GROUND WATER
RESOURCES

Davis County

Open File Report 80-26 WRD

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GROUND WATER RESOURCES OF DAVIS COUNTY

Introduction

Approximately 63% of the residents of Davis County rely on ground water as the source of their drinking water. It is estimated that the use of ground water in the county currently approaches .35 billion gallons per year. For comparison, this amount would provide each resident with 104 gallons of water a day during the year. Actually, few if any households use this much water, and the rather large annual per capita use reflects the greater water requirements of the county's industries, agribusinesses, and municipalities.

The users of ground water in the county draw their supplies from several different geologic sources. Several factors must be considered in determining the availability of ground water and the adequacy of a supply source:

distribution - having water where it is needed,

accessibility - affects the costs for drilling wells and pumping water,

yield - relates to the magnitude of the supply that can be sustained,

quality - determines for what purposes the water can be used.

In terms of these factors, there are few locations in Davis County where the availability of ground water is not limited to some degree. The most common limitation is poor water quality, that is, highly mineralized ground water. Secondary limitations are generally related to poor distribution, small yields from some sources, and poor accessibility due to the great depth to more adequate sources.

Occurrence of Ground Water in Davis County

The occurrence of ground water is influenced by geology -- the position and their physical and chemical make-up. Geologic units that store and transmit water and yield appreciable amounts to wells are called aquifers. The best aquifers are usually composed of unconsolidated sand and gravel, porous sandstone, and porous or fractured limestone and dolostone. Other units with materials such as clay and silt, shale, siltstone, and mudstone yield little or no water to wells. These impermeable units are called aquicludes or aquitards and commonly separate one aquifer unit from another.

In Davis County there are four principal aquifers from which users obtain water supplies. The loose, unconsolidated materials near the land surface comprise the surficial aquifer. Below this there are three major rock aquifers -- the Mississippian, the Devonian, and the Cambro-Ordovician aquifers. Figure 1 shows the geologic relation of these beneath the county. Each of the aquifers has its own set of geologic, hydrologic, and water quality characteristics which determine the amount and potability (suitability for drinking) of water it will yield.

Surficial Aquifers

Unconsolidated deposits at the land surface are comprised of mixtures of clay, silt, sand, gravel, and assorted boulders. The water-yielding potential of surficial deposits is greatest in units composed mostly of sand and/or gravel. Three types of surficial aquifers are used: the alluvial aquifer, the drift aquifer, and the buried channel aquifer.

The alluvial aquifer consists mainly of the sand and gravel transported and deposited by modern streams and makes up the floodplains and terraces in major valleys. Alluvial deposits are shallow, generally less than 50-60 feet and thus may be easily contaminated by the infiltration of surface water.

The drift aquifer is the thick layer of clay to boulder size material deposited over the bedrock by glacial ice which invaded the county at least twice in the last two million years. The composition of the glacial drift varies considerably and in many places does not yield much water. There are, however, lenses or beds of sand and gravel within the drift which are thick and widespread enough to serve as dependable water sources. These lenses are difficult to locate because they are irregular in shape and buried within the drift deposits. Usually one or two sand layers can be found in most places that will yield minimum water supplies for domestic wells.

The buried channel aquifer consists of stream alluvium of partially filled valleys that existed before the glacial period. The valleys were overridden by the glaciers and are now buried under glacial and recent alluvial deposits.

The distribution, yield, and water quality characteristics for the surficial aquifers are summarized in Figures 2, 9, and 13. An indication of accessibility can be obtained by comparing the elevations of the top (the land surface) and the bottom (the bedrock surface) of the surficial deposits from Figures 4 and 5. The thickness of the glacial drift and the depth of the buried channels are determined by subtracting the elevations at selected locations.

Rock Aquifers

Below the surficial materials is a thick sequence of layered rocks formed from deposits of rivers and shallow seas that have covered the state within the last 600 million years. The geologic map (Figure 3) shows the geologic units which form the top of this rock sequence. These rocks are Pennsylvanian in age and are shales. Although the Pennsylvanian rocks usually act as an aquiclude, there are locally sandstone layers (particularly in the northwestern area of Bloomfield 30-90 feet thick and going south east to Pulaski 5-10 feet thick) which supply small yields to domestic wells. The Pennsylvanian rocks are found generally underlying the whole county, except for a couple of patches in north-central and northeast parts of the county (refer to Figure 3). They are found to be the thickest in the southwestern corner, up to 230 feet thick and in the extreme north west corner, up to 210 feet.

Underlying the Pennsylvanian aquiclude is a sequence of older rocks, portions of which form the three major rock aquifers in Davis County. This sequence and its water-bearing characteristics are shown in Table 1.

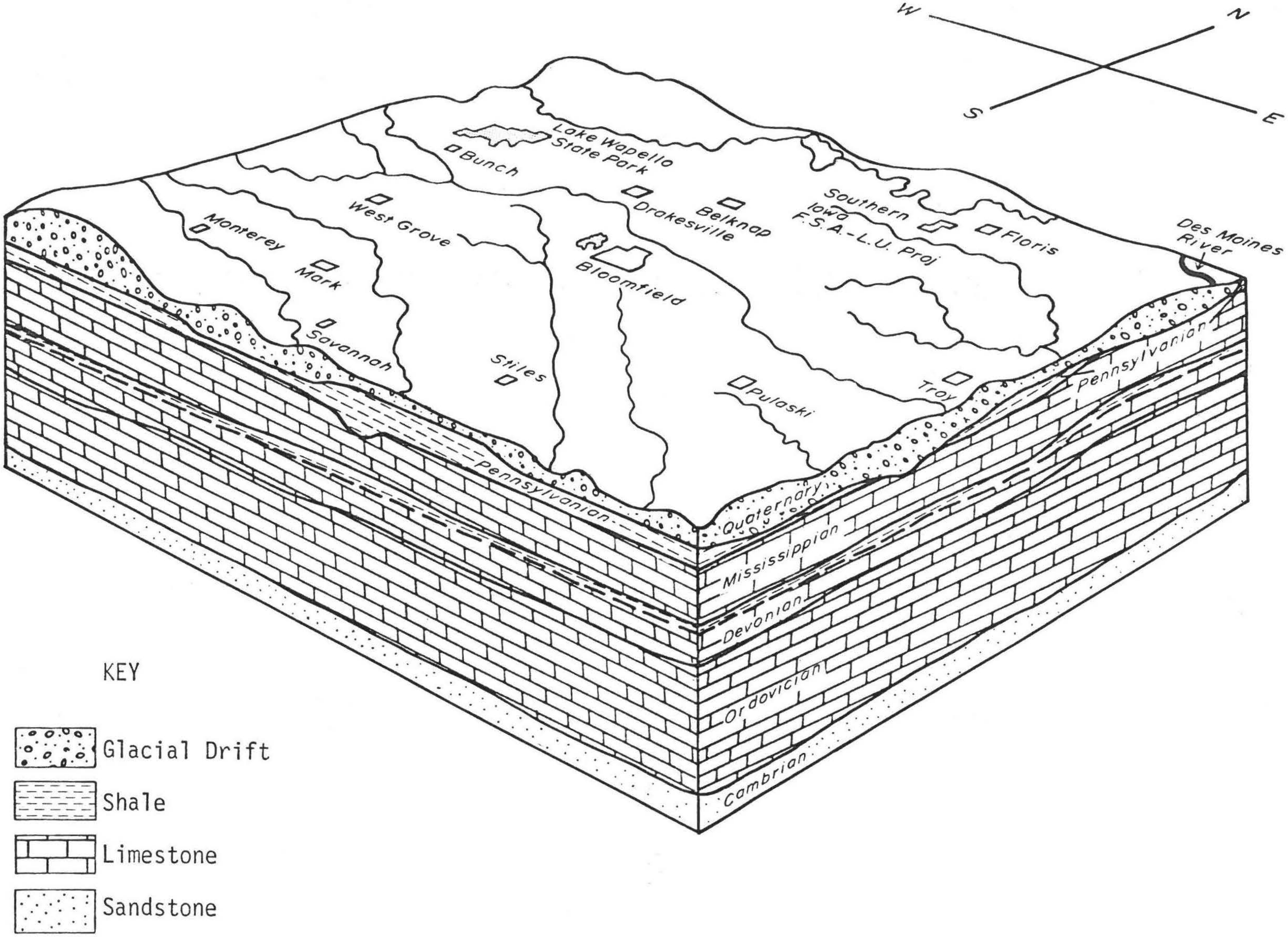


Figure 1

BLOCK DIAGRAM SHOWING THE GEOLOGY OF DAVIS COUNTY

Examples of the rock units encountered in several wells at various locations in Davis County are indexed and illustrated in Figures 7 and 8. The geologic unit that supplies ground water and the rate of yield are shown for each well.

The relative accessibility of ground water in rock aquifers depends on the depth to the aquifer. The deeper a well must be, the greater the cost for well construction and pumping. The depths to and thicknesses of units at specific sites will vary somewhat because of irregularities in the elevation of the land surface and in the elevation of the underlying rock units. Estimates of depths and thicknesses can be made by comparing Figure 4 with the maps of aquifer elevations in Figures 10, 11 and 12. The range in depth below land surface to the top of the county's principal bedrock aquifers is given for each township in Figure 6.

A second factor affecting ground water accessibility is the level to which the water will rise in a well (the static water level). Throughout the county water in the rock aquifers is under artesian pressure and rises in the well once the aquifer is penetrated. This can reduce the cost of pumping. Average static water levels for Davis County wells are shown in Figures 10, 11 and 12.

Average rates of yield and water quality characteristics for each of the aquifers are summarized in the maps in Figures 10, 11, 12, 13, 14 and 15.

