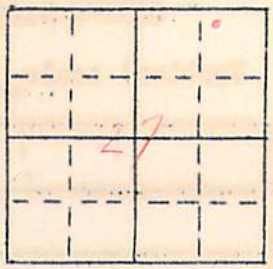
W-3443

Advanced Topo
Prairie du Chien SW
- well located sec. 22 SWSESE Mac 1998

IOWA GEOLOGICAL SURVEY
In Cooperation with U. S. Geological Survey
RECORD OF WELL



Location:

Town: McGregor (N E / S W): County Clayton

NW-NE-NE sec. 27 T 95 N., R. 3 W. Mendon Twp.

Well name and number McGregor City Well No. 5

Owner City of McGregor Address McGregor

Tenant (Raymond Trygg, supt.) Address

Contractor Layne-Western Address Ames, Ia

Drillers Nels Holmer

Drilling dates October 1 1948 – November 30, 1948

Well data:

Elevations: Drilling curb ____ feet; Land surface 635 feet

Determined by

Topographic position Valley of Miss. River

Total depth: Reported 645 feet, Measured ____ feet

Drilling method

Hole and casing data 15" 282', 12" 363 – 72' of 16" pipe; 282' of 10" pipe

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

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

Sources of water: Principal ____; Others ____

Production data: Date _____

Static depth to water Flow Measuring point _____
Pumping level 12 at 325 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	2/2/49	2/2/49	2/2/49	
Sampled by	K.E.Andersen	K.E.Andersen	K.E.Andersen	
Total solids		2067	2063	
Insoluble matter		15.5	14	
Alkalinity (Meo)	252	250	248	
Alkalinity (Phn)	0	0	0	
pH	7.7	7.6	7.6	
Fe_2O_3+ Mn_2O_3+Al_2O_3		6.0	4.0	
Alkali as sodium		616.6	571.1	
Calcium		116.5	115.6	
Magnesium		47.6	47.8	
Iron (unfiltered)	1.0	1.	0.8	
Manganese		0	0	
Nitrate		0	0	
Fluoride		0.7	0.7	
Chloride	830	875.	810	
Sulfate		315.6	325.3	
Bicarbonate		305	302.6	
Hardness (ppm)		489	487	
Hardness (gpg)		29.5	29.4	

Remarks _____

Laboratory data: Sample storage location _____

Sample range _____ No. spls. _____ No. dupls. & cond. _____

Spls. prepared by _____ Washed range. _____ by _____

Driller's log and cond. _____

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

Microscopic study 0-646 strip log ✓

Gen. log _____ Correl. by M. Parker

W#3443

IOWA GEOLOGICAL SURVEY
Iowa City, Iowa
Water Analysis Report

County Clayton Date Sampled about 1910

Town McGregor Sampled by

Location of well sec. 22(?), T. 95 N., R. 3 W. Twp.

Owner City of McGregor Well No. 2 (1877) Depth 1,006 Ft.

Type of well Static level ft. Curb elevation 632 Ft.

Producing Formation(s) Sss below Dresbach Depth range

Notes on condition of well, casing, or formations:

Dissolved constituents and properties (in parts per million except as indicated):

Silica (Si_2O)	6	Dissolved solids	2585 ±
Iron (Fe)		Hardness (calc. as $CaCO_3$)	
Manganese (Mn)		Total	482
Calcium (Ca)	160	(as grains per gallon)	
Magnesium (Mg)	44	Carbonate	417
Sodium and potassium (Na+K), as sodium	706	Noncarbonate	65
Carbonate (CO_3)		Alkalinity (as $CaCO_3$)	417
Bicarbonate (HCO_3)	509	pH	
Sulfate (So_4)	465	Specific Conductance (micromhos at 25°C.)	
Chloride (Cl)	968	Temperature (°F)	55
Fluoride (F)			
Nitrate (NO_3)			

Analysis No. Date analyzed I.G.S. well No.

Remarks: From I.G.S. Vol. 21, p. 169 + 252

2 copies Iowa Geol Survey
3 copies State Health Dept.

wd3443
Mineral 2924
Bottle 103
IV

MRM

THE STATE UNIVERSITY OF IOWA
STATE HYGIENIC LABORATORIES
IOWA CITY

FEB 4 1949

No. 1221

Mineral Water Analysis

(Parts per Million)

2-2 19 49

Town McGregor County Clayton Source City well #5; 645' drilled at pump Constructed Nov. 48, pumped 12 hrs. @ 250 g.p.m.

Collected by K.E. Anderson for Ia. Geol. Survey on Jan. 18 19 49

Rec'd 1-25-49

Total Solids 2063 Suspended Solids Dissolved Solids

Turbidity None Coefficient of Fineness Color pH 7.6 on 1-25-49

Alkalinity (to MeO) 248 Alkalinity (to Phn.) 0 Free Carbon Dioxide

Insoluble Matter 14 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+	571.1	x 0.0435 =	24.843	N as NO_3^-	0	x 0.0714 =	
K+		x 0.0256 =		F^-	0.7	x 0.0526 =	.037
Na+		x 0.0435 =		Cl^-	810.	x 0.0282 =	22.842
Ca++	115.6	x 0.0499 =	5.768	SO_4^{--}	325.3	x 0.0208 =	6.766
Mg++	47.8	x 0.0822 =	3.929	HCO_3^-	302.6	x 0.0164 =	4.963
Total (Fe++)	0.8	x 0.0358 =	---	CO_3^{--}	None	x 0.0333 =	
(Mn++)	0	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+ =	34.540			Sum rA⁻ =	34.608

Specific Conductance
K @ 25° = 314 x 10^{-5}

$$E = \frac{\text{Sum rM+} - \text{Sum rA}^-}{\text{Sum rM+} + \text{Sum rA}^-} \times 100 = .01 \text{ o/o}$$

Permitted error = 2%

Calculated Hardness as $CaCO_3$ = (Ca x 2.497) + (Mg x 4.115) + (Fe x 1.792) + (Mn x 1.822) = 487 p.p.m.

One space = _____ milligram equivalent

Soap Hardness = 550 ppm
32 gr/gal.

nrw

Assistant Director (Water Laboratory Division.)
A. Kurz

Ia. Geol. Survey 2 copies
Div.Pub.Health Engr. 3 copies

W# 3443 ✓ 3
Mineral #2925
Bottle #104

FEB 4 1949

#V

(High chlorides - over 1000 ppm)

THE STATE UNIVERSITY OF IOWA
STATE HYGIENIC LABORATORIES
IOWA CITY

No. 1222

Mineral Water Analysis

(Parts per Million)

Feb. 2 19 49

Constructed in 1876, City Well#2 40/ feet from well, 1006' drilled, — flowing @ 75/ gpm. Well hasn't been sampled in this past.

