

IOWA GEOLOGICAL SURVEY
In Cooperation with U. S. Geological Survey

W-4843

RECORD OF WELL

Location:

Town: Bondurant

(N E)
(S W)

County Polk

NW 1/4 sec. 31 T 80 N., R. 22 W.

Twp.

	31	

Well name and number Town of Bondurant (1951)

Owner Town of Bondurant

Address _____

Tenant _____

Address _____

Contractor Hoeg & Ames

Address Lincoln, Iowa

Drillers Kenneth Kroeger & Ed Martin

Drilling dates Started March, 1951 Finished April 21, 1951

Well data:

Elevations: Drilling curb _____ feet; Land surface 971 feet

Determined by _____

Topographic position Upland

Total depth: Reported 650 feet, Measured _____ feet

Drilling method Cable tool

Hole and casing data 8" from 0 - 350'; 6" open hole to T.D.
with "shales cased"

Acidized w/ 500 gal HCl

Original depth to water 160 ft. ^{above} curb below Date April 21, 1951

Original elevation of water level _____ ft.; Source of data _____

Sources of water: Principal Miss.; Others _____

CASING DIAGRAM

LOG

Vertical scale

[illegible]

Production data:

Date _____

Static depth to water _____

Measuring point _____

Pumping level _____

at _____

g.p.m. _____

*bailey
(after analyzing)**36 gpm for 15 hrs pumping*

Specific capacity _____

g.p.m. per ft. drawdown; Temperature _____

°F.

Pump data: Type pump _____

Column Dia. _____

Length _____

Cylinder or bowls: Dia. _____

Length _____

Suction pipe _____

Power _____

Airline _____

Estimated rate of production: _____

g.p.m. for _____

hrs. a day

Use of water _____

WATER ANALYSES (in parts per million)

Date samples _____

Sampled by _____

Total solids _____

Insoluble matter _____

Alkalinity (Meo) _____

Alkalinity (Phn) _____

pH _____

 $\text{Fe}_2\text{O}_3 + \text{Mn}_2\text{O}_3 + \text{Al}_2\text{O}_3$ _____

Alkali as sodium _____

Calcium _____

Magnesium _____

Iron (unfiltered) _____

Manganese _____

Nitrate _____

Fluoride _____

Chloride _____

Sulfate _____

Bicarbonate _____

Hardness (ppm) _____

Hardness (gpg) _____

Remarks _____

Laboratory data:

Sample storage location *CI100-10*Sample range *0-650*No. spls. *112*No. dupls. & cond. *112 G*Spls. prepared by *Staff*Washed range *95-650*by *Staff**4/25/57*

Driller's log and cond. _____

Insoluble residues: Prepared by _____

Studied by _____

Strip log _____

Microscopic study _____

strip log *Ref - G*

Gen. log _____

Correl. by *April 24, 1951*

IOWA GEOLOGICAL SURVEY
Iowa City, Iowa

Well Log Record

Well name and number _____ Town _____ County Polk

Owner of well Town of Boudurant Address Boudurant

Tenant _____ Address _____

Location NW sec. 31, T. 80 N., R. 22 W. E. Twp.
Present final

Curb elevation _____ ft. depth _____ ft. depth _____ ft.

Static level: (Depth to water ^{above} curb) 174 ft. level 468 ft. at 36 g.m.
_{below} Pumping

Contractor Weg & Sons Date drilled Feb 28 - April 20, 1927
draw down 29'

Description*	F E E T			Description*	F E E T		
	Thick	From	To		Thick	From	To
Yellow clay		0	25	Sh. & limestone		190	195
Blue clay		25	40	Shale		195	205
Tan & brown clay		40	50	Black shale		205	210
Yellow clay		50	85	Gray "		210	250
Blue clay		85	110	Black shale		250	295
Gray clay		110	115	Black shale & slate		295	305
Red shale		115	125	Black shale		305	330
Gray shale		125	130	Gray shale		330	347
Red & gray shale		130	140	Brown ls.		347	353
Black shale		140	150	Rock		353	370
Gray shale		150	190	Rock & sh.		370	380
				Rock		380	397
				Shale		397	400
				Rock		400	403
				Shale		403	405
				Rock		405	413
				Shale		413	415
				Rock		415	438
				Shale		438	430
				Rock		430	440

*Abbreviate descriptions: use one line for each formation (over)

Remarks on water zones and casings 355' 7" of 8, 292' 7" of 6 1/4
at 575' - 16 g.p.m. at 300', 140' drawdown, 292' 7" of 6 1/4
cas perforated & let in water. Pumped 36 g.p.m. at 295'
drilled 35.3' of 10" hole. 8" was set from top to bottom. 10" & 16" pulled

Temperature: Air _____ °F., Water _____ °F. at P.M. _____ 19 _____ A.M.