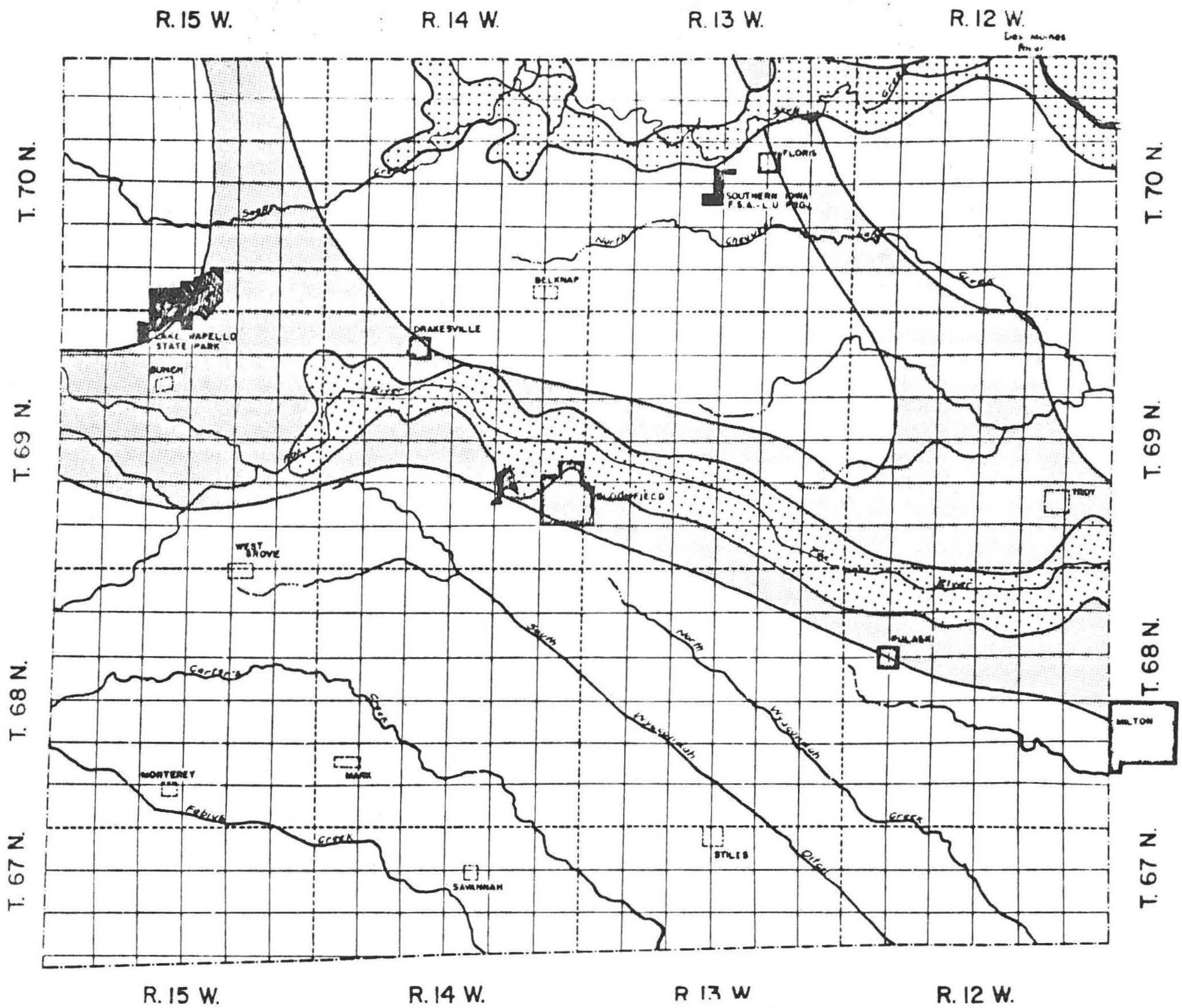
Table 1

GEOLOGIC AND HYDROGEOLOGIC UNITS IN DAVIS COUNTY

Age	Rock Unit	Description	Thickness Range	Hydrogeologic Unit	Water-Bearing Characteristics
Quaternary	Alluvium	Sand, gravel, silt and clay	0-320 (feet)	Surficial aquifer	Fair to large yields (25 to 100 gpm)
	Glacial drift (undifferentiated)	Predominantly till containing scattered irregular bodies of sand and gravel			Low yields (less than 10 gpm)
	Buried channel deposits	Sand, gravel, silt and clay			Small to large yields
Pennsylvanian	Des Moines Series	Shale; sandstones; mostly thin	0-250	Aquiclude	Low yields only from limestone and sandstone
Mississippian	Meramec Series	Sandy limestone	150-500	Mississippian aquifer	Fair to low yields
	Osage Series	Limestone and dolostone cherty; shale			
	Kinderhook Series	Limestone, oolitic, and dolostone, cherty			
Devonian	Maple Mill Shale Sheffield Formation Lime Creek Formation	Shale and siltstone; limestone in lower part	80-125	Devonian aquiclude	Does not yield water
	Cedar Valley Limestone Wapsipinicon Formation	Limestone and dolostone; contains evaporites (gypsum) in southern half of Iowa	125-250	Devonian aquifer	Fair to low yields
Ordovician	Galena Formation	Dolostone and chert	650-850	Minor aquifer	Low yields
	Decorah Formation-Platteville Formation	Limestone, dolostone and thin shale includes sandstone in SE Iowa		Aquiclude	Does not yield water
	St. Peter Sandstone	Sandstone		Cambrian-Ordovician aquifer	Fair yields
	Prairie du Chien Formation	Dolostone, sandy and cherty			High yields (over 500 gpm)
Cambrian	Jordan Sandstone	Sandstone	50-95		
	St. Lawrence Formation	Dolostone		Aquitard	Low yields
	Franconia Sandstone	Sandstone and shale			
	Dresbach Group	Sandstone		Dresbach aquifer	High to low yields
Precambrian	Undifferentiated	Coarse sandstones: crystalline rocks		Base of ground-water reservoir	Not known to yield water

