to the future management of the aquifer system. The design of each RASA study area varies according to the regional investigations and problems in the aquifer system.

This report and accompanying computerized database were prepared to provide a convenient and condensed summary of and reference to the Nation's major aquifers in the regional aquifer systems that are described in detail in the numerous reports of the individual RASA studies. The report provides the user a starting point for obtaining general information on the distribution of the major aquifers, a means of obtaining summary information and references on specific aquifers, and a guide to the usage of aquifer nomenclature within the RASA program of the USGS. In regard to the last point, this compilation is somewhat comparable to the Lexicon of Geologic Names for rock-stratigraphic units that the USGS has published in book format and updated for more than 50 years and now is available in a computer database. For guidance in naming aquifers, the user is referred to the publication, **Suggestions to Authors of the Reports of the United States Geological Survey, Seventh Edition**, p. 65-82, edited by W. R. Hansen and



EXPLANATION

REGIONAL AQUIFER-SYSTEM ANALYSIS PROGRAM—Study areas 1-23 are included in the aquifer database, areas 24-28 are not included in the database. Numbers in parenthesis refer to the number of aquifers in each study area.

1. Appalachian Valleys and Piedmont (2)
2. Caribbean Islands (3)
3. Central Midwest (6)
4. Central Valley (12)
5. Columbia Plateau (4)
6. Edwards-Trinity aquifer system (3)
7. Floridan aquifer system (2)
8. Great Basin (5)
9. Gulf Coastal Plain (8)
10. High Plains (1)
11. Michigan Basin (3)
12. Northeast glacial aquifers (1)
13. Northern Atlantic Coastal Plain (53)
14. Northern Great Plains (5)
15. Northern Midwest (5)
16. Oahu aquifer system (1)
17. Ohio-Indiana carbonate-bedrock and glacial aquifer system (2)
18. Puget-Willamette Lowland (2)
19. San Juan structural basin (10)
20. Snake River Plain (6)
21. Southeastern Coastal Plain (4)
22. Southwest alluvial basins (4)
23. Upper Colorado River Basin (15)
24. Alluvial basins, Oregon, California, Nevada
25. Illinois Basin
26. Northern Rocky Mountains Intermontane basins
27. Pecos River Basin
28. Southern California alluvial basins

Figure 1.--Location of regional aquifer systems identified for study under the Regional Aquifer-System Analysis Program of the U.S. Geological Survey (modified from Sun and Weeks, 1991, see p. 3 this report).

published in 1991. This report and database on aquifer descriptions complement not only the various RASA reports, but also the USGS **Ground Water Atlas of the United States** that describes the distribution of aquifers in 13 multistate segments of the Nation.

Data on 23 regional aquifer systems consisting of 157 aquifers in those systems are included in this report and the computerized database (table 1 at the back of report). The data for each aquifer include the aquifer name, geographic area, rock units, equivalent aquifer names, lithology, thickness, hydrologic characteristics, water quality, water use, and references. A brief discussion of the geology, structure, and hydrogeologic framework of each aquifer is included within the geographic area attribute. Rock units that compose the aquifers are described in order of increasing age, youngest to oldest.

Each aquifer is described alphabetically on a disk in the pocket at the back of this report. The aquifer database file is 1.2 megabytes, and access to the information is available on two platforms. The first access method is available through anonymous ftp on the USGS Distributed Information System and is available to those who have a Unix-based system and Internet privileges. The second method is based on a personal computer using the disk, which contains the aquifer database and the retrieval software. Instructions and descriptions of these database access systems, including an example for the High Plains aquifer, are detailed in the section **Use of the Aquifer Database.**

Available USGS Professional Papers and Hydrologic Investigations Atlases on an entire RASA area (as opposed to subregional, local, and topical studies) were the principal sources of information for the database. Preliminary USGS RASA reports or articles in scientific journals were used where needed for supplemental information, because some RASA study area reports are still in preparation or review. The references used were selected from the **Bibliography of Regional Aquifer-System Analysis Program of the U.S. Geological Survey, 1978-91**, by R. J. Sun and J. B. Weeks, published by the U. S. Geological Survey in 1991, as Water-Resources Investigations Report 91-4122, 91 p. The information in the database conforms to the original author's description almost verbatim or is summarized as necessary for brevity. Because aquifer information in RASA reports varies from area to area, information in the database is not necessarily consistent.