Town McGregor County Clayton Source

Collected by K.E. Anderson, for Ia.Geo. Survey on Jan. 18 19 49

Rec'd 1-25-49

Total Solids 2664 Suspended Solids Dissolved Solids

Turbidity None Coefficient of Fineness Color pH 7.5 on 1-25-49

Alkalinity (to MeO) 246 Alkalinity (to Phn.) 0 Free Carbon Dioxide

Insoluble Matter 14.0 Silica (SiO_2) $Fe_2O_3+Al_2O_3+Mn_2O_3$ 7.0

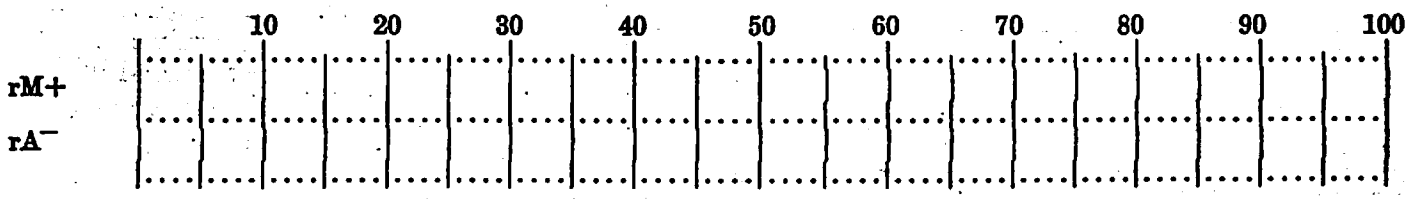
POSITIVE IONS.	r		rM+	NEGATIVE IONS.	r		rA⁻
N as NH_4+		x 0.0714 =		N as NO_2^-		x 0.0714 =	
Alkalies as Na+	733.4	x 0.0435 =	31.903	N as NO_3^-	0	x 0.0714 =	
K+		x 0.0256 =		F^-	0.8	x 0.0526 =	.042
Na+		x 0.0435 =		Cl^-	1020	x 0.0282 =	28.764
Ca++	137.5	x 0.0499 =	6.861	SO_4^{--}	474.7	x 0.0208 =	9.874
Mg++	58.9	x 0.0822 =	4.842	HCO_3^-	300.1	x 0.0164 =	4.922
Total (Fe++)	1.5	x 0.0358 =	--	CO_3^{--}	None	x 0.0333 =	
(Mn++)	0	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+ =	43.606			Sum rA =	43.602

Specific Conductance
K @ 25° = 403 x 10^{-5}

$$E = \frac{\text{Sum rM+} - \text{Sum rA}^-}{\text{Sum rM+} + \text{Sum rA}^-} \times 100 = .005 \text{ o/o}$$

Permitted error = 2%

Calculated Hardness as $CaCO_3$=(Ca x 2.497)+(Mg x 4.115)+(Fe x 1.792)+(Mn x 1.822)= 588 p.p.m.



One space = _____ milligram equivalent

Sample received in a container not prepared and sent out by this laboratory.

Principal Chemist

mlc

A.Kurz

2 copies - State Geol. Survey Wd 3443 coded 4/72 MRM
3 copies - State Health Dept.

STATE HYGIENIC LABORATORY IOWA CITY, IOWA
Water Laboratory Division
MINERAL ANALYSIS

Lab No. 7415
Mineral No. 2999
5-24-49 19....

MAY 27 19-9

Town McGregor County Clayton
Owner of Supply City of McGregor
Collector's Name Raymond Trygg for H.G. Hershey
Date Collected 5-6-49 Date Received 5-12-49
Report to: Name H. G. Hershey, Iowa Geological Survey
Address Iowa City, Iowa

Field Data

Source: Well Name, Number, Point of Collection, Depth, Construction Date, etc., McGregor city well #5

Well pumped .... hrs. at 250 ± gpm. Date of Previous Sample 1-18-49
Was sample free of turbidity when collected yes
Temperature °C..... Alkalinity (ppmCaCO$_3$) P..... T..... pH.....
Carbon Dioxide (ppmCO$_2$) ..... Iron (ppmFe) ..... Dissolved Oxygen (ppmO$_2$) .....
(Spl. quite hard & chloride high)

Laboratory Analysis
(Parts Per Million)

Specific Conductance K @ 25°C.... 305.8 .....x10^{-6} Turbidity .....
Insoluble Matter ..... 42 ..... $Fe_2O_3+Al_2O_3+Mn_2O_3$ (R_2O_3) ..23.....
Total Solids ..... 2066 ..... Dissolved Solids ..... Total Iron (Fe) .....0.3.....

Positive Ions	r		rM+
Na, K as Na+	511.3	x 0.0435	22.242
Na+	.....	x 0.0435	.....
Ca++	116.6	x 0.0499	5.818
Mg++	48.1	x 0.0822	3.954
Mn++	..0....	x 0.0364	.....
.....	.....		.....

Negative Ions	r		rA−
NO_3−asN	...0...	x 0.0714	.....
F−	7	x 0.0526	.037
Cl−	.747.4	x 0.0282	21.077
SO_4−−	.319.3	x 0.0208	6.641
HCO_3−	.300.1	x 0.0164	4.922
CO_3−−	..None	x 0.0333	.....
.....	.....	x	.....

Totals Sum rM+ 32.014 Sum rA− 32.677
Error...1.....% Permissable error on this sample...2....%

Calculated Hardness as CaCO$_3$ = (Ca x 2.497) + (Mg x 4.115) + (Fe x 1.792) + (Mn x 1.882) = ...490...ppm 28.6 ..gpg
Sample received in a container not prepared and sent out by this laboratory.
Date 5-16-49 pH 7.3 Alkalinity P 0 T 246

Analyst A. Kurz.
mrw

Principal Water Analyst

2 copies - State Geol. Survey
3 copies - State Health Dept.

W#3443 11/3/49 / coded 4h6 MRM

STATE HYGIENIC LABORATORY IOWA CITY, IOWA

Water Laboratory Division

MINERAL ANALYSIS

Lab No. 8775
Mineral No. 3087
11-2-49 .... 19....

