Punched FCH

WRD Exp. (GW)
Aug. 1964

Verified PMJ

U. S. DEPARTMENT OF THE INTERIOR GEOLOGICAL SURVEY

Water Resources Division Well Schedule Form

MASTER CARD

Record by P. J. Horick Source of data Files Date 5/3/65 Map H. & T.

State Iowa (16) County (or town) Lyon (60)

Latitude: 43 18 44 N Longitude: 096 26 35 Sequential number: 1

Lat-long accuracy: 2 T. 98 N S, R. 47 W E Sec. 18, NW ¼, SE ¼, NW ¼ 5 PM B & M

Local well number: 098 47 W 18 b d 2 Other number: W-1344

Local use: 0349 40 CITY 1 Owner or name: INWOOD

Owner or name: INWOOD Address: INWOOD, 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, (C) Comm, (D) Dewatering, (F) Fire, (H) Dom, (I) Irr, (N) Ind, (P) R.S, Stock, (S) Instit, (T) Unused — P

Use of well: (A) Anode, (D) Drain, (G) Seismic, (O) Obs, (P) Oil-gas, (R) Recharge, (S) Spring, (T) Test, (U) Unused, (W) Withdraw, (X) Waste, (Z) Destroyed — W

DATA AVAILABLE: Well data 1 Freq. W/L meas.: INVENTORY 2 Field aquifer char.

Hyd. lab. data:

Qual. water data; type: COMPLETE — C

Freq. sampling: INTERMITTENT I Pumpage inventory: yes / no, period:

Aperture cards: yes / no

Log data: GEOLOGIST LOG — G

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD Depth well: 518 ft 518 Meas. rept 6

Depth cased; (first perf.) 405'8" ft 406 Casing type: STEEL; Diam. 8 in accuracy

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

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

Date Drilled: SPRING 1940 9 40 Pump intake setting: ft 37

Driller: Rasmussen, Sioux City

Lift (type): (A) air, (B) bucket, (C) cent, (J) jet, (L) multiple (cent.), (M) multiple (turb.), (N) nope, (P) piston, (R) rot, (S) submerg, (T) turb, (Z) other; Deep / Shallow D

Power (type): diesel, elec, nat gas, gasoline, hand, LPG gas, wind; N.P.; Trans. or meter no.:

Descrip. MP LSD ft above / below lsd, Alt. MP 1463

Alt. LSD: 1463 1463 Accuracy: (source) ALTIMETER 7

Water Level 27.1 ft above / below MP; Ft above / below lsd 27.1 Accuracy: 6

Date meas: 7 4 1 Yield: 60 gpm 60 Method determined

Drawdown: 78 ft 78 Accuracy: 6 Pumping period hrs

QUALITY OF WATER DATA: Iron 5.80 ppm 7 Sulfate 464 ppm 7 Chloride 8.5 ppm 0 Hard. 620 ppm

Sp. Conduct 1310 K x 10⁶ 5 Temp. °F Date sampled 2/26/59

Taste, color, etc.

098-47W-18 bdb

Well Number 43, 18, 44 (N/S) 096, 26, 35.1
(d m s d m s)

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD (1–19) | Physiographic Province: CENTRAL LOWLAND [1 2] (20–21) | Section: DISSECTED TILL PLAIN [C] (22)

Drainage Basin: [ ] (23–25) | Subbasin: [ ] (26)

Topo of well site: local depression, (D) flat surface, (F) hilltop, (H) hillside, (S) terrace, (T) valley flat, (V) [ ] (27)

MAJOR AQUIFER: Cretaceous (system), LOWER (series) [K 1] (28–29), Dakota Sandstone (aquifer, formation, group) [D 1] (30–31)

Lithology: [ ] [V] (32–33) | Origin: MARINE [6] (34) | Aquifer Thickness: [ ] ft

[ ] (35–37) Length of well open to: 98 ft | [9 8] (38–40) Depth to top of: 420 ft [4 2 0] (41–43)

MINOR AQUIFER: C or PC (system), [ ] (series) (44–45), [ ] (aquifer, formation, group) (46–47)

Lithology: [ ] (48–49) | Origin: [ ] (50) | Aquifer Thickness: [ ] ft

[ ] (51–53) Length of well open to: [ ] ft | [ ] (54–56) Depth to top of: [ ] ft [ ] (57–59)

Intervals Screened: [ ]

Depth to consolidated rock: [3 1 0] (60–63) ft | Source of data: WELL CUTTINGS [C] (64)

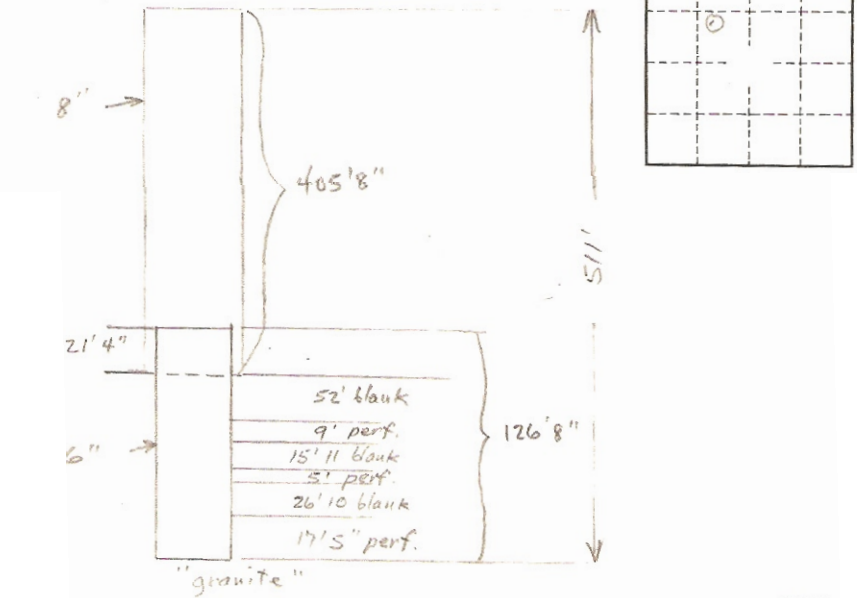
Depth to basement: [ ] (65–68) ft | Source of data: [ ] (69)