Robert L. Laney, USGS hydrologist (now retired) conceived the idea of a computer database that summarized information on aquifers in publications of the RASA program. He developed the hydrologic and geologic format of the database and advised on the content of the aquifer attributes in the early phase of the compilation. B. Jean Hawes Bour, USGS computer specialist, developed the program to input aquifer descriptions into the Prime minicomputer. INFOTEXT and EMACS were used in combination to input the information.

USE OF THE AQUIFER DATABASE

By Helen Doherty

The aquifer information is stored in a large data file, and can be accessed from a Unix system (the USGS Data General system) or from a personal computer-disk operating system (PC-DOS). The Unix version is easy to use if you have access to Internet and a Unix-based system, the PC version is more complex but has more text searching capabilities. The data file includes all the aquifer information, specifically: aquifer name, geographic area, rock units, equivalent name, lithology, thickness, hydrologic characteristics, water quality, water use, and references. In both systems the aquifer information can be viewed on the screen or printed to a file or output device. The PC version has detailed text searching capability within the key areas, and the Unix version relies on the name of the aquifer for data searches and retrievals.

Unix Version of the Aquifer Database

Transferring the files to your system

The Data General version of the Aquifer Database is written using the Unix Korn shell, and Unix string editing utilities. It is stored in an anonymous ftp directory on the pbhdqvarsa workstation. To obtain a copy of the data and required programs follow these steps:
(all bold type is entered by the user and a carriage return at the end of the line is assumed)

1. From a Data General or Unix-based system ftp to the pbhdqvarsa workstation:
   >**ftp pbhdqvarsa.er.usgs.gov (or 130.11.51.85)**
   >name: **anonymous**
   >password: **<enter your username>**

2. At the ftp> prompt type:
   >cd pub
   >get aquifer.tar.Z

3. Exit ftp by typing '**quit**'

Copies of the files you obtained will now be in your current directory, these are the files you need to successfully run the shell program.

4. Uncompress all the files that you transferred
   >uncompress aquifer.tar.Z

5. 'Untar' the files by typing
   >tar xvf aquifer.tar
   >rm aquifer.tar

Accessing the aquifer database - example

This is a straightforward text retrieval and display program. Below is a step-by-step example detailing how to access the data in the text file.

In the directory where the aquifer files were placed, type:
>menu

The following selections will appear with the options to view aquifer information or print the list of available aquifers: Enter 1

1) View and print information about Aquifers (select alphabetically)
2) Print list of available Aquifers (to default printer)
3) exit
Enter Selection> **1**

The menu divides the aquifers alphabetically for manageability. Select 2
1) Aquifer_A-G
2) Aquifer_H-M
3) Aquifer_N-S
4) Aquifer_T-Z
5) done
Enter set of Aquifers to list or press <return> for default menu> **2**

The program lists the aquifers alphabetically in the four segments. The number associated with the aquifer is the key to retrieving detailed information about the aquifer. For example, to retrieve the High Plains aquifer previously mentioned in the report enter 49

49) High Plains aquifer

50) Ironton-Galesville aquifer, Cambrian-Ordovician aquifer system,
Northern Midwest aquifer system

51) Kingshill aquifer, Caribbean Islands aquifer system

etc.
.
.
.
Enter the number of the aquifer you want to see in greater detail, in this example: 49

Enter the Aquifer number : **49**

Now you can select the way you want to view the data. Enter 1

1) List to screen
2) Save to file
3) Print (default printer)
4) done
Enter selection or press <return> for default menu> **1**
Complete information on aquifer number 49 will be displayed on the screen.{49}

AQUIFER NAME:

High Plains aquifer

GEOGRAPHIC AREA:

The High Plains aquifer underlies about 174,000 square miles in eastern Colorado (14,900 sq mi), western and central Kansas (30,500 sq mi), Nebraska (63,650 sq mi), eastern New Mexico (9,450 sq mi), Oklahoma panhandle (7,350 sq mi), southwestern South Dakota (4,750 sq mi), Texas panhandle (35,450), and eastern Wyoming (8,800 sq mi). The High Plains is in the southern part of the Great Plains physiographic province which lies between the Rocky Mountains on the west and the Central Lowland on the east. The region extends from South Dakota to Texas. The High Plains, which is characterized by flat to gently rolling terrain, is a remnant of a vast plain formed by sediments that were deposited by streams flowing eastward from the Rocky Mountains.