Town ....McGregor.....County .....Clayton.....
Owner of Supply .....City of McGregor.....
Collector's Name ...Raymond Trygg.....
Date Collected ....10-13-49.....Date Received .10-25-49.....
Report to: Name H. G. Hershey.....
Address ....Iowa Geol. Survey, Iowa City, Iowa.....

Field Data

Source: Well Name, Number, Point of Collection, Depth, Construction Date, etc., .McGregor City well No. 5, at well, drilled 1948, depth 480 ft. (plugged back), flowing 100 gpm.....
.....
Well ~~pumped~~ flowing ..... hrs. at ..100..... gpm. Date of Previous Sample none at this depth.....
Was sample free of turbidity when collected.....yes.....
Temperature °C.....Alkalinity (ppmCaCO$_3$) P..... T..... pH.....
Carbon Dioxide (ppmCO$_2$) ..... Iron (ppmFe) ..... Dissolved Oxygen (ppmO$_2$).....
.....
.....

Laboratory Analysis

(Parts Per Million)

Specific Conductance K @ 25°C.....248.9.....x10^{-5} Turbidity .....
Insoluble Matter .....7.0..... $Fe_2O_3+Al_2O_3+Mn_2O_3$ (R_2O_3) .4.5.....
Total Solids ....1471..... Dissolved Solids ..... Total Iron (Fe) ....0.5.....

Positive Ions	r		rM+	Negative Ions	r		rA−
Na, K as Na+	421.9	x 0.0435	18.353	NO_3—asN	None	x 0.0714	---
Na+	.....	x 0.0435	.....	F−	0.6	x 0.0526	0.032
Ca++	102.9	x 0.0499	5.135	Cl−	575.	x 0.0282	16.215
Mg++	38.5	x 0.0822	3.165	SO_4−−	235	x 0.0208	4.888
Mn++	none	x 0.0364	----	HCO_3−	314.8	x 0.0164	5.163
.....	.....		.....	CO_3−−	none	x 0.0333	.....
				.....	.....	x	.....

Totals Sum rM+ 26.653 Sum rA− 26.298

Error..0.7....% Permissable error on this sample..2.3..%

Calculated Hardness as $CaCO_3$ = (Ca x 2.497) + (Mg x 4.115) + (Fe x 1.792) + (Mn x 1.882) = ~~416~~ 416 ...ppm. 24.3..gpg
Alkalinity P...none. T.258....pH.7.6..Date.10-26-49.....
Sample received in a container not prepared and sent out by this laboratory. Cap on jug was very rusty.....

Analyst .J.. Cerny..
mrw

Gilbert D. Nelson
Principal Water Analyst

Wt 3449 OCT 13 19[illegible] CODEO 4/76 MRM

STATE HYGIENIC LABORATORY IOWA CITY, IOWA

Lab No. 6429

Water Laboratory Division

Mineral No. 3259

MINERAL ANALYSIS

10-12 19 50

Town McGregor County Clayton

Owner of Supply Town of McGregor

Collector's Name W. E. Hale

Date Collected 9-24-50 Date Received 9-25-50

Report to: Name Iowa Geological Survey

Address Geology Annex
Iowa City, Ia.

Field Data

Source: Well Name, Number, Point of Collection, Depth, Construction Date, etc.,

McGregor town well #5 TD 481'

Well pumped ..... hrs. at ..... gpm. Date of Previous Sample .....

Was sample free of turbidity when collected Yes

Temperature °C..... Alkalinity (ppm$CaCO_3$) P..... T..... pH.....

Carbon Dioxide (ppmCO_2) ..... Iron (ppmFe) ..... Dissolved Oxygen (ppmO_2) .....

Sample collected from tap on discharge line letting tap flow at 5gpm for 11 hours with well shut down

Laboratory Analysis

(Parts Per Million)

Specific Conductance K @ 25°C. 337.8 x10^{-6} Turbidity .....

Insoluble Matter 18 $Fe_2O_3+Al_2O_3+Mn_2O_3$ (R_2O_3) 15

Total Solids 2066 Dissolved Solids ..... Total Iron (Fe) 1.9

Positive Ions	r		rM+	Negative Ions	r		rA−
Na, K as Na+	553.5	x 0.0435	24.077	NO_3—asN	None	x 0.0714	----
Na+	.....	x 0.0435	.....	F−	0.6	x 0.0526	.032
Ca++	120.8	x 0.0499	6.028	Cl−	792.5	x 0.0282	22.349
Mg++	49.6	x 0.0822	4.077	SO_4−−	318.7	x 0.0208	6.629
Mn++	None	x 0.0364	.....	HCO_3−	302.6	x 0.0164	4.963
.....	.....		.....	CO_3−−	None	x 0.0333	.....
				.....	.....	x	.....

Totals Sum rM+ 34.182 Sum rA− 33.973

Error 0.3 % Permissable error on this sample 2 %

Calculated Hardness as $CaCO_3$ = (Ca x 2.497) + (Mg x 4.115) + (Fe x 1.792) + (Mn x 1.882) = 509 ppm 29.7 gpg

Versenate Hardness 496 ppm or 29 g/gal

Hardness and chloride reported by phone to Geo. Survey 9-25-50

bh Alkalinity P 0 T 248 pH 7.6 Date 10-9-50

Analyst A. Kurz

Gilbert L. Kalsbeek
Principal Water Analyst

MRM

W#3443

STATE HYGIENIC LABORATORY, IOWA CITY, IOWA
WATER LABORATORY DIVISION
MINERAL ANALYSIS

LAB. NO. 29626
MINERAL NO. 5242
7-3 1957

TOWN McGregor COUNTY Clayton
OWNER OF SUPPLY Town of McGregor
COLLECTOR'S NAME C. E. Schreiner
DATE COLLECTED 6-24-57 DATE RECEIVED 6-25-57
REPORT TO: NAME Division of Public Health Engineering
ADDRESS Des Moines, Iowa

FIELD DATA

SOURCE: WELL NAME, NUMBER, POINT OF COLLECTION, DEPTH, CONSTRUCTION DATE, ETC., 6/24/57
#5 = Pump house = Well discontinued 1952

WELL PUMPED _____ HRS. AT _____ GPM. DATE OF PREVIOUS SAMPLE _____
WAS SAMPLE FREE OF TURBIDITY WHEN COLLECTED Yes
TEMPERATURE °C _____ ALKALINITY (ppm $CaCO_3$) P _____ T _____ pH _____
IS A POLYPHOSPHATE BEING USED? _____

LABORATORY ANALYSIS
(PARTS PER MILLION)