Figure 2

SURFICIAL MATERIALS



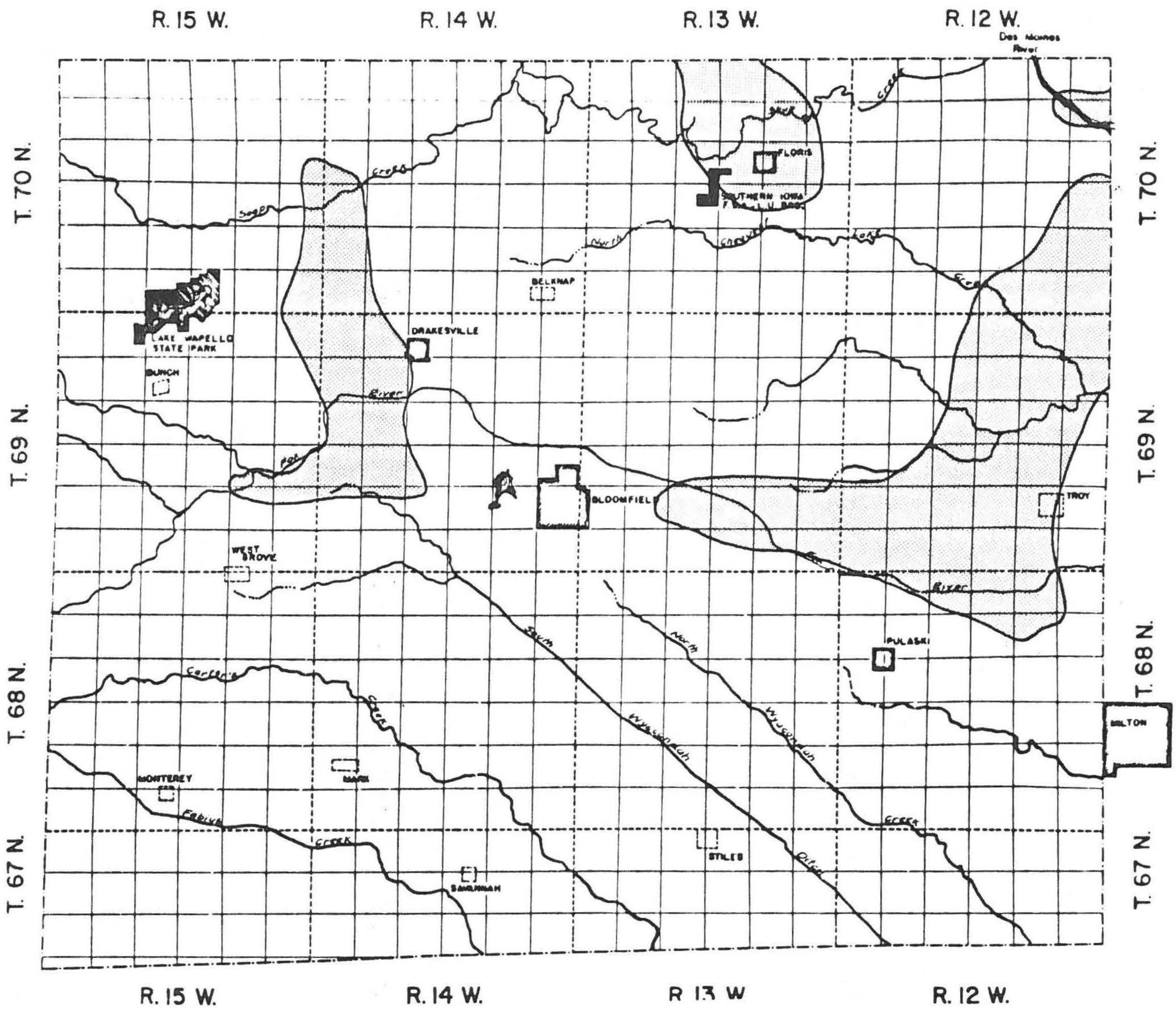
Alluvium

Glacial Drift

Buried Channels

Figure 3

GEOLOGIC MAP



Pennsylvanian aquiclude

Mississippian aquifer - Upper Part

Figure 4

ELEVATION OF LAND SURFACE IN FEET ABOVE MEAN SEA LEVEL

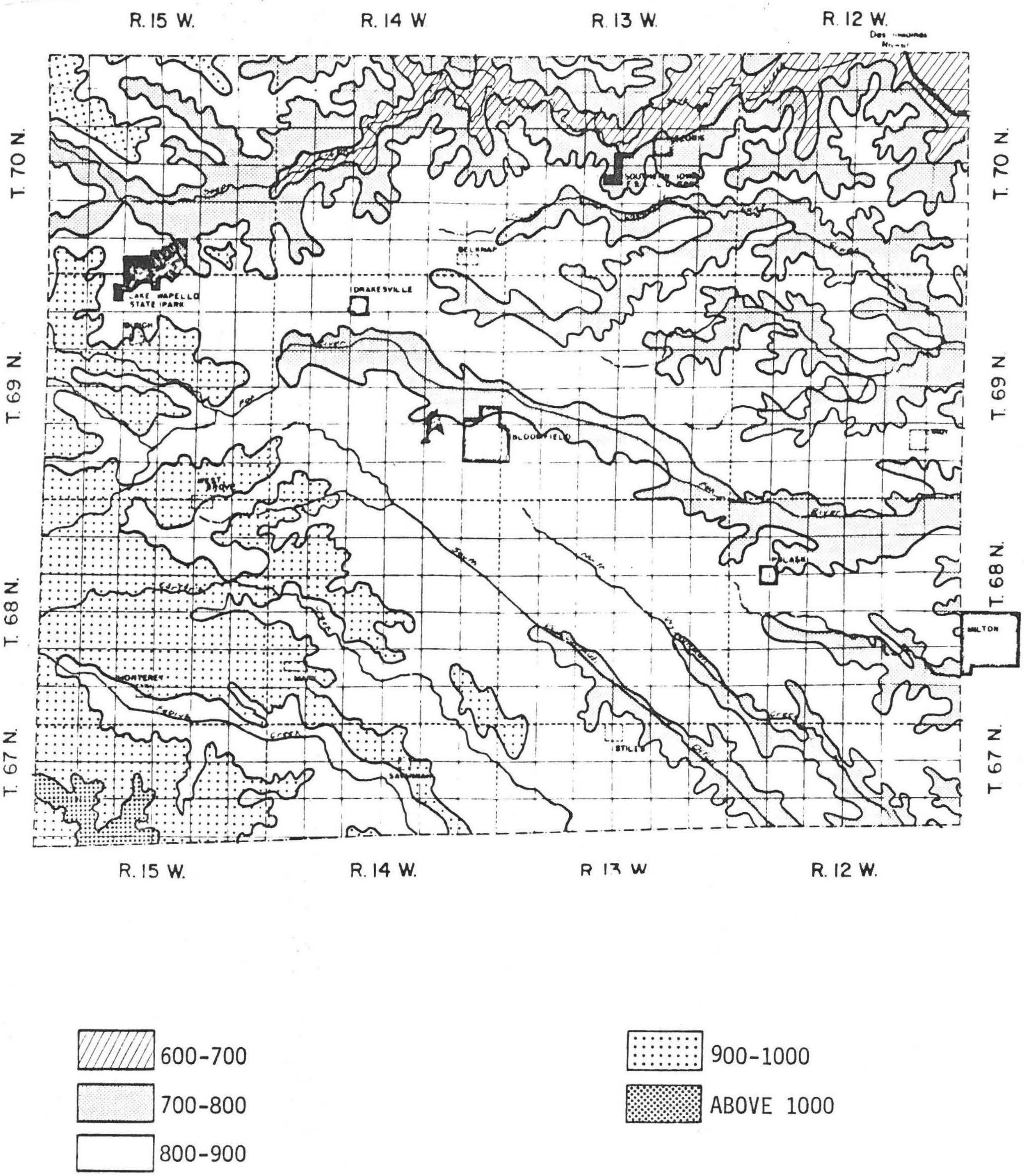
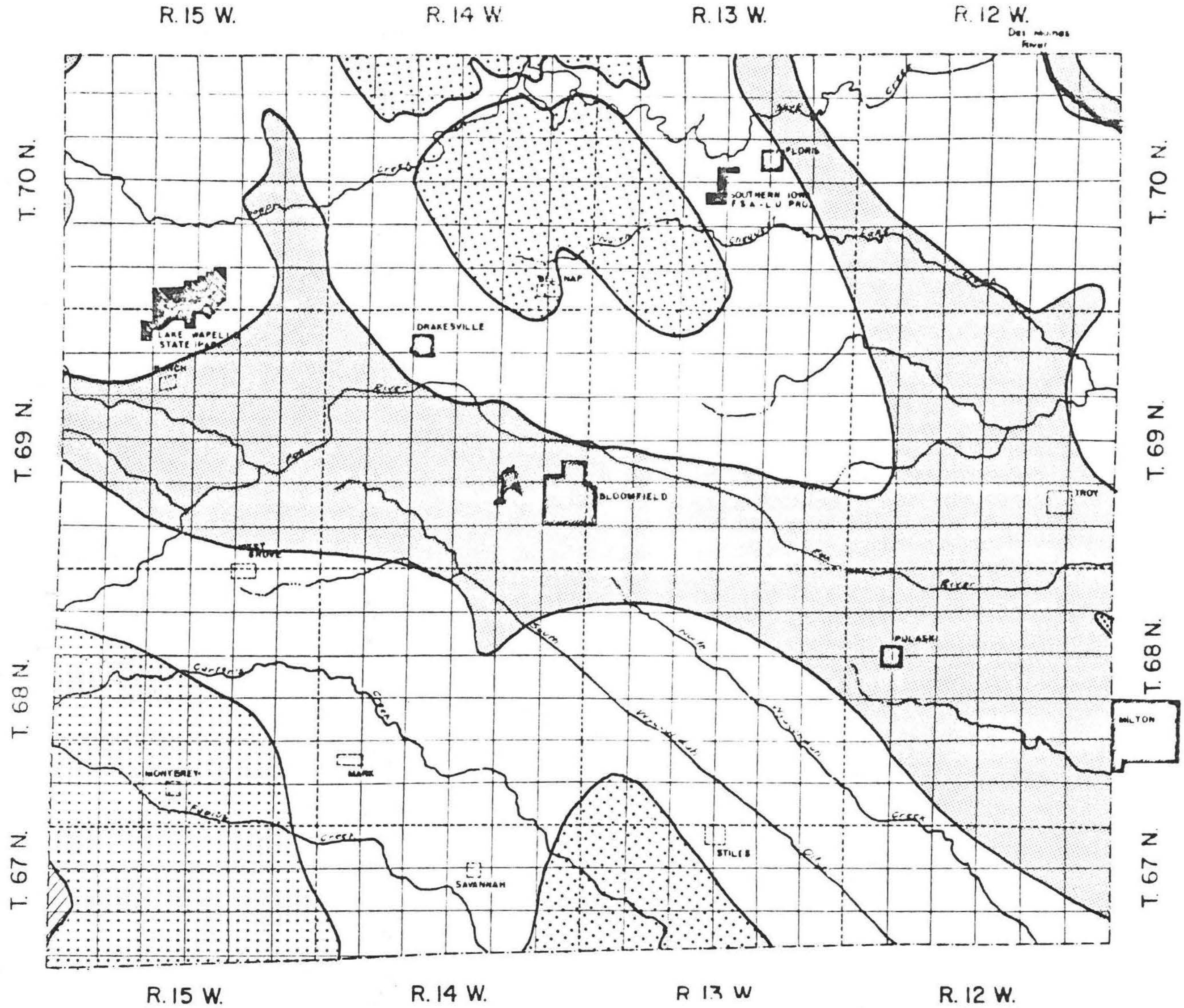


Figure 5

ELEVATION OF BEDROCK SURFACE IN FEET ABOVE MEAN SEA LEVEL



400-500

500-600

600-700

700-800

800-900

Figure 6

RANGE IN DEPTH TO DAVIS COUNTY'S PRINCIPAL ROCK AQUIFERS

	R. 15 W.	R. 14 W.	R. 13 W.	R. 12 W.	
T. 70 N.	BEDROCK 0-400 MISSISSIPPIAN 0-500 DEVONIAN 650-1000 CAMBRO-ORDOVICIAN 1800-2200	BEDROCK 0-200 MISSISSIPPIAN 0-400 DEVONIAN 650-900 CAMBRO-ORDOVICIAN 1800-2100	BEDROCK 0-200 MISSISSIPPIAN 0-400 DEVONIAN 700-900 CAMBRO-ORDOVICIAN 1800-2100	BEDROCK 0-200 MISSISSIPPIAN 0-400 DEVONIAN 700-900 CAMBRO-ORDOVICIAN 1700-2100	T. 70 N.
T. 69 N.	BEDROCK 0-400 MISSISSIPPIAN 200-500 DEVONIAN 800-1100 CAMBRO-ORDOVICIAN 1900-2200	BEDROCK 0-200 MISSISSIPPIAN 200-400 DEVONIAN 750-1100 CAMBRO-ORDOVICIAN 1900-2200	BEDROCK 0-300 MISSISSIPPIAN 100-300 DEVONIAN 750-950 CAMBRO-ORDOVICIAN 1900-2100	BEDROCK 200-300 MISSISSIPPIAN 100-300 DEVONIAN 750-1000 CAMBRO-ORDOVICIAN 1900-2100	T. 69 N.
T. 68 N.	BEDROCK 100-300 MISSISSIPPIAN 200-600 DEVONIAN 850-1100 CAMBRO-ORDOVICIAN 2000-2200	BEDROCK 200-300 MISSISSIPPIAN 200-500 DEVONIAN 850-1100 CAMBRO-ORDOVICIAN 2000-2200	BEDROCK 100-300 MISSISSIPPIAN 200-500 DEVONIAN 750-1100 CAMBRO-ORDOVICIAN 1900-2200	BEDROCK 200-400 MISSISSIPPIAN 200-400 DEVONIAN 750-1000 CAMBRO-ORDOVICIAN 1900-2100	T. 68 N.
T. 67 N.	BEDROCK 100-200 MISSISSIPPIAN 200-400 DEVONIAN 850-1050 CAMBRO-ORDOVICIAN 2000-2200	BEDROCK 100-200 MISSISSIPPIAN 200-500 DEVONIAN 850-1100 CAMBRO-ORDOVICIAN 2000-2200	BEDROCK 100-200 MISSISSIPPIAN 200-500 DEVONIAN 800-1100 CAMBRO-ORDOVICIAN 1900-2200	BEDROCK 100-300 MISSISSIPPIAN 200-400 DEVONIAN 800-1000 CAMBRO-ORDOVICIAN 1900-2100	T. 67 N.
	R. 15 W.	R. 14 W.	R. 13 W.	R. 12 W.	

