WRD Exp. (GW)
April 1966

Well No. 067-18W-03 BCBC

WELL SCHEDULE

U. S. DEPT. OF THE INTERIOR — GEOLOGICAL SURVEY — WATER RESOURCES DIVISION

MASTER CARD

Record by P. AARONSON Source of data FILE Date 1/7/67 Map 1:62,500 CENTERVILLE QUAD.

State IOWA [16] County (or town) APPANOOSE [04]

Latitude: 40 37 58 N Longitude: 092 55 26 Sequential number: [1]

Lat-long accuracy: [2] T 67 (N) S, R 18 (W) Sec 3, SW NW ¼, SW ¼, NW ¼ 5

Local well number: 067/18W03BCBC Other number: B & M W-0976

Local use: 00976 Owner or name: CINCINNATI CONSOL. SCHOOL #1

Owner or name: CINN. CON SCH #1 Address: CINCINNATI, IA.

Ownership: (C) County, (F) Fed Gov't, (M) City, (N) Corp or Co, (P) Private, (S) State Agency, (W) Water Dist [M]

Use of water: (A) Air cond, (B) Bottling, (C) Comm, (D) Dewater, (P) Power, (F) Fire, (Dom) Dom, (Irr) Irr, (Md) Md, (Ind) Ind, (PS) P S, (R) Rec, (S) Stock, (T) Instit, (U) Unused, (V) Repressure, (W) Recharge, (X) Desal-P S, (Y) Desal-other, (Z) Other [P]

Use of well: (A) Anode, (D) Drain, (G) Seismic, (H) Heat Res, (O) Obs, (P) Oil-gas, (R) Recharge, (T) Test, (U) Unused, (W) Withdraw, (X) Waste, (Z) Destroyed. [W]

DATA AVAILABLE: Well data [2] Freq. W/L meas.: INVENTORY [0] Field aquifer char. [ ]

Hyd. lab. data: [ ]

Qual. water data; type: COMPLETE [C]

Freq. sampling: INVENTORY [0] Pumpage inventory: yes / no; period: [ ]

Aperture cards: yes [ ]

Log data: GEOLOGIST - DRILLER'S [G D]

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD Depth well: 635 ft [635] Meas. rept accuracy: DRILLER'S LOG [3]

Depth cased: (first perf.) 590 ft [590] Casing type: STEEL; Diam. 8 in [8]

Finish: (C) porous concrete, (F) gravel w. (perf.), (G) gravel w. (screen), (H) horiz. gallery, (O) open end, (P) perf., (S) screen, (T) sd. pt., (W) shored, (X) open hole, (Z) other [X]

Method Drilled: (A) air rot, (B) bored, (C) cable, (D) dug, (H) hyd rot., (J) jetted, (P) air percussion, (R) reverse rotary, (T) trenching, (V) driven, (W) drive wash, (Z) other [ ]

Date Drilled: APRIL 1939 [939] Pump intake setting: 387 ft [387]

Driller: MC CUTCHEON WELL CO. (name) DES MOINES, IA. (address)

Lift (type): (A) air, (B) bucket, (C) cent, (J) jet, (L) multiple (cent.), (M) multiple (turb.), (N) none, (P) piston, (R) rot, (S) submerg, (T) turb, (Z) other [ ] Deep / Shallow [D]

Power (type): diesel, elec, nat gas, gasoline, hand, LP gas, wind; d.P. [T] Trans. or meter no.

Descrip. MP LSD ft above/below LSD, Alt. MP 1031

Alt. LSD: 1031 [1031] Accuracy: (source) ALTIMETER [7]

Water Level 95 ft above/below MP; Ft above/below LSD [95] Accuracy: DRILLER'S LOG [D]

Date meas: APRIL 1939 [439] Yield: 5 gpm [5] Method determined [ ]

Drawdown: ft [ ] Accuracy: [ ] Pumping period hrs [ ]

QUALITY OF WATER DATA: Iron TRACE ppm [ ] Sulfate 521.2 ppm [8] Chloride 650 ppm [5] Hard. 60 ppm [3]

Sp. Conduct K x 10^6 [ ] Temp. °F [ ] Date sampled APRIL 4, 1939 [439]

Taste, color, etc.