ROCK UNITS:

Valley-fill deposits in Wyoming, Nebraska, and Kansas include Quaternary clay, silt, sand, gravel. Dune sand deposits are in parts of all states but are most extensive in Nebraska (20,000 square miles) and Kansas. The Quaternary dune deposits include very fine- to medium-grained wind-blown sand. Unconsolidated Quaternary alluvial deposits in Nebraska and Kansas include stream-laid clay, silt, sand, and gravel. Much of the deposits are reworked from the Ogallala Formation.
The Ogallala Formation underlies 134,000 square miles in parts of all states. It is the principal unit in the High Plains aquifer and includes Miocene clay, silt, and sand. All upper Tertiary rocks younger than the Arikaree Group and equivalent rocks of the Ogallala Formation are included in the aquifer. Distinctive caliche layers or mortar beds when cemented with calcium carbonate form cap rock near the top of the Ogallala Formation.
The Arikaree Group in South Dakota, Wyoming, and Nebraska includes Miocene massive fine-grained sandstone containing localized beds of volcanic ash, silty sand, and sandy clay. Secondary porosity in the unit is similar to

that in the underlying Brule Formation. Equivalent rocks between the underlying Brule Formation and the overlying Ogallala Formation are included in the aquifer. The Brule Formation is the upper unit of the White River Group in Nebraska, Colorado, and Wyoming. It includes Oligocene massive siltstone containing beds of channel sand deposits and locally lenticular beds of volcanic ash, claystone, and fine sand. The permeability of the formation is increased by secondary porosity in joints, fractures, and solution openings. Where the secondary porosity is not developed, the top of the Brule is considered the base of the High Plains aquifer.

EQUIVALENT NAMES:

High Plains aquifer system and Ogallala aquifer used in several states (Kapple, G. W., and others, 1977).

LITHOLOGY:

The aquifer includes clay, silt, sand, gravel, sandstone with beds of volcanic ash, claystone, siltstone, limestone, marl, caliche layers, and mortar beds. Geologic units are hydraulically connected. Detailed lithology of geologic units in the aquifer is described under rock units.

THICKNESS:

The total thickness of the aquifer varies. The valley-fill deposits are as much as 60 feet thick; the dune sand is as much as 300 feet thick; and the unconsolidated alluvial deposits are as much as 550 feet thick. The maximum thicknesses of the geologic units in the High Plains aquifer are: Ogallala Formation is 700 feet; Arikaree Group is 1,000 feet where it is part of the aquifer; and the Brule Formation of the White River Group is 600 feet.

HYDROLOGIC CHARACTERISTICS:

Regionally the High Plains aquifer is a water-table aquifer. The maximum saturated thickness of the aquifer is about 1,000 feet, and the average saturated thickness is about 200 feet. Hydraulic conductivity and specific yield of the aquifer are variable and depend on sediments which vary horizontally and vertically. Hydraulic conductivity ranges from less than 25 to 300 feet per day and averages 60 feet per day. Specific yield ranges from less than 10 percent to 30 percent and averages about 15 percent. Ground-water flow is from west to east at an average rate of about 1 foot per day. Estimated recharge rates range from .024 inches per year in Texas to 6 inches per year in south-central Kansas. About 3.25 billion acre-feet of drainable water was stored in the aquifer in 1980. Well yields are greater than 750 gallons per minute throughout large areas in all states in the

High Plains, but the well yields are about 250 gallons per minute where the saturated thickness is thin near the edge of the aquifer or where declining water levels have decreased the saturated thickness.