Figure 7

INDEX MAP FOR TYPICAL WELLS IN DAVIS COUNTY

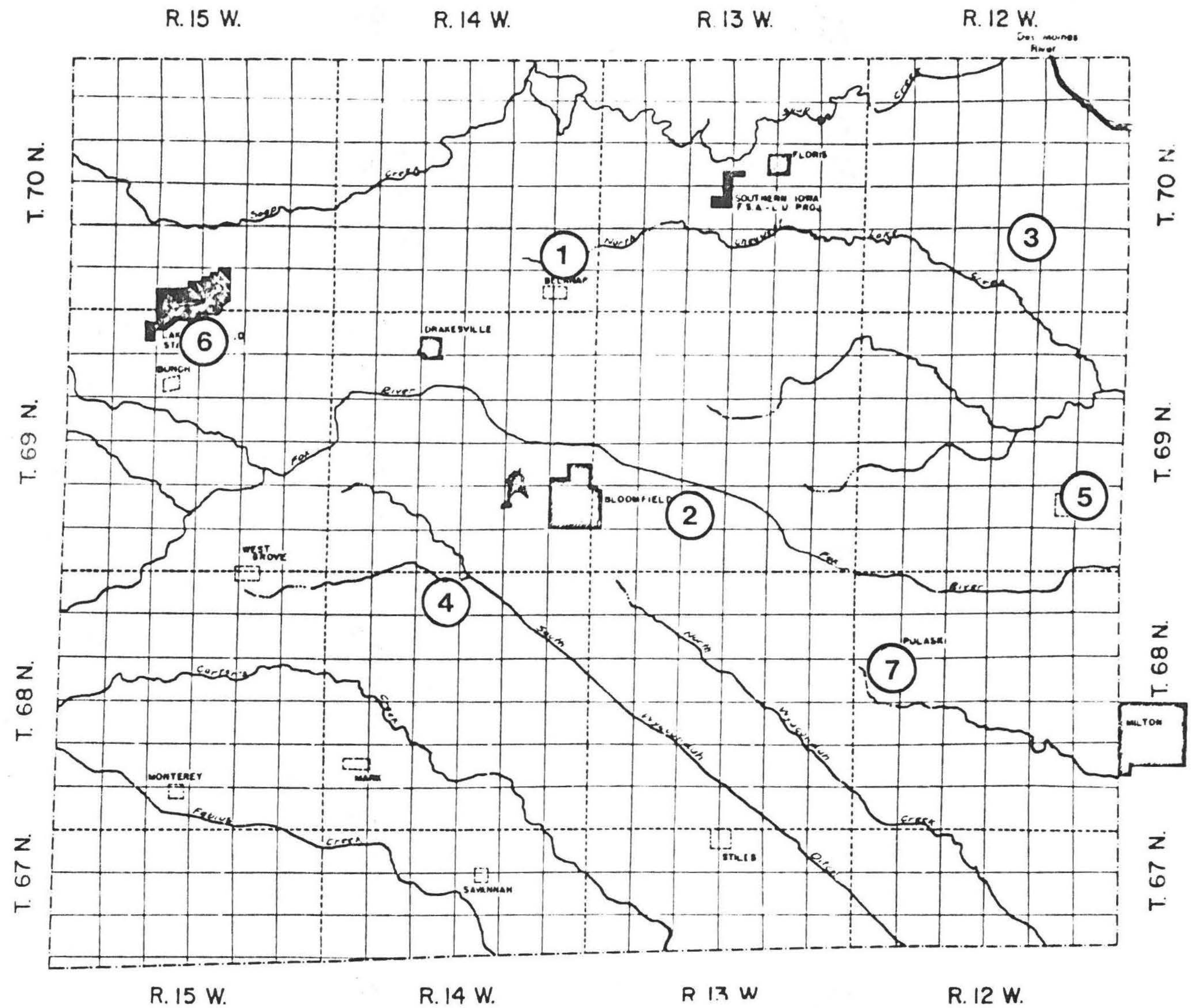


Figure 8

TYPICAL WELLS IN DAVIS COUNTY

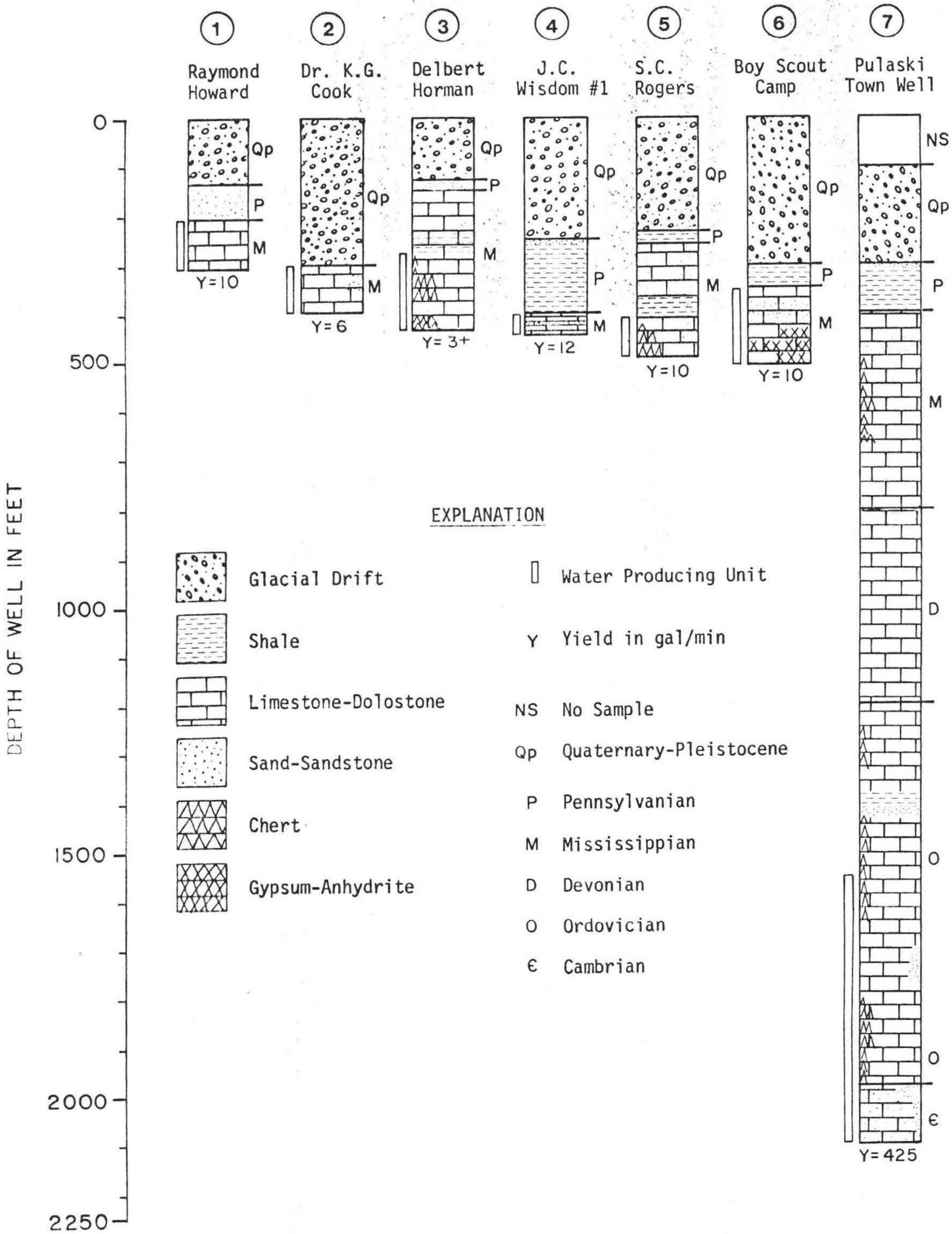


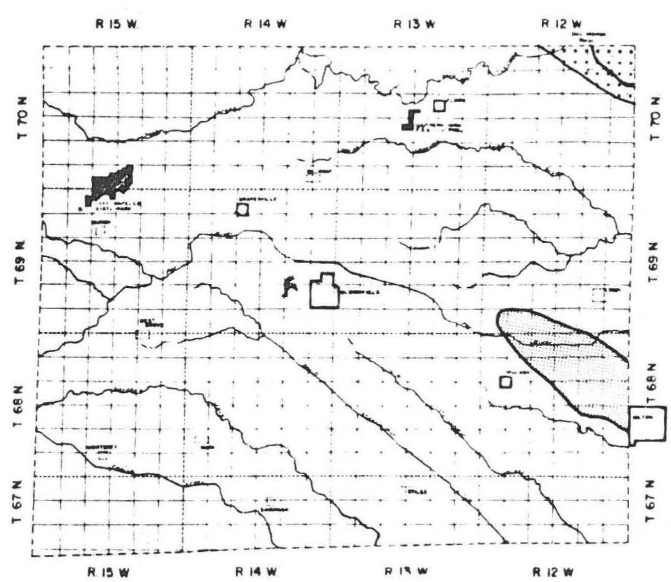
Figure 9

SURFICIAL AQUIFERS

Water Levels

Water levels in the surficial aquifers are difficult to analyze, water rises to different levels in wells drilled into alluvial, buried-channel, and drift aquifers. The water table in the drift aquifer generally slopes from high land areas toward the streams and, changes noticeably throughout the year. Levels in drift and buried-channel aquifers respond rapidly to recharge from precipitation. Water levels in the alluvial aquifer fluctuates somewhat in the same way as those in the drift and buried-channel aquifers; however, the main influence on the alluvial aquifer is the stage (level) of the associated streams. Water levels will be high during periods of high stream stage and low during the low-stage periods.

Water levels in the drift aquifers commonly are from 10 to 50 feet below the land surface, and those in the buried-channel aquifers have been reported to be as low as 175 feet below the land surface. The water levels in alluvial wells are from 4 to 20 feet below the flood-plain surface and the depth to the water surface will be accordingly deeper in wells located on terrace surfaces.