Record obtained from _____ Recorded by KRC

Shale	440 - 444
Rock	444 - 456
Shale	456 - 458
Rock	458 - 513
Shale	513 - 514
Rock	514 - 529
Shale	529 - 533
Rock	<u>533 - 575 tested</u>
Rock	575 - 640
Rock & sh	640 - 645
Shale	645 - 650

Polk

June 1, 1951

Hoeg & Ames
Lincoln, Iowa

Gentlemen:

Enclosed is a copy of the report on the mineral analysis of water from the 650-foot well of the town of Bondurant as shown by a sample collected by Mr. A. R. Smith of the Health Department on April 23, 1951. It was my thought that you might wish to have these data for your files.

If you have any questions concerning the report, please do not hesitate to let me hear from you.

Very truly yours,

H. G. Hershey

Enclosure

HGH:emh

Ralph

June 1, 1951

Mr. Ralph W. Gearhart
349 21st Street, SE
Cedar Rapids, Iowa

Dear Mr. Gearhart:

Enclosed is a copy of the report on the mineral analysis of water from the 650-foot well of the town of Bondurant as shown by a sample collected by Mr. A. R. Smith of the Health Department on April 23, 1951. It was my thought that you might wish to have these data for your files.

If you have any questions concerning the report, please do not hesitate to let me hear from you.

Very truly yours,

H. G. Hershey

Enclosure

HGH:WEH:emh

May 23, 1951

Mr. Ralph W. Gearhart
349 21st Street, SE
Cedar Rapids, Iowa

Dear Mr. Gearhart:

Enclosed is a report on the mineral analysis of water from the well of the town of Bondurant as shown by a sample collected by Mr. Ed Martin on April 6, 1951.

If you have any questions concerning this report, please do not hesitate to let us hear from you.

Very truly yours,

C. Richard Murray

Enclosure

CRM:emh

Polp

May 23, 1951

Mr. Sylvan Ames
Hoeg & Ames
Lincoln, Iowa

Dear Mr. Ames:

Enclosed is a report on the mineral analysis of water from the well of the town of Bondurant as shown by a sample collected by Mr. Ed Martin on April 6, 1951.

If you have any questions concerning this report, please do not hesitate to let us hear from you.

Very truly yours,

C. Richard Murray

Enclosure

CRM:emh

APR 23 '51

File

CERTIFICATE AS TO ADEQUACY
OF THE BONDURANT, IOWA, TOWN WELL

STATE OF IOWA)
COUNTY OF POLK) SS

APRIL 21, 1951
Bondurant, Iowa.

I certify that the town well drilled by Hoeg & Ames, Contractors, Lincoln, Iowa, for the Town of Bondurant, Iowa, was completed and tested on April 21, 1951 and that the log and characteristics were found to be as Listed Below:

LOG:	From	TO	THICKNESS	FORMATION
	0	105	105	Pleistocene
	105	350	245	Pennsylvanian
	350	650	300	Mississippian

Construction:

The well is cased with 8 inch pipe from the ground surface to the top of the Mississippian a distance of 350 feet. There is an open hole, 6 inches in diameter, with the shale formations cased through the Mississippian, 300 feet, to the top of the Maple Mill Shale.

PRELIMINARY TESTING:

The well was then tested for quantity with a bailer. Before bailing the static level of the water stood at 160 feet from the ground surface. When bailed at 22 gallons per minute the water level drew down 140 feet to 300 feet below the ground surface.

TREATMENT OF THE WELL WITH ACID:

The well was capped, 500 gallons of Hydrochloric Acid was pumped into the well and left to stand over night. The cap was removed and the well was bailed. The static level remained the same, but it required 36 gallon per minute bailing to draw the well down 182 feet to 292 feet below the ground surface.