WATER QUALITY:

The quality of water generally is suitable for irrigation. The water does not meet drinking-water regulations of the Environmental Protection Agency in many places. The concentrations of dissolved solids, fluoride, chloride, selenium, sulfate, and nitrate exceed drinking water regulations in parts of the aquifer in all states. Water in the aquifer containing less than 250 milligrams per liter dissolved solids is calcium bicarbonate type water. Sodium and sulfate are more prevalent at concentrations of 500 milligrams per liter, and calcium, sodium, sulfate, and chloride are most prevalent in concentrations exceeding 500 milligrams per liter. The concentration of dissolved-solids in 85 percent of the volume of water in the High Plains aquifer contains less than 500 milligrams per liter. About 27 percent of the volume of water in the aquifer contains less than 250 milligrams per liter of dissolved-solids.

WATER USE:

About 20 percent of the irrigated land in the United States is in the High Plains, and about 30 percent of the ground water used for irrigation in the country is pumped from the High Plains aquifer. About 95 percent of all water pumped from the aquifer is used for irrigation. During 1980, about 170,000 wells pumped about 18 million acre-feet of water to irrigate nearly 14 million acres. Annual pumpage is from 2 to 100 times greater than recharge in parts of the area. Water levels have declined more than 50 feet in 12,000 square miles and more than 10 feet in 50,000 square miles of the area of the aquifer. As of 1980, the volume of water in storage in the aquifer decreased 166 million acre-feet since irrigation started in the late 1800's.

REFERENCES:

Gutentag, E. D., Heimes, F. J., Krothe, N. C., Luckey, R. R., and Weeks, J. B., 1984, Geohydrology of the High Plains aquifer in parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming: U. S. Geological Survey Professional Paper 1400-B, 63 p.

Kapple, G. W., Luckey, R. R., and Hofstra, W. E., 1977, Digital ground-water model of the Ogallala aquifer in parts of Cheyenne and Kiowa Counties, northern High Plains of Colorado: Colorado Water Conservation Board, Water

Resources Circular 35, 20 p.

Weeks, J. B., and Gutentag, E. D., 1981, Bedrock geology, altitude of base, and 1980 saturated thickness of the High Plains aquifer in parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming: U. S. Geological Survey Hydrologic Investigations Atlas HA-648, scale 1:2,500,000, 2 sheets.

Weeks, J. B., Gutentag, E. D., Heimes, F. J., and Luckey, R. R., 1988, Summary of the High Plains regional aquifer-system analysis in parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming: U. S. Geological Survey Professional Paper 1400-A, 30 p.
--end

Print the aquifer information to a file or to the printer, and then exit

Enter selection or press <return> for default menu> **<return>**
1) List to screen
2) Save to file
3) Print (default printer)
4) done
Enter selection or press <return> for default menu>**4**
Enter <return> to continue...**<return>**
1) Aquifer_A-G
2) Aquifer_H-M
3) Aquifer_N-S
4) Aquifer_T-Z
5) done
Enter selection or press <return> for default menu>**5**
Enter <return> to continue...**<return>**
1) View and print information about Aquifers (select alphabetically)
2) Print list of available Aquifers (to default printer)
3) exit
Enter Selection>**3**

The rest of the menu is straightforward with an option to print the list of aquifer titles.

PC Version of the Aquifer Database

System Requirements

The PC version of the database is stored on one floppy disk in a sleeve at the back of this report. The minimum system requirements to install this program are:

- IBM or compatible personal computer
- 1 Megabyte RAM (will probably run with even less)
- MS- OR PC-DOS version 3.0 or later
- hard disk drive
- color monitor

Installation

Insert the floppy disk that came with the report into your PC floppy drive A (or B). 'Change directory' to the directory on your hard drive where you want to store the aquifer program. Copy all the files from the floppy to your hard drive*.

```
>COPY A:*.*
```

(*note - The program assumes the directory will be on hard drive 'C'; if you wish to use a different drive ('D' for example) modify the GS.BAT file to the following:
- you only need to do this if you are installing the program on a drive other than 'C' -
>gss_swdr AQUIFER <enter new drive letter here>
In most cases drive 'C' is available.)