Water yields to wells in gallons per minute

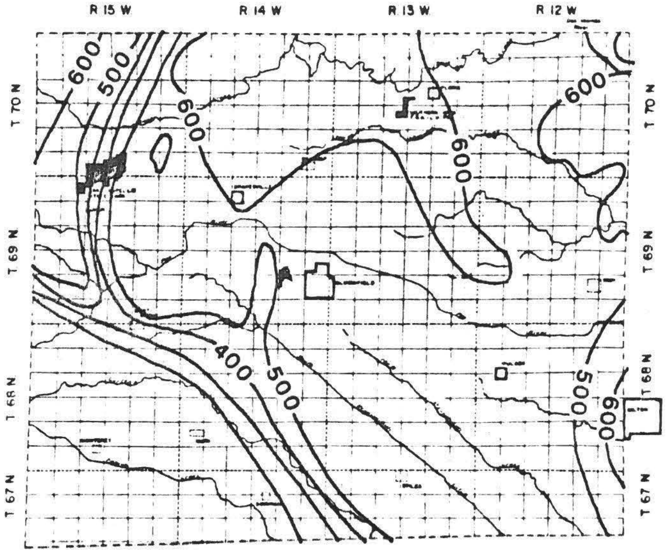
Below 20

20-100

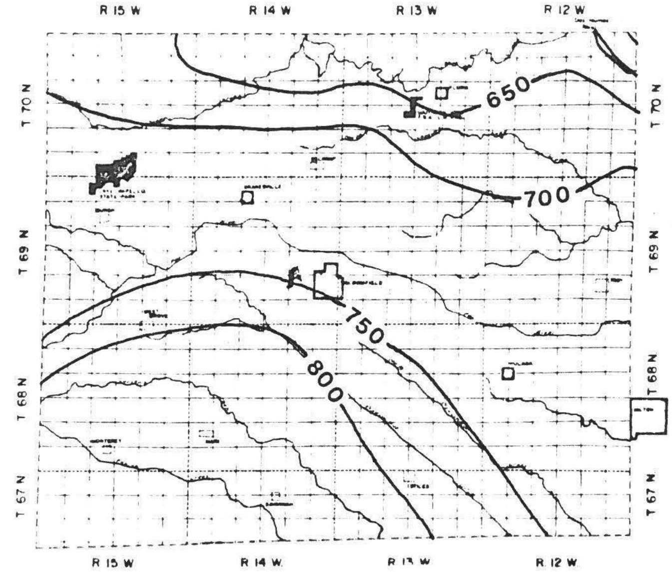
100-500

Figure 10

MISSISSIPPIAN AQUIFER

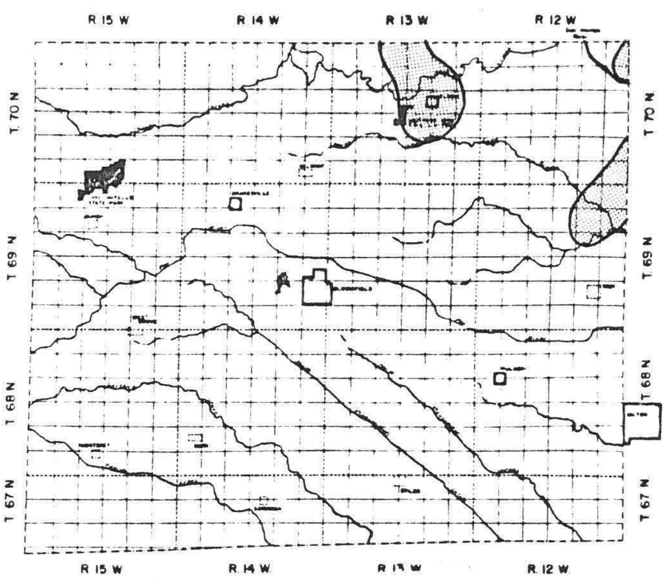


Elevation of Mississippian Aquifer in feet above mean sea level



Water levels in wells in feet above mean sea level

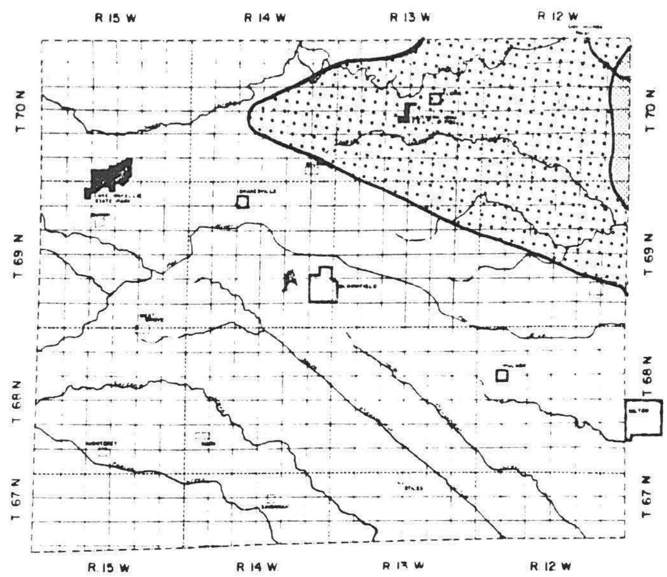
Upper-Part



Water yields to wells in gallons per minute

Below 20

20-50



Dissolved solids content in milli-grams per liter (mg/1)*

500-1000

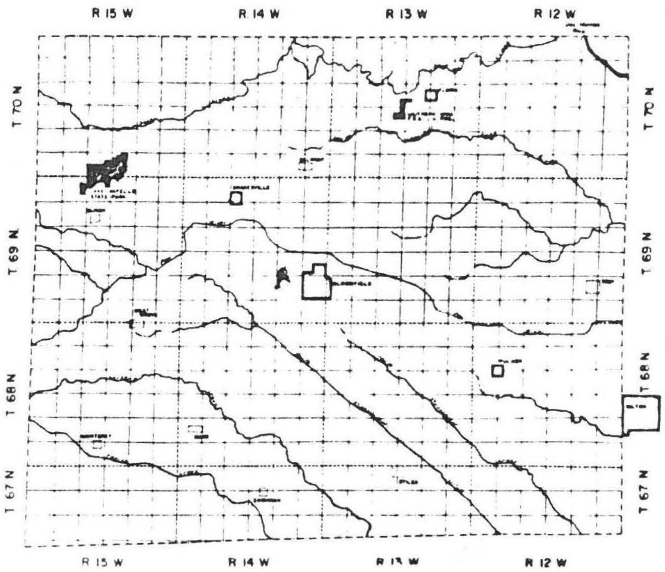
1000-2500

Above 2500

* Other water quality data in Figure 13

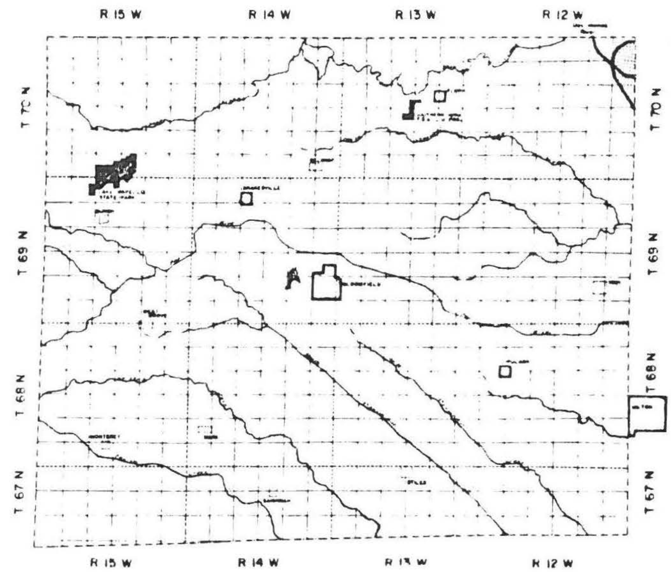
MISSISSIPPIAN AQUIFER

Lower Part



Water yields to wells in gallons per minute

Below 20



Dissolved solids content in milligrams per liter (mg/l) *

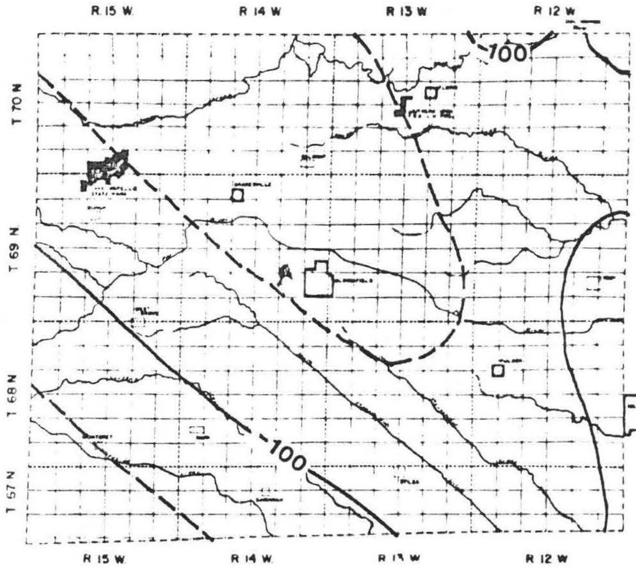
1000-2500

2500-5000

*Other water quality data in Figure 14

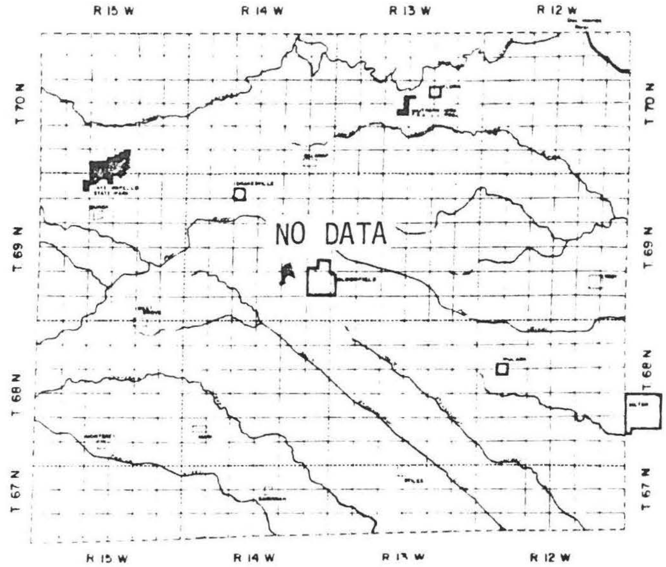
Figure 11

DEVONIAN AQUIFER

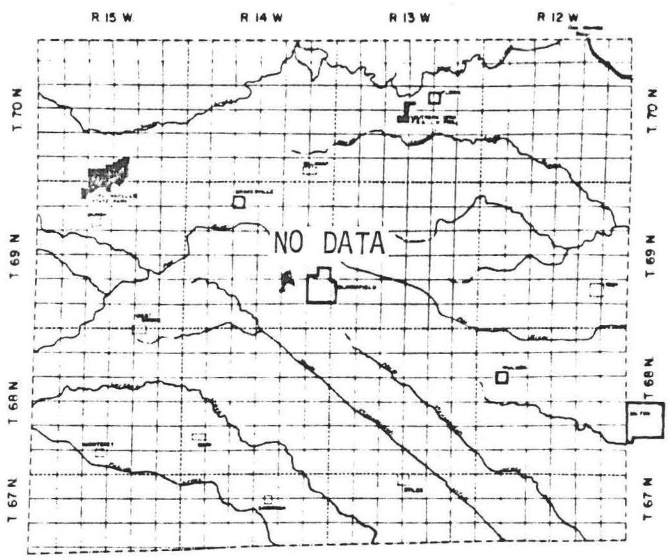


Elevation of the Devonian Aquifer in feet above mean sea level

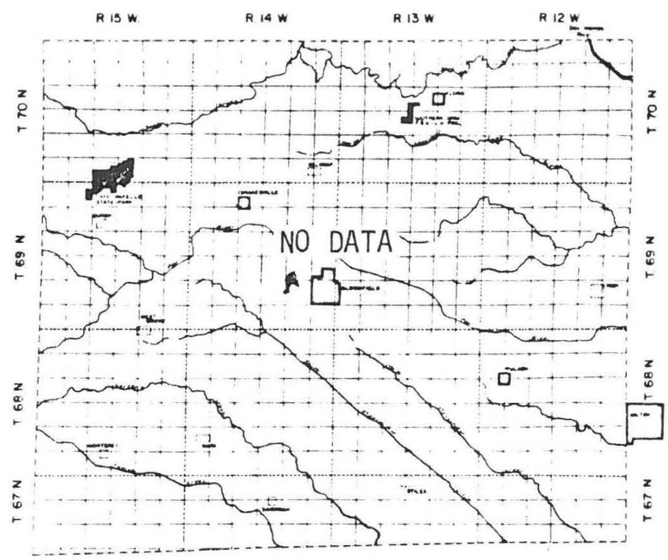
--- 50 foot contour



Water levels in wells in feet above mean sea level



Water yields to wells in gallons per minute

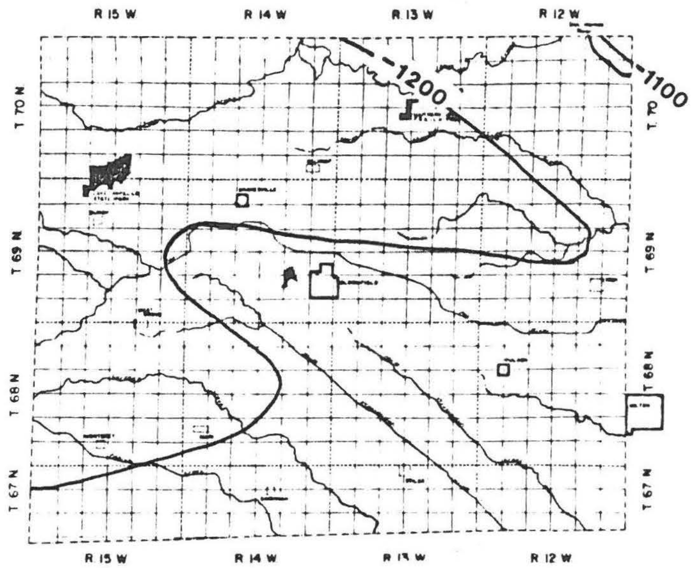


Dissolved solids content in milligrams per liter (mg/l)*

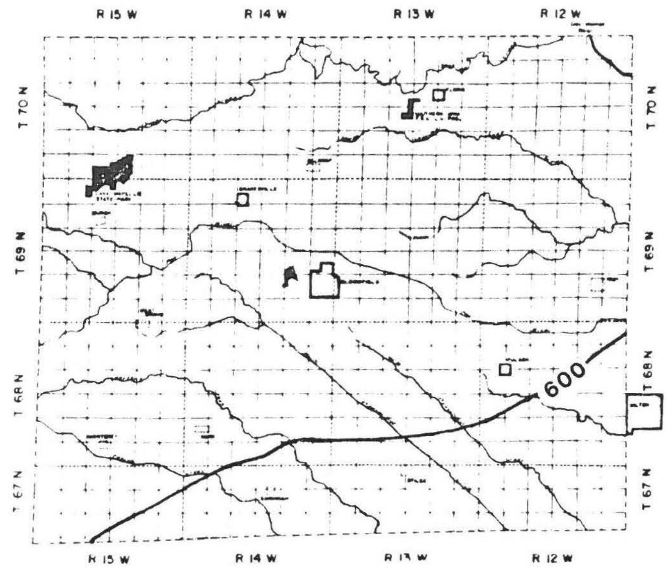
*Other water quality date in Figure 15

Figure 12

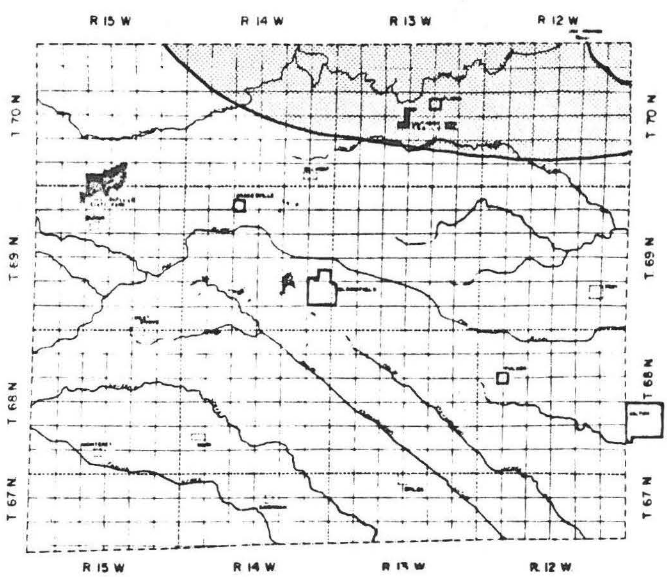
CAMBRO-ORDOVICIAN (JORDAN) AQUIFER



Elevation of the Jordon aquifer in feet above sea level



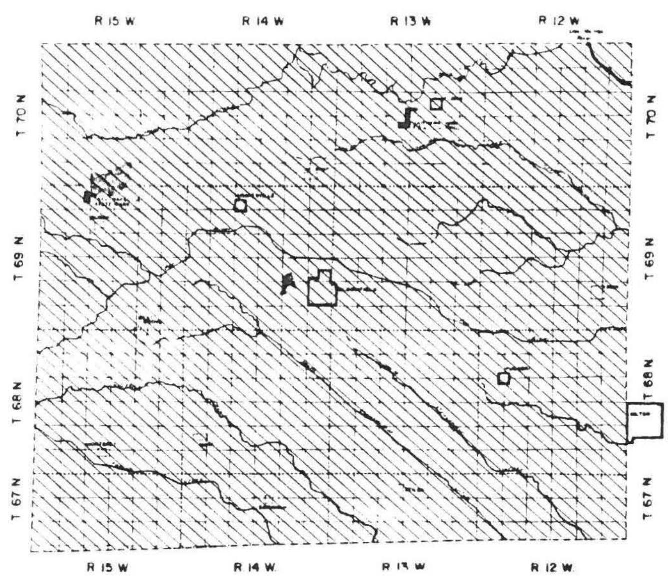
Water levels in wells in feet above mean sea level



Water yields to wells in gallons per minute

500-1000

Above 1000



Dissolved solids content in milligrams per liter (mg/l)*

1000-1500

*Other water quality data in Figure 15

Table 2

SIGNIFICANCE OF MINERAL CONSTITUENTS AND PHYSICAL PROPERTIES OF WATER

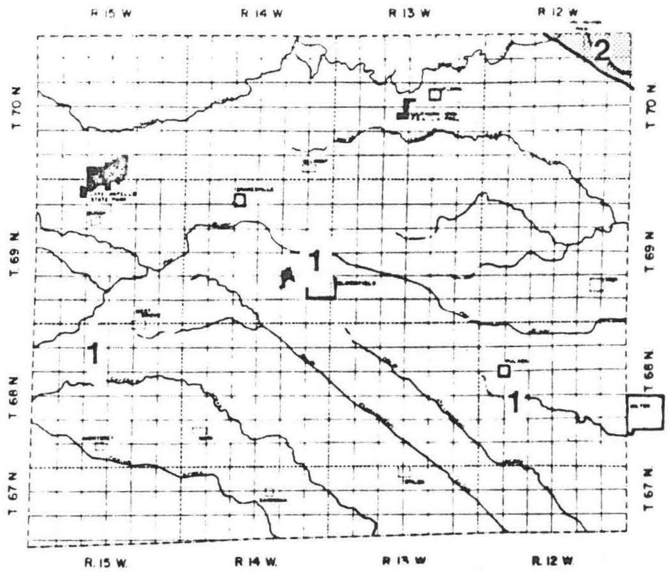
Constituent or Property	Maximum Recommended Concentration	Significance
Iron (Fe)............	0.3 mg/l...........	Objectional as it causes red and brown staining of clothing and porcelain. High concentrations affect the color and taste of beverages.
Manganese (Mn)......	0.05 mg/l..........	Objectionable for the same reasons as iron. When both iron and manganese are present, it is recommended that the total concentration not exceed 0.3 mg/l.
Calcium (Ca) and Magnesium (Mg).....		Principal causes for hardness and scale-forming properties of water. They reduce the lathering ability of soap.