PUMPING TEST:

There was then set in the well at 315 feet a stroke pump and the well was pumped for 15 hours, at 36 gallons per minute. The strength of the well seemed to increase some what.

ADEQUACY ASSUMPTIONS:

With Bondurant's population estimated at 360, and the consumption, including the school at 50 gallons per capita per day, a total of 18,000 gallons per day, which could be pumped in 10 hours per day at 30 gallons per minute.

It is my considered professional opinion that the well will provide an adequate water supply for Bondurant, Iowa.

Respectfully, *R.W. Gearhart*
R.W. Gearhart, Engineer.

Mr. A. H. Wieters, Director
Division of Public Health Engineering
State Department of Health
Des Moines 19, Iowa

Dear Mr. Wieters:

The town of Bondurant is located in the southwest corner of T. 80 N., R. 22 W. in Polk County. The population is approximately 320. A water supply of 25 gallons per minute would probably be adequate for the town. The elevation at the Chicago Great Western Railroad station is 984 feet above sea level, and we have used this as a starting elevation for the forecast of the geologic section which follows.

<u>Formation and Description</u>	<u>Thickness</u>	<u>From</u>	<u>To</u>
Pleistocene system (till)	105	0	105
Pennsylvanian system (shale and sandstone, with a few thin limestone beds)	260	105	365
Mississippian system			
St. Louis formation (limestone and sandstone)	50	365	415
Warsaw formation (cherty dolomite and shale)	100	415	515
Keokuk-Burlington formation (dolomite, lime- stone and chert)	120	515	635
Hampton formation (dolomite and chert)	75	635	710
Maple Mill formation (shale)	40	710	750
Devonian system			
Sheffield formation (dolomite)	20	750	770
(shale)	20	770	790
Lime Creek formation (limestone)	60	790	850
(shale)	90	850	940
Cedar Valley formation (limestone and dolomite, sandy at base)	170	940	1110
Wapsipinicon formation (gypsum and dolomite)	240	1110	1350
Silurian system (chert, dolomitica at base)	95	1350	1445
Ordovician system			
Maquoketa formation (shale)	95	1445	1540
(dolomite, chert and shale)	60	1540	1600
(shale)	35	1600	1635
(dolomite and chert)	90	1635	1725
Galena formation (dolomite, some chert)	190	1725	1915
Decorah-Platteville formation (shale and dolomite)	70	1915	1985

St. Peter formation (sandstone)	35	1985	2020
Prairie du Chine (dolomite and chert, sandy)	210	2020	2230
(dolomite and sandstone)	45	2230	2275
(dolomite)	190	2275	2465
Cambrian system			
Jordan formation (sandstone)		2465	

The Pleistocene section at Bondurant is believed to be made up entirely of sandy or pebbly clay which will probably yield little water. From the well cuttings which we have received from the area it appears that there are no sand or gravel beds at Bondurant. We do have records of several wells in town which yield a small supply of water. A mineral analysis of the water from one of these is shown on a mineral comparison sheet at the end of this report. It does not seem likely that a satisfactory well can be developed in the Pleistocene deposits at Bondurant.

The bedrock in this area is the sandstones, shales and occasional limestones of Pennsylvanian age. These rocks are usually poor aquifers, and the water is highly mineralized. It is likely that the entire Pennsylvanian section, which is here thought to be 260 feet thick, will have to be cased out because of the caving shales and undesirable water.

The rocks of the Mississippian system are mostly cherty dolomites with a sandy limestone at the top and shales at the base. Shales of the Warsaw and Maple Mill formations will probably cave and therefore should be cased out. The dolomite and limestone portions usually yield only enough water for satisfactory farm wells. North of Bondurant, the Jensen farm well which penetrated the Burlington formation produced only 5 gallons of water a minute with a drawdown of 60 feet from a static water level of 95 feet. The Colonial Baking Company well at Des Moines which penetrates the entire Mississippian section produced 57 gallons per minute with a drawdown of 195 feet. The static water level was 6 feet below the drilling curb. The sulphate and fluoride content of this water was very high. Analyses of the water encountered in these two wells are shown in the appendix.