Uncompress the necessary files:

```
>LHA e AQUIFER.LZH
```

Try out the program by stepping through the following example

Accessing the aquifer database - example

You wish to view all the aquifers with 'Chesapeake' in the title.

At the DOS prompt in the directory where the GS.BAT file is located type:

```
>GS AQUIFER
```

All options you can select from are displayed on the screen at all times; type <F1> if you need help in building your search.
A large empty window will be displayed with the following keywords below it:

Add Search Display Clear Edit Quit

Select 'Add' from the list to start a search query.

A listing of Aquifer attributes will be displayed (press F1 for help at this point)
AQUIFER.NAME
GEOG.NAME
ROCK UNITS
EQUIV. NAME
LITHOGRAPHY
THICKNESS
HYDROLOGY
WATER QUAL.
WATER USE
REFERENCES

Select AQUIFER.NAME from the list by typing <ENTER> on the highlighted word AQUIFER.NAME

A second listing of search terms available under the AQUIFER.NAME will be listed in a second window.
ALAMO
ALLUVIAL
ALLUVIUM
ANIMAS
APISHAPA
APPALACHIAN
etc...
Page down with the <page down> key and highlight 'CHESAPEAKE'
Press the <Enter> key to select CHESAPEAKE

The search term 'CHESAPEAKE' will appear as the selected search term at the top of the main window.

At this point you can add additional search terms by selecting the 'Add' option again, but this example is only interested in the 'CHESAPEAKE' search term.

Select the 'Search' option by typing 'S' or highlighting the Search option with the mouse or arrow keys and pressing <Enter>

When the search for matching records is complete the Display option will automatically become highlighted prompting you to display the selected records press <Enter>

Four matching records will be selected with the word 'CHESAPEAKE' in the aquifer name.

Select the Aquifer you are interested in viewing by highlighting and pressing <Enter>

The complete Aquifer will be displayed in the main window with the word 'CHESAPEAKE' highlighted wherever it occurs. Page down to see all the information.

Press F8 (function key) to print out the record in ASCII (text) format; options for format, field selection and destination will be displayed. Make your selections. (*note - If you want to print out the references for an aquifer, you must print in landscape mode to view the complete reference. All other fields may be printed in portrait mode.)

Cycle through the windows and view all the 'CHESAPEAKE' aquifers selected. The <esc> key will cycle you back one window.
When you are done, start the search process all over again with a new search term or type 'Q' to quit.

Table 1. Aquifer names and regional aquifer systems in the database

Alluvial basin aquifers, Colorado, New Mexico, Texas, Southwest alluvial basins aquifer system
Alluvial aquifers, South Coast Province, Caribbean Islands aquifer system
Alluvium or younger alluvium, Snake River Plain aquifer system
Apishapa aquifer, Great Plains aquifer system in Central Midwest aquifer system
Aquia-Rancocas aquifer, Maryland and Delaware, Northern Atlantic Coastal Plain aquifer system
Aquia aquifer, Virginia, Northern Atlantic Coastal Plain aquifer system
Atlantic City 800-foot sand, New Jersey, Northern Atlantic Coastal Plain aquifer system
Basal Paleozoic aquifer, Upper Colorado River Basin aquifer system
Basal Tertiary aquifers, Upper Colorado River Basin aquifer system
Beaufort-Aquia aquifer, Northern Atlantic Coastal Plain aquifer system
Beaufort aquifer, North Carolina, Northern Atlantic Coastal Plain aquifer system
Bedrock aquifers, Ohio-Indiana carbonate-bedrock and glacial aquifer system
Black Creek-Matawan aquifer, Northern Atlantic Coastal Plain aquifer system
Black Creek aquifer, North Carolina, Northern Atlantic Coastal Plain aquifer system
Black Warrior River aquifer, Southeastern Coastal Plain aquifer system
Brightseat aquifer, Maryland, Northern Atlantic Coastal Plain aquifer system
Brightseat aquifer, Virginia, Northern Atlantic Coastal Plain aquifer system