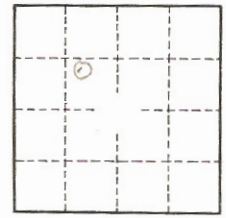
Surficial material: LOESS [Q] (70–71) | Infiltration characteristics: POOR [4] (72)

Coefficient Trans: [ ] (73–75) gpd/ft | Coefficient Storage: [ ] (76–78)

Coefficient Perm: [ ] gpd/ft^2; Spec cap: .79 gpm/ft; Number of geologic cards: [ ] (79)

Construction





GPO 844-225

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

W-1344

RECORD OF WELL

Location:

Town: Inwood (N E / S W); County Lyon

NW-SE-NW sec. 18 T. 98 N., R. 47 W. Richland Twp.

Well name and number Inwood Town well No. 1

Owner Town of Inwood Address

Tenant Address

Contractor Rasmussen Well Co. Address Sioux City (Leeds), Iowa

Drillers

Drilling dates Spring 1940

Well data:

Elevations: Drilling curb 1463 feet; Land surface feet

Determined by Hand level K.E. Anderson

Topographic position

Total depth: Reported 518 feet; Measured feet

Drilling method

Hole and casing data

(Give amount, size, kind, and depth of all casing; type and position of seals and packers; cementing; how finished--perforated pipe, screen, gravel pack, open hole, etc.)

Original depth to water 271 ft. below (above) curb Date July 30, 1941

Original elevation of water level 1192 ft.; Source of data E.J. Herzog

Sources of water: Principal ; Others

Production data: Date July 30-31, 1941

Static depth to water 271 ; Measuring point Curb Elev. 1463

Pumping level 349'+ at 60 g.p.m.

Specific capacity _____ g.p.m. per ft. drawdown; Temperature 57 °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 sampled	testing			
Sampled by				
Total solids				
Insoluble matter				
Alkalinity (Meo)	272			
Alkalinity (Phn)				
pH	7.1			
$Fe_2O_3+Mn_2O_3+Al_2O_3$				
Alkali as sodium	low			
Calcium	198.7			
Magnesium	54.6			
Iron (unfiltered)	0.8			
Manganese	trace			
Nitrate				
Fluoride				
Chloride	14.0			
Sulphate	487.5			
Bicarbonate	331.8			
Hardness (ppm)	722			
Hardness (gpg)	42.2			

Remarks _____

Laboratory data: Sample storage location _____

Sample range 5-518 No. spls. 103 No. dupls & cond. 36 poor

Spls. prepared by Summerfield Carrier Washed range _____ by _____

Driller's log and cond. Yes good

Insoluble residues: Prepared by _____ Studied by _____ Strip log _____

Microscopic study 300-518 strip log July 28, 1941 Elias

Gen. log _____ Correl. by Elias

Iowa
State Department of Health
DISTRICT HEALTH SERVICE NO. 3
HEADQUARTERS
Le Mars, Iowa

WALTER L. BIERRING, M. D.
COMMISSIONER
DES MOINES, IOWA

IN REPLYING
ADDRESS
E. J. Marzec
Public Health Engineer

July 7, 1941

H. G. Hershey
Assistant State Geologist
Iowa Geological Survey
Iowa City, Iowa

Dear Dr. Hershey:

At the request of the town officials of Inwood, I collected bacteriological and chemical samples from the recently drilled well. Mr. Kountz was requested to return a partial analysis as soon as possible. Please follow the sample so that the results will be received in a short time.

The well was pumped intermittently at 50 to 70 gpm. for two days. The sandstone was sloughing at times making the water turbid, which is the reason for the turbid sample.

Following is a log of the well:

0 - 5	Black soil
5 - 60	Yellow clay
60 - 65	Blue clay
65 - 75	Yellow clay
75 - 85	White & blue clay
85 - 115	Brown shale (sticky)
115 - 150	Blue clay
150 - 178	Black shale
178 - 188	Yellow joint clay
188 - 200	Gray shale
200 - 202	Rocks (large & small)
202 - 288	Black shale
288 - 310	Lime stone, grey sand
310 - 333	Black shale
333 - 350	Rock lime stone & shale
350 - 438	Black shale
438 - 448	Dirty sand stone
448 - 460	Grey shale
460 - 465	Sand stone
465 - 480	Dirty sand stone
480 - 485	Black shale
485 - 498	White lime stone
498 - 504	Sand stone
504 - 518	Sand stone & granite

Temp. 57° F.
pH 7.1
pH (after removing CO_2) 7.6

Water elevation and drawdown were unobtainable, as drawdown equipment was not installed. Howard Rasmussen was to get this information on the 5th.