The total thickness of the Devonian system at Bondurant is about 600 feet. There are shales at the base of the Sheffield and Lime Creek formations which generally do not "stand" without casing. The Cedar Valley formation is composed of limestone and dolomite. The underlying Wapsipinicon formation is about 240 feet thick. We expect a considerable amount of gypsum, especially in the lower part of this formation, and any water found at this horizon is likely to be high in sulphates. Casing would be necessary to prevent the undesirable water from entering the well. A well in southern Story County which is drilled through the limestone section of the Lime Creek formation, produces 55 gallons of water a minute with a 40 foot drawdown from a static water level of 97 feet. This well was cased through the formations of Upper Mississippian age, but part of the water came from rocks of the Hampton formation. The water from this well was moderately hard. (See comparison sheet) In general, the yield of water from rocks of Devonian age is small.

The Silurian rocks are composed largely of chert and dolomite. The Northland Dairy well at Des Moines was finished in this horizon and obtained at least 100 gallons of water a minute. However, the water contains a large amount of sulphates and is exceedingly hard.

The Maquoketa formation is composed of dolomites and shales and has a thickness of approximately 280 feet. This formation would probably have to be cased out because of caving shales. The underlying Galena dolomite may yield a small amount of water. Some shales will be encountered above the St. Peter sandstone which would have to be cased out.

The St. Peter sandstone should be encountered at a depth of 1985 feet. The Reed Ice Cream Co. well at Des Moines was finished just below the St. Peter formation. The well was probably cased through the Pennsylvanian, Devonian, Silurian and the Maquoketa formations. The static depth to water was 150 feet below the curb, and the drawdown was 84 feet when pumped at the rate of 44 gallons a minute. The water from the Mississippian rocks was not cased out so part of the production is undoubtedly from these formations. The water is very hard and has a high fluoride and iron content.

We know little about the yield or quality of the water in the underlying formations of the Prairie du Chien group in this area.

The Jordan sandstone should be encountered at a depth of 2465 feet. Several wells in Des Moines obtain water from this zone, as do wells to the north of Bondurant in Story County. A well at the Woods Bros. Thresher Company was pumped at a rate of 200 gallons a minute with a 40 foot drawdown. The quality of the water is fair.

Summary: It seems that the fluoride content of the water will be in excess of 2.0 parts per million from any horizon except the Pleistocene at the town of Bondurant. It does not appear that a well can be developed in the Pleistocene strata as the drift is composed of sandy clay. A supply of 25 gallons per minute could probably be obtained by drilling through the entire Mississippian section. The fluoride content of this water would be particularly high, but the water would be soft. Waters in the Devonian and Silurian rocks are usually highly mineralized, and the water is much harder than that from the Mississippian section. The St. Peter formation is not likely to be very productive nor are the underlying formations of the Prairie du Chien. The Jordan sandstone will undoubtedly yield at least 100 gallons of water a minute, and the quality of the water should be fair.

If you have any questions concerning the foregoing please let me know. I will appreciate it if you will keep me posted as to developments.

Very truly yours,

H. G. Hershey

HGH:ES:BH

IOWA GEOLOGICAL SURVEY
Water Analysis Comparison

Town _____ County: _____ Location _____ Sec. _____ T. _____ N., R. _____ E.
W.

Owner _____ Contractor: _____ Date Started: _____

	1	2	3	4	5	6
Well Number or Location	Bondurant	E. Jensen	Colonial Baking	Story County	Northland Dairy	
Depth of Sample	83	482	602	765	1350	
Formation Source	Pleistocene	Keokuk-Burlington	Entire Miss.	Devonian-Lime	Silurian-Devonian	
Water Level Below Curb		95	18	97	Creek Flowing	
How Sampled						
Sampled by						
Date Sampled	4/22/46	5/3/45	7/26/37	1/3/45	1/22/35	
Total Solids	870	1141	2780.0	601	4622.0	
Dissolved Solids						
Insoluble Matter	15	13.0	28.0	11.5	12.4	
Alkalinity (MeO)	294	406.0	284.0	334.0	224.0	
Nitrite (NO ₂)					trace	
Nitrate (NO ₃)	0.7	0.00	0.70	0.0	0.0	
Sodium (Na) & Potassium (K)*	79.2	374.8	494.9	16.8	616.9	
Calcium (Ca)	142.2	20.0	299.4	130.1	542.6	
Magnesium (Mg)	38.9	9.9	66.2	42.3	136.1	
Iron (Fe)						
Iron (Unfiltered)**	1.2	3.4	0.1	2.4	6.0	
Manganese (Mn)	0.0	0.18	trace	0.0	0.0	
Aluminum (Al)					3.6	
Fluorine (F)	1.0	9.0	4.0	2.2	2.0	
Chlorine (Cl)	3.	22.0	106.0	5.0	236.0	
Sulphates (SO ₄)	345	459.9	1576.9	169.1	2588.0	
Bicarbonates (HCO ₃)	358.7	466.0	346	407.5	273.3	
Phosphates (PO ₄)						
Borates (BO ₃)						
Calculated Hardness***	517	97	59.6	503	1912.0	
Water Lat. Number						