Table 1. Aquifer names and regional aquifer systems in the database--continued

Cambrian-Ordovician aquifer (AQ1), Northern Great Plains aquifer system
Carbonate rocks (lower part), Great Basin aquifer system
Carbonate rocks (upper part), Great Basin aquifer system
Carbonate aquifers, North Coast Province, Caribbean Islands aquifer system
Castle Hayne-Piney Point aquifer, Northern Atlantic Coastal Plain aquifer system
Castle Hayne aquifer, North Carolina, Northern Atlantic Coastal Plain aquifer system
Chattahoochee River aquifer, Southeastern Coastal Plain aquifer system
Chickahominy-Piney Point aquifer, Virginia, Northern Atlantic Coastal Plain aquifer system
Chickasawhay River aquifer, Southeastern Coastal Plain aquifer system
Cliff House Sandstone, San Juan structural basin
Coastal lowlands aquifer system in Gulf Coastal Plain aquifer system
Columbia aquifer, Virginia, Northern Atlantic Coastal Plain aquifer system
Continental rocks and deposits, QTc, Central Valley aquifer system
Continental rocks and deposits, Tce, Central Valley aquifer system
Continental and marine rocks and deposits, Tcmd, Central Valley aquifer system
Continental rocks and deposits, Tcmo, Central Valley aquifer system
Continental rocks and deposits, Tcpm, Central Valley aquifer system
Dakota Sandstone, San Juan structural basin

Table 1. Aquifer names and regional aquifer systems in the database--continued

Dakota aquifer, Upper Colorado River Basin aquifer system
Drift and Cretaceous aquifers, Northern Midwest aquifer system
Edwards-Trinity aquifer, Edwards-Trinity aquifer system
Edwards aquifer, Edwards-Trinity aquifer system
Englishtown aquifer or aquifer system, New Jersey, Northern Atlantic Coastal Plain aquifer system
Entrada-Preuss aquifer, Upper Colorado River Basin aquifer system
Floridan aquifer system
Gallup Sandstone, San Juan structural basin
Glacial drift aquifers, Michigan Basin aquifer system
Glacial aquifers, Ohio-Indiana carbonate-bedrock and glacial aquifer system
Grand River-Saginaw aquifer, Michigan Basin aquifer system
Grande Ronde unit, Columbia Plateau aquifer system
Granitic rocks, pTg, Central Valley aquifer system
High Plains aquifer
Ironton-Galesville aquifer, Cambrian-Ordovician aquifer system, Northern Midwest aquifer system
Kingshill aquifer, Caribbean Islands aquifer system
Kirkwood-Cohansey aquifer system, New Jersey, Northern Atlantic Coastal Plain aquifer system

Table 1. Aquifer names and regional aquifer systems in the database--continued

Kirtland Shale and Fruitland Formation, San Juan structural basin
Lloyd aquifer, Long Island, New York, Northern Atlantic Coastal Plain aquifer system
Lower basin fill, Arizona, Southwest alluvial basins aquifer system
Lower Cape Fear aquifer, North Carolina, Northern Atlantic Coastal Plain aquifer system
Lower Chesapeake aquifer, Maryland and Delaware, Northern Atlantic Coastal Plain aquifer system
Lower Chesapeake aquifer, Northern Atlantic Coastal Plain aquifer system
Lower Claiborne-upper Wilcox aquifer, Mississippi embayment and Texas coastal uplands aquifer systems in Gulf Coastal Plain aquifer system
Lower Cretaceous aquifer, North Carolina, Northern Atlantic Coastal Plain aquifer system
Lower Cretaceous aquifer (AQ4), Northern Great Plains aquifer system
Lower Paleozoic confining layers and aquifers, Upper Colorado River Basin aquifer system
Lower Potomac aquifer, Northern Atlantic Coastal Plain aquifer system
Lower Potomac aquifer, Virginia, Northern Atlantic Coastal Plain aquifer system
Lower Tertiary aquifers and confining layers, Upper Colorado River Basin aquifer system
Lower Wilcox aquifer, Mississippi embayment aquifer system in Gulf Coastal Plain aquifer system
Madison (or Mississippian) aquifer (AQ2), Northern Great Plains aquifer system