SPECIFIC CONDUCTANCE K AT 25°C 551 x 10^{-5}. TURBIDITY _____
DISSOLVED SOLIDS 293 SOLUBLE IRON (Fe) 1.4
TOTAL SOLIDS 293 SILICA (SiO_2) 3.6 TOTAL IRON (Fe) 1.4
ALKALINITY (ppm $CaCO_3$) P 6.0 T 30.0 pH 9.2 DATE 6-25-57

POSITIVE IONS		NEGATIVE IONS	
K^+	6.0	NO_3 – asN	<0.1
Na^+	91.0	F^-	0.9
Ca^{++}	9.2	Cl^-	160
Mg^{++}	3.4	SO_4^{--}	0.0
Mn^{++}	0.05	HCO_3^-	22.0
Al^{+++}		CO_3^{--}	7.2

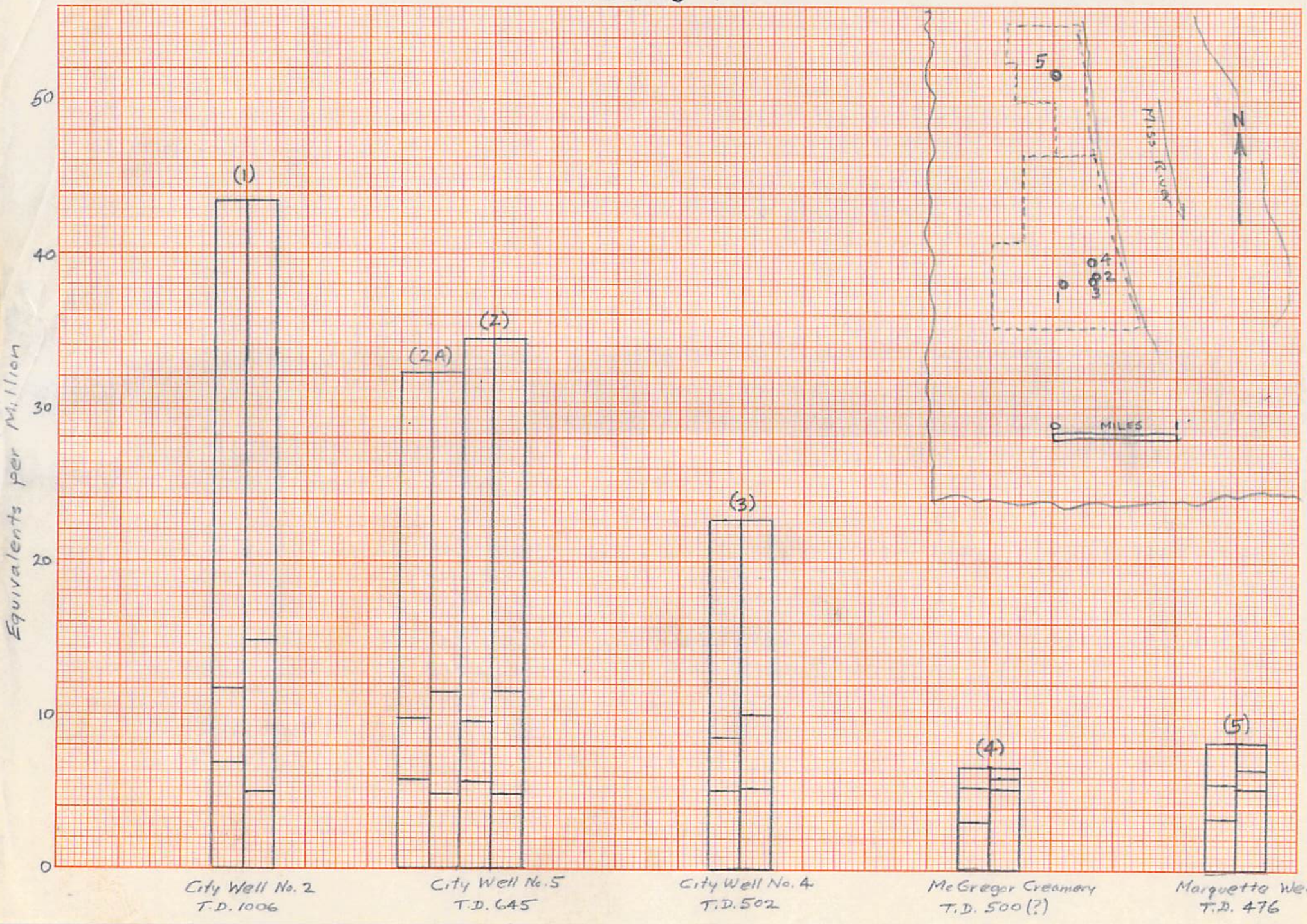
HARDNESS AS $CaCO_3$: 35 40.0 ppm 2.3 gpg 0

Clear when received.