Sodium (Na) and Potassium (K)........		Impart a salty or brackish taste when combined with chloride. Sodium salts cause foaming in boilers.
Sulfate (SO_4).........	250 mg/l...........	Commonly has a laxative effect when the concentration is 600 to 1,000 mg/l, particularly when combined with magnesium or sodium. The effect is much less when combined with calcium. This laxative effect is commonly noted by newcomers, but they become acclimated to the water in a short time. The effect is noticeable in almost all persons when concentrations exceed 750 mg/l. Sulfate combined with calcium forms a hard scale in boilers and water heaters.
Chloride (Cl).........	250 mg/l...........	Large amounts combined with sodium impart a salty taste.
Fluoride (F)..........	2.0 mg/l...........	In central Iowa, concentrations of 0.8 to 1.3 mg/l are considered to play a part in the reduction of tooth decay. However, concentrations over 2.0 mg/l will cause the mottling of the enamel of children's teeth.
Nitrate (NO_3)........	45 mg/l............	Waters with high nitrate content should not be used for infant feeding as it may cause methemoglobinemia or cyanosis. High concentrations suggest organic pollution from sewage, decayed organic matter, nitrate in the soil, or chemical fertilizer.
Dissolved solids.......	500 mg/l...........	This refers to all of the material in water that is in solution. It affects the chemical and physical properties of water for many uses. Amounts over 2,000 mg/l will have a laxative effect on most persons. Amounts up to 1,000 mg/l are generally considered acceptable for drinking purposes if no other water is available.
Hardness (as $CaCO_3$)..		This affects the lathering ability of soap. It is generally produced by calcium and magnesium. Hardness is expressed in milligrams per liter equivalent to $CaCO_3$ as if all the hardness were caused by this compound. Water becomes objectionable for domestic use when the hardness is above 100 mg/l; however, it can be treated readily by softening.
Temperature.........		Affects the desirability and economy of water use, especially for industrial cooling and air conditioning. Most users want a water with a low and constant temperature.

To the user, the quality of ground water is as important as the amount of water that an aquifer will yield. As ground water moves through soil and rock materials, it dissolves some of the minerals which, in turn, affect water quality. In addition to mineral content, bacterial and chemical contamination may be introduced through poorly constructed wells and seepage from other pollution sources.