Table 1. Aquifer names and regional aquifer systems in the database--continued

Magothy aquifer, Maryland and Delaware, Northern Atlantic Coastal Plain aquifer system
Magothy aquifer, Northern Atlantic Coastal Plain aquifer system
Magothy aquifer, Long Island, New York, Northern Atlantic Coastal Plain aquifer system
Maha aquifer, Great Plains aquifer system in Central Midwest aquifer system
Marine rocks, pTs, Central Valley aquifer system
Marine rocks and deposits, Tm, Central Valley aquifer system
Marshall aquifer, Michigan Basin aquifer system
Matawan aquifer, Maryland and Delaware, Northern Atlantic Coastal Plain aquifer system
McNairy-Nacatoch aquifer, Mississippi embayment aquifer system in Gulf Coastal Plain aquifer system
Menefee Formation, San Juan structural basin
Mesaverde aquifer, Upper Colorado River Basin aquifer system
Metamorphic rocks, pTm, Central Valley aquifer system
Middle Claiborne aquifer, Mississippi embayment and Texas coastal uplands aquifer systems in Gulf Coastal Plain aquifer system
Middle Mesozoic aquifers, Upper Colorado River Basin aquifer system
Middle Paleozoic aquifers, Upper Colorado River Basin aquifer system
Middle Potomac aquifer, Northern Atlantic Coastal Plain aquifer system
Middle Potomac aquifer, Virginia, Northern Atlantic Coastal Plain aquifer system

Table 1. Aquifer names and regional aquifer systems in the database--continued

Middle Tertiary aquifers, partly drained aquifers, and confining layers, Upper Colorado River Basin aquifer system
Middle Wilcox aquifer, Mississippi embayment and Texas coastal uplands aquifer systems in Gulf Coastal Plain aquifer system
Mississippi River Valley alluvial aquifer, Mississippi embayment aquifer system in Gulf Coastal Plain aquifer system
Morrison Formation, San Juan structural basin
Morrison aquifer, Upper Colorado River Basin aquifer system
Mount Simon aquifer, Cambrian-Ordovician aquifer system, Northern Midwest aquifer system
Navajo-Nugget aquifer, Upper Colorado River Basin aquifer system
Northeast glacial aquifers
Oahu aquifer system
Ojo Alamo Sandstone, San Juan structural basin
Older basin-fill deposits, Great Basin aquifer system
Older alluvium, Snake River Plain aquifer system
Older basalt, Snake River Plain aquifer system
Older silicic volcanic rocks, Snake River Plain aquifer system
Overburden aquifer, Columbia Plateau aquifer system
Ozark aquifer, Ozark Plateaus aquifer system in Central Midwest aquifer system

Table 1. Aquifer names and regional aquifer systems in the database--continued

Patapsco aquifer, Maryland and Delaware, Northern Atlantic Coastal Plain aquifer system
Patuxent aquifer, Maryland and Delaware, Northern Atlantic Coastal Plain aquifer system
Pearl River aquifer, Southeastern Coastal Plain aquifer system
Peedee-Severn aquifer, Northern Atlantic Coastal Plain aquifer system
Peedee aquifer, North Carolina, Northern Atlantic Coastal Plain aquifer system
Pennsylvanian aquifer (AQ3), Northern Great Plains aquifer system
Pictured Cliffs Sandstone, San Juan structural basin
Piedmont and Blue Ridge physiographic provinces, Appalachian Valleys and Piedmont aquifer system
Piney Point-Nanjemoy aquifer, Maryland and Delaware, Northern Atlantic Coastal Plain aquifer system
Piney Point aquifer, New Jersey, Northern Atlantic Coastal Plain aquifer system
Point Lookout Sandstone, San Juan structural basin
Potomac-Raritan-Magothy aquifer system, New Jersey, Northern Atlantic Coastal Plain aquifer system
Puget Sound Lowland aquifer system in Puget-Willamette Lowland aquifer system