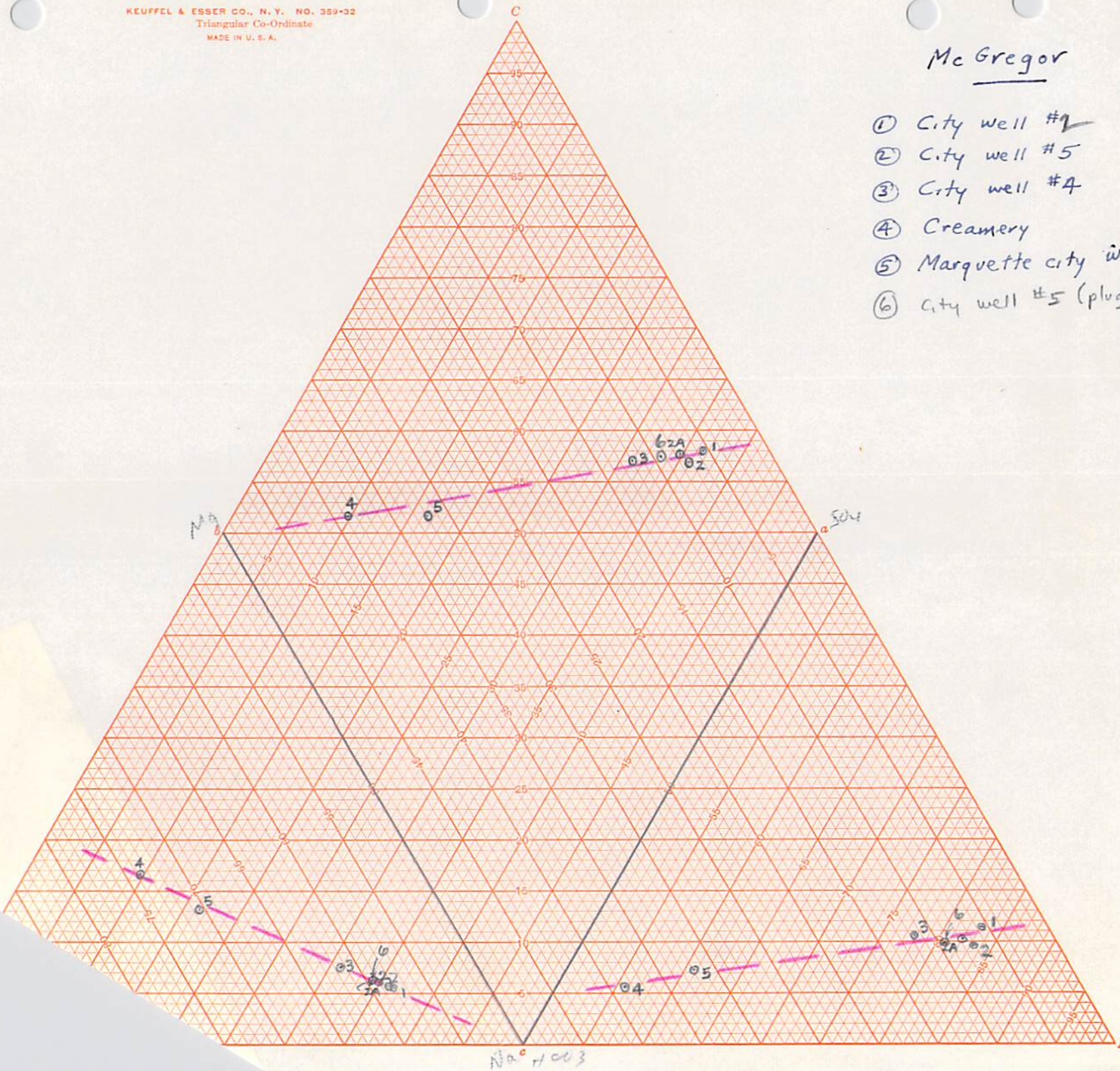
ANALYST Baughertz

R. L. MORRIS
PRINCIPAL CHEMIST

WATER ANALYSES
McGregor, Iowa



KEUFFEL & ESSER CO., N.Y. NO. 359-32
Triangular Co-Ordinate
MADE IN U.S.A.



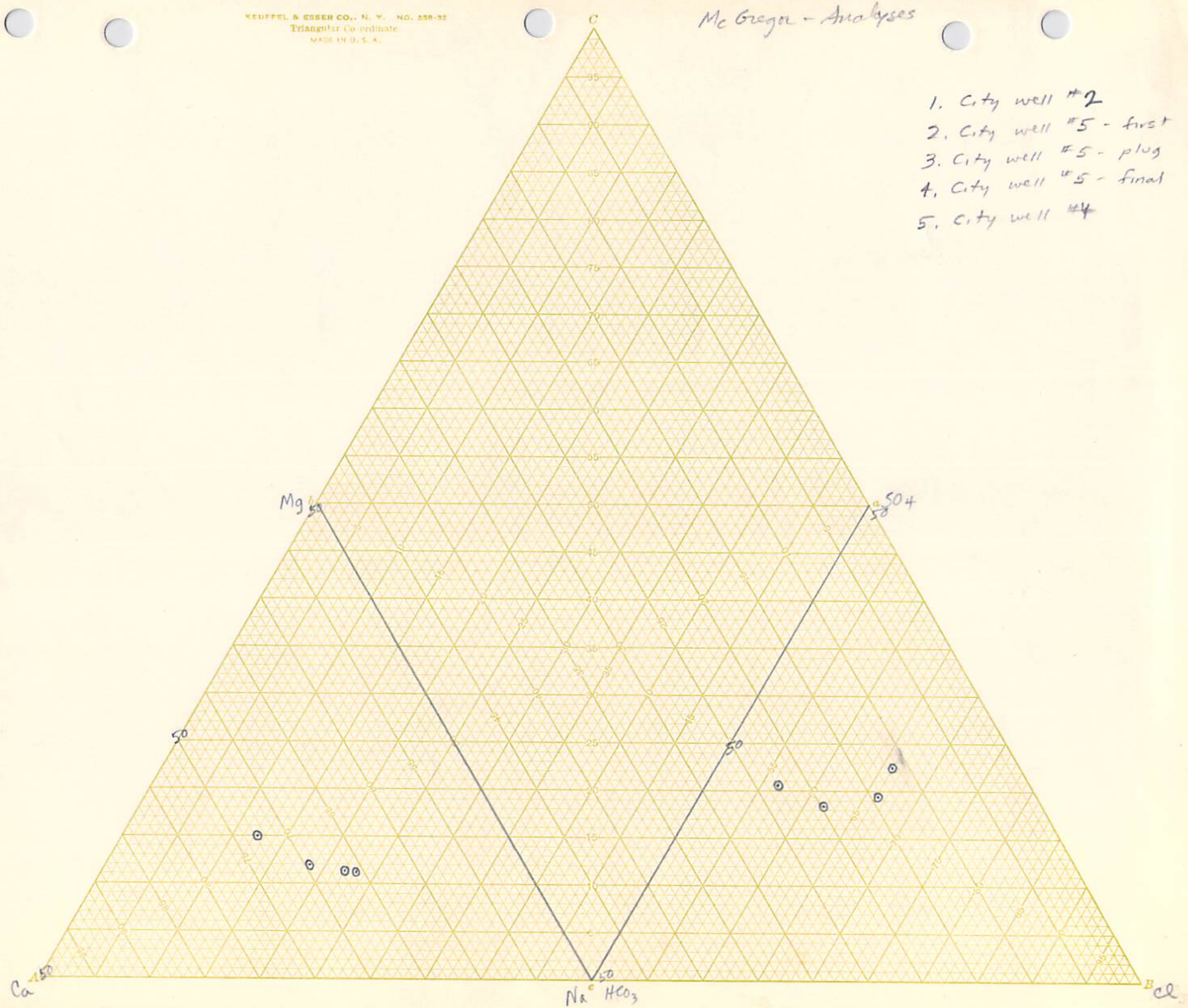
McGregor

1. City well #1
2. City well #5
3. City well #4
4. Creamery
5. Marquette city well
6. City well #5 (plug)

KEUFFEL & ESSER CO., N. Y. NO. 358-32
Triangular Co-ordinate
MADE IN U. S. A.