Recommended standards for common water constitutents are described in the table above. These are rationally accepted as guidelines for acceptable drinking water supplies. Limits for uses other than drinking often differ from these. For instance, water that is unacceptable for drinking and household use may be completely satisfactory for industrial cooling.

From analyses of ground water averages (A) and ranges (R) of values in milligrams per liter (mg/1) for several mineral constituents are summarized in Figures 13, 14 and 15 for the 4 major aquifers in Davis County. Recommended concentrations for some constituents are often exceeded without obvious ill effects, although the water may be unpalatable. Water quality analyses for individual wells should be obtained to determine if concentrations of constituents that affect health are exceeded.

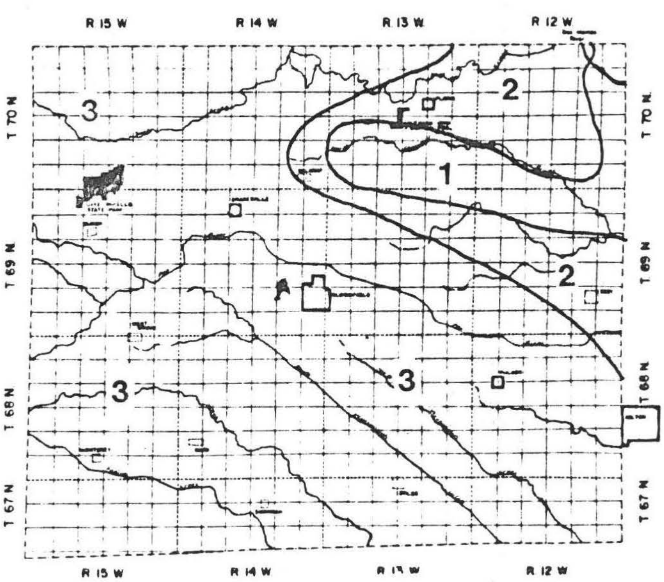
Figure 13
CHEMICAL CHARACTER OF GROUND WATER
Surficial Aquifers



Area	Average and Range	Calcium (Ca)	Magnesium (Mg)	Sodium and Potassium (Na+K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Dissolved Solids	Hardness (as $CaCO_3$)
Drift Aquifer										
1	A	103	36	40	506	74	2.7	0.4	547	406
	R	77-150	24-61	13-88	304-739	11-393	0.5-7.5	0.2-0.7	357-982	292-625
Alluvial Aquifer										
2	A	108	31	21	295	169	11	.4	552	395
	R	84-143	20-41	11-28	218-390	22-287	3.5-17	0-1.0	440-726	304-525

Surficial aquifers yield water which is least mineralized and of good quality. The alluvial and drift aquifers yield good quality water and in large amounts. The dissolved solids content tends to be a bit high, but is acceptable for drinking purposes if no other water is available. Water temperatures average 54°F (12.0°C) and the range of temperatures is from 48°F to 58°F (9.0°C to 14.5°C).

Mississippian Aquifer
Upper Part



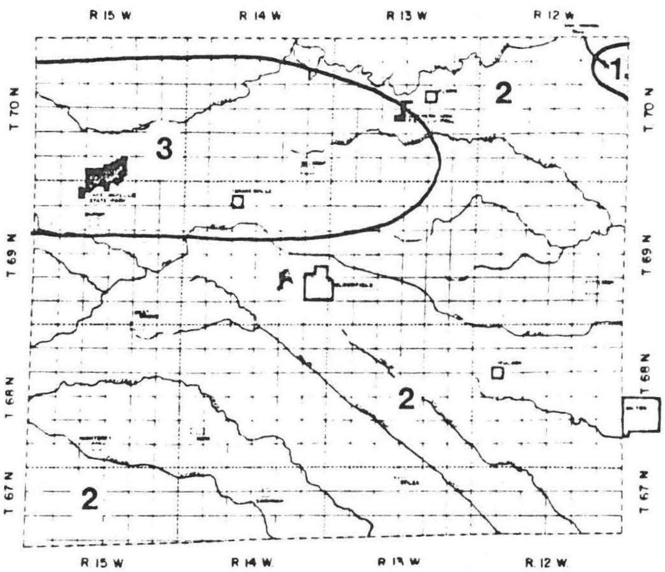
Area	Average and Range	Calcium (Ca)	Magnesium (Mg)	Sodium and Potassium (Na+K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Dissolved Solids	Hardness (as $CaCO_3$)
1	A	155	46	84	423	397	9.9	.6	955	578
	R	104-210	21-61	8-177	349-498	321-480	.5-35	0-1.8	793-1050	385-660
2	A	299	92	125	281	1100	8.5	.8	1950	1130
	R	197-547	47-124	33-214	44-434	750-1590	2-22	.3-1.6	1420-2740	723-1560
3	A	327	76	679	284	2160	68	1.4	3620	1130
	R	154-490	54-99	474-1080	212-350	1500-2850	27-186	1.2-2.4	2710-4880	605-1520

Good to fair water quality is available in the upper part of the Mississippian in area 1 and area 2 which is acceptable for many uses. The water is more highly mineralized than that typically found in the surficial aquifers and is usually very hard. The dissolved solids content gets increasingly higher from areas 1 to 3, where it is very high, and the sulfate concentrations also increase to where they greatly exceed recommended standards. Average water temperature is 55°F (13°C) and the range of temperatures is from 51°F to 60°F (10.5°C to 15.5°C).

Figure 14

Mississippian Aquifer

Lower Part



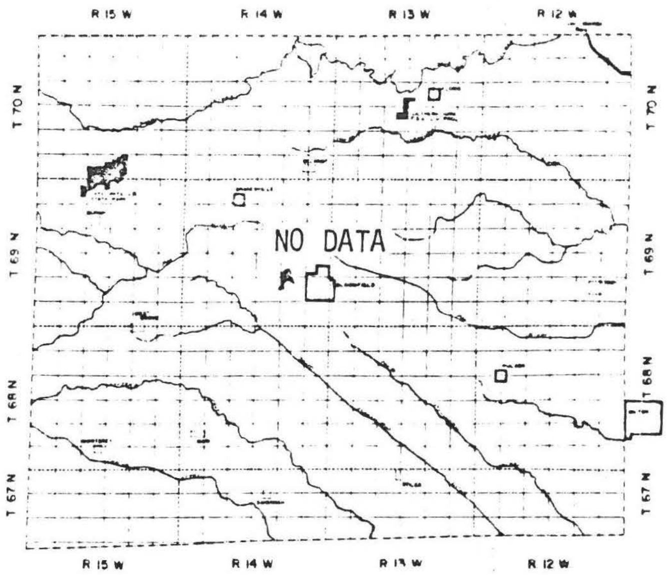
Area	Average and Range	Calcium (Ca)	Magnesium (Mg)	Sodium and Potassium (Na+K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Dissolved Solids	Hardness (as $CaCO_3$)
1	A	152	44	79	432	322	45	.4	964	565
	R	132-174	28-98	17-162	334-608	84-658	13-93	.2-.7	566-1610	466-840
2	A	102	52	718	459	1340	169	2.6	2710	469
	R	35-193	15-107	451-994	266-595	920-1660	19-365	.5-6	2220-3250	148-891
3	A	486	71	203	205	1750	17	0.0	3030	1510

Water in the lower part of the Mississippian aquifer is generally of poorer quality than found in the upper part. Throughout the county the water is exceptionally hard and sulfate concentrations greatly exceed recommended values. Total dissolved solids are extremely high and fluoride content is high in area 2. Average water temperature is 55°F (13°C), and the range of temperature from 51°F to 60°F (10.5°C to 15.5°C).

Figure 15

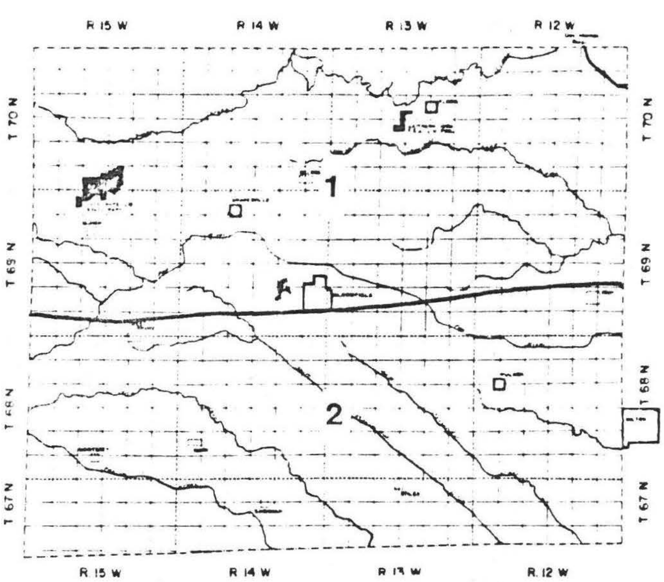
CHEMICAL CHARACTER OF GROUND WATER

Devonian Aquifer



For the Devonian aquifer in this county, which is not a potable water source, there is no immediate data available, but from data extrapolation of nearby counites, the water quality is found to be very poor. The water is highly mineralized with sulfate, sodium, iron and manganese and has a very high content of dissolved solids, most likely in excess of 10,000 mg/l. Water temperatures are higher than that from the Mississippian aquifers sources averaging 60°F (15.5°C)and with a temperature range of 54°F to 64°F (12.0°C to 18.0°C).

Cambro-Ordovician Aquifer



Area	Average and Range	Calcium (Ca)	Magnesium (Mg)	Sodium and Potassium (Na+K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Dissolved Solids	Hardness (as $CaCO_3$)
1	A	84	34	267	298	476	124	1.7	1160	349
	R	78-92	26-41	247-283	283-317	455-500	100-148	1.0-2.2	1100-1220	322-388
2	A	71	30	322	304	394	216	2.4	1210	300
	R	65-76	25-32	310-331	273-326	338-420	209-222	2.0-2.9	1080-1310	290-321

This deep aquifer yields water of relatively good quality compared to the other rock aquifers. The water is noticeably hard and exceeds recommended standards for sulfates, fluorides and dissolved solids, but it is not as highly mineralized as that from parts of the Mississippian and Devonian aquifers. Water temperatures are higher than other rock aquifer sources averaging 72°F (22°C) and with a temperature range from 68°F to 76°F (20.0°C to 24.5°C).