Table 1. Aquifer names and regional aquifer systems in the database--continued

Pungo River aquifer, North Carolina, Northern Atlantic Coastal Plain aquifer system
Rio Grande water-bearing zone, New Jersey, Northern Atlantic Coastal Plain aquifer system
Saddle Mountains unit, Columbia Plateau aquifer system
San Jose, Nacimiento, and Animas Formations, San Juan structural basin
Severn aquifer, Maryland and Delaware, Northern Atlantic Coastal Plain aquifer system
Silurian-Devonian aquifer, Northern Midwest aquifer system
Springfield Plateau aquifer, Ozark Plateaus aquifer system in Central Midwest aquifer system
St. Francois aquifer, Ozark Plateaus aquifer system in Central Midwest aquifer system
St. Marys-Choptank aquifer, Virginia, Northern Atlantic Coastal Plain aquifer system
St. Peter-Prairie du Chien-Jordan aquifer, Cambrian-Ordovician aquifer system, Northern Midwest aquifer system
Stream alluvium, Arizona, Southwest alluvial basins aquifer system
Surficial aquifer, overlies the Floridan aquifer system and Southeastern Coastal Plain aquifer system
Surficial aquifer, Maryland and Delaware, Northern Atlantic Coastal Plain aquifer system
Surficial aquifer, Northern Atlantic Coastal Plain aquifer system
Surficial aquifer in North Carolina, Northern Atlantic Coastal Plain aquifer system

Table 1. Aquifer names and regional aquifer systems in the database--continued

Surficial deposits undifferentiated, New Jersey, Northern Atlantic Coastal Plain aquifer system
Trinity aquifer, Edwards-Trinity aquifer system
Upper basin fill, Arizona, Southwest alluvial basins aquifer system
Upper Cape Fear aquifer, North Carolina, Northern Atlantic Coastal Plain aquifer system
Upper Chesapeake aquifer, Maryland and Delaware, Northern Atlantic Coastal Plain aquifer system
Upper Chesapeake aquifer, Northern Atlantic Coastal Plain aquifer system
Upper Claiborne aquifer, Mississippi embayment and Texas coastal uplands aquifer systems in Gulf Coastal Plain aquifer system
Upper Cretaceous and Tertiary aquifer (AQ5), Northern Great Plains aquifer system
Upper glacial aquifer, Long Island, New York, Northern Atlantic Coastal Plain aquifer system
Upper Mesozoic confining layers and aquifers, Upper Colorado River Basin aquifer system
Upper Paleozoic aquifers and confining layers, Upper Colorado River Basin aquifer system
Upper Potomac aquifer, Northern Atlantic Coastal Plain aquifer system
Upper Potomac aquifer, Virginia, Northern Atlantic Coastal Plain aquifer system
Upper Tertiary discontinuous aquifers, Upper Colorado River Basin aquifer system
Valley and Ridge physiographic province, Appalachian Valleys and Piedmont aquifer system

Table 1. Aquifer names and regional aquifer systems in the database--continued

Vincentown aquifer, New Jersey, Northern Atlantic Coastal Plain aquifer system
Volcanic rocks, Great Basin aquifer system
Volcanic rocks and deposits at Sutter Buttes, QTvs, Central Valley aquifer system
Volcanic rocks and deposits, Tvd, Central Valley aquifer system
Volcanic rocks, Tvu, Central Valley aquifer system
Wanapum unit, Columbia Plateau aquifer system
Wenonah-Mount Laurel aquifer, New Jersey, Northern Atlantic Coastal Plain aquifer system
Western Interior Plains aquifer system in Central Midwest aquifer system
Willamette Valley aquifer system in Puget-Willamette Lowland aquifer system
Yorktown-Eastover aquifer, Virginia, Northern Atlantic Coastal Plain aquifer system
Yorktown aquifer, North Carolina, Northern Atlantic Coastal Plain aquifer system
Younger basin-fill deposits, Great Basin aquifer system
Younger basalt, Snake River Plain aquifer system
Younger silicic volcanic rocks, Snake River Plain aquifer system

*U.S. G.P.O.:1995-387-030:56R