Very truly yours,

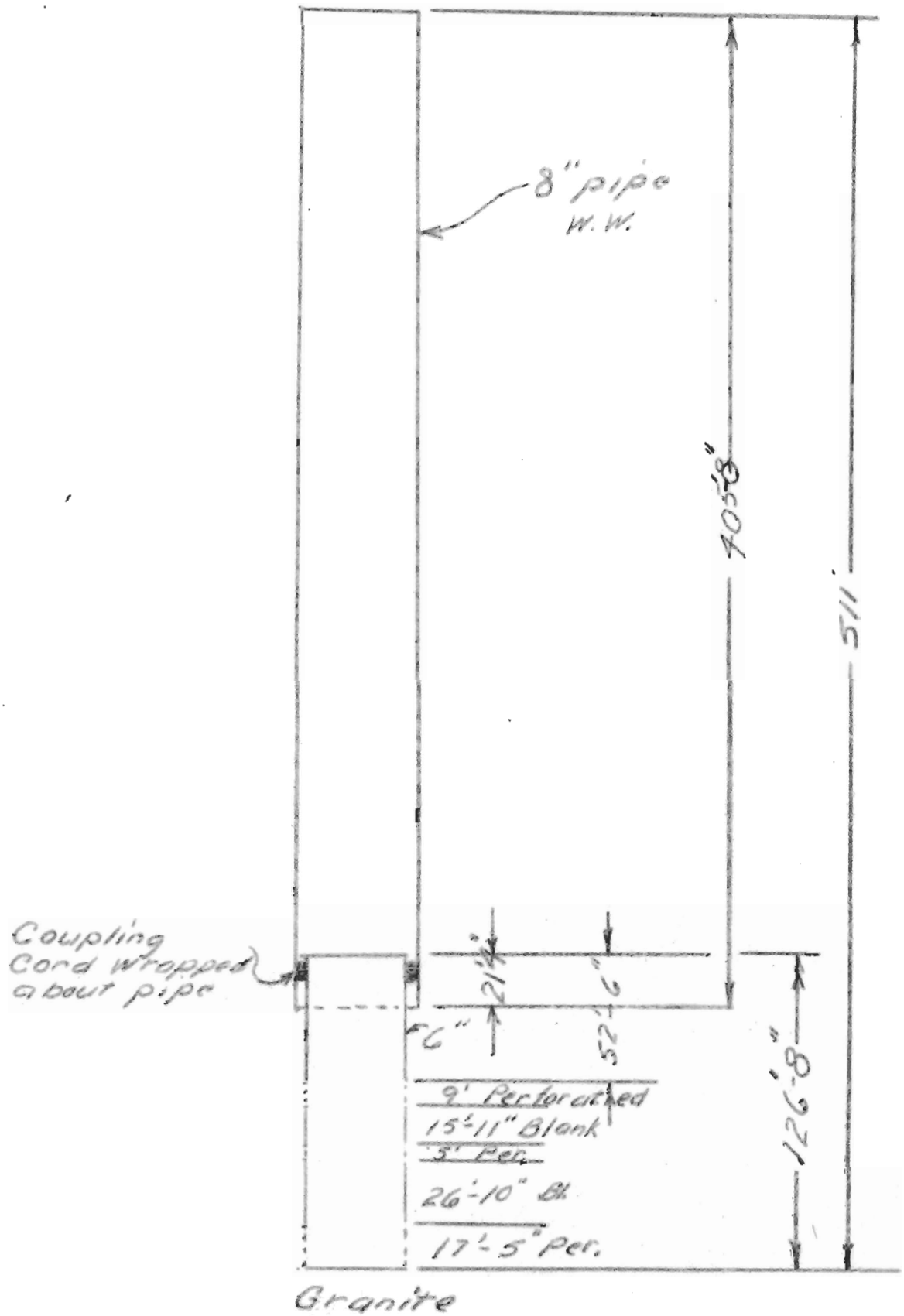
E. J. Marzec

E. J. Marzec
Public Health Engineer
Health District No. III
Le Mars, Iowa

ejm/ns

cc-A. H. Wieters
Iowa State Dept. of Health

INWOOD
July 3, 1941



WELL AT INWOOD, IOWA July 31, 1941

Pumping Period:	7:00 A.M., July 30 to 11:00 A.M., July 31
Static Level:	271 ft.
Drawdown:	78 + ft.
Operating Level: (Water drew down below air line)	349 + ft.
Lower Bowl Elevation: (No air was being pumped)	370 ft.
Rate of Pumping:	60 gpm.
Drawdown:	Rapid
Rate of Recovery: (Water in drop pipe will raise water in the well above the static level. Water will then recede to static level.)	

Office Copy

REPORT
ON THE
GEOLOGY AND UNDERGROUND WATER RESOURCES
OF
INWOOD, IOWA

Introduction

The town of Inwood is located in sections 17 and 18, T. 98 N., R.47 W. Richland Township, southwestern Lyon County, Iowa. According to the 1930 census the population is 670. The citizens have the usual occupations of a typical Iowa town surrounded by a farming district. There are no large industries and no abnormally large water consumers.

Topographically, Inwood is on the upland between the Big Sioux River four miles west, and Rock River ten miles east. No streams of consequence are nearer town than the Big Sioux River.

At the request of the Inwood town council and the Iowa Department of Health, T. W. Robinson of the U. S. Geological Survey and H. G. Hershey of the Iowa Geological Survey, visited Inwood on January 24, 1939 and made a reconnaissance study of the general geology and water possibilities of the immediate vicinity.

Normal Water Supply

At present Inwood depends primarily on two municipally owned wells for water supply. Both of these wells are

located in the southeastern portion of town (SE¼, SE¼, SE¼, Sec. 18, T. 98 N., R. 47 W.) and both have a curb elevation of 1469 feet above sea level. One is a deep drilled well, the other is a shallow dug well.

The deep well was drilled in 1917 by the McCarthy Well Company of Minneapolis, to a depth of 990 feet, where Sioux quartzite or some other basement rock was encountered and drilled into for a short distance. No appreciable amount of water was reported below a depth of 334 feet and the well was completed by placing a 20-foot screen from 314-334 feet. The reported diameter of the hole is 12" and the static water level 264± feet. Inhabitants report that the water is exceptionally hard, a fact substantiated by mineral analysis. This well will deliver 22 gallons of clear water for an indefinite period of time, but when production is increased to 28 g.p.m. the water brings up sand.