*Na and K not separated, calculated as Sodium (Na): **Includes iron precipitated or flocculated after sample collected: ***Calculated as CaCO₃.

Completed Depth _____ ft.; Final Static Water Level _____ ft.; Production _____ GPM; Draw-down _____ ft., at _____ GPM; Gallons per foot draw-down _____. Date Completed _____ 194____.

Remarks: _____

IOWA GEOLOGICAL SURVEY
Water Analysis Comparison

Town _____ County: _____ Location _____ Sec. _____ T. _____ N., R. _____ E.
W.

Owner _____ Contractor: _____ Date Started: _____

	1	2	3	4	5	6
Well Number or Location	Reed Ice Cream	Wood Bros.				
Depth of Sample	2061	2423				
Formation Source	St. Peter	Jordan				
Water Level Below Curb	147.7	50				
How Sampled						
Sampled by						
Date Sampled	6/19/36	2/22/45				
Total Solids	4907.0	722				
Dissolved Solids						
Insoluble Matter	207.0	16.5				
Alkalinity (MeO)	260.0	274.0				
Nitrite (NO ₂)	0.0					
Nitrate (NO ₃)	0.0	0.00				
Sodium (Na) & Potassium (K)*	523.2	119.9				
Calcium (Ca)	395.2	82.5				
Magnesium (Mg)	118.6	30.3				
Iron (Fe)						
Iron (Unfiltered)**	6.0	0.9				
Manganese (Mn)	.20	0.00				
Aluminum (Al)						
Fluorine (F)	2.0	2.0				
Chlorine (Cl)	153.0	26.5				
Sulphates (SO ₄)	2108.4	245.5				
Bicarbonates (HCO ₃)	317.2	334.3				
Phosphates (PO ₄)	.2					
Borates (BO ₃)	6.0					
Calculated Hardness***	1485.00	332				
Water Lat. Number						

*Na and K not separated, calculated as Sodium (Na): **Includes iron precipitated or flocculated after sample collected: ***Calculated as CaCO₃.

Completed Depth _____ ft.; Final Static Water Level _____ ft.; Production _____ GPM; Draw-down _____ ft., at _____ GPM; Gallons per foot draw-down _____. Date Completed _____ 194__.

Remarks: _____

DEPUTY COMMISSIONER AND DIRECTOR OF
LOCAL HEALTH SERVICES
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PREVENTABLE DISEASES—EPIDEMIOLOGY
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MATERNAL AND CHILD HEALTH
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PUBLIC HEALTH ENGINEERING AND
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DIRECTOR

Iowa
State Department of Health

WALTER L. BIERRING, M. D., COMMISSIONER

Des Moines 19

September 3, 1946

VENEREAL DISEASE CONTROL
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DIRECTOR
BUSINESS MANAGER
C. E. FOOTE

Dr. H. G. Hershey
Associate State Geologist
Iowa Geological Survey
Iowa City, Iowa

Dear Dr. Hershey:

We are in receipt of a letter from Mr. Ralph W. Gearhart, Consulting Engineer of Cedar Rapids, Iowa, requesting a geological forecast on the possibility of obtaining water for the Town of Bondurant, Iowa.

We will greatly appreciate your forecast on this area with reference to the possibility of both shallow and deep sources.

Very truly yours,

A. H. Wieters

A. H. Wieters, Director
Division of Public Health Engineering

FB/mm
cc Mr. R. C. Hanlon