RECOMMENDATIONS FOR PRIVATE WATER WELLS

Contracting for Well Construction

To protect your investment and guarantee satisfactory well completion, it is a good idea to have a written agreement with the well driller. The agreement should specify in detail:

size of well, casing specifications, and types of screen and well seal

methods of eliminating surface and subsurface contamination

disinfection procedures to be used

type of well development if necessary

test pumping procedure to be used

date for completion

itemized cost list including charges for drilling per foot, for materials per unit, and for other operations such as developing and test pumping

guarantee of materials, workmanship, and that all work will comply with current recommended methods

liability insurance for owner and driller

Well Location

A well should be located where it will be least subject to contamination from nearby sources of pollution. The Iowa State Department of Health recommends minimum distances between a new well and pollution sources, such as cesspools (150 ft.), septic tanks (50 ft.), and barnyards (50-100 ft. and downslope from well). Greater distances should be provided where possible.

The well location should not be subject to flooding or surface water contamination. Select a well-drained site, extend the well casing a few feet above the ground, and mound earth around it. Diversion terraces or ditches may be necessary on slopes above a well to divert surface runoff around the well site.

In the construction of all wells care should be taken to seal or grout the area between the well bore and the well casing (the annulus) as appropriate so that surface water and other pollutants cannot seep into the well and contaminate the aquifer.

Locate a well where it will be accessible for maintenance, inspection, and repairs. If a pump house is located some distance from major buildings and wired separately for power, continued use of the water supply will not be jeopardized by fire in major buildings.

Water Treatment

Water taken from a private well should ideally be tested every six months. The University Hygienic Laboratory will do tests for coliform bacteria, nitrate, iron, hardness, and iron bacteria in drinking water for private individuals. Special bottles must be used for collecting and sending water samples to the laboratory. A sample kit can be obtained by writing to the University Hygienic Laboratory, University of Iowa, Oakdale Campus, Iowa City, Iowa 52242. Indicate whether your water has been treated with chlorine, iodine, or bromine; for different sample bottles must be used for treated and untreated water. The charge for the bacterial test is $3.00; for iron hardness and nitrate, it is $3.00; and for iron bacteria, $5.00. If your well is determined to be unsafe, advice for correcting the problem can be obtained from your county or state Department of Health. Several certified private laboratories also run water analyses.

Shock chlorination is recommended following the construction and installation of a well and distribution system and any time these are opened for repairs or remodeling a strong chlorine solution is placed in the well and complete distribution system to kill nuisance and disease-causing organisms. If the first shock chlorination does not rid the water supply of bacteria it should be repeated, if this does not solve the problem the well should be abandoned or the water should be continuously disinfected with proper chlorination equipment.

Since most of the ground waters in Davis County are mineralized, water softening and iron removal equipment may make water more palatable and pleasant to use. Softened water contains increased sodium, contact your physician before using a softener if you are on a sodium-restricted diet. Chlorination followed by filtration will remove most forms of iron and iron bacteria. Iron bacteria has no adverse effect on health but will plug wells, water lines, and equipment and cause tastes and odors. Iron removal equipment can be used if problems persist.

Well Abandonment

Wells taken out of service provide easy access for pollution to enter aquifers supplying water to other wells in the vicinity. Unprotected wells may also cause personal injury. Proper abandonment procedures should be followed to restore the natural condition that existed before well construction and prevent any future contamination. Permanent abandonment requires careful sealing. The well should be filled with concrete, cement grout, or sealing clays throughout its entire length. Before dug or bored wells are filled at least the top 10 feet of lining should be removed so surface waters will not penetrate the subsurface through a porous lining or follow cracks in or around the lining. The site should be completely filled and mounded with compacted earth.

ABANDONED WELLS SHOULD NEVER BE USED FOR DISPOSAL OR SEWAGE OR OTHER WASTES.

SOURCES OF ADDITIONAL INFORMATION

In planning the development of a groundwater supply or contracting for the drilling of a new well, additional information is often required. This section lists several types and sources of information.

State Agencies

Iowa Department of Natural Resources (515)-281-8666
Environmental Protection Division
Wallace Building
Des Moines, IA 50319-0034

(Pollution problems, public drinking water, wastewater treatment, water quality, assistance to local communities, protection of surface and underground reservoirs, allocates water use, permits water use of 25,000 or more gallons per day)

Environmental Protection Division (319) 653-2135
Regional Office No. 6
117 N. 2nd Avenue
Washington, IA 52343

(Municipal water supplies and waste water treatment routine sanitary inspections, local pollution problems, assistance to communities)

Energy and Geological Resources Division (319) 335-1575
Geological Survey Bureau
123 North Capitol Street
Iowa City, IA 52242

(Geologic and groundwater data repository, consultant for well problems, well forecasing, hydrogeologic research, and related services)

Iowa Department of Public Health (515) 281-4942
Lucas Building
Des Moines, IA 50319

(Promotes public health hygiene and sanitation; programs of health education, quality of health care)

University of Iowa Hygienic Laboratory (319) 335-4500
University of Iowa
Oakdale Campus
Iowa City, IA 52242

(Water analyses)

Cooperative Extension Service (515) 294-4569
Iowa State University
Ames, IA 50011

(Advice on water system design and maintenance)

Well Drillers and Contractors

The listing provided here was drawn from an Iowa Geological Survey mailing list and yellow pages of major towns in phone books. Those selected are within an approximate radius of 50 miles of Davis County. For a statewide listing contact either the Iowa Water Well Drillers Association, 4350 Hopewell Ave., Bettendorf, Iowa 51712, (319) 355-7528 or the Iowa Geological Survey, (319) 338-1173.

Bailey Well Co.
203 East Main
New London, Iowa 52645

Brooks Well and Pump Co.
Knoxville, Iowa 50138

Douglas Bruinekool
Bruinekool Well Co.
Pella, Iowa 50219

Dwayne Bruinekool
Bruinekool Well Co.
Oskaloosa, Iowa 52577

Campbell Well
701 South Columbia
Bloomfield, Iowa 52537

Detrick Well Co.
R.R. #1
New London, Iowa 52645

Hopson Well Drilling
R.R. 1
Hamilton, Illinois 62341

Kramer Well Co.
Mt. Pleasant, Iowa 52641

Neal Lyon Well Co.
Salem, Iowa 52649

Schilicher Bros. Well
Hwy. 34 West
Fairfield, Iowa 52556

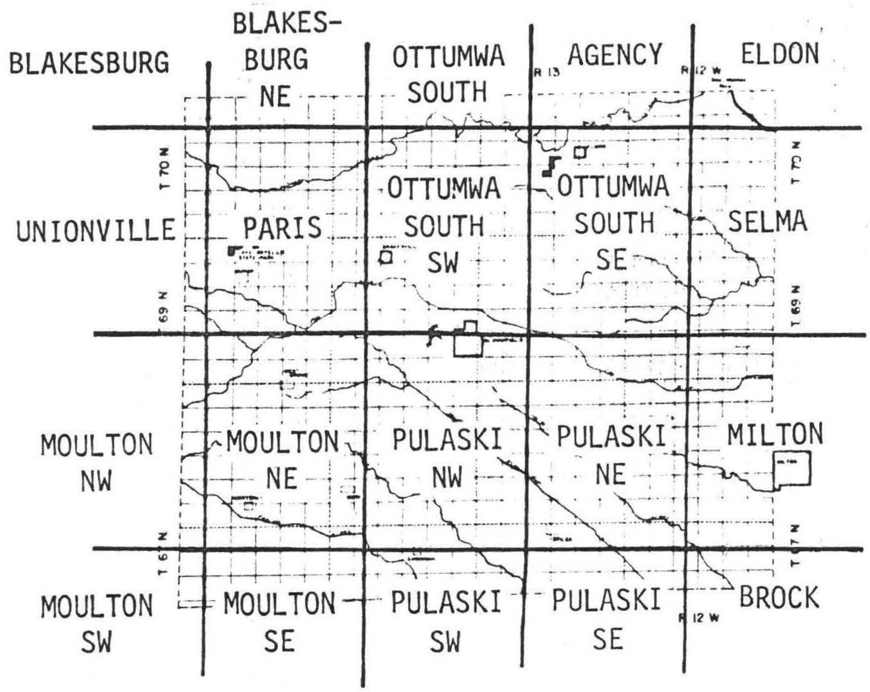
Schlicher Well Co.
P.O. Box 207
Donnelson, Iowa 52625

Schmeiser Well Co.
1111 Hagemen St.
Burlington, Iowa 52601

Snook Well Co.
Promise City, Iowa 52583

Wilson Well Co.
R.R. #3
Burlington, Iowa 52601

Topographic Maps (Available from the Iowa Geological Survey)



Map Title	Date	Scale	Contour Interval
	(Published)		
Blakesburg	1968-(76-1)*	1:24,000	10 ft.
Blakesburg NE	1968-(76-1)	1:24,000	10 ft.
Ottumwa South	1956	1:24,000	10 ft.
Agency	1956	1:24,000	10 ft.
Eldon	1965	1:24,000	10 ft.
Unionville	1968	1:24,000	10 ft.
Paris	1968	1:24,000	10 ft.
Selma	1965	1:24,000	10 ft.
Milton	1970	1:24,000	10 ft.
Brock	1970	1:24,000	10 ft.
	(Preliminary)		
Ottumwa South SW		1:24,000	10 ft.
Ottumwa South SE		1:24,000	10 ft.
Moulton NW		1:24,000	10 ft.
Moulton NE		1:24,000	10 ft.
Pulaski NW		1:24,000	10 ft.
Pulaski NE		1:24,000	10 ft.
Moulton SW		1:24,000	10 ft.
Moulton SE		1:24,000	10 ft.
Pulaski SW		1:24,000	10 ft.
Pulaski SE		1:24,000	10 ft.

*Map photoinspected 1976-no major culture or drainage changes observed

Useful Reference Materials

Coble, R.W., and Roberts, J.V., 1971, The water resources of Southeast Iowa, Iowa Geological Survey, Water Atlas No. 4.

Horick, P.J., and Steinhilber, W.L., 1973, Mississippian aquifer of Iowa, Iowa Geological Survey, Misc. Map Series No. 3.

Horick, P.J., and Steinhilber, W.L., 1978, Jordan aquifer of Iowa, Iowa Geological Survey, Misc. Map Series No. 6.

Iowa State Department of Health, 1971 Sanitary standards for water wells, State Department of Health, Environmental Engineering Service.

Van Eck, O.J, 1971, Optimal well plugging procedures, Iowa Geological Survey, Public Information Circular No. 1.

Van Eck, O.J, 1978, Plugging procedures for domestic wells, Iowa Geological Survey, Public Information Circular No. 11.