The shallow well is 93 feet deep and approximately seven feet in diameter. It will produce 85 g.p.m. for a period of two hours before pumping dry, but must then be allowed to rest for some time before efficient pumping can be resumed.

Numerous privately-owned wells are utilized by the residents of Inwood.

Geology of the Area

Loess is at the surface in the vicinity of Inwood. This deposit is very fine, wind-blown material derived from the west. It is composed primarily of equigranular quartz, and is so fine grained that drillers often refer to it as yellow clay.

Beneath the loess are the glacial drift formations composed of sandy and silty clays containing numerous pebbles and some boulders, with a few beds of sand and gravel. Immediately below the loess is the yellow Kansan drift followed by gray or blue Kansan drift, followed by Aftonian sand and gravel, the base of which should occur at approximately 100-145 feet. Beneath the Aftonian occur the Nebraskan yellow and gray clays, silts and sands, and gravels to a depth of approximately 335 feet.

Usually shales, limestones, siltstones, and sandstones of Cretaceous age underlie the glacial drift in northwestern Iowa. From what is known of other wells, Carlisle shale should occur beneath the drift at Inwood and be followed in depth by the Greenhorn limestone, shale and possibly sandstone, the Graneros shale and the Dakota sandstone. Under normal conditions the top of the Dakota sandstone should occur at about 520 feet. However, there is reason to believe that conditions are not normal at Inwood.

In the deep well now in use and in a hole 550 feet deep drilled a short distance from it, no water bearing sandstone such as the Dakota was reported. It is probable that the sandstone is high in shaly material at this point, which would hinder or prevent the passage of water; or there is some structural feature present which disturbs the normal occurrence of the Dakota sandstone.

From one interpretation of the log of the deep well at Inwood the top of the Dakota sandstone may occur at a depth of 475 feet, which suggests the presence of a structure. The only way to determine if a structure is present at Inwood is to study samples of well cuttings from a drill hole in that vicinity. No samples are available at present.

Water Possibilities

Small water supplies are sometimes obtained from the loess, but because the water producing value of loess depends almost entirely on rainfall and because wells into loess are among the first to fail during dry seasons, it should not be developed for a town supply.

Within the glacial drifts the beds of sand and gravel are the principal water producers. Large amounts of water may be obtained from them in certain localities. There are several sand and gravel beds underlying the area adjacent to Inwood. One zone is that encountered between depths of 90-143 feet in the town and utilized for numerous private water supplies and the shallow town well. A second sand zone occurs 150-200 feet lower and is believed to represent the basal Nebraskan drift. This source is utilized by the deep well at Inwood and many other wells in Lyon County obtain water from one or the other of the glacial sand or gravel beds.

The mineral content of these glacial waters is shown by Table I. Although water of this type is now being used by the town of Inwood almost entirely, it is of such character that it can not be recommended for public or even domestic use. Hardness, sulphate, iron, lime and magnesium are high and beyond a reasonable limit. The present town wells are included in this group.

The only exception to the highly mineralized zones within the glacial drift are those sand and gravel bodies which occur at very shallow depth; less than 50 feet. Occasionally they yield a sufficient quantity of soft water for a town supply. A deposit which may be of this type is reported southeast of Inwood. It is suggested that a competent driller be employed to drill a test hole into this

TABLE I

Principal Constituents of Water from Glacial Drift
Lyon and Sioux Counties
(Shown in parts per million)

	1 Inwood	2 Larchwood Bontje Bros.	3 Larchwood	4 Ireton	5 Inwood
Dissolved Solids	2993.0	1982.0	2043.	2211.0	
Sodium & Potassium	48.2	83.41	54.10	118.5	94.4
Calcium	243.9	307.1	389.50	280.9	460.9
Magnesium	316.2	117.6	111.20	169.0	167.3
Iron (unfiltered)	Tr.	6.25	4.5	2.0	1.7
Fluorine	0.0	0.50	1.5	Tr.	Tr.
Chlorine	10.0	6.0	7.0	7.0	13.0
Sulphates	1654.0	1042.5	1086.10	1123.0	1620.9
Bicarbonates	356.2	395.3	434.32	514.8	409.9
Hardness (Calculated)	1914.0	1264.0	1442.	1402.0	1844.
Hardness Grains per U. S. Gallon	111.9	73.9	84.3	81.9	107.8

1. Inwood well, depth 93 feet. Curb elevation 1469 ft.±. Sample No. 88315.
2. Larchwood well, Bontje Bros., southeast of Larchwood, depth 275 ft. Curb elevation 1460 ft.±. Sample No. 100018.
3. Larchwood, McMullen Farm, 3½ miles southeast of Larchwood, depth 465 feet.
4. Ireton, old well, depth 168 feet. Curb elevation 1368 feet ±. Sample No. 88493
5. Inwood, city well, depth 334 feet. Curb elevation 1469 feet.

deposit and run an adequate pumping test to determine the productivity and that the water be analyzed to determine its mineral content.

Waters of variable character are found in the Cretaceous sandstone formations of northwestern Iowa. The best of these from the standpoint of mineral content is from what has been called the "soft water zone." The Larchwood well and several wells in Canton, South Dakota derive water from this source, the character of which is shown in columns 3 and 4 of Table II. Many farm wells also utilize this source and its presence near Inwood is indicated by the analysis of water from the Hage Farm well (Column 1, Table II).

Water from this zone is much less mineralized and infinitely more suitable for town use than the present Inwood supply. No information is available at present regarding the amount of water available from it at Inwood.

Since subsurface conditions are not accurately known at Inwood it is difficult to forecast at exactly what depth the "soft water zone" may be expected. If a well is sunk in the town park it is believed that this horizon will be first encountered between 475-520 feet. It will then be necessary to drill for some distance into it before a pumping test is attempted, but drilling should not be carried below the shale which will underlie the sandstone before a pumping test is run. The distance that the sandstone is penetrated should not exceed 100 feet.