Mc Gregor - Analyses

1. City well #2
2. City well #5 - first
3. City well #5 - plug
4. City well #5 - final
5. City well #4



Clayton 1

January 27, 1950

Mr. J. F. Walter, Chairman
Board of Trustees
McGregor Municipal Utilities
McGregor, Iowa

Dear Mr. Walter:

In our letter to you of August 23, 1949, following the surveys made in your new well, we stated that if the new well were plugged back the chemical quality of the water should eventually be approximately the same as that formerly obtained from your old No. 4 well.

We are enclosing the results of analysis of a sample of water from the new well collected by Mr. Trygg on December 8, 1949. Along with this analysis, for purposes of comparison, we are sending the analysis of water from the old No. 4 well. You will note that there are essentially no differences between these two analyses.

It is our understanding that since plugging the well at a depth of 490 feet the well has continued to flow and satisfactory operation can still be carried on with the same centrifugal pumping equipment.

If you have any questions regarding these analyses, or if we can be of further assistance, do not hesitate to let us know.

Very truly yours,

Keith E. Anderson

KEA:LPS

Enc.

cc: Raymond Trygg, McGregor Municipal Utilities
Layne-Western Co., Ames
H. B. McAllister, Dept. of Health, Decorah

Comparison of Water Analyses

McGregor, Iowa

(Values in parts per million)

Well	City Well No. 5	City Well No. 4
Date Sampled	12-8-49	10-14-45
Depth of Well	490 ft.	502 ft.
Total Solids	1335.	1390.
pH	7.5	7.5
Total Alkalinity (as $CaCO_3$)	260.	263.
Sodium and Potassium (as Sodium)	319.	325.
Calcium	102.	103.
Magnesium	40.	42.
Total Iron	0.6	0.6
Fluoride	0.6	0.7
Chloride	440.	454.
Sulphate	214.	225.
Bicarbonate	317.	321.
Calculated Hardness (as $CaCO_3$)	420.	430.
Specific Conductance ($\times 10^{-6}$)	226.	228.

Clayton Co.

MEMORANDUM

TO : H. G. Hershey

FROM: W. E. Hale

RE : McGregor Town Well

DATE: October 3, 1949

Mr. ~~Raleigh~~ Rollins Brooks called from Ames to inform us that they had backfilled the McGregor Town Well from 650 ft. to 490 ft. with gravel. This apparently reduced the flow considerably and appeared to effectively reduce the flow from the lower sandstone. Brooks now plans to fill the interval from 490 to 420 ft. with a heavy mix of neat cement. This may be expected to entirely shut off the flow from the lower sandstone. They may expect to get an adequate supply of water from the upper sandstone. An analysis of the water after the well had been backfilled with gravel did not appear to be greatly different from the water obtained before plugging back operations were undertaken. Mr. Brooks will let us know of the outcome of the job.

WEH:am

See Geophysical File for further data.

August 23, 1949

Mr. J. F. Walter, Chairman
Board of Trustees
McGregor Municipal Utilities
McGregor, Iowa

Re: Results of Surveys in McGregor City well No. 5

Dear Mr. Walter:

Research electrical surveys were made in your No. 5 well on August 19-20, 1949. Instruments used measured the hole diameter, fluid resistivity, formation self-potentials, and fluid flow. Fluid flow was measured with the well both flowing and shut in.

These data indicate that there are two principal water-bearing beds yielding water to this well as follows: 1) the "upper" sandstone comprising the section between the bottom of the 10-inch casing at 280 feet and a depth of approximately 410 feet, and 2) the "lower" sandstone comprising the section between a depth of approximately 530 feet and the bottom of the well.

With the well open at the flange just above land surface, the natural flow is approximately 225 gallons a minute. This total flow represents approximately 125 gallons a minute coming from the "lower" sandstone and 100 gallons a minute coming from the "upper" sandstone.

With the well shut in, the static water level is slightly more than 17½ feet above the top of the 10-inch casing flange. Under these conditions, approximately 60 gallons a minute circulates from the "lower" sandstone up the well bore and out into the "upper" sandstone.

The chemical quality of water now obtained by pumping the well 6 to 7 hours a day at a rate of 250 gallons a minute is essentially the same as that in the "lower" sandstone.

If the well is plugged back to a depth of 410 feet, we would anticipate that the static level of the water from the "upper" sandstone would be about 10 feet above the top of the casing. The well should then flow at a rate of about 100 gallons a minute when open at the top of casing and should yield about 250 gallons a minute with a pumping level of 15 to 20 feet below the top of casing.

The chemical quality of water from the "upper" sandstone alone will be similar to the present water until pumping has continued for enough time to remove the highly mineralized water that has been stored in the

"upper" sandstone since completion of the well last winter. If the well is plugged at 410 feet in the near future, the quality of water should improve after an estimated 3 weeks of continuous pumping at a rate of 250 gallons a minute. If continuous pumping is not feasible, the well should be allowed to flow to waste during nonpumping periods. This latter schedule would require an estimated 5 to 6 weeks to produce the improvement in quality of water. In the meantime, you may wish to allow the well to flow to waste during nonpumping periods. This procedure will reduce the time required to remove the highly mineralized water from the "upper" sandstone after the well has been plugged.

The chemical quality of water from the "upper" sandstone should eventually be approximately the same as that formerly obtained from your old No. 4 well. The improvement accomplished by the plugging will be a reduction in the sodium and chloride content of the present water.

The fact that the No. 4 well was in production at the time the present well was drilled probably accounts for the fact that no flow was present at the surface when the new well had reached a depth of 410 feet.

In plugging the present well it should be recognized that water is flowing up the well bore at the 410-foot level. The velocity of the water is estimated to be about 0.5 feet per second upwards when the well is flowing at the surface, and about 0.25 feet per second upwards when the well is entirely shut in. It would be desirable to eventually plug the entire well bore from the bottom of the present hole up to a depth of 410 feet. In any case, the plug should extend from 410 to 530 feet in the well. Care should be taken to see that the plug is watertight to prevent any further upward circulation of water between the "lower" and "upper" sandstones.

It may appear desirable to set a temporary plug somewhere in the interval between 410 and 530 feet to check the static water level and specific capacity of the "upper" sandstone.

We appreciate very much the opportunity to make these surveys in your well and hope that the results will be of assistance to you in planning any future work on the well. If the well is plugged, we will be anxious to learn of the results.

If you have any questions about any of the foregoing statements, or if we can be of further help do not hesitate to call upon us.