Punched EBC Verified FCB

Well No. 067-18W-03 BCBC

Well No. 067-18W-03BCBC

Latitude-longitude 40 37 58 (N) S 092 55 26.1
d m s d m s

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD (1, 19) Physiographic Province: CENTRAL LOWLAND (20, 21) Section: DISSECTED

TILL PLAIN E (22) Drainage Basin: CHARITON 3 1 E (23–25) Subbasin: ____ (26)

Topo of well site: (D) depression, (C) stream channel, (E) dunes, (F) flat, (H) hilltop, (K) sink, (L) swamp, (Φ) offshore, (P) pediment, (S) hillside, (T) terrace, (U) undulating, (V) valley flat ____ (27)

MAJOR AQUIFER: MISSISSIPPIAN (system), UPPER (series) M 3 (28, 29) STE GENEVIEVE LS (aquifer, formation, group) M G (30, 31)

Lithology: FINE LIMESTONE 1 L (32, 33) Origin: MARINE 6 (34) Aquifer Thickness: 55 ft

(35, 37) Length of well open to: 20 ft 2 0 (38–40) Depth to top of: 505 ft 5 0 5 (41–43)

MINOR AQUIFER: MISSISSIPPIAN (system), UPPER (series) M 3 (44, 45) ST. LOUIS FM (aquifer, formation, group) M L (46, 47)

Lithology: FINE LS. & SANDST. 3 V (48, 49) Origin: MARINE 6 (50) Aquifer Thickness: 50 ft

5 0 (51, 53) Length of well open to: 50 ft 5 0 (54–56) Depth to top of: 560 ft 5 6 0 (57–59)

Intervals Screened: NONE

Depth to consolidated rock: 130 ft 1 3 0 (60–62) Source of data: WELL CUTTINGS C (64)

Depth to basement: ____ ft (63–68) Source of data: ____ (69)

Surficial material: TILL T (70, 71) Infiltration characteristics: Poor 4 (72)

Coefficient Trans: ____ gpd/ft (73–75) Coefficient Storage: ____ (76–78)

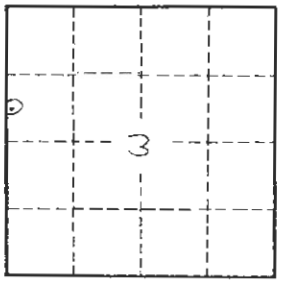
Coefficient Perm: ____ gpd/ft²; Spec cap: ____ gpm/ft; Number of geologic cards: ____ (79)

CASING:

8" CASING 0-140 FT.

6" CASING 140'-375 FT.

4" CASING 375'-540 FT.



T

Well No. 067-18W-03BCBC

GPO 857-700

W# 976

1590

THE STATE UNIVERSITY OF IOWA
STATE HYGIENIC LABORATORIES
IOWA CITY

No. 14,1670

Mineral Water Analysis

(Parts per Million)

April 28, 1932

Town Cincinnati County Appanoose Source New 10cu well, depth 655'; Water level 105' Lo Bottle Number

Collected by Paul ... avis & S. L. Richey on April 4, 1932

Total Solids 7[illegible] Suspended Solids Dissolved Solids

Turbidity Coefficient of Fineness Color pH 8.2

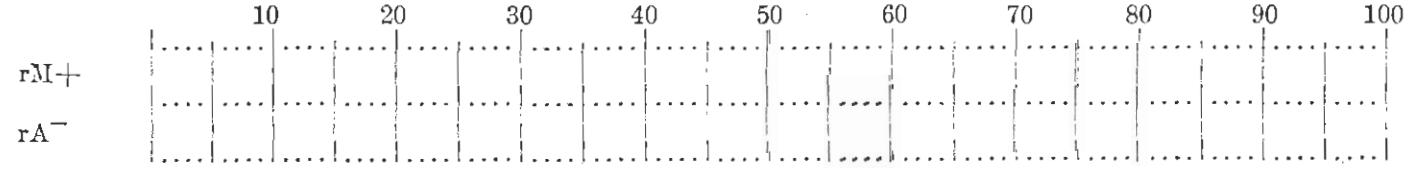
Alkalinity (to MeO) 820.0 Alkalinity (to Phn.) 52.0 Free Carbon Dioxide