Not all water from the Cretaceous is of the best quality. The mineral analysis of water from the Jacobsen farm well (Column 2, Table II) shows one which is less desirable than that from the Hage farm, Larchwood and Canton wells, although it is of better quality than that now being used at Inwood. Complete test should be made before any well is finally accepted.

Conclusions and Recommendations

It is believed that "soft" water, with moderate iron and manganese content is available in the vicinity of Inwood. This zone should first be encountered somewhere between 430-480 feet. Special attention, however, must be given to developing the proper zone. No water should be accepted without critical production tests and chemical analysis. Care should be taken that the drilling is not carried below the "soft water zone" and a lower zone of poorer water developed, and that higher, more strongly mineralized zones are carefully excluded from the well. Care should also be taken that the "soft water zone" is properly developed to obtain the maximum water available, and if a screen is necessary, that the screen be of suitable slot opening.

These conditions can be fulfilled by proper supervision of the drilling and by examination of the well cutting samples so that the exact geologic formations can be identified. The proper construction and testing of the well can be assured by careful selection of the drilling contractor, preferably one

Table II

Principal Constituents of Water from Cretaceous

(Shown in parts per million)

	1 Inwood Hage Farm	2 Inwood Jacobsen Farm	3 Larchwood	4 Canton No. 1
Dissolved Solids				666.0
Sodium & Potassium	154.6	61.0	103.08	194.0
Calcium	72.2	252.3	115.76	30.0
Magnesium	22.7	70.5	29.16	13.0
Iron (unfiltered)	Tr.	0.9	0.9	0.5
Fluorine	1.6	Tr.	0.5	--
Chlorine	9.0	12.0	64.0	15.0
Sulphates	282.6	727.8	279.60	164.0
Bicarbonates	390.4	346.5	312.32	432.0
Hardness (Calculated)	274.	922.	411.0	128.0
Hardness Grains per U. S. Gallon	16.0	53.9	24.0	7.5

1. Inwood, Hage well, one mile north, 1 mile west of NW corner, depth 426 feet. Curb elevation 1447 feet.
2. Inwood, Southeast corner, Curb elevation 1464 feet, depth 440 feet. Jacobsen farm
3. Larchwood City well #1, depth 562 feet, curb elevation 1475 feet.
4. Canton, S. D., City Well No. 1, SW corner Dakota and 9th Sts. T. D. 306 ft. Curb elevation 1280 ft.

who has had considerable experience in drilling the Cretaceous rocks.

Since the location at the present wells has proven unsatisfactory for developing an adequate water supply it is suggested that the new well be located in the northwestern portion of the city park as far away from the present wells as possible. This location is suggested because it is within the town limits and some distance from the present wells. However, the distance from the present wells may not be sufficient to allow the necessary change in subsurface conditions and a second location at a greater distance may be necessary. Therefore, arrangements should be made with the drilling contractor so that he be paid a fair price for drilling the first well, but that the town be credited with any casing or other materials which may be reclaimed from the well if a second well is necessary.

If a deep well is constructed it should be tightly cased to the top of the water producing zone. It is believed that cast iron pipe will withstand the corrosive effect of the highly mineralized glacial waters more effectively than any other type.

As suggested earlier in this report it may be possible to obtain a very shallow well southeast of town. Before starting a well of this type, the sand or gravel should be thoroughly tested.

038-47W-18 BDB

KDD

UNITED STATES DEPARTMENT OF THE INTERIOR
Geological Survey
Water Resources Division

Inwood town well No. 1 (1940)
W-1344
"Preliminary analysis"

Water Quality
(ppm)

Card Q

State: Iowa (1 2) 16 County: Lyon (3 4) 60 Town: Inwood

Well No. Latitude 43 18 44 N (5–11) Longitude 096 26 35 (12–18) Seq. No. 1 (19) Date M 05 D 27 Y 41 (20–25)

Sampling Depth 518 (26–29) Type 1 (30) Kx10^6 (31–35) pH 7.1 (36–38) Temp. °F (39–41)

SiO_2 (42–44) Ca 199 (45–49) Mg 55 (50–53) Na (54–58) K (59–61)

HCO_3 332 (62–65) CO_3 0 (66–67) SO_4 488 (68–72) Cl 14 (73–78) Source No. (79–80)

Card R

Duplicate Columns 1-25 from Card Q

F (26–28) NO_3 (29–32) PO_4 (33–35) B (36–38) Al (39–41) Fe .80 (42–45)

Mn (46–49) Cu (50–52) Pb (53–54) Zn (55–57)

Solids Determined 1020 (58–63) Calc. (64–69) Hardness Ca,Mg 722 (70–73) Non-Carb. (74–77)

Color (78–79) No. R (80)

Card S

Duplicate Columns 1-25 from Card Q

Br (26–28) I (29–31) Alk. as $CaCO_3$ (32–35) Free CO_2 (36–38) SAR (39–41)

RSC (42–44) ABS (45–47) (48–50)

Alpha (pc/l) (55–57) Beta (pc/l) (58–60) Ra (pc/l) (61–63) U (ug/l) (64–66)

No. (80)

Verified PMJ

Recorded by: P.T. Hornick

Punched by: Punched FCH Date:

Published:

093-47W-18BDB

KDD

UNITED STATES DEPARTMENT OF THE INTERIOR
Geological Survey
Water Resources Division

Town well No. 1 (1940)
W-1344

Water Quality
(ppm)

Card Q

State: Iowa 16 (1-2) County: Lyon 60 (3-4) Town: Inwood

Well No. Latitude 43 18 44 N (5-11) Longitude 096 26 35 (12-18) Seq. No. 1 (19) Date M 02 D 26 Y 59 (20-25)