Very truly yours,

H. G. Hershey

HGH:KRA:AEH
cc: Raymond Trygg
R. W. Brooks
R. B. McAllister
File

February 22, 1949

Mr. Raymond A. Trygg, Superintendent
McGregor Municipal Utilities
McGregor, Iowa

Dear Mr. Trygg:

We are enclosing a summary of water analyses from your city wells 4 and 5, together with analyses of samples collected from the old city well No. 2 and the creamery well.

These analyses indicate the following:

1) Water from the old city well No. 2 is much more highly mineralized than any of the other waters analyzed.

2) Water from the present city well (No. 5) contains nearly twice as much sodium and chloride as was present in the No. 4 well. Water from the new well is also slightly harder and contains slightly more iron than that in the No. 4 well.

3) Water from the creamery well is quite low in mineralization, and is somewhat comparable with the water from the Marquette city well which has a total depth of 476 feet.

4) Graphical interpretation of these analyses indicate that the "normal" quality of wells 400 to 500 feet deep in this area is probably something like the water now obtained at Marquette or from the creamery well at McGregor. The mineralization of water from your city wells Nos. 4 and 5 can be explained by a mixture of this "normal" water with the highly mineralized water from deeper zones penetrated by the old No. 2 well.

It is rather difficult to explain the low hardness, as determined by the soap method by R. B. McAllister, of the sample of water collected from your No. 5 well approximately one day after completion of drilling. One explanation, eliminating the possibility of analytical error, is that the major portion of the producing rocks were partially sealed during drilling and that the well had not flowed for sufficient time to completely clear the hole and permit all of the deeper waters to enter the well.

It will probably be possible for you to improve the quality of water obtained from your No. 5 well by plugging it back to a shallower depth. It is extremely doubtful, however, that plugging back will make the water any better than the water that was obtained from your No. 4 well a short distance away.

It should be possible for you to obtain a much better quality of water by drilling another well at some distance from the known areas of mineralization. A location might have to be selected, however, that would require turbine pumping equipment or additional water main installation or both. If you consider drilling another well, we will be glad to assist you in any way possible.

In view of the information obtained thus far, it would appear to be very desirable to fill and seal the old city well No. 2 and, if another source of supply is developed, to partially or completely plug the No. 5 well. Some electrical surveys of these wells would probably furnish valuable information with regard to the proper method of plugging the wells and we would be glad to assist in this work. We are still negotiating for the cable and other equipment that I mentioned might be used in a study of your No. 5 well to attempt to determine the best place for a plug. There appears to be no need for immediate action on the plugging of the No. 2 well since it has been allowed to flow for so many years.

In order to complete our files on this problem, we would appreciate it if you could let us know the details of the plugging of your No. 4 well and also any reliable information that may be available in McGregor as to the depth or construction of the creamery well.

We trust that this letter satisfactorily summarizes the situation. If you have any questions concerning this report, or if we can be of further help, do not hesitate to let us know.

Very truly yours,

Keith E. Anderson

KEA:AEH
Enc.

SUMMARY OF WATER ANALYSES

McGregor, Iowa

Well	Total Solids	pH	Alkalinity	Sodium	Calcium	Magnesium	Total Iron	Boride	Chloride	Sulphate	Bicarbonate	Calculated Hardness	Soap Hardness	Specific Conductance (x 10^{-5})	Remarks (see below)
City Well No. 2	2664	7.5	246	733	138	59	1.5	1.8	1020	475	300	568	—	403	(1)
City Well No. 4	1403	—	272	320	98	43	0.4	0.0	478	225	332	424	—	—	(2)
	1350	7.5	263	325	109	42	0.6	0.7	464	225	321	430	—	228	(3)
	—	7.2	273	552	—	—	Tr.	—	643	169	333	333(a)	—	—	(4)
	—	7.5	—	337	94	41	1.7	—	456	210	—	403	—	—	(5)
City Well No. 5	—	—	—	—	—	—	—	—	—	—	—	188(a)	—	—	(6)
	—	—	—	—	—	—	—	—	—	—	—	—	183	—	(7)
	—	7.4	267	1270	—	—	1.4	—	1180	313	—	490	—	—	(8)
	—	7.5	—	525	125	51	1.6	—	804	270	—	521	—	—	(9)
	2067	7.6	250	617	117	48	1.0	0.7	875	316	305	489	520	333	(10)
	—	7.7	252	—	—	—	1.0	—	830	—	—	—	530	306	(11)
	2063	7.6	248	571	116	48	0.8	0.7	810	325	303	487	550	314	(12)
McGregor Creamery	319	7.7	260	31	64	27	0.2	0.4	23	37	317	272	—	55	(13)

(a) Probably determined by soap method

(1) Total Depth 1,006 ft. Well flowing at estimated 75 gpm. Sample collected Jan. 18, 1949. Analysis by Iowa Geological Survey.
(2) Total Depth 502 ft. Sample collected Aug. 28, 1934. Analysis by State Board of Health.
(3) Total Depth 502 ft. Sample collected Oct. 14, 1945. Analysis by Iowa Geological Survey
(4) Total Depth 502 ft. Sample collected Jan. 27, 1948. Analysis by General Filter Co.
(5) Total Depth 502 ft. Sample collected in 1946. Analysis by Infilco, Inc.
(6) Drilling depth of 585 ft. Sample collected in November 1948. Analysis by General Filter Co.
(7) Total Depth 645 ft. Well completed and flowing for about one day. Sample collected about Dec. 1, 1948. Field analysis by District Engineer, State Board of Health.
(8) Total Depth 645 ft. Well flowing for about 9 days. Sample collected Dec. 9, 1948. Analysis by General Filter Co.
(9) Total Depth 645 ft. Sample collected Jan. 3, 1949. Analysis by Infilco, Inc.
(10) Total Depth 645 ft. Well partially shut in but flowing approximately 10 gpm. for 9 hours. Sampled Jan. 18, 1949. Analysis by Iowa Geological Survey.
(11) Total Depth 645 ft. Well pumped 6 minutes at 250 gpm. Sample collected Jan. 18, 1949. Analysis by Iowa Geological Survey.
(12) Total Depth 645 ft. Well pumped 12 minutes at 250 gpm. Sample collected Jan. 18, 1949. Analysis by Iowa Geological Survey.
(13) Reported depth approximately 500 ft. Well flowing about 50 gpm. Sample collected Jan. 18, 1949. Analysis by Iowa Geological Survey.