Insoluble Matter 18.0 Silica (SiO_2) $Fe_2O_3+Al_2O_3+Mn_2O_3$ 4.0

POSITIVE IONS.	r		rM+	NEGATIVE IONS.	r		rA⁻
N as NH_4^+		x 0.0714 =		N as NO_2^-		x 0.0714 =	
Alkalies as Na^+	1010.0	x 0.0435 =	44.000	N as NO_3^-	3.05	x 0.0714 =	
K^+		x 0.0256 =		F^-	5.6	x 0.0526 =	0.100
Na^+		x 0.0435 =		Cl^-	650.0	x 0.0282 =	18.330
Ca^{++}	13.4	x 0.0499 =	0.669	SO_4^{--}	321.1	x 0.0208 =	10.[illegible]1
Mg^{++}	1.0	x 0.0822 =	0.082	HCO_3^-	926.7	x 0.0164 =	15.200
(Fe^{++})	trace	x 0.0358 =		CO_3^{--}	62.4	x 0.0333 =	2.075
(Mn^{++})	trace	x 0.0364 =		OH^-		x 0.0588 =	
(Al^{+++})		x 0.1112 =		PO_4^{---}		x 0.0316 =	
(Pb^{++})		x 0.0097 =		(BO_3^{---})		x 0.0510 =	
(Zn^{++})		x 0.0306 =		(Free CO_2)		x 0.0454 =	
TOTALS:		Sum rM+ =	45.580			Sum rA⁻ =	46.904

$$E = \frac{\text{Sum rM+} - \text{Sum rA}^-}{\text{Sum rM+} + \text{Sum rA}^-} \times 100 = -1.56 \text{ o/o}$$

Calculated Hardness as $CaCO_3$=(Ca x 2.497)+(Mg x 4.115)+(Fe x 1.792)+(Mn x 1.822)= 60 p.p.m.



One space = 1.4 milligram equivalent

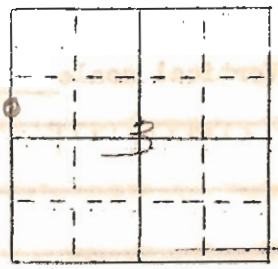
Chief, Water Laboratory Division.

IOWA GEOLOGICAL SURVEY

In Cooperation with U. S. Geological Survey

W-0976

RECORD OF WELL



Location:

Town: Cincinnati (N E / S W): County Appanoose

C-Wh SW-NW sec. 3 T 67 N., R. 18 W. Pleasant Twp.

Well name and number Cincinnati School Well

Owner _____ Address _____

Tenant _____ Address _____

Contractor McCutcheon Well Co. Address Des Moines

Drillers _____

Drilling dates March - April 1, 1939.

Well data:

Elevations: Drilling curb _____ feet; Land surface 1052 feet

Determined by _____

Topographic position _____

Total depth: Reported 635 feet, Measured _____ feet

Drilling method _____

Hole and casing data _____

Original depth to water _____ ft. above / below _____ Date _____

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

Sources of water: Principal _____; Others _____

W-0976

Production data: Date

Static depth to water 95 Measuring point

Pumping level at g.p.m.

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	April 4, 1939			
Sampled by	Davis & Eckhey			
Total solids	2794			
Insoluble matter	12.0			
Alkalinity (Meo)	828.0			
Alkalinity (Phn)	52.0			
pH	8.4			
$Fe_2O_3 + Mn_2O_3 + Al_2O_3$	4.0			
Alkali as sodium	1018.9			
Calcium	10.0			
Magnesium	8.5			
Iron (unfiltered)	Trace			
Manganese	Trace			
Nitrate	0.00			
Fluoride	3.6			
Chloride	650.0			
Sulfate	521.2			
Bicarbonate	946.7			
Hardness (ppm)	66			
Hardness (gpg)	3.5			

Remarks

Laboratory data: Sample storage location

Sample range 0-635 No. spls. 127 No. dupls. & cond. 114 7-6.

Spls. prepared by Washed range by

Driller's log and cond.

Insoluble residues: Prepared by Studied by Strip log

Microscopic study Chas. Huff strip log Chas. Huff

Gen. log Correl. by Chas. Huff.

Iowa Geological Survey
Iowa City, Iowa

Cincinnati, Appanoose County
Cincinnati School

0-70	Yellow clay
70-90	Blue clay
90-130	Yellow clay
130-135	Gray shale
135-138	Water rock
138-152	Shale
152-155	Cap rock
155-158	Coal
158-160	Shale
160-166	Limestone
166-180	Shale
180-182	Limestone
182-200	Shale
200-202	Limestone
202-205	Shale
205-210	Limestone
210-220	Shale
220-225	Limestone
225-230	Shale
230-235	Limestone
235-255	Shale
255-260	Limestone
260-275	Shale
275-280	Limestone
280-320	Shale
320-325	Limestone
325-345	Shale
345-350	Limestone
350-367	Shale
367-370	Limestone
370-400	Shale
400-440	Shale
440-455	Limestone B.
455-460	Shale
460-465	Limestone B.
465-505	Shale
505-508	Gray limestone
508-540	Shale
540-545	Gray lime tone
545-563	Gray lime
563-590	Sandstone

folder

Casing: 122'6" of 6"
326'6" of 5"

Gen

REVISED ANTICIPATED LOG OF PROPOSED WELL AT CINCINNATI SCHOOL

Curb Elevation: 1031 Feet A. T.

	Thickness	From	To
PLEISTOCENE			
Glacial drift, possibly some sand and gravel	91	0	91
PENNSYLVANIAN SYSTEM			
Limestone (Darbyville or 50 foot) possibly a few feet of shale above	6	91	97
Shale, blue, gray and some red to purple	32	97	129
Limestone, probably soft (17 ft. ls.)	1-3	129	131
Shale, gray, blue and very dark gray	8	131	139
Limestone with shale seams (Mystic Captrock)	4	139	143
Shale, dark gray and black. Lower part slaty.	6-7	143	150
Coal (Mystic)	2(?)	150	152
Shale and limestone, mostly shale with ls. at base	50	152	202
Shale, black, at least partly slaty	2	202	204
Shale, gray and blue, with thin limestone at base	20	204	224
Shale, black	2	224	226
Shale, gray and blue	8	226	234
Limestone, shaly (Lower Ft. Scott)	4	234	238
Shale, gray and blue	7	238	245
Shale, black, with a little coal	4	245	249
Clay, grading into red shale and silt	12	249	261
Horizon of the Albia ss. which, if present may produce sufficient water. If not present shale and thin limestone bands will alternate with occasional sandstones (which may produce water) to the Bedford Coal	50	261	311

Alternating shale and thin limestone bands, occasional fine sandstones which may carry water. To base of Pennsylvanian	214	311	525
MISSISSIPPIAN SYSTEM			
Limestones and thin shale with possible sandstone near top		525	

IOWA GEOLOGICAL SURVEY
Generalized Log Based on Detailed
Description of Drill Cuttings

Name of Well: Cincinnati School Well Survey No. W- 0976

Drilled by: McCutcheon Well Co., Des Moines Date March - April 1, 1939

Total Depth: 635 ft; Curb Elevation; 1031 ft; Static Level: 95 ft.

Casing Data: cased to 590' 2 GPM

Pump and Screen Data:

Pumping Test: ____ Hours ____ Min; Gal. Per Min. 5 ; Drawdown ____ ft. in ____ min.

Description of Formations

No.	Rock Unit	Thick.	From (Feet)	To
	PLEISTOCENE			
1.	Loess, leached, brownish yellow, little sand and gravel, some red clay	25'	0'	25'
2.	Clay, slightly calcareous, yellow and some light gray, sandy and gravelly	10'	25'	35'
3.	Loess and clay, calcareous, yellow, sandy and gravelly	25'	35'	60'
4.	Clay, calcareous, medium gray, sandy and gravelly	15'	60'	75'
5.	Clay, calcareous, yellow, little light yellowish gray at top, sandy and gravelly	20'	75'	95'
6.	Clay, calcareous, yellow and red, few medium gray spots, sandy and gravelly	5'	95'	100'
7.	Clay, calcareous, yellow to gray brown, sandy and gravelly	10'	100'	110'
8.	Clay, calcareous, brownish yellow to medium brownish gray, sandy and gravelly including much, up to 60%, limestone pebbles, 5% brown chert	15'	110'	125'
9.	Clay, slightly calcareous, medium brownish gray, sandy and gravelly, including limestone pebbles	5'	125'	130'

Notes: Water from "Albia" static level 95', 2 g.p.m.

Copy to Frank S. McCutcheon, 4214 Fourth St., Des Moines, Iowa,
Jan. 15, 1940

W-0876

Description	Thick.	From	To.
PENNSYLVANIAN			
Des Moines series (top -901' elevation)			
10. Limestone, light gray to brown, very fine to fine, very fossiliferous, pyritic, some with mica flakes, with up to 15 % light gray shale	10'	130'	140'
11. Shale, medium to dark gray, little black, some fissile	17'	140'	157'
12. Coal, with some pyrite	3'	157'	160'
13. Limestone, pale gray, slight buff, very fine, fossiliferous, little pyrite	5'	160'	165'
14. Shale, light to medium gray, well laminated, micaceous	15'	165'	180'
No sample	5'	180'	185'
15. Shale, calcareous, light gray, poorly laminated, with some black, hard, fossiliferous, 5 % coal; 185-195' with 25% limestone, light gray very fine 195-200'	20'	185'	205'
16. Dolomite, very silty and sandy with very fine sand, micaceous, light gray to light drab and brown, little pyrite	5'	205'	210'
17. Shale, chocolate brown mottled with some light gray, laminated	5'	210'	215'
18. Sandstone, very fine, very silty, dolomitic cement, micaceous, lower 5' shaly, light gray little drab and brown	15'	215'	230'
19. Shale, slightly dolomitic, micaceous, light gray, poorly laminated	11'	230'	241'
20. Shale, light to medium gray, little dark gray, micaceous, little pyrite	19'	241'	260'
21. Dolomite, shaly, with much black fibrous carbonaceous material, light gray, fine granular 5% coal, with 25% light gray shale, little pyrite	5'	260'	265'
22. Sandstone, 50%, silty, dolomitic, very fine, micaceous, light gray and 50% black fissile shale, pyrite	5'	265'	270'
23. Limestone, slightly dolomitic, light gray to buff, some medium gray, very fine to fine, fossiliferous, 15% dark gray to black shale, little pyrite	10'	270'	280'

	Description	Thick.	From	To
24.	Shale, very slightly dolomitic, light gray, little medium gray, soft, laminated	5'	280'	285'
25.	Shale, black, carbonaceous, non-laminated	10'	285'	295'
26.	Alternating limestone and shale; limestone is light to medium gray and brown, very fine to fine, shale is light to medium gray, non-laminated to laminated, some micaceous	30'	295'	325'
27.	Shale, light to medium gray, some brownish, poorly to well laminated, some micaceous, little carbonaceous material in lower part, up to 15% dolomite, drab and brown	40'	325'	365'
28.	Dolomite, calcareous, light gray, slightly drab, fine granular, micaceous, 25% shale slightly sandy, light gray to dark brownish gray, little very fine pyrite	5'	365'	370'
	No sample	5'	370'	375'
29.	Shale, light to dark gray and black, micaceous, poorly or non-laminated, 15% dolomite 380-85', 5% coal and carbonaceous material 380-390', little pyrite	25'	375'	400'
30.	Shale, light to dark gray, partly speckled with black carbonaceous spots, less than 5% of dark drab very fine dolomite, little pyrite	55'	400'	455'
31.	Shale, light to dark gray, micaceous, non or poorly laminated, dolomitic in spots with masses of small dark brown spherules, very slowly effervescent	5'	455'	460'
32.	Limestone, slightly shaly, light to medium gray, very fine, fossiliferous	4'	460'	464'
33.	Shale, dolomitic and calcareous, medium gray to black carbonaceous, non-laminated, to well laminated, finely micaceous, pyrite	26'	464'	490'
34.	Shale, light gray to black, laminated 15% and less dolomite brown spherules 490-500', 3% coal at 495-500', 10% dolomitic siltstone 490-495'	25'	490'	515'
35.	Shale, light greenish gray, little light brownish gray, non-laminated, with 10% siltstone, little pyrite	10'	515'	525'

W-0976

Description	Thick.	From	To
36. Shale, light gray to black, porly to well laminated, little micaceous, 2% and less light gray limestone and brown dolomite, little fine pyrite	15'	525'	540'
MISSISSIPPIAN			
Meramec Series (Top - 491' elevation) [May belong several feet higher in section.]			
St. Genevieve			
37. Limestone, pale gray, slight buff tint, chalky to sub-lithographic, with fine calcite crystals scattered through, little pyrite	5'	540'	545'
38. Shale, light gray, non-laminated	2'	545'	547'
39. Limestone, dolomitic, slightly sandy in spots, pale to medium drab, some dark gray spots, fine compact to granular, few large clear calcite crystals	13'	547'	560'
40. Sandstone, angular, little sub-angular, medium with some fine and coarse, friable, lower 15' with more than half of sandstone cemented by limestone white to light gray, very fine to fine, with 25 - 50% shale, light green gray with scattered brown spherules	31'	560'	591'
St. Louis (?)			
41. Limestone oolitic, pale gray to light drabish gray, 5% light green gray shale with brown spherules, rare pyrite	9'	591'	600'
42. Limestone, slightly sandy, pale to medium gray, some drabish, very fine, with 10% light green shale with brown spherules	10'	600'	610'
Salem			
43. Dolomite, calcareous, pale drab, very fine to fine	10'	610'	620'
Osage series			
Warsaw			
44. Shale, dolomitic, light gray, non-laminated, finely micaceous, pyrite common	15'	620'	635'

Dec. 17, 1938

MEMORANDUM

To: H. G. Hershey

From: H. J. Russell

Subject: Casing for the well at Cincinnati, Appanoose co.

The Iowa Geological Survey is not in a position to give other than general reccommendations as to the type of casing which should be used in a well. Final conclusions should be drawn by the consulting engineer in charge of operations. The information given is the best we have available.

The well should be started with either an 8 or 10 inch diameter and cased with 8 or 10 inch temporary casing to a depth of 50 or 60 feet. This casing need not be heavy nor need it be new, since it should be removed when the well is completed. Below this the well should be eight inches in diameter and cased with either wrought or cast iron casing, the casing being driven as drilling progresses in order to prevent cavings from filling the hole. If any sand lenses are struck within the glacial drift they should be carefully tested and, if found to supply a sufficient quantity of water, should be used. In such an event a screen should be selected in accordance with the reccommendations of the screen manufacturer and the Iowa Geological Survey. The driller should be instructed to send samples of all materials to the Survey and, in the case of possible producing sands, size grade analyses will be made and the results submitted together with reccommendations as to screen size.

Should no glacial sands worthy of developement be encountered, the eight inch casing should be continued throughthe underlying Pennsylvanian materials to seal out all waters from sandy shale or coal horizons. In the event a suitable volume of water is found in one of the sandstones indicated in the anticipated log, great care should be exercised to seal out <u>all</u> water except that from the producing horizon. In the event a small quantity of water is found and it is desirable to use two producing horizons, the casing may be seated on the top of the sandstone and the size of hole be reduced below.

If it is necessary to drill to the Mississippian limestone casing should be set securely in the top of the solid limestone to prevent any possible leakage from above. No casing should be required in the limestone since it will be sufficiently solid to stand without caving.

Any time the casing size is reduced because of reduction of size of hole there should be inserted between the two sizes of casing, some sort of packer or lead seal to prevent the influx of undesirable waters. Slotted casing may be found desirable to prevent caving in the sandstones of the Pennsylvanian if it is found advantageous to leave them exposed for water production.

December 21, 1938

Mr. Paul E. Davis
Superintendent, Cincinnati Public
Schools
Cincinnati, Iowa

Dear Mr. Davis:

Since making my report to the Cincinnati School Board on April 9, 1938, some additional information has been obtained which changes the forecast somewhat.

A revised forecast of the formations which are anticipated is as follows:

	Thickness Ft.	From Ft.	To Ft.
Coal (Mystic)			
Shale and limestone, mostly shale with ls. at base	50	150	200
Shale, black, at least partly slaty	2	200	202
Shale, gray and blue, with thin limestone at base	20	202	222
Shale, black	2	222	224
Shale, gray and blue	8	224	232
Limestone, shaly (Lower Ft. Scott)	4	232	236
Shale, gray and blue	7	236	273
Shale, black, with a little coal	4	273	281
Clay, grading into red shale and silt	12	281	293
Horizon of the Albia ss. which, if present, may produce sufficient water. If not present shale and thin ls. bands will alternate with occasional sandstones (which may produce water) to the Bedford Coal	50	293	340
Alternating shale and thin limestone bands, occasional fine sandstones which may carry water. To base of Pennsylvanian	290	340	530
Mississippian limestone		530	

Starting from an elevation of 1,031 feet above sea level, normal glacial drift formations should be encountered to a depth of 100 to 125 feet and be underlain by a series of thin limestones and thicker shales to a depth of 150 feet where the Mystic coal should occur. As suggested in my earlier letter, every effort should be made to develop any sand or gravel which may occur in the glacial drift.

The sequence of beds to be expected below the Mystic coal are shown by the log.

The depth to the top of the Mississippian limestone is approximate since we have no definite information on it in the near vicinity of Cincinnati. Except for the corrections mentioned above other details of my letter of April 9 still hold.

It is against the policy of the Geological Survey to write direct specifications of wells and it is suggested that a competent engineer be contacted for this purpose. However, I believe that the well should be started with a sufficient diameter to leave a depth of 630 feet if necessary. It would be ideal to grout around the outside of the casing from the surface to five to ten feet below the Mystic coal, although that process would be expensive.

The question of casing or pipe is a difficult one to answer. Cast iron would be the best but it is impracticable in this instance because of the cost. According to most authorities wrought iron is better than steel, but some have evidence to show that the steel is less expensive and will stand up just as long as wrought iron. At present it is difficult to obtain wrought iron because many companies have discontinued making it.

I am very sorry that it is impossible for me to go into more detail regarding the constructional features of the well.

Under separate cover we are sending you a supply of 200 sample sacks and two log books. I trust that they will be turned over to the driller and that a complete set of samples and record will be saved.

I will appreciate it greatly if you will notify me when drilling is to start and to whom the contract is let.

Very truly yours,

HGH:LM

H. G. Hershey

CC -- C. E. Richey, Sanitary Engineer
Centerville, Iowa
CC -- Art Bruinekool, Pella, Ia.

January 17, 1939

School Board
Mr. L. C. McDonald, Secretary
Cincinnati, Iowa

Gentlemen:

In checking over the forecast of the proposed Cincinnati School water well, I have discovered several points which demand revision and correction. I am, therefore, submitting the following as a final corrected report. Some of the following statements are quoted from my earlier letters.

The elevation of the school grounds at Cincinnati is considered to be 1031 feet. Glacial drift composed essentially of clays mixed with silt sand and some gravel pebbles are at the surface and continue to a depth of 90 to 100 feet. It is reported that no sand or gravel bed capable of producing the required supply of water is present within the glacial drift. However, if a water-bearing zone is encountered every effort should be made to develop it because water from that source is the softest available in the area.

The Pennsylvanian coal measures which underlie the glacial drift consist of shales, coals, thin limestones, and sandstones as shown by the attached revised log. Locally, especially near the base, the sandstones are water bearing.

Beneath the coal measure formations are rocks of the Mississippian system composed chiefly of limestones with a few thin shales near the top. Often there is a sandstone near the top of the Mississippian formation in south central Iowa. The limestones and sandstones contain water to the north of Cincinnati, and it is believed that they will be found productive at your well site, although it may be necessary to drill 100 feet or more into them before an adequate supply is obtained.

School Board:

From the information available I would suggest that a well be started with such a diameter that it could be carried to a depth of 625 feet if necessary. There appears to be little hope that an adequate supply will be found within the glacial drift, but if encountered it should be developed. If not, drilling should be carried down into the Pennsylvanian where the possibilities of striking a water-bearing sandstone above a depth of 525 feet are fair. However, drilling should be carried well into the Mississippian if no water is encountered in the Pennsylvanian. I believe that the chances of obtaining a sufficient quantity of water for your needs above a depth of 630 feet are good.

In any event, the well should be cased through the entire depth of the Pennsylvanian which is drilled, except for the producing formation, because the shales cave and would in time fill the hole. Waters from the coal beds or very small supplies from sandy shales should be carefully kept from the well because of their extremely high mineral content.

Waters from the Pennsylvanian and Mississippian are relatively hard and vary from place to place. Hardness from 298 to 446 parts per million has been reported from the Pennsylvanian, and from 564 to 1252 from the Mississippian. These hardness values may be reduced roughly to grains per U. S. gallon by dividing by 17.

I trust that samples will be saved of each five-foot interval of drilling and that an accurate log of the well will be kept. We will be glad to furnish sample bags and log books if notified prior to the time that drilling is to start.

Very truly yours,

HGH:LM

A. G. Hershey

CC: C. E. Richey
J. M. Schlicher
Mr. Paul Davis, Supt. Schools
Mr. Art Bruinekool
Mr. Sylvan Ames

DIRECTORS
J. M. Reed C. E. Samson
Clarence Milner
L. E. Best L. A. Osborn

Cincinnati Public Schools

PAUL E. DAVIS - - Superintendent

Cincinnati, Iowa

OFFICERS
President - - - - J. M. Reed
Secretary - - L. C. McDonald
Treasurer - - - John Browitt

April 8, 1939.

Iowa Geological Survey,
H. G. Hershey,
Iowa City, Iowa.

Dear Mr. Hershey:

The deep well constructed by the McCutcheon Well Co., Des Moines, Iowa, was completed last week. The samples from five foot intervals was expressed to you as requested.

We were disappointed in obtaining only five gallons per minuite but the water seems to be of a good quality. Samples were sent to the State Health Department for water analysis.

The depth as you will notice from samples was six hundred forty feet with shale evidently below the limestone beginning at a depth of approximately 125 feet.

The log sent by your department was very useful and we did obtain some water from a sixty foot level and a 300 foot level but not sufficient for our use. Any other information which you would like regarding this well we will send gladly.

Please send a log as determined from the samples to the McCutcheon Well, Co., and the Cincinnati School.

Very truly yours,

Paul E Davis

DIRECTORS
J. M. Reed C. E. Samson
Clarence Milner
L. E. Best L. A. Osborn

Cincinnati Public Schools

PAUL E. DAVIS - - Superintendent

OFFICERS
President - - - - J. M. Reed
Secretary - - L. C. McDonald
Treasurer - - - John Browitt

Cincinnati, Iowa

January 24, 1940

H. G. Hershey
Iowa Geological Survey
Iowa City, Iowa

Dear Mr. Hershey:

In reply to your letter of January 22, I will be glad to furnish you with the final records on our well. The well is cased for a distance of 140 feet with 8" steel casing, from 140 feet to 375 with 6" steel casing and from 375 to 540 with 4" steel casing.

The final pumping test was approximately 6 gallon per minute at the end of ten hours.

The mineral analysis showed a hardness of only 60 parts per million with very little iron and manganese. The flouride content of 3 parts per million was considered too high for drinking purposes.

The well is equipped with the Myers Brother's pump and 1½ horse power century motor, with the cylinder set 387 feet below the ground surface. The water stands in the well at 165 feet with a temperature of 18 degrees centigrade.

Thank you very much for the information given us in preparation for drilling our well. We trust that the log obtained from our well will assist others in our locality who may wish information on the same.

Very truly yours,

Paul E Davis

Paul E. Davis

PED:RHL