Sampling Depth 518 (26-29) Type 1 (30) Kx10^6 .310 (31-35) pH 7.3 (36-38) Temp. °F (39-41)

SiO_2 14. (42-44) Ca 151. (45-49) Mg 59. (50-53) Na 57. (54-58) K 1.8 (59-61)

HCO_3 332 (62-65) CO_3 0 (66-67) SO_4 464. (68-72) Cl 85. (73-78) Source No. 3 (79) Q (80)

Card R

Duplicate Columns 1-25 from Card Q

F .8 (26-28) NO_3 .9 (29-32) PO_4 (33-35) B (36-38) Al (39-41) Fe .58 (42-45)

Mn .08 (46-49) Cu (50-52) Pb (53-54) Zn (55-57)

Determined Solids .020 (58-63) Calc. (64-69) Ca,Mg Hardness 620 (70-73) Non-Carb. 348 (74-77)

Color (78-79) No. R (80)

Card S

Duplicate Columns 1-25 from Card Q

Br (26-28) I (29-31) Alk. as $CaCO_3$ 272 (32-35) Free CO_2 (36-38) SAR (39-41)

RSC (42-44) ABS (45-47) (48-50)

Alpha (pc/l) (55-57) Beta (pc/l) (58-60) Ra (pc/l) (61-63) U (ug/l) (64-66)

No. S (80)

Verified PMJ

Recorded by: P. J. Horick

Punched by: Punched FCH Date:

Published:

UNITED STATES DEPARTMENT OF THE INTERIOR
Geological Survey
Water Resources Division

Water Quality
(ppm)

Local Well No. 098-47W-18BDB
Aquifer Code(s) KD1
Owner's Name INWOOD, IA. CITY
W Number 1344

Card Q

State: IOWA [19] (1 2) County: LYON [60] (3 4) Town:

Well No. Latitude [43184 4 N] (5–11) Longitude [096263 5] (12–18) Seq. No. [1] (19) Date (M D Y) [06 30 66] (20–25)

Sampling Depth [518] (26–29) Type [1] (30) Kx10^6 [1340] (31–35) pH [7.5] (36–38) Temp. °F [55] (39–41)

SiO_2 [12.] (42–44) Ca [140.] (45–49) Mg [55.] (50–53) Na [57.] (54–58) K [18.] (59–61)

HCO_3 [337] (62–65) CO_3 [0] (66 67) SO_4 [455.] (68–72) Cl [9.] (73–78) Source No. [3] [Q] (79 80)

Card R

Duplicate Columns 1-25 from Card Q

F [.7] (26–28) NO_3 [.5] (29–32) PO_4 [ ] (33–35) B [ ] (36–38) Al [ ] (39–41) Fe [.98] (42–45)

Mn [.05] (46–49) Cu [ ] (50–52) Pb [ ] (53 54) Zn [ ] (55–57)

Solids Determined [998] (58–63) Calc. [ ] (64–69) Hardness Ca,Mg [577] (70–73) Non-Carb. [301] (74–77)

Color [ ] (78 79) No. [R] (80)

Card S

Duplicate Columns 1-25 from Card Q

Br [ ] (26–28) I [ ] (29–31) Alk. as $CaCO_3$ [276] (32–35) Free CO_2 [ ] (36–38) SAR [ ] (39–41)

RSC [ ] (42–44) ABS [ ] (45–47) [ ] (48–50) [ ]

Alpha (pc/l) [ ] (55–57) Beta (pc/l) [ ] (58–60) Ra (pc/l) [ ] (61–63) U (ug/l) [ ] (64–66)

No. [S] (80)

Recorded by: D. AARONSON

Punched by: T Date:

Published:

McCarthy WELL COMPANY
Well Drilling Contractors
SPECIALIZING IN WELL DRILLING SINCE 1860
Phone NESTOR 7566
NORTHWEST'S LARGEST WATER DEVELOPERS
MINNEAPOLIS & ST. PAUL
Address Reply to
670 EUSTIS ST.-ST. PAUL, MINN.

March 25, 1939

City well No. 1 (1917)

Iowa Geological Survey
Iowa City, Iowa

Dear Sir: Attention: Mr. H. G. Hershey

Received your letter of the 23rd asking for records of the Inwood Town well and also for samples of the well cuttings. The samples of well cuttings are saved only for a few years and then discarded. Our actual log of the well was destroyed some years ago in a fire and our information on this particular job is rather vague. The best information that we have available is that clay is 300', very thin vein of sand at about 300 to 305', and shale to 500' and the granite was struck at this point. I am very sorry that we have not further information on this particular job.

I would appreciate hearing from you if this log corresponds with what information you have in that immediate vicinity.

Yours very truly,

MC CARTHY WELL COMPANY

RB:lg

BY Roy Bergerson

occurrence of granite at 500' is abnormal for area.

H. G. H.
3/27/39

well drilled in 1917

WALTER L. BIERRING, M. D.
COMMISSIONER

State of Iowa
Department of Health
Des Moines

DIVISION OF
PUBLIC HEALTH ENGINEERING
AND INDUSTRIAL HYGIENE

December 13, 1940

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

Dear Mr. Hershey:

I have your letter of the 12th with reference to the water supply at Inwood, and am at a loss to understand why Mr. Marzec made a statement to you that I doubted the desirability of water which might be developed from the Cretaceous formations at Inwood.

For your information, I am enclosing copies of letters recently written to Mr. Marzec and to Mr. Cliff Pruitt, Town Clerk at Inwood, and you will note that in both letters I refer to your report.

I may have discussed this matter verbally with Mr. Marzec at sometime or other, but I do not recall such discussion. If I did, he certainly must have gotten the wrong impression as I certainly did not wish to raise any question in regard to your report. In speaking of the Cretaceous formations generally, I may have said something about undesirable waters which have been developed in the Cretaceous in the northwestern part of the state.