File - McGregor - Clayton

MEMORANDUM

To: H. G. Hershey
From: B. Hayes
Date: November 17, 1948
Re: McGregor

R. W. Brooks called this morning and requested some information in regard to a well Layne-Western is drilling at McGregor.

He gave me the following information: They are now drilling at 500'. At approximately 430' went into some shale and had some brown shale streaked with sandstone from 430' to 465'. Now back in sandstone again. At 410' flowing 20 g.p.m. At 465' water level was 3' below derrick floor. Present pump and well located about 30' away, and is now lowering water in new well (more now than did 20' up).

Mr. Brooks would like to know about how much farther they will have to go to get an appreciable flow. He will call back between 4 and 5 this afternoon.

Mrs. Parker talked to Mr. Brooks at 4:45 and reported to him that he was probably drilling in the Eau Claire. Mr. Brooks wondered if the shale between 500' and 750' would require casing. They had been through a thick shale section just before reaching 500'. Mrs. Parker advised him that there would be shale in the section from 500' to 750' but it would probably stand without casing, as no thick shale section was anticipated. Mr. Brooks inquired about Lansing city well, as to depth and flow. He wanted to know if the granite section would occur at a lower depth at McGregor than at Lansing, and Mrs. Parker said she thought so. Evidently they are going to drill to approximately 750' in order to obtain a flowing well.

Mr. Brooks will not be in his office for a few days, but if he wants any further information he will call.

Anticipated section

St. Lawrence	20' - 140'
Franconia	140' - 315'
Galesville	315' - 375'
Eau Claire	375' - 575'
Mt Simon	575' -1075'?
Granite	1075'?

Clayton Co.

July 30, 1948

Mr. Raymond Trygg
McGregor Municipal Water Works
McGregor, Iowa

Dear Mr. Trygg:

We have been informed by Mr. S. R. Ames that you desire information on the ground-water possibilities at McGregor. The following information has been assembled from the files of the Geological Survey.

Sandstone and siltstone of the Trempealeau formation are exposed at the surface in and near McGregor. These rocks yield water in other parts of the state where they lie deeply buried, but could not be utilized for a municipal supply at McGregor.

The St. Lawrence dolomite and the shales and siltstones of the Franconia formation lie beneath the Trempealeau formation. These rocks do not yield any appreciable amount of water to wells in the vicinity of McGregor.

Water-bearing sandstones of the Dresbach formation underlie the Franconia. These sandstones are the source of water in the other city wells at McGregor and at Marquette. A well drilled at Marquette in 1917 for the C. M. St. P. and P. R.R. flowed 250 gallons per minute at a depth of 450 feet. The McGregor city well No. 4, drilled to a depth of 502 feet, reportedly furnished an ample supply of water.

It is believed that as much as 400 gallons of water per minute could be obtained from a well into the Eau Claire sandstone approximately 450 feet deep, assuming a starting elevation of 625 feet above sea level.

Although the city wells at McGregor and Marquette are approximately the same depth, the water obtained at Marquette is of much better quality (see attached analyses). The McGregor water is somewhat mineralized, particularly in dissolved sodium and chloride, probably due to the existence of at least one nearby well over 1000 feet deep. The more mineralized water from the deep well, under somewhat higher head, may have entered the sandstones at a depth of around 450 feet. It would seem desirable, therefore, to select the site for a new well as far from the old deep well as conveniently possible in an attempt to secure a better quality of water.

It would also be well to consider cementing the well casing in place throughout its entire length to minimize the corrosion effects that have been experienced in other wells in town.

An estimated geologic section at McGregor, based on a starting elevation of 625 feet, is as follows:

Formation and Character	Thickness (feet)	From (feet)	To (feet)
Pleistocene system (sand and gravel)	50±	0	50±
Cambrian system			
Trempealeau formation (sandstone and siltstone)	25±	50±	75
St. Lawrence formation (dolomite)	70	75	145
Franconia formation (shale, siltstone and sandstone, some dolomite)	165	145	310
Dresbach formation			
Galesville member (sandstone)	90	310	400
Eau Claire member (sandstone)		400	

Depths given are subject to revision for starting elevation and may have to be corrected somewhat once drilling has commenced and samples are available for examination.

When the contract for a new well is let, we would appreciate your requesting the driller to save samples of the formations penetrated from each five feet of drilling. We will be glad to furnish small cloth sacks and drillers log books for this purpose. The samples may be sent to us by express collect, at which time they will be examined microscopically. The information thus obtained is valuable in furthering our knowledge of the ground-water conditions in that part of the state.

I trust that the above information will be helpful to you. If we can be of any further assistance, do not hesitate to let us know.

Very truly yours,

H. G. Hershey

HGH:KEA:AEH
cc: S. R. Ames
Enc.

IOWA GEOLOGICAL SURVEY
Water Analysis Comparison
(Parts per Million)

	1	2	3	4	5	6
Town	McGregor	McGregor	Marquette			
Well Name	City No. 4	City No. 4 (?)				
Depth of Well	502		476			
Formation Source	Galesville		Galesville			
Water Level Below Curb	8					
[illegible] Elevation	625					
Sampled by	Pullan	H. G. Hershey	Pullan			
Date Sampled	Sept.14,1934	Oct.14,1945	Sept.14,1934			
Total Solids	1403	1350	649			
pH						
Insoluble Matter	17.8	3.0	4.4			
Alkalinity (MeO)	272.	263.	266.			
(Phn)	0.0	0.0	0.0			
Nitrate (NO_3)	0.0	0.1	0.0			
Sodium (Na) & Potassium (K)*	310.0	324.5	57.7			
Calcium (Ca)	98.0	102.6	67.5			
Magnesium (Mg)	43.4	41.9	29.0			
Iron (Fe)						
Iron (Unfiltered)**	0.4	0.55	0.25			
Manganese (Mn)	Trace	0.00	0.03			
$Fe_2O_3+Al_2O_3+Mn_2O_3$	3.0	3.0	1.8			
Fluoride (F)	0.0	0.7	0.0			
Chloride (Cl)	448.0	454.0	64.0			
Sulphates (SO_4)	224.8	225.1	59.0			
Bicarbonates (HCO_3)	332.0	320.9	324.5			
Carbonates (CO_3)	0.0	0.0	0.0			
Silica (SiO_2)						
Calculated Hardness***	424.	430.	288.			
Hardness (Grains per Gal.)	24.8	25.1	16.8			

*Na and K not separated, calculated as Sodium (Na): **Includes iron precipitated or flocculated after sample collected: ***Calculated as $CaCO_3$.