I shall write Mr. Marzec setting him right on the Inwood situation.

Thanking you for calling this to my attention promptly, I am

Very truly yours,

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

AHW/MM
Enc.
Copy to Mr. E. J. Marzec,
Health Dist. #1,
LeMars, Iowa.

Iowa
State Department of Health
DISTRICT HEALTH SERVICE NO. 1
HEADQUARTERS
Le Mars, Iowa

WALTER L. BIERRING, M. D.
COMMISSIONER
DES MOINES, IOWA

IN REPLYING
ADDRESS
E. J. Marzec
Public Health Engineer

December 14, 1940

H. G. Hershey
Assistant State Geologist
Iowa Geological Survey
Iowa City, Iowa

Dear Mr. Hershey:

My letter of December 10th to you was hurriedly written, with the result I did not fully amplify my statements. You have, undoubtedly, received correspondence from Mr. Wieters pertaining to the location of this well at Inwood. All his statements questioning this location refer to page eight of your report, which in brief is that there is a possible chance of not finding the Dakota sandstone under the proposed park location.

When the park location was approved for sanitary features, the paragraph referred to was read to Mayor Klein and Mr. Pruitt. The only reason this town is developing a new well is to obtain a softer water than is now being pumped. As your report brings out that the Dakota sandstone formation may not be encountered, unless the well be located some distance from the present well, I stressed this point.

Inwood is not in a financial condition, which would allow them to drill an expensive test hole, and then have to locate the well so that the water main will have to be extended a number of blocks. If there is a reasonable chance of missing the Dakota sandstone, it would be desirable to relocate the well at once, so that any money spent for drilling a test hole could be placed into a main extension.

It was emphasized by Mayor Klein and Mr. Pruitt that what was most desired was a soft water, and it is definitely known that a water of this nature can be obtained from the Dakota sandstone.

Any misinterpretations of statements made in the previous correspondence are entirely due to my not having given more attention to writing the letter, and I trust this corrects the impression you received from my letter of December 10th.

Very sincerely yours,

E. J. Marzec

E. J. Marzec
Public Health Engineer
Health District No. I

ejm/ns
cc-A.H.Wieters

December 31, 1940

Mr. Walter E. Buell
Buell & Winter Engineering Co.
Insurance Exchange Building
Sioux City, Iowa

Dear Mr. Buell:

We are glad to have your letter of December 27 and hope you will always write us when you have any criticism to make or learn of anything in the service we try to render which might lead to criticism on the part of others.

Our definite policy is to recommend no driller in preference to other drillers and to advise town councils and others to secure the services of consulting engineers. We do not propose to draw plans and specifications or in any other way to compete with private engineers. I believe you know and approve of this policy.

Since receipt of your letter I have gone over carefully all of the correspondence related to the well at Inwood and have conferred with Dr. Hershey. For the life of me I cannot see that there has been any departure from our regular procedure or policy in this case.

Dr. Hershey was called in to the Inwood project officially in January, 1939 through letters from Mr. William R. Mark, Jr. and Mr. A. H. Wieters of the State Department of Health. After the necessary studies in field, office, and laboratory, Dr. Hershey prepared the usual report copies of which were sent by request to you, Mr. Mark, Mr. Wieters, the mayor of Inwood, and the Thorpe Well Company.

Dr. Hershey's recommendations to the town of Inwood were as stated in his letter to you dated November 25, 1940. His only recommendation in regard to a driller was that a driller should be employed who

is experienced in the drilling of water wells in northwestern Iowa. Any one of four or five drillers would be qualified. And Dr. Hershey did specifically advise the employment of a consulting engineer and thought the mayor at least was in favor of doing so.

Personally, I do not know what more Dr. Hershey could have done to be entirely fair to all concerned. If you still feel that he should have acted otherwise I hope you will write me again. We are anxious to give the service expected of us without friction or competition of any kind.

Very sincerely yours,

A. C. Trowbridge

ACT:N

BUELL & WINTER ENGINEERING CO.
CONSULTING ENGINEERS
INSURANCE EXCHANGE BUILDING
SIOUX CITY, IOWA

PLANS REPORTS
ESTIMATES SUPERVISION
APPRAISALS

SEWERAGE PAVEMENTS
WATERWORKS SEWAGE DISPOSAL
POWER PLANTS

December 27, 1940

Iowa Geological Survey
Iowa City, Iowa.

Re: Inwood, Iowa
Waterworks Improvements

Gentlemen:

We desire to thank you for the letters of Mr. Trowbridge and Mr. Hershey regarding the above project.

It is our understanding that the municipality is contemplating going ahead with this improvement without an engineer from specifications furnished by the Rasmussen Well Company. It is a well-known fact that Mr. Rasmussen is one of the very best Well Contractors operating in northwest Iowa, and that he does excellent work. We are always very glad to see him secure a job on which we are serving as engineers. Somehow we have gathered from Mr. Hershey's letter, and on other prior well jobs, that Mr. Hershey is very favorable to the Rasmussen Company; and we naturally can see that this interest is prompted by Mr. Hershey's desire to see a contractor, familiar with the formations in northwestern Iowa, secure the well jobs, as he feels that with such a contractor there is more possibility of the municipality securing an absolutely satisfactory well. On the other hand we believe that, as a State Official, if he recommends the Rasmussen Well Company, he is laying himself open to possible criticism which ultimately might result in a great deal of unjustified criticism against your Department. We do not question Mr. Hershey's honest motives in this matter, but do believe that eventually such a procedure will result in unjust criticism of your Department.

We would rather judge from Mr. Hershey's letter that mentally he was making a comparison of the fact that the well at Hull was finally completed by a rotary drill, while other successful wells were completed by the use of a cable tool. The fact that the Well at Hull was part of a P.W.A. project, on which the low bid must be accepted, and the fact that the driller which the contractor had on the first job could not be considered as a first class workman, and other subsequent events which developed, does not mean that all of our work is to be handled that way.

In view of the fact that plans and specifications for water supplies must be prepared by a registered engineer and approved

by our State Department of Health, we believe your Department would do well to insist that before you give out information to these municipalities that they agree to employ a consulting engineer on their work who is registered to do business in the state of Iowa. This does not mean that they must employ the Buell and Winter Engineering Company, but they should and must employ some engineer. As it is now, after you have given these municipalities the necessary information and given them the same advice as indicated in Mr. Hershey's letter of November 25, they naturally feel that the service of an engineer is not necessary and that they can just as well contract their work with some responsible contractor. Such procedure as this eventually is going to reflect back on your Department from the engineering profession.

We trust you will give these matters careful consideration, and receive them in the same spirit in which they are given.

Yours very truly,

BUELL & WINTER ENGINEERING CO.

By- Walter E Buell

WEB:ER

To: Dr. H.G. Hershey

From: D.A. Davis

Subject: Inwood City Well

Date: May 23, 1941

From the top to 300 feet the cuttings are from glacial drift, which appears to be reworked Cretaceous shales.

From 300 to 310 feet is sand, medium to coarse, subround to angular with almost all grains highly polished.

From 310 to 315 feet is shale, medium gray, calcareous, rough shale structure; 5% sand and granules. Probably Cretaceous shale.

INCORPORATED

Town of Inwood, Iowa

LYON COUNTY

ADDRESS REPLY TO

INWOOD, IOWA

Inwood, Iowa.
June I6-I94I

INWOOD, IOWA

Dr H.G. Hershey,
Iowa. Geological Servey,
Iowa. City, Iowa.
Dear Dr Hershey,

I am in receipt of your letter regarding the samplies of the formation while digging the Inwood, City Well. I called Mr Russesen, at City City, and He told me that he would send these samplies to you, they are reaming out the well here now they are 520 feetdeep. while the water is quite hard it is very good tasting and a big improvement over the old city well, but we only a voluime or capacity of 30 gallon which I do not thinwill be enoughtas we get more uses of the city water if we can get fairly good water,

Yours very truly,

W.H. Klein, Mayor,

Iowa
State Department of Health
DISTRICT HEALTH SERVICE NO. 1
HEADQUARTERS
Le Mars, Iowa

WALTER L. BIERRING, M. D.
COMMISSIONER
DES MOINES, IOWA

IN REPLYING
ADDRESS
E. J. Marzec
Public Health Engineer

June 18, 1941

H. G. Hershey
Assistant State Geologist
Iowa Geological Survey
Iowa City, Iowa

Dear Dr. Hershey:

During a recent conference with Mr. Klein, Mayor of Inwood, he indicated his desire to complete the new well and connections in the near future.

According to the telphone conversation Mr. Klein had with Dr. Trowbridge, the hardness (42.2 grains) of the water was mentioned. As the acceptance of this well depends upon volume and quality of the water, Mr. Klein is interested in obtaining written confirmation of the hardness. If the examination has progressed to the point a partial analysis including hardness, iron, manganese and flourine can be submitted to Inwood, they would appreciate obtaining this data.

Only 30 gpm. was obtained from the well with a reasonable drawdown, (drawdown not mentioned). At the present time Rassmussen is under-reaming his open hole in an attempt to increase the flow of water. This work should be completed in several days, and the well tested.

Not being notified of the first test, I was not in Inwood at that time.

Very truly yours,

E. J. Marzec

E. J. Marzec
Public Health Engineer
Health District No. I

ejm/ns

Iowa
State Department of Health
DISTRICT HEALTH SERVICE NO. 1
HEADQUARTERS
Le Mars, Iowa

WALTER L. BIERRING, M. D.
COMMISSIONER
DES MOINES, IOWA

IN REPLYING
ADDRESS
E. J. Marzec
Public Health Engineer

June 21, 1941

H. G. Hershey
Assistant State Geologist
Iowa Geological Survey
Iowa City, Iowa

Dear Dr. Hershey:

The open hole in the Inwood well was reamed from six to eight inches in diameter. The water did not clear during the four hour pumping period, so no samples were obtained. After the reaming and before the pump was installed, a bailer was run into the well, and about eight feet of fill was found. Howard throught that it was the limestone, uncased, above the sandstone that was disintegrating. His opinion now is that the strata is a white shale. I suggested he check the cuttings with hydrochloric acid.

The six inch casing is to be driven beyond this shale or a piece of blank pipe installed. Additional column pipe is to be purchased and the well repumped about the first of the month.

Very sincerely yours,

E. J. Marzec
Public Health Engineer
Health District No. I

ejm/ns
cc-A.H.Wieters

July 15, 1941

Mr. E. J. Marzec
Public Health Engineer
Health District #3
State Department of Health
Le Mars, Iowa

Dear Mr. Marzec:

Your letter of July 14, regarding Inwood, has just been received. The State Water Laboratory sent us a report dated July 10 on a sample which you had collected on July 3, and I assumed that a copy of this report had been sent to you from your Des Moines office. For this reason I did not send out copies of the report to you or to the town of Inwood.

According to the laboratory report the soap hardness of the Inwood water was 700 p.p.m. After decantation the iron determination showed a trace and the manganese determination was 0.0. These were the only determinations made.

You realize, of course, that the soap hardness is not accurate and that in all probability most of the iron and manganese had precipitated by the time of the determination here at Iowa City, so that the decantation would virtually eliminate any iron and manganese that might have been present in the original sample.

Thank you very much for calling to my attention the fact that you district will be known henceforth as Health District #3.

Very truly yours,

H. E